

THE NEW RIGHT STUFF:
SOCIAL IMAGINARIES OF OUTER SPACE AND
THE CAPITALIST ACCUMULATION OF THE COSMOS

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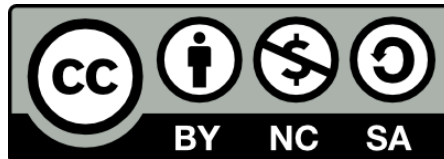
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ABSTRACT

THE NEW RIGHT STUFF: SOCIAL IMAGINARIES OF OUTER SPACE AND THE CAPITALIST ACCUMULATION OF THE COSMOS

TAYLOR R. GENOVESE

This thesis utilizes ethnographic and historical data in order to propose that the trajectory of outer space imaginaries—and therefore, as will be demonstrated, the future realities of outer space affairs—has drifted from peaceful exploration to violent exploitation due to the rise of private space corporations (operating under the moniker of NewSpace). This is partially due to the increasing acceptance of neoliberal capitalism within the United States—and much of the Global North—since the 1970s. Furthermore, NewSpace companies—which now possess multi-billion dollar contracts with governmental space agencies—are zealous adopters of neoliberal economics, and these philosophies are tied to colonial conceptions of the individual, limited governance, unchecked resource extraction, and frontier mentalities. These concepts became apparent during my multi-sited ethnographic investigations of NewSpace—as well as governmental—facilities and museums. This thesis argues that these hegemonic economic ontologies must be met with resistance from social scientists, science fiction authors, and the public in order to create a human future in outer space that is equitable, decolonized, and democratic.



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Field Notes – September 8, 2016 (Cape Canaveral, Florida):

I see the light and smoke first. The radiant fuel pours out of the rocket's engines and the glow is absolutely blinding—like the brilliant ball of light at the end of a welding tool. I have to squint and look away from the base of the rocket as if I am staring directly into the sun. Then the sound comes. Roaring ripples of sound, reflecting off the Banana River and ricocheting off of buildings before finally kicking me square in the chest. The reverberations rock through my body as this asteroid-interceptor spacecraft, nestled on top of a cylinder of explosives begins to pick up speed—punching through the thick atmosphere of our planet. Within a few seconds, it is nothing but a small point of light high in the eastern sky—in a few more seconds, it has vanished.

I walk down the observation gantry and sit in the cool grass while other spectators begin to file out of the enclosure. I look up into the reverent afterglow of the rocket's exhaust—the contrails swirling and slithering into sublimely beautiful colored shapes in the high winds of the stratosphere.

A mother and her son walk by. The mother asks her child what he thought of the launch. Clutching a toy rocket, he looks up at his mother and replies unabashedly and honestly:

"I have never seen quite a beautiful sight."

—

INTRODUCTION: THE ROOM TO DREAM¹

My love affair with outer space began as a child growing up in a rural community southeast of Tucson, Arizona. I hated it. Every day at school, I would hear the recounting of my classmate's weekends spent at water parks, miniature golf courses and arcades. My weekends were spent wandering the 2,000 acres of empty desert behind my parent's house, pretending I was the first human to walk on Mars. In fact, I held steadfast to my goal of becoming an astronaut from early childhood until sophomore year of high school, when the dreaded realization that my brain could not comprehend mathematics ruined my decade-long dream.

My nights were spent gazing at the foggy belt of the Milky Way—visible to the naked eye—as it swung slowly through the obsidian blackness of the sky above. From my adolescent viewpoint, living “in the boonies” was sometimes perceived as a detriment to my already lacking social life, but looking back today, these were the formative years for my research. A friend and I used to build our own rockets and cook solid rocket fuel in his mother's oven (kids, please do not try this at home). Some of our homemade missiles soared thousands of feet into the heavens and floated back to Earth on our homemade parachutes, while some spiraled wildly into fiery explosions on the desert floor. While certainly these acts of pubescent rocket science tipped the scales of the mortally dangerous, they also served as the best hands-on research that even post-graduate students could hope to experience.

¹ This preface was partially edited from a post I wrote for Space+Anthropology (see: Genovese 2015).

My interest in the cosmos can be directly attributed to growing up in the wide-open spaces of the Southwestern United States. As Chris Jones (2007) notes, I had the room to dream:

City kids don't have the room nor any need to dream. The lights and chaos burn away their imaginations. The only decent dreaming gets done out here, in our wider landscapes, in our deserts and canola fields, those beautiful places where we don't even have to look up to see all the sky at daybreak and every last star at night. (95)

The cosmos also served as a canvas of dreams for our ancestors. Many ancient peoples derived their cosmologies from the night sky, imagining outer space to be an otherworld, Heaven, or an ethereal place full of spirits and deities. The Maya believed the Milky Way to be *xibalba be*—the Road to the Underworld—serving as a gateway to the afterlife (Tedlock 1985). Speculations about planets other than Earth—as well as extraterrestrial life—can be traced back to ancient Greece and the theory of “infinite worlds” (ἄπειρες κόσμους—*ápeires kósmos*)—which came to the Latin West as “many worlds” (*plures mundi*) and from there translated into English, French, and German as “plurality of worlds,” “*pluralité des mondes*,” and “*vielheit der Welten*”—discussed by philosophers ranging from Democritus, Epicurus, and Aristotle to Thomas Aquinas and Immanuel Kant (Dick 1982).

July of 2017 marks the 48th year since the National Aeronautics and Space Administration (NASA) sent Apollo astronauts to land on the surface of the moon. It has been 152 years since Jules Verne took us on a trip from the Earth to the Moon in his book by the same name (*De la Terre à la Lune*). Scientific advancement and human imagination have allowed for humans to extend themselves as far as interstellar space, with the Voyager 1 spacecraft still sending data—its tales of otherworldly encounters—

back to Earth (Oman-Reagan 2016c). Robotic rovers scale Martian impact craters, sending back breathtaking panoramas and even “selfies.” Astronauts regularly tweet from space—engaging with the population of Earth—and even start their own hashtags²; most recently, Scott Kelly’s #YearInSpace reached 4.7 million Twitter users according to keyhole.co.

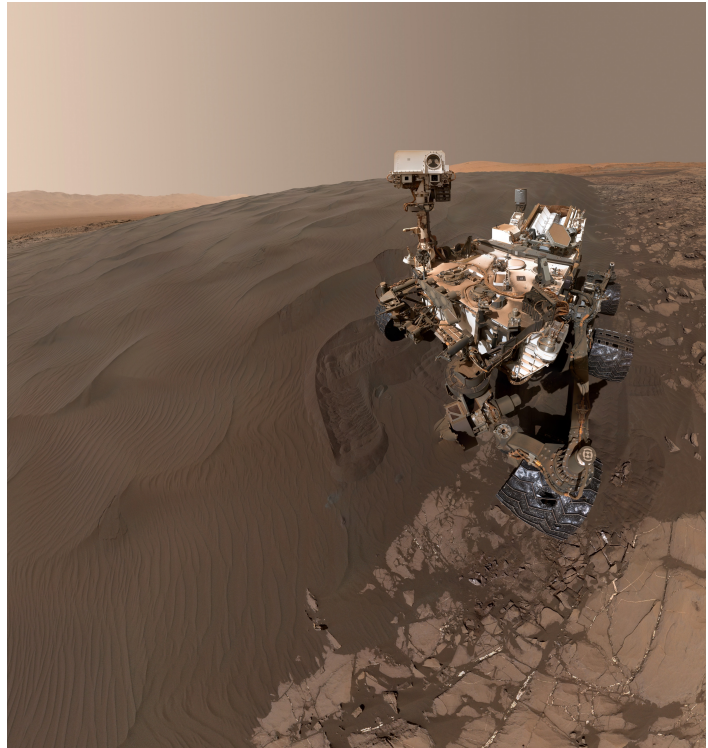


Figure 1. NASA’s Curiosity Mars rover takes a selfie at the “Big Sky” drilling site near Namib Dune on Mars.
Image Credit: NASA/JPL-Caltech/MSSS

At the same time, Elon Musk—the CEO of NewSpace³ corporation SpaceX—has proposed that we should be “nuking Mars” in order to prepare it for future terraforming and human habitation (Leopold 2016). Others, such as Lowell Wood—an architect of the Reagan-era “Star Wars” program that hoped to weaponize outer space—has said unironically that terraforming Mars is “the manifest destiny of the human race” (Grinspoon 2004, para. 7). He furthers the colonialist rhetoric by saying that “in this country we are the builders of new worlds. In this country we took a raw wilderness and turned it into the shining city

² “Tweets” refer to openly broadcast messages—limited to 140 characters—shared on the social media micro-blogging website Twitter. Hashtags are a word or phrase prefaced by a pound/number sign (#) and are used to identify messages on a specific topic. Clicking on a hashtagged word or phrase will link the user to all of the messages utilizing that hashtag.

³ NewSpace is the umbrella term for a movement and philosophy affiliated with the emergent private spaceflight industry. These corporations are usually started by wealthy entrepreneurs or venture capitalists who are hoping to privatize the spaceflight industry and create “low-cost” access into space.

on the hill of our world” (Grinspoon 2004, para. 7). As Grinspoon (2004) comments in his article, this seems less like terraforming and more like “Ameriforming” Mars.

This likening of outer space to a frontier-space—like the American West—is troubling. Not only is it historically inaccurate and culturally insensitive, it also fails to capture the most compelling aspect of venturing into the cosmos—a new beginning for *all* people. Humans have never lived untethered from Earth and yet, we cannot wait to export our globalized capitalist system of oppression and inequality into the cosmos; the only thing more frightening than globalized capitalism is interplanetary capitalism.

Yet, we are already beginning to see this capitalist expansion, as evidenced by the passing of the U.S. Commercial Space Launch Competitiveness Act (2015), which facilitates *commercial* exploration and *commercial* recovery of space resources. It also “discourage[s] government barriers” and according to §51303 of the law, any “United States citizen engaged in commercial recovery of an asteroid resource or a space resource under this chapter shall be entitled to any . . . resource obtained, including to possess, own, transport, use, and sell” (U.S. Commercial Space Launch Competitiveness Act 2015). This seems to be in direct violation of The Outer Space Treaty of 1967—of which the United States is a signatory—which states that “the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind [sic]” and that “outer space is not subject to national appropriation by claim of sovereignty, by means or use of occupation, or by any other means” (Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1966).

The foundation of the capitalist expansion into the cosmos is happening right now. Other than the objections from a small group of space scientists—including anthropologists interested in space—it is proceeding unchecked. The field of anthropology is uniquely poised to engage in research about human futures in outer space. Anthropologists are able to confront and answer questions about colonialism, imperialism, the danger of unrestrained capitalism, human-machine interaction, fictive kinship among those living in close quarters, and discussions about the Other—including the ultimate Other, possible extraterrestrial life (Dick 2006). Much like science fiction writers, anthropologists studying space are thinking about life here on Earth while imagining possible futures here and off our planet (Oman-Reagan 2016c). Furthermore, the way that we talk and think about our imagined futures influences what happens in our reality (Polak 1973).

As the NewSpace industry continues to grow, national space agency/military budgets expand, and more countries on Earth begin to enter space—such as recent spacefarers China and North Korea—the question is no longer *whether* humans will migrate into space, but when (Oman-Reagan 2016c)? And who will have access? Anthropology, as a field and discipline, has a choice to make: do we become a complacent tool of capitalist and colonial expansion as we did in the past or do we learn from our bygone follies and affect positive change in a future that is beginning to look eerily similar to the time of anthropology's genesis?

I hope to argue for the latter within this thesis. In order to do this, I have broken this thesis into four sections. The first section contains my literature review and my theoretical perspective; these sections were written prior to my conducting research in

order to situate myself within the milieu of outer space anthropology. The second section is entitled “The Past” and will take readers through a crash course on science fiction’s influence in outer space realities, the effects and consequences of the coterminous development of nuclear weapons and crewed spacecraft during the Cold War, and NASA’s neoliberal turn starting in the 1970s. The third section—titled “The Present”—is a presentation of my fieldwork data by presenting three ethnographic vignettes, written in an experimental, imaginative style (Elliott and Culhane 2017) followed by an anthropological analysis of coded themes that I have extracted post-fieldwork. The last section is labeled “The Future” and utilizes anthropological and phenomenological speculation and theorizing about an outer space future that is dominated by NewSpace and how resistance to the neoliberalization of outer space could form.

SECTION I—THE “ACADEMIC SECTION”

If I have seen further, it is by standing on the shoulders of giants.

—Isaac Newton (1675)



Figure 2. A drawing within a German manuscript (ca. 1410) depicting the blind giant Orion carrying his servant Cedalion on his shoulders to act as his eyes.

Image credit: Library of Congress. Rosenwald Collection, MS 4.

This section—which I have dubbed the “Academic Section”—is not meant to be a pretentious label. All are welcome (and encouraged) to read these traditional and vital portions of an academic thesis. However, one of my goals when I set out to conduct this research was to make the final product accessible to as wide of an audience as possible, while still meeting the requirements necessary to earn my degree. After much deliberating, I concluded that I would place the literature review and theory within their own section—while placing my methods in an appendix—so that those who wished to proceed to the history and ethnography portions could advance directly to Section II.

This is not to diminish the importance of placing one’s research within an academic lineage—and I use the word lineage purposefully here. Some like to say that a literature review is recognizing and servicing a *disciplinal* obligation but I tend to challenge the desire for divisions between disciplines. I believe a preferable system of education would be a holistic one—it prevents unproductive schisms and suppresses a sense of superiority that occurs when bodies of study are chopped up into meticulously crafted disciplines. Therefore, I subscribe to a concept of academic lineage—that functions much like a family lineage—of scholars that have impacted me greatly, but also perhaps with which I squabble occasionally. It is important to recognize and pay homage to these scholarly ancestors to whom you are connected through theoretical lenses and scholastic insights. As an old Greek proverb states: “A society grows great when old people plant trees whose shade they know they shall never sit in.” Or perhaps Lin-Manuel Miranda, in his hit musical *Hamilton*, said it best lyrically as: “What is a legacy? It’s planting seeds in a garden you never get to see.” These two chapters are

my reverent remembrances to the academics who have shaped my worldview—with the hope that I can plant my own seeds in the future.

CHAPTER 1: LITERATURE REVIEW

I have broken my literature review into the three major themes of my thesis. I will start by giving a general background on the nebulous field of astro-/exo-/xeno-anthropology. I will then discuss some of the literature surrounding social and/or technoscientific imaginaries—as well as defining and operationalizing this concept—while including the work that has been done on anthropological futures. Lastly, I will discuss literature that pertains to political economy in late capitalism with a focus on outer space, specifically focusing on Marx’s concept of primitive accumulation.

Anthropology of Outer Space

The field of anthropology has a history of engagements with outer space. In the 1970s, an interdisciplinary symposia sponsored by the American Anthropological Association (AAA) brought together a number of academics to talk about the speculative cultures of the future. In 1974, the participants decided to narrow their focus on what extraterrestrial communities and culture may look like. The papers produced during this symposia were collected together in a book: *Cultures Beyond Earth: The Role of Anthropology in Outer Space* (Maruyama et al. 1975). Although anthropologists remained interested in outer space and human futures, the field remained under the radar of mainstream anthropology until the twenty-first century.

In 2009, David Valentine, Valerie Olson, and Debbora Battaglia challenged anthropologists to take outer space seriously as a field site, pointing out that many nations and groups have a stake in space—including (at the time) the newly forming

NewSpace industry—and argued that for many “being earthbound is not a limitation, and it should not be one for anthropologists” (Valentine et al. 2009, 11). Anthropological engagements with outer space began to increase. At the 2012 AAA annual meeting, there was a panel entitled “Alter(native) Visions of Futures and Outer Spaces.” That same year, *Anthropological Quarterly* released a special collection titled “Extreme: Humans at Home in the Cosmos” focusing specifically on the anthropology of outer space (Valentine et al. 2012). At the 2015 AAA meeting, my colleagues Michael Oman-Reagan and Kira Turner organized a panel called “Anthropology of Outer Space: Familiar Scales, Strange Sites.” Since 2009, it seems that anthropology, as a discipline, has heeded Valentine, Olson, and Battaglia’s call for the revitalization of outer space anthropology.

An anthropology of outer space—like many areas of focus in anthropology—can encompass an array of topics. Alice Gorman (2005; 2009) focuses on an archaeology of outer space, arguing that there exists cultural significance for the thousands of objects—sometimes referred to as “space junk”—that eternally spiral in a lonely orbit around our planet; some of these objects date back to the late 1940s. Lisa Messeri—who wrote a book based on her dissertation as an “earthly ethnography of other worlds” (Messeri 2016)—has focused on presenting a critical look at the space industry (Messeri and Richards 2009) as well as investigating cultural attachments to celestial objects, such as her article about the intense, emotional connection people have with the dwarf-planet Pluto (Messeri 2009). Some anthropologists wish to engage with the possibilities of extraterrestrial life and/or their relationship with human imaginaries (Battaglia 2006; Dean 1998; Dick 2006; Riner 1991; Traphagan 2014, 2015; Tumminia 2007; Vakoch

and Harrison 2011) while some wish to engage in more Earthly pursuits, like Hoeppe's (2012) ethnographic study of professional astronomers and their increasing disenchantment with cosmic wonder. Luděk Brož (2007) looks at rockets from a decolonial perspective; in his field site in the Altai Republic, spent Russian rocket boosters fall over traditional Indigenous lands because Russia views these areas as being "uninhabited." As such, he studies how "rocketphobia" has morphed from a phobia to an ontology by the Indigenous Altai in Siberia (Brož 2015). The anthropology of outer space is not just for those that study culture—even the fields of biological anthropology and computer science have joined the fray (see: Masali et al. 2011).

An interesting—and frequently discussed—position within cultural space studies is called the overview effect. Initially proposed by Frank White (2014) in his book *The Overview Effect: Space Exploration and Human Evolution*, White's position—utilizing interviews with astronauts and cosmonauts—is that humans feel a profound connectedness with the rest of humanity when viewing Earth from orbiting altitude. While the sentiment is nice, Jordan Bimm (2014) argues that models of Earth are political objects and the claims argued by White (2014) are cultural claims—and in particular, Western cultural claims. "White, who was educated at Harvard and Oxford, views spaceflight through a lens that is eerily similar to American manifest destiny. But rather than Americans being destined to colonize the West, White argues that humanity is supposed to colonize space..." (Bimm 2014, 43). Bimm pulls apart the overview effect—which is widely accepted and championed by both space scientists and social scientists alike—as being a culturally specific, Western, colonial view of how space is imagined.

I hope that it is now clear that the anthropology of outer space—while on the fringes of mainstream anthropology (for now!)—is an area of study that is currently flourishing, as well as having a 40 year tradition in anthropological research. I would now like to engage specifically with two recent articles that are especially relevant to this thesis research.

The first is an article written by the original trio that called for space anthropology's revival: David Valentine, Valerie Olson, and Debbora Battaglia. In the article titled "Relational Space: An Earthly Installation," the authors argue that anthropology is poised to consider the "peaceful uses of outer space and—from the perspective of space entrepreneurs—the useful pieces of outer space" (Battaglia et al. 2015, 251). This dichotomy is more than just clever wordplay; if it becomes a reality as humans move into space, we must reevaluate humankind's capacities for making worlds differently (Latour 2002) and focus anthropology on the meaning(s) of value both on Earth and off (Battaglia et al. 2015). This includes theories of value that exist outside of capitalism (Graeber 2001). In order to do this, a "space-inclusive anthropology" consists of questioning and engaging with an array of epistemologies—anthropological, social, biological, environmental, ecological—and seeing not only how they "relate conceptually, but also how they scale with *and* against one another" (Battaglia et al. 2015, 248). Looking at humans living in space is performative—an "exhibit to the cosmic" (Battaglia et al. 2015, 245)—and studying the human expansion into space is truly an ethnographic endeavor.

The second article is titled "Exit Strategy: Profit, Cosmology, and the Future of Humans in Space" by David Valentine and focuses on NewSpace companies

themselves, highlighting their speculative imaginaries of human habitation in space. Valentine (2012) also posits that although NewSpacers are motivated by capitalist profit-margins, their visions of the future should not be disregarded by anthropologists as fantastical pipe-dreams without a basis in reality. Valentine (2012) admits that the NewSpace industry is united by a common vision of the future as being based in free-market capitalism, as well as a belief that right-libertarian entrepreneurship will radically and positively transform the future of our species in space and on Earth. However, he urges anthropologists to take a culturally relativistic stance when studying these companies and individuals; he asks: “what is at stake for us as anthropologists and critical theorists in taking such kinds of cosmological visions seriously, and in their own terms?” (Valentine 2012, 1047). Valentine (2012) argues that the promise of a radically transformed human social future is what motivates most people in NewSpace corporations and that *only* looking at NewSpace as the latest incarnation of neoliberal capitalism is a disservice to anthropological research. Valentine (2012) also points out that many anthropologists dislike conducting near-futures research—largely due to anthropology’s focus on the ethnographic present following the postmodern turn—and “fewer [anthropologists] have attempted to engage the political economies of particular and long term futures” (1051).

While a culturally relativistic approach is important, I also do not believe Valentine’s (2012) approach is entirely appropriate because it ignores many of the concerns from those who are at the weaker end of power dynamics. After all, SpaceX employees themselves have filed class-action lawsuits against the company for unpaid wages and management coercion to “shave” time off of their time sheets (Koebler

2015). When Valentine (2012) says that anthropologists need to realize that NewSpacers are motivated by boundless space resources *and* “new possibilities for human freedoms, expression, and sociality” (1052), I feel compelled to ask: whose human freedom? Certainly the freedom of the capitalist; but is a venture capitalist economic ideology going to promote freedom for the worker, the minority, the poor? I would argue that we need to look to Earth as an analog for living in space and our hyper-capitalist, globalized, neoliberal system is only widening the wealth gap with very little concern about ecological, social, or economic justice. I believe cultural relativism is an important concept, but it should take a back seat to affecting positive change for the oppressed. Many in the NewSpace industry also fold “White Knight” valorous delusions into their right-libertarian philosophies—e.g. “Something is going to hit us, we need to survive. We have to convince people of that” (Valentine 2012, 1062)—and while the risk of asteroid strikes exist, this kind of desperation can lead to the justification of increasing the brutalizing effects of capitalism for “the greater good” (Mellor 2007), a concept that has been used in the past to justify terrible injustice to those not in power.

For example, in the 1980s, Brazil seized communal land from the rural poor in Alcântara to build a spaceport. This was built in order to make Brazil more globally competitive—for the greater good of the country. However, this displaced 1500 people and forced them into wage labor, an economic system that was not previously used by residents of Alcântara; furthermore, in 2003, a rocket exploded on the launch pad, killing 21 technicians and billowing toxic gas into the worker’s settlement (Mitchell 2013).

Despite this—as argued by Valentine (2012)—if we do not pay attention to the utopian imaginaries from the people who are powerful enough to set them in motion,

anthropologists will not be able to join the debate, and will be forced into passivity by those who hold power and capital. It should be the priority of anthropologists to debate—and hopefully deter—NewSpacers who hold onto rose-tinted, racist, and inaccurate notions of what Istvan Csicsery-Ronay (2008) refers to as a “future past” (76) of “free markets, American exceptionalism, science fiction precedents, a valorization of colonialism and [right-]libertarian principles and ethics” (Valentine 2012, 1064).

Social / Technoscientific Imaginaries & Anthropological Futures

The term “social imaginary” can conjure numerous definitions in a reader’s mind. In this section, I will outline a brief history of social imaginaries as well as its lineage into the technoscientific age. The first mention of “social imaginary” came out of the book *The Imaginary Institution of Society* by French theorist Cornelius Castoriadis ([1975] 1998). Castoriadis ([1975] 1998) argues that “every society posits a ‘view of itself’ which is at the same time a ‘view of the world’ . . . and that this ‘view’ is part of its ‘truth’ or its ‘reflected reality’ . . . without being reducible to it” (25). Since social institutions are human inventions, their functions are imbued with symbolic meaning that make sense of their functions within the broader structures of society (Gilleard and Higgs 2013). However, that does not mean that human beings do not have agency. Since society—according to Castoriadis ([1975] 1998)—is an invented system of social institutions, it is always open to new configurations and the social imaginary is a necessary part of human consciousness. Castoriadis’ ideas about social imaginaries reflect a theme that runs through sociological and anthropological thought: the search for an organizing principle around which societies are structured, formed, and changed.

In this way, the social imaginary shares similarities with Durkheim's ([1893] 1984) theory of the conscious collective, which consisted of the shared beliefs and ideas of a society. However, Durkheim's theory tends to strip agency and makes no concessions for individual consciousness. Later in his career, Durkheim ([1895] 1982) replaced his society-based theory of conscious collective with a culture-based theory of collective representations which is "the way in which the group conceives of itself in its relationships with the objects that affect it" (40).

One way of maintaining a social imaginary is through myth and storytelling (Taylor 2004; Bottici 2007). In our technoscientific age, the social imaginary of outer space lies overwhelmingly in the realm of science fiction. In fact, if technological innovation is a train car, science fiction is the locomotive, even though it can sometimes take decades (or longer) to see imagination birth reality (Genovese 2016b). For example, Mary Shelley's *Frankenstein* told the story of a creature created in a laboratory 150 years before new life forms were created in a modern biological laboratory, Jules Verne took his audience on an adventure under the sea before modern, deep-sea submarines came into existence, and Edward Bellamy warned of an economy dependent on rapid communication, credit cards, and in-home delivery of commodities 100 years before these realities became routine (Jasanoff 2015). However, calling these visions "technoscientific imaginaries" is an inaccurate term, according to Jasanoff (2015), who notes that:

Scientific knowledge, in particular, is not a transcendent mirror of reality. It both embeds and is embedded in social practices, identities, norms, conventions, discourses, instruments, and institutions—in short, in all the building blocks of what we term the social. The same can be said even more forcefully of technology. (3)

Therefore, I wish to also utilize Jasanoff's (2015) term of "sociotechnical imaginaries" to describe the state of modern social imaginaries, rather than the previous term "technoscientific imaginaries" (Marcus 1995). Sociotechnical imaginaries is a framework designed to investigate how, "through the imaginative work of varied social actors, science and technology became enmeshed in performing and producing diverse visions of the collective good, at expanding scales of governance from communities to nation-states to the planet" (Jasanoff 2015, 11). In other words, these imaginaries do not only exist on the global scale—it isn't just about the conscious collective of universal homogeneity—it also relates directly with the individual. "The imagination has become an organized field of social practices, a form of work (both in the sense of labor and of culturally organized practice) and a form of negotiation between sites of agency ('individuals') and globally defined fields of possibility" (Appadurai 2002, 50). In this way, sociotechnical imaginaries are not confined to a single scale; instead, they are like an aligning of chakras, able to flow back and forth—influencing everything—from individual interactions to global ideologies. I will use the term sociotechnical imaginaries interchangeably with the term "social imaginaries" for the purpose of this thesis.

As an extension of sociotechnical imaginaries is research that is conducted on anthropological futures. After the postmodern turn, anthropology has shrugged away from engagements with futurology because of the disciplinary stain of social evolutionism on one hand and the stigmatization of utopianism on the other; instead the discipline focused on the "ethnographic present" (Collins 2008). However, in the twenty-first century, it is time for anthropologists to consider human futures as a tenable field of study. As argued by Collins (2008):

But we need—more than ever—to revisit the idea that anthropology might provide material and critique for cultural futures, for the imagination of different life ways less premised on exploitation and environmental degradation. And not simply as an ancillary effect of anthropological research either; I argue that raising the possibility for radical alterity is one of the chief roles of cultural anthropology in the twenty-first century. (8)

While anthropology avoided the discussion of human futures—save for a handful of researchers (see: Finney and Jones 1985; Marcus 1995; Maruyama et al. 1975; Riner 1987, 1991, to name a few)—science fiction picked up the slack and began to influence the movers and shakers of space exploration. In fact, in an official NASA study on designing future space settlements, Arthur C. Clark is referenced multiple times as imagining feasible design elements (“Space Settlements: A Design Study” 1977). Science fiction also incorporated elements of activist anthropology to introduce alternative futures as a form of protest against neoliberal expansion. Ursula K. Le Guin (1974)—daughter of anthropologist Alfred Kroeber—is one such author. This tradition has continued into modernity, with many minorities—including Indigenous peoples (Lempert 2014) and people of color (Brown and Imarisha 2015)—using science fiction to protest and “force” themselves into the imaginaries of the future. Radical imaginaries and narrative power provided “escape hatches from the control myths of the powerful” (Reinsborough 2010, 68).

Anarchist & Neo-Marxian Political (Anti-)Economy

I will be looking at outer space through a political economic lens utilizing Neo-Marxist and anarchist perspectives. More specifically, I will be focusing on Marx’s ([1867] 1990) idea of primitive accumulation—sometimes called previous or original accumulation. This principle was conceived of by Marx ([1867] 1990) to explain how capitalists were able to amass enormous amounts of wealth. Essentially, it consists of

those in power enclosing common land and privatizing the means of production, which forces workers to sell their surplus labor for a wage. This concept is closely tied to colonialism, as touched on by Marx ([1867] 1990):

The discovery of gold and silver in America, the extirpation, enslavement and entombment in mines of the aboriginal population, the beginning of the conquest and looting of the East Indies, the turning of Africa into a warren for the commercial hunting of black-skins [sic], signaled the rosy dawn of the era of capitalist production. These idyllic proceedings are the chief moments of primitive accumulation. (915)

However, for most Orthodox Marxists, this also marks the end of primitive accumulation; it is always thought of as something that happened in the past in order to jumpstart the capitalist system out of feudalism. However, an anarchist—or post-work Neo-Marxist approach⁴—posits that primitive accumulation must perpetually continue in order for the capitalist economy to sustain itself. The burden of this constant accumulation—at least from an anarchist standpoint—continually falls on the state. Work and primitive accumulation are two sides of the same coin: “enforcing work, as the other side of defending property rights, is a key function of the state. . .” (Weeks 2011, 7). I will go into this in more depth in Chapter 2.

Outer space seems to be a new frontier-space which can be utilized by capitalists in order to continue primitive accumulation (in the case of asteroid mining) or to commodify (in the case of space tourism). Although space is currently only open to government employees—and a handful of very rich tourists—the cosmos will soon be

⁴ A post-work society divorces from the capitalist tendency to derive self-worth from how productive one is in their job. Many proponents of a post-work society propose a universal-basic income (UBI) in which the state would give everyone enough money to have their basics covered (rent, food, health insurance, education, etc.). This requires heavy corporate taxation and technological automation for most repetitive jobs, but allows for people to embrace self-worth outside of job efficiency and incorporated bureaucracy (Schiller 2016). Many countries—including Finland, Switzerland and Canada—have UBI trials planned (Schiller 2016).

open as either a commons (Battaglia 2014) or for a continuance of resource exploitation like on Earth (Dickens 2009; Tiziani 2013). Resource extraction and manipulating environments is not necessarily a bad thing; I think it is a pretty good argument that human beings would not have been able to extend across this planet without manipulating resources for survival. The problem lies in the exploitative and oppressive system of resource extraction for profit. In other words, the cosmic equivalent of that 5-year-old on the playground, hoarding all the blocks screaming “They’re mine! These are all mine!” However, as argued by Gorman and Freeland (2016), we should really be working together—utilizing a system of mutual aid (Kropotkin [1902] 2012)—as we begin to mine the solar system.

Furthermore, for those living and working in outer space, or on other planets, would it be necessary or right to be exploiting profits for Earthlings? Haqq-Misra (2015) makes the argument that those living and working off of the Earth’s surface have human rights that differ from those who live on Earth. Haqq-Misra (2015) utilizes liberation theories—going so far as calling the future human presence on Mars “liberated settlements”—to argue that any human not living or working on Earth has the right to self-determination and should be “free from [the] controlling interests [of] Earth” (5). The speculative nature of his article brings up interesting anthropological points, particularly in reference to a political economy of place. A political economy of place—as argued by Logan and Molotch (2007)—states that space and place hold political economic pretenses; after all, apartment buildings provide both a use-value as a home and exchange-value as profit for the landlord. Although not related directly to outer space, anarchist geographer Simon Springer (2011; 2012; 2013) argues against the capitalist

takeover of public space, using examples from Cambodia and the North American West, to illustrate the slow encroachment by neoliberalism of what little commons still exist today.

With this in mind, is there a way for a multitude of philosophies and ideologies to exist harmoniously in a possible human future throughout the cosmos? In other words, are there people thinking about space as a host for “exilic spaces”—places where communities can live relatively removed from the clutches of capitalism, such as the Zapatistas of southern Mexico and the Kurds of northern Syria here on Earth (O’Hearn and Grubačić 2016)? After all, when the commons began to be enclosed in England in the 1500s, the peasants who had freely worked that land did not “go quiet into that good night”, settling subserviently into a wage economy, as many Western history books wish to espouse (Federici 2004). Rather, this time was marked by near-constant peasant rebellions. Gerrard Winstanley, the leader of the Diggers, declared that “it did not make any difference whether one lived under the enemy or under one’s brother, if one worked for a wage” (Federici 2004, 72). Many peasants took to the road as “vagabonds”—risking enslavement or death—rather than work for a wage (Federici 2004). Will the attempted enclosure of the cosmos also be met with stiff resistance and worker struggle?

CHAPTER 2: THEORETICAL PERSPECTIVE OR: MY ONTOLOGY OF ASSUMPTION

In order to study outer space from an anthropological perspective, a radical theoretical approach is necessary. Space science research is largely dominated by those in the “hard” sciences—physics, astronomy, chemistry, engineering, biology—including research that directly relates to humanity’s role within the cosmos. Often this research is couched in traditional scientific methods, and outside-of-the-box thinking can be highly discouraged. Anthropological theory is uniquely positioned to ask and answer an abundance of questions that are currently being left out of the conversation by the space science community.

I have utilized post-postmodernist—specifically a metamodernist approach (Turner 2011; Vermeulen and van den Akker 2010)—and other critical theoretical frameworks that rely on strong interdisciplinary relationships with other social sciences as well as the arts and humanities. Furthermore, I have engaged in theoretical perspectives that cater to strong social justice and activist components in order to properly critique the globally hegemonic capitalist system in an attempt to affect positive change.

In this chapter, I will explore and explain anthropological approaches to political economy, anarchist anthropology, activist anthropology, gonzo anthropology, and the social construction of reality that have influenced my personal worldview and have framed this thesis research. In other words, the outlined theoretical perspectives can be thought of as my ontology of assumption as I pursued this research.

Social Constructionism

There are many theoretical perspectives one could employ while undertaking research about imaginaries and their influence in reality. I have chosen to utilize the philosophical and sociological model of social constructionism. These ideas were made popular in the United States by Berger and Luckmann's ([1966] 1967) book *The Social Construction of Reality*. With roots in phenomenology and strong links to philosophers Heidegger and Husserl, Berger and Luckmann ([1966] 1967) argue that all knowledge—including basic, common sense knowledge—is not real; knowledge and concepts only exist because we, as humans, give them reality through social agreement.⁵ In other words, concepts and objects that many people use and interact with daily—such as nation-states, books, and money—do not exist in the absence of human society; all of these forms of knowledge are derived from, maintained by, and altered into something else by social interactions (Berger and Luckmann [1966] 1967). Hugh Gusterson (1996) distills this point well through the lens of the cultural significance of nuclear weaponry:

. . . reality is a social construction. I do not mean to suggest that presidents, missiles, and mushroom clouds are figments of our imagination. Clearly they are not. But groups of people have to share and communicate about entities in the world—whether these are physical entities such as nuclear missiles or abstract entities such as nuclear deterrence—through language and other mediating forms of representation, and *in the process of representing the world, we construct it*. (1–2; emphasis my own)

Furthermore, the most fundamental basis for how most people construct reality—our conceptualizations of self—are also completely socially constructed. Identity is

⁵ Obviously knowledge is “real” in a certain sense. The knowledge and language that engineers agree upon and use to build rockets *works*; however, these agreements are highly *contextualized*—as well as being socially and culturally *bounded*—and this is what I mean by *a* reality through social agreement. Sorry about all the italics.

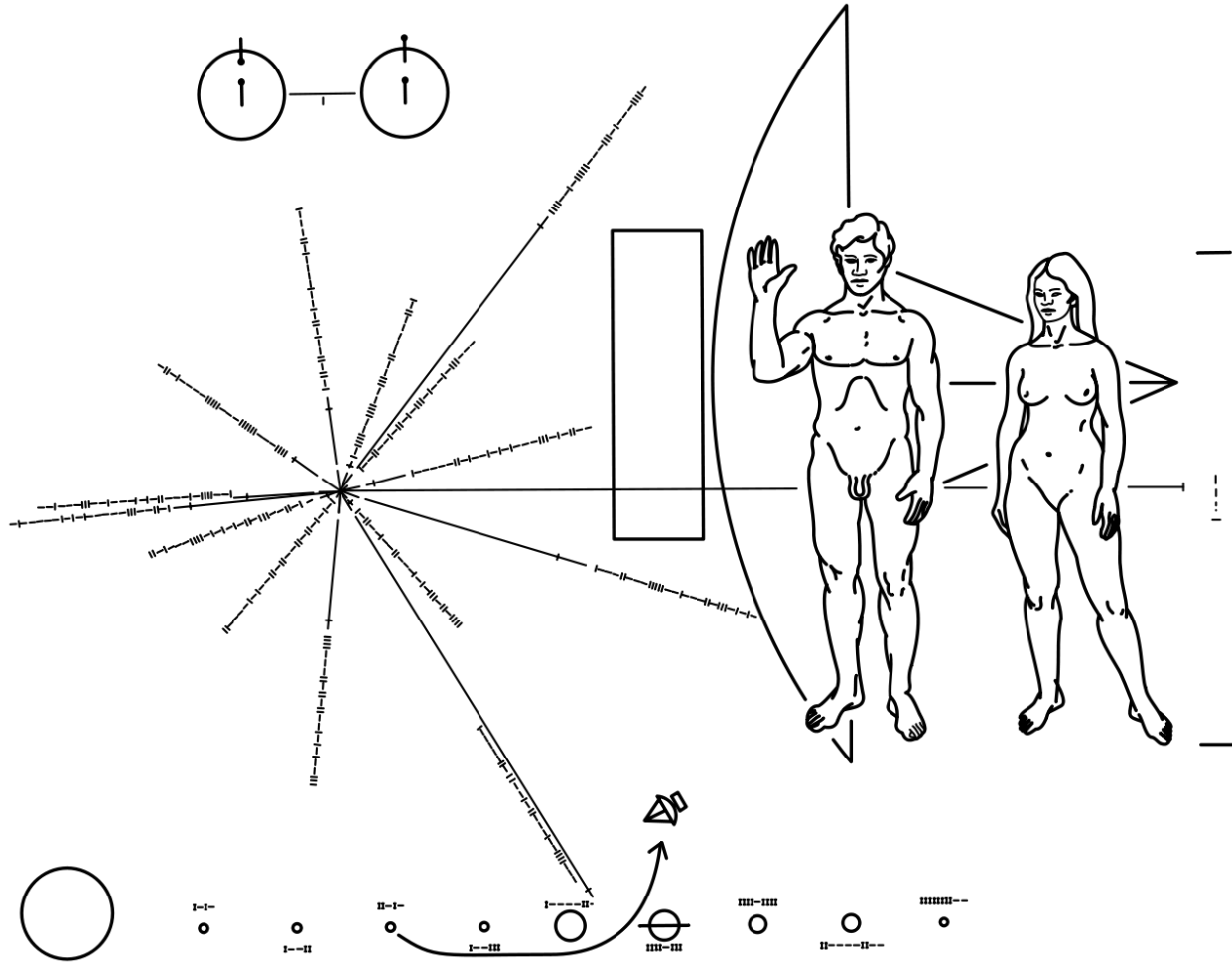


Figure 3. An illustration of the Pioneer plaques that are onboard the space probes Pioneer 10 (launched 1972) and Pioneer 11 (launched 1973). The plaques are designed to provide information to any extraterrestrial life about where the spacecraft originated. The plaque contains symbols of the hyperfine transition of neutral hydrogen, the figures of a man and a woman, the relative position of the Sun to the center of the Galaxy along with 14 pulsars, our Solar System with the spacecraft's trajectory, and the silhouette of the spacecraft. However, the question becomes: whose reality is this depicting? Undoubtedly, a Western scientific one. More to the point, is it right to broadcast to the cosmos that this is *the* human reality?

Image credit: Designed by Carl Sagan & Frank Drake; artwork by Linda Salzman Sagan

created by interactions with other people, as well as by our reactions to the expectations of our society (Berger and Luckmann [1966] 1967).

Therefore, the foundation of Western research—that is, the idea that reality is an objective truth “waiting to be uncovered through positivist scientific inquiry” (Fairhurst and Grant 2010, 174)—is an exercise in futility in its present form, because there can

exist multiple realities that compete for truth and legitimacy. This is true for any hegemonic ontology, including science, electoral politics, and capitalism. In other words, it is important to remember that our current globalized capitalist system—and the possible hyper-capitalized future in the cosmos—is just one of the many realities that can be true. These numerous realities are formed in imagined worlds—or imagined universes—of human social existence, slowly materialized by habits and power dynamics into institutions—such as capitalism—which are propped up by cosmology, ideology, and philosophy, maintained by socialization, and indoctrinated by family rearing and standardized education to become a part of a social citizen's identity, sense-of-self, and reality.

This does not mean that it is a one-way street from the imaginary to perceived reality. They are both highly influenced by one another; social imaginaries influence perceived reality and vice-versa (Berger and Luckmann [1966] 1967). In this way, social imaginaries and Western research fit into Bourdieu's (1990) conception of habitus, which he argued is a way for society to be deposited into persons to form dispositions that are shaped by the interplay between one's agency as well as societal structures. This is also true of imaginaries concerning human futures. Polak (1973) argues that when a population's social imaginary is optimistic—as evidenced by artistic endeavors and philosophies—it actually creates a future that is generally “good.” Polak (1973) also argues the opposite is true; when a population of people are overwhelmingly pessimistic in their worldview, their future will turn out to be “poor.” Granted, his argument is rather essentialist and his examples are lacking some historical intricacies, but I believe that Polak is proceeding in the right direction.

As Bourdieu (1989) says: “to change the world, one has to change the ways of world-making, that is, the vision of the world . . .” (23). This extends into the realm of science fiction as an “image of the future”—as Polak (1973) would say—or as an extension of symbolic power, for projects that take on a social justice and/or utopian outlook, such as Ursula K. Le Guin’s (1974) *The Dispossessed*, or *Octavia’s Brood: Science Fiction Stories From Social Justice Movements* (Brown and Imarisha 2015). “Symbolic power is the power to make things with words” (Bourdieu 1989, 23) and I believe that these women—along with other social justice minded artists, such as the Indigenous science fiction filmmakers described by Lempert (2014) and the authors of *Walking the Clouds: An Anthology of Indigenous Science Fiction* (Dillon 2012)—are attempting to make more than books and films with their words: they are trying to make a better reality.

Feminist Neo-Marxian Political Economy

I utilize a political economic theoretical approach when looking at the motivations and actions of NewSpace corporations as they set their sights on space resources. More specifically, I utilize a Neo-Marxist approach—and further refined, I look at the feminist, autonomous Marxism discussed by Silvia Federici (2004)—in order to investigate the concept of primitive accumulation within the context of outer space.

As discussed in Chapter 1, I will primarily focus on Marx’s idea of primitive accumulation. However, Marx never extrapolated his ideas about primitive accumulation beyond the Earth’s atmosphere. To my knowledge, only one other scholar—that I could find—has engaged explicitly with the idea of cosmic primitive accumulation (see: Dickens 2009). However, I believe that we are experiencing a new enclosure: an

enclosure of the cosmos. This may seem like I am being facetious or insulting, since as of this writing, outer space does not have a population of people to displace. However, the conversation about who has access to outer space, as well as the ultimate purpose of outer space—for capitalists, it's for “commercial exploration and commercial recovery of space resources” (U.S. Commercial Space Launch Competitiveness Act 2015)—directly relates to the concept of enclosures.

Marxist geographer David Harvey (2003) describes primitive accumulation as “taking land . . . enclosing it, and expelling a resident population to create a landless proletariat, and then releasing the land into the privatized mainstream of capital accumulation” (149). Eric Wolf (2010) expands on this noting that “‘primitive accumulation’ required not only the seizure of resources but also their concentration, organization, and allocation” (109). However, the Orthodox Marxist view of primitive accumulation is restricting in that it does not take into account the effect it had on women (Federici 2004). Furthermore, most Orthodox Marxist thinkers believe that primitive accumulation peaked and ended with the advent of capitalism; traditional Marxist examples of primitive accumulation include the slave trade, the enclosures of public European land, and the exploitation of the so-called “New World” (Federici 2004; Wolf 2010). I do not mean to belittle or deny the atrocities of these acts of primitive accumulation; I am just arguing that primitive accumulation did not end hundreds of years ago.

My theoretical basis is more in line with Federici (2004), who argues against the Orthodox Marxist claim that primitive accumulation is only a necessary *foundation* for the capitalist system. She instead argues that primitive accumulation is necessary for

the continuation of capitalism as a system, and that without a constant infusion of expropriated capital, capitalism is unable to sustain itself (Federici 2004; Graeber 2014). This is why capitalist crises continue to occur. Primitive accumulation was not a one-time event, it is an ongoing process of enclosures of different commons; and, as argued by Graeber (2014), it has also given rise to new forms of *capitalist* commons, such as the US military. I believe that with the intensifying environmental crisis we are facing here on Earth, capitalists are looking for new sources of primitive accumulation outside of Earth's atmosphere, particularly in the form of metals and minerals found on asteroids.

Much like the primitive accumulation of Indigenous land in North America by the Spanish, British, Americans, and French that made white men rich from—in the opinion of the settler-colonists—an uninhabited, lawless frontier-space which was their manifest destiny, we are seeing that the space in outer space is also viewed as an uninhabited, lawless frontier-space that is “the manifest destiny of the human race” (Grinspoon 2004, para. 7). I do not mean for this comparison to be insensitive; I know that tens of millions of North American Indigenous people lost their land, traditions, and lives due to the expansion of settlers. What I am saying is that the motivations that are behind the capitalist expansion into outer space are the same as those genocidal settlers that began moving West for resources that were “free” for the taking. After the capitalists grew rich from their primitive accumulation, they began to exploit the labor force through wage-labor that paid very little compared to the profits which the capitalist would make.

This kind of exploitation continues around the world today, including “frontiers” such as the Brazilian Amazon, where Amazonians “seek out risk, since in a highly

inflationary economy the ideal is not incremental gain but large, short term pay-offs” (Cleary 1993, 347). When capitalist corruption and exploitation is high—and it could be argued that this is always the case—“risk avoidance becomes not so much a question of minimizing risk, but of maximizing it, since the more lottery tickets one holds, so to speak, the likelier it is that one will provide a return” (Cleary 1993, 347). If Earth-based capitalists are willing to allow workers to gamble with their lives for the relatively slim profit margin of lumber, rubber, or oil, what levels of exploitation would be acceptable when a single asteroid’s worth is as much as \$5.4 trillion in precious metals and minerals (Tracy 2016)?

Outer space should be a place accessible to everyone and the resources available should be for the benefit of all of humanity, as outlined by the United Nations (Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1966). The “peopling” of outer space should not be a continuation of the mistakes we are making on Earth. Instead, we should be dreaming and imagining new ways of living outside of capitalism and oppressive government, incorporating a blend of philosophies that cater to equality, sustainability, justice, and mutual aid.

Anarchist Anthropology

Taking on a multi-dimensional thesis project that ranges from space science to imaginaries to political economy requires an unconventional approach to research. Despite modern anthropology’s denunciation of Social Darwinism, certain principles still remain unchallenged by many in the social sciences. Capitalism—and particularly venture-capitalism, the rather vicious form of capitalist gambling that many space

corporations are funded by—thrives on a Darwinian (or perhaps a Spencerian) mythos of “survival of the fittest” as well as a belief that competition fuels a laundry-list of perceived benefits: innovation, creativity, resilience, prosperity, justice, etc. However, analyzing space futures from an anarchist approach illuminates an alternative view of social construction, economics, philosophy, and politics. More specifically, I utilize the theories of Peter Kropotkin ([1906] 2011; [1902] 2012)—a contemporary and critic of Darwin who argued that mutual-aid, rather than competition, was a driving force in evolution—in order to investigate whether capitalism is the most effective tool for the human habitation of space. Like the Social Darwinists, Kropotkin transposed his theories to the social sphere, arguing that every facet of human development included forms of social organization that wedged people apart; however, “in each stage, mutual aid reappeared as a common way of organizing social relations from below—a sort of antidote used by communities to protect themselves against the cruelties of proto-state, then state, then capitalist forms of regulation and oppression” (O’Hearn and Grubačić 2016, 149).

Furthermore, Kropotkin ([1906] 2011) does not differentiate between the modern capitalist system and its feudal predecessor. He argues that the break between the two economic systems is merely ideological rather than a change in systemic practice.

We cry shame on the feudal baron who forbade the peasant to turn a clod of earth unless he surrendered to his lord a fourth of his crop. We call those the barbarous times. But if the forms have changed, the relations have remained the same, and the worker is forced, under the name of free contract, to accept feudal obligations. For, turn where he will, he can find no better conditions. Everything has become private property, and he must accept, or die of hunger.
(11)

In the past, a majority of anarchists who had taken anthropology seriously—or at least had been exposed to anthropology courses—identified as Primitivists, a vocal minority who argued that the only way to restore equality and get “humanity back on track” was to separate from modernity (i.e. technology and conceptions of “civilization”) and return to the way humans were living in the Upper Paleolithic (Graeber 2004). This philosophy was largely influenced by Marshall Sahlins’ (1972) essay “The Original Affluent Society,” which romanticized and generalized hunter-gatherer life as being purely egalitarian and without alienation. However, the more recent ethnographic record has shown an immense variation in hunter-gatherer social structure, ranging from stratified societies of nobles and slaves to staunch defenders of egalitarian principles (Graeber 2004). Instead of taking the flawed Primitivist perspective, I argue for a more optimistic position than throwing the baby out with the bath water. I believe that anarchic forms of organizing and living are well suited for our technoscientific modernity; in fact, I argue that anarchist anthropology can contribute greatly to the discussion about human futures both on and off of our planet.

Anarchist anthropology then—at least when it is interfaced with this thesis project—is to ensure a heavy dose of philosophical and personal reflexivity, as well as an analytical method that looks outside of the academic establishment. This is within the lineage of more established anthropological theory, particularly those developed after the postmodern turn. As Paul Durrenberger (2016) has said: “[in] my mind anarchism, existentialism and anthropology go together or mutually imply one another as a philosophy, a political outlook, and as a way of understanding the world and the people in it” (para. 20).

Taking this approach includes being aware that language can contain hegemonic instances of patriarchy, especially within space science and history. The most prominent example—and one which has been gaining a lot of press recently (see: Gorman 2014; Oman-Reagan 2016c)—is the use of “manned” and “unmanned” to describe a spacecraft’s status of human occupation. Gorman (2014) suggests a multitude of words⁶ to replace the gendered language that exists when one writes about human space missions, both in a historical perspective, as well as contemporarily. Language matters; and utilizing gendered language or enforcing the manned/unmanned dichotomy not only undermines the immense role of women in space science, but it also reenforces the false and oppressive concept of a fixed gender binary.

Anarchist anthropology argues for a blurring of the line between economically “developed” and “developing,” in that not only do industrial societies still hold dearly to kinship and cosmologies, so too do other societies have social movements and revolutions (Graeber 2004). This is particularly important within my research, especially as I began looking at human conceptions and imaginaries of outer space—an environment and industry (in the West) that has been made purely scientific and highly secularized. Certainly this is not the case for those who view outer space through an ethereal lens, such as Indigenous peoples, philosophers, artists, and science fiction writers; and often, this is not the case for those who have actually been in outer space,

⁶ man: human, people, person

mankind: humanity, humankind

man-made: manufactured (this is derived from hands), artificial, human-made, human

manned: crewed, staffed, piloted, astronaut (adj)

manned mission: human spaceflight, astronaut mission

manned spaceflight: human spaceflight

spaceman: astronaut, cosmonaut, taikonaut

unmanned: robotic, automatic, autonomous (Gorman 2014, para. 5)

with many astronauts reporting a feeling of connection with all of humanity as well as sentiments that reflect anti-war, anti-corruption, and spiritual oneness (White 2014). However, have the imaginative qualities of gazing into the cosmos been stripped away from those who work within space corporations, whose sole purpose is the accumulation of capital? Further afield, are visions of outer space—even scientific ones—truly objective and without preconceived cosmologies? Often scientific “facts” are touted as being independent of opinion, belief, and cultural background, but this is not the case (Feyerabend [1975] 2010). An anarchist *anthropological* approach disrupts the researcher’s comfort zone and allows for innovation to bubble to the surface while serving as a catalyst for the anthropological creed of making the strange familiar and the familiar strange.

Due to the fact that some Western academics (such as Richard Dawkins and Sam Harris) are caught in a hegemonic environment that places scientific method and the concept of pure “objectivity”⁷ as the only way that research can be pursued, I have utilized some alternative visions as I investigated outer space imaginaries. Paul Feyerabend’s ([1975] 2010) book *Against Method* sent shock waves through the academic community as he proposed that scientific objectivity does not exist and blind belief in the scientific method restricts scientific progress. Since I have incorporated data from those who do not subscribe to Western ontologies and epistemologies, I have

⁷ It should be noted that I am discussing the broader academic community here, particularly those engaged in research within our STEM-prioritized present. Mainstream anthropology—especially sociocultural anthropology—has already rejected the idea of pure objectivity. As I have said before, there tends to be a vocal minority of Old Guard anthropologists/archaeologists who can sometimes dominate the discourse and argue for an “objective” anthropology, whatever that means.

utilized Feyerabend's ([1975] 2010) call for an "anarchistic methodology and a corresponding anarchistic science" (5).

As noted by Csicsery-Ronay (2008): "In a scientific culture, people widely accept theories that they are unable to verify, or even to explain in a rudimentary fashion, on educated *faith* in the authority of scientists" (117; emphasis my own). In our technoscientific modernity, certain Western-educated scientists have become our priests and missionaries, with high-visibility public scientists—such as Neil deGrasse Tyson and Richard Dawkins—preaching the scientific method as the new faith-based system of the 21st century to a public who may have little knowledge on the methods of scientific research. Similar to the Middle Ages—in which the clergy were the only members of the community who were able to read and write—the scientific literature is written with such heavy jargon and incomprehensible mathematical formulas, decipherable only to other scientists in that particular field, that the public relies on faith alone to trust what scientists are saying.

I accept that "the concept of culture an ethnographer takes into the field will determine his or her 'positionality' within the field, thus shaping how the data are collected, or construed, and represented" (Conquergood 2013, 16). This includes shedding the Western paternalistic notion of human development happening in prescribed, uniform stages. The study of human futures is not without guilt in imposing Spencerian-like evolutionary models; take for example, Nikolai Kardashev's (1964) three-tiered scale of measuring a civilization's level of technological advancement based on energy consumption, ranging from modernity to possible interstellar civilizations.

Often modern anthropology wishes to make a distinction between a “kinship-based society” and a “modern society”—and sometimes, the term “kinship-based” is merely a replacement for the term “savage” or “primitive”—when in actuality, the “modern” social problems that plague us today (race, class, gender, etc.) explode out of our continued deep connection with kinship systems. David Graeber (2004) illustrates this point by asking: what does it mean to say most Americans see the world as divided into “races”?

It means they believe that it is divided into groups which are presumed to share a common descent and geographical origin, who for this reason are seen as different “kinds” of people, that this idea is usually expressed through physical idioms of blood and skin, and that the resulting system regulates sex, marriage, and the inheritance of property and therefore creates and maintains social inequalities. We are talking about something very much like a classic clan system, except on a global scale. (52)

An anarchist anthropological approach—at least when it pertains to this thesis—hopes to engage both the etic and emic approaches to anthropological research. It also urges the anthropologist to engage heavily with self-reflexivity and critical thought processes in order to analyze social structure, economics, value, imaginaries, futures, etc. outside of the dominant and hegemonic environment of Western scientific thought; it is a relinquishing of assumption and blind faith to perceived “fact” (Feyerabend [1975] 2010; Taussig 2013). In order to challenge the status quo—which is direly needed, socio-political-economic stasis seems to be the root cause of social conflict and environmental deterioration around the globe—anthropologists need to begin to engage in alternative theories of research (Graeber 2004). Namely, an anarchist approach.

Activist Anthropology / Gonzo Anthropology

In tandem with the utilization of an anarchist anthropological framework—which includes a refutation of scientific objectivity—I will also be utilizing an activist anthropological approach. Rather than claiming true scientific objectivity, my interpretation of activist anthropology “asks us to identify our deepest ethical-political convictions, and to let them drive the formulation of our research objectives” (Hale 2001, 14). This approach accepts that the anthropologist “is always a necessarily flawed and biased instrument of cultural translation” and that the act of sensitively performing ethnography can be an act of solidarity; conversely, taking a hands-off, objective approach can actually be a hostile act against your participants (Scheper-Hughes 1995, 417–18).

In order to properly critique capitalism’s hold on the imaginary of outer space—as well as capital’s control on who is able to gain access to the cosmos—I must incorporate a deep level of self-reflexivity. I must recognize that my own cultural upbringing, ethnicity, gender, bias, interactions, schooling, etc. will influence how I view this subject and I must own that and act upon it. After all, “the misogynist and the feminist, the conservative and the liberal, each believe that their personal ‘theory’ provides an ‘undistorted’ report of reality” (Sefcovic 1995, 23). In actuality, a truer form of objectivity exists when a researcher can accept that all research contains bias, states that within the research, and reports their findings in a self-reflexive manner. However, this brazen shunning of the scientific method in an attempt to service humankind can sometimes irritate those entrenched within the traditional, positivist academic system,

so perhaps it is best not to attribute this radical approach to the more established activist anthropological theory.

Several social scientists have built upon the ideas of activist anthropology while engaging other theories and methodologies—including the unique writings of Hunter S. Thompson—to create what has been called Gonzo Anthropology (see Fedorowicz 2013; Sefcovic 1995; Wozniak 2014). In 2016, a colleague and I presented a paper outlining our own take on the gonzo approach to ethnographic theory that I will be utilizing in my thesis research (Genovese and Magaña 2016). It builds upon ideas in seminal works by anthropological theorists, such as Geertz's (1973; 1988; 1998) ideas about "deep hanging out," "thick description," and "deep play," while incorporating established ideas about gonzo anthropology by the authors listed above. We have proposed that gonzo anthropological theory comprises of three branches: creativity, performance, and praxis.

This tripartite theoretical model has assisted me in sorting through thesis research that includes varied and complex topics such as social imaginaries, political economy, and human futures. Creativity refers to the willingness to accept that anthropological writings are interpretations—second or even third interpretations (Geertz 1973). It also refers to the style in which an ethnography is written: "ethnography becomes, it is said, a mere game of words, as poems and novels are supposed to be" (Geertz 1988, 2). In order to attempt to affect change, a body of work must be accessible to a general audience, or an audience of space scientists who are not used to anthropological writing. Performance refers not only to the fact that ethnography itself is a performative exercise, in that the researcher is always playing a

part in order to build rapport or collect data (Denzin 2003), but it also follows up with the anarchist anthropological principles that anthropology is not an objective bench science and that anthropologists should “. . . be aware of how description and analysis of an event is a culture-creating activity, and write accordingly” (Taussig 2013, 3). The element of performance when researching imaginaries and futures is an important concept to embrace because I have attempted to interpret the imaginations and conceptual futures of my participants. Finally, praxis relates heavily to the activist role of this research in giving back and empowering the disenfranchised. By blurring the lines between ethnographer and participants, art and science—and allowing for an exchange of the ethnographic gaze between participant and anthropologist—a wealth of interesting information can arise (Bessire 2015; Clifford 1986; Genovese and Magaña 2016).

This leads to my final theoretical consideration within an activist framework: decolonization. The basic principles of Western research are inexorably influenced by colonialism and imperialism and the fact that “research is implicated in the worse excesses of colonialism remains a powerful remembered history for many of the world’s colonized peoples” (Smith 1999, 1). It is especially important to remember that archival methodology is heavily linked with colonization and imperialism and archives have dodged public scrutiny more than other institutions concerned with collective memory, such as museums, monuments, galleries, and libraries, due to the fact that NAGPRA and other related laws do not apply to them (Genovese 2016a). During the archival research portion of my thesis, I made sure to keep in mind that archival institutions are deeply trapped in a hegemonic colonial environment that tend to value Western

philosophies over Indigenous worldviews and cultural principles; and while I proceeded with archival research, I critically evaluated the meaning—and possible hidden agendas—that may have existed behind the materials that were within archives (Genovese 2016a).

Furthermore, it is important to note that imaginaries—particularly within artistic and literary traditions, and especially science fiction—can be utilized as a form of protest against both the settler colonial and white supremacist system (Brown and Imarisha 2015; Lempert 2014; Nama 2008). These social imaginaries and speculative futures manifest themselves as artistic endeavors in order to nurture community and solidarity, redefine service, and rediscover the human spirit amidst increasingly challenging times for those who are oppressed minorities. As Adrienne Brown and Walidah Imarisha (2015) say in the forward of their edited volume that contains short science fiction stories from those involved with social justice movements: “we believe it is our right and responsibility to write ourselves into the future” (1).

SECTION II—THE PAST

The way we remember the past determines our dreams for the future.

—Kristen Ghodsee (2015, 1)

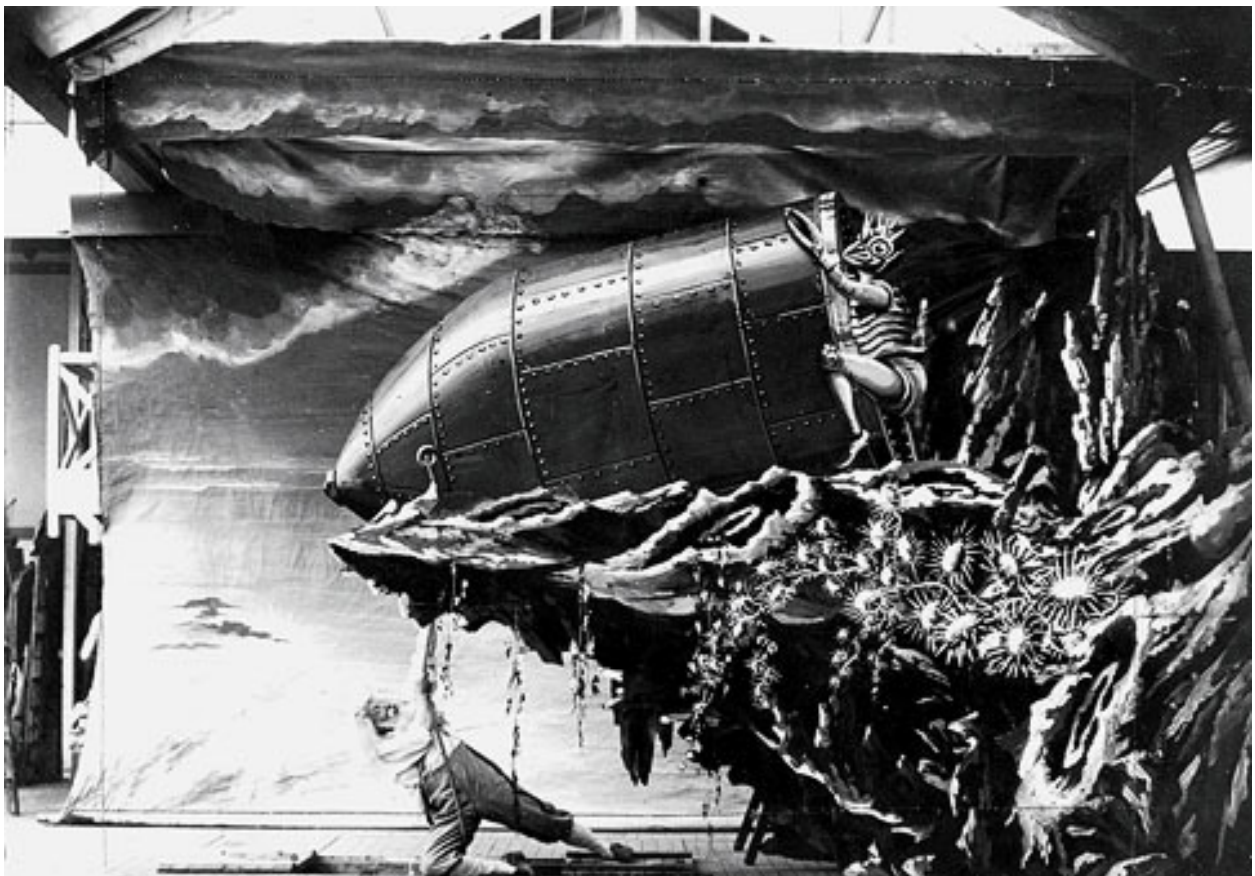


Figure 4. Production still from Georges Méliès's 1902 film *La Voyage Dans La Lune* (A Trip to the Moon). In this uncropped still, you can see the edges of the backdrop as well as the studio floor and ceiling.

Image credit: Georges Méliès

CHAPTER 3: SCIENCE FICTION IMAGINARIES AND TECHNOLOGICAL REALITIES

Science fiction and spaceflight are kindred spirits. As was discussed in Chapters 1 and 2, science fiction has been a catalyst for scientific advancement on Earth and in the cosmos. In Chapter 1, I described science fiction as a locomotive pulling the train-car of technological innovation. While this is true in a certain sense, the close relationship between science fiction and technoscientific advancement—including human spaceflight—is more of a symbiotic one; feeding into and off of one another as real-world science and science fiction dreamscapes advance and meld into realities that are almost unable to be differentiated from one another (Haraway 2013; Landis 2015; Milburn 2003).

Jules Verne's *De la Terre à la Lune* (From the Earth to the Moon)—written in 1865—was one of the first science fiction works that injected Western science into the genre. Instead of traveling throughout the cosmos in a dream state or brushing off the plot device of how one actually travels outside of the Earth's atmosphere, Verne correctly imagined that journeying from one cosmic body to another would take a feat of engineering (Landis 2015). Verne, however, utilized the technology of his time to imagine how humans would arrive on the surface of the moon: via an enormous cannon. Despite the difference in propulsion method (cannon vs. rocket), the engineering imaginary in *De la Terre à la Lune* and the engineering reality for NASA's Project Apollo—that took humans to the moon—were remarkably similar. Both launched from Florida with a crew of three in a capsule made from aluminum; Verne called his capsule Columbiad, the Apollo 11 crew called their command module Columbia (Landis

2015). Verne's story also served as the main inspiration for one of the first motion pictures: Georges Méliès's 1902 film *La Voyage Dans La Lune* (A Trip to the Moon).

Science fiction continues to inspire contemporary outer space developments. On April 8, 2016, SpaceX launched their CRS-8 mission to re-supply the International Space Station (ISS). After their Dragon spacecraft separated from its Falcon 9 rocket booster and continued toward orbit and eventually the ISS, SpaceX succeeded in doing something that hadn't previously been done. Instead of their rocket booster falling back down to Earth to be forgotten in the deserts of Kazakhstan (like Russia's Soyuz rocket) or parachuting into the ocean and reused (as was done with the Space Shuttle's solid rocket boosters), SpaceX successfully landed their rocket booster vertically on an autonomous spaceport drone ship (ASDS) off the coast of their launch site at Cape Canaveral for later recovery, refurbishment, and reuse on another flight.

In 1959, the Soviet science fiction film *Небо зовет* (*Nebo Zovyot*—The Sky Calls) was released. In the film, the fictional Soviet spacecraft called *Родина* (*Rodina*—Motherland) landed vertically on a floating platform in the

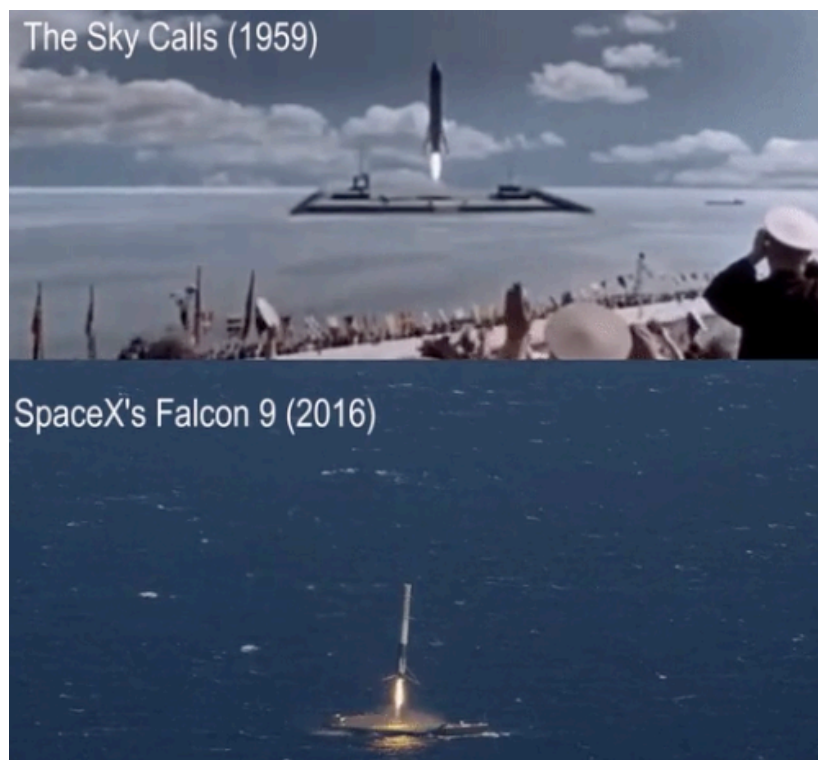


Figure 5. Illustration of the striking similarity between *Nebo Zovyot* and the landing of SpaceX's CRS-8 Falcon 9 booster.

Image credit: Dovzhenko Film Studios/SpaceX/NASA

harbor of Yalta on the Crimean peninsula. Despite the 57 years that separated the imaginary from the reality, the similarities are striking, including the shape of the rockets—each utilizing three landing legs. The science fiction influence is compounded when one looks at the names of SpaceX's two ASDS. In the Pacific Ocean—in order to support launches from Vandenberg in California—SpaceX has the ASDS *Just Read The Instructions*; in the Atlantic Ocean, in order to support launches from Cape Canaveral (and the ship pictured in Figure 5) is ASDS *Of Course I Still Love You*. The two ASDS are named after the enormous, sentient starships which appear in Iain M. Banks' (1988) science fiction novel *The Player of Games*.

This is not to say that Elon Musk—the founder and CEO of SpaceX—was directly influenced by a 1959 Soviet science fiction film (although he was directly influenced by Banks' novel). Vertical take-off, vertical landing spacecraft were not restricted to a single film; they have appeared in many science fiction works. What I am arguing is that science fiction—as a part of the social imaginary—not only inspires technoscientific advancement, it actually serves as a liberatory dreamscape that is not beholden to the rigidity of scientific rules. As Milburn (2003) puts it: "Succinctly, science fiction assumes an element of transgression from contemporary scientific thought that in itself brings about the transformation of the world" (266). In other words, science fiction takes to heart the suggestions by Feyerabend ([1975] 2010) and allows for science fiction authors to dream of realities and technologies without being indebted to the scientific method (see Chapter 2 for more). The result of this liberation from scientific restriction of the imagination is that science fiction authors become prophetic of scientific advancement decades before actual technoscientific discoveries are made—from

mobile phones (Venables 2013) to tanks and armored vehicles (Wells [1902] 2016) to cryopreservation (Ettinger [1962] 1964) to military airplanes (Milne [1914] 2012) to the atomic bomb (Wells 1914). The coterminous aspects of science fiction and “real” science will be discussed further in Chapter 10.

However, it is important to remember that the science fiction imaginary does not exist outside of world ideologies and sociocultural hegemony.⁸ The dreamscapes and ideas that are promulgated by science fiction authors are both tethered to and feeding into the social, cultural, and political ideas of the time in which they are written. In order to illustrate this, I am going to focus on and analyze a particular plot component within science fiction—asteroids and comets—and illustrate how the shift in the ways these celestial objects have entered the social imaginary have played into ideas of technological salvation, the weaponization of outer space, and colonial “Othering” within outer space imaginaries.

The Militarization of Science Fiction

It is hard to speculate on when comets entered folklore as being harbingers of war, famine, plague, suffering, and general doom, but it can be traced back to at least

⁸ Cultural hegemony is an important concept to operationalize within this thesis. Hegemony was theorized by Italian Neo-Marxist Antonio Gramsci ([1948] 1992)—he defined it as: “The ‘spontaneous’ consent given by the great masses of the population to the general direction imposed on social life by the dominant fundamental group; this consent is historically caused by prestige (and consequent confidence) which the dominant group enjoys because of its position and function in the world of production” (11). I interpret Gramsci’s definition as meaning an implicit control by the bourgeoisie, who manipulate the beliefs, values, perceptions, etc. of the proletariat not only by force, but also by propagating their own values and norms so that the bourgeoisie and the proletariat end up sharing a similar ideology, thus creating an environment in which the proletariat identify their own sense of well-being, progress, right, and wrong with that of the bourgeoisie, even though the worldview of each may be disparate. This ends up producing a feedback loop wherein the proletariat and the petite bourgeoisie are reproducing and reenforcing the bourgeois status-quo. Hegemony is a political and ideological superstructure that, according to Gramsci, is tied to folklore, popular culture, and religion in order to maintain a “consented coercion.” However, as argued by Gramsci, when there is a “crisis of authority”—when the dominant hegemony begins to be challenged—the “masks of consent” are stripped away and the true violent arm of the state is revealed—as evidenced by violent police and military action at sites of radical protest and revolt.

Aristotle in ancient Greece.⁹ Aristotle—and other Greek philosophers—believed comets to be “barometers of the times” (Genuth 1997, 20) that foretold droughts, earthquakes, and torrential rains. Aristotle called them ἀστήρ κομήτης (*astēr komētēs*—“long-haired” star)—this is where we derive the English word “comet” from—or πωγωνίας (*pagonias*—“bearded” star), the latter being the preferred nomenclature until the early modern era (Genuth 1997). The Roman poet Marcus Manilius shifted the Aristotelian meaning of comets from heralds of only naturally occurring phenomena to a more severe meaning: that the gods were warning humans of forthcoming death, pestilence, war, and suffering (Hellman 1944). Manilius’ poem—entitled *Astronomicon Libri Quinque*—was frequently read throughout the Middle Ages and the Renaissance, influencing the Western social imaginary of comets (Genuth 1997).

However, this same prophetic narrative of doom and gloom did not exist for asteroids until the late 20th century. Throughout the 19th century and into the early 20th century, asteroids were viewed taxonomically as either the building blocks of planets, or as the fragments left over after planet formation (Mellor 2007). Asteroids follow planet-like orbits, moving predictably through familiar geometrically abstracted space inclined close to the planetary plane—so much so that they are also called “minor planets” (Mellor 2007, 502). Comets, on the other hand, have elongated orbits oriented in all different directions, which makes them hard to observe and accounts for their perceived irregular visits to Earth—personifying them as unscrupulous and making them

⁹ This history is skewed toward Western philosophy because I do not wish to speculate on the oral traditions about astral phenomena that no doubt exist(ed) outside of the bubble of Western thought. However, I do recognize the need for future ethnographic research in order to compile the meanings of comets from Indigenous peoples worldwide, should they wish to share them. Furthermore—to speak of my positionality—I have a minor in Classics and that training has influenced the way I view historical events; this thesis also speaks of the settler-colonial American imaginary, which has particularly fetishized Classical/Western philosophy.

seem dangerous. Therefore, early science fiction authors were able to reconcile—in the Age of Science—utilizing a similar narrative for comets as their so-called “myth-oriented” ancestors.

Late 19th and early 20th century poets and authors began to engage in narratives of comet encounters with Earth, such as Edgar Allan Poe ([1839] 1985), H.G. Wells ([1906] 2001), and Camille Flammarion ([1893] 1894), whose novel *La Fin du monde* (The End of the World) was later adapted into one of the first science fiction sound-films by the same name (Gance 1931). Most science fiction works prior to the mid-20th century cast comets as agents of global destruction, although not usually due to an impact.¹⁰ For example, Poe and Wells each described Earth’s orbit moving through a comet’s gases, removing (or igniting) nitrogen and oxygen in the atmosphere and thus eliminating life as we know it.

Since the 1930s, astronomers understood that there existed the possibility of future asteroid impacts due to their researching asteroid collision rates on other celestial bodies; however, their work was never framed as alarmist (Mellor 2007). In 1967, after the close pass of the asteroid Icarus to Earth, students at Massachusetts Institute of Technology (MIT) ran a thought exercise that imagined how to mitigate an asteroid impact and published their results (Kleiman 1979). However, it wasn’t until Luis Alvarez (1980) and his co-workers published their ground-breaking work attributing a large asteroid strike to the extinction of the dinosaurs that asteroid impact became a

¹⁰ There are some notable exceptions, such as the 1835 Russian novel 4338-й год: Петербургские письма (The Year 4338: Petersburg Letters) by Vladimir Odoevsky, which is set in the year 4338, a year before Biela’s Comet was to collide with Earth, utilizing comet trajectory data computed in the 1820s. Biela’s Comet is now thought to have broken apart in 1842 or 1843 while it was near Jupiter (Jenniskens and Vaubaillon 2007). Its fragments are now associated with the annual Andromedids meteor shower in November, although activity has weakened significantly since the 19th century (Hergenrother 2008).

mainstream potential threat within the astronomer and paleontologist social imaginary (Mellor 2007).

More evidence showing asteroids to be a viable threat began to mount as NASA's planetary probes showed asteroid impacts on other planets (Shoemaker 1983) as well as the discovery of Chicxulub Crater—supposedly the impact site formed after the dinosaur-killing asteroid struck Earth—off the coast of the Yucatán Peninsula in México (Hildebrand et al. 1991). Instead of solely possessing a cosmic taxonomical component, asteroids were suddenly imbued with a scientific narrative. Developing narratives can either generate or constrain scientific research; several scholars have already written on how the role of narrative in research creates scientific coherence (see: Brown 1998; Haraway 1989; Mellor 2007; O'Hara 1992). Creating a scientific narrative not only implies an anticipated ending but, as Mellor (2007) has said, “narrative is inherently teleological and ideological. The inexorable movement of a narrative towards a predetermined end ensures that its many assumptions go unchallenged” (501). Asteroids had now entered the broader scientific social imaginary—and by the late 1990s, with films like *Armageddon* (1998) and *Deep Impact* (1998), the public's social imaginary—as catastrophic harbingers of doom, a designation once only associated with comets.

By the late 1980s, civilian and military defense scientists—usually at odds with each other ideologically—began to utilize the same futurological narrative: that asteroids are the enemy of the human race and technologies must be developed in order to mitigate an asteroid impact that could initiate a global holocaust (Mellor 2007). This narrative—that continues into the present—plays into existing narratives and

anthropological research on power and security (see: Goldstein 2010; Ortner 2006; Price 2016, among others). Throughout the Cold War, technological salvation narratives were prominent, especially ones that espoused that peace could only be achieved through the development of super-weapons—such as nuclear missiles and the Strategic Defense Initiative (SDI)¹¹ (Franklin 1988). This Cold War fantasy, hinged on politics of fear, reached its logical conclusion as the threat of global nuclear war cooled and shifted from nuclear impact to the threat of asteroid impact—particularly as the Iron Curtain began to collapse in the late 1980s and early 1990s (McCurdy 1997). As Howard McCurdy (1997) put it: “Because bombs did not fall from space, advocates of space exploration looked for other objects that did” (78).

Science fiction writers played their part in the development of the politics of fear, shifting their views of asteroids as resource objects to asteroids as destructive agents. In fact, many science fiction writers not only defended programs like SDI, they imagined it into reality, with many physicists at the Livermore National Laboratory—the weapons laboratory headed by Edward Teller, the so-called “father of the hydrogen bomb”—citing science fiction staples like George Lucas, Larry Niven, Jerry Pournelle, and Robert Heinlein as influences for their weapons designs (Seed 1999). Furthermore, several science fiction authors themselves, such as Niven and Pournelle, were in direct contact with weapons scientists (Mellor 2007). Some scholars have argued that militaristic science fiction and military policy itself both operate within the same discourse system

¹¹ The Strategic Defense Initiative, known also as Star Wars, was a Reagan-era program that hoped to create a sophisticated anti-nuclear missile system that could prevent attacks from the Soviet Union. This included proposals to weaponize outer space, such as satellites with anti-missile lasers and Brilliant Pebbles, a satellite that could fire high-velocity, basketball-sized projectiles that would punch through and disable intercontinental ballistic missiles when they entered outer space.

(Franklin 1988; Gray 1994). In fact, the Air Force Academy held “Nexus” conferences that brought together science fiction writers and military policymakers in order to collaborate and generate ideas (Mellor 2007). This collaboration influenced military practices and war-gaming—which are themselves military fictions—and are highly influenced by militaristic science fiction (Gray 1994); so much so that a 1996 Air Force study utilized an asteroid impact as an instigating incident while incorporating science fiction devices like “force shields” and “gravity manipulation” (Mellor 2007).

In 1994, several NASA workshops were convened—under request from the House Committee on Science, Space, and Technology, after the comet Shoemaker-Levy 9 collided with Jupiter—in order to survey and catalog all comets and asteroids that were 1 kilometer or larger and crossed the orbital path of Earth. The group decided to call themselves the Spaceguard Survey—a name taken from a similar project fictionalized in Arthur C. Clarke’s (1973) science fiction novel *Rendezvous with Rama*. As asteroids were surveyed, logged, and tracked, they completed their narrative journey from passive minor planets traveling through the vacuum of space into active destructive agents that could turn on Earth’s population at any moment (Mellor 2007). As such, science fiction authors and scientists began contributing to a social imaginary feedback loop—labeling asteroids as “menacing,” having “teeth,” and that they were unleashing “ferocious assaults” because they were “global killers” (Mellor 2007, 516). Militaristic language was also employed, calling asteroids “missiles,” “pieces of ordinance,” or “stealth weapons” (Lewis 1997, 37). Even Carl Sagan—who was vehemently opposed to the militarization of outer space—said that in order to protect

ourselves from the bombardment of asteroids, our choice is “spaceflight or extinction” (McCurdy 1997, 80).

So, in a matter of several decades, the space in outer space was populated with swarms of asteroids intent on the destruction of humanity. What was once a passive, mathematical space peppered with components from early planetary formation had now been shifted into a narrative place of danger—crammed full of planet-killing asteroids—in need of Earthly intervention (Mellor 2007). This is what Lisa Messeri (2016) has called the “place-making of outer space.” As Messeri (2016) defines it, “space is universal, empty, and a priori, while places are meaning-filled subsections of space” (13). Militaristic science fiction authors, military policymakers, and politicians have made a *place* out of (outer) *space*. In the example of asteroids, they have created an enemy Other that threatens and menaces humankind and—in the American imaginary—the conclusion of this narrative is to weaponize outer space in order to protect the American homeland (Andrews 2015). This creation of an otherworldly Other draws from settler-colonial, frontier conceptions utilized in the American past and had been coopted as the chief narrative of NewSpace corporations.

Colonial and White Supremacist Visions of Outer Space Futures

Edward Said (1994) has said that “the novel, as a cultural artifact of bourgeois society, and imperialism are unthinkable without each other” (70–71) and I believe this statement can also be applied to science fiction works.¹² As John Rieder (2008) has said, “science fiction [was] polarized by the energies of the colonial field of discourse,

¹² That is not to say that all science fiction espouses latent colonial and white supremacist visions—in fact, there is an abundance of science fiction that retaliates against these tropes and utilizes the genre as a form of protest and resistance. See Chapter 2 for further discussion.

like a piece of iron magnetized by its proximity to a powerful electrical field” (15). I think this metaphor is a good one because it illustrates that many science fiction authors are not writing from a place of colonial activism; rather, science fiction authors are caught within the colonial and imperial hegemony that is pervasive throughout Western culture.

This intertwining of colonial ideology is—in the discipline of anthropology—a familiar one, and in fact, evolutionary theory and anthropology served as chief inspirations for early science fiction (Rieder 2008). Social Darwinian conceptions of competition, adaptation, race, and destiny became thematic nexuses for anthropological research and science fiction during the same span of history—beginning around the mid-19th century (Rieder 2008). Many early science fiction works—and even some contemporary works—are grounded within conceptions of exoticism, adventure, and the Other. A group of intrepid, usually white, usually male, explorers set out to seek adventure on an alien world—to see the sights and kill the inhabitants. This is, of course, hyperbolic but many activist science fiction writers, such as Ursula K. Le Guin—daughter of famed anthropologist Alfred Kroeber—have complained about the patriarchal, colonial, and white supremacist direction implicit in many science fiction works (Le Guin 1975).

Edward Said’s (1979) *Orientalism* provides an excellent conceptual framework in which to analyze the colonial science fiction dreamscapes that interface with space science and public imaginaries. Said analyzed how English literature constructed the “Orient” as not only being an exotic geographic place, but also framed its population as an alien “Other” within the Western popular imagination (Nama 2008). Said’s observations can be utilized in science fiction studies as well; in many science fiction

works, the same binary relationship of a strong, rational, masculine West and a weak, irrational, feminine East can be seen in strong, white, male science fiction protagonists and in the weak, feminine, alien Others. By “alien,” I do not mean strictly an extraterrestrial character—although it can be that as well—but also any trope that is unfamiliar, unknown, or strange. Sometimes, these alien Others can also be violent. In Larry Niven and Jerry Pournelle’s (1977) science fiction novel *Lucifer’s Hammer*, a comet has impacted the Earth’s surface. A former senator sets up a small community within the lawless devastation in order to re-establish a “civilized,” technological society. This community attempting to re-create civilization is predominantly white, and is constantly attacked by violent, predominantly black gangs, including one group that has turned to ritualized cannibalism.

In this particular work of fiction, Niven and Pournelle (1977) have created a violent, exotic Other in both the comet that has plunged Earth into disarray, and also in the roving “savage” gangs that threaten white civilization, utilizing a familiar trope of exoticism in the form of cannibalism, a practice abhorred by the “civilized” West. What makes this work of fiction so troubling—aside from the racist undertones—are the accolades showered on the novel from planetary scientists, defense scientists, and NewSpace advocates who say it is “good science fiction” based on “real science” (Mellor 2007, 512) and that “estimating sociological responses to catastrophe are more nearly in the purview of science-fiction writers, like Jerry Pournelle and Larry Niven, who addressed these matters in *Lucifer’s Hammer*” (Chapman and Morrison 1989, 279).

When planetary scientists see anthropological/sociological commentary within the purview of only science fiction authors, there exists the danger of racist, outdated, Spencerian social theory being understood as human reality. In other science fiction works, future blackness can be omitted entirely—such as in science fiction films *2001: A Space Odyssey* (1968), *Logan's Run* (1976), and *Star Wars* (1977), to name a few. By including only whiteness in these visions of the future, it sends a message of white, Western ideology and bodies as being the social, cultural, and technological peak of civilization. In some of these science fiction works, such as *2001: A Space Odyssey*, blackness is starkly primitive and wild—as Nama (2008) has observed:

The celebrated depiction of Darwinian evolution—illustrated in a single transition shot from primates using a bone tool to a similarly shaped white space station, its technological analog—also conveys a visual code whereby racial difference divides the uncivilized from the civilized. In the futuristic world of *2001: A Space Odyssey* humankind is technologically advanced, civilized, socially composed, and exclusively white. The film's white world of the future, however, stands in sharp contrast to the colored primates of the past. In this case, the dark brown progenitors of humankind are primitive, violent, and wild apelike creatures. (13)

Some works of science fiction combine these racial tropes with an American colonial vision of the western frontier in order to invoke what Csicsery-Ronay (2008) has called a “future past” (76). Messeri (2016) says of this concept: “we can think of sci-fi stories not as prophecies but as histories of events yet to happen” (59); or as Julian Pitt-Rivers (1977) has said, “it is once-upon-a-time that has yet to occur” (142). This future past element to science fiction also projects a romanticized vision of the American frontier—one of opportunity, freedom, adventure, and untold profits. However, the future past vision of the frontier tends to leave out the Indigenous, slavery, disease, suffering, oppression, and poverty (Messeri 2016). No group has adopted this future past philosophy more than the NewSpace movement.

Robert Zubrin, the founder of the NewSpace and outer space migration advocacy group The Mars Society, has drawn on this science fiction inspired, frontier-based viewpoint that is held by many planetary scientists and NewSpace corporations. His polemic utilizes a rose-tinted future past ideology of the New World frontier—one of persecuted settlers fleeing a repressive world in order to establish so-called true democracy in unspoiled lands.

Without a frontier from which to breathe new life, the spirit that gave rise to the progressive humanistic culture that America has represented for the past two centuries is fading. The issue is not just one of national loss—human progress needs a vanguard, and no replacement is in sight. The creation of a new frontier thus presents itself as America's and humanity's greatest social need. Nothing is more important: Apply what palliatives you will, without a frontier to grow in, not only American society, but the entire global civilization based upon values of humanism, science, and progress will ultimately die. I believe that humanity's new frontier can only be on Mars. (Zubrin 1996, 297)

Zubrin's techno-utopian sermon—reeking of Manifest Destiny-like romanticism—leaves out the realities of the hardships that would exist for any human migrating to Mars. Furthermore, it ignores the brutalities of Western colonialism of which he is deriving his inspiration from. However, Zubrin is drawing upon the American cultural mythology that canonizes the frontiersman—the proto-Titan of early neoliberalism—who is clever, competent, and depends on no one but himself (Bartter 1986). Zubrin's zealous insistence that Americans need a frontier in order to prevent stagnation or elimination is not a new concept. His rhetoric is reminiscent of the Frontier Thesis, proposed by Frederick Jackson Turner ([1893] 2011). In his book *The Frontier in American History*, Turner ([1893] 2011) proposed that:

The appeal of the undiscovered is strong in America. For three centuries the fundamental process in its history was . . . the discovery and occupation of the vast free spaces of the continent . . . American democracy was born of no theorist's dream; it was not carried in the *Susan Constant* to Virginia, nor in the

Mayflower to Plymouth. It came out of the American forest, and it gained new strength each time it touched a new frontier. Not the constitution, but free land and an abundance of natural resources open to a fit people, made the democratic type of society in America . . . (226)

The Frontier Thesis became a well accepted cultural mythos for the American people; by the time of Turner's death in 1932, 60% of the leading history programs in the United States were offering an undergraduate course utilizing Turner's Frontier Thesis (Bogue 1994). It was also utilized by John F. Kennedy; in his Presidential acceptance speech, he announced: "I am asking each of you to be new pioneers on that New Frontier. My call is to the young in heart, regardless of age—to the stout in spirit, regardless of party" (Kennedy 1991, 101). When Kennedy took office in 1960—as the Cold War escalated towards its peak—he developed his political platform of the New Frontier to include one of the largest undertakings in modern history: to land an American on Earth's moon in less than ten years.

CHAPTER 4: THE COLD WAR

Providing a comprehensive history of spaceflight during the Cold War is beyond the purview of this thesis; in fact, histories of the Cold War and the Space Race could be dozens of theses and dissertations in themselves.¹³ Instead, I will give a short, pointed history that provides details pertaining to my ethnographic sections in order to operationalize concepts, develop a common baseline knowledge of human spaceflight development during the Cold War years, and analyze historical events through a politically economic and ideological lens. As such, this section assumes the reader already has a basic historical knowledge of the Cold War era—including the Space Race—in order to keep this chapter at a reasonable length.

The date range of the Cold War is contested by many historians, but for the sake of this thesis—since I am focusing primarily on human spaceflight—I will be bracketing the bulk of this chapter from the successful launch of Sputnik in 1957 to the Apollo 11 moon landing in 1969. Specifically, this chapter will focus on NASA's crewed spaceflight programs and the corresponding Soviet programs because, as Apollo astronaut Frank Borman has said, "the Apollo program was just a battle in the Cold War" (Klesius 2008, para. 10).

The Early Years: NACA Becomes NASA

On March 3, 1915, President Woodrow Wilson chartered the National Advisory Committee for Aeronautics (NACA) in an emergency measure to promote aeronautical

¹³ For general historical accounts of the Space Race, I would recommend Dick et al. (2007) and Gorn (2005) if one is interested in the United States. For those interested in the Soviet Union's side of the Space Race, Chertok's (2005; 2006; 2009; 2012) four-part series on Soviet space development is excellent and thorough, as is Siddiqi's (2011) *Challenge to Apollo*—both of which are free from the NASA Headquarters History Office.

coordination amongst military, academia, and industry in support of war projects for World War I (Dick et al. 2007). NACA was instrumental in the development of early aerodynamic research, supersonic aircraft design, and early rocket propulsion (Dick et al. 2007; Gorn 2005). However, many of these advancements in American rocketry didn't occur until after World War II due to Operation Paperclip, a program by the United States Office of Strategic Services that consisted of bringing over 1,500 German scientists, engineers, and technicians to the United States—this included German rocket scientists Kurt H. Debus, Arthur Rudolph, and Wernher von Braun (Jacobsen 2014). Von Braun—who went on to develop many rockets for the United States, including the Saturn V moon rocket—was a former Nazi Party and SS member who was instrumental in developing the German V2 rocket, the first weaponized rocket that was used to bomb Great Britain (Ward 2009).

The Soviet Union, similarly, had what they called Трофейные бригады (*Trofeynnye brigady*) or “trophy brigades” that followed closely behind their infantry forces in order to acquire German scientists, engineers, and technicians. Both the United States and Soviet Union utilized methods of coercion—including outright violence and force—to compel German scientists to migrate to their respective countries in order to work on each nation's burgeoning nuclear and space programs (Taylor 2013). Many of these captured Germans, including the three listed above, were classified as “menace[s] to the security of the Allied Forces” (Ford 2011, 144). In the United States, the Joint Intelligence Objectives Agency expunged and falsified many of the records of these former Nazi members in order to grant them security clearances and allow them to live in the United States (Jacobsen 2014).

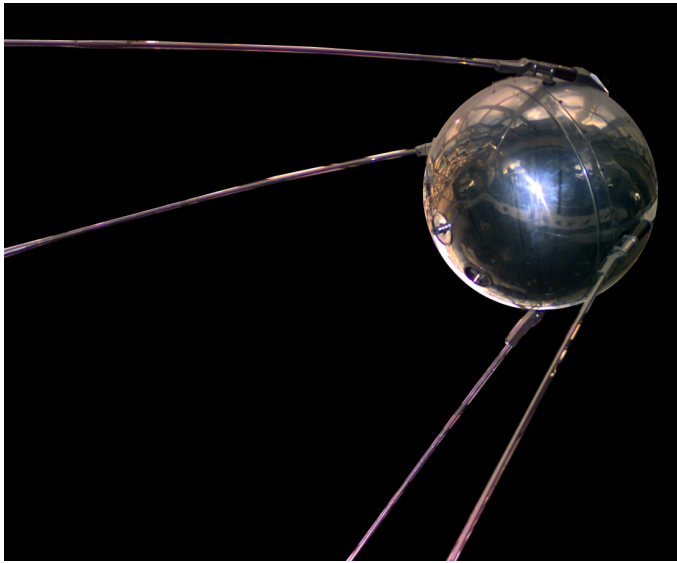


Figure 6. A replica of Sputnik-1 on display at the U.S. National Air and Space Museum.

Image credit: NASA

On October 4, 1957, the Soviet-made artificial satellite Спутник-1 (*Sputnik-1*—Satellite-1) was successfully launched into Earth orbit, initiating the Space Race. The American people were shocked at the apparent technological superiority of the Soviet Union. Americans felt a mixture of outrage and fear, as their Cold War enemy now had the

capability of reaching the United States with missiles; this fact was obvious to anyone with a shortwave radio who could pick up Sputnik’s beeping transmission as it orbited overhead (Devine 1993). This fear-based rhetoric so permeated the American imaginary that the so-called “missile gap”—the perceived superiority of the number and power of the Soviet Union’s missiles in comparison to the United States—became a dominant issue in the 1960 Presidential campaign (Prados 1982). President Eisenhower began to increase spending on science education, scientific research, and technological development as a response. He also passed the National Aeronautics and Space Act on July 29, 1958, which formally dissolved NACA and absorbed its personnel, laboratories, and assets into the newly established National Aeronautics and Space Administration (NASA), which was tasked with encouraging peaceful applications to space science (Dick et al. 2007; Gorn 2005).

The Space Race: A Brief History and Ideological Analysis

On April 12, 1961, the United States was shocked again when the Soviet Union launched the first person in space, as well as first to orbit our planet. Yuri Gagarin, a 27-year old Soviet Air Force pilot, successfully completed the first crewed space mission while the U.S. was still making preparations for their own inaugural space shot. At that time, the United States' Project Mercury had recruited seven former military test pilots to become the nation's first astronauts, but were still analyzing ballistic, sub-orbital launch tests they had completed with chimpanzees (Dick et al. 2007). The Soviet Union also initially tested the stresses of outer space travel on animals, only they primarily utilized dogs (Siddiqi 2011). While the space programs of these two superpowers had many similarities and differences, I argue that certain differences are due to *ideological* dissimilarities. In order to illustrate this, I will discuss the differences in the capsule designs utilized during each program's first crewed space projects.

While the Project Mercury capsule and Soviet Восток (*Vostok*—East) capsule each seated a single cosmonaut/astronaut—and derived their launch vehicles from each country's intercontinental ballistic missiles (ICBM)—there existed several major differences other than design aesthetic that are worth mentioning. The Mercury capsule had large parachutes attached to the capsule itself and splashed down in the Pacific Ocean with the astronaut inside. This method contrasts the Vostok capsule which would descend over land. This was mainly due to the fact that the United States' largest friendly territory that was perceived as being “uninhabited” was the Pacific and Atlantic Oceans. In contrast, the Soviet Union had vast land territory that they viewed as being “uninhabited;” however, many of these territories—both in the case of the United States

and the Soviet Union—consisted of Indigenous land and territories, reenforcing the colonial overture of the Space Race (see: Brož 2007; 2015).

The Vostok capsule was equipped with parachutes for capsule recovery, however, they were smaller and would cause the capsule to land at too fast a velocity to keep the cosmonaut safely inside. Instead, the Vostok's hatch would explode off and eject the cosmonaut out of the spacecraft when it descended to 7 kilometers in elevation (around 23,000 feet) and the cosmonaut would parachute to the ground independent of the spacecraft (Hubbard 2016). After orbiting the Earth once, Yuri Gagarin—clad in a large orange spacesuit and giant helmet—re-entered the Earth's atmosphere, ejected from his spacecraft, and parachuted into a farmer's field near the city of Engels in the Saratov region on the banks of the Volga River. So the story goes, a farmer's wife and her daughter were working in the field when they witnessed this strange site. According to Gagarin: "When [the farming family] saw me in my space suit and the parachute dragging alongside as I walked, they started to back away in fear. I told them, 'Don't be afraid. I am a Soviet like you, who has descended from space and I must find a telephone to call Moscow!'" (Hubbard 2016, 4).

This difference in landing locations could very well be solely about geography and engineering. However, the ideology of the Soviet Union being founded upon classless fellowship between the working proletariat and the United States being founded upon individual freedoms and liberty may have had something to do with how these space programs were structured.¹⁴ Having a cosmonaut land in a farmer's field

¹⁴ I also argue that neither the Soviet Union nor the United States had (or have) the ideologies that they espouse as being a foundational truth in their respective countries. However, I believe that the social imaginary that exists within the populations of these territories can affect policy and create a macro-reality out of that ideology (see Chapter 2 for more theoretical discussions on social constructionism).

and greet that farmer as an equal, requesting the location of the nearest telephone so that they might notify the central government that they had successfully returned from outer space is almost unthinkable in the American imaginary. Meanwhile, the American astronauts would splash down in the ocean, waiting inside of their spacecraft until the United States Navy could arrive and scoop them out of the water to be returned to the continental United States—only to be seen by the American public after a media spectacle could be arranged.

Another ideological difference between the Vostok and Mercury spacecraft was the ability to control the vehicle. The Vostok spacecraft—and many other subsequent Soviet spacecraft—were completely controlled by either automatic systems on board, or by ground control. The cosmonaut was merely a passenger, although they were given a sealed envelope that contained a code to unlock the controls in case of an emergency (Siddiqi 2011). As Weibel and Swanson (2006) have said, “Cosmonauts really rode their spacecraft rather than flying them” (57). The Mercury astronauts, on the other hand, had taken part in the design and development of the Mercury spacecraft. The astronauts insisted that the spacecraft have manual controls, as well as a window and periscope in order to facilitate the piloting of the spacecraft (Catchpole 2001). Furthermore, if and when the astronaut decided to switch to manual control, it could replace or override ground control and the on-board computer. This difference mirrored each country’s ideology—that is, mission responsibility being placed on the whole (i.e. the Soviet state) versus responsibility being placed on the individual (the U.S. astronaut knowing better than ground control or computers).

The Soviet space program was always secondary to its military funding—much like the United States—however, the space program was integrated into the military’s Five-Year economic plans (Siddiqi 2011). Therefore, many of the Soviet spacecraft designs were made to be dual-use in order to gain Communist Party approval; for example, the Vostok space capsule could also be outfitted with cameras and launched as an uncrewed spy satellite (Gorin 1997). Furthermore, Nikita Khrushchev—the First Secretary of the Communist Party of the Soviet Union and Soviet leader until 1964—was more interested in ICBMs than spaceflight, and therefore, all crewed space missions were based upon rocket availability, or for ad hoc reasons, rather than for structured scientific motives (Siddiqi 2011). In the United States, all outer space affairs (other than military operations) were under the jurisdiction of civilian-controlled NASA, which was bestowed their own tax-payer supported budget. Due to this tax-payer accountability, NASA structured their spaceflights and planned missions carefully (Dick et al. 2007; Gorn 2005). However, until the United States was beaten into outer space by Yuri Gagarin, there did not exist a strong desire for crewed spaceflight within the federal government.

After Gagarin’s historic flight, President Kennedy—sensing the public’s fear following the embarrassing defeat at the Bay of Pigs and the Soviet’s “missile gap” superiority—felt pressure to boost perceived American superiority (Launius and McCurdy 1997). Kennedy, with the assistance of Lyndon Johnson and von Braun, decided that attempting to land Americans on the moon was the most feasible space-based effort that had the highest chance of American success in beating the Soviet Union—as opposed to other proposals, such as building an Earth orbiting space station

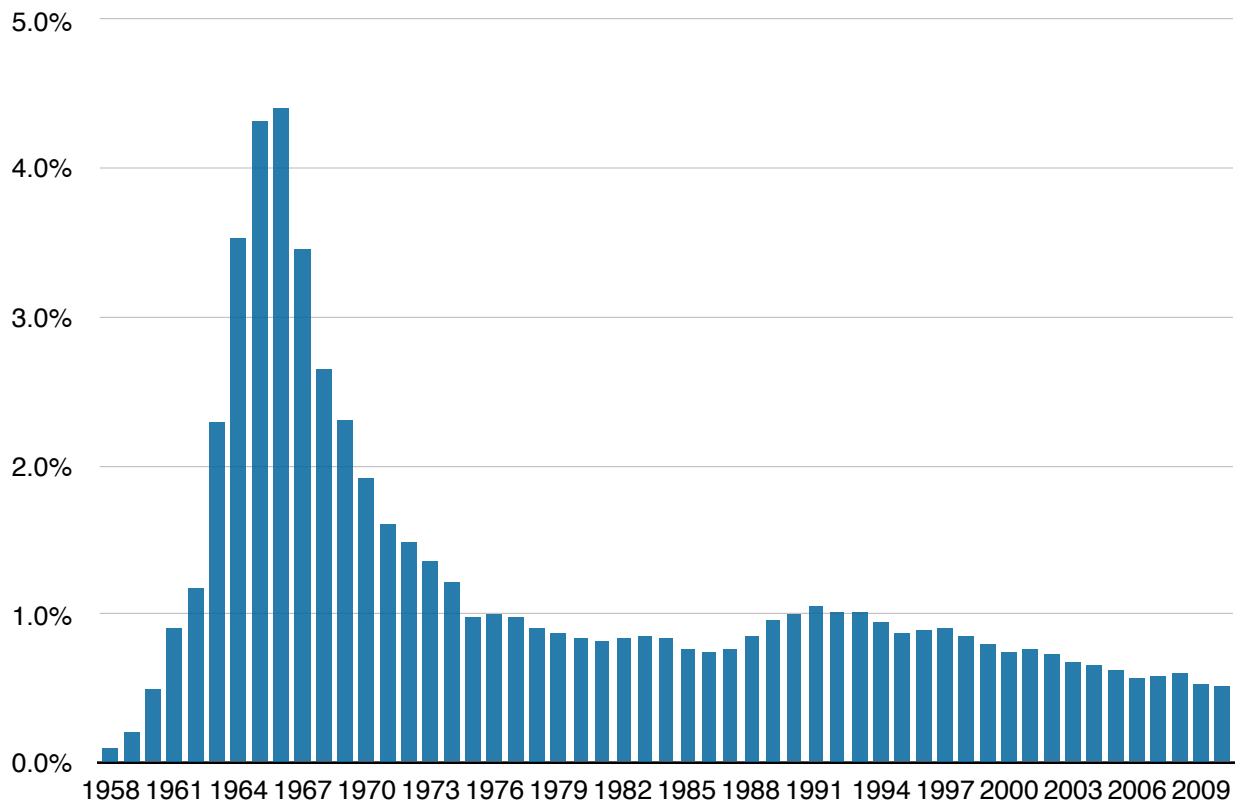


Figure 7. NASA Budget as a Percentage of Federal Budget (data from: Rogers 2010)

(Launius and McCurdy 1997). On September 12, 1962, Kennedy delivered his now famous “we choose to go to the moon” speech at Rice University and much like his soaring optimism, so too did NASA’s budget. In 1962, NASA’s budget was 1.18% of total U.S. spending; by 1966, it had jumped to 4.41%—the high-water mark for NASA’s budget, historically (Rogers 2010).

Khrushchev and the Soviet Union responded to Kennedy’s call for an American crewed moon mission with complete silence. According to Siddiqi (2011), Khrushchev was not interested in competing with the United States in their moonshot, however, the Soviet Union spent the next decade secretly attempting to develop the technology that would land a Soviet cosmonaut on the moon before the Americans. The Soviet Union quickly developed the *Восход* (*Voskhod*—Ascent/Dawn) spacecraft out of recycled

components from Vostok in order to compete with NASA's Gemini Program. Voskhod launched the first multi-crewed flight with two cosmonauts in 1964 and successfully completed the first spacewalk in 1965 before NASA was able to launch any of their crewed Gemini spacecraft (Siddiqi 2011). This ideological predilection toward thrift and ingenuity allowed the Soviet Union to continue pulling ahead in the Space Race while the United States was developing and testing novel spacecraft. However, after Khrushchev was ousted in 1964, Leonid Brezhnev, the new Soviet leader, along with the rest of his leadership, were less concerned about prestige and decided to focus on developing the next-generation Союз (*Soyuz*—Union) spacecraft (Siddiqi 2011).

The two year gap caused by Soyuz development allowed NASA to begin achieving space firsts: the first space rendezvous between two piloted spacecraft, the first docking between two spacecraft (a necessary prerequisite to a moon mission), a human spaceflight endurance record of fourteen days in space, and the first direct-ascent rendezvous—that is, rendezvousing with a target spacecraft on the first orbit (Dick et al. 2007; Gorn 2005). The Soviet Union was also plagued with testing complications in their Soyuz, as well as rocket malfunctions, leading to prolonged delays (Siddiqi 2011). The United States' Apollo Program, which would take Americans to the moon, was also dealing with malfunctions and delays (Dick et al. 2007). The pressure was on for both sides to continue producing crewed space firsts, which may have contributed to the joint disasters in 1967.

On January 27, 1967, Apollo 1 was on the launch pad performing a “plugs-out” test, a simulated launch necessary to test the spacecraft's ability to run on its own internal power. At 6:31pm, an electrical arc in weak wiring ignited the pure oxygen

environment of the spacecraft, killing all three astronauts aboard: Mercury and Gemini veteran Virgil E. “Gus” Grissom, the first American to walk in space Edward H. White II, and rookie astronaut Roger B. Chaffee (Dick et al. 2007; Gorn 2005). On April 24, 1967, the test flight of Soyuz-1 —after successfully launching, but having to abort the mission after one day due to a litany of problems—crashed into the Earth at 89 miles per hour after the main parachute tangled, killing cosmonaut Vladimir Komarov. Komarov became the world’s first in-flight spaceflight fatality (Siddiqi 2011).

After program delays on both sides due to their respective tragedies, spaceflight operations continued in 1968. In December, NASA launched Apollo 8, the first spacecraft to leave low-Earth orbit and travel to another celestial body: the moon. The Apollo 8 mission had an interesting unintended ideological effect. The now famous “Earthrise” photograph was the first time human beings took a photo of the Earth from beyond low-Earth orbit. This photograph is credited with jumpstarting the environmental movement and played a large role in



Figure 8. The famous “Earthrise” photo taken by Apollo 8 crew member Bill Anders as the spacecraft swung around from the dark side of the moon on December 24, 1968.

Image credit: NASA/Bill Anders

initiating the first Earth Day in 1970 (Poole 2008). Seeing the fragility of our blue marble from such a great distance injected activism into the outer space imaginary and generated both hopeful and defeatist beliefs about human futures.

The next month, in January 1969, the Soviet Union launched two crewed missions—Soyuz 4 and 5—and for the first time, two crewed spacecraft docked with each other and transferred crew between the two vehicles (Siddiqi 2011). However, following that success, the Soviet moon program was mired in issues. Their massive N1 super heavy lift launch vehicle—the rocket that was to take cosmonauts to the moon—failed to launch four consecutive times during uncrewed tests (Siddiqi 2011). The second uncrewed launch attempt on July 3, 1969 ended in the 344 foot rocket exploding shortly after lift off, destroying the pad and the launch facility (Siddiqi 2011). The consistent failures of the N1 rocket caused major delays, allowing NASA to finish testing the lunar lander in Earth and lunar orbits in preparation for Apollo 11.

On July 20, 1969, Neil Armstrong and Edwin “Buzz” Aldrin successfully landed on the Sea of Tranquility while Michael Collins orbited overhead. On July 24th, all three astronauts safely splashed down in the Pacific Ocean, driving a stake into Soviet ambitions to win the Space Race (Dick et al. 2007; Gorn 2005). After losing the race to the moon, the Soviet Union decided to pivot their cosmic objectives to low-Earth orbit space stations (Siddiqi 2011). The United States followed suit with their Skylab space station, partially utilizing the Apollo 18-20 spacecraft after those missions were canceled due to waning public interest in moon missions. However, in the spirit of détente between the Soviet Union and the United States, in the mid-1970s, the first cooperative spaceflight mission was planned called the Apollo-Soyuz Test Project. The plan was for

a Soviet crew in a Soyuz and an American crew in an Apollo spacecraft—fitted with a special docking adaptor—would dock together in Earth orbit and the crews of each country would shake hands, exchange gifts, and initiate cosmic cooperation.

Soviet leader Leonid Brezhnev, speaking on the significance of Apollo-Soyuz, said, “The Soviet and American spacemen [sic] will go up into outer space for the first major joint scientific experiment in the history of mankind [sic]. They know that from outer space our planet looks even more beautiful. It is big enough for us to live peacefully on it, but it is too small to be threatened by nuclear war” (Garan 2015, 13). The mission was a success and astronaut-cosmonaut relations aboard the joint spacecraft were filled with jokes, handshakes, food sharing in microgravity, and kinship

bonding—what Debbora Battaglia (2012) has called an *extra-territorial ethics of hospitality*—that was so intense that many of the crew members remained close friends for decades after the



Figure 9. The first handshake of cooperation between American commander Thomas Stafford (foreground) and Soviet commander Alexey Leonov (in the docking tunnel) on July 17, 1975.
Image credit: NASA

mission's end.¹⁵ This strong friendship between crew members did not ascend to the geopolitical level, however, and the United States and the Soviet Union returned to their chilled political relationship—especially after the election of Ronald Reagan in 1980—until the fall of the Soviet Union in the early 1990s. In 1995, the American Space Shuttle docked with the Russian space station Мир (*Mir*—Peace/World) and this renewed cooperation blossomed into the two countries becoming primary partners on the largest engineering project in human history: the International Space Station.

Gendered Labor

An often overlooked dimension in human spaceflight—particularly within the United States—is the heavy bias that exists towards men, and more specifically, white men. A majority of astronauts and cosmonauts were active-duty or retired military during the Cold War—and more specifically, test pilots—and with that profession came hyper-masculine posturing (Haraway 1992). Women were often relegated to secretary or administrative assistant positions—not that those positions are somehow lesser or unimportant! However, there are examples of women taking on the engrained masculine theatricality that existed (and exists) within military culture, both in the United States and the Soviet Union.

In the United States—at the peak of the Apollo Project in 1965—NASA engaged with 5.4% of the national supply of scientists and engineers; however, women only accounted for 3% of NASA's scientific and engineering staff (Howes and Herzenberg

¹⁵ A great example of the intense relationship between Apollo-Soyuz crew members is when American Thomas Stafford called Russian Alexey Leonov in 2003—28 years after the historic spaceflight—in order to ask Leonov to arrange the adoption of two Russian boys from an orphanage (Battaglia 2012). As Stafford said, “When we did the Apollo-Soyuz mission . . . I never thought I'd have two new Russian sons out of it” (Battaglia 2012, S84).

2003, 14). The statistics are even more bleak when one looks at the racial component—although NASA was surprisingly progressive in their hiring practices (compared to the rest of the United States)—as Shetterly (2016) has reported: “As late as 1970, just 1% of all American engineers were black—a number that doubled to a whopping 2% by 1984. Still, the federal government was the most reliable employer of African Americans in the sciences and technology: in 1984, 8.4% of NASA’s engineers were black” (xiv). Specifically, Shetterly (2016) has been able to uncover almost fifty black women who worked as computers, mathematicians, engineers, or scientists that worked at Langley Memorial Aeronautical Laboratory—a NACA, and later NASA, operated lab—between 1943-1980 and believes “that twenty more names can be shaken loose from the archives with more research” (xvi).

However, American women did not only have their sights set on Earth-bound engineering or scientist jobs—some wished to have the same chance as men to become astronauts for Project Mercury. In 1960, William Lovelace, an independent researcher who developed the astronaut tests for NASA, was curious how women would perform (Ackman 2003; Nolan 2002). Lovelace invited accomplished pilot Geraldyn “Jerrie” Cobb to take the tests—independent of the NASA testing process—and Cobb was able to pass all three of the strenuous and invasive physical and psychological tests (Weitekamp 2004).

After passing the tests, Cobb and Lovelace began to invite other women pilots to take the tests—twelve of whom were able to pass the first phase of testing (Ackman 2003). Cobb designated herself and these twelve women Fellow Lady Astronaut Trainees (FLATs) and she attempted to continue the other FLATs training at the same

location she had previously accomplished her Phase III training: the Naval School of Aviation Medicine in Pensacola, Florida (Weitekamp 2004). However, they were denied their training request under the pretense that without an official NASA request, they were not allowed to run tests on the FLATs (Ackman 2003; Weitekamp 2004).

Cobb immediately flew to Washington in order to try and resume the FLAT testing and in July of 1962, Republican congressman Victor Anfuso of New

York agreed to convene a special subcommittee of the House Committee on Science and Astronautics to investigate the possibility of gender discrimination a full two years before the Civil Rights Act (Weitekamp 2004). During the hearings, Cobb and another FLAT, Jane Hart, testified to the benefits of allowing women to become astronauts. Mercury astronaut John Glenn testified against the women in a hyper-masculine diatribe: "I think this gets back to the way our social order is organized really. It is just a fact. The men go off and fight the wars and fly the airplanes and come back and help



Figure 10. Jerrie Cobb next to a model of a Mercury spacecraft. Cobb ranked in the top 2% of tests administered to all astronaut candidates, regardless of gender, but was denied admission to astronaut candidacy. **Image credit:** NASA

design and build and test them. The fact that women are not in this field is a fact of our social order” (Teitel 2016, para. 40). NASA ended up ruling against the FLATs, stating that all astronaut candidates were required to be graduates of a military jet test piloting program—an impossibility at the time, as the military forbid women to join their test pilot schools—as well as having earned engineering degrees. Ironically, John Glenn conceded that he had been accepted into NASA’s Project Mercury without having earned the required college degree, showing that dispensation of program requirements could be granted to men, but not to women (Ackman 2003).

Meanwhile in the Soviet union, the Communist Party—in a rare instance of *planning* a space mission for political reasons (according to Siddiqi 2011)—launched the first woman into space, Valentina Tereshkova, aboard Vostok 6 on June 16, 1963. The United States did not launch their first woman into space until Sally Ride’s historic mission in 1983, an enormous twenty year gap that the Soviet Union used to their advantage in order to propagandize that their Communist ideology was more in line with equality than the capitalist West (Siddiqi 2011). However, following Tereshkova, the Soviet Union launched only one other woman into orbit, Svetlana Savitskaya, in 1982 (and again in 1984). Following Savitskaya, the Soviet Union never flew another woman cosmonaut (although Russia did in 1994, 1997, and 2014) so it seems that the flights of Tereshkova and Savitskaya may have been purely for political and propaganda reasons, rather than for virtues of equality.

Human or Warhead? The Dual Use of Rockets

The Space Race was not independent of forces within the greater geopolitical arena. Namely, the Space Race and the nuclear arms race were two sides of the same

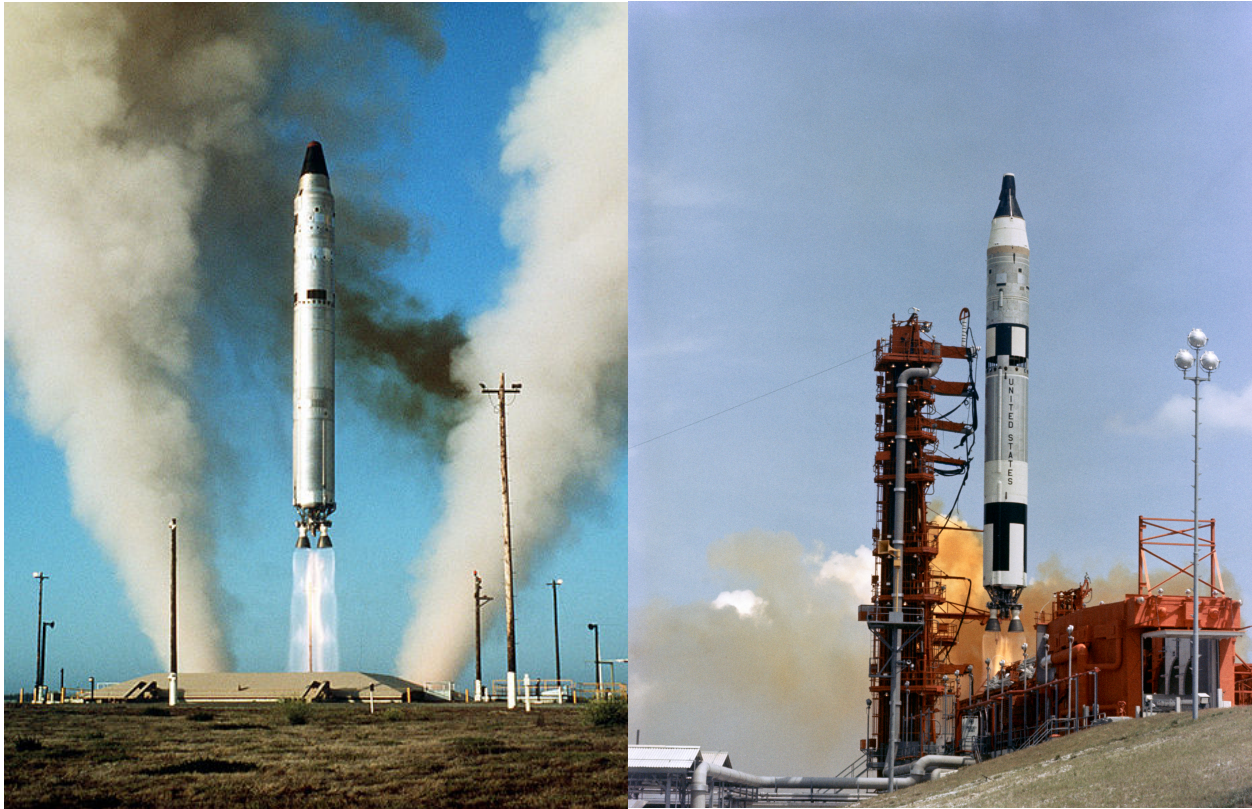


Figure 11. A Titan II ICBM capable of carrying a 9 megaton thermonuclear warhead (left) and a Titan II carrying the crewed Gemini 1 spacecraft (right).

Image credit: United States Department of Defense/NASA

coin. In the most cynical sense, one could make the argument that the Space Race was a techno-cultural showcase—a theatrical performance—of what each country’s nuclear capabilities were, cloaked behind the pretense of science and exploration. In fact, NASA’s Projects Mercury and Gemini converted intercontinental ballistic missiles (ICBM) for the purpose of carrying their astronauts into space. Mercury utilized the Redstone rocket for sub-orbital flights and the Atlas rocket for orbital flights; Gemini used the Titan II (Dick et al. 2007). Each of these rockets started their lifting careers in service to warhead transportation, not for scientific endeavors.

For the astronauts riding these rockets, it could sometimes be an unsettling experience. Michael Collins—a crew member of Apollo 11—first flew to space on

Gemini 10, lifted above our atmosphere by a Titan II rocket (Collins 1974). He describes the unsettling rocking motion after lift-off—and continuing until reaching orbit—due to the extreme gimbaling of the engine nozzles, a motion necessary for a missile designed with extreme maneuverability in mind so that it could target a variety of objectives (Collins 1974). This interesting anecdote reports on an embodied experience that was rare during the highly theoretical imaginary of nuclear deterrence, especially when it came to nuclear missiles, which were never flown in malice against a foe. Although the missiles were never launched, the terror caused by the potential for nuclear war should not be brushed aside. Interestingly, the didactic text at Kennedy Space Center, at the base of a Titan II rocket, utilizes an apologist—even triumphalist—rhetoric regarding the Titan II:

Looking into the rearview mirror, we can only shake our heads at the fear and paranoia that chained two powerful nations to a seesaw of guided missiles and possible nuclear destruction. In that mirror we should also remember that it was the Cold War between the Soviet Union and the United States that triggered the greatest adventure in human history. (Field Notes, September 8, 2016)

However, in the 1950s and 1960s—prior to the signing of the Outer Space Treaty in 1967—the United States and the Soviet Union each experimented with creating anti-satellite missiles (ASATs) owing to the perceived threat that each country would begin creating bomb-dropping satellites (Grego 2012). Due to the inaccuracy of many early guidance systems, each nation began to experiment by tipping ASATs with megaton-class nuclear weapons in order to ensure that even an inaccurate shot would still destroy its intended target (Grego 2012). After the signing of the Outer Space Treaty, nuclear weaponry was banned from outer space (Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and



Figure 12. The destruction of the NRO satellite USA-193 after being struck with an ASAT in 2008.
Image credit: United States Department of Defense

Other Celestial Bodies, 1966).

However ASAT weapons did not cease just because nuclear weaponry could not be mounted on them. In fact, in 2008, the U.S. Air Force launched an ASAT SM-3 missile in order to destroy an inoperative National Reconnaissance Office (NRO) satellite called USA-193, drawing condemnations from Russia and China (Webb 2008).

Perhaps the most ambitious plans to weaponize outer space was Wernher von Braun's (1959a; 1959b) plans to build a lunar outpost for the United States Army that would be crewed by a task force of twelve soldiers. Although this plan was never brought to fruition, the reports that were written are terrifying in their goals of establishing a military outpost on another celestial object. Von Braun (1959a; 1959b) suggested that the base would be powered by two nuclear reactors and defended by unguided Davy Crockett guns (see: Figure 13) with low-yield nuclear warheads, as well as claymore mines that would be modified to puncture pressure suits. This intertwining of the nuclear and outer space imaginaries can generate frightening knowledge production that, if it were realized, could have been disastrous for humankind both on and off planet Earth.

Hugh Gusterson (2004a) discusses the importance of nuclear weapons tests as being “high-tech rituals that are as important for their cultural and psychological as for their technical significance” (148). I believe that Gusterson’s definition could also be applied to human spaceflight.



Figure 13. A Davy Crockett “tactical” nuclear weapon system being tested in 1961.

Image credit: United States Department of Defense

A ritual implies a temporally static activity—it needs a beginning and an end—and perhaps this is why the NASA budget dropped significantly after the moon landing (see: Figure 7). This American ritual—based on competition—had been completed and was no longer necessary to flood with funding. I argue that the moon landings—from the perspective of the federal government elites—were never about scientific exploration, they were about a techno-cultural ritual that culminated in symbolic defeat of their sworn Communist enemy. After the 1960s—with decades of sub-par budgets from the federal government—NASA began its neoliberal turn along with the rest of the United States government during the 1970s (Harvey 2005) and it continues to enact extreme neoliberal reforms contemporarily.

CHAPTER 5: NASA'S NEOLIBERALIZATION: RESISTANCE, ACCEPTANCE, AND SUBSUMPTION

Before discussing the neoliberalization of NASA, it is important that the concept is operationalized properly. David Harvey (2005) provides a clear and concise definition for such a complex political economic theory:

Neoliberalism is in the first instance a theory of political economic practices that proposes that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterized by strong private property rights, free markets, and free trade. The role of the state is to create and preserve an institutional framework appropriate to such practices. The state has to guarantee, for example, the quality and integrity of money. It must also set up those military, defense, police, and legal structures and functions required to secure private property rights and to guarantee, by force if need be, the proper functioning of markets. Furthermore, if markets do not exist (in areas such as land, water, education, health care, social security, or environmental pollution) then they must be created, by state action if necessary. But beyond these tasks the state should not venture. State interventions in markets (once created) must be kept to a bare minimum because, according to the theory, the state cannot possibly possess enough information to second-guess market signals (prices) and because powerful interest groups will inevitably distort and bias state interventions (particularly in democracies) for their own benefit. (2)

NASA has engaged with the free-market since its inception. As a tour guide told my group at Kennedy Space Center, “the first thing I want you to leave here understanding is that NASA is a contracting agency.” Rather than having a large permanent staff, NASA has contracted with private corporations—requiring them to compete for a contract—in order to provide them with spacecraft, launch services, intellectual labor, construction, tours, etc. (Dick et al. 2007; Gorn 2005). Gene Kranz (2000), a flight director for many early NASA missions, relays a humorous story told by Alan Shepard—the first American in space—regarding NASA’s policies contracting with private corporations: “When reporters asked Shepard what he thought about as he sat

atop the Redstone rocket, waiting for liftoff, he had replied, ‘The fact that every part of this ship was built by the lowest bidder’” (66).

Although Shepard’s comment was facetious, it sheds light on the normalization of neoliberal, capitalist economics early in NASA’s history. It began a lineage—and established a precedent—that continues to forge its way into the present administration’s policies. Neoliberalism is no friend to the worker; it pits them against each other in an all-against-all gladiator fight of meritocracy (Springer 2016). NASA’s workforce—and other government employees whose agencies underwent neoliberal reforms—are not exempt from this worker hardship, including astronauts. The workload of astronauts has always been strenuous. The stress of spaceflight aside, astronauts have had to work very long hours due to the limited time spent in space or on the moon (McKinnon 2015). However, as weeks-long moon missions became months-long space station rotations, NASA’s continued insistence on astronaut efficiency and unconditional obedience to issued orders led to the first major mutiny and worker strike in space.

“We need more time to rest!”: The Skylab 4 Strike

On November 16, 1973, NASA launched the final mission of its Skylab program: the first and only solely American space station. The all rookie crew—Gerald Carr, Edward Gibson, and William Pogue—were to set a spaceflight endurance record of 84 days in space (Vitello 2014). Tension between the crew and mission control began almost immediately when Pogue vomited—a normal reaction to microgravity that sometimes afflicts even veteran astronauts—and decided, with the consent of his crew members, not to report his retching to mission control (Chopra 2013). Unbeknownst to the astronauts, however, mission control was monitoring and eavesdropping on the

Skylab crews whenever they desired and had overheard this attempted deception, scolding the astronauts and insisting they report and record all activities aboard Skylab.

The constant surveillance from mission control—combined with the nightmarish level of bureaucratic regulation—began to irritate the Skylab crew. The astronauts began to complain—in a combative and brusque manner—about a litany of issues: their towels, their toilets, the pockets on their spacesuits being too small, the Velcro strips—the only way to secure things in a microgravity environment—not functioning properly (Chopra 2013). Psychologist Karl Weick (1977) described the situation aboard:

To get the most information from this final trip . . . ground control in Houston had removed virtually all the slack from the astronaut's schedule of activities and had treated the men as if they were robots. To get everything in, ground control shortened meal times, reduced setup times for experiments, and made no allowance for the fact that previous crews aboard Skylab had stowed equipment in an unsystematic manner. The astronaut's favorite pastimes—watching the sun and earth—were forbidden. (31)

Mission control was unsatisfied with the slow progress of the astronauts and ordered that the crew work through meal times and breaks in order to catch up with the schedule. Gibson told mission control that their constant monitoring of the crew was “no way to do business” and felt the mission so far was a “33-day fire drill” (Chopra 2013, para. 10). The astronauts requested time off. In confusion, mission control concluded that because the astronauts were demanding rest, they must either be lazy or depressed (McKinnon 2015). Carr, the commander of the mission, radioed to mission control: “On the ground, I don't think we would be expected to work a 16-hour day for 85 days, and so I really don't see why we should even try to do it up here” (McKinnon 2015, para. 4). Pogue also tried to explain the difficulty of being beholden to minute-by-minute scheduling and the crew's unanimous feeling of being overworked:

You have to put away equipment, you have to debrief, and then you have to move from one position to another, and you have to look and see what's coming up, and we're just being driven to the wall! . . . There's not enough consideration given for moving from one point in the spacecraft to another and allowing for transition from one experiment to another . . . When we're pressed bodily from one point in the spacecraft to another with no time for mental preparation, let alone getting the experiment ready, there's no way we can do a professional job. Now, I don't like being put in an incredible position where I'm taking somebody's expensive equipment and thrashing about wildly with it and trying to act like a one-armed paperhanger trying to get started in insufficient time! (Freeman 2000, 8)

NASA and mission control continued to ignore the complaints of the astronauts, imploring them to work harder and faster. Things came to a head six weeks into the mission when the Skylab crew mutinied and decided to strike from work for a day; they turned off communications with mission control and relaxed by taking a shower, playing in microgravity, looking out of the windows at Earth, and conducting solar research at their own pace (Chopra 2013; McKinnon 2015). After the strike, Carr delivered the crew's demands: "We need more time to rest. We need a schedule that is not so packed. We don't want to exercise after a meal.¹⁶ We need to get things under control" (McKinnon 2015, para. 7). Mission control capitulated and agreed to the terms; they were left alone during meal times, chores were placed on a list to be taken care of throughout the day rather than during scheduled times, no strenuous work was scheduled after 8pm, and the crew were made partners in their mission's planning (Chompra 2013; McKinnon 2015). As a result, efficiency and morale skyrocketed and the rest of the mission was uneventful and successful (McKinnon 2015).

¹⁶ This demand may seem confusing to those that are Earth-bound. However, many astronauts have reported feeling overwhelmed with nausea, vomiting, headaches, and/or dizziness after eating meals in space—Pogue has said that Skylab astronauts used to called it "Space Crud"—and so being ordered to exercise while suffering from Space Crud was sometimes uncomfortable or impossible (Vitello 2014, para. 5).



Figure 14. Commander Gerald Carr jokingly demonstrates microgravity weight lifting by “balancing” William Pogue on his finger.
Image credit: NASA

Much like Earthly labor struggles, the strike was not without consequence. Management retaliation was swift and strict—none of the rookie crew ever flew in space again. This was not the first time that NASA retaliated on dissenting crews either. On Apollo 7, the crew was afflicted with head colds, making them irritable and snappy with mission control—even insulting their intelligence on open-communication channels (Teitel 2013). Mercury and Gemini veteran astronaut

Wally Schirra disobeyed several orders from mission control; like Skylab 4, none of the three Apollo 7 crew members ever flew in space again (Teitel 2013). This flight blacklist may be coincidence, but it deserves attention and scrupulous deconstruction.

Tangentially, Carr and Pogue grew large beards during the mission—a practice not common for American astronauts—which, combined with their labor struggle, made them appear to be like Cuban revolutionaries and could have played into the American imaginary of leftist revolutionaries in space.

Additionally, like Earthly labor struggles, the Skylab 4 revolt resulted in significant changes for future astronauts. First, it led NASA to develop conflict resolution strategies for long-duration spaceflight (McKinnon 2015). It also established a less rigid routine consisting of 10 hour workdays, uninterrupted meal times and breaks, as well as a half-day off on Saturdays; this schedule is still utilized on the International Space Station missions today (McKinnon 2015). The Skylab 4 strike is an important argument against those that ignore Earth as an analog for living in outer space. Furthermore, it illustrates the importance of collective direct action by workers, whether it is in a fast food restaurant on Earth or in a space station orbiting Earth. The victorious mutiny of Skylab 4 will be an important historical example that should be championed as we enter the “second space age”—as NewSpacers are calling it—of elevating free-market capitalism and frontier resource extraction into the cosmos.

NewSpace and the Commercial Resupply / Crew Program

NASA’s most recent neoliberalizing effort has been with the Commercial Resupply Services (CRS) and the Commercial Crew Development (CCDev) program. The CRS program was initiated in 2006 with successful resupply missions to the International Space Station occurring in 2012 and 2013. CCDev programs are still in testing phases but are supposed to begin transporting astronauts to the International Space Station (ISS) in 2017.

However, NASA has been dreaming of engaging with private enterprise in order to satisfy their needs and monetize outer space since it began to take its neoliberal turn in the 1970s. Take, for example, a comic strip produced by NASA in order to generate children's interest in the space program that includes the "commercial potential of space" as a chief reason why "Space Station Freedom"¹⁷ should be built. Interestingly,

"pharmaceuticals" is featured prominently on one of the boxes carried by an astronaut.

Although this level of private, free-market research is not available on the ISS, it is within the realm of possibility in the near future as

private

corporations begin to spread into low-Earth orbit and beyond.



Figure 15. Close-up on a comic strip panel—probably produced in 1990/91—extolling the benefits of building “Space Station Freedom.”

Image credit: NASA HQ Historical Reference Collection, Record #5849, Folder: Impact, Education (1989-1991), Washington DC.

¹⁷ Space Station Freedom was the original name for the International Space Station prior to the signing on of partner countries that occurred after the production of this comic.

In the meantime, NASA has utilized a textbook neoliberal program for private competition in order to develop their next crewed spacecraft, following the retirement of the Space Shuttle in 2011. In 2006, NASA organized a competition to develop uncrewed CRS spacecraft—and in 2010, it organized the same competition for CCDev—by offering milestone incentives with a fixed dollar value attached per milestone; each company would receive a funded award at each milestone it successfully reached (McGuyer 2010). NASA also required that these private corporations have some “skin in the game”—that is, an unspecified amount of capital already invested in their proposals so that NASA is not paying for the entire project (McAlister 2010).

In 2008, NASA awarded CRS contracts to NewSpace corporations SpaceX and Orbital Sciences Corporation, each delivering uncrewed supply spacecraft to the ISS in 2012 and 2013 respectively. In 2014, NASA awarded SpaceX and Boeing multi-billion dollar contracts in order to return the United States to the status of a spacefaring nation, with NASA astronauts supposedly launching on spacecraft from each respective corporation in 2017 (Foust 2014). However, there is little discussion within NASA, or the federal government, about the implications—and possible ramifications—of allowing private corporations to continue their march towards controlling vast portions of how Americans go about living their lives, including in the affairs of human expansion into space.

SECTION III—THE PRESENT

I would like to die on Mars. Just not on impact.

—Elon Musk (2013)



Figure 16. The SpaceX Dragon commercial cargo craft—grappled by the Canadarm2—became the first commercially developed space vehicle to be launched to the International Space Station. It was successfully berthed to the Harmony node at 12:02pm on May 25, 2012.

Image credit: NASA

In this section, I will be writing a chapter per major field site. These chapters are written in a style that could be described as “imaginative ethnography” (Elliott and Culhane 2017)—or “gonzo ethnography” (see: Chapter 2)—and will read more as creative non-fiction. This includes heavy incorporation of media—mostly in the form of photographs—as I outlined in my visual anthropology research method (see: Appendix 1). As such, these chapters are highly reflexive and describe the experiences that I had while visiting these sites—think of them as literary ethnographic vignettes. I have chosen these three particular sites because they were the most ethnographically rich and engaged the most with my thesis arguments. In Chapter 9, I will analyze my experiences throughout all of my field sites and anthropologically analyze my ethnographic data, including the results from my survey.

CHAPTER 6: FEAR AND LOATHING IN TRUTH OR CONSEQUENCES (SPACEPORT AMERICA)¹⁸

I race south down I-25 from Albuquerque towards Truth or Consequences as the sun slowly begins to peak over the eastern mountains. The clock on my car dash glows menacingly and the colon that separates the hour and minute blinks scornfully at me: 6:15am. I sip slowly and deeply from my cup of coffee while shifting my gaze quickly between the empty highway and the kaleidoscope of colors produced by another sunrise in the high desert of New Mexico.

One may raise the question — and, honestly, it is a fair inquiry — why would anyone travel to Truth or Consequences, of all places, especially for fieldwork? Is there really a wealth of ethnographic data about outer space in a sleepy town of 6,000, known

¹⁸ This chapter was edited from a post I wrote for Space+Anthropology (see: Genovese 2016c).

only for its hot springs and the fact that the town voted to name itself after a radio program in 1950 (Copquin 2014)?

Prior to 2011, this was certainly true. However, on October 18, 2011—20 miles outside of Truth or Consequences—Spaceport America was officially declared as open, changing a sleepy New Mexican town into a gateway to the world’s first purpose-built spaceport. A billboard erected outside of town attempts to entice travelers hurtling towards Las Cruces or El Paso with a simple binary question:

Your Invitation to Space is at exit 79

☐ **TRUE** ☐ **FALSE**

The billboard answers its own question with New Mexico’s latest ad campaign slogan, scrawled in cursive at the bottom of the sign:

Truth or Consequences is New Mexico TRUE



Figure 17. The Spaceport America visitor’s center.
Image credit: Taylor R. Genovese

Today, I
begrudgingly
cave to
advertising and
snap on my turn
signal at exit 79,
heeding my
“invitation to
space,” despite
the fact that the
spaceport has yet

to be used to send any human outside of the Earth's atmosphere. I wind my way through the historical downtown district of Truth or Consequences until I reach my destination.

The juxtaposition between old Spanish adobe and a sign advertising the visitor's center for a spaceport is fairly jarring. However, this is all part of what I perceive as the meticulous marketing plan for Spaceport America: a coalescing of old and new; an *attempt* at creating a positive lineage from settler-colonists moving across the western frontier and Spaceport America moving upward into the cosmic frontier. But more on that later . . .

I walk into the historic adobe building and am greeted with more contrasting design choices: a science-fiction inspired door fixed into old-growth wood beams. I proceed through the door into a foyer full of science exhibits catered towards children. All of the employees wear blue flight jumpsuits.

This place reminds me more of an Apple store than the first stop one takes before



Figure 18. The entrance to the Spaceport America visitor's center.

Image credit: Taylor R. Genovese

arriving at a spaceport. Strategically placed merchandise—t-shirts, sweatshirts, polos, magnets, keychains, beer koozies—are spread across the room. There is an abundance of missing sizes—an illusion of scarcity; I know they must have enormous quantities in the back.

The employee at the register beckons for me to approach. She asks me to register, motioning to the four iPad minis bolted to the small counter.

“It says there’s no connection, but don’t worry, it will transfer to this computer,” she says, tapping her PC.

I nod.

A long legal disclaimer spills forth from the screen before me. I use my finger to slide my signature onto the screen and tap “accept.”

Error: No connection found.

A fitting sentiment. What is more welcoming and exciting than a comprehensive legal disclaimer? Visiting a fully operational spaceport should evoke feelings of wonder and exhilaration, not feelings that are usually reserved for meeting with a divorce attorney.

I board the branded shuttle with branded televisions to begin the 20 mile journey to the spaceport. As we jolt forward, chugging out of town and into the beige desert, the tour guide—also in a blue flight jumpsuit—begins to tell us about New Mexican history, as well as the history of the spaceport. He begins by saying that Virgin Galactic’s spaceflights are “not just joyrides for billionaires” and proceeds to pop a DVD into the television mounted to the front of the shuttle. A commercial for Virgin Galactic—currently the Spaceport’s highest paying tenant (see Table 1)—and Spaceport America begins to

play. With hopeful rhetoric, interviews with CEOs, and action-movie imagery, the commercial ends with:

“These visionaries [the CEOs of NewSpace corporations] are conquering the final frontier and beginning the democratization of space!”

Looking past the obviously loaded words tied to the brutality of Western colonialism such as “conquering” and “frontier,” I found the word “democratization” an interesting choice considering the \$250,000 required as a lump-sum, up-front deposit in order to reserve a seat on Virgin Galactic’s SpaceShipTwo (“Fly with Us” 2016). It furthers the rhetoric of democracy for those that can afford it. Many proponents of commercial space companies say that \$250,000 is still less money than is spent on launching government-employed astronauts; therefore, space will be more democratized because more human beings will be able to reach space than when access is strictly controlled by governments. This is true; however, it is still only the mega-rich that are able to access our cosmos, leaving the 99% anchored to a slowly dying Earth, a planet profiteered and poisoned by the very people who are able to afford trips to space.

It is also important to remember that SpaceShipTwo is only capable of making sub-orbital flights—that is, reaching space but falling back down to Earth in a parabolic arc rather than reaching a velocity capable of orbiting the planet. In order to reach orbit—and the International Space Station—you currently have two options: contract with the Russian government for \$81 million per seat, or NewSpace company SpaceX (starting in late-2017, supposedly) for \$58 million per seat (Colloredo 2016). While the \$23

million in savings is “cost-effective” (the words used by Colloredo) for governments and the mega-rich, it is hardly what I would describe as democratizing.

The tour guide puts on another video for us to watch as we begin to pull into the spaceport. The massive LEED Gold certified terminal and hanger facility designed by Lord Norman Foster begins to loom on the horizon. This time, the video describes the region, especially *El Camino Real de Tierra Adentro*—in English, The Royal Road of the Interior Land—the 1600 mile Spanish road that snaked its way up from Mexico City to San Juan Pueblo in New Mexico. The road served as the main trade route for the Spanish (and after 1821, the Mexicans) from 1598 until 1882. The video briefly discusses the Pueblo Revolt and Geronimo’s uprising but breathlessly announces that the “territory was eventually *tamed*” (emphasis my own).

Many NewSpace corporations—and even many space exploration advocates—do not think about the language that is used when they discuss outer space and humankind’s possible expansion into the cosmos. The importance of language—and its role in the subjugation of the oppressed—is widely discussed (Bauman and Briggs 2003; Foucault [1978] 1990; Gorman 2014; Hill 2008; Oman-Reagan 2016a). While on the Spaceport America tour, the language was firmly couched in colonialist rhetoric; Indigenous peoples were either referenced using the stereotype of the “noble savage” (the morally superior “Other,” uncorrupted by “civilization”) (see: Ellingson 2001) or as belligerents—thorns in the heel of Spanish, Mexican, or American colonists—who needed to be brought to heel in order for progress and stability to reign.

The tour guide pushes a button on his remote in order for us to watch the last DVD before disembarking into the terminal and hanger facility. A campfire is shown on

the television. The camera slowly follows the smoke up into the starry, night sky. Native American flute-and-drum music plays.

“The present has a way of hiding what is truly here,” says the voiceover, dripping with a stereotypical Indigenous platitude. “They spoke of a time when humans would once again travel back into space...”

I resist the temptation to roll my eyes while looking around the bus at my fellow tourists. They all seem to be eating this up.

“Spaceport America and Virgin Galactic will help that dream become a reality, much like the wandering of early humans throughout this land, using tools truly made in America.”

The screen shows arrowheads in the dirt while steady hands are knapping more projectile points. I grimace. The video presents Indigenous tool-making as part of a Western, settler-colonial, capitalist American tradition of ingenuity and excessive pulling-up of bootstraps thousands of years before the United States even existed.

“As we pass through the old frontier of storied land into the final frontier...” the video drones.

I tune out, snapping some photos of the terminal and hanger facility as we gently glide to a rehearsed stop in sync with the video’s final crescendo.

“Welcome to the next giant leap for humanity! Welcome...to Spaceport America!”

The shuttle driver hops out and makes his way to the building to make sure security knows of our presence while the tour guide strikes up a quick lecture about the spaceport.



Figure 19. The shuttle seen in reflection of the terminal and hanger facility's windows.

Image credit: Taylor R. Genovese

“This facility is prepared to handle rapid spaceflight. Spaceport America had to be sure that it could handle commercial flights multiple times a month, a week, even a

day. That’s what commercial space companies want: daily operations.”

For some reason I imagine a scene from the film *Gattaca* (1997): a depressed Ethan Hawke staring mournfully up at the sky, watching multiple rockets launch every day while desperately wishing he could be aboard. I wonder if that kind of alienation could become a reality as outer space becomes more and more commodified, allowing the gap between rich and poor to manifest itself physically as the gap between Earth and space.

“This isn’t the government space age,” the tour guide continues. “This is the commercial space age. As a space corporation, you have two choices: cede the business and die...or innovate. There will be no more government hand-outs and that forces innovation.”

I knew that I would be confronted with the neoliberal, capitalist mythos eventually —the NewSpace mantra that I have dubbed: “pull yourself up by the spaceboot-straps.” However, what the tour guide dictated is not entirely true, considering the New Mexico General Fund Plus Special Appropriation is slated to give Spaceport America \$2,262,000 in the 2017 budget (see Table 1). Furthermore, there exists a line item “Excess Pledged Revenue” of \$585,000 that is actually coming from taxpayers as well.

TABLE 1 SPACEPORT AMERICA Projected FY 2017 Revenues (data from Messier 2016)	
SOURCE	AMOUNT
Virgin Galactic Facilities Lease & Ground Rent	\$1,030,000
Virgin Galactic User Fees	\$600,000
Excess Pledged Revenue†	\$585,000
Utilities	\$167,000
Special Events*	\$750,000
Other Aerospace Customers*	\$680,000
Tourism / Merchandising*	\$150,000
Sponsorships*	\$174,000
Subtotal:	\$4,136,000
New Mexico General Fund Plus Special Appropriation	\$2,262,000
Total:	\$6,398,000

† These “excess revenues” are actually coming from taxpayers in Dona Ana and Sierra counties (Messier 2016).

* New Mexico Spaceport Authority (NMSA) revenue is based on aggressive marketing and a fully functioning spaceport (Messier 2016). As of this writing, Spaceport America is not a fully functioning spaceport.

According to Messier (2016), “voters agreed to increase county use taxes to support construction of the spaceport. The excess revenues are what is left over after paying off

bonds that were sold to finance construction” (para. 10). That means that around 44% of the spaceport’s projected operating budget in 2017 will be taxpayer money —“government hand-outs,” if you will. However, this is not a novel situation, corporate subsidies are an important tradition within the capitalist system (Harvey 2005).

“Movement of people and goods is a natural progression,” preaches the tour guide. “The goal of humanity is to make the world a smaller place. Space travel can do that. For example, take what happened at Benghazi. Imagine we could deploy a SEAL team on rocket planes anywhere in the world within minutes!”

I can barely take it. This is my first time visiting any NewSpace facility and—as an anthropologist—I want to remain a fly-on-the-wall for this initial visit. But the activist in me begins screaming and clawing its way up my throat. I was about to burst when a voice calls out from behind me.

“OK, but wouldn’t it be great if we all worked together in space? Shouldn’t space be without a military application?”

I breathe a sigh of relief as my activist spirit begins to pacify. The tour guide begins with the double-speak that continues throughout the remainder of the tour.

“That’s the good thing about space,” he says, floundering slightly at the tourist’s audacity to challenge corporate policy. “It transcends politics. The good thing about space is it’s a Trump-free zone. A Hillary-free zone.”¹⁹

Except that is obviously not true—and not just in the Foucauldian “everything is political” sense (Deuber-Mankowsky 2008). Abu Dhabi’s Aabar Investments has a 32% stake in Virgin Galactic (Selding 2009). SpaceX has put in unsolicited bids to launch

¹⁹ The tour guide is making a reference to the candidates in the 2016 United States Presidential election. At the time of my visit, the electoral vitriol was pervasive in the news media.

American spy satellites (Gruss 2015) and recently won an \$82.7 million contract from the Air Force to launch their GPS satellites (Avery 2016). The metaphysical ideal of outer space may be a place beyond politics, but the reality in this “second space age” (as NewSpacers, including Spaceport America, have dubbed it) is that globalized capitalism—and all the politics that are inherently intertwined within it—are alive and well in the commercial space industry.

The tour guide turns to the launching capabilities of the Boeing 747, especially as it pertains to Virgin Galactic’s LauncherOne program which hopes to strap a rocket to one of the wings of a 747, fly up to around 50,000 feet, and release the rocket to be launched the rest of the way to space.

“Does anyone else see a problem with this photograph?” asks the tour guide—holding his iPad out for us to see—referencing the fact that there exists only *one* missile on *one* of the wings. “What about a 747 carrying missiles on both wings? What about bomb bay doors? There’s a lot of volume inside of a 747! It carried the Space Shuttle on its back, it seems like a waste to only carry a single missile.”

He holds his hand flat and horizontal to us, as if his fingers are a 747 and then uses the index finger of his other hand to simulate spacecraft dropping from the belly of the aircraft—his palm.

“You could
drop
drop
drop
What is that?
profit
profit
profit.”

Almost a neoliberal haiku. I begin to feel sick. The tour guide follows this up with more double-speak—as if he could sense that I wasn’t buying it.

“But it’s not about spaceports. It’s not about spaceships. It’s about how can space better humanity?”



Figure 20. Mural entitled “The Journey Upward.”
Image credit: Taylor R. Genovese

We finally disembark the shuttle and head to the visitor exhibits inside of the terminal and hanger facility. A large mural—titled *The Journey Upward*—is adorned on one of the walls.

This mural serves as a summation of the NewSpace worldview and ideology. A natural, inescapable, linear progression toward human beings spreading into the cosmos: from dinosaurs (?) to Anglo-looking Paleo Indians to settler-colonists to space migration. This romanticized *lineage of the frontier*—as I am calling it—is tied to the capitalist dream, mythology, and cosmology of untold profits and constantly expanding markets.

Of course, the capitalist mythology also likes to ignore the horrendous inequality and violence that tends to attach itself to the frontier mentality. When frontiers are seen as limitless, uninhabited, and uncivilized, it encourages doctrines like slavery and Manifest Destiny. Yet NewSpace corporations seem to be overlooking the bigger picture and instead focus on the “glory of the frontier” as endless profit potential and romantic adventure.

As an anthropologist, I am trained to pay attention to the larger picture—to not get caught up in rose-tinted romanticism. As an anthropologist interested in outer space, this is especially important. Journeying into the cosmos *is* romantic. It is adventurous. It pulls at deep-seated desires to move, to explore—some have even said this is “human nature.” I’m not against human space migration; in fact, I want nothing more than slip the surly bonds of Earth.

However, if we do it without looking at the broader picture—without contemplating the entirety of the human experience—we are doomed to fail in the most atrocious ways. Likewise, if we do not embrace cooperation—and, more generally, respect for humanity—prior to departing for a harsh, unforgiving environment, the results could be tortuous, and even deadly. We need not look any further than our own

planet thirty years ago in order to extract an example of this danger. Instead of the potential danger being purely imaginary—i.e. the speculation of interpersonal relationships in the cosmos—a very real threat lurked in the missile silos beneath the Earth's surface.

CHAPTER 7: TARGET 2, 9-MEGATON GROUND-BURST (TITAN MISSILE MUSEUM)

The drive toward the former Air Force Facility Missile Site 8—or Titan II Intercontinental Ballistic Missile (ICBM) Site 571-7—twenty-five miles outside of Tucson, takes us through southern Arizona desert consisting of creosote bushes, prickly pear cactus, and the iconic saguaro. I am driving my mother’s Hyundai Sonata on flat, straight blacktop through the unassuming town of Sahuarita. In the passenger seat is my friend Marty, a PhD anthropology student at University of New Mexico who studies nuclear weapons. A native of Louisiana, the saguaro cactus—with its iconic arborescence and multiple, needled arms stretching toward the clear, hot, summer sky—still fascinated Marty.

“I had no idea they grew this frequently. It’s truly like a forest,” he says.

I nod as we spot the sign for our destination: Titan Missile Museum.

As we pull into the parking lot, I notice that the facility is rather unassuming. Other than the security fence, some antennas jutting out of the desert floor, and the recently constructed visitor’s center, the site would be easy to pass by. And while the



Figure 21. Topside at the former Titan II ICBM Site 571-7, now the Titan Missile Museum.
Image credit: Taylor R. Genovese

intentional discretion of nuclear missile silos is a bit of a trope—silos were designed to protect all of the important components by keeping them underground, not to hide the silos themselves—to me, it still played into the hegemonic American nuclear narrative of “the bomb” being a monolithic, larger-than-life concept shrouded in mystery and secrecy.

Marty and I walk into the small visitor’s center/museum and purchase tickets for the next available tour of the facility. In the meantime, we wander around the small building, speaking to an older docent who used to fly airplanes with mobile launch capability during the Cold War. While Marty asks the docent technical questions about nuclear weaponry, I begin to wander around the small museum.

The rhetoric espoused by the docent—and the didactic text around the museum—is one of “peace through deterrence.”

The motto for the Strategic Air Command (SAC)—the entity in charge of nuclear missiles for the United States—was “War is our profession. Peace is our product,” until 1958 when it was changed to “Peace is our profession” (Sambaluk 2015, 12). The rhetoric from the Titan Missile Museum is one steeped in the doublespeak of the military—power, force, and violence create peace, freedom, and safety.

Our tour guide walks into the



Figure 22. The rather phallic emblem utilizing another deterrence catchphrase: “Protection Through Power,” displayed at Titan Missile Museum.

Image credit: Taylor R. Genovese

visitor's center and announces that all those in our tour group need to report to the briefing room for a pre-tour briefing. Suddenly, I realize what is happening here—we are being exposed to a performance, a historical reenactment of sorts, meant to bridge discourse with patrons (Decker 2010) while legitimizing and defending the American strategy of nuclear deterrence (Masco 2008).²⁰ Furthermore, by treating this event as a reenactment depicting a specific time in history, there is an explicit construction of masculine identity *vis-à-vis* the military experience (Hunt 2008). As we file into the briefing room, we are involved in a performance of a Cold Warrior's experience before heading underground to serve their shift as a member of a missile combat crew (MCC)—or missileer. Part of this experience includes nuclear discourse that relies on deep levels of abstraction and an emotional removal from the horrors of nuclear weapons in order to normalize nuclear annihilation (Cohn 1987a; 1987b).

It was at that moment that I decided to utilize living history, or historical reenactment, as a research method (Pickering 2010)—much like when archaeologists use experimental archaeology to recreate past toolmaking, construction, or artwork contemporarily (Planel and Stone 2002). I attempted to change my mindset from anthropologist to missileer, to pretend I was in the Air Force during the Cold War—a process that is a core component in what historical reenactors call “being period” (Decker 2010). While the briefing ends with a video describing the Titan II rocket and the role of nuclear deterrence in winning the Cold War, I close my eyes, take a deep breath, and by the time my eyelids flick open, Marty and I were heading down for a shift

²⁰ It is worth noting here that discourses on “nuclear deterrence” and “strategies” lends a coherence to US behavior that it lacked in practice. Many top government officials, civilian defense strategists, and military personnel had conflicting, ever-changing viewpoints. Nuclear “strategy” was never a fixed monolithic entity (Pfeiffer, personal communication, January 4, 2017).

as MCC members in One-Seven—as the crew members would have referred to this particular site.

We walk across the red gravel toward the personnel entrance, a large steel door



Figure 23. Marty and a docent descend into the silo.
Image credit: Taylor R. Genovese

is propped open at ground level and a set of concrete stairs descend beneath the hot, desert ground. A sign warning us to watch our step—and to watch for rattlesnakes—is posted above us as we proceed into the silo. According to Chuck Penson (2008), the rattlesnake sign was unique to the silos in Arizona. After descending several flights of metal stairs, we walk through a 6,000 pound blast door capable of resisting a nuclear explosion, and enter into the Launch Control Center (LCC).

The LCC is the nerve center of the silo, with machinery and computers lining the walls, it reminds me of the villainous lair in a James Bond film. Two large consoles are in the middle of the room. The docent asks for volunteers to take on the roles of the Missile Combat Crew Commander (MCCC) and the Deputy Missile Combat Crew Commander (DMCCC)—Marty and I jump at the chance. Actually, Marty and I had positioned ourselves to the front of the tour group so that when this time came, we

would be able to take on these roles. Marty—now Major Martin—takes the role of MCCC and sits down. I myself am a lowly Lieutenant and I too sit down, but I take a seat at the console to the left of the commander.

I look around the console and try to picture

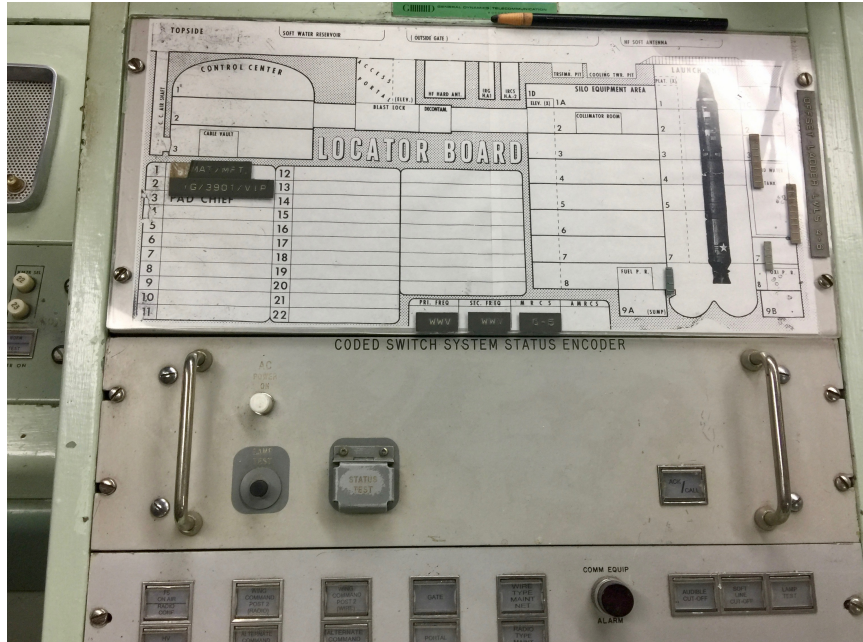


Figure 24. A section of the DMCCC console, showing the locator board.

Image credit: Taylor R. Genovese

myself as a Cold War missileer. In front of me is a spread of indicator lights that show missile status, communications, and a locator board—the DMCCC was in charge of keeping track of where missileers were while on duty. DMCCC’s also made sure missileers were following the SAC’s “Two-Man [sic] Rule”—recently changed to the “Two-Person Concept” (Woodward 2013)—in which certain restricted areas of the silo were “no lone zones,” in order to keep the nuclear weapons secure and to provide for accountability. Trying to get into character, I imagined having to call the mess—guessing that the other two crew members were eating, rather than attending to their posts in the LCC . . .²¹

²¹ From this point on, I will be dramatizing the launch sequence as if Marty and I were Cold War missileers for purposes of writing immersion. As such, it must be disclosed that this may not be up to a historian’s level of fidelity—instead, I am constructing and dramatizing a launch event from both my personal experience reenacting the affair and from my field notes that were taken while the tour guide described the Titan II launch sequence.

Suddenly, a loud, shrill beeping pierces the relative silence. After 10-12 rapid beeps, the muffled, tinny, static-filled voice of a man shrieks carefully and methodically from the small intercom mounted above us.

“ALPHA. BRAVO. TWO. THREE. CHARLIE. HOTEL. VICTOR.”

Marty and I scramble for the red, three-ring binders on our consoles and scribble down the authentication code. After we use the grease pencils to write down the code, we swivel in our chairs towards each other and repeat the code, per procedure—according to the docent who was instructing us throughout this reenactment.

“Alpha, bravo, two, three, charlie, hotel, victor,” we say to each other.

“We have a valid message,” Marty confirms.



Figure 25. The safe where the authenticator cards are stored.

Image credit: Taylor R. Genovese

This has authorized us to open a large, red safe in the corner of the LCC. The safe is really more of an armored filing cabinet, with two combination locks hanging from the top drawer. We only know the combination for our own lock; this is so we *both* have to agree to go inside to fetch the authenticator cards. Inside is a large stack of small, notecard-sized manila envelopes. On the top-right corner of each envelope is a set of two letters that needs to match the first two letters of our authentication code. We file

through the envelopes until we find the one labeled “AB.”

We both walk back to our stations and Marty opens the envelope. He is bent over his command console—lips silently mouthing the seven character code—matching it to the code that previously squawked at us from over the intercom. After he finishes, he extends his hand holding the authenticator card to me, keeping his eyes firmly planted on his binder. I grab the notecard and swivel with it to my console.

The card reads: A B 2 3 C H V.

A legitimate order. Someone at the Pentagon has just ordered World War III. And Marty and I are, possibly, the two people that have been ordered to start it. I purse my lips and try to swallow, but my throat is dry as a bone. I slowly look up at Marty and nod solemnly. He takes a deep breath and grasps his launch key on the front of his console.

I drop the card and reach around the side of my console, gripping my cold, metal key. The two keys are at least eight feet apart from each other. This is by design. It requires at least two people to turn the keys, which activates the launch command to the Titan II missile that slumbers in the silo next to us. I shift my focus from the key and look at Marty. He looks pensive—a bit disturbed. After a few seconds of silence he says,

“On ‘turn,’ you turn your key and hold for five seconds.”

The two keys must be turned within two seconds of each other in order to activate a launch command to the missile. Furthermore, the keys are spring-loaded, so they must also be held for five seconds in order to start a valid launch sequence. This is another fail-safe in order to stop one person from running back and forth and turning both keys.

“Three . . . two . . . one . . . TURN!” Marty exclaims.

We both turn our keys clockwise and hold them for what seems like an eternity. Finally, several indicators light up green on our consoles under Launch Control and Monitor: READY TO LAUNCH and LAUNCH ENABLE. Soon after, the BATTERIES ACTIVATED turns a beige color—the two batteries on-board the missile are charging in order to supply the Titan II with its own power for the duration of its grisly flight. It takes 28 seconds to fully charge the two batteries. Just before my mind begins to think about what we are doing, the console lights up with APS POWER. The batteries have been charged and the missile is now operating under its own electricity.

Suddenly, a loud alarm that sounds like an analog telephone fills the LCC. The



Figure 26. The author about to walk through a “tipsie”—these “scoops” created a radar beam between the two. When the radar beam was broken, it set off an alarm at the LCC.

Image credit: Martin Pfeiffer, used with permission

silo doors have begun to open and have tripped the security radar alarms on the surface called “tipsies.” The next indicator lights up: SILO SOFT. The silo door has opened and this indicator tells us that we are now a more vulnerable target due to the missile silo being exposed to the open

air. GUIDANCE GO lights up—the internal guidance computer on board the missile now

has full control of the mission including where the nuclear warhead will be going. Then comes main-engine start.

A high pitched fire alarm erupts in the LCC and fire-alarm lights begin to flash on our consoles: FIRE DIESEL AREA, FIRE OXI PUMP ROOM, FIRE IN ENGINE, FIRE LAUNCH DUCT, FIRE FUEL PUMP ROOM. Flashing, flashing, flashing. The alarm screams. Fire pours out of the missile's base, incinerating everything in its vicinity as the Aerozine 50 and the dinitrogen tetroxide unite in the Titan II's LR87 engine, supplying the missile with its 430,000 pounds of thrust. Water rushes into the bottom of the silo in order to channel the flames into the flame ducts that led to the outside.



Figure 27. The missile silo door (topside) and skids that would direct the 750 ton steel and concrete door as it opened to allow for the missile to launch.
Image credit: Taylor R. Genovese

Explosive charges

explode the blocks holding the missile down and it soars, screaming out of the silo.

The last light pops on our consoles and it feels like a camera flash in a dark room.

LIFT-OFF.

This was the first moment I had to reflect on what Marty and I had just reenacted. The launch procedure was so rigid—so monotonous, like checking items off a grocery

list—that even the two of us, who hadn’t spent hours upon hours drilling this exact sequence, were able to execute without question. The first thing that I thought was: “Now what?” Marty and I—like the actual missileers during the Cold War—only knew two things about our simulated missile: 1) The anonymized location of where our missile was headed—our nuclear warhead was heading to “Target 2;” at the time of this silo’s operation, that probably would have been somewhere in the Soviet Union; and 2) It was set for a ground-burst explosion, as opposed to an air-burst. No names of cities, no identifiers about whether it was a military or civilian target, no idea who fired first. Nameless, faceless, anonymous. All we knew was in roughly 35 minutes, Target 2 would be wiped off the map. The only orders would be to await further orders.

I sat for a few seconds in my seat, staring blankly, horrified, at my console. I slowly looked up at Marty, who did not look good. Marty, who studies the anthropological significance of nuclear weapons, had a wealth of knowledge about what we had just done that I did not possess. His brow was furrowed and his lips were tightened around a clenched jaw. He



Figure 28. Marty moments after ICBM lift-off.
Image credit: Taylor R. Genovese

looked a little sick. I began to feel guilty. Marty had expressed a doubt about the possibility of engaging in this simulation of nuclear apocalypse before we arrived, but I had egged him on.

“What kind of nuclear anthropologist would you be if you did not experience the launch sequence first-hand?” I teased.

“A sane one,” he replied.

And now I understood. The gravity of even simulating a nuclear holocaust is grim, if not a tad sadistic. However, to the Titan Missile Museum, it is an illustration of post-Cold War triumphalist rhetoric indebted to nuclear deterrence strategies. The Soviet Union is killed with every tour—Communism defeated every key-turn—a pure “future past” (Csicsery-Ronay 2008, 76) reenactment of a Cold War doomsday scenario that never played out. The key-turning is also part of broader themes of official heritage and tourist economy practices aimed at producing authentic experiences and affective engagements (see: Gusterson 2004b; Krupar and Depoe 2008; Mollela 2003; Schafer 2015; Taylor 1997).

Atop each Titan II ICMB sat a Mark 6 launch re-entry vehicle, meant to protect its payload—the W-53 thermonuclear warhead—from the intense heat of reentering the Earth’s atmosphere. The W-53 warhead had a yield of nine megatons—9,000 kilotons—and was the highest yield weapon ever deployed by the United States on a missile. For a historical comparison, a 9 megaton explosion has a yield 600 times more powerful than the nuclear explosion that flattened Hiroshima at the end of World War II. It is a little difficult to visualize—or even mentally comprehend—the intensity of a 9 megaton thermonuclear explosion, so I will give a visual example that will illustrate this point. As

grim of an idea as this is, I will simulate a nuclear detonation in the heart of Flagstaff, Arizona.

Alex Wellerstein, a historian of science at Stevens Institute of Technology, created a web-based nuclear weapon simulation tool called NUKEMAP.²² Wellerstein utilized Google Maps API and declassified nuclear weapons effects data in order to create a tool that allows users to virtually detonate nuclear weapons on any geographic area of their choice. It is with this tool that I will show the intense, awesome, brutal power that a 9 megaton thermonuclear weapon has. This will hopefully illustrate the amount of foreboding and hopelessness that I felt after simulating such a disastrous event.

For reasons that may be obvious, I decided to nuke the Social and Behavioral Sciences, West (SBS West) building on Northern Arizona University's (NAU) campus. I chose this location not only because of my (very) dark humor, but also because it is a familiar location for my thesis committee, as well as any possible NAU students reading this in the future.²³ The next several pages are dedicated to visuals from NUKEMAP—annotated by myself with roadways, landmarks, and cities—that simulates the powerful effects of a 9 megaton thermonuclear explosion.

The first figure is a Flagstaff map that focuses on localized damage—the size of the crater, the damage caused by the fireball, and the intense air blast pressure that accompanies a nuclear explosion. The second map is a regional map that shows the

²² NUKEMAP can be found at www.nuclearsecrecy.com/nukemap.

²³ Due to the political climate at the time of my writing this thesis, I feel I must disclose that this is in no way a threat to bomb or commit any sort of violence in Flagstaff, NAU, or anywhere, for that matter. This is purely an illustration of the destructive power of nuclear weaponry utilizing a familiar landscape.

area around Flagstaff and illustrates further air blast pressure damage as well as the extent of thermal radiation burns that would be felt as far away as 17 miles from ground zero. The third map illustrates the potential nuclear fallout over the southwest region. This map is speculative, but assumes a 9 megaton ground burst with 15 mile per hour winds. Furthermore, it assumes wind direction as coming from the southwest, which is the average direction of Flagstaff's prevailing winds ("Average Wind Direction" 2002).

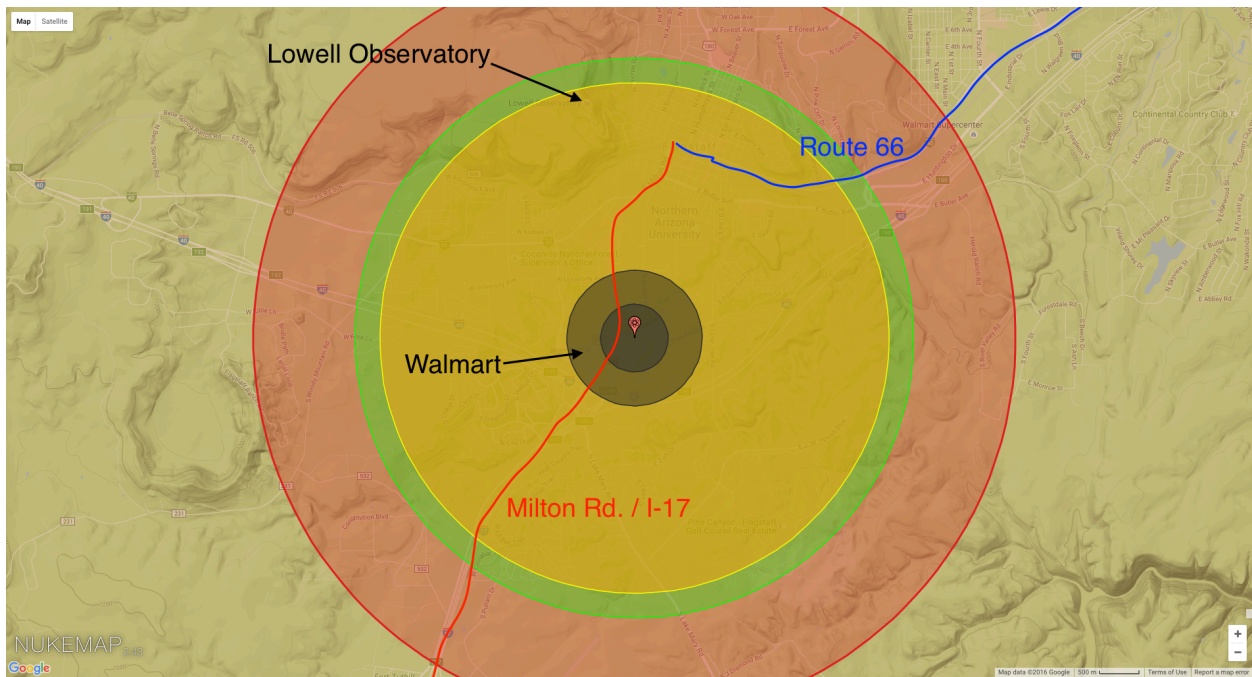


Figure 29. Local view of effects from a nine megaton nuclear explosion.

Image credit: Alex Wellerstein/NUKEMAP, used with permission

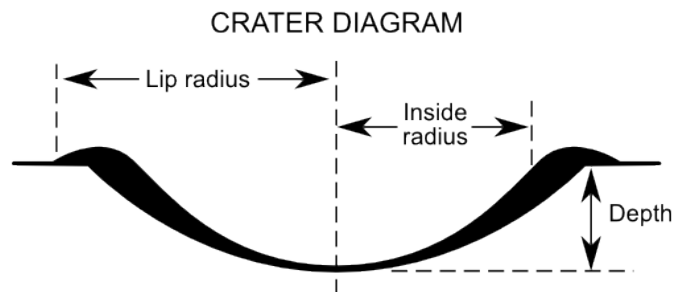
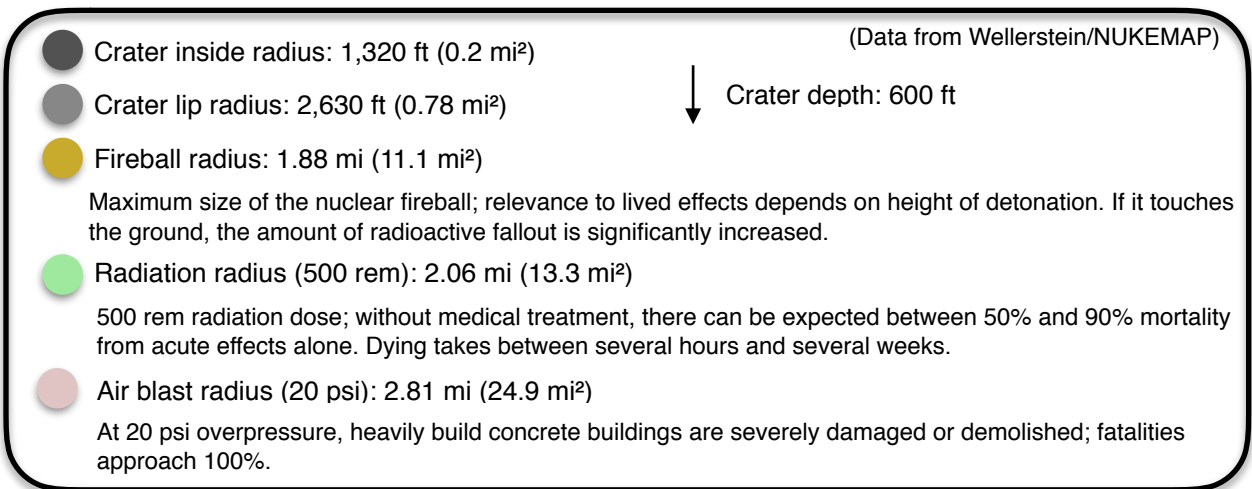


Figure 30. Crater diagram

Image credit: Alex Wellerstein/NUKEMAP, used with permission

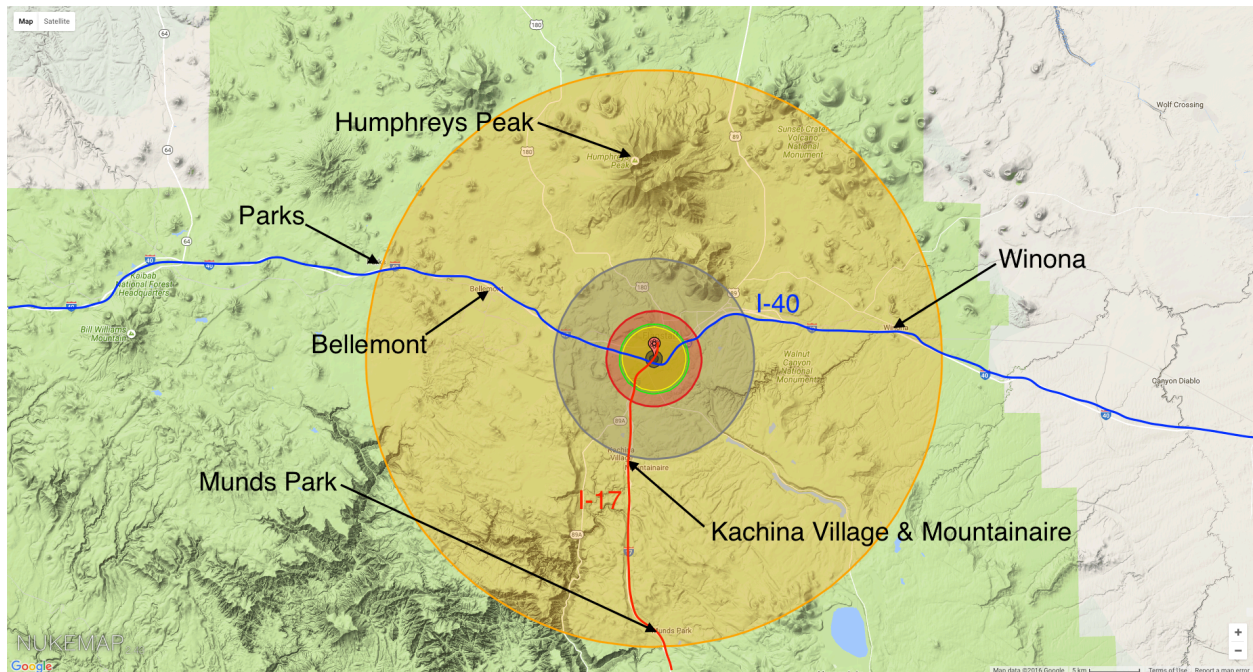


Figure 31. Flagstaff regional view of effects from a nine megaton nuclear explosion.

Image credit: Alex Wellerstein/NUKEMAP, used with permission

- Air blast radius (5 psi): 5.92 mi (110 mi²)** (Data from Wellerstein/NUKEMAP)
 At 5 psi overpressure, most residential buildings collapse, injuries are universal, fatalities are widespread.
- Thermal radiation radius (3rd degree burns): 17 mi (910 mi²)**
 Third degree burns extend throughout the layers of skin, and are often painless because they destroy the pain nerves. They can cause severe scarring or disablement, and can require amputation. 100% probability for 3rd degree burns at this yield is 12.7 cal/cm².

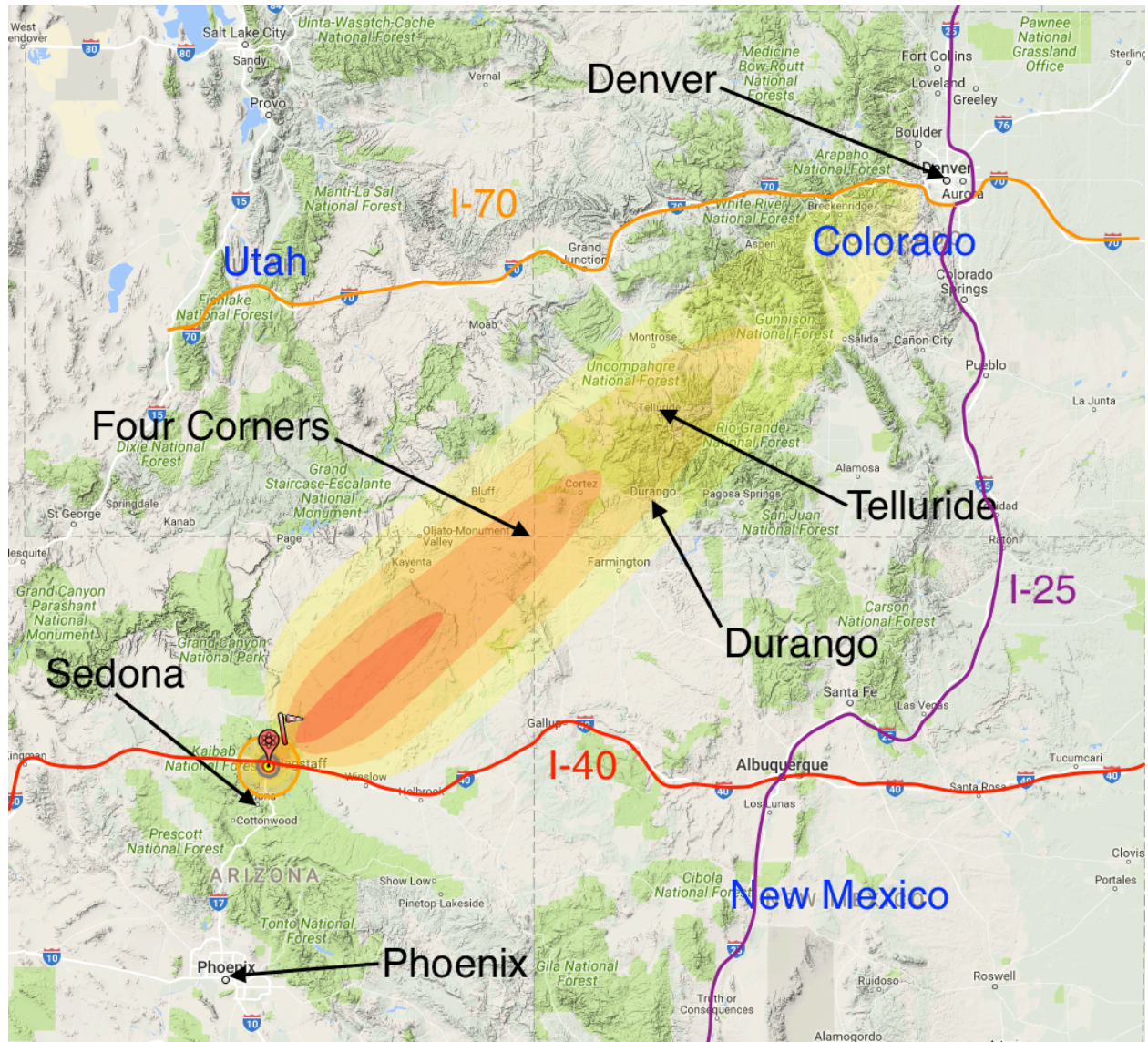


Figure 32. Fallout map from nine megaton nuclear explosion in Flagstaff.
Image credit: Alex Wellerstein/NUKEMAP, used with permission

- | | |
|--|---|
| <p>◆ Fallout contour for 1 rad per hour:</p> <ul style="list-style-type: none"> • Maximum downwind cloud distance: 477 mi • Maximum width: 114 mi • Approximate area affected: 42,610 mi² <p>◆ Fallout contour for 10 rads per hour:</p> <ul style="list-style-type: none"> • Maximum downwind cloud distance: 361 mi • Maximum width: 82.3 mi • Approximate area affected: 23,450 mi² <p>◆ Fallout contour for 100 rads per hour:</p> <ul style="list-style-type: none"> • Maximum downwind cloud distance: 246 mi • Maximum width: 51 mi • Approximate area affected: 9,960 mi² | <p>◆ Fallout contour for 1,000 rads per hour:</p> <ul style="list-style-type: none"> • Maximum downwind cloud distance: 130 mi • Maximum width: 19.8 mi • Approximate area affected: 2,120 mi² |
|--|---|
- (Data from Wellerstein/NUKEMAP)

This hopefully illustrates the destructive power from a single 9 megaton thermonuclear warhead. Most nuclear target data remains classified by the United States, but a SAC Atomic Weapons Requirements Study for 1959 was recently declassified and showed that the US targeted 1,100 airfields and 1,200 cities throughout Eastern Europe—including East Germany²⁴—and the former Soviet Union (Burr 2015). Although the bomb yield ranged from 1.7 up to 9 megatons (Burr 2015), the results of this scale of an attack would have been devastating, not to mention the possibility for planet-wide nuclear fallout.

And so, as I sat in the DMCCC chair, staring solemnly at the still illuminated LIFT-OFF indicator, these are the kinds of facts that ran through my head. I think it's important to reflect again on how easy the launch sequence check-list was. Furthermore, after the key-turn step, it is impossible to abort; as the docent said on the tour, "there is no oopsie button." After the two missileers turned their keys, into what kind of world would that crew emerge—assuming they survived? Can it really be called survival? The horror of nuclear war is imperative to keep in mind while studying humanity's expansion into outer space—they are inexorably linked. But humans and scientific instruments that ride rockets have the power to inspire and bring hope to humanity in the same way that nuclear warheads—that sometimes ride those same rockets—have to bring fear and death to our fragile species.

²⁴ This fact deserves a quick deconstruction—the United States military targeted East Germany with nuclear weaponry but—perhaps through cognitive dissonance—never bothered to consider the proximity of West Germany, where its own military and citizens resided on military bases. Furthermore, SAC targeted East Berlin with "systematic destruction" without any mention of the fact that West Berlin exists within the *same city* (Burr 2015). How can a nuclear warhead "systematically destroy" one-half of a city? This is the supreme danger of taking a hard stance of "us" vs. "them"—borders become more than a line in the sand, or walls, but sturdy, impenetrable bubbles in the mind. As Gusterson (1996) said, channeling Geertz, "ideology naturalizes itself as common sense, and one group's common sense is another group's nonsense" (56).

CHAPTER 8: “I HAVE NEVER SEEN QUITE A BEAUTIFUL SIGHT” (KENNEDY SPACE CENTER)

I watch as a bead of sweat slips slowly down off the tip of my nose and spirals wildly—its death throes—until the poor, salty little pearl impacts the ground. I stare down at its resting place among the wilted blades of grass in which I’m sitting cross-legged. God, it’s hot. Actually, I’m used to the heat; it’s not so much the heat. It’s the damn humidity that’s the culprit. I feel like I’m encapsulated in cellophane. Like I have a plastic grocery bag over my head and tied around my neck—humidity’s executioner’s hood. But I guess that’s what I get for traveling to the eastern coast of Florida in early September.

I reach into my shorts pocket and pull out my launch ticket. I stare forlornly at it—still many hours to go. After a big sigh, I squint painfully through the sting of sweat on my eyelids down the line. Next to me in the grass, stretching back hundreds of feet, are at least two hundred fellow space enthusiasts, waiting to board the buses to take us to the exclusive LC-39 Observation Gantry. Months prior, I sat at my computer, waiting for the LC-39 tickets to go on sale. The LC-39 site is the closest you can get to a rocket when it launches from Cape Canaveral—as such, the tickets are highly sought after. In fact, the tickets sold out in two hours, but I managed to secure one.

We are all here to watch the launch of an asteroid-interceptor spacecraft dubbed OSIRIS-REx. In typical NASA fashion, the spacecraft’s name is an acronym that stands for the primary duties of its mission: Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer. Of course, the name also has a double meaning. The Principal Investigator of the mission—University of Arizona’s Dante

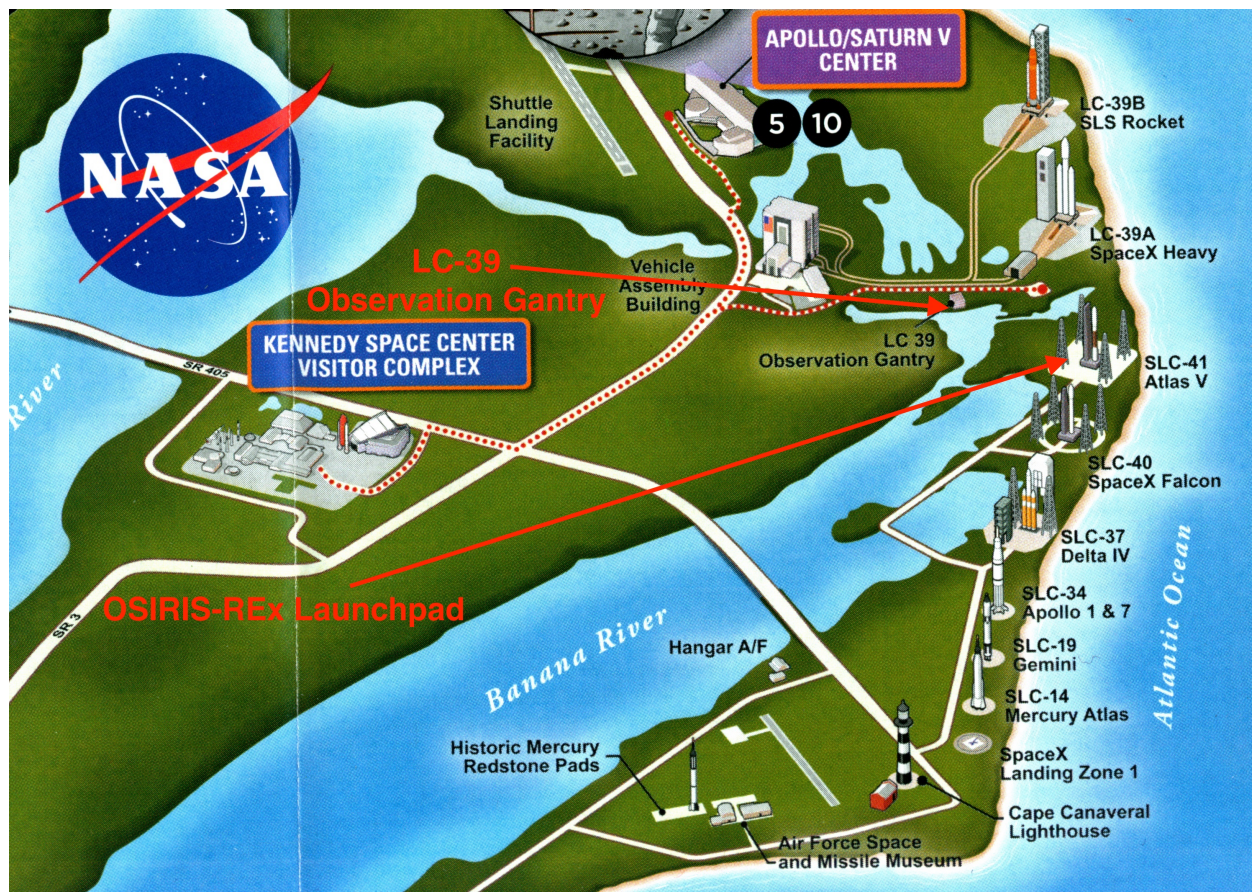


Figure 33. My map of the Kennedy Space Center Visitor Complex and launch pads showing the location of OSIRIS-REx's launchpad and the LC-39 Observation Gantry. Most launch spectators remain at the Visitor Complex.

Image credit: NASA Kennedy Space Center (scanned from the author's collection)

Lauretta (2015)—has a soft spot for mythology and named the original mission after the Egyptian god Osiris when the principle objective of the mission was to intercept and study an asteroid. Lauretta (2015) claims that much like in the Egyptian mythology—in which Osiris spread agriculture throughout the Nile Delta—the OSIRIS-REx mission hopes to discover the building blocks of life that may have spread across the universe.

Osiris was also the god of the underworld and this darker aspect also plays into OSIRIS-REx's mission. The asteroid that is the target of this mission is dubbed 101955

Bennu²⁵ and is a potential Earth impactor that has the second highest rating on the Palermo Technical Impact Hazard Scale with a 1-in-2700 chance of impacting Earth in the late 22nd century (“Sentry Risk Table” 2017). The mission hopes to study the Yarkovsky effect, which states that heat from the sun on the surface of an asteroid will create momentum—or, as was described by a tour guide, act as a “small thruster”—that will minutely change the trajectory of the asteroid through space (Bottke et al. 2006). These small changes in trajectory—when played out over millions of miles—can determine whether or not the asteroid strikes our planet. The more that is known about the Yarkovsky effect—according to Lauretta (2015)—the more scientists will be able to accurately predict asteroid flight paths, and thus insure the security of Earth’s population by providing enough advance warning of a potential future asteroid strike and allow humans to mitigate its flight path.

The “REx” designation came after the Touch-And-Go Sample Acquisition Mechanism (TAGSAM) was



Figure 34. An animation of OSIRIS-REx with the TAGSAM extending from the bottom.

Image credit: NASA/UA-LPL/Lockheed Martin

added to the spacecraft—Lauretta’s dual-use of acronyms again came into play as *rex*

²⁵ The name Bennu further plays into the Egyptian mythology theme of the mission. The name was chosen after a “Name That Asteroid!” contest run by the University of Arizona, The Planetary Society, and the LINEAR Project; the submission winner was 9 year old Michael Puzio, who was inspired by the Egyptian god Bennu (Murphy 2013). Bennu is an Egyptian deity that is typically depicted as a heron, representing creation and rebirth and may have been the inspiration for the phoenix in Greek mythology (Wilkinson 2003). To Puzio, the Touch-And-Go Sample Acquisition Mechanism (TAGSAM) resembled the long neck and beak of Bennu (Murphy 2013).

is Latin for “King,” signifying an enhancement to the original mission. The purpose of the TAGSAM is to fulfill the most ambitious and never-before-attempted aspect of the OSIRIS-REx mission: to retrieve a physical sample from the rocky carbonaceous surface—or regolith—of the asteroid and return the sample to Earth. In order to do this, the spacecraft will not land on the asteroid; instead, it will slowly descend toward Bennu over a period of several hours—following a number of months orbiting and mapping the asteroid—and “kiss” the surface with the sample collector at the end of the TAGSAM. During the roughly five-second contact with the surface, the sampler head will shoot a burst of nitrogen gas that will churn and loosen the regolith in order for the samples to be caught in the filter of the TAGSAM’s sample collector. After a successful collection, between 2 ounces and 4.4 pounds of Bennu regolith is slated to return to Earth in September 2023.

But none of this incredibly interesting information mattered—not while enveloped in an oppressive sheet of humidity waiting in the launch queue. The only thing that mattered was that I get into that air-conditioned bus as fast as I could. As the line surged forward, my obsession to arrive early to everything paid off as I boarded the first bus and was greeted by that familiar blast of artificially cool air. I walked to the next available seat and sat down next to a man who looked to be in his late-40s.

“Hello,” I said to him.

“Hello,” he replied, in a thick Australian accent.

“It’s nice to get in the air conditioning,” I said. “I was dying out there.”

“Yes,” he said. “I hope it will be worth the wait.”

“Did you come here just for the launch?” I asked.

“Yes,” he said. “I leave back to Australia tomorrow. I have always been a space nut and I finally had the opportunity to come and see a launch so I took it. I’m always just in awe that someone could say ‘do this’ and then . . .”

He mimics a rocket launching with his hand.

I smile. I’m a bit shocked by his devotion to spaceflight and we sit silently for the rest of the bus ride in quiet contemplation. I begin to listen to the conversations happening around us on the bus and I hear a variety of accents and languages: British, German, Dutch, Russian. Did they all come to the United States just for this rocket launch? Is this a technoscientific pilgrimage? I have never been a particularly religious person. I was raised in a household that implored the righteousness of the Golden Rule, but did not try to force a certain religious dogma upon me. I never went to a house of worship.²⁶ I think my experience is fairly typical of older Millennials raised by ex-hippies. However, I couldn’t shake the feeling that I was participating in something spiritual in nature. I was sitting on a bus with 50 other people—behind us, there were five other busses to cart the rest of us—all to witness a fleeting moment of awe together.

The bus drove over the Banana River on human-made causeways built to support NASA’s infrastructure. It drove past the press areas with reporters scribbling in their notebooks and holding cameras with massive lenses. It drove past the enormous crawler-transporters that were used to carry the Saturn V moon rockets and Space Shuttles from the Vehicle Assembly Building to the launchpads. Sitting behind barbed wire fences amidst piles of trash, these machines looked like sad, lethargic prisoners—

²⁶ I did go to several Friday prayers at a mosque with a Pakistani fictive-cousin of mine, as kinship anthropologists would call him. I also joined a synagogue and attended Shabbat services—as well as the High Holidays—in Tucson when I found out I had Jewish ancestry. None of it really became a habit, though.



Figure 35. A crawler-transporter on the route to the observation gantry.

Image credit: Taylor R. Genovese

colossal dormant
monsters that may have
made an admirable foe
for Don Quixote before
their imprisonment.

We finally reached
the LC-39 Observation
Gantry. We disembarked
from the bus and were
greeted with a large

banner hanging down off

of the gantry advertising SpaceX—the new gods, the new religion—as we walked into
the exclusive area, the shrine we had all waited to get to. Inside, there was a feast for
the hungry pilgrims—a spread of fruit, vegetables, hot dogs, hamburgers, sodas, water.

I grabbed a bottle of
water and skipped
the food, opting to
fast for this
experience—my first
time witnessing a
rocket launch in
person. I climbed the
gantry and claimed



Figure 36. The LC-39 Observation Gantry with SpaceX advertisement

Image credit: Taylor R. Genovese

my space on Level 3 in the stairwell. Straight ahead of me was the launch pad; wisps of water vapor was streaming off of the rocket as it was being fueled. My heart was racing. I could hardly believe that I was here. A man sets up his camera tripod next to me. He tells me he lives nearby and tries to photograph every launch he can. I tell him I'm a poor graduate student pilgrim here for my first launch. He doesn't seem to understand me and orders his wife to fetch him several hot dogs—no ketchup. We cannot all be pious in the illustrative majesty of rocket techno-science.



Figure 37. The author's view from on top of the observation gantry.
Image credit: Taylor R. Genovese

Suddenly, I hear cries from down below.

"Here we go!"

"Quick! Look!"

Across the river, smoke and vapor began to erupt from the base of the rocket. The rocket started to rise from the ground atop a brilliant flame. Television cameras and photographs cannot capture the blinding brilliance of rocket's fire. It hurt my eyes and I had to avert them from the rocket's image—it was too great to handle. The pilgrims began cheering and clapping—the only noise that could be heard; we haven't been hit

by the sound yet. Then the deafening roar of the rocket slams into us. The sound modulated as it bounced off the river and the buildings. It sounded like waves—deep and ripping, tearing the atmosphere apart. It only took half-a-minute for the rocket to become a point of light in the sky—the sound began to dampen.

Suddenly, I realized that my mouth was hanging open and I had tears in my eyes. I had transitioned beyond the *limen* (Turner 1987); I was different from this experience, this ritual, this rite of passage. I had never had a religious or spiritual experience before in my life, but I think that I had just experienced my first. Is this why people participate in religion? I walked down from the gantry slowly, and watched everyone begin to line up to leave on the busses—the experience was over, now it was time to get back to the “real world.” I opted to go sit in the grass with one or two other stragglers and I looked up into the sky. The exhaust from the rocket was surging, twisting, contorting in the upper atmosphere—a temporal reminder of the spacecraft’s otherworldly journey. I lowered my eyes from the heavens and saw a child of 8 or 9 walking with his mother—with one hand he clutched his mother’s hand and with the other he gripped a toy Saturn V rocket. I smiled at this intergenerational liminal experience.

“What did you think of that?” I heard her ask.

The child looked up at his mother, his eyes slightly moist—like my own—and replied with such sincerity that it tugged on my heartstrings. He said,

“I have never seen quite a beautiful sight.”

CHAPTER 9: ANTHROPOLOGICAL REFLECTIONS ON CONTEMPORARY IMAGINARIES OF OUTER SPACE

In this chapter, I am hoping to withdraw ethnographically and allow the reader to see the forest for the trees. I have divided this section into themes that became apparent to me in the analysis phase of my research. These are not in any way exclusive themes of my work; however, they are the ones that I found to be major and interconnected throughout all of my field sites. In this chapter, I will also disclose the results from my survey and analyze the results.

Engagements in Expertise

One of the major themes within my research has been the construction and reproduction of conceptions of experts and expertise. Imaginaries of outer space within mainstream American culture are inherently scientific in nature and are therefore beholden to Western scientific presuppositions and the creation of specified scientific experts—what Berger and Luckmann ([1966] 1967) have dubbed “universal experts” (117). That is not to say that universal experts claim to have a complete grasp on all scientific knowledge, but that they have ultimate jurisdiction over a particular stock of knowledge in its entirety (Berger and Luckmann [1966] 1967). As I have argued in Chapter 2, public scientists—such as Neil deGrasse Tyson and Richard Dawkins—have created an additional layer to this constructed expertise in that they have also amassed a cult of personality around *their* opinions on scientific principles. Because of a cultural construction of expertise that surrounds them—and the American obsession with celebrity—their scientific opinions are taken as fact without much question or critique.

Therefore, the construction of expertise and the creation of an expert class are engrained with a certain amount of power and political capital. Experts have the ability to wield authority—a political concept—over questions of true belief without being democratically accountable to their truths (Turner 2001). Tying political authority to conceptions of expertise and the knowledge production of truth can be perplexing; often political theory holds a contrasting opinion toward truth and authority (Turner 2001). This is mainly due to Hobbes' ([1651] 1985) polemic claiming that authority makes law, not truth. However, in the United States—especially in the STEM-prioritized present—techno-scientific experts possess both truth and authority.²⁷ Furthermore, by experts claiming a monopoly (or to use Feyerabend's word, "universality") on defining and dispensing expertise, they begin to accumulate and wield political power (Koppl 2010).

The influence over truth and authority directly impacts education systems and helps in bolstering the hegemony of the state as well as the expert class themselves. Paul Feyerabend ([1975] 2010) proposes that science education itself is a form of state propaganda and legitimates the role of experts and expertise within American culture. This is perhaps a cynical view—or at least not as nuanced as it could be—but the argument that public education is an indoctrination apparatus is nothing new (see: Lott 1999; Saunders 2010; Stolzenberg 1993, to name a few). It is also worth mentioning the Foucauldian argument that there exists no true neutrality, therefore expertise is only bestowed by state power anyway, which reproduces inequalitarian effects in service to

²⁷ Although—at the time of this writing—we seem to be entering a "post-truth" world (one that I hope is brief), a world of Trumpist "alternative truths." Sadly, this rhetoric seems to prove the hypothesis that truth/reality/science are socially constructed and can be manipulated through power structures to benefit the status-quo and perpetuate control by the dominant ruling classes. Furthermore, we are beginning to see mass media threaten the role of academics and universities as the traditional sources of expertise (Arnoldi 2007)—perhaps this is why scientists/academics are having to participate more on social media or attempt to become media personalities in order to retain their "expert" status.

authoritative power structures and promotes certain hegemonic ideologies (Carr 2010; Turner 2001).

Throughout my fieldwork, the chief method for demonstrating expertise—as well as the production of knowledge—was didactic text in museums. Museum displays are presented as being politically removed and unbiased, but in actuality, they are tied into the same power structures as expertise and experts (Moser 2010). Many of the



Figure 38. “Why go to space?” display at Spaceport America.
Image credit: Taylor R. Genovese

museum displays utilized didactic text that promoted the neoliberal turn in the space sector. Rather predictably, the Spaceport America displays advocated the most neoliberal, capitalist skew toward how they believed outer space should be viewed. For example, in the figure above, Spaceport America has prioritized the reasons why we should go into space; the first being for economics—the last, humanity. Welcome to the second space age, indeed. Spaceport America also utilizes politically populist rhetoric reminiscent of Westward Expansion advertisements: “Our mission is to unlock the potential of space for everyone, and in doing so, share a new era of prosperity, security,



Figure 39. The Spaceport America tour guide (center).
Image credit: Taylor R. Genovese

and advancement for all.”

Furthermore, Spaceport America employed an embodied performance of expertise by placing their tour guides in blue flight suits, setting them apart from the patrons and imbuing them with the

appearance of authority and

expertise. Although NASA placed their tour guides in vests with NASA patches affixed to them, they were not as extreme—performance-wise—as the bright blue flight suits at Spaceport America.

The National Air and Space Museum in Washington D.C. takes a more historical perspective to NewSpace, and, in fact, does not use the term NewSpace at all. Instead,

the display does not hide behind marketable buzzwords; instead, they label the single display “Spaceflight as Business.” The display utilizes passive voice within the didactic text and takes the patron through the history of monetized spaceflight—from the Russian attempt to turn Mir into a tourist hotel to the successful launch of Virgin Galactic’s SpaceShipOne in 2004. The contrast is interesting, to say the least, however, the National Air and Space Museum is not without an implicit political undercurrent. Take, for example, the tagline on the display: “When is space no longer a frontier?” The museum utilizes the same colonial language that is employed by Spaceport America and presents it as a normalized, de-politicized term for how outer space should be viewed. I will discuss this at greater length in the Colonialism and Space Science section below.

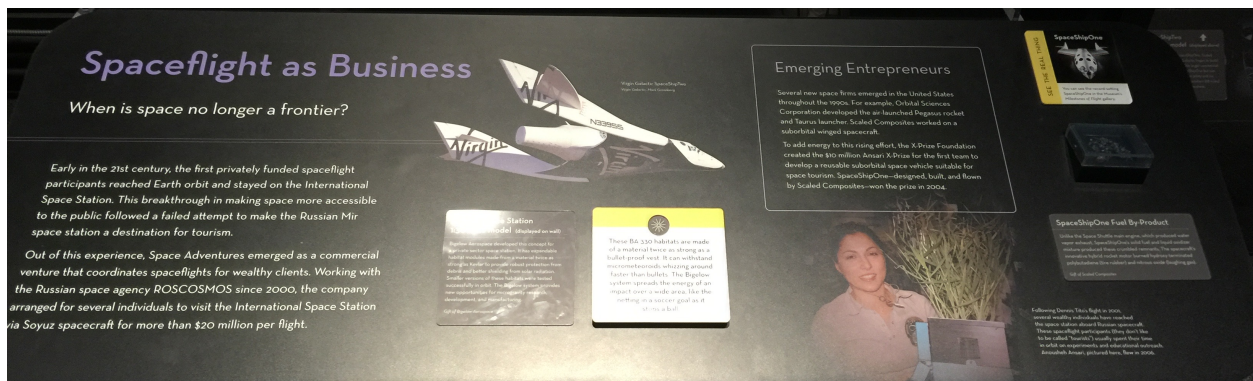


Figure 40. “Spaceflight as Business” display at the National Air and Space Museum.
Image credit: Taylor R. Genovese

Political Economies in Space

Another major theme in my research was the shifting political economies within the space sector. In particular, I argue that outer space is being imagined as a site for capitalist accumulation—what Marx has dubbed “primitive accumulation” (see Chapters 1 and 2 for in-depth discussions about this). As the imaginary for outer space shifts from

a place in need of exploration²⁸ to a place in need of exploitation, the political economy of the *space* in space begins to mirror colonial and capitalist expansion on Earth. Specifically, the commons that were created by the ratification of the Outer Space Treaty (Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1966) are beginning to be enclosed by NewSpace corporations.

The cosmos as commons—as Debora Battaglia (2014) calls it—was an idea that outer space is a place open to anyone to conduct peaceful, scientific experiments. However, as space science—particularly within the field of human spaceflight—drifts toward privatization and neoliberalization, the cosmic commons are being enclosed by wealthy entrepreneurs, seemingly in violation of the Outer Space Treaty. Interestingly, as I discussed in Chapter 3, the progression of asteroids within the imaginary has taken another step in this so-called “second space age.” Initially, asteroids were thought of taxonomically as proto-planets, then they were thought of as vicious destroyers of humanity (and still are), but now they are also thought of as sites for capitalist accumulation. Valerie Olson (2012) discusses this duality of asteroids as human-killer and human-enricher. However, as NewSpace corporations—such as Deep Space Industries and Planetary Resources—begin developing the technology to mine asteroids that have been estimated as being worth up to \$5.4 trillion each (Tracy 2016),

²⁸ The word exploration deserves a quick deconstruction since it is a word loaded with colonial baggage. In the West, exploration is tied to the brutality of colonial expansion, including genocide, forced relocations, assimilation, and a litany of other violent acts. When I say exploration in this context, I do not mean to lessen the horrors of colonial exploration, but I also do not utilize this word in the same way when discussing the scientific exploration of outer space—a place that (so far) holds no other forms of life to terrorize and displace.

the seemingly endless growth of capital in the cosmos provides exactly what is needed in order for capitalism as a system to continue to persevere.

The neoliberal imaginary of outer space is the same as on Earth: that everything is a commodity to be bought and sold. Asteroids are not the only celestial objects that the neoliberal gaze has fallen upon. For example, imaginaries of the moon have shifted from a site of scientific experiments to a site of vast quantities of the resource Helium-3, waiting to be mined and shipped back to Earth in order to be sold for fuel (Bilder 2009). NewSpacers have their eyes set on the commons of low-earth orbit in order to enclose that space for the use of media satellites and solar power satellites that would sell solar energy to Earthlings (Damjanov 2017; Launius 2011). Some warn that—much like on Earth—the competition over commodities of space will lead to further war and imperialism both on the Earth and off (Dickens 2009).

In fact, the battle over outer space access from the surface of Earth is currently being waged. Spaceport America claims that New Mexico is the home of American spaceflight, tracing their claim to early rocket tests from the White Sands Missile Range. NASA, on the other hand, claims Cape Canaveral as the home of American spaceflight due to their history of crewed spaceflight launching from the coast of Florida. Each organization teleologically constructs reasons why NewSpace corporations should engage with their competing spaceport facilities. On my tour of Spaceport America, the tour guide called NASA's launch facilities in Cape Canaveral "obsolete" because most NewSpace launch technologies have boosters that no longer need to fall back to Earth—thus was the advantage of launching from a coast, so that the boosters land in the

ocean, not over populated land. Both SpaceX and Jeff Bezos' (founder/CEO of Amazon.com) company Blue Origin have autonomous vertical landing boosters.

NASA's tour guide countered this argument by saying that the Space Coast already has decades of launch infrastructure lining its coast, with space professionals (launch support teams, engineers, scientists, etc.) residing at or near the Cape.

Spaceport America's tour guide countered that by launching from Truth or

Consequences

—which rests at

an elevation of

4,595 feet—

customers get

close to “the

first mile free”

as compared to

launching at

sea level;

furthermore, the

tour guide

exclaimed that

launch facilities in the dry desert of New Mexico do not have to worry about

maintenance and repair from ocean salt damage or hurricanes. While this competitive

sniping was partially due to my exhortative outbursts during the tours by presenting tour

guides with dialectic statements, the presentations of each site's geographic and



Figure 41. The SpaceX facility and leased launchpad at Cape Canaveral, Florida.
Image credit: Taylor R. Genovese

infrastructure virtues were heavily intertwined within each tour's script. Furthermore, each tour guide was passionate about extolling the reasons why each location was the better one for the future of human spaceflight. All of this rhetoric contained a desirous undercurrent for enormous profits to be made through launch contracts.

However, this is not to say that there hasn't been some resistance to this hyper-capitalist imaginary of outer space futures. Former chief historian for NASA, Roger D. Launius (2014), suggests several Earthly analogs—utilizing public and private cooperation—that could be applied to outer space, such as the establishment of the National Parks, the regulation and subsidizing of the airline industry in the United States, and the development of the transcontinental railroad. Although these analogs do not take into consideration systems outside of a capitalist framework—nor do they acknowledge that all three of these projects required coercive authority and colonial violence—they are at least beginning to present ways to wrestle the cosmos away from the dominion of oligarchs.

Unfortunately, NASA has largely been silent on alternatives to the increasing neoliberalization of spaceflight services. Since NASA is a part of the federal government, this is not entirely the fault of the administration; it is at the mercy of socio-economic policies of those in power. However, there seems to be little interest within the administration to look toward alternatives. In fact, in January 2017, NASA awarded four additional crew missions to SpaceX and Boeing prior to either company completing the necessary orbital flight tests (Siceloff 2017). This is good news for SpaceX—and its CEO and founder Elon Musk—because it brings a steady flow of capital into his company's coffers so that he might continue work on his dream to colonize Mars.

Colonialism and Space Science

On September 27, 2016, SpaceX founder and CEO Elon Musk unveiled his plans to create the Interplanetary Transport System (ITS) at the International Astronautical Congress in Guadalajara; he hopes to create a permanent, self-sustaining colony on Mars within the next 50 to 100 years (Wall 2016). His plans are grand; he wishes to send 1,000 or more ships—each filled with between 100 to 200 people—to Mars every 26 months. Musk announces to the crowd: “The Mars colonial fleet would depart en masse” (Wall 2016, para. 14). The language Musk uses when talking about the spread



Figure 42. A sign at Spaceport America utilizing colonial language.
Image credit: Taylor R. Genovese

of humanity off the Earth's surface is one rooted in colonialism (Lee 2015). And he is not alone.

I have already discussed the desire for NewSpace corporations to appropriate romanticized colonial language that harkens back to a right-libertarian, rose-tinted viewpoint toward Westward Expansion and Manifest Destiny—two United States policies that were aggressive and violent to the Indigenous peoples already on this continent. Although I have already discussed the colonial connection to spaceflight at great length throughout this thesis, I feel that contemporary issues in space science that are tied to colonialism need to be discussed further—and not all of these issues are related to the extraterrestrial.

Astronomers and Indigenous peoples have long been at odds with each other due to conflicting worldviews over the purpose and significance of tall mountains. In the late 1980s, the San Carlos Apache Tribe and astronomers battled over the building of telescopes on their sacred mountain, whose Anglo name is Mount Graham, in Arizona—the astronomers won in court; in the early 2000s, Kitt Peak National Observatory clashed with the Tohono O'odham Nation in order to build another large telescope on its sacred peak—the Tohono O'odham were able to stop the project, but many large telescopes remain on the mountain; as of the time of this writing, native Hawaiians are battling to stop the Thirty Meter Telescope to be built on Mauna Kea, a sacred peak already filled with telescopes (Hall 2015). Western science, astronomy included, is often closed to alternative worldviews—including traditional Indigenous views—because it threatens the hegemony of “the method” and the ingrained politics within it (Smith 1999). As such, many astronomers do not recognize the importance of keeping sacred



Figure 43. Soviet poster extolling the virtues of “progress.” It reads: во имя мира и прогресса! (*vo imya mira i progressa!*—In the name of Peace and Progress!)

Image credit: Grant W. Trent, used with permission

peaks ecologically cleansed and will hold implicitly racist views toward Indigenous peoples, thinking that they are against scientific progress (Messerli 2016). Ideas of “progress”—usually measured within a capitalist framework to mean technoscientific advancement—have often been tied into a variety of ideologies in order to impose domination over minority views.

One may even be able to argue that projects like the International Space Station—whose primary participants are all countries within the Global North—can be construed as a colonial project. As an orbital laboratory practicing experiments based solely on Western science, this beacon of international scientific cooperation is completely closed off to traditional knowledge that—as on Earth,

so too in space—is viewed as being an enemy of progress.

So when Elon Musk says things like, “It’ll be, like, really fun to go [to Mars] . . . You’ll have a great time” (Wall 2016, para. 11) after calling his spacecrafts a “colonial



Figure 44. A mural of the International Space Station with the flags of participating countries at Kennedy Space Center.

Image credit: Taylor R. Genovese

fleet”, I would like to implore him to enroll in an Anthropology or American Indian Studies class covering the brutalities and rippling consequences of Western colonialism and its obsession with the “frontier.” Perhaps a deeper understanding of what colonizing a frontier means from a more historic, linguistic, and semiotic perspective would deliver some much needed empathy to the tunnel-visioned industry of NewSpace.

Magic & Ritual in Human Spaceflight

One may think that with the extreme emphasis on the perceived empiricism of Western science within the realm of outer space affairs, that there would be no room for the subjective—let alone magic, ritual, and religion. However, one of the themes that

became apparent to me throughout this research is that there exists an enormous amount of mysticism within human spaceflight. Some rituals are performed within the confines of accepted Western religious dogmas, while some fall into the realm of how anthropologists understand magic and witchcraft.²⁹ The first mystic component to human spaceflight is the spiritual oneness that many astronauts feel after reaching outer space—described by Frank White (2014) as the overview effect—with many developing environmental and social justice viewpoints, after seeing Earth from an orbital altitude. Furthermore, many astronauts report that their time in space was filled with spiritual experiences, including temporal shifts, floods of emotion, and feelings of being a part of something larger than themselves. For a recent example, take what astronaut Ron Garan (2015) reports in the beginning of his autobiography:

As I approached the top of this [orbital] arc, it was as if time stood still, and I was flooded with both emotion and awareness. But as I looked down at the Earth—this stunning, fragile oasis, this island that has been given to us, and that has protected all life from the harshness of space—a sadness came over me, and I was hit in the gut with an undeniable, sobering contradiction. In spite of the overwhelming beauty of this scene, serious inequity exists on the apparent paradise we have been given. I couldn't help thinking of the nearly one billion people who don't have clean water to drink, the countless number who go to bed hungry every night, the social injustice, conflicts, and poverty that remain pervasive across the planet. (3–4)

However, astronaut engagements with magical moments goes beyond the spiritual experience and into the realm of ritualized behaviors that would seem familiar to Malinowski and other anthropologists that study symbol, myth, and ritual. Many of these ritual forms of magic come from the ancestors of spaceflight. For American

²⁹ Obviously the terms “magic” and “witchcraft” are loaded with their own colonial baggage, as well as Western suppositions about what these terms mean within the dominant Christian theology. In terms of the latter, I use them explicitly in order to provoke the scientific community to reflect on their own practices.

astronauts on launch day, the entire crew must complete a series of rituals before proceeding to the launch pad. First, they must eat a meal of steak and eggs, the Mercury astronaut's food of choice before a mission. Many contemporary astronauts report that they only pick at the hearty meal due to nerves, but it is never refused for fear that it will jinx the mission (Mullane 2006). After the meal, the crew participates in a simple card game and must continue playing until the crew's commander loses.



Figure 45. Astronaut Winston Scott's comments about the card game played by all American astronauts before launch.

Image credit: Taylor R. Genovese

Malinowski ([1925] 1948) argued that people usually engaged in magical and ritualized behaviors when they were placed in stressful situations, or found themselves with limited control over situations. If we apply these criteria to human spaceflight, I do not believe it is too far-fetched to assert that those who ride automated rockets into the vacuum of outer space are engaging with magic and ritual in order to grasp at a certain amount of control absent within the launch itself (Weibel and Swanson 2006).

Magical and ritualized behavior in human spaceflight is not only restricted to just American astronauts; Soviet—and now Russian—cosmonauts also participate(d) in ritual prior to launching into outer space. On April 12, 1961, as Yuri Gagarin was being driven to the launchpad prior to his mission, he was overcome with a human urge that often manifests itself when one is nervous—or drinks too much coffee. Gagarin charged the driver to pull to the side of the road where he relieved himself on the rear passenger bus tire before re-boarding and rocketing his way into the history books (Weibel and Swanson 2006). Due to his mission being successful—and for fear of being jinxed should they not perform the same ritual—every cosmonaut after Gagarin has also had the bus driver pull over so that they may micturate on the rear passenger bus tire prior to launch; women are not exempt from this, carrying vials of their own urine to splash on the bus wheel (Weibel and Swanson 2006). Cosmonauts and NASA astronauts launching on Soyuz to the International Space Station today still perform this ritualized urination. Furthermore, all those who wish to board a Russian spacecraft must watch the 1969 Soviet film *Белое солнце пустыни* (*Beloye solntse pustyni*—White Sun of the Desert) the night before launch (“Gagarin’s Traditions” 2017).

However, during the Space Race, there was also a battle between the two superpowers over the predominantly Christian United States and the state-atheism of the Soviet Union. One prominent Soviet propaganda poster after Gagarin’s flight featured a grinning cosmonaut on a spacewalk, orbiting above Russian Orthodox churches with two bold words in red between the two: *бога нет* (*boga nyet*—There is no god). The United States countered this affront to its religious sensibilities when the Apollo 8 astronauts read from the Book of Genesis after circling around the moon for

the first time. Furthermore, after Apollo 11 successfully landed on the surface of the moon, Buzz Aldrin asked for a moment of silence so that he might partake in the ritual consumption of bread and wine; communion, therefore, became the first food and drink to be consumed on another celestial body (Weibel and Swanson 2006). Although I am not sure whether the

practice is still continued, I did uncover in the archives that NASA used to collect astronaut religious preference, although I am not sure of the reason.

More ethnographically, I observed a certain amount of multi-species mysticism that surrounded rocket launches in Cape Canaveral. On one of the tours that I attended, the tour guide

<u>RELIGION (3)</u>	
Anders	Catholic
Armstrong	No Preference
Bassett	
Borman	Episcopal
Bull*	Episcopal
Carpenter	
Chaffee	Presbyterian
Collins	Episcopal
Cooper	Methodist
Eisele	Presbyterian
Freeman	Methodist
Givens	Methodist
Glenn	Presbyterian
Graveline	
Grisson	Church of Christ
McDivitt	Catholic
Michel	No Preference
Llewellyn	None
O'Leary	No Preference
See	Christian Science
Schirra	Episcopal
White	Methodist
Williams	Catholic

Figure 46. One page from a list of NASA astronaut's religious preference.

Image credit: NASA HQ Historical Reference Collection, Record #6742, Folder: Impact, Religion (1972-79), Washington DC.

delighted in pointing out every bit of wildlife as we drove around Kennedy Space Center. One of the other tour patrons asked about how the wildlife reacts to the abrasive rocket launches. The tour guide replied: “Oh, the animals know when there’s a launch. I don’t know how they know but they do. All the birds are gone for launch day, the turtles . . . the alligators go right under water. That’s their own sound suppression system!”³⁰ This is reminiscent of Eduardo Viveiros de Castro’s (2013) argument that nature is not a monolithic entity that is interpreted differently by disparate cultures, but instead nature



Figure 47. Apollo 15 left this commemorative plaque at the Hadley-Apennine landing site on the moon with the names of American and Soviet astronauts/cosmonauts who had died in the name of space exploration along with a fetish figurine of a fallen astronaut/cosmonaut.

Image credit: NASA

itself is multiple, with no one species having a privileged position from which to view others (Valentine 2016). The wildlife surrounding Kennedy Space Center is thought of as being connected to the rockets that launch there—having a special relationship that allows them to feel the same reverence toward these rocket-totems that the humans do.

In fact, without essentializing it too greatly,

³⁰ The tour guide was referring to the Sound Suppression System that NASA employs to protect its rockets from the acoustical energy that is reflected off of the launch pad during lift-off. This is accomplished by releasing 900,000 gallons of water per minute onto the launch pad just before the rocket ignites and lasts until the rocket clears the tower.

witnessing a rocket launch first-hand allowed me to understand cargo cults more clearly. Witnessing this enormous, dangerous object—whirring and humming on a platform of twisted metal—with vapor hissing and swirling around its icy body makes worship seem like a reasonable human response to something so otherworldly. And while rockets can giveth awe, they can also taketh away by claiming human life. Memorials and ritualistic remembrances of those who have lost their lives in the name of space travel have many Earthly memorials, including several at Kennedy Space Center, and one on the moon. However, as with all things in life, there is a balance between good and evil, prosperous and poor, sacred and profane.

“Shitting in Space”: An American Obsession With Cosmic Taboo

I have chosen this title for two reasons. The first is the literal. Many Americans, especially, are obsessed with the mundane of space travel; specifically, how astronauts perform common taboos such as urination, defecation, and sexual intercourse. The second is a play on words from the last section; while previously I discussed the sacred and the spiritual, now I shall discuss the profane, starting with the use of profanity.

If one searches Google for how to use the bathroom in space, there is a return of 168 million results, including several instructional

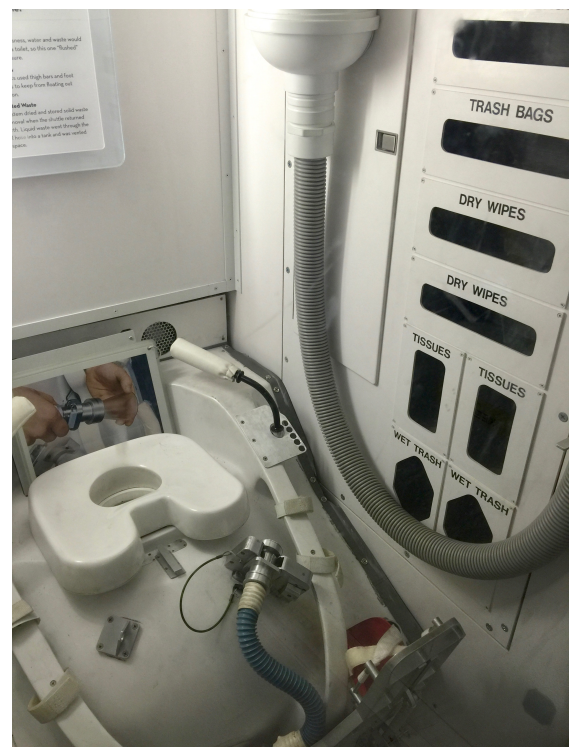


Figure 48. A Space Shuttle toilet exhibit at the National Air and Space Museum in Washington, DC.

Image credit: Taylor R. Genovese

videos filmed at the International Space Station; of course, these videos only demonstrate the actions in theory, the astronauts do not actually videotape themselves relieving themselves. Although the reality of human evacuation of waste in microgravity is rather dull in actuality (the toilets utilize an initiation of air flow that pulls any waste in

the direction of the waste collection opening), it is still a question that is repeatedly asked of astronauts and tour guides. Museums have also created exhibits with reproductions of space toilets in order to satiate the American desire to engage with the taboo in microgravity. The largest of which—that I have observed—is at



Figure 49. The International Space Station toilet exhibit at Kennedy Space Center in Cape Canaveral, Florida.
Image credit: Taylor R. Genovese

Kennedy Space Center. The exhibit gives patrons a step-by-step guide on how exactly astronauts are able to poop on station and then allows them to touch the different parts of the toilet.

The cultural significance of space toilets have run so deep that the manufacturers of the Waste and Hygiene Compartment (WHC)—the official name of the space toilet on the International Space Station

—were compelled to create a patch for the cosmic commode, which is affixed to the outside of the WHC on orbit. This is in contrast to the Russian view of space toilets, which is far less obsessed with the act of using the toilet. At the Museum of Cosmonautics in Moscow, there is a toilet display in a recreation

of the Mir space station, but there exists no didactic text

around it and it is merely there to uphold historical fidelity.

The topic of sex in space is another taboo that contains a large amount of conjecture and speculation. NASA has never confirmed whether or not sexual intercourse has ever occurred in outer space but speculation spiked after the first (and so far, only) married couple flew on the same crew in 1992—Jan Davis and Mark Lee



Figure 50. The official patch for the International Space Station toilet: the Waste and Hygiene Compartment (WHC).

Image credit: Taylor R. Genovese

flew to space together on STS-47. This spike in speculation is also culturally telling; why does anyone need to be married—or be heterosexual—to perform sexual acts



Figure 51. The toilet display recreation of the *Mir* original at the Museum of Cosmonautics in Moscow, Russian Federation.

Image credit: Grant W. Trent, used with permission

anywhere, including outer space? A Google search for “Has anyone had sex in space?” returns 22.1 million results—including a hoax document that looks like it came from NASA, describing an orbital experiment to determine which sexual positions are possible in microgravity. Despite the taboo nature of sex in the United States—and the conspiracy theories that the hoaxed document is genuine—it is a concern that will need to be addressed for future missions that may include human settlements. Microgravity and gravitational forces lesser and greater

than Earth will need to be considered when it comes to procreation—and pleasure.

A Survey of Contemporary Outer Space Imaginaries

One of the chief ethnographic tools that I utilized for this research was an online survey. At first, I was skeptical about participation. However, after 24 hours, I already had nearly 200 participants. By the time I closed the survey—after nearly four months—I had 306 total participants from around the world. Throughout my fieldwork, most of my

information was coming from those inside of the NewSpace or NASA establishment and I wanted to release an online survey in order to gauge how members of the public felt about the direction of human spaceflight and whether or not science fiction affected imaginaries of those possible futures. I released the survey on a variety of websites—as well as on my personal social media accounts—targeting online communities that were focused on spaceflight, science fiction, anthropology, futurology, and politics.

The age breakdown surprised me. Since my main method of distribution was online communities, I was prepared for a skew toward the young. While that does exist somewhat, I did have far more participation from those over 35 years old than I was initially expecting. Ethnicity, however, was as expected—an excess of white people. Those that inputted an ethnicity for “Other” wished to define themselves as multi-racial, filling in how they wished to be identified. Some examples include: “Scotchican/

Figure 52: Age (n=306)

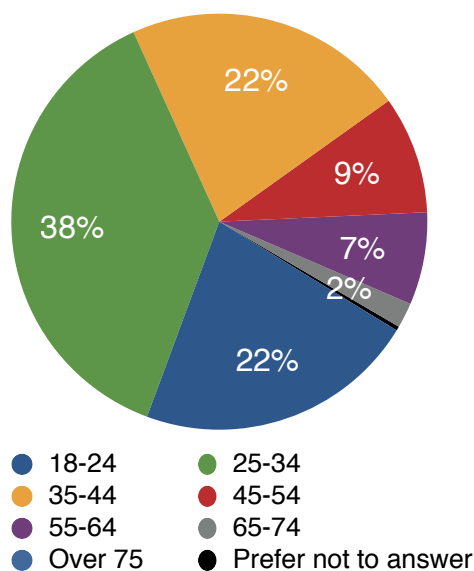
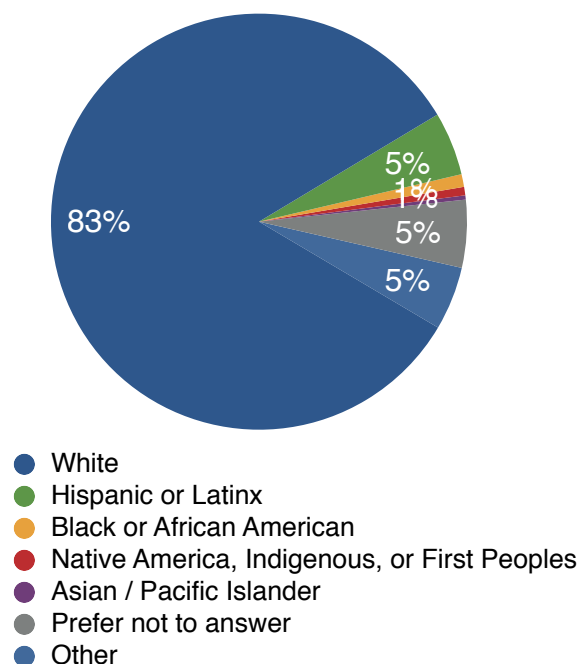


Figure 53: Ethnicity (n=304)



Mexiwhite,” “Anglo-Jewish,” and “mix black white asian.”

Gender was also fairly predictable, with a majority identifying as male. Several of the “Other” responses identified as “agender” or “nonbinary” with other responses being “I don’t” and “Gender is bullshit.” Geographic location was mostly within North America, but also included 34 responses from Western Europe and a smattering of responses from all around the world.

Figure 54: Gender (n=304)

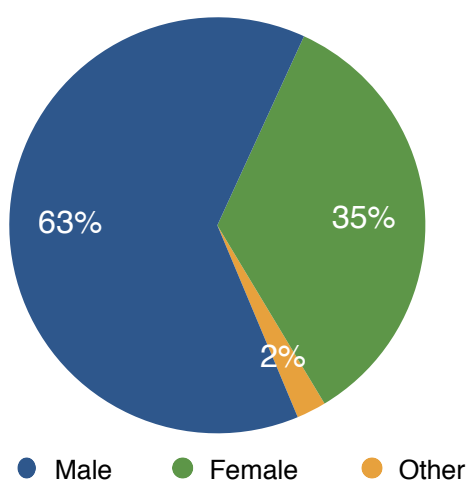
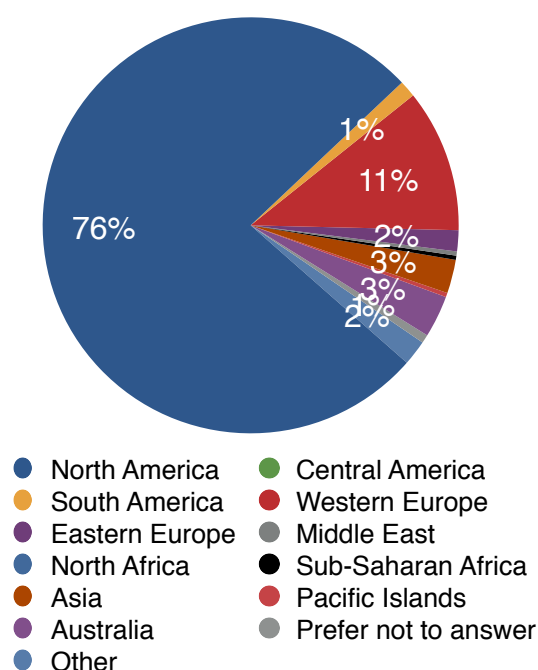


Figure 55: Location (n=306)



Political views were also largely skewed to the left-wing, which was surprising considering the previous data showing that many of those that think about outer space futures tend to identify as right-libertarian. The survey question asked for the participant to place themselves on the political spectrum with 1 being far-left and 5 being far-right.³¹ Fourteen participants chose not to answer. I followed up by asking which economic system that the participants agreed with most; two did not answer. I was surprised to

³¹ For the exact wording of all survey questions, see Appendix 3.

Figure 56: Political Spectrum (n=292)

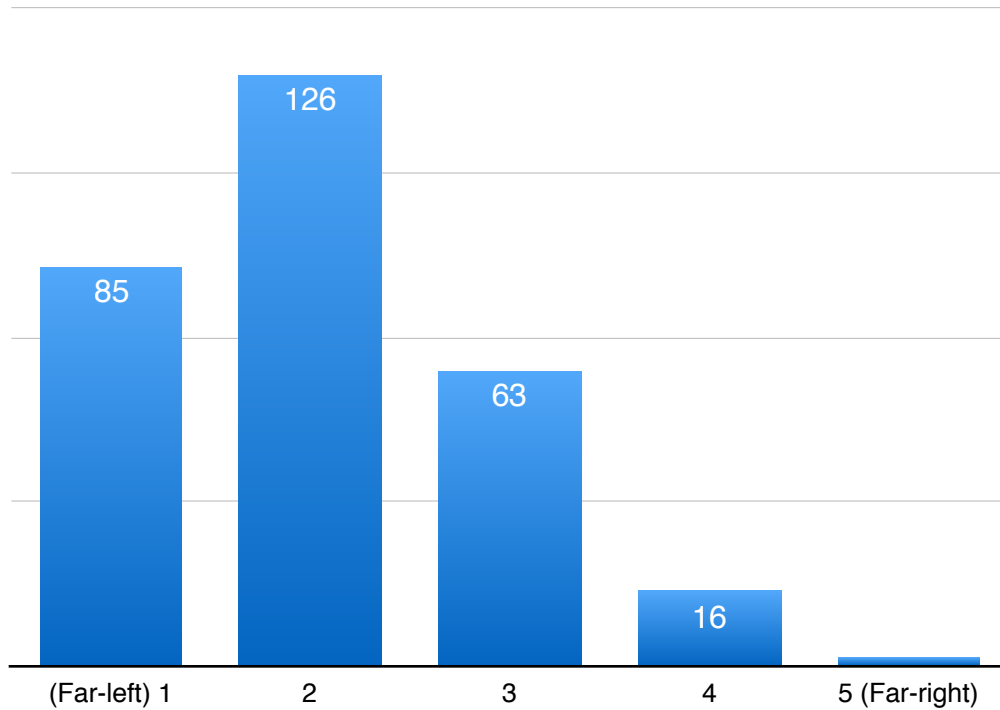
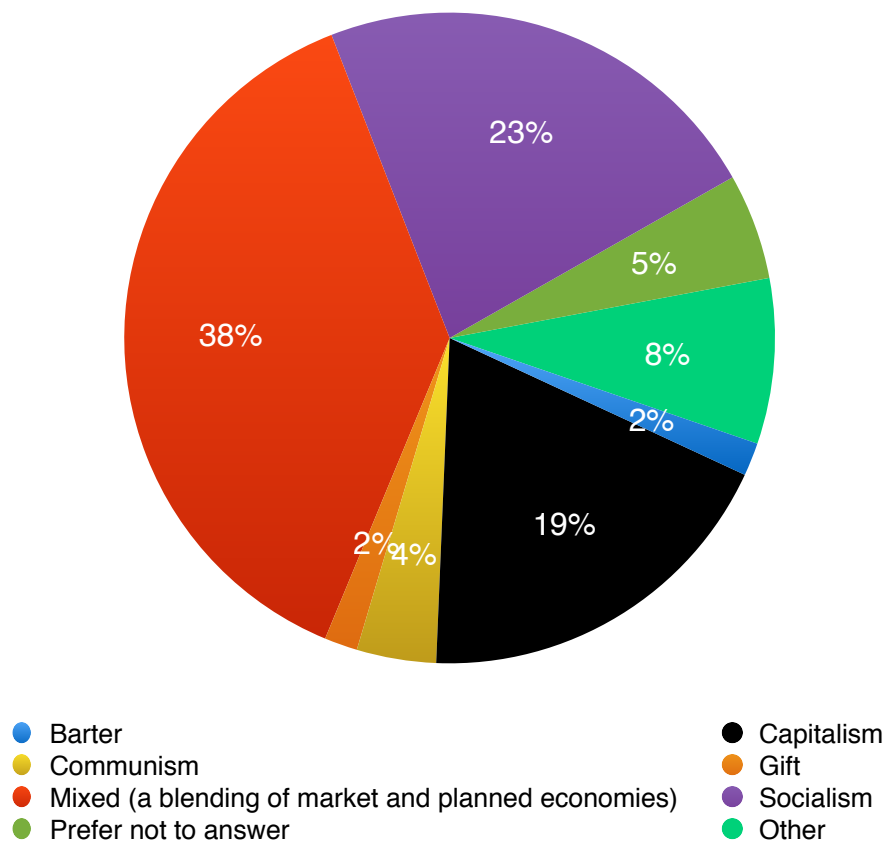


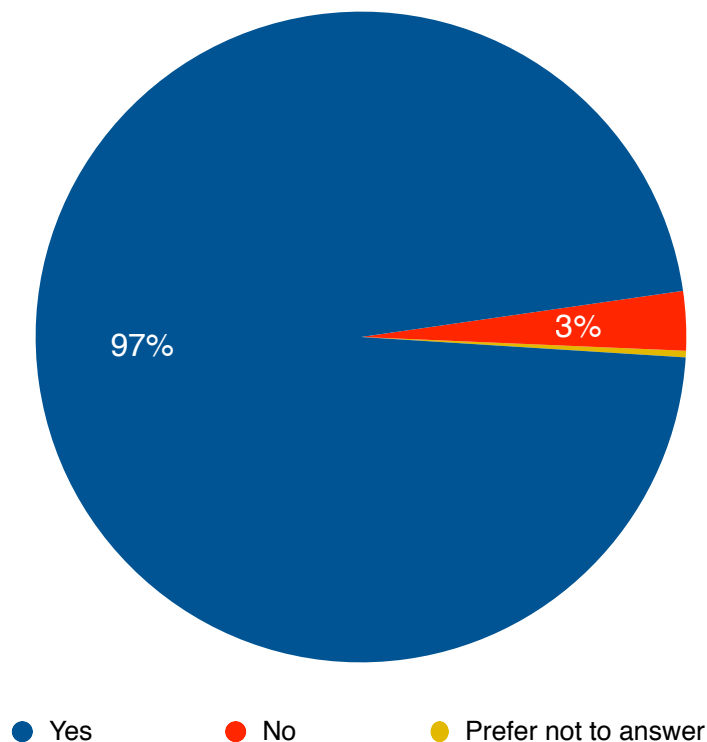
Figure 57: Preferred Economic System (n=304)



find that 69 responded with Socialism. Some of those that responded with “Other” said “modified socialism hybrid,” “I don’t know!” and “None of them really make any sense.”

The next section had to do with science fiction influence. Since one of my arguments in this thesis is that science fiction influences the way that people think about outer space, I wanted to find out if those that were interested enough in taking a survey about outer space would also be interested in science fiction. The answer was a resounding yes.

Figure 58: Do you enjoy—or have you ever enjoyed—science fiction media? (n=306)



Many listed science fiction classics like Star Wars (237 participants / 79%), Star Trek (232 / 78%), and The Hitchhikers Guide to the Galaxy (213 / 71%) as favorite science fiction franchises. When asked to list any favorite science fiction authors or screenwriters (219 responded), some of the most popular were Isaac Asimov (47

participants), Ray Bradbury (21 participants), and Ursula K. Le Guin (20 participants). I then asked for participants to write in a few sentences to a paragraph explaining why they enjoy science fiction. Out of the 203 participants, there was an interesting similarity of answers—participants cited an expansion of one’s imagination (54 participants) as well as mentioning that science fiction was an outlet for their futurist interests (82 participants). Twenty seven said that they enjoyed science fiction because it made them stop and think, or think differently. Nineteen cited science fiction as a vehicle for escapism and 15 said they enjoyed the political, technological, or social speculation that science fiction provided. I was surprised when many participants gave incredibly thoughtful and beautiful write-in answers. For example:

- “Dreaming is a way to test the future, what might be possible, how we would react. We then can search for the reasons that made the image beautiful. So that beauty we can start building now.” —Respondent #28
- “I love to see how imagination believes the world can be.” —Respondent #68
- “They reveal a great deal about what people think of society now through how they imagine the future. The future is often (or always) some exaggeration of some already existing facet of society, which is usually interesting when it is used to criticize the contemporary social order.” —Respondent #86
- “I forget who said it, but I once heard SF [science-fiction] described as ‘the fiction of ideas’. This is the crux of why I love it -- it's a playground that allows authors and audiences to creatively interface with the fictional shadows of real-world concepts and systems -- whether scientific, social, cultural, spiritual, etc.” —Respondent #197

And of course, there are some responses that were lackluster—yet still quite truthful—and provided a much needed laugh during analysis.

- “They aren't boring usually” —Respondent #89
- “They were entertaining. That's what entertainment is for.” —Respondent #194
- “Because I enjoy watching spaceships” —Respondent #226
- “Shit's dope yo.” —Respondent #116

I then moved on to contemporary outer space developments in order to get a feel for how people thought about the cosmos, Earthly developments, and the neoliberalization of the space sector. Quite unsurprisingly, almost 95% of the 306 participants said that they believed that outer space exploration was a worthwhile endeavor for human beings. However, I then asked two questions that probed participants to reflect on political economic aspects of outer space. The first question asked if the participant believed that private space corporations (such as SpaceX, Blue Origin, and Virgin Galactic) are better at space exploration than governmental organizations (NASA, ESA, and JAXA); I purposely left this question vague (i.e. using the word “better”) in order to elicit a gut reaction from participants.

The second question asked the participants if they believed that private space corporations should be allowed to keep and sell materials they mine from space or if space resources should belong to all humankind (a question that hinted at reflection on the recently passed U.S. Commercial Space Launch Competitiveness Act). As I expected, there were many participants (21%) that selected “Other” and opted to fill out an answer. This could have been due to the wording of the question itself or their being unfamiliar with the recently passed legislation. However, many that answered “Other”

Figure 59: Are space corporations better at exploration than governmental organizations?
(n=306)

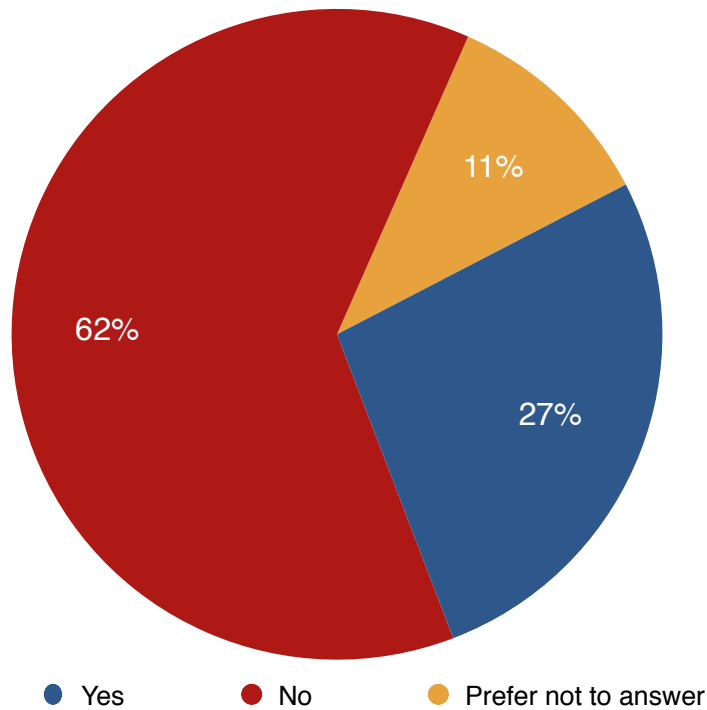
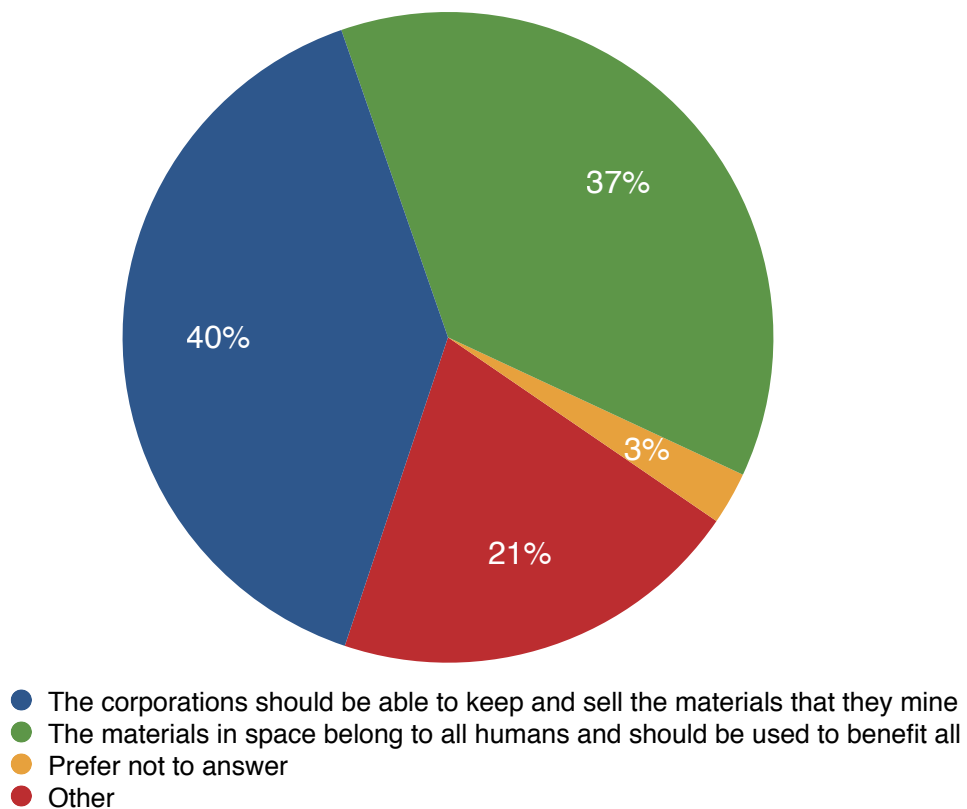


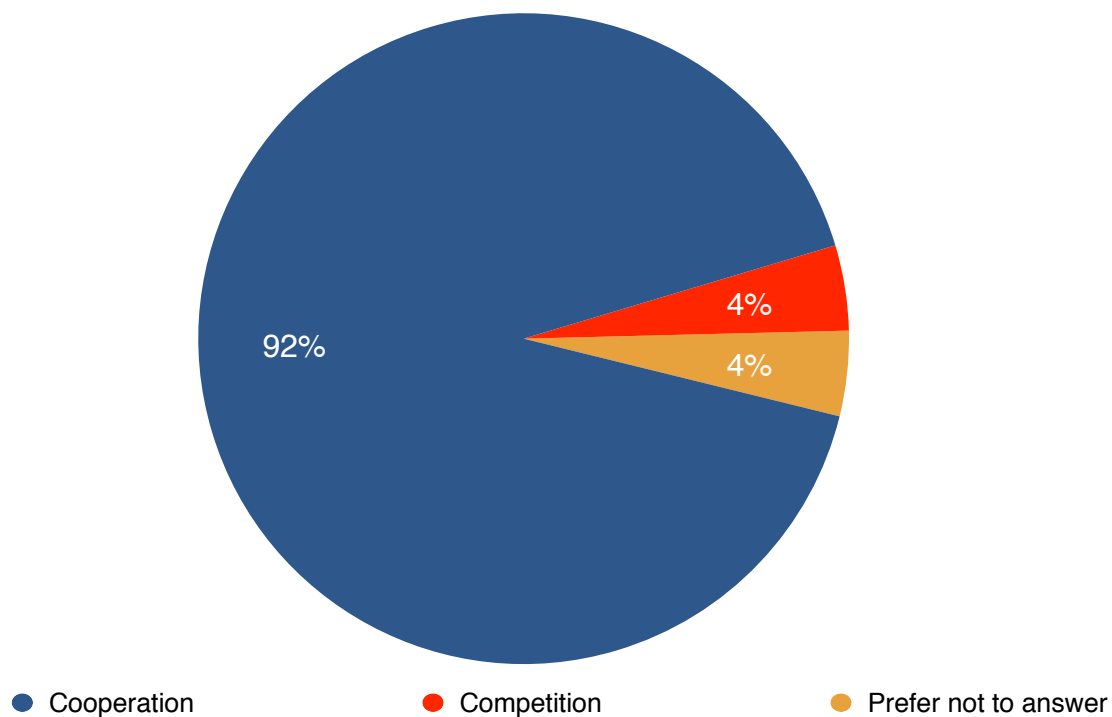
Figure 60: Should space corporations be allowed to keep materials? (n=306)



filled in answers concerned with human agency and governance; several answered that there should be a public/private partnership, while some said that space resources didn't belong to humanity at all.

While a majority of participants responded that governmental organizations were “better” than private corporations, a majority of participants also said that private corporations should be able to keep and sell the materials that they mine from space. This contradiction was deepened when I asked which philosophy would be best for the survival of humans off of the Earth's surface.

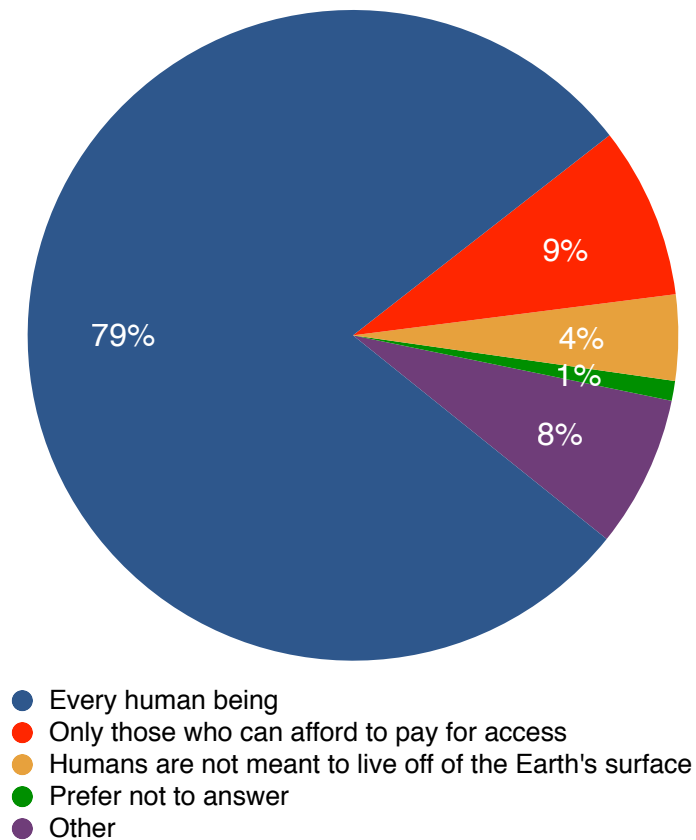
Figure 61: Best philosophy for survival
(n=306)



A large majority of participants responded that cooperation was the best philosophy for survival, yet 40% still responded that corporations—the children of capitalism that only survive due to competition and the competitive spirit—should be able to thrive unchecked in the cosmos (see: Figure 60). Is the capitalist hegemony of

the West to blame for this contradiction? Perhaps. However, the cooperative and competitive clashing does not stop there. For one of the questions, I asked who has the right to gain access to outer space. Surprisingly, almost 80% of the participants said that everyone, regardless of class, should be able to access the cosmos.

Figure 62: Who has the right to access outer space? (n=305)



Although 306 total participants is not an enormous sample size, I believe it is sizable enough to make some inference from the data. I believe that this survey shows that science fiction is a powerful tool that affects the imaginary of outer space—to both resist the neoliberal creep into the space sector, and possibly also to reenforce it, depending on the the author’s motives. However, I believe that conformist social

scientists should cease ignoring the power behind science fiction to deeply influence a technoscientific society like the United States.

I believe the survey also illustrates the contradictions in capitalist societies. Namely, the suppression of the instinct toward cooperation and mutual aid (Kropotkin [1906] 2011) in order to prop up and reenforce capitalism—and not necessarily explicitly or maliciously. The subtle hand of hegemony tends to mold and indoctrinate the American mind toward colonial, racist, and capitalist intention in order to sustain its power structures. A dominant power system will never dismantle itself from the inside; its only threat is from outside agitation. I believe that this survey, in a small way, has illustrated this constant struggle in the Western mind between compassionate cooperation and selfish competition. However, it has also shown that resistance and outside agitation has the power to tip the scales of this cerebral battle. In the case of this thesis research, resistance takes the form of subversive science fiction, which has the power to transport the reader's mind into the imaginary of alternative futures that, in turn, could be used to build impressively cooperative human realities.

SECTION IV—THE FUTURE

Another world is not only possible, she is on her way . . .

On a quiet day . . . I can hear her breathing.

—Arundhati Roy (2003, 75)

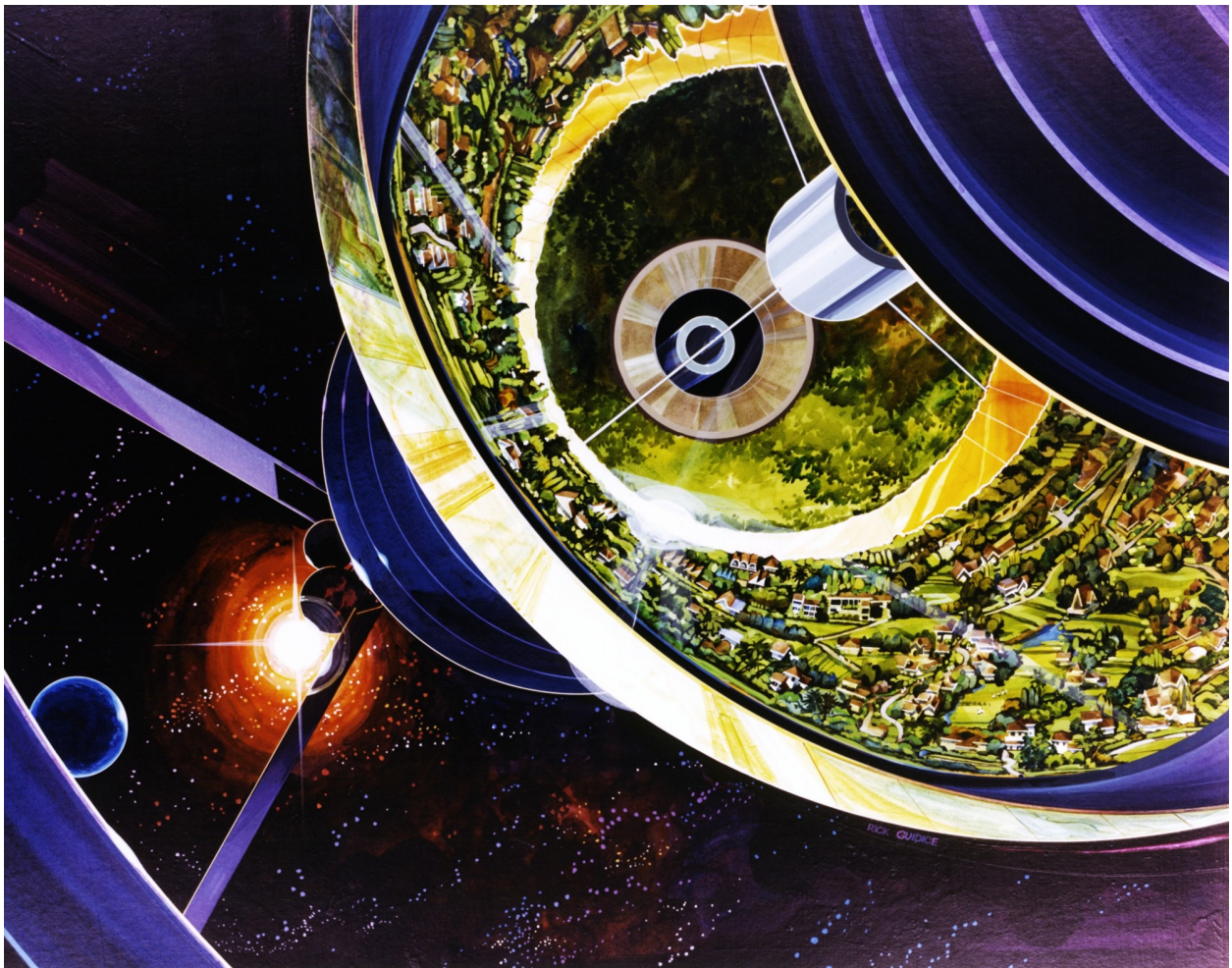


Figure 63. Cutaway view of a Bernal Sphere.

Image credit: Artwork by Rick Guidice; Image by NASA Ames Research Center

CHAPTER 10: OF HYPERREALITY AND NEWSPACE AS SIMULACRA

The discussion of human futures is a difficult topic with which to engage. Within the Western conception of linear time, the future is temporally forward and veiled within statically three-dimensional existence. Therefore, in this chapter, I will turn to some postmodern theorists and philosophers in order to engage with how to situate the role of science fiction, science, and NewSpace within human futures in outer space. This section is also a dreamscape of ideas that may not be fully fleshed out, but are here to generate discussion, hence the heavy reliance on phenomenology.

The ideas of hyperreality were first generated by Jean Baudrillard ([1981] 1994) who defined the concept as “the generation by models of a real without origin or reality” (1). Hyperreality is a simulation; an intense blending of “reality” and representation so that there is no longer any clear line wherein one ends and the other begins—and in fact, if one accepts the theory of hyperreality, there is no reality anymore, only simulations of reality, which are unmeasurable because reality and hyperreality are indistinguishable—there’s nothing to measure against the two since reality no longer exists as a separate entity (Baudrillard [1981] 1994). Umberto Eco (1986) expands on Baudrillard’s ideas to suggest that hyperreality is created through a desire for a certain “reality,” and in order to realize that desire, one must fabricate a reality that can be consumed as real. Like Baudrillard before him, Eco (1986) uses Disneyland as an example of hyperreality that manufactures desires that can only be realized within the hyperreality it has created, leading one to wish for the hyperreal rather than nature/the “real.” Eco (1986) illustrates this by saying:

In this sense, Disneyland not only produces illusion, but—in confessing it—stimulates the desire for it: A real crocodile can be found in the zoo, and as a rule it is dozing or hiding, but Disneyland tells us that faked nature corresponds much more to our daydream demands. When, in the space of twenty-four hours, you go (as I did deliberately) from the fake . . . wild river of Adventureland to a trip on the Mississippi, where the captain of the paddle-wheel steamer says it is possible to see alligators on the banks of the river, and then you don't see any, you risk feeling homesick for Disneyland, where the wild animals don't have to be coaxed. Disneyland tells us that technology can give us more reality than nature can. (44)

Baudrillard ([1981] 1994) further discusses what happens when science emerges out of science fiction and what happens when the difference between the two is indistinguishable—in other words, the real recedes and all that is left are simulations of the hyperreal and “science fiction in this sense is no longer anywhere, and it is everywhere” (126). In this age of accelerated technoscientific development—as I have argued in previous chapters—science and science fiction are melded into a Baudrillardian simulation where artificial intelligence, autonomous rocket boosters that land on autonomous drone ships, and a constant human presence in outer space is the sedimentation of hyperreality where, as Milburn (2003) has said, “the model becomes indistinguishable from the real, supplants the real, precedes the real, and finally is taken as more real than the real” (267).

When the hyperreal meets the *hyperobject* of the cosmos, a term coined by Timothy Morton (2013) to describe a thing that is “massively distributed in time and space relative to humans” (1), interesting (and confusing) discussions can arise. For the purpose of this thesis, I would like to argue that the nebulous entity of NewSpace—which is multifaceted in that it is philosophical, ideological, and physical in itself—has emerged as a simulacrum from the hyperreality of contemporary space developments. Baudrillard ([1981] 1994) describes a simulacrum as not exactly a copy or imitation of

the real, but a thing that becomes a truth in itself—as it has emerged from hyperreality, which is its own truth. I believe Gilles Deleuze (1990) defined simulacra (plural of simulacrum) best when he said: “The copy is an image endowed with resemblance, the simulacrum is an image without resemblance” (257).

The overarching colonial romanticism—of a rustic pioneer traveling to a distant land—that is utilized so often by NewSpace plays into similar romanticisms employed by NASA, but instead of the objectives remaining the same, the NewSpace agenda is only concerned with profits. This is why I argue that NewSpace is acting as Saturn devouring his son,³² simultaneously destroying and emerging as a simulacrum from the hyperreality of cosmic imaginaries. In essence, NewSpace is a copy without an original—feeding off of imaginaries that are simulations and creations of their own devising. The public, in turn, is buying into this vision as if it is the only reality possible. To utilize Eco’s (1986) example above, NewSpace is Adventureland in Disneyland and NASA and other governmental agencies of “OldSpace” are the paddle-boat on the Mississippi. No one wants to wait ten years for a scientific mission when Elon Musk can bring them to Mars in half that time.

However, this is not a defense of the “real.” I am a proponent of “utopic thinking,” which in itself is hinged on a dislocation from reality in order to imagine a better world. The tyranny of the so-called real—a term that is often defined by governments and corporations in order to sustain the status-quo (Collins 2008)—is precisely how NewSpace is able to invade the imaginaries of the future so easily. If one is able to dismiss a social justice minded futurologist or science fiction writer with a “Get real!” or

³² This is in reference to the Francisco Goya painting.

“That could never work in reality” then it shuts down entire social theories that resist the established ideology. David Harvey (2000) discusses this in relation to alternatives to capitalism, which fits quite well when discussing the resistance to NewSpace:

If the mess seems impossible to change then it is simply because there is indeed “no alternative.” It is the supreme rationality of the market versus the silly irrationality of anything else. And all those institutions that might have helped define some alternatives have other been suppressed or—with some notable exceptions, such as the church—brow-beaten into submission. (154)

In the “rationality of the market” all that remains are “degenerate utopias” (Collins 2008; Marin 1993), places like the previously mentioned Disneyland, which presents itself as a utopic place, but is actually shrouding the commercial “reality”—“the Main Street façades are presented to us as toy houses and invite us to enter them, but their interior is always a disguised supermarket, where you buy obsessively, believing that you are still playing” (Eco 1986, 43). According to Eco (1986), Disneyland’s hyperreality begins when one submits to the complete “fakeness” of the simulation in order to bask in the desirous visions of the utopia that it presents. Thus it becomes completely real. I saw this attempt at creating a hyperreality at Spaceport America, with the science fiction inspired door frames and the tour guides dressed in flight suits. Elon Musk presents it to

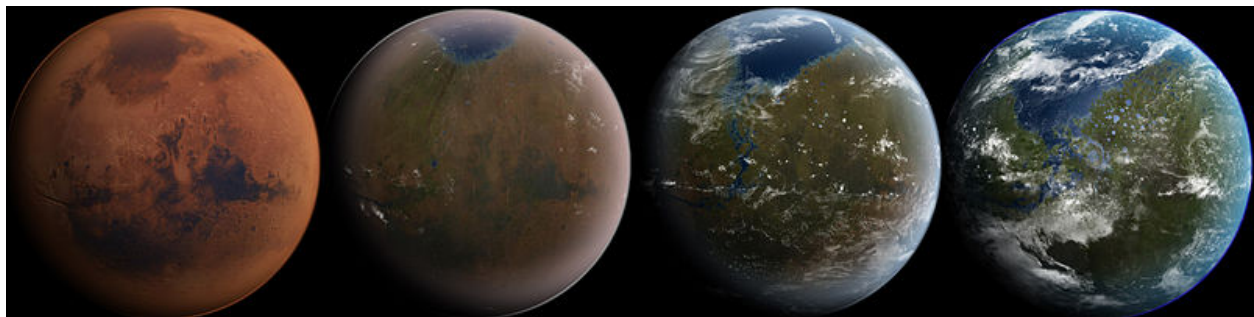


Figure 64. An image created by Wikipedia user Ittiz and appropriated by SpaceX. In 2014, SpaceX placed this image on all of their social media accounts and their website in order to give “spectacle” to their Martian terraforming plans.

Image credit: Artwork by “Ittiz,” used with permission

us when he utilizes a four-stage image of Mars, starting with the red planet and ending with a terraformed, Eden-like utopia of oceans and clouds and green forests; a new Earth that beckons to colonizers with new possibilities and untapped markets.

This photo is a Debordian “spectacle” that establishes and mediates a social relationship with the public through images (Debord 1994). Photos like the one above are preambles to the spectacle of 1,000 ships departing to Mars every 26 months. Even if that does not become a reality, Musk and other NewSpacers have already begun to creep into the social imaginary of space and supplant their own ideologies as truth into the cosmic hyperreality, which may relate to why my survey results contained foundationally contradictory answers. These photos are part of a larger trend within the space science hyperreality. Messeri (2016) ethnographically uncovers how Martian mapmakers are creating incredibly detailed maps that are created without direct reference to the landscape, since we have never set foot there. Therefore, “the primary goal of today’s [Martian] maps is . . . to establish Mars as inviting to human explorers,” much like the images of a terraformed Mars advertised by SpaceX (Messeri 2016, 74). Like the Jorge Luis Borges short story *Del rigor en la ciencia*, the map precedes the territory, and the obsession of creating a perfect map makes that map the new reality (as a simulation), while the empire it’s supposed to represent—or in this case, the planet Mars—crumbles away, ceding to the hyperreality of its representation.

NASA—in its neoliberal present—is enveloped within this hyperreality as well, perhaps as it recognizes the simulation that NewSpace exists within, and how powerful it can be in the sphere of public relations. However, their production of nostalgia inducing travel posters for places humans have never been are coded to invite—and



Figure 65. In early 2016, NASA and the Jet Propulsion Laboratory (JPL) released vintage travel posters advertising places in our solar system and beyond; these are two of them.

Image credit: NASA/JPL

exclude—certain types of futures (Messeri 2016). Namely, these futures are white, colonial, and evoke vintage 1950s–1960s travel advertisements, a period of U.S. history ripe with inequality and oppression. The political cannot be divorced from aesthetic, no matter how much opponents may try to argue against this point; I’m sorry³³ but Foucault was right.

And these theoretical frameworks are the reason why I have argued for social science to take science fiction seriously, especially science fiction that does not espouse the tropes of Spencerian social theory. Science fiction writers who identify as

³³ Not sorry.

people of color, Indigenous, women, and LGBTQI+—with enough critical mass—can create a simulation and hyperreality with their own work that forces change at the root. The power of words, of worldmaking, of placemaking that is so inherent in science fiction writing are the catalysts for social change, especially in Earth-bound space science. Furthermore, social scientists should not only embrace the political world that science fiction inhabits, but we should be working together as a collective to actively disseminate the social science that good science fiction writers are already conducting.

CHAPTER 11: WHAT IS TO BE DONE?

This chapter title should really be the title of the entire thesis since it is the question that I have been muttering since the beginning of this research project—except that the title has already been skillfully used by the likes of Nikolai Chernyshevsky, Leo Tolstoy, and Vladimir Lenin. I do not think that my name has quite the prestige to fit in with the company of those gentlemen. So instead, I have decided to make it the name of my final chapter in which I try to discuss how we move forward from the rather bleak present I have divulged in these pages; but I will also throw in some radical tangents in order to keep with the titular theme.

As I have argued extensively in this thesis, American imaginaries of the future are dominated by right-libertarianism. NewSpace venture capitalists like Elon Musk and Peter Thiel have latched on to futurist thinking and have the power and capital to begin enacting some of their visions. This is no surprise; engagements with the future emerged as a distinct field of social inquiry during the Cold War when neoliberal capitalism was battling state Communism for supremacy—and the political context has changed very little (Tolon 2012).

However, NewSpacers depend on a climate of stress and conflict in order to justify their drastic socio-political-economic actions. For example, Peter Thiel—founder of PayPal, Facebook board member, and heavy investor in SpaceX—has said: “Because there are no truly free places left in our world, I suspect that the mode for escape must involve some sort of new and hitherto untried process that leads us to some undiscovered country; and for this reason I have focused my efforts on new technologies that may create a new space for freedom” (Gittlitz 2016, para. 8). To Thiel,

and many of his right-libertarian venture capitalist revolutionary vanguard, these places are threefold: artificial island micro-nations, the Internet and cyber-communities, and outer space (Gittlitz 2016). Thiel has invested in all three of these areas and was recently placed on Trump's transition team. Soon after Thiel's appointment, Trump decided to divert NASA funds from climate change studies to deep space exploration.

This has a lot to do with the fostering of another American frontier. As of the time of my writing this thesis, Trump has announced plans to build a wall along the United States / Mexico border. These Earthly enclosures are direct manifestations of the cosmic enclosures championed by NewSpace—and often these two proclamations are advocated by the same people in the same positions of power. Is the cosmic frontier doomed to represent the same tragedies and oppression as our Earth frontiers? Not necessarily. And here, I will begin to take a long needed—albeit brief—shift toward optimism.

Today, our borderlands are places of violence, where states exert their influence in order to destroy or capitulate the Other—either figuratively or literally. However, this was not always the case. As Durrenberger (2016) has said:

[In the past] the borderlands were less foreboding, places the regularizing reach of states had bypassed because they were not worth the effort. To them went those castoffs the states threw off in their great drives to define and unify: prophets, anthropologists, missionaries, and more recently revolutionaries and terrorists. Many who have lived in those areas return with stories of human potential, encouraged by what they have seen of the power of our species' humanity. (para. 5–6)

Could outer space provide a space to unleash the human potential for compassion? With the absolute vastness of the cosmos, it seems impossible—past a certain technoscientific level that I believe we are rapidly approaching—for dominant

power systems like states or corporations to garner control over such enormous distances. A certain degree of anarchy—if not full fledged social anarchism or anarchist-communism—seems to be, in my mind, an inevitability. As I have argued in previous publications, direct democracy within communities outside of the Earth’s influence seems to be the most equitable and efficient way to socially organize in a hostile environment (Genovese 2016d). Haqq-Misra (2015) proposes “liberated settlements” on Mars that reject Earthly authority and operate within their own self-determination. Philosophers, social scientists, and science fiction writers all seem to be contributing socio-political theory to this new “Space Age of Enlightenment.”

With the continued generation of liberatory work, we may have a chance at chipping away at NewSpace’s hegemonic *lineage of the frontier* that I introduced in Chapter 6 and establish a *lineage of liberation* instead. In fact, I do not think that we have a choice any longer. As of this writing, as I sit behind the abrasive glow of my computer screen at 11:49pm on February 1, 2017, the United States and the world seem to be at a dangerous tipping point. The fascist creep has turned into a fascist sprint, and those that wish to claim neutrality or inaction are implicitly siding with the dominant powers that wish for nothing less than the destruction of the environment for capital gains, a stripping of what little civil protections are left, a mass defunding of all educational systems, a homogenizing of this country utilizing Nazi-era racial order schemes, a villainization of anyone who is not a right, white, Christian man, continued colonial expansion into sovereign Indigenous land while repeatedly breaking treaties, rampant hetero-patriarchy, and the list continues ad nauseam.

It is our duty as anthropologists, as social scientists, as science fiction writers, as space enthusiasts, as educators, as *human beings* to make sure that while we are on Earth, we will fight for the weak, the marginalized, and the disenfranchised by any means necessary and with respect, ears open to the requests of those people who have suffered for years under the boots of oppression, and for whom we may have very little frame of reference in regard to their suffering under structural violence. And as we begin to journey and live away from the only place we have ever called home, we must leave into the cosmos for the right reasons—not for capital, for power, or for narcissistic perceptions of glory, but in the spirit of equity, mutual aid, love, diversity, as well as playful curiosity, and we must do it with soul, with heart, and with joy.

SECTION V—REFERENCES AND APPENDICES

We're made of star-stuff. We are a way for the cosmos to know itself.

—Carl Sagan (Cosmos 1980)



Figure 66. Teach on Mars
Image credit: NASA

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APPENDIX 1: RESEARCH METHODS

This thesis project was not a conventional ethnography; nor was this project a purely historical account of outer space imaginaries and its influence on the social, political and economic systems of Earth. Instead, this project utilized a multi-sited, mixed-methods approach that consisted of archival research, museum didactic text analysis, multi-sited ethnography, and surveys in order to answer my research questions effectively.

In this section, I will describe the methods that I chose to utilize for this thesis project—which included a visual anthropological component—and how those methods were the best tools to answer my research questions. Furthermore, I will discuss the importance of my ethical obligations to this project and participants, especially considering my unorthodox theoretical perspectives within modern anthropological thought.

IRB & Ethics

It was important for me—both professionally and personally—to conduct this research project in a way that adheres to the AAA's current ethical code, as well as fulfilling the Institutional Review Board (IRB) process through Northern Arizona University. With anthropology's checkered past (and present) as an instrument for colonialism and empire, it was important that anthropological ethics remained at the forefront of my mind during the research process.

Per IRB requirements, I provided my participants with a Human Subject Consent Form that outlined the purpose of my thesis project as well as the details about

procedures, confidentiality, benefits and risks. Furthermore, I included a clause that authorized photographic and video collection for those that agreed to take part in the visual anthropology supplement of this research. Participants retained the option of declining participation in either the ethnographic and/or the visual elements of this project at any time, including after research had already been conducted.

Most interviews were conducted informally during participant observation and were, therefore, not recorded. I chose to utilize my field notes rather than an audio recorder since most of my participants were unable to commit to large blocks of time. I utilized codenames for all of my notes and did not record any form of personal identifier—such as names, addresses, phone numbers, etc. Those that agreed to my visual anthropological project knew prior to my taking photographs that their image may be used within the confines of my thesis research and for possible future publication and/or professional presentation; and again, the participants were aware of their right to disallow my use of their image at any time.

The Northern Arizona University IRB assigned my thesis research a review type of “expedited” and granted research approval on May 27, 2016 (IRB Project Number: 889091-1).

Archival Research

The best way to trace cultural processes throughout time—as well as social imaginaries, economic data, political systems, etc.—is to utilize archival resources (Bernard 2006). Since one of my primary research questions dealt with uncovering the ebb and flow of how people have viewed outer space—both historically and contemporarily—an archival approach provided me with a larger degree of data in a

shorter amount of time than if I were relying solely on ethnographic methods. However, I found it important not to look at archival data as purely objective; “no data are free of error” (Bernard 2006, 450). In fact, archives can be incredibly political institutions, with colonial archival gaps being prevalent in many Western archival institutions (Genovese 2016a).

I primarily utilized the NASA HQ History Office Archives, as well as the National Archives. These two archival institutions house the most historical materials related to the space industry in the United States (as well as some materials related to the Soviet Union). With help from one of my research partners, I was also able to analyze photographs taken at the Russian Museum of Cosmonautics, which provided me with data that were outside of the political sphere of the United States.

Survey

I designed a short nine-part online self-administered survey in order to reach the largest amount of participants possible (Bernard 2006). I designed the survey on Google Forms which allowed me to pull all of the collected, anonymous data into a Microsoft Excel spreadsheet for analysis (see the Appendix 3 for a copy of the survey’s content). I utilized non-probability sampling (Bernard 2006) and targeted various online message boards and online communities—including Reddit, Spaceflight Now!, Facebook, and Twitter—that have an affinity for outer space exploration. I then created a post that introduced my research project, briefly discussed that their participation would be completely anonymous, and invited participants to take the survey. Utilizing an online survey allowed for access to a larger participant base and their responses yielded more data in a shorter amount of time than other methods such as interviewing

or participant observation (Bernard 2006). The online survey also broadened involvement to a global participant base, with roughly 25% of the participants being outside of North America. I opened the survey on June 16, 2016 and closed it on October 11, 2016. There were 306 participants.

Interviews

When I first started this project, I was hoping to sit down and conduct semistructured interviews, utilizing a domain-based interview guide, with NewSpace workers and officials. However, I soon found out that those in NewSpace are not keen on speaking with anthropologists. Secrecy is paramount with the NewSpace community and a closed community is not new within anthropological study. Hugh Gusterson (1996) ran into similar issues when he wanted to study nuclear weapons scientists and commented that “secrecy is a means by which power constructs itself as power, and the knowledge of secrets is a perquisite of power” (87).

I was required—in part, due to the limited timeframe in which I needed to complete my field work—to rely on informal interviewing (Bernard 2006). This does not mean that I was taking an easy way out. In fact, informal interviewing—in my opinion—is far harder than mainstay for ethnographic interviews: the semistructured interview. As Bernard (2006) says: “When it comes to interviewing, never mistake the adjective ‘informal’ for ‘lightweight.’ This is hard, hard work. You have to remember a lot; you have to duck into private corners a lot (so you can jot things down) . . . Informal interviewing can get pretty tiring” (211). This is accurate. I spent much of my time at field sites furiously typing direct quotes into an app on my phone to be transcribed and flushed out when I returned to my hotel in my field journal.

(Participant) Observation

Participant observation is the foundation of cultural anthropological research (Bernard 2006). It involves building enough rapport with your participants that you blend in enough to be able to participate in cultural activities as an equal, or at least as equal as you can be. Due to the rapidity of this project, I was not be able to participate in fieldwork for an extended period of time, as Malinowski ([1922] 2005) encouraged. —as I mentioned before—space corporations are closed sites and secretive, so I was not able to build enough rapport in three months to be able to gain access, hence I have put the word “participant” in parentheses. In order to make up for the lack of time in the field, I will be heavily utilizing Geertz’s (1973) method of “thick description”—that is taking extensive, in-depth field notes—in order to soak up as much cultural data as I possibly can. Furthermore, I shifted my main field sites to include museums, tours of facilities, etc. in order to participate with fellow members of the public. Geertz’s methods, combined with the visual anthropological methods discussed below, helped make the most out of the short fieldwork season while still yielding deep cultural data.

Field Journal / Field Notes

The field journal is the most important possession of the cultural anthropologist. Keeping detailed field notes allows for a deeper and more interpretive analysis after fieldwork has ended. Furthermore, it sharpens the memory of events experienced, allowing for richer and more complex ethnographic data (Emerson et al. 2011). However, I used my field journal as more than just a tool. While I still utilized my journal and phone app to record the “thick description” of my field sites and participants (Geertz 1973), I believe that a field journal has more potential than as just a functional

anthropological instrument. Taussig (2011) argues for new ways of seeing and using the notebook as form; written observation should be juxtaposed with drawings, watercolors and newspaper cuttings. An anthropologist's field journal should be a piece of modernist literature, a dreamscape that allows the researcher to work out the imaginative logic of anthropological discovery (Taussig 2011). My field journal included writing, drawings, blueprints, ethnographic artifacts (ticket stubs, maps, etc.), and photographs in order to tell the complete story of my research.

Visual Anthropology

Part of my objective with this research project is to present my findings to a general audience, or at least an audience that is typically not familiar with anthropological research. One of the most effective ways of accomplishing this was taking a visual anthropological approach (Rollwagen 1988). It is important to note that I took a critical visual methodology as outlined by Gillian Rose (2001) that "thinks about the visual in terms of the cultural significance, social practices and effects of its viewing, and reflects on the specificity of that viewing by various audiences" (32). However, I agree with Pink (2003) when she argues that Rose's approach could be strengthened by utilizing a visual-*anthropological* framework. Doing so went beyond a simple visual methodology; a stronger visual-anthropological approach contained intersubjectivity through which ethnographic knowledge was produced and enhanced "human and image agencies" as well as creating a stronger methodological base for this project (Pink 2003, 191).

Furthermore, I utilized photographs as a main ethnographic tool to remind me of situations, memories, and feelings for writing my thesis. I also decided to take the old

adage that a “picture is worth 1,000 words” to heart and have incorporated many of the photographs that I took during fieldwork into this thesis in order to enhance my ethnographic writing. My research partner Grant also took an abundance of photographs while he was in Moscow so that I had a complete photographic data set to work with. While this is not ideal when it comes to ethnographic research, it did open a wider and multi-cultural range of didactic text analysis.

My photo essay companion to this thesis is hosted here:

<http://trgenovese.exposure.co/the-new-right-stuff>

Coding & Analysis

Branching from my literature review—as well as what I found in the field—I developed several codes that I used to thematically analyze my interview, (participant) observation, and survey data. These themes were presented in Chapter 9. My theoretical frameworks were the foundation for my analysis phase. Due to the ambiguity of concepts like imaginaries and futures, I utilized several methods for text and image analysis.

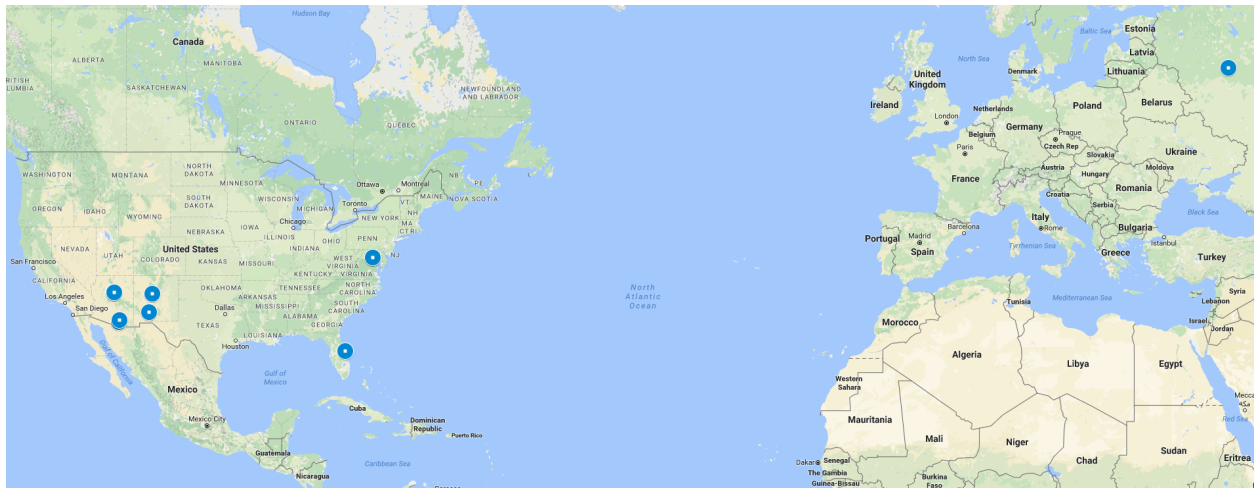
The first is a hermeneutic analysis; originally utilized as a way to critically analyze biblical texts, this method catered well to analysis of imaginaries while I searched for “meaning and [its] interconnection in the expression of culture” (Bernard 2006, 475). The second analytical method—which I have touched on above—is grounded theory. That is, after looking at all of my datasets as a whole, I developed analytic categories (themes), built these categories into theoretical models and used quotes from interviews and my field notes that illuminated those theories (called exemplars) (Bernard 2006).

Finally, I utilized narrative and performance analysis to “discover regularities in how people tell stories...” (Bernard 2006, 475). This includes my own storytelling.

APPENDIX 2: RESEARCH SITES

In most anthropological research, one is encouraged by ethics boards not to disclose one's field sites for reasons of anonymity, security, heritage protection, etc. However, for this particular research project, most of the sites that I visited were so high-profile, it would be impossible to not disclose where my research partners and I were conducting research.

Inventory of Research Sites (utilized by myself* and/or by my research partners†)



NASA Headquarters*

Smithsonian National Air and Space Museum*

Spaceport America*

National Museum of Nuclear Science & History*†

Kennedy Space Center*

Titan Missile Museum*†

Pima Air & Space Museum*†

Lowell Observatory*†

Музей космонавтики†

Museum of Cosmonautics†

Washington, D.C., USA

Washington, D.C., USA

Truth or Consequences, NM, USA

Albuquerque, NM, USA

Cape Canaveral, FL, USA

Sahuarita, AZ, USA

Tucson, AZ, USA

Flagstaff, AZ, USA

Москва́, Росси́йская Федера́ция

Moscow, Russian Federation

APPENDIX 3: ONLINE SURVEY

This survey was shared as a link utilizing Google Forms. I have reproduced the content of this survey below. For clarifications that do not exist in the actual survey, I have placed brackets ([]) around that information. If a question contains “Other,” it allowed the participant to fill in an answer(s).

PARTICIPATION

You are being invited to participate in a research study titled “The New Right Stuff: Social Imaginaries of Outer Space in Late Capitalism and the Primitive Accumulation of the Cosmos.” [this was the preliminary title of my study] This study is being done by Taylor R. Genovese from Northern Arizona University.

The purpose of this research study is to understand the way that people think about outer space and see if those thoughts change over time, especially now that outer space exploration is shifting from a national project to one that is privatized by corporations. If you agree

to take part in this study, you will be asked to complete an online survey. This survey will ask about your thoughts on outer space and science fiction and it will take you approximately 15 minutes to complete.

BENEFITS

You will receive no direct benefits from participating in this research study. However, your responses may help my research, which hopes to learn more about how human beings are thinking about the changing landscape of outer space and human futures within in.

RISKS

We believe there are no known risks associated with this research study;

however, as with any online related activity the risk of a breach of confidentiality is always possible. To the best of our ability your answers in this study will remain confidential.

CONFIDENTIALITY

Your survey answers will be sent to Google Documents where data will be stored in a password protected electronic format. Google does not collect identifying information such as your name, email address, or IP address. Therefore, your responses will remain anonymous. No one will be able to identify you or your answer, and no one will know whether or not you participated in the study.

During the analysis phase of this research, all of the data collected will be transferred to an Excel spreadsheet and securely stored on an encrypted flash drive which will be locked in a filing cabinet when not in use. After analysis of

these data (in May 2017) the Google Forms information—as well as the thumb drive spreadsheet—will be securely deleted.

At the end of the survey, you will be asked if you are interested in participating in an additional interview by phone, Skype or email. If you choose to provide contact information such as your phone number or email address, your survey responses may no longer be anonymous to the researcher. However, no names or identifying information will be included in any publications or presentations based on these data, and your responses to this survey will remain confidential.

Your participation in this study is completely voluntary and you can withdraw at any time. You are free to skip any question that you choose. If you choose not to participate it will not affect your relationship with Northern Arizona

University or result in any other penalty or loss of benefits to which you are otherwise entitled.

CONTACT

If you have questions about this project or if you have a research-related problem, you may contact the researcher or his faculty advisor.

Principal Investigator:

Taylor R. Genovese

MA Candidate

Department of Anthropology

Northern Arizona University

(518) 347-7223

trgenovese@nau.edu

Faculty Advisor:

Dr. Miguel Vasquez

Professor

Department of Anthropology

Northern Arizona University

(928) 523-9506

Michael.Vasquez@nau.edu

If you have any questions concerning your rights as a research subject, you may contact the Northern Arizona University IRB Office at irb@nau.edu or (928) 523-9551.

ELECTRONIC CONSENT

Please select your choice below.
you may print a copy of this consent form for your records. Clicking the "Agree" button indicates that:

— You have read the above information

— You voluntarily agree to participate

— You are 18 years of age or older

☐ AGREE ☐ DISAGREE [if

‘disagree’ was chosen, this exited the survey]

DEMOGRAPHICS

What is your age range?

☐ 18-24 years old

☐ 25-34 years old

☐ 35-44 years old

☐ 45-54 years old

☐ 55-64 years old

°65-74 years old

°Over 75 years old

°Prefer not to answer

How do you define your ethnicity?

°White

°Hispanic or Latinx

°Black or African American

°Native American, Indigenous or First Peoples

°Asian / Pacific Islander

°Prefer not to answer

Where are you located?

°North America

°Central America

°South America

°Western Europe

°Eastern Europe

°Middle East

°North Africa

°Sub-Saharan Africa

°Asia

°Pacific Islands

°Australia

°Prefer not to answer

°Other

What is your religious or spiritual outlook?

°Baha'i

°Buddhism

°Christianity

°Confucianism

°Hinduism

°Islam

°Jainism

°Judaism

°Shinto

°Sikhism

°Taoism

°Zoroastrianism

°Spiritual but not religious

°Prefer not to answer

°Other

How often do you attend religious services?

°More than once a week

°Once a week

°Once or twice a month

°Once or twice a year

°Never

°Prefer not to answer

Where would you place yourself on the political spectrum?

Far-Left 1 2 3 4 5 Far-Right

What is your political affiliation?

°Democrat

°Republican

°Independent

°Green Party

°Libertarian Party

°None

°Prefer not to answer

°Other

What economic system do you agree with most?

°Barter

°Capitalism

°Communism

°Gift

°Mixed (a blending of market and planned economies)

°Socialism

°Prefer not to answer

°Other

SCIENCE FICTION AFFINITY

Do you enjoy reading or watching science fiction (sci-fi) books, films or television shows? Or have you ever enjoyed them?

°Yes [continued to following questions]

°No [skipped to **Attitudes About Outer Space Exploration**]

°Prefer not to answer [skipped to

Attitudes About Outer Space Exploration]

Do you consider yourself a fan of sci-fi?

°Yes

°No

°Prefer not to answer

What sci-fi books/films/TV shows do you enjoy reading or watching? Check all that apply.

☐ 2001: A Space Odyssey

☐ Battlefield Earth

☐ Battlestar Galactica

- ☐ Contact
- ☐ Dune
- ☐ The Hitchhiker's Guide to the Galaxy
- ☐ The Hunger Games
- ☐ Jurassic Park
- ☐ K-PAX
- ☐ The Martian
- ☐ Nineteen Eighty-Four
- ☐ Solaris
- ☐ Starship Troopers
- ☐ Star Trek
- ☐ Star Wars
- ☐ Prefer not to answer
- ☐ Other

Please list any particular sci-fi authors or screenwriters that you enjoy the work of.

In a few sentences to a paragraph, why do you enjoy sci-fi books, films or television shows?

ATTITUDES ABOUT OUTER SPACE

EXPLORATION

Do you believe the exploration of outer space is a worthwhile endeavor for human beings?

°Yes

°No

°Prefer not to answer

Do you believe that private space corporations (such as SpaceX, Blue Origin, Virgin Galactic) are better at space exploration than governmental organizations (such as NASA, ESA, JAXA)?

°Yes

°No

°Prefer not to answer

Do you believe that private space corporations should be allowed to keep and sell materials they mine from space (such as asteroids, comets and planetary minerals/metals) or should they belong to all humans?

°The corporations should be able to keep and sell the materials that they mine

°The materials mined in space belong to all humans and should be used to benefit all

°Prefer not to answer

°Other

In your opinion, who has the right to gain access to outer space?

°Every human being

°Only those who can afford to pay for access

°Humans are not meant to live off of the Earth's surface

°Prefer not to answer

°Other

Do you believe that future human beings who are permanently living in space or other planets should be governed by those on Earth?

°Yes

°No

°Prefer not to answer

°Other

Which philosophy would be best for the survival of humans off of the Earth's surface?

°Cooperation

°Competition

°Prefer not to answer

How would you define a person who has been born and raised somewhere other than Earth?

°Human

°Alien

°Earthling

°Prefer not to answer

°Other

THANK YOU!

Thank you for your interest in and/or participation in this survey. Are you interested in participating in an additional interview by phone, Skype or email? If so, please enter your preferred contact information below. Please do not include

any other personal information in order to maintain confidentiality.

If you do not wish to participate further, please submit this survey. Thank you again.

Would you like to participate further? If so, please enter your preferred method of contact below.