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21 April 2016

On the Ecological Implications of Space Exploration and Colonization Narratives

Although the primary goal of space exploration and colonization is to put great distances between human astronauts and the earth, the processes have terrestrial origins and implications. Popular culture often portrays space exploration and colonization as means for humanity to escape terrestrial environmental crises by transcending nature, but the history and future of space travel technology is enmeshed in humanity's relationship with the natural world. Reading and viewing fictional space colonization narratives through the lens of environmental criticism can make these connections more apparent, and considering that these narratives are often intended to inspire interest in real-world space exploration, it is important to ensure that they are promoting space exploration for appropriate reasons. This essay will explore these connections by examining the ecological, military, and colonial implications of the 2014 film *Interstellar* and *The Martian* (both Andy Weir's 2011 novel and Ridley Scott's 2015 film adaptation). Both narratives focus on space travel, resource scarcity, and colonization, but they approach each topic from a vastly different perspective.

Christopher Nolan's 2014 film *Interstellar* is one of the most recent examples of a fictional space colonization narrative that advocates a space program as an alternative to, rather than a supplement to, terrestrial environmental programs in response to anthropogenic environmental crises. The film tells the story of a secret NASA mission to discover a new planet suitable for human colonization after earth's crops are destroyed by a disease known only as The Blight, which feeds on atmospheric nitrogen. NASA and the space program have been shut down

due to their impracticality and perceived irrelevance to the food shortage. The film follows an ex-NASA pilot named Cooper who, when the extinction of the human race becomes a real possibility, is recruited by the remnants of NASA to lead a secret search for a new human home world in another galaxy.

The unspecified origin of *Interstellar*'s Blight suggests that the apocalyptic scenario would have arisen naturally with or without anthropogenic climate change. However, its activities (destruction of vegetation and alteration of atmospheric composition) and imagery strongly echo contemporary anthropogenic environmental destruction. Specifically, the film utilizes footage and interviews from the Dust Bowl of the 1930s to visualize and contextualize the fictional dust storms caused by The Blight, and in doing so invites attention to the fact that the Dust Bowl was caused by human agricultural activities. This is not to say the film makes this connection explicitly clear; in fact, it avoids it. In one of the Dust Bowl interviews, which the film presents instead as an interview with a person who survived the film's fictional food shortage, a woman says "you didn't expect this dirt that was giving you this food to turn on you like that and destroy you," (*Interstellar*). By turning the dirt into the agent of destruction in this scenario, this quotation reverses the common narrative trope of humanity destroying its own planet. Instead, *Interstellar* utilizes this quotation to construct a narrative in which earth actively rejects its resident human population, which not only personifies but also villainizes the natural world. This implication is reinforced in a later scene when Cooper, contemplating mankind's conflict with nature, skeptically asks his co-astronaut, "You don't think nature can be evil?" (*Interstellar*). However, by comparing it with the Dust Bowl, the film cannot fully avoid associating its fictional catastrophe with anthropogenic environmental destruction.

The actual Dust Bowl, which inspired the crisis of food and dust depicted in *Interstellar* on a visual level at the very least, was a direct result of human mismanagement of the environment. In his book *Dust Bowl: The Southern Plains in the 1930s*, Donald Worster describes the Dust Bowl as "the inevitable outcome of a culture that deliberately, self-consciously, set itself [the] task of dominating and exploiting the land for all it was worth," (Worster 4). Worster argues that the Dust Bowl resulted from a combination of drought and mechanized over-farming of land which itself was caused by the increased "expansionary energy" and "resource hunger" of the capitalist society of the United States (Worster 6-7). Therefore, if the agricultural disaster depicted in *Interstellar* is not necessarily narratively anthropogenic, it is still symbolically anthropogenic by way of association with the Dust Bowl phenomenon. The film's overarching theme of the necessity for mankind to expand to new worlds even mirrors the very same resource-hungry mentality that Worster argues caused the Dust Bowl. It explicitly states importance of expansion over conservation when, prior to his departure from Earth, Cooper says to his father in law, "You know, it's like we've forgotten who we are, Donald. Explorers, pioneers, not caretakers," (*Interstellar*). Assuming that, intentionally or not, The Blight is connected to anthropogenic environmental crisis, humanity as depicted in the film is stuck in an implicit negative feedback loop in which their drive to conquer nature also renders them vulnerable to it.

Cooper's comments about the inferiority of terrestrial "caretaking" to space exploration strongly echoes Ben Bova's distinction between "Luddites" and "Prometheans" in his novel *The High Road*. According to Bova, people with any opinion on human space exploration can be divided into these two camps. He describes the Luddites as technology-fearing people who, although they fight "carcinogenic additives in our food, unsafe factories, unsafe cars, and

unhealthful environments," also "pull the plug on the future," (Bova 42). The Prometheans "fear neither technology nor the future. Instead, they rush forward and try to build tomorrow," (Bova 44). They are so named because they equate contemporary technology, such as space travel, to fire in the Prometheus myth. The delivery of fire to humanity allowed human civilization to exist, but was also perceived by the gods as a great insult, for which Prometheus was punished. The comparison is meant to suggest that despite the initial discomforts of new technologies, such as ethical or ecological discomforts, the technologies are usually beneficial to humanity in the long run. *Interstellar*'s Cooper closely resembles not only one of Bova's Prometheans, but also Prometheus himself. He makes a literal ascent into the realm of celestial bodies (space) and ultimately discovers fire in the heart of a black hole in the form of gravitational data that enables the earthbound human population to travel to a new home world. Also like Prometheus, in return for saving humanity he suffers punishment in the form of extended life, since the time dilation effect of the black hole's incredible mass causes him to outlive his own children. By turning Cooper into a martyr-savior, the film simultaneously villainizes the so-called Luddites who tried to shut down the space program in order to focus on agriculture. The problem with this narrative, other than the fact that it pushes the space program via the emotional weight of Cooper's journey rather than a rational argument, is that in its binarism, it leaves no room for cooperation between advances in agriculture and aeronautics. It instead suggests that humanity's only hope for surviving environmental crises is ultimately to leave nature behind completely.

Interstellar attempts to present a scenario where terrestrial and extraterrestrial scientific ventures are mutually exclusive. At one point, Cooper says "We used to look up at the sky and wonder at our place in the stars. Now we just look down, and worry about our place in the dirt," (*Interstellar*) implying that one cannot do both simultaneously. One of the film's promotional

movie posters even depicts Cooper and his daughter pointedly turning their attention away from the barren soil at their feet, up towards a starry sky. By presenting space travel as a mere means to escape a troubled earth without looking back, the film ignores the fact that space exploration technology has its roots in 20th century attempts to visualize the earth from space during the Space Race. According to Elizabeth Deloughrey in her essay "Satellite Planetarity and the Ends of the Earth", "the *Apollo* images of the earth, *Earthrise* in 1968 and *The Blue Marble* in 1972, have catalyzed a new understanding of the fragility of the planet and the sense of a globally connected environment," (Deloughrey 262). Not only did the early days of the space program produce global images of earth that suggested its vulnerability, it also launched flights responsible for detecting some of the first large-scale anthropogenic changes to the planet. The *Explorer* satellites launched by the United States during operation ARGUS in 1958, in the process of "tracking upper-atmosphere radiation levels from nuclear detonations," revealed "irradiation of the earth's atmosphere" and created "consciousness of the atmosphere itself," (Deloughrey 272-273). Historically, the space program has given humanity plenty of reasons to worry about their "place in the dirt," and has even been vital in recognizing them. The suggestion that space travel is simply a means to abandon a fragile planet ignores the role that space travel has played, and still plays, in bringing the dangers of global climate change to the forefront of the public consciousness.

It is worth considering the possibility that *Interstellar* is not ignorant of the connection between the space program and the visualization of earth's fragility, but is rather stating that the connection will eventually no longer be relevant. There is an early scene in which Cooper, in order to calm down his nervous colleague Romilly during their journey away from earth, hands him an mp3 player full of recordings of cricket songs. In a close up, Romilly looks towards the

left edge of the frame while listening to the sounds. In the language of American cinema, left-to-right movement is in the direction of progress, while right-to-left movement is in the direction of regression. Therefore, by staring towards the left side of the frame while listening to the crickets, the audience is meant to understand that these cricket noises are calming his nerves by means of their connection to the earth he is leaving behind. Paradoxically, this aural connection between Romilly and earth ecology bears the implication that earth's environment is now aesthetically obsolete to humanity. Romilly appears to be content with the reduction of a familiar element of his former environment (the sounds of crickets) to a digital file, and the digitized sound of crickets appears to be a suitable replacement for the crickets themselves. In short, *Interstellar* implies that technology is capable of replacing nature.

The recent novel *The Martian* by Andy Weir, and its eponymous film adaptation directed by Sir Ridley Scott, disagree with this notion, and in doing so reveals some of the ways space programs carry beneficial implications for earthly ecological problems. The story follows NASA astronaut, botanist, and engineer Mark Watney, who accidentally becomes stranded on Mars when the rest of his team aborts their research mission due to a dust storm. Due to a projected food shortage, Watney plants potatoes from his food stores in a bed of Martian soil (mixed with his own bacteria-rich waste) inside his habitat. He then converts hydrazine (a commonly used but highly toxic jet fuel) into nitrogen and hydrogen, burning the hydrogen in the presence of oxygen in order to make water, which he uses to water his potato plants. The habitat is also equipped with a fictional device called the "oxygenator" which is capable of converting carbon dioxide into oxygen.

Watney's potatoes exist in sharp contrast to Romilly's crickets in that the potatoes are living plants which (in addition to their agricultural function) perform the same aesthetic

function of making a harsh extraterrestrial environment more comfortably earthlike. *The Martian,* then, places more emphasis on role of actual earthlike ecosystems in the human experience. In addition, the oxygenator and Watney's use of plants to ensure his survival are both small-scale elements of a Controlled Ecology Life Support System, or CELSS. In his book *Bound for the Stars,* Saul J. Adelman defines a CELSS as "a long-range program to develop a biologically assisted life support system to support more people for a longer time than purely physicochemical life support systems such as that of the Space Shuttle's," (Adelman 49). A full scale CELSS would incorporate small livestock, aquaponics, composting, dehumidifiers, algae-mediated oxygen production, et cetera. The overall goal of a CELSS is to construct a balanced micro-ecosystem based on earth ecology in order to sustain astronauts. This added focus on intense human-ecosystem interactions in space could bring new perspectives to human-ecosystem problems on earth. Furthermore, a CELSS could serve as a small-scale testing space for both terrestrial sustainability programs and artificial ecosystems that could see large-scale implementation during the process of terraforming a planet for colonization.

In Sir Ridley Scott's film adaptation of *The* Martian, there is a wide angle shot of Watney standing in the middle of his crop of green potato plant sprouts, which are emerging from red Martian soil and growing up towards a bright white upper-frame. Through its composition and mise en scène, the shot becomes a visual symbol for the importance of mutualistic interspecies interactions in a sustainable future. The use of complementary colors (green potato sprouts within red soil) creates a distinct and aesthetically pleasing shot that also hints at the mutualistic species relationships at work between the plants, the bacteria in the soil, and Watney himself in order to create a sustainable Martian micro-ecosystem. The choice to devote the entire upper half of the frame to bright white highlights suggests that this sort of close environmental management

is part of a path towards a "bright future." Where *Interstellar* depicts a failing earth agriculture as a symbol for conflict between humanity and the earth, *The Martian* depicts agriculture as a means for humanity to utilize a balanced relationship with nature as a means to sustain a human population (even if the population in this particular narrative is one person). Watney's use of a CELSS to sustain himself also represents a promising marriage between technology and natural science that *Interstellar*'s Promethean-Luddite binarism never even considers. Watney himself, being both an engineer and a botanist, is a symbol of this interdisciplinary cross-pollination.

When reading or viewing narratives of space exploration or space colonization, it is also crucial to note that the Space Race itself has its roots in US and USSR military missile testing during the Cold War. The missiles that comprised these tests, on both sides, were based on the V-2 rocket, which was built by German engineers for use in World War II and later used by the US to take the first photographic image of earth from space (Deloughrey 262). Sending satellites like *Sputnik* into earth orbit sent a message that the same rocket, armed with a nuclear warhead, could easily traverse the distance between Eastern Europe and Washington, D.C.. Deloughrey also argues that "[w]hile the *Apollo* space mission photographs were certainly influential, they were part of a context in which *National Geographic* and other US magazines used wartime cartography in ways that naturalized militarism and empire under the guise of a unifying view of the globe," (Deloughrey 7). Therefore, the very same programs that made public the "the fragility of the planet" also made it more vulnerable to environmentally destructive military acts such as nuclear testing and, potentially, nuclear war.

Cormac McCarthy's novel *The Road* is not a space exploration or colonization narrative, but by echoing the lost potential for space travel in its post-apocalyptic earth, it draws particular attention to this paradox. The novel follows a man and his son traveling the wasteland of the US

after an apocalyptic event. Although the nature of the apocalyptic event is, like the nature of *Interstellar's* Blight, unspecified, an early scene involving the man filling his bathtub with water (presumably in order to secure a non-irradiated water supply) suggests that the event is nuclear in nature. Later in the book, the son asks his father "If we had a spaceship could we go there [to Mars]?" to which the father responds, "Well. If you had a really good spaceship and you had people to help you I suppose you could go . . . There's nothing there." (McCarthy 167). This response draws particular attention to the lack of both spaceships and people in this landscape, rendering the task impossible and, even if it were possible, unhelpful. In this narrative, McCarthy implies that the same missile programs that once put Mars within reach have now turned the idea of reaching the red planet into a sort of fairy tale. Another way of interpreting the scene is that it is a visualization of the end result of the mutually assured destruction that pushed the space program into existence into the first place. These interpretations are opposite sides of a single coin, as the history of the space program is intertwined with the paranoia-driven arms race of the Cold War.

Interstellar, like *The Road*, is a post-apocalyptic narrative with references to space exploration, but it fails to address the environmentally destructive implications of space exploration's military history. In fact, at times the film implies that NASA's military history still plays a significant role in space exploration. Specifically, all of the robots in the expedition are stated to be military designs. Early on in the film, Cooper even refers to the first one he encounters, named TARS, as a "marine." This line of dialogue suggests that at one point these robots were primarily designed for combat. However, these ex-military designs play crucial roles in the expedition at multiple points. One of them, named CASE, rescues an astronaut from an oncoming wave on an aquatic planet. TARS also proves essential by relaying gravitational data

back to NASA that allows a large "population ship" to make its way toward the new colony with the entire human race on board. *Interstellar* openly acknowledges the military nature of these beneficial robots, and it is unclear whether the protagonists' mission could have been completed without their military traits. The use of ex-military robots in the successful completion of Cooper's mission is a clear parallel to the use of military rocket designs in successful US and USSR space programs. It would be impossible to completely avoid military undertones in any space exploration or colonization narrative. As Deloughrey states, "The introduced gaze of a satellite, like an omniscient narrator, suggests that while there may be scales of vision, this viewpoint of the globe cannot be obtained outside the technologies of militarism," (Deloughrey 269-270). However, the choice to reinforce this connection through robotic characters that, from a storytelling standpoint, could have been built for any non-military purpose without significantly affecting the plot, suggests advocacy for further military spending.

When dealing with narratives of space colonization, as with any other colonial narratives, one must consider the political ramifications of said colonization. The Outer Space Treaty of 1967, in conjunction with the Law of the Sea and Antarctic Treaty, resulted in a full territorialization of "the extraterrestrial spaces of the planet . . . in an unprecedented remapping of the planet," (Deloughrey 271). If one thinks of the plots of *Interstellar* and *The Martian* as silent extensions of the Space Race that began in the Cold War, then it is fair to say that the United States "wins" both times. In both versions of *The Martian,* there is a scene in which, after reading an email from the University of Chicago, Watney mentions, "They say once you grow crops somewhere, you have officially 'colonized' it. So technically, I colonized Mars. In your *face* Neill Armstrong!" By this definition of colonization, in a way, America becomes the first country to colonize Mars. In *Interstellar,* America becomes the first country to land an astronaut

on a planet in another galaxy. Interestingly, even though the Martian primarily centers around a single American man, the Chinese government proves invaluable in delivering Watney supplies to keep him alive until an evacuation ship arrives. This plot point reinforces the call for political cooperation in space exploration established by the Space Exploration Treaty, and echoes the cooperation between the United States and the Soviet Union in post-Space Race projects such as the construction of the International Space Station. *The Martian*, therefore, depicts a future that is optimistic about international adherence to the Outer Space Treaty, including its stipulations against the use of extraterrestrial resources for weapons testing. Cooperation under this treaty also functions as a model for political cooperation regarding terrestrial resources and may serve as a way to build mutualistic international relationships.

The political implications of America's actions in *Interstellar*, however, are more unclear. Although this movie refers to space travel as the last hope for all of humanity, humanity is represented throughout the film only by Americans. It is unclear if the populations of any other countries have survived the ecological disaster depicted in the film, but if they have, they do not appear to be present on the large ark-like ship carrying the last of humanity to the new colony in the film's conclusion. In fact, the closing shot of the film depicts an American astronaut looking down and to the right of the frame over a budding colony with an American flag at its center. The fact that the American astronaut looks down on the colony, combined with the left-to-right line of sight suggesting progress, suggests American superiority over the colony that is about to be established. Of course, the American flag signifies this on its own as well. This begs the question of whether the Outer Space Treaty is still relevant if there are no other countries around, which begs the further question of whether the irrelevance of the Outer Space Treaty would lead to unregulated abuse of extraterrestrial resources for environmentally destructive acts such as

weapons testing. While *Interstellar* does not answer any of these questions, the uncertainty surrounding them suggests that going forward, international cooperation may be essential to protecting any extraterrestrial colonies humanity may discover or create through terraforming.

Just as films like *Jurassic Park* resulted in the creation of new generations of paleontologists and geneticists, films and books about space exploration and colonization are invaluable in their ability to inspire interest in aeronautics, engineering, and newer fields of science such as astrobiology and astrogeology. Therefore, the way these narratives portray space travel, its terrestrial origins, and its relationship to terrestrial ecology will be vastly influential to the ways in which future generations of space scientists consider them. In this way, popular films and books such as *Interstellar* and *The Martian* may have a very real impact on the way in which both space exploration and terrestrial environmental programs are conducted in the future.

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