THE EAGLE HAS LANDED: A PRESERVATION ETHIC FOR OFF-PLANET CULTURAL RESOURCES

by

THOMAS COOPER JONES, JR.

(Under the Direction of WAYDE BROWN)

ABSTRACT

The cultural landscape of humanity extends beyond Earth. We have permanent robotic equipment on the Moon and Mars, and we have sent Voyager 1 and 2 on a now over 35-year-long journey towards the edges of our solar system and beyond. In 1961, Yuri Gagarin became the first human in space, and on July 20, 1969, Neil Armstrong became the first human to set foot on another celestial body. Humanity has maintained a presence off-planet for over fifty years. This thesis focuses on the cultural heritage of the exploration of space. An analysis of international treaties that govern the use of space and other areas of the international commons is presented, and a three part ethic for the preservation of this heritage is proposed that includes a legal path, a cultural impetus that encourages preservation, and the cultural landscape model as a method for the evaluation of these cultural resources.

INDEX WORDS: Cultural Landscape, Lunar Preservation, Moon Treaty, NASA, Outer Space Treaty, Recent Past, Space Archaeology, Space History, Space Preservation, Tranquility Base

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THOMAS COOPER JONES, JR.

BLA, University of Georgia, 2000

A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

MASTER OF HISTORIC PRESERVATION

ATHENS, GEORGIA

2013

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THOMAS COOPER JONES, JR.

Major Professor:	Wayde Brown
Committee:	Cari Goetcheus Dan Nadenicek James Sipes

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
May 2013

ACKNOWLEDGEMENTS

I would like to thank my advisor, Wayde Brown, for his guidance and encouragement throughout this process, and my family and friends for all of their support. A special acknowledgement goes to the MHP class of 2012, I could not have picked a better group to experience graduate school with than these friends, and to my buddy Sean Dunlap for sending me the newspaper article that led to the selection of this thesis topic.

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Chapter 1: Introduction

> The greater danger for most of us lies not in setting our aim too high and falling short; but in setting our aim too low, and achieving our mark.
> — Michelangelo Buonarroti (Buonarroti 2013, NP)

The cultural landscape of humanity extends beyond Earth. We have permanent robotic equipment on the Moon and Mars, we have crashed probes into Jupiter's gaseous layers, and we have sent Voyager 1 and 2 on a now over 35-year-long journey towards the edges of our solar system and beyond. In 1961, Soviet cosmonaut Yuri Gagarin became the first human in space when he made a single orbit of the Earth. Twenty-three days later, Alan Shepard became the first American in space with his fifteen minute journey in the Freedom 7 capsule, and on February 20, 1962, John Glenn became the first American to orbit Earth, also in a Friendship 7 capsule. Humanity has established and maintained a presence off-planet for over fifty years. This thesis focuses on the cultural heritage of this exploration of space.

Perhaps no off-planet site captures the human spirit of exploration and curiosity better than Tranquility base, the site on Earth's Moon, where on July 20, 1969, Neil Armstrong became the first human to step onto another celestial body. The footprints left at this site have heritage significance comparable to those at Laetoli in Tanzanai, the first evidence of upright locomotion in an early form of human. This base on the moon is the embodiment of a new stage in human evolution, as well as a site of universal importance and significance, seen in many ways but most visibly in the initial intention of Armstrong and NASA to erect a United Nations flag at this site. (NASA 1993, NP)

Although the decision was changed by Congress just prior to the flight, there is significance in the intention of NASA to represent all of humanity with this Moon landing.

A growing community of researchers is now producing a wide variety of literature on the topic of space and lunar heritage. California and New Mexico have listed the 106 artifacts left at the site of the Apollo 11 landing on their respective state historic registers. (Chang 2012, NP) Dr. Alice Gorman, a lecturer in the Department of Archaeology at Flinders University in Adelaide, South Australia, has authored several journal articles and book chapters on the understanding of space heritage as a cultural landscape, linking terrestrial sites, human-made objects in orbit or on celestial bodies, and human-made objects beyond the solar system such as the Voyager space exploration crafts. Dr. Beth Laura O'Leary, a professor specializing in cultural anthropology and archeology at New Mexico State University, heads the Lunar Legacy Project, an organization dedicated to raising space heritage awareness, and has been instrumental in getting both state register listings for the Apollo 11 artifacts, as well as co-editing the *Handbook of Space Engineering, Archaeology, and Heritage,* a large collection of information related to all aspects of space heritage. Dr. Dirk H. R. Spennemann, an associate professor specializing in cultural heritage management at Charles Sturt University in Albury, Australia, focuses on emerging heritage issues, and has authored many scholarly articles on the ethics of space and lunar heritage preservation. The space heritage field is being led by anthropologists and archeologists to this point, and at least three preservation master's theses on the topic have been completed or are in process.

Question

The term ethic or ethics is defined as "…judgments as to righteousness or wrongness…" in the traditional philosophical sense, and is also seen as a way of "…establishing or recommending certain courses of action, ends, or ways of life as to be taken or pursued…" (Runes 1960, 98) It is this latter version of ethic that applies in the definition of 'an ethic', and in this case a preservation ethic for off-planet resources; a series of actions that taken together create a strategy that moves toward a plausible plan for the identification, evaluation and management of the cultural resources that reside somewhere other than on planet Earth. This thesis considers the creation of that ethic; specifically, what is a preservation ethic for the consideration of off-planet cultural heritage?

Methodology

The research was carried out in several steps. A literature review established the current research in the field, identified the primary researchers and their specific interests in the field, and suggested the challenges that are faced in the study and protection of cultural resources that are not on Earth. In addition, data gathered through questionnaires and conversations with accomplished experts in the preservation and cultural landscape communities was analyzed to establish current awareness of the subject of space heritage, as well as how a new ethic should be approached. Interviewees were asked to address specific issues related to their area of expertise and experience as it relates to the development of this preservation ethic. Next, conceptual frameworks were researched to determine an appropriate method for the identification, evaluation and management of sites that include many types of cultural

resources. National and international laws and treaties related to space and the preservation of space heritage were explored, as well as those which may become precedent setting for this field. Finally, an analysis and synthesis of this information led to the creation of the proposed preservation ethic for off-planet cultural resources.

The process of soliciting input through the interview/questionnaire process revealed the scope of the challenge faced in considering a 'new' type of cultural resource. Seventeen requests for involvement were sent to members of the preservation, cultural landscape, space and space heritage communities. Of those seventeen, two replied with no interest in participating in the study, three agreed to phone conversations, and one responded to the questionnaire. Eleven requests received no response. The primary reason for the low (23.5%) rate of involvement quickly became clear; ranging from preservation to space to international law, as one respondent said, the questionnaire covered too many seemingly disparate areas. This sentiment was either shared or evident in two other responses.

Four responders provided input and guidance for this thesis. Professor W. Brown Morton of the University of Mary Washington, co-author of the original version of The Secretary of the Interior's Standards for the Treatment of Historic Properties and former chairman of US International Council on Monuments and Sites (ICOMOS) committee, gave input in the form of a phone conversation. Ms. Carol D. Shull, the Keeper of the National Register (U.S.), gave comments in a phone conversation as well, as did Ms. Jennifer Groman, the Federal Preservation Officer for NASA, who gave her professional opinion but not necessarily the opinion of NASA. Dr. Eric MacDonald, an associate professor focusing on cultural landscape interpretation and management at the University of Georgia also provided input in response to the questionnaire.

Overview

Humanity is on the cusp of the next great space race—the push by private companies to go into space. Many national and international companies are creating their own space craft and plans to go into space (SpaceX, founded by Elon Musk who co-created PayPal), or sponsoring competitions to encourage others to develop the necessary technology and demonstrate it by going into space (Google's Lunar X Prize), with the intent to offer these transportation services to governments and space agencies and companies, as well as to 'space tourists'. NASA has recently become concerned about the potential loss of or damage to historic sites on the Moon based on these developments, releasing in 2001 *NASA's Recommendations to Space-Faring Entities: How to Protect and Preserve the Historic and Scientific Value of U.S. Government Lunar Artifacts*. The expansion of space travel made possible by commercial organizations, along with the growing body of interest in space cultural heritage, as events such as the Moon landings become the subject of history books more so than personal recollection, together create an interest in the story of humanity's expansion beyond Earth into the solar system.

Chapter two of this thesis provides an overview of the issues of preserving space heritage through the work of active researchers who are shaping the field today, as well as NASA's guidelines for ensuring the protection of sites on the Moon. Many of the challenges that must be addressed in the creation of a preservation ethic for off-planet cultural resources become evident in the studies presented.

Chapters three through six focus on the international legal treaties that guide activities in space, and international treaties and concepts that address other areas of the international 'commons' that will be instrumental in providing insight for the

modification of space law. Chapter three discusses the influence of the Common Heritage of Mankind conceptualization of international common areas, such as the seabed, and how that concept influences international agreement on activities in space and on the Moon.

Chapter four reviews the development of the Antarctica Treaty System that has governed international cooperation in Antarctica since 1959, and the influence of that treaty on the development of the Outer Space Treaty.

Chapter five shows the development of the UN Law of the Sea Convention, and how the use of that international common area has been influenced by Common Heritage of Mankind principles, and in turn has influenced the language of the Moon Treaty.

Chapter six discusses the Outer Space Treaty and Moon Treaty, along with other UN treaties governing activities in space and on celestial bodies, relating the shared evolution of these international space agreements with the Antarctica Treaty System and the Law of the Sea Convention.

Chapter seven focuses on the method of studying historic sites as cultural landscapes, specifically in the conceptualization of landscape characteristics as a tool for the identification, evaluation and management of these resources.

Chapter eight is the synthesis of an ethic for the preservation of off-planet cultural resources. The ethic is formed by three components: a legal avenue for the recognition of these resources, a cultural impetus for the preservation of these resources, and a method for the preservation of these resources.

Chapter nine is a synopsis of the thesis, with some suggestions for future research.

Resource

Off-planet cultural resources exist on the Moon, on other celestial bodies and in orbit around the Earth. Robotic rovers on Mars are currently active and returning data to scientists on Earth. The rover Spirit has covered 4.8 miles on Mars during its now over 2,500 sol (Martian day) trip, while Spirit's companion rover Opportunity has covered 22.14 miles in over 3,240 sols of activity. (NASA 2013, NP) Artifacts in orbit around the Earth bear witness to the human expansion into the solar system. NASA launched the satellite Vanguard 1 into orbit on March 17, 1958, and although the batteries have long since died and communication has been lost with the craft, it remains in orbit today, the longest orbiting satellite in existence. According to NASA's orbital calculations, Vanguard 1 will remain in space for another 240 years before orbital decay finally ends the record-setting trip. (NASA 2012e, NP)

The artifacts that evidence humanity's first venture to any other celestial body are on the Moon. The first human visit to the Moon took place over 21 hours, 36 minutes from July 20 to 21, 1969, including two hours, fifteen minutes of Extra-Vehicular Activity (EVA) by the astronauts outside of the Lunar Module on the surface, during which time they gathered 21.5 kilograms of lunar soil and rock samples. (NASA 2012c, NP) The weight of the samples required the discarding of some equipment before liftoff, beyond that which was intended to remain on the Moon, resulting in a total of 106 items being left at Tranquility Base. The focus of space cultural heritage recognition thus far has been these artifacts, which include a portion of the Lunar Descent Module, the flag, a plaque to commemorate the event, camera and scientific equipment, and the items that were discarded to lighten the payload for the return liftoff, such as food and equipment bags, and the boots worn by Neil Armstrong and Buzz Aldrin on the Moon.

(CA 2009, 3-7) These artifacts are the tangible connection to the first moon landing made by Neil Armstrong and Buzz Aldrin, existing as they were when the astronauts placed them, with the exception of some potential dust that may have settled on them after being disturbed when the Lunar Module lifted off from the site.

The Tranquility Base site is a human-influenced landscape much larger than the ground covered by these artifacts. Armstrong and Aldrin travelled a total of 250 meters on foot around the landing site, (NASA 2012c, NP) leaving a trail of footprints in the lunar soil. Later Apollo missions resulted in much-larger human-influenced areas on the Moon. Apollo 17, the last human visitation to the Moon, took place over 75 hours from December 11 to December 14, 1972, including 22 hours, four minutes on the surface during three separate EVA events. Astronauts Eugene Cernan and Harrison H. Schmitt travelled 30 kilometers in the lunar rover during these EVA's, in addition to the area covered on foot, and gathered 110.5 kilograms of sample material. (NASA 2012d, NP)

The cultural heritage of space exploration exists in these tangible artifacts of human visitation, as well as in the experience of being in space and the profound awakenings that seeing their home planet as a 'blue-dot' brought to the astronauts. The experience led the Bulgarian Aleksandr Aleksandrov, who spent nine days in space on a Soviet Soyuz spacecraft in 1988, (Spacefacts 2013, NP) to a new understanding of humanity:

> We were flying over America and suddenly I saw snow, the first snow we ever saw from orbit. I have never visited America, but I imagined that the arrival of autumn and winter is the same there as in other places, and the process of getting ready for them is the same. And then it struck me that we are all children of our Earth. It does not matter what country you look at. We are all Earth's children. (Meadows 2013, NP)

American astronaut Edgar Mitchell, who walked on the Moon during the Apollo 14 mission, (NASA 2007, NP) described a similar expansion of awareness, and the impact that this experience had for him:

> On the return trip home, gazing through 240,000 miles of space toward the stars and the planet from which I had come, I suddenly experienced the universe as intelligent, loving, harmonious. It occurred when looking at Earth and seeing this blue-and-white planet floating there…seeing that there was a purposefulness of flow, of energy, of time, of space in the cosmos—that it was beyond man's rational ability to understand, that suddenly there was a non-rational way of understanding that had been beyond my previous experience. (Meadows 2013, NP)

An ethic for the preservation of off-planet cultural resources must include a method for addressing this variety of resources and values.

Figure 1.1. Astronaut deploying solar wind experiment (http://www.lpi.usra.edu/resources/apollo/images/print/AS11/40/5872.jpg)

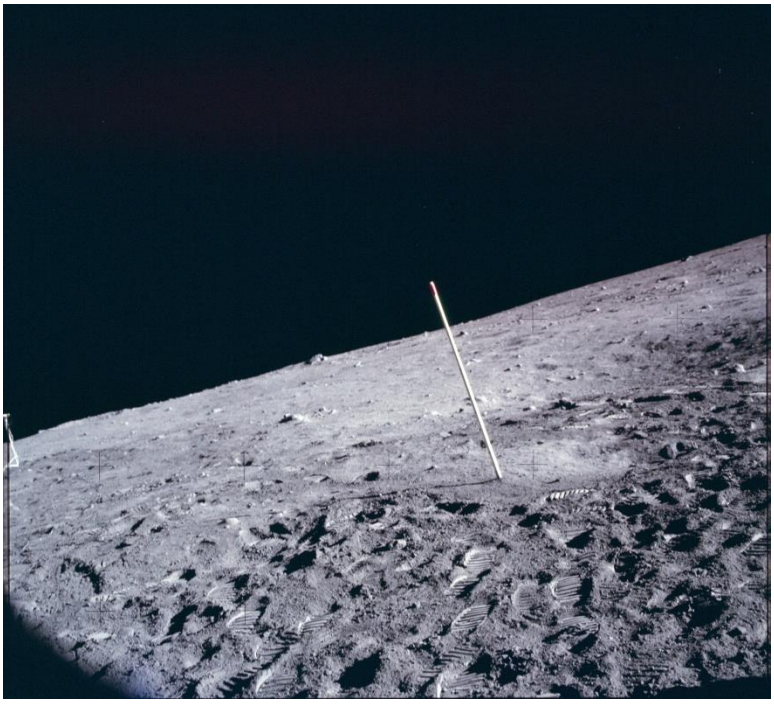

Figure 1.2. Solar wind experiment staff that remains at Tranquility Base (http://www.lpi.usra.edu/resources/apollo/images/print/AS11/40/5968.jpg)

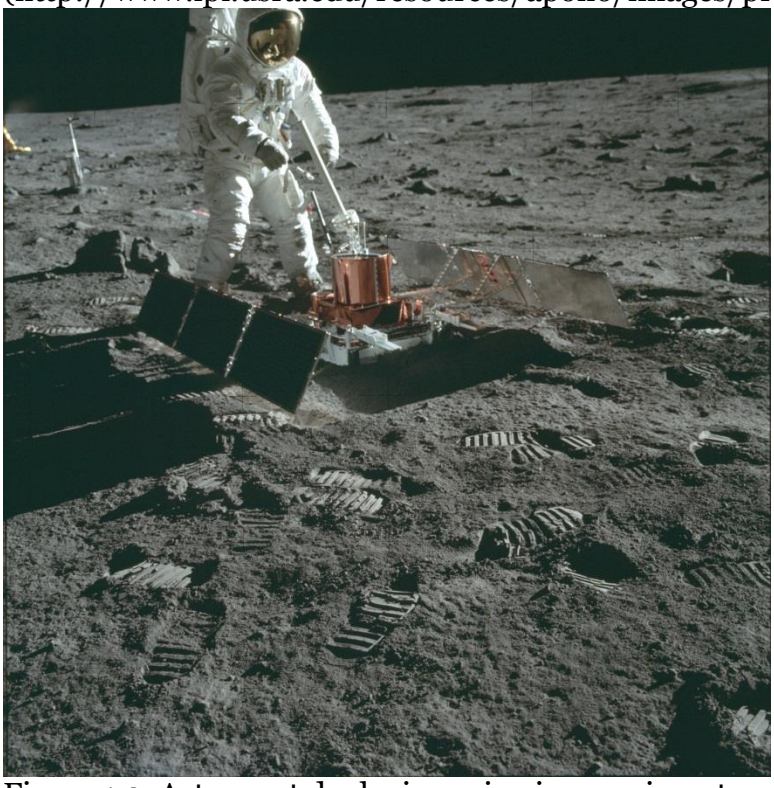

Figure 1.3. Astronaut deploying seismic experiment equipment (http://www.lpi.usra.edu/resources/apollo/images/print/AS11/40/5951.jpg)

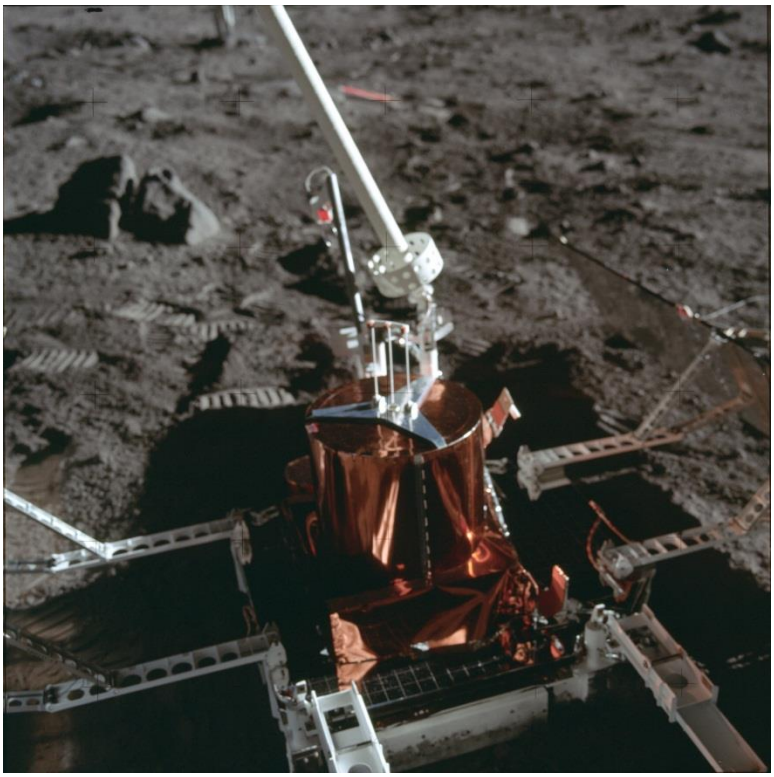

Figure 1.4. Seismic experiment equipment remaining at Tranquility Base (http://www.lpi.usra.edu/resources/apollo/images/print/AS11/40/5953.jpg)

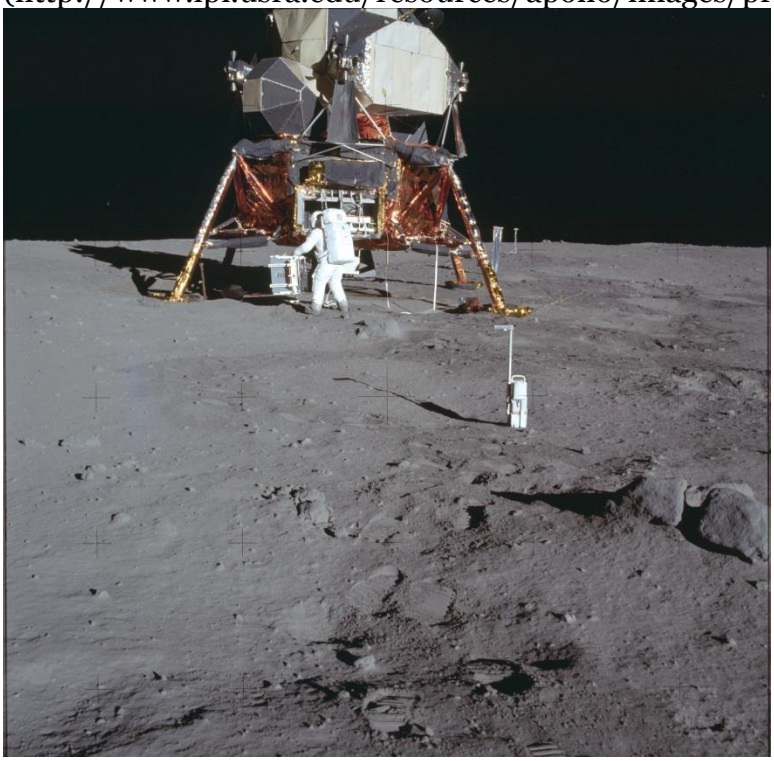

Figure 1.5. Apollo 11 Lunar Module, the bottom portion (descent stage) remains at Tranquility Base (http://www.lpi.usra.edu/resources/apollo/images/print/AS11/40/5931.jpg)

Figure 1.6. The Apollo 11 flag at Tranquility Base remains, although likely blown down upon liftoff (http://www.lpi.usra.edu/resources/apollo/images/print/AS11/37/5544.jpg)

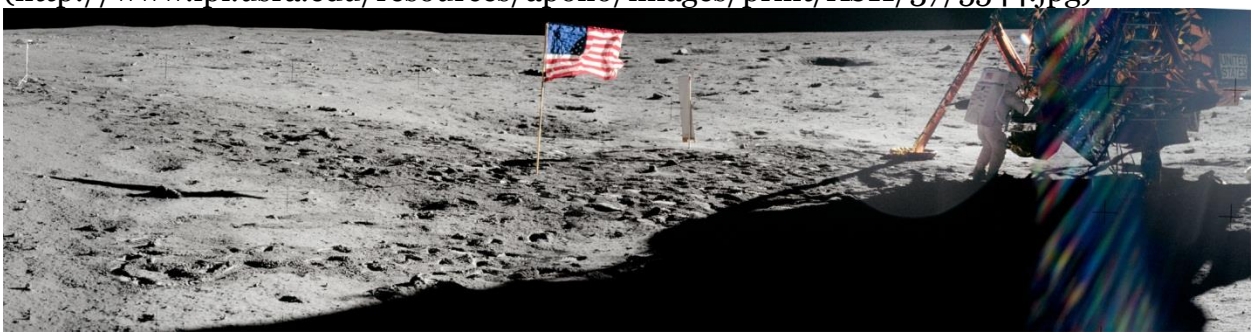

Figure 1.7. Tranquility Base panorama, showing (from left) camera, flag, solar wind experiment, and Lunar Module. The camera stand, flag, a part of the solar wind experiment and the bottom of the Lunar Module remain (http://www.lpi.usra.edu/resources/apollopanoramas/images/print/original/JSC2007e045375.jpg)

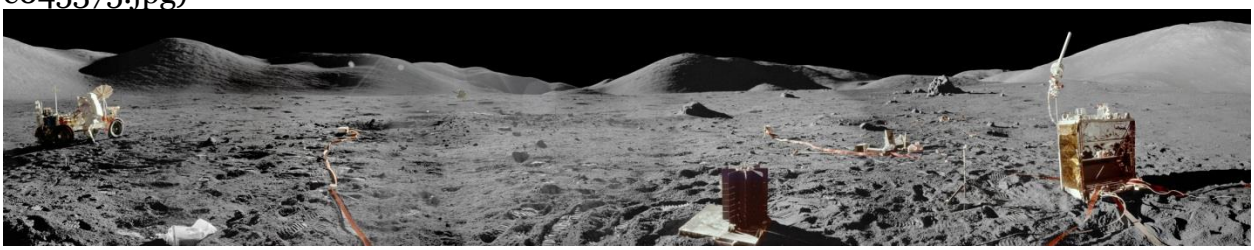

Figure 1.8. Apollo 17 experiment station (http://www.lpi.usra.edu/resources/apollopanoramas/images/print/original/JSC2004e52772.jpg)

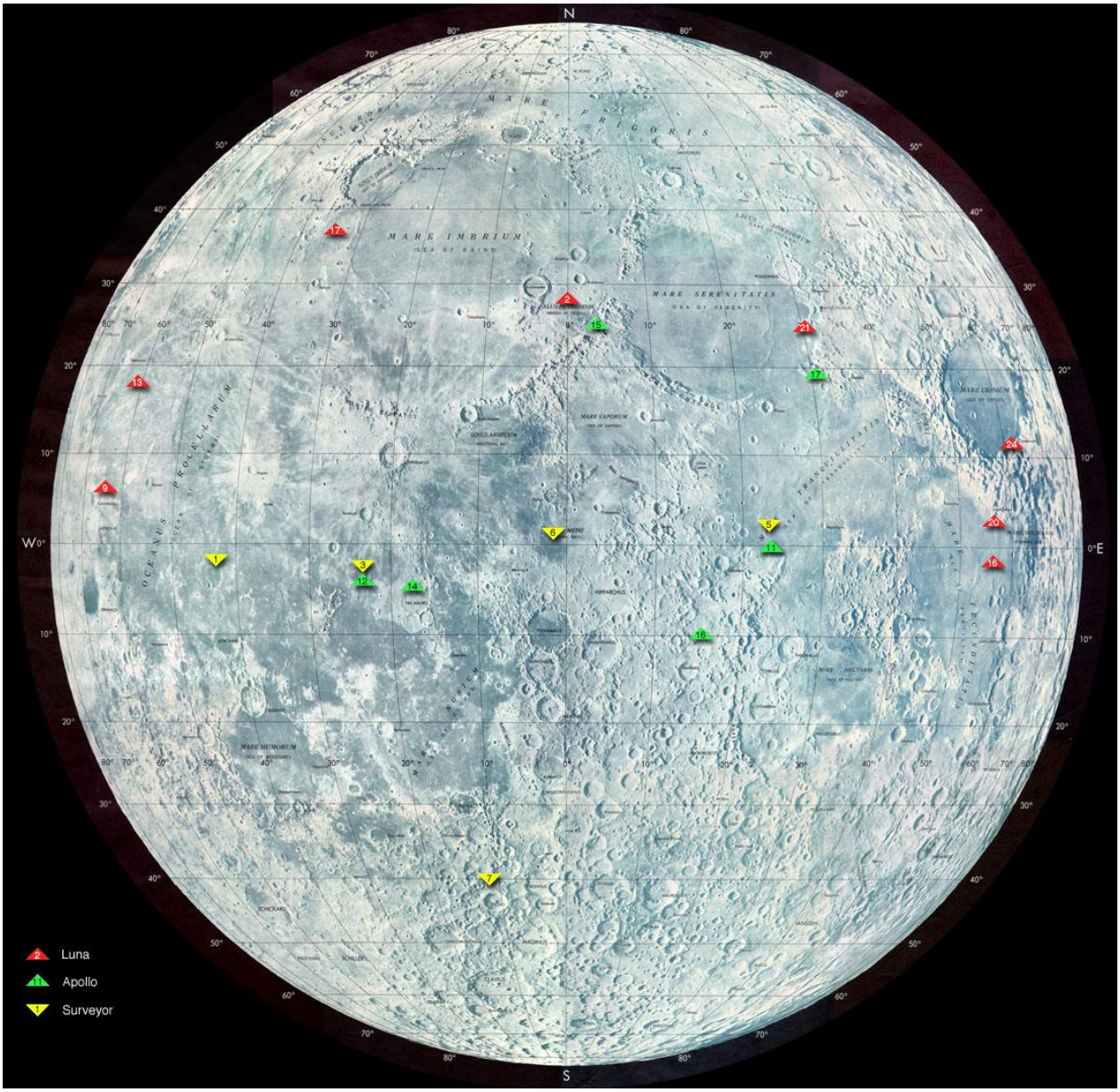

Figure 1.9. Map showing Luna (red), Apollo (green) and Surveyor (yellow) mission landing sites (http://nssdc.gsfc.nasa.gov/planetary/lunar/moon_landing_map.jpg)

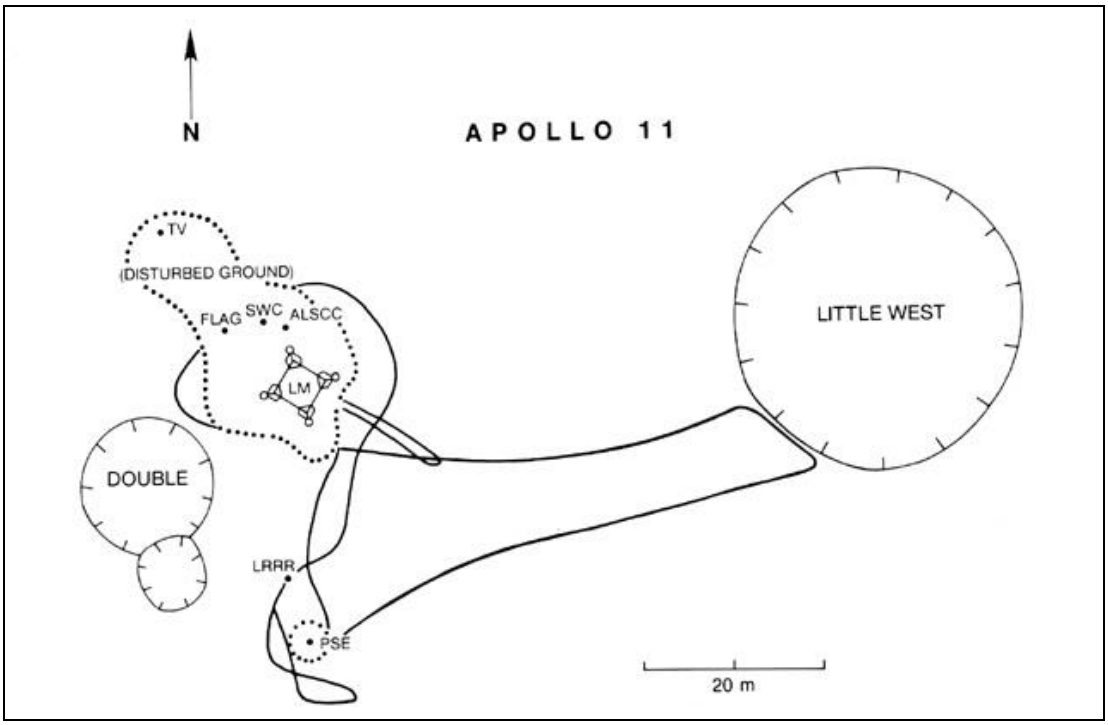

Figure 1.10. Apollo 11 site map showing extent of human-influenced landscape (http://www.lpi.usra.edu/publications/slidesets/apollolanding/ApolloLanding/slide_07.html)

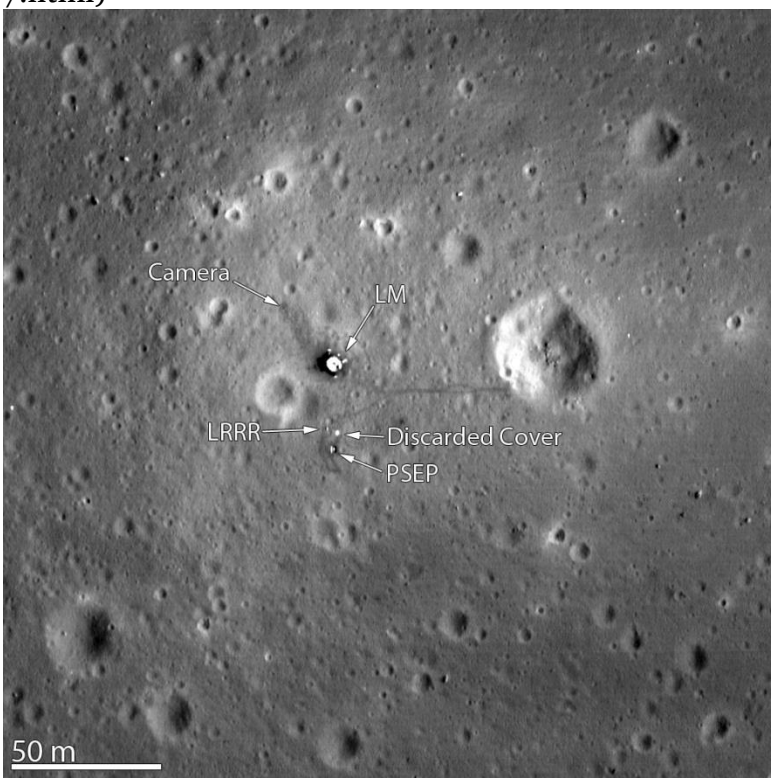

Figure 1.11. Apollo 11 landing site aerial photograph taken by NASA's Lunar Reconnaissance Orbiter sometime between July 11-15, 2009, showing larger artifacts and footpaths (http://www.nasa.gov/images/content/628459main_Apollo_11.jpg)

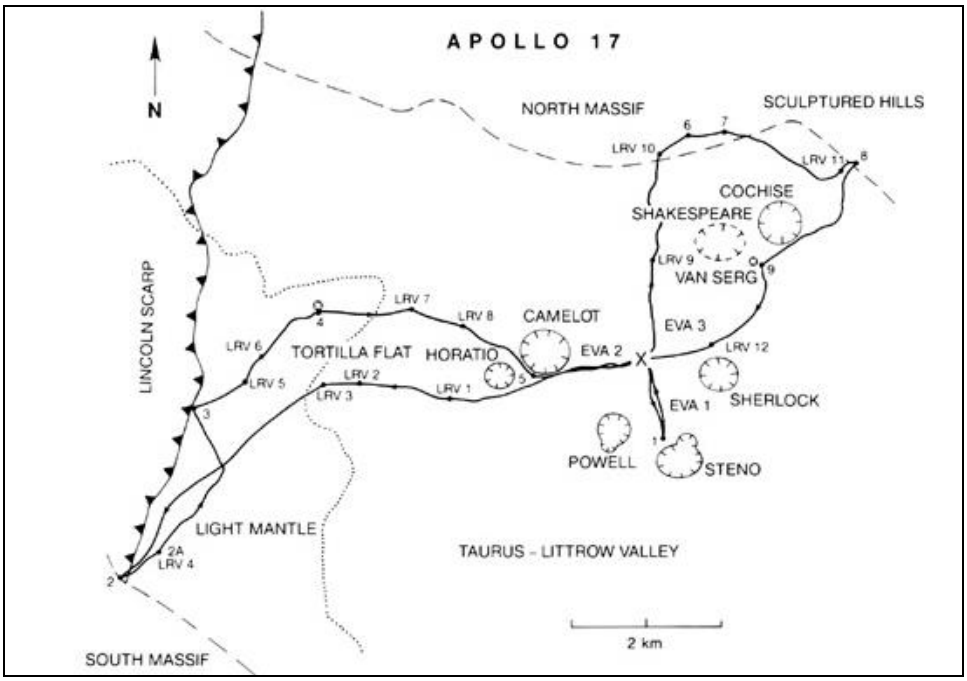

Figure 1.12. Apollo 17 site map showing extent of human-influenced landscape (http://www.lpi.usra.edu/publications/slidesets/apollolanding/ApolloLanding/slide_37.html)

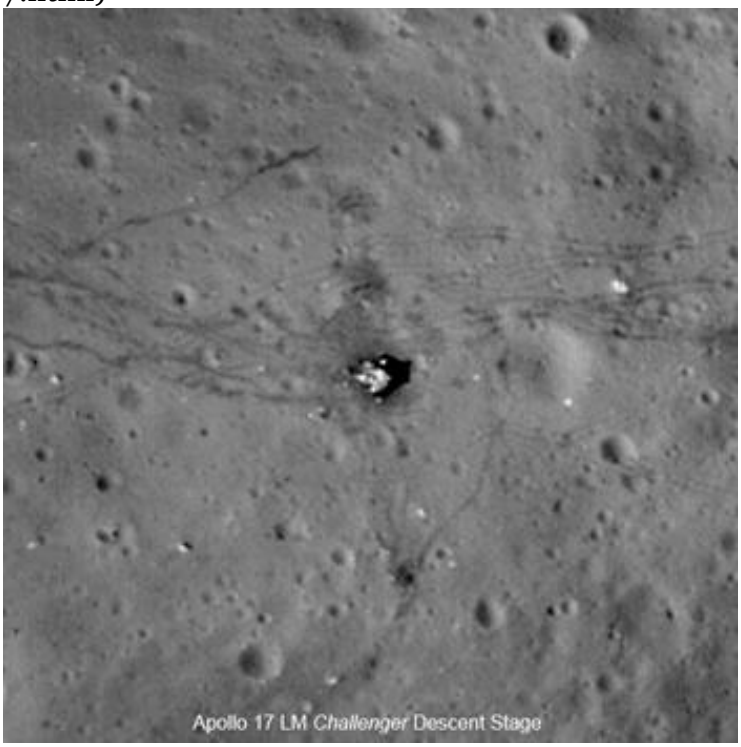

Figure 1.13. Apollo 17 landing site aerial photograph taken by NASA's Lunar Reconnaissance Orbiter sometime between July 11-15, 2009, showing larger artifacts, footpaths and lunar rover paths (http://www.nasa.gov/mission_pages/LRO/multimedia/lroimages/lroc-20110906-skimming.html)

Figure 1.14. Earth rise as seen from Moon orbit
(http://www.lpi.usra.edu/resources/apollo/images/print/AS11/44/6549.jpg)

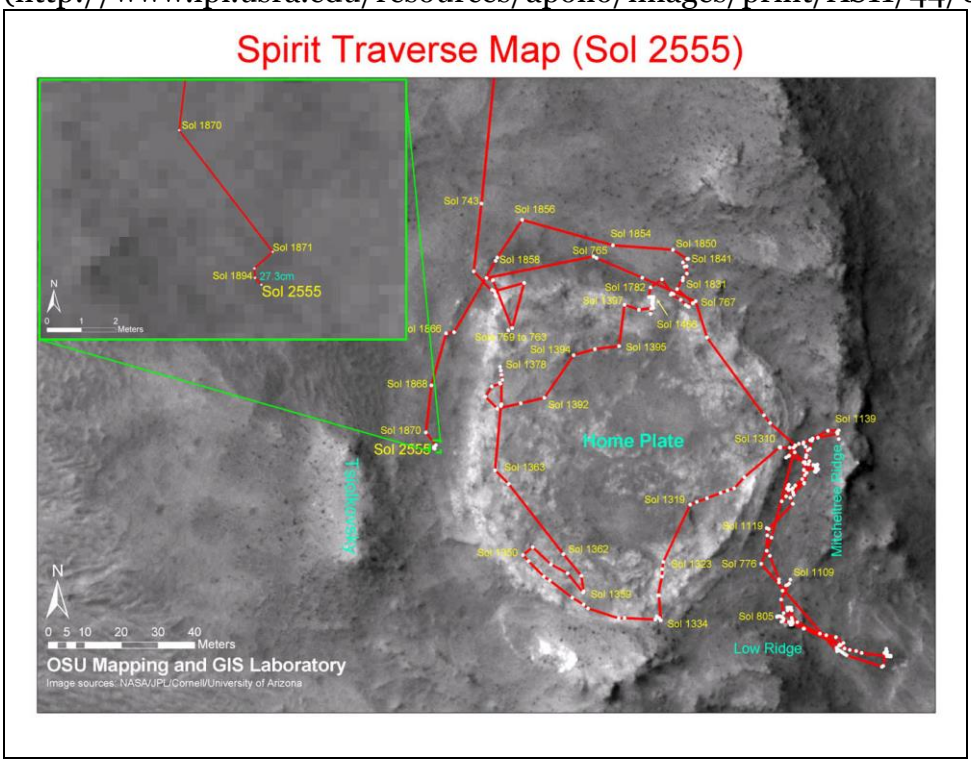

Figure 1.15. Traverse of Mars Rover 'Spirit', showing the 4.8 mile route
(http://marsrover.nasa.gov/mission/tm-spirit/images/MERA_Sol2555_1.jpg)

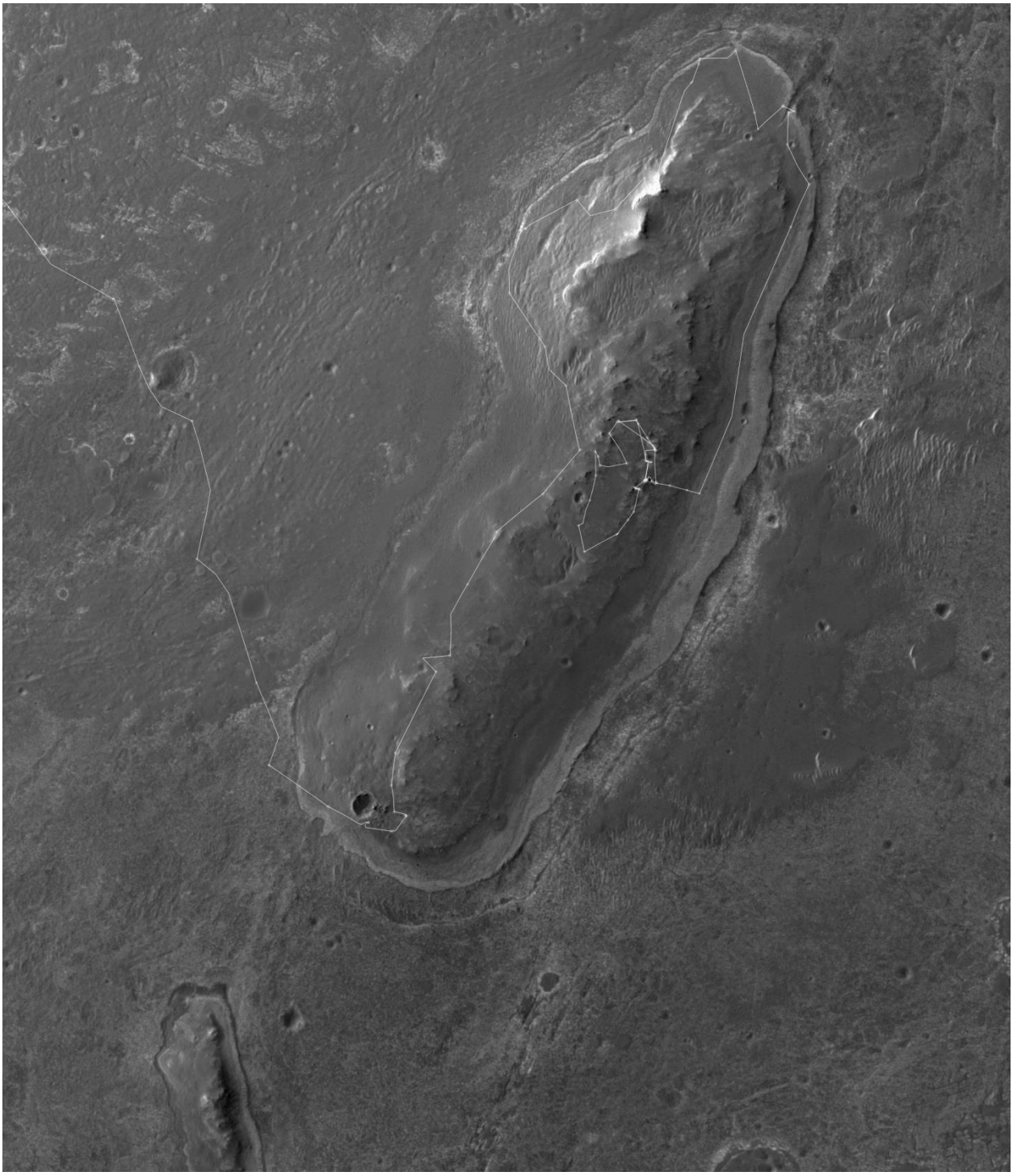

Figure 1.16. Traverse of Mars Rover ‘Opportunity’, showing the 22.14 mile route (http://marsrover.nasa.gov/mission/tm-opportunity/images/MERB_Sol3246_1.jpg)

Chapter 2: Background and Literature Review

> Space exploration is still a living system. If space sites are unclaimed and not treatable under current agreements we must find new ways to address preservation on an international scale. (O'Leary 2006, NP).

There is growing interest at the national and international level in the burgeoning space heritage movement, as evidenced by the volume of information available not only in scholarly journals, but in the popular press as well. As with Historic Preservation itself, this is a cause that people feel strongly compelled to support through personal and professional efforts. This chapter introduces some of the people and organizations that are important to the development of thought in the movement, some of the relevant books and papers that establish the current state of the movement and a brief summation of human space travel thus far.

Humanity has long held a fascination with the night sky. The influence of the stars and planets can be seen in ancient rock art and in the alignment of structures in the landscape, and as time passed in writing and stories. Space became a part of the human cultural landscape on October 4, 1957, when the Soviet Union launched the first satellite, Sputnik, into orbit, followed by the launch of Explorer 1 by the United States on January 31, 1958. These events took place during the International Geophysical Year (1957-8), an unprecedented time of global cooperation in science that not only helped usher in the space era, but also created an atmosphere of collaboration that led to the first agreements on the management of Antarctica as an international science preserve.

Since these first launches of the smallest Earth orbiters, space travels and exploration have grown to include sending vehicles beyond the edge of the solar system to the creation and operation of a permanently crewed space station, and more recently the beginning of a new era, of commercial space flight, with the founding of SpaceX by Elon Musk and Virgin Galactic by Richard Branson. We are witnessing the beginning of a new age of human history, comparable to the taming of fire and the creation of language according to Dr. Dirk Spennemann, an anthropologist who focuses on emerging heritage issues. (Spennemann 2004, 283) This new age presents new opportunities for cultural heritage management that are being explored by a growing body of researchers and practitioners worldwide.

The document entitled Recommendations to Space-Faring Entities: How to Protect and Preserve the Historic and Scientific Value of U.S. Government Lunar Artifacts, released by the National Aeronautics and Space Administration (NASA) on July 20, 2011, the forty-second anniversary of the first Moon landing, represents a move toward space heritage preservation by a nation state. The document is specifically released as a series of recommendations, but the existence of these ideas is a significant step toward a more formal discussion of the protection of space material culture, at least in the U.S., and presumably internationally. (NASA 2011, 1-97)

This NASA document is essentially a description of clear zones around different types of artifacts on the Moon, specifically artifacts from the Apollo program, and with most restrictions for those from the first human visitation, Apollo 11, and the last human visitation by the crew of Apollo 17 on December 14, 1972. (NASA 2012a, NP) The zones are described as radii around the objects on the surface, with an associated vertical no over-flight zone. For descent and landing operations to landing sites, this zone is two

kilometers; to impact sites, one-half kilometer. Specific artifact boundaries are also described, as many of the objects remaining on the Moon are still the subject of scientific research. These boundaries range to one meter for some components. The document includes detailed rationale for each of its recommendations, with explanations of both the experimental and observed data from the moon that was used to calculate these distances. The damage to the Surveyor 3 spacecraft by lunar soil abrasion during the nearby landing of the Apollo 12 lunar module, for example, is used to explain the potentially devastating impact to a historic site and artifact of this rocket wash. (NASA 2011, 1-32)

The recommendations document is both minutely detailed in terms of the specific dangers to artifacts on the Moon, and broadly informative in terms of describing the scientific and heritage value that NASA sees in these artifacts. The special attention given to the Apollo 11 and Apollo 17 landing sites can be interpreted as philosophy of space heritage preservation by the agency, as seen in their recommendation:

> While all the Apollo sites represent significant historical/heritage value in material culture, the Apollo 11 and 17 landing sites carry special historical and cultural significance. It is recommended that the sites for Apollo 11 and 17 be treated as unique by prohibiting visits to any part of the site and that all visiting vehicles remain beyond the artifact boundaries (AB) of the entire site. (NASA 2011, 17)

The rationale given for this recommendation is even more explicit is its endorsement of preservation:

> Project Apollo in general, and the flight of Apollo 11 in particular, should be viewed as a watershed in human history and humanity…The site of the first landing requires preservation; only one misstep could forever damage this priceless human treasure. (NASA 2011, 17)

These statements indicate a concern by the U.S. space agency for the damage to historic sites and artifacts on the Moon that may come with visitation, and the intent to put in

place some form of protection for the material culture of the space program. (NASA 2011, 1-32)

Dr. Alice Gorman is a lecturer in the Department of Archaeology at Flinders University in Adelaide, South Australia, specializing in space archeology. She is the author of at least six book chapters and journal articles on the topic, and is an Adjunct Research Fellow in the Research School of Astronomy and Astrophysics at the Australian National University, as well as a Faculty Member of the International Space University's Southern Hemisphere Summer Space Program (Flinders 2013, NP). Dr. Gorman is a prolific researcher on the topic of the material culture of the space program. In researching this thesis her ideas for conceptualizing and describing the approach to space archeology have consistently been a point of reference and guidance.

In her 2009 article *The Archaeology of Space Exploration*, Gorman discusses the reasons that the material culture of space and space travel should be studied archaeologically as well as historically. She explains that the methods used in archeological research allow for the multiplicity of narratives embedded in a site or artifact to be explored in an objective way, adding aspects of the story that may not be in the documentary record, especially when considering objects and events that happened within living memory, and placing the site or artifact within a larger context of human history. She uses this analysis to make clear the need for study of this material culture even though it may be seen as having little heritage value due to its relative recentness. In addition, Gorman explains that this archaeological treatment of recent history permits the "alternative narratives of spacefaring" (Gorman 2009c, 134) to be considered equally in the establishment of heritage value, and uses the example of launch sites in remote locations in Australia and Algeria to relay the significance and

impact of the space race to cultures beyond the two main players of the Cold-War. The typical narrative of the U.S. competition with the U.S.S.R. is only one aspect among many that comprise the story of space exploration. The need to consider recent history in archaeological terms is made clear, since "For many, the history of space exploration is also that of the 'Space Race': a narrative that emphasizes the adversarial relationship of the Cold War superpowers and downplays the international collaboration and the contributions of 'Third' and 'Fourth' world people." (Gorman 2009c, 132; 2009c, 132-145)

Much of Gorman's work focuses on the conceptualization of space heritage as a vast cultural landscape, and conducting archaeological study within this framework. In her 2005 article *The Cultural Landscape of Interstellar Space*, Gorman explains how the cultural landscape approach not only allows for the multiple narratives and values to be equally addressed in the consideration of space heritage, as many people and places around the world that are a part of this story are often missing from the documentary record, but also how this approach allows for proper consideration of the total 'place' of space exploration. She describes this place as a spacescape "form[ing] a three-tiered vertical landscape, starting from designed space landscapes on Earth… [to] organic landscapes in orbit and on the surface of celestial bodies… and beyond the solar system, where only the Voyager spacecraft have yet ventured…" (Gorman 2005, 88)

Gorman illustrates the multiplicity of values embodied in space heritage by undertaking three case studies of different aspects of the story of space. In the first, she examines the creation and development of the V2 rocket during World War II in Germany. The development of the rocket was led by Wernher Von Braun at the Peenemunde complex, with manufacturing at the Mittelbau complex, and in both

instances prisoners from nearby concentration camps were used as laborers; some 60,000 were used at Mittelbau, of which over 20,000 died. This aspect of space history is often untold in the heroic exploration narratives that dominate the documentary record. She discusses the ways that the Peenemunde complex has been interpreted as a site of space tourism, and the need for a more comprehensive story to make the full social impact of the development of space clear. (Gorman 2005, 89-93)

The next case study considers the impact on indigenous people of the development and operations of Woomera Rocket Range in central Australia. This is an area larger than the entire United Kingdom that the British and Australian governments initially created after World War II as a rocket testing grounds, and that later was used as a tracking station by many nations in the development of their space programs. In this example Gorman discusses how this use was imposed on the Aborigines who lived in this area and the cultural impact not only of this imposition but also of the interaction, whether intentional or not, of these outsiders with Aborigines in the area. The governments considered this land to be empty and open for their use, while the Aborigines considered much of it as significant to their history and culture, not to mention their subsistence. A narrative of the space race that is inclusive of this social history is required to place actions in context. (Gorman 2005, 93-99)

The final example used to show the multiple narratives of space heritage and the need for a cultural landscape approach is the dual ideologies behind the creation of the U.S. space program. Gorman contrasts the discovery and exploration stories used to urge the American people to support the space race with the realities of the Cold War competition with the U.S.S.R. to show dominance in science and military capabilities. She relates the power of both ideologies in the development of the U.S. program, as

exemplified by the discussions held in NASA and in Congress over which flag to place on the Moon when the first landing was made in 1969. Initially the UN flag was to be placed at the landing site on the Moon, however this decision and NASA's appropriations bill was changed so that only the U.S. flag may be used when the U.S. solely funds a space endeavor. The Moon landing was seen as an achievement for all of humanity, and the potential implications of placing the UN flag as opposed to the U.S. flag bear consideration. (Gorman 2005, 99-102) (NASA 1993) This article gives examples of the many values that must be respected in the management of space heritage, and makes clear that "[t]o manage these values appropriately, their significance must be assessed in a way that allows multivocality." (Gorman 2005, 103) The cultural landscape approach, Gorman contends, is the way to achieve that goal. (Gorman 2005, 85-107)

Gorman contributed two chapters to the 2009 book Handbook of Space Engineering, Archaeology, and Heritage, edited by Ann Garrison Darrin and Beth Laura O'Leary. Gorman's first chapter is *Cultural Landscape of Space*, in which she further clarifies her position on the appropriateness of the cultural landscape conceptualization in the consideration of space heritage. She also contributed *Heritage of Earth Orbit: Orbital Debris – Its Mitigation and Cultural Heritage*, and uses this chapter to describe the meaning that can be read and the heritage value of this discarded and abandoned material, as well as satellites and other long-term orbiting elements. She details the process through which the historic significance of Vanguard 1, the longest orbiting satellite still in orbit, can be described using the terms of the ICOMOS Burra Charter, for example, to illustrate the applicability of preservation and archaeological study to these elements of our culture. (Gorman 2009a, 335-346; 2009b, 381-398)

Dr. Beth Laura O'Leary, a professor specializing in cultural anthropology and archeology at New Mexico State University, is a leader in the movement to have Tranquility Base listed as a National Historic Landmark in the U.S., and as a World Heritage Site. (NM State 2013, NP) Through this work two U.S. states, California and New Mexico, have listed the 106 objects left at Tranquility Base on their state registers of Historical Resources (CA) and Cultural Properties (NM). (O'Leary and Westwood 2011, NP) She co-edited and authored five chapters in the 2009 book Handbook of Space Engineering, Archaeology, and Heritage, which will become known in time as a groundbreaking manual on collaboration between scientists and cultural resource managers in the consideration of the heritage of space.

The successful nominations of the objects remaining at Tranquility Base to the California and New Mexico state listings was made possible in large part by the work of O'Leary and her team through the Lunar Legacy Project. (Donaldson 2010, 2) The Lunar Legacy Project exists to inform people about the Apollo 11 mission, with a goal "…to preserve the archaeological information and the historic record of Apollo 11. We also hope one day to preserve Tranquility Base for our planet as a World Heritage Site." (LLP 2002a, NP) O'Leary created this project with a grant from NASA's New Mexico Space Grant Consortium, as an outgrowth of the grant-funded work she did for the Consortium in 1999 to catalog the items left at Tranquility Base. (De Luca 2009, NP) The website of the project is a reference point for those researching the archaeology of space travel, especially the Apollo 11 program, and the on-going discussions related to the preservation of these heritage places. Included are essays on the necessity for preservation of sites on the Moon, a listing of articles of interest to researchers, and an education section directed toward the teachers of school-age children, with five modules

and exercises for children to undertake to make the need for inclusion of space sites in our heritage regimes clear. O'Leary's work on this project is groundbreaking in scope and focus, and is evidence of a growing popular movement for the preservation of space heritage among researchers and the public, as well as a growing concern from NASA for the protection of space places, as this work was made possible by their support. (LLP 2002a, NP) (Donaldson 2010, 1-2)

O'Leary co-edited and authored five chapters in the Handbook of Space Engineering, Archaeology, and Heritage, a compendium of information on space cultural heritage. The forty-nine chapters of this book are arranged in ten sections that comprehensively cover the issues to be addressed when considering space heritage. A listing of the sections shows the breadth of topics that in essence form a framework for the creation of a space heritage historic context:

Section 1: All Sky Survey
Section 2: The Sky: A Cultural Perspective
Section 3: Introduction to the Space Age
Section 4: The Landscape of Space
Section 5: Spacecraft Forensics and Mystery Solving
Section 6: Environmental Effects and the Material Record
Section 7: Preservation of Space Objects and Case Studies
Section 8: Space Policy and Preservation
Section 9: The Future and Space Archaeology
Section 10: The Mind and the Cosmos

O'Leary, and co-editor Ann Garrison Darrin of Johns Hopkins University's Applied Physics Laboratory, have compiled a body of knowledge in this book that is unparalleled, with contributions from forty-three authors of various backgrounds that by coming together have created the context for the space preservation movement. As with the Lunar Legacy Project, with this book O'Leary is building a popular movement

to expand our cultural heritage regimes to include space heritage. (Darrin and O'Leary 2009, v-x)

O'Leary contributed three chapters to the Handbook of Space Engineering, Archaeology, and Heritage, in addition to co-writing the introduction and an appendix on terminology and definitions with Darrin. In *Evolution of Space Archaeology and Heritage*, O'Leary gives an overview of the field today, and discusses important concepts and events that become the groundwork for the book. She discusses previous and on-going efforts to tell the story of the space program, such as the NPS 1984 "Man in Space" Historic Landmark Theme Study, and the Smithsonian Air and Space Museum's curation of artifacts from the space program. The "Man in Space" study considered sites important to the development of space flight in the U.S., with the intention of declaring National Historic Landmarks of several of the sites. The study only considered terrestrial sites in the United States; nevertheless it is an effort to recognize and manage the cultural value of space heritage. She explains the relevance of the study of so-called "space junk" by archaeologists and others interested in telling the story of the past, making the parallels between space junk and discarded items at prehistoric and historic sites that yield information to the careful inquisitor. Space tourism is discussed as another reason for the need to protect space heritage, and lunar sites in particular, since the Moon will likely become a tourist destination with the development that we see today of commercial space travel capabilities. This chapter shows the variety of influences, ideas and the reasons for the development of space archaeology as a necessary next-step in our practice of cultural resource management. (O'Leary 2009a, 29-48)

In *One Giant Leap: Preserving Cultural Resources on the Moon*, O'Leary presents the case for recognition of off-planet heritage using the example of Tranquility Base on the Moon. She relates the significance of the Moon throughout human history, from petroglyphic representations of the celestial body to narratives that include the Moon to sacred sites that are oriented to feature prominent points in the progression of the Moon across the Earth's sky. An overview of the lunar programs and milestones of the U.S. and U.S.S.R.'s space race is given, and an analysis of Tranquility Base is undertaken that relates the applicability of U.S. preservation law to the recognition and protection of this site through listing on the National Register of Historic Places, and listing as a National Historic Landmark. The site is shown to meet the criteria for both, leading to a discussion of the legal limitations that prohibit this action from taking place. O'Leary documents the issues of ownership presented in the Outer Space Treaty as the primary reason for this oversight, including correspondence that shows that the U.S. government sees the prohibition on claims over territory on any celestial body in the Outer Space Treaty as a measure that prevents any heritage recognition and preservation actions. Finally, she discusses the impending visitation of these sites as the commercial space industry becomes a significant component of our space travel agenda, and the pressing need that this creates for protection of sites on the Moon. In the previously discussed chapter O'Leary explained the evolution of our philosophy of heritage management that includes recent and off-planet resources; in this chapter she shows the challenges that await solutions as the space preservation movement continues this evolution. (O'Leary 2009b, 757-780)

O'Leary addresses solutions to the challenges facing the space preservation movement in her final individual contribution to the book, *Plan for the Future*

Preservation of Space. In this chapter she presents several conceptualizations of her own creation as well as those of other contributors to the book that aid in understanding and describing the practice of space heritage management. She discusses Gorman's three components of the space cultural landscape—sites and objects on earth, in orbit or on other celestial bodies, and beyond the solar system—as well as Spennemann's five components of the heritage specifically related to the Apollo program—sites, artifacts on Earth, artifacts that went to space and are back on Earth, artifacts in space, and samples collected and brought to Earth—as tools to envision and comprehend space cultural heritage. (O'Leary 2009c, 819-825)

O'Leary goes on in this presentation of ideas to discuss the legal options that may create an avenue of action for the space preservation movement. Having analyzed the applicability of U.S. federal preservation laws to the Tranquility site in a previous chapter, she here applies the guidelines of Australia's heritage protection document, the Burra Charter, summing up the relevance of the guidelines by quoting their intent "…to do as much as is necessary and as little as possible in order to maintain the cultural significance of place…" (O'Leary 2009c, 826) She discusses the creation of the Space Heritage Task Force as a component of the World Archaeological Congress, again showing the growing interest in the movement to preserve space heritage. O'Leary finishes with a discussion of various options that have been presented to create an international agreement to allow for the preservation of space heritage, including modification of the World Heritage Convention to cover this aspect of heritage. One recommendation, for example, that has been made is that the U.S. State Department should form a working group to propose methods for considering space heritage, making clear the necessity of the movement, and in essence becoming a sponsor for

elevating the issue to international status through the U.N. The parallels to underwater heritage management and heritage management in Antarctica are mentioned as international examples that may lend some guidance in the creation of a space heritage program, as are the problems of effectiveness that these two heritage regimes currently face. The movement is building momentum and gaining international awareness. (O'Leary 2009c, 819-834)

Dr. Dirk H. R. Spennemann is an associate professor specializing in cultural heritage management at Charles Sturt University in Albury, Australia, and the author of several papers on emerging heritage issues, and a contributor to the Handbook of Space Engineering, Archaeology, and Heritage. His focus on emerging heritage includes space cultural heritage issues, an examination of the way in which the heritage of technology is addressed in cultural heritage management and the consideration of the potentially significant impacts of heritage tourism on sites that are becoming accessible to tourists as technology advances. (CSU 2013, NP)

In his 2004 paper in the journal "Space Policy" entitled *The Ethics of Treading on Neil Armstrong's Footprints*, Spennemann gives an overview of the history of the space programs of the U.S. and U.S.S.R. as an introduction to a discussion of the work of his fellow researchers in the field of space heritage, including O'Leary and Gorman, to establish the state of the field and place his thoughts in context. Following this Spennemann presents a conceptualization of the heritage of the Apollo program into five distinct resource types based on location as:

> (i) physical sites associated with the development and execution of the program on Earth;
> (ii) artefact material associated with the programme which remained on Earth;
> (iii) artefact material that went into space but returned to Earth;
> (iv) artefact material that still remains in space; and

> (v) lunar sample material that was collected on the Moon and brought to Earth. (Spennemann 2004, 281)

This conceptualization, along with Dr. Gorman's three locational conceptualizations for overall space heritage discussed previously, begin to create a framework for the consideration of this heritage. (Spennemann 2004, 279-282)

Spennemann places the significance of Tranquility base and the Apollo program into context by describing it as a component of human evolution in the same timeline as, among other achievements, beginning to use fire as a tool, the creation of rock art and our first use of language as a communication tool. (Spennemann 2004, 283) He continues with an analysis of the issues related to our inability to preserve aspects of space heritage in category iv, materials that remain in space, by showing the limitations inherent in the Outer Space Treaty and its component Moon Treaty, as well as the lack of an international heritage authority focused on this type of historic resource. He postulates that the consideration of off-planet material culture can be seen in the same light and managed in similar ways as that in the Earth's oceans, as those resources are similarly owned by the respective creator nations, although the ocean floor on which they rest cannot be claimed by that nation. Spennemann discusses the impending challenges that heritage tourism on the moon will bring, and closes by reinforcing the need for an international agreement through the United Nations Office of Outer Space Affairs or Committee on the Peaceful Uses of Outer Space. (Spennemann 2004, 283-288)

Spennemann focuses on the pressing challenges of the development of space tourism in the article *Out of this World: Issues of Managing Tourism and Humanity's Heritage on the Moon,* presented in the "International Journal of Heritage Studies" in

2006. He relates the dangers of uncontrolled tourism on Mt. Everest and at the Titanic site, both places that until recently were considered safe from tourist visitation, and through this comparison makes the urgent case for preservation of sites in space, and specifically on the Moon, before adventurers begin to disrupt or destroy these currently inaccessible historic resources. Spennemann also presents a case for regulation of the Moon's surface, using examples of failed communal ownership of British and German town commons areas that were abused due to the perception that these places were open to whatever use the community deemed necessary since they were owned by all, and by none. The impact of this philosophy on the management of the surface of the Moon is a significant threat to the preservation of material resources. Spennemann closes by emphasizing the rapidity with which tourism on the Moon could become a significant challenge by showing that from the beginnings of tourist visitation in 1956 to the 2003-2004 season, the number of annual visitors to Antarctica rose to over 24,000. Heritage preservation on the Moon will quickly become a lost cause without forward-thinking action in the near future. (Spennemann 2006, 356-371)

In the 2011 thesis, *Over the Moon: Lunar Heritage Protection,* prepared as a component of the Historic Preservation MFA program at the Savannah College of Art and Design, Chloe Castro uses aspects from the handling of Antarctica and the open sea, as well as the language of the World Heritage List, to propose a Lunar Heritage List for the recognition of in-situ artifacts left on the Moon during human visitation, and the sites of these lunar landings, both from human and robotic missions. In this exploration of issues related to beginning to recognize the value of space cultural heritage, Castro argues that in many cases terrestrial preservation activities are made possible by organizations that work around and within existing legal frameworks, and that the

preservation of lunar heritage could proceed in much the same way, without a lot of change to existing international treaties and conventions, as long as a Lunar Heritage List is created that closely mimics the language of the existing World Heritage List. (Castro 2011)

In the 2002 thesis, *Extending the Principle of the Common Heritage of Mankind to Outer Space,* prepared as a component of the Master of Laws program at McGill University's Institute of Air and Space Law, George Dietrich discusses the increasing influence of the Common Heritage of Mankind (CHM) principles in international legal affairs, including the Antarctica Treaty System (ATS) and the United Nations Convention on the Law of the Sea (UNCLOS), among others. Following this analysis, he explores ways to implement CHM principles in international outer space cooperation via various international organizations and agreements, some existing and some that he proposes. Dietrich contends that any successful application of CHM principles in international outer space cooperation will require an international trusteeship to oversee the sharing of benefits and resources, as individual nations will show bias in their selection of less developed nations with whom they chose to cooperate, thereby meeting the proverbial 'letter' of the CHM 'law,' while possibly missing or more likely intentionally rendering ineffective the intent. Dietrich's assessment of the need for this international body is a key component of his work. (Dietrich 2002)

Summary

The space heritage movement is gaining momentum. The topics presented herein vary in focus and scope, and show the many influences that are coming together in this movement, all with the goal of moving toward the identification, evaluation and

management of the cultural heritage of space travel. The cultural impetus for this movement is clear, as is the need for new international agreements to enable the progression of the movement into a state of action. These two components, in addition to a realized method of evaluation and management, will lead to a workable ethic for space preservation.

Chapter 3: The Common Heritage of Mankind

> In its most positive form, the [common heritage of mankind concept] epitomizes the aspirations of friendly and cooperative international relations to manage communal resources for the common good. (Shackelford 2009, 139)

The concept of the Common Heritage of Mankind (CHM) emerged and began to play a more prominent role as a basic principle of fairness in the creation of agreements related to areas of the international commons in the second half of the twentieth century. Although not entirely obvious in the initial Antarctica Treaty negotiations of 1959 that led to the creation of the body of agreements known collectively as the Antarctica Treaty System (ATS), the CHM concept has been a component of the other comparable international agreements used in this thesis, namely the Outer Space Treaty of 1967 (OST) and the related Moon Treaty of 1979 (MT), and the Law of the Sea Convention of 1982 (LOSC). The body of thought represented by the CHM concept is an evolving framework of ideas related to the fair use and equitable distribution of the resources of Earth by all people. As such, the CHM ideal continues to be hard to precisely define in legal terms, and its applicability to specific issues is not entirely clear, but what is clear is a distinct trend in international relations toward a modern interpretation of fairness that is not solely based on the ability of the powerful to exploit common resources as they wish. Rather, the concerns of and benefits to all must be considered equally in matters of international concern, and this will be the case with any successful agreements that lead to the establishment of heritage recognition and

protection for off-planet cultural resources. (Baslar 1998, xix-161) (Shackelford 2009, 103-139)

Five elements of the common heritage of mankind have been synthesized by Baslar (in his book *The Concept of the Common Heritage of Mankind in International Law)* and Shackelford (in his article *The Tragedy of the Common Heritage of Mankind* in the "Stanford Environmental Law Journal") as definers of the concept. Paraphrased, they are: no party can claim ownership; the area in question must be managed jointly by all involved; all involved must share in the resources of the area; the area must only be used for peaceful purposes; and the area and resources must be protected so that they exist and benefit future users. (Baslar 1998, xx-xxi; Shackelford 2009, 103 & 109) While no internationally accepted legal definition exists to date, this list of characteristics can serve as a general definition for discussion. (Shackelford 2009, 109)

The concept of the common heritage of mankind can be traced to the Roman legal precept of *res communis*, in which things (*res*) that are important to all are owned in common by all (*communis*) and therefore cannot be claimed by any one person or country. (Shackelford 2009, 107-108) In its most basic form, *res communis* refers to such resources or commodities as water and air, (Baslar 1998, 40-41) those things that all depend upon for survival and whose loss or appropriation could impact a great deal of people. The concept became a consideration in international legal matters when brought to the United Nations General Assembly (UNGA) in 1967 by the Maltese delegate to the UN, in relation to considerations of sea bed and ocean floor issues. The resultant 1970 Declaration of Principles Governing the Sea-bed and Ocean Floor is the first UN document to use the common heritage of mankind terminology to describe an aspect of international common space. (Baslar 1998, xix) In 1982, this was expanded

upon in the language of the Law of the Sea Convention, which describes "…the deep seabed and ocean floor beyond the limits of national jurisdiction and its resources [as] the common heritage of mankind." (Baslar 1998, xix-xx)

The 1970s were an active period in the development of the idea of the common heritage of mankind, and the related influence on international policies and agreements. Most indicative of this activity is the passage of United Nations General Assembly Resolution 3201, the Declaration on the Establishment of a New International Economic Order (NIEO). Among other purposes, the resolution intended to:

> …proclaim our united determination to work urgently for the Establishment of a New International Economic Order based on equity, sovereign equality, interdependence, common interest and cooperation among all States, irrespective of their economic and social systems which shall correct inequalities and redress existing injustices, make it possible to eliminate the widening gap between the developed and the developing countries and ensure steadily accelerating economic and social development and peace and justice for present and future generations… (UNGA 1974, NP)

The NIEO was a way for countries that had previously been unrepresented in international economic affairs to participate on an equal footing with developed nations. (Shackelford 2009, 116-117) In international negotiations at the UN, and in other arenas, these previously ignored nations began to find power in a shared voice in the 1960s-1970s, banding together as the so-called Group of 77, linking less developed and in some cases recently independent nations who realized their economic need to be a larger part of the decision-making process about issues in international common areas. (Churchill and Lowe 1999, 17) The passage of the NIEO Resolution and the efforts of the Group of 77 signified a growing concern for equality among nations, as well as the desire of the United Nations to provide tools for creating equitable opportunity for all,

bolstering the use of common heritage of mankind language in international agreements.

The negotiations leading to the MT overlapped those of the LOSC, and much of the common heritage of mankind language in the MT may be borrowed from the LOSC work, but in the MT the ideals are expanded and are more interwoven as a basic component of the treaty. (Baslar 1998, 159-161) This was largely due to the efforts of Argentina to direct the development of the MT, as they submitted an early draft of the treaty in 1970 that was revised and amended several times over the next nine years, (Baslar 1998, 160) but outside of this influence the common heritage of mankind concept was gaining credence throughout the 1970's, and likely would have been a large part of the treaty with or without Argentina's proposals. The common heritage of mankind concept is clearly a driving concern of the LOSC framers, but the MT is "…the first treaty which carried the common heritage phrase from the philosophical and moral realm into the domain of positive international law." (Baslar 1998, 159) The MT was not only influenced by the LOSC common heritage of mankind thoughts, but also by the language in article 1 of the OST referring to space and all celestial objects as the "province of all mankind." (Bini 2010, 500)

Summary

The strong common heritage of mankind focus of the MT has been criticized as a major reason for its lack of support thus far as an international agreement by Baslar and other CHM scholars, with only 13 signatories to date, none of which are major space faring nations, (Baslar 1998, 161) but this should not be seen as a refutation of the concept. Rather, this is a step towards refinement of the concept that should be the

focus of future international agreements. The CHM concept is a theme that carries through the development of agreements and policies related to international common areas in the discussion to follow, and is an important ideal that must be acknowledged in successful international treaties that address humanity's use of space and other areas of the international commons in the move toward the creation of an ethic for the preservation of space heritage.

Chapter 4: The Antarctica Treaty System

> Many problems are now before us that need concrete international cooperation to be solved. It seems that the cooperation in Antarctica may be a good example of what should be done in outer space.
> — Armel Kerrest, Professor of Law; Board Member, European Centre for Space Law (Kerrest 2011, 133)

The international cooperation evident in the Antarctica Treaty System (ATS) is a potential model for future international agreements concerning humanity's expansion into the solar system, although more emphasis on CHM principles will need to be considered. The ATS provides insight into the handling of other international common areas, specifically space, because similarly Antarctica is an area without a population, within which many governments of the world have agreed to work together toward a common goal of scientific understanding. The remote- and 'otherworldly-ness' of Antarctica have made it a place that has long held a sense of fascination and danger-laden excitement in the minds of the curious. The first documentation of the existence of the Antarctica appears in 1820-21, when British (Bransfield) Russian (Bellingshausen) and American (Palmer) expeditions all reported siting the mainland, with the Russian expedition performing a circumnavigation between 1819-1821; indeed it was not even known to be a continent until the 1840's. Landing on the continent is first recorded in 1895, and the first expedition to stay over winter was the Belgian expedition led by Baron De Gerlache in 1897-99, leading to the race of expeditions climaxing in 1911-12 in the contest between a Norwegian team led by Roald Amundsen and a British team lead by Robert Scott to reach the South Pole. Since the triumph of Amundsen in attaining

this victory and the second-place finish of Scott thirty-three days later, the race to understand Antarctica has been intense. (US-CIA 2012, NP) (Myhre 1986, 1-18) (Peterson 1988, 31-34)

The British first claimed territory on the continent in 1908, beginning a series of sometimes tense international negotiations and disputes surrounding the ownership and use of this land, without an indigenous population and therefore without any regime of territorial sovereignty. (Myhre 1986, 12-18) Other nations soon followed, based either on expeditions to, or proximity with, the continent, and by 1948 seven Antarctic territories were described and claimed by Argentina, Australia, Britain, Chile, France, New Zealand and Norway, with the U.S. and Russia both reserving the right to claim territory based on their expeditions to Antarctica. Some of these claims overlapped, increasing tensions and the threat of war, especially between Britain and Argentina, and in 1948 the U.S. Policy Planning Staff issued PPS-31, a policy paper that included the framework of what would become the Antarctica treaty, including a proposal to merge all of the claims under the joint management of the claimants. This agreement was not accepted in initial form by the parties claiming territory, but after modification proposed by Chile, which included the notion of scientific cooperation among the parties, agreement was reached. (Myhre 1986, 1-32) (Peterson 1988, 31-34)

The combined agreement based on the Chilean modifications of the PPS-31 paper held in Antarctica throughout the 1950's, bolstered in no small part by the international cooperation engendered in the concept of the International Geophysical Year (IGY) of 1958. This was a time of unprecedented scientific discovery and achievement; the IGY was a dedicated period of time during which world governments and organizations pledged to share information and work together to build upon this momentum. The IGY

was extended through 1959 as the International Geophysical Cooperation (IGC), creating an environment that was ripe for further discussion on the scientific considerations in Antarctica. (Myhre 1986, 1-32)

The ATS, signed in Washington on December 1, 1959, was the result of this cooperation. This agreement between the now twelve claimants (Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the U.S.S.R., the U.K. and the U.S.) further solidified the loose agreement to keep Antarctica free of Cold-War militarization and disputes over territorial boundaries, and strengthened the purpose of scientific pursuit on the continent, spelled out in four objectives: "…the preservation of Antarctica for peaceful purposes, …the establishment of freedom of scientific activity in the region, …the decreasing of political tensions and, …the establishment of a system of consultations between the interested states." (Myhre 1986, 35) The agreement created "consultative parties" of the twelve claimants, with the ability for other states to become "contracting parties" if they show substantial research interest and investment in Antarctica, and are approved by the consultative parties. The list today has grown to include twenty-nine signatory nations with operations in Antarctica. (US-CIA 2012, NP) (Myhre 1986, 35-40)

The ATS includes the original treaty composed of fifteen articles, along with an Environment Protocol, a Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), a Convention for the Conservation of Antarctic Seals (CCAS), and other administrative documents and protocols that have been developed over time. A Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA) intended to allow some well-regulated mining on the continent was drafted and signed by some consultative parties in the late 1980's, but concern over environmental

degradation led to the ultimate failure of the proponents of CRAMRA to attain approval of all consultative parties. As a result, the ATS specifically forbids the use of natural resources for any purpose other than scientific research. (BAS 2012, NP) (SATS 2013a, NP) (SATS 2013c, NP) The articles of the ATS are summarized as follows:

> 1. Antarctica will be used for peaceful purposes only.
> 2. The spirit of scientific cooperation embodied in the IGY will continue in Antarctica.
> 3. Scientific inquiry will be encouraged by the exchange of scientific data and personnel.
> 4. Claims to territory are suspended as long as the ATS is in place.
> 5. No nuclear weapons or nuclear disposal is allowed in Antarctica.
> 6. The ATS applies south of 60 degrees south latitude, but does not override the LOSC.
> 7. Each consultative party shall be able to inspect the premises of any other party.
> 8. Each consultative party's personnel are subject to the laws of their nation.
> 9. The parties will meet regularly to ensure the intent of the ATS is being carried out.
> 10-15. Dispute resolution, ratification and other administrative details.
> (SATS 2013c, NP)

The position of Secretariat of the Antarctic Treaty was created in 2003 by the representatives at the consultative meeting for that year. Article IX of the ATS calls for meetings among the consultative parties to aid in implementation of and to further the intentions of the treaty system; these Antarctic Treaty Consultative Meetings (ATCM) were held biannually from 1961 until 1994, and have been held annually since. The Secretariat functions as an executive of the ATS, especially in handling issues related to the ATCMs among the member states, and coordinating environmental work of the Committee for Environmental Protection (CEP). The Secretariat is essentially the face of the ATS, and the organization through which international cooperation in Antarctica is facilitated. (SATS 2003, NP; 2013a, NP; 2013b, NP)

The cultural heritage of Antarctica is not addressed specifically in the original treaty, but the Environment Protocol that is now a component of the ATS states that

historic sites or monuments shall not be "…damaged, removed or destroyed." (SATS 2013d, Article 8) Historic sites or monuments can be proposed by any party, and once approved by the consultative parties they are maintained on the Antarctic Specially Protected Areas list, along with other sites of "…outstanding environmental, scientific, historic, aesthetic or wilderness values." (SATS 2013d, Article 3) Article 9 of the Environment protocol also requires consultative parties to share information on the boundaries of these areas and their management plans so that all other parties and visitors are aware of the sites. In addition to this listing and protection within the ATS, two non-profit trusts exist as 'sister-trusts' to advocate for and provide preservation services for the sites and objects in Antarctica that evidence its history of research and exploration. The New Zealand Antarctic Heritage Trust (NZAHT) focuses on the Ross Sea region of Antarctica, and works hand in hand with the United Kingdom Antarctic Heritage Trust (UKAHT), which also focuses on the Ross Sea region, as well as the Antarctic Peninsula area and the South Shetland Islands and South Orkney Islands. Both serve as contact points for those persons and organizations who are interested in being a part of the preservation of Antarctica, either in person, through donations, or through donated services, and through their partnership they together form the preservation regime for the continent. The NZAHT receives the majority of its funding through the New Zealand government and a few major sponsors, while the UKAHT receives most of its funding through fund raising activities aimed at specific projects. Both are actively conducting preservation activities, with the NZAHT being on continent year-round. Both seem to be in relatively solid financial standing, but at least the UKAHT seems to be losing some financial standing in the global economic slowdown, as income has fallen from about 600,000 pounds in 2008 to about 340,000 pounds in

2012. (UKCC 2008, NP) (UKAHT 2006, NP; 2012, NP) (SATS 2013d, NP) (NZAHT 2012a, NP; 2012b, NP)

Summary

The ATS can be seen as an analog to our existing and future measures to ensure cooperation among nations in dealings with off-planet resources and heritage, and in fact much of the language of the Outer Space Treaty is directly reminiscent of the ATS. However, significant challenges exist that must be addressed for the long term durability of the ATS, and its continuing applicability to space. Most significantly, the ATS is not administered through the UN; therefore the interests and needs of those who are not currently a part of the ATS are in many ways immaterial to operations in Antarctica. When less-developed nations have shown interest in being a part of the Antarctica regime, there has been little international recourse for them to become a part of the ATS. Antarctica is a continent without an indigenous population, therefore it is seen by many as an area of the international commons where the principles of CHM should be applied, to the extent that in a show of mutual support and concern the Council of Ministers of the Organization of African Unity declared Antarctica to be an area of CHM in 1985. (Myhre 1986, 113-114) Without the UN as an organization through which such discussions can be carried out, it seems that Antarctica will remain closed to these interests for the foreseeable future. The ATS is without question a long-standing, highly regarded international agreement that has been incredibly successful in keeping Antarctica a place of scientific inquiry and pursuit, and it has had enormous influence on the development of international space agreements. Nevertheless, its application to

off-planet heritage management must be contingent on a more open system for involvement by all.

Chapter 5: The Law of the Sea

> The exploration of the [seabed] and the exploitation of its resources shall be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States, whether land-locked or coastal, and taking into particular consideration the interests and needs of the developing countries. (United Nations General Assembly Declaration 2749, 1970)

The long history of the development of legal agreements regarding the Earth's oceans reveals much about understanding of the international commons. The importance of the sea to humanity began with its ability to provide sustenance, then grew to include its facilitation of transportation and international trade, and today includes all of this as well as its significance as a source of ores and other mined resources, in addition to a new understanding of the role that the sea plays in the interconnected web of life and environmental homeostasis on Earth. The oceans are the place where life began on Earth; from the time that our earliest ancestors ventured onto land until the present, our vital connection to the sea has influenced the development of cultures and nations. The development of philosophies of fairness and equity represented in international agreements on the use of the Earth's oceans over time can be read almost as a geological record of humanity's notions of purpose and society.

Many legal scholars have contributed to the body of international thought on the use of the oceans, but perhaps most influential is Dutch author Hugo Grotius. Working for the Dutch East India Company, Grotius wrote *Commentary on the Law of Prize* in 1604-5 as a response to the capture of a Dutch trading vessel by the Portuguese in the contested waterways that opened sea access to India for European traders. While this

response was not published until the middle of the nineteenth century, one chapter, "The Free Sea," was published in 1608. "The Free Sea" espoused the view that travel on the oceans should not be restricted, even though some nations claimed authority over vast areas of the sea at the time. Grotius' work was commissioned by his employer to further the purpose of free trade in the growing global market. (Anand 1983, 2-3, 77-94)

Grotius' concept of free seas was challenged in 1635 by the English legal scholar John Selden. In *The Closed Sea*, written at the request of the English monarchy, Selden argued for continuing dominance of the open sea by the traditional European maritime powers of the day. This approach held sway until the industrial revolution in the middle of the nineteenth century, as industrialization and colonization by an expanding roster of nations and the associated economic benefits of this development created the political will for a more open interpretation of use of the sea, bringing Grotius back into favor. (Anand 1983, 105-135)

International agreements related to the seas began with discussions in the 1920's-30's. Discussions are held at a League of Nations conference at The Hague in 1930, although no specifics were agreed upon. When the former League of Nations became the United Nations in 1945, the previous discussions about the use of the sea transferred to the International Law Commission (ILC) beginning in 1948, and resulted in the production of several reports and recommendations by 1956. These reports formed the basis for the first United Nations Conference on the Law of the Sea (UNCLOS) in 1958. (Churchill and Lowe 1999, 14-15) (Anand 1983, 175-176)

UNCLOS I was held in Geneva, and took up the work begun by the ILC. Fifty-four of the eighty-six nations attending the proceedings were recently independent Asian and African nations, or Central and South American nations; both groups having a goal of

breaking through the dominance of the traditional maritime powers over issues related to the seas, and both fighting for the declaration of a larger area of territorial waters. This desire was counter to Western and European goals, since a larger territorial area would diminish the ability of larger nations to use the open sea in any way they saw fit. (Anand 1983, 176-185) Four conventions were adopted as a part of UNCLOS I that codified many conventional and in-use practices; the Convention on the Territorial Sea and Contiguous Zone, the Convention on the High Seas, the Convention on the Continental Shelf, and the Convention of Fisheries and Conservation of the Living Resources of the High Seas. (Churchill and Lowe 1999, 14-16)

The second UNCLOS was not as prolific in the production of conventions. The focus was on issues of territorial water boundaries that were not settled in the first conference, with essentially two points of view taking shape. The traditional maritime powers such as the U.S., Canada and the U.K. argued for smaller territorial areas, while smaller nations, wanting more control and decision-making abilities for their waters, argued for larger territorial zones. No conventions were adopted in UNCLOS II. (Anand 1983, 185-190) (Churchill and Lowe 1999, 14-16)

The conceptualization of the seabed outside of territorial waters as an international commons and therefore an area of Common Heritage of Mankind (CHM) was formalized by declaration of the United Nations General Assembly (UNGA) in 1968, and a Seabed Committee was formed to ensure that this notion was put into practice. Larger nations questioned the sometimes vague language and the concept itself, as it still seen today, but smaller nations were emboldened in their efforts to be an equal partner in determining the uses and conservation of vast areas of the Earth's oceans. In fact, prior to this declaration, many smaller nations had already pushed their assumed

territorial boundaries beyond that agreed upon in UNCLOS I, as they could see the changing notions of the international commons coming into consideration in advance of the UNGA declaration. (Anand 1983, 185-204) (Baslar 1998, xix)

The proceedings of the third UNCLOS clearly show the influence of the CHM notion. The conference occurred in sessions of up to 158 nations between 1973 and 1982, and dealt mainly with issues of the seabed that were being revisited in light of the newly codified ideas of equality in the international commons. The considerations of the various negotiators began to take shape as a discussion between northern hemisphere (generally developed) and southern hemisphere (generally considered 'third-world') nations and interests, as opposed to traditional American-influenced versus Soviet-influenced nations. One of the notable occurrences during the sessions was the creation of a voting agreement that ensured equitable participation and decision-making, calling for "…a 2/3 majority of the representatives present and voting provided that majority shall include at least a majority of states participating in that session of the conference." (Anand 1983, 210) The expanded territorial limit of twelve miles that developing nations had already put into place was confirmed in this conference, as well as an exclusive economic zone of 200 miles. The International Tribunal for the Law of the Sea (ITLOS) and the International Seabed Authority (ISA) were created as a part of this conference as well, creating regulatory agencies for the administration of international common areas. The body of agreements up to and including UNCLOS III became known as the Law of the Sea Convention (LOSC) with the end of this convention. (Anand 1983, 209-219) (Churchill and Lowe 1999, 15-19)

The inclusion of the regulatory functions in the LOSC language and the creation of these two agencies brought concern to industrialized nations who had plans to mine

the deep ocean floor, particularly for ore-rich manganese nodules discovered to be common in the sea. While the LOSC was adopted in 1982, many sea-faring nations did not ratify the agreement, including the U.S. and the U.K. This concern led to additional negotiations in the 1990's intended to bring all nations into agreement, resulting in implementation agreements in 1994 (related to resource extraction and the role of the ISA) and 1995 (related to fish stocks), that added language more specifically dealing with the concerns of non-signatory nations. The 1994 implementation agreement dealt with financial aspects of access to seabed minerals, and specifically guaranteed access to seabed mining for commercial organizations in the industrialized nations, in addition to the organization that was to be created through the ISA. The 1995 agreement clarified definitions related to "straddling fish stocks" in the ocean. The 1982 LOSC agreements along with the 1994 and 1995 implementation agreements are known as the "UN LOSC Package" that are now considered to be in force, with the U.S. being the only major maritime nation in the world who still withholds full support due to right-wing paranoia over negative perceptions of the intent of UN policy of this type. (Churchill and Lowe 1999, 18-24) (Landler 2012, NP)

The ISA administers all LOSC directives related to seabed mineral resources. These include licensing mining operations in the deep seabed, as well as enabling the sharing of economic benefits and technical information and training with developing countries as required by CHM principles in the LOSC. The ISA is composed of three main parts: the Assembly, Council and Secretariat, as well as a Legal and Technical Commission and a Finance Committee. In the future, once mining operations on the seabed begin to become a significant source of ores, a mining arm of the ISA, the Enterprise, will begin operation. The ISA is funded by the contributions of member

states that play a role in the organization, until that time in the future when mining license income to and mining profits of the Enterprise will become the funding source. (Churchill and Lowe 1999, 238-253)

The 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage (CPUCH) is an instrument separate from the LOSC Package, allowing states the ability to ascribe to the tenets of CPUCH independent of their status regarding the LOSC Package. CPUCH came about because of a need for further guidance on the issue of dealing with underwater cultural heritage that the LOSC describes in articles 149 and 303. Article 149 addresses these materials in light of CHM principles, stating that "[a]ll objects of an archaeological and historical nature found in the [seabed] shall be preserved or disposed of for the benefit of mankind as a whole…" (UNGA 2011) Article 303 further prescribes that "[s]tates have the duty to protect objects of an archaeological and historical nature found at sea and shall cooperate for this purpose." (UNGA 2011) CPUCH exists to guide these actions, in much that same way that other UNESCO conventions deal with terrestrial heritage sites. (UNESCO 2013, 1-13) (UNESCO 2001, NP)

The CPUCH is organized around four main principles, the "Obligation to Preserve Underwater Cultural Heritage" as directed by the LOSC Package; the use of "In Situ Preservation as a Preferred Option" for that heritage; that "No Commercial Exploitation" of heritage items should be allowed; and the need for "Training and Information Sharing" related to the management of these sites and materials. (UNESCO 2013, 13) Similar to other UNESCO conventions on heritage, CPUCH has no regulatory authority, but functions as a guideline for nations and commercial operations in dealing with underwater cultural resources. (UNESCO 2013, 1-13)

Summary

The LOSC Package is the result of generations of negotiations regarding an area of the international commons, and has influenced the development of the OST and related MT. The sea is an appropriate analog for space, as many of the same issues that have been dealt with will be and have been seen as humanity becomes a culture of the solar system, including the need for rules to deal with the protection of environments, rules to guide the use of natural resources, and rules to ensure that CHM principles are followed in the commons. The balance of CHM notions with natural resource use as it currently exists in the LOSC Package perhaps still favors the economies of the more developed states; but as more financial resources become available to the ISA over time this will be rectified, and this model for the use of commercial endeavors to fund the common good in the international commons will be instructive in the development of space policy, specifically in future amendments to the MT.

Chapter 6: The Outer Space Treaty

> I want to see the day when citizens can travel to the Moon themselves and visit the site where Neil and I first walked…appropriate measures should be taken not to disrupt the historic nature of Tranquility Base.
> – Buzz Aldrin (Donaldson 2012, 2)

The primary international instrument governing activity in space is 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," commonly known as the Outer Space Treaty (OST). Early negotiations toward the OST were primarily concerns over U.S. and U.S.S.R. interests. Basic differences in the approach to their respective national space programs created significant stumbling blocks in the process; the U.S. created NASA as a relatively open, civilian organization while the U.S.S.R. viewed their space operations as a component of their military complex, and this kept almost all information secret, to the extent that many of the primary players in the development of space flight in the U.S.S.R. were known only by title, not name, within the space program that they were actively directing. Cold War tensions between the two countries heavily influenced the development of an international space operations agreement, with the U.S.S.R. insisting that the negotiation over weapons on the ground be a component of the negotiation of weapons in space, and thus a required consideration for any international agreement. Eventually the connection between the two was severed, although the prohibition on the militarization of space remains as a key component of the OST. The U.S. and U.S.S.R. signed the OST in January of 1967,

and it entered into force on October 10 of the same year. (Sagdeev 1991, NP) (US-State Dept 2013, NP) (UNOOSA 2002, 3-6)

The seventeen articles begin with a statement linking the OST to the growing CHM notions seen in international agreements of the time; the document uses the language "province of all mankind" as opposed to "common heritage of mankind," which is perhaps a difference without distinction as the OST was finalized about the same time as a presentation to the UN General Assembly (UNGA) during the Law of the Sea Convention discussions by the Maltese delegate to the convention in which the terminology of the CHM was first entered as a primary issue, and two years before the first UN use of CHM language in an international agreement. (Baslar 1998, xix) The OST goes on to ban the militarization of space and celestial bodies, using the same "for peaceful purposes" language as the ATS. Much of the intent and language of the OST mimics the intent of the ATS, as is also seen in the OST's stipulations against any claims of territory either in space or on celestial bodies. In addition, the OST states that governments are responsible for their own actions in space and on other celestial bodies, as well as the actions of their citizenry in that realm, creating a responsibility for compliance as well as ensuring that non-governmental endeavors do not create a loophole for bypassing the intent of the treaty. (UNOOSA 2012g, NP) (US-State Dept 2013, NP)

The articles of the OST reveal not only the scope of the agreement, but also the connections to the ATS:

> 1. The exploration and use of space will be for the benefit of all; space will be open for exploration by all, with all states encouraging international cooperation.
> 2. No claims of sovereignty in any form are allowed in space.
> 3. The exploration and use of space will be undertaken in compliance with the UN Charter, and with the intent of international cooperation.

4. No nuclear weapons or militarization in any form are allowed in space; space will only be used for peaceful purposes.
5. Astronauts are considered envoys of mankind; all astronauts in space will render aid to astronauts of other states in the event of emergency; states will return astronauts to the country of registration in the event of emergency landing on Earth.
6. States are responsible for their activities in space, as well as the actions of any citizens or organizations of their state.
7. States are responsible for any damages resulting from their spacecraft, whether on Earth or in space.
8. States retain ownership of all material and personnel launched into space, whether on Earth or in space.
9. States will conduct activities in space without adversely affecting the activities of other states in space, and without contaminating or adversely affecting the environment of Earth with extraterrestrial material.
10. States will respect requests from other states to observe the flight of space craft, to promote international cooperation in space.
11. States will inform the UN and other states of their activities in space, and the results of those activities to the extent possible.
12. Any installations, equipment, etc. in space are open to inspection by parties of all states.
13-17. Administrative details for carrying out the intent of the OST.
(UNOOSA 2012g, NP) (US-State Dept 2013, NP)

The OST is the primary international treaty of the five that exist to guide the activities of states in space. In addition are the Rescue Agreement (RA), entering force in 1968, and further elaborating on the provisions for rendering aid in articles five and eight of the OST; the Liability Convention (LC), entering force in 1972, and elaborating on elements from article seven of the OST and clarifying that the launching state is responsible for any damage from their actions, both on Earth and in space; the Registration Convention (RC), entering force in 1976, and helping define the method used to make sure that the UN and all states are informed of the actions of a state in space; and the Moon Treaty (MT), entering force in 1984, and in addition to furthering the notion of space as an area of the CHM, it also proposes the beginnings of a natural resource regime for the Moon and other celestial bodies, including an authority to oversee this use. In addition to these are five declarations clarifying the intent of the

treaties, including "The Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries," released in 1996, in which the CHM concept is formalized as a component of international space cooperation. (UNOOSA 1996, NP; 2002, NP; 2012d, NP; 2012f, NP; 2012g, NP; 2012h, NP; 2012i, NP; 2012k, NP)

Of the four treaties that support the OST, the MT provides the most additional information on the exploration and use of celestial bodies and the orbits of these bodies. The MT repeats and expounds upon many of the same issues as the OST, such as the prohibition on any claims of sovereignty on other celestial bodies, the prohibition on militarization and environmental destruction of celestial bodies, and the calls for international cooperation in space exploration and scientific understanding. The MT goes beyond the OST, however, in more directly applying the CHM notion to the moon and other celestial bodies (Article 4), and in allowing for the use of their natural resources, including the creation of an authority to administer the use and sharing of these resources in accordance with CHM principles (Article 11). (UNOOSA 2002, 27-35)

The UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS) was formed in 1958, and made permanent in 1959 in response to the first satellite launches by the U.S. and U.S.S.R. The committee exists to:

> …review the scope of international cooperation in peaceful uses of outer space, to devise programmes in this field to be undertaken under United Nations auspices, to encourage continued research and the dissemination of information on outer space matters, and to study legal problems arising from the exploration of outer space. (UNOOSA 2012b, NP)

The committee meets annually to make recommendations to the UNGA, and is composed of two bodies, the Scientific and Technical subcommittee, and the Legal

subcommittee. UNCOPUOS is one of the larger of the UN committees, with 74 members at present. (UNOOSA 2012b, NP; 2013b, NP)

The UN Office of Outer Space Affairs (UNOOSA) functions as the secretariat for UNCOPUOS. In this capacity, UNOOSA administers the decisions of the UNGA and UNCOPUOS, and serves as a hub for the sharing of space technology in accordance with CHM principles and requirements. Beyond this, UNOOSA:

> …follows legal, scientific and technical developments relating to space activities, technology and applications in order to provide technical information and advice to Member States, international organizations and other United Nations offices. (UNOOSA 2013a, NP)

UNOOSA in essence is the point of contact for all space administrative issues at the international level, and is composed of a Space Applications Section and a Committee Services and Research Section. (UNOOSA 2012a, NP; 2013a, NP)

Summary

International disagreement over the intention and application of Articles 4 and 11 of the Moon Treaty (MT) have led to a lack of support of the treaty by space-faring states to date, although enough non-space-faring states have ratified or acceded to elevate the treaty to in-force status. The remaining issues for resolution are essentially the same as those that were eventually resolved in the third UN Conference on the Law of the Sea (UNCLOS 3) and the 1994 and 1995 Implementation Agreements that led to the nearly universally accepted Law of the Sea Convention (LOSC) package. In order for the LOSC package to be fully accepted, the agreement was changed to allow for commercial operations to mine the seabed, with the International Seabed Authority (ISA) governing this mining and receiving some fee income from the operation, and administering the

sharing of economic and technological benefits. With the LOSC history as a guide, the MT will likely follow a similar evolution as the use of off-planet resources becomes more economically feasible. (UNOOSA 2002, 27-35) (Bini 2010, 496-501) (Churchill and Lowe 1999, 18-24)

The restrictions on claims of territory in space in article two of the Outer Space Treaty (OST) are a challenge that will need to be addressed in future amendments of the OST and MT to create a path toward the preservation of off-planet cultural resources. The precedent for this change exists in the additions to the LOSC package that addressed natural resource use, and included language that required the protection of historic resources on the sea bed, leading to international efforts and the creation of the UNESCO Convention on the Protection of the Underwater Cultural Heritage (CPUCH) to address this heritage, as well as the creation of the ISA to administer the use of natural resources. While two uses are not specifically linked in the LOSC package or in function, in the case of the MT, these two seemingly separate purposes of natural resource use and cultural resource protection would be best housed within the UNOOSA, with a similar system of fee use income from natural resource mining being used to provide services related to CHM principles. Among these services, this fee use income can become the basic financial support for a cultural resource protection regime on the Moon. The idea of incentivization of the protection of cultural resources as a component of other uses was supported by NASA Federal Preservation Officer Jennifer Groman on a call on March 5, 2013, speaking of her own professional opinion, not necessarily that of NASA.

The UN Office of Outer Space Affairs (UNOOSA) is the international point of contact for space issues. As humanity expands into the solar system, UNOOSA is the

likely candidate to house any necessary administrative and regulatory functions, including what will eventually become the lunar/celestial body mining authority. This authority will likely follow the model of the Enterprise of the ISA per the LOSC, and will oversee an immense operation unlike any in existence today. With the impending availability of private space transportation, and the developing plans for Moon use by NASA and other international space agencies as well as private organizations, UNOOSA will become a critical component of the space regime, including perhaps ensuring that cultural resources are avoided and protected.

The influence of the ATS on the creation of the OST shows the interconnected nature of international agreements dealing with areas of common concern. The OST recalls much of the language of the ATS, and indeed follows a very similar model for the creation of a scientific preserve for shared cooperative research. The LOSC similarly influenced the development of the OST, most directly in the application of CHM principles in the MT and the supporting declarations of principle by the UNGA in support of the OST. The LOSC in many ways is the most advanced of the three international agreements, with discussions over the use of the sea having taken place in various forms throughout history. Through the influence of the latest round of negotiations, and the Implementation Agreements that guide the application of the LOSC, this international precedent will continue to direct the evolution of the OST and the MT, continuing the pattern of reciprocal development that has been seen in the three agreements over the last several decades.

Chapter 7: The Cultural Landscape Model

> The cultural landscape is fashioned from a natural landscape by a culture group. Culture is the agent, the natural area is the medium, the cultural landscape the result. (Sauer 1963, 343)

A preservation ethic for off-planet cultural resources requires a conceptual method for the identification, evaluation and management of those resources. The U.S. National Park Service (NPS) defines cultural landscapes as "…a geographic area, including both natural and cultural resources, associated with a historic event, activity, or person." (NPS 1998, NP) UNESCO defines cultural landscapes as the "combined works of nature and of man." (UNESCO WHC 2012b, 47) The cultural landscape model of study is based on the consideration of a variety of factors or elements, referred to as landscape characteristics, to categorize and describe the natural and man-made aspects of an historic site or assemblage of historic resources. The 1998 NPS document A Guide to Cultural Landscape Reports: Contents, Process, and Techniques described the use of landscape characteristics in detail, describing how "[i]ndividually and collectively, the characteristics give a landscape character and aid in understanding its cultural value." (Page et al 1998b, 1) Addressing off-planet resources as a cultural landscape defined by landscape characteristics allows for the consideration of the variety of influences that, taken together, describe each unique assemblage of artifacts both on celestial bodies and in space.

The cultural landscape model has been most elucidated by the NPS, which commissioned guidelines by prominent practitioners of cultural landscape study that

defined methods of identifying, documenting and managing these sites, ultimately leading to the creation of a system of landscape characteristics. Charles Birnbaum documented many of the processes that describe the methods of the NPS cultural landscape model, including editing the The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes, issued by the NPS in 1996, in which the nation's historic preservation treatment standards were translated for more direct applicability to cultural landscapes. Two years later, Robert Page, Cathy Gilbert, and Susan Dolan wrote A Guide to Cultural Landscape Reports: Contents, Process, and Techniques, commissioned by the NPS, a document which describes in detail the cultural landscape model that is used in evaluating NPS sites, based on the evaluation of thirteen landscape characteristics. (Birnbaum and Hughes 2005, 19-36) (Birnbaum and Peters 1996) (Page et al 1998a)

The use of landscape characteristics to describe aspects of cultural resources first appeared as landscape components in the 1984 NPS report Cultural Landscapes: Rural Historic Districts in the National Park System. Ten components were listed in this report, growing to become twelve landscape features by the time the 1987 National Register Bulletin (NRB) 18: How to Evaluate and Nominate Designed Historic Landscapes was issued. These features evolved to become eleven landscape characteristics in 1990's NRB 30: Guidelines for Evaluating and Documenting Rural Historic Landscapes, and were described as seven organizational elements and character defining features in the 1996 document The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes, mentioned above. By the time the previously mentioned A Guide to Cultural Landscape Reports: Contents, Process, and Techniques was produced in

1998, the current list of thirteen landscape characteristics was solidified as the method to be used in the identification, evaluation and management of cultural landscapes. (Page et al 1998b, 2-4)

Landscape characteristics are used to categorically dissect a cultural resource into processes and components that include both the natural and human-made features present at the site now or in the past. Once the features of a historic resource are thus understood, they can be clearly and consistently evaluated, documented and managed, and their context can be understood both at the site under study, and in context with other sites. (Page et al 1998b, 1-6)

A description of the thirteen landscape characteristics that are the basis of the NPS cultural landscape model relays the comprehensiveness of their use in describing a historic resource:

> Natural Systems and Features: Natural aspects that often influence the development and resultant form of a landscape.
>
> Spatial Organization: Arrangement of elements creating the ground, vertical, and overhead planes that define and create spaces.
>
> Land Use: Organization, form, and shape of the landscape in response to land use.
>
> Cultural Traditions: Practices that influence land use, patterns of division, building forms, and the use of materials.
>
> Cluster Arrangement: The location of buildings and structures in the landscape.
>
> Circulation: Spaces, features, and materials that constitute systems of movement.
>
> Topography: Three-dimensional configuration of the landscape surface characterized by features and orientation.
>
> Vegetation: Indigenous or introduced trees, shrubs, vines, ground covers, and herbaceous materials.

> Buildings and Structures: Three-dimensional constructs such as houses, barns, garages, stables, bridges, and memorials.
>
> Views and Vistas: Features that create or allow a range of vision which can be natural or designed and controlled.
>
> Constructed Water Features: The built features and elements that utilize water for aesthetic or utilitarian functions.
>
> Small-Scale Features: Elements that provide detail and diversity combined with function and aesthetics.
>
> Archaeological Sites: Sites containing surface and subsurface remnants related to historic or prehistoric land use. (Page et al 1998a, 53)

These categories can describe individual elements of a historic resource, or groupings of elements, as required to describe the resource.

The use of landscape element categorizations for cultural landscape study is also seen in the heritage regimes of other nations, as well as in recommendations of international organizations. In Canada, eleven elements of a cultural landscape are used to document a site, including:

> Evidence of land use; evidence of traditional practices; land patterns; spatial organization; visual relationships; circulation; ecological features; vegetation; landforms; water features; and built features…. (CHP 2010, 50)

Similarly, the Cultural Landscape Committee of the International Federation of Landscape Architects (IFLA-CLC) recommends a list of 'landscape character-defining features' for documentation when considering a cultural landscape:

> Land Uses, Patterns, Clusters; Natural Systems; Spatial Organization; Visual Relationships; Topography, Surface Drainage; Vegetation; Circulation Systems; Water Features, Natural and Constructed; Non-Habitable Landscape Structures and Buildings; Spatial Character of Habitable Structures; Vocabulary of Site Furnishings and Objects. (IFLA-CLC 2008, NP)

The U.S. NPS, Canadian and IFLA-CLC systems of cultural landscape conceptualization make use of nearly identical break-downs of characteristics.

Summary

Landscape characteristics represent aspects of historic sites that can be applied universally as a method to understand complex historic resources, which makes them applicable to the study of off-planet sites. Some practitioners (Page et al 2009) have included an additional category of "other" in the list of landscape characteristics, so that sites with features that do not necessarily fit these thirteen categories can be fully described. In the case of off-planet resources, this category can be used to describe those aspects of the resource that are unique to space, such as the orbital mechanics that were used to determine the placement of the resource on the celestial body and the route that was flown to place it in its chosen location. With resources that are in orbit, the other category can be used to describe the orbital mechanics that keep the object in its orbit. With this inclusion, the cultural landscape model can be used to cover all aspects of the description of off-planet cultural resources, and can be used as a method for this work.

Application of Model

The following is an existing conditions analysis of the Apollo 11 landing site, based on landscape characteristics.

Natural Systems and Features

The landing site for the Apollo 11 mission was chosen based on five requirements:

> Smoothness: Relatively few craters and boulders
> Approach: No large hills, high cliffs, or deep craters that could cause incorrect altitude signals to the lunar module landing radar
> Propellant Requirements: The least expenditure of spacecraft propellants
> Recycle: Effective launch preparation recycling if the Apollo Saturn V countdown is delayed

Free Return: Within reach of the spacecraft launched on a free-return translunar trajectory
Slope: Less than 2° slope in the approach path and landing site (LPI 2013a, NP)

The 'smoothness' and 'approach' requirements relate to the geologic structure of the Moon, specifically the arrangement of craters, hills or highlands and relatively flat 'seas' on the surface of the Moon. The site that met these criteria was in the Sea of Tranquility, Mare Tranquillitatis, located at 0°41'15" N latitude, 23°26' E longitude. During their approach to the site, Neil Armstrong visually guided the Lunar Module (LM) to a relatively flat site without large boulders, and chose their landing spot based on these features as well as the proximity to a variety of other types of geologic features. (NASA 2012f, NP) The boulders being avoided were ejected from West Crater approximately 400 meters east of the landing site around 100 million years ago. The rock ejected from this crater also makes up most of the samples returned by the astronauts. (NASA 2013c, NP)

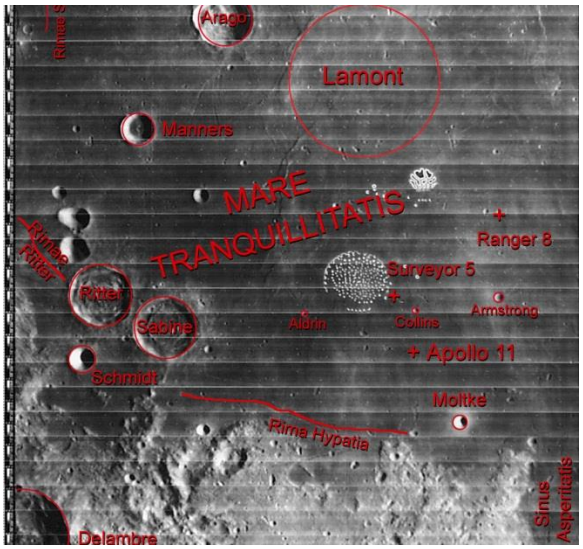

Figure 7.1. Apollo 11 landing site, showing crater, highland and sea features in the area that led to the selection of this site (http://www.lpi.usra.edu/resources/lunar_orbiter/images/aimg/iv_085_h1.jpg)

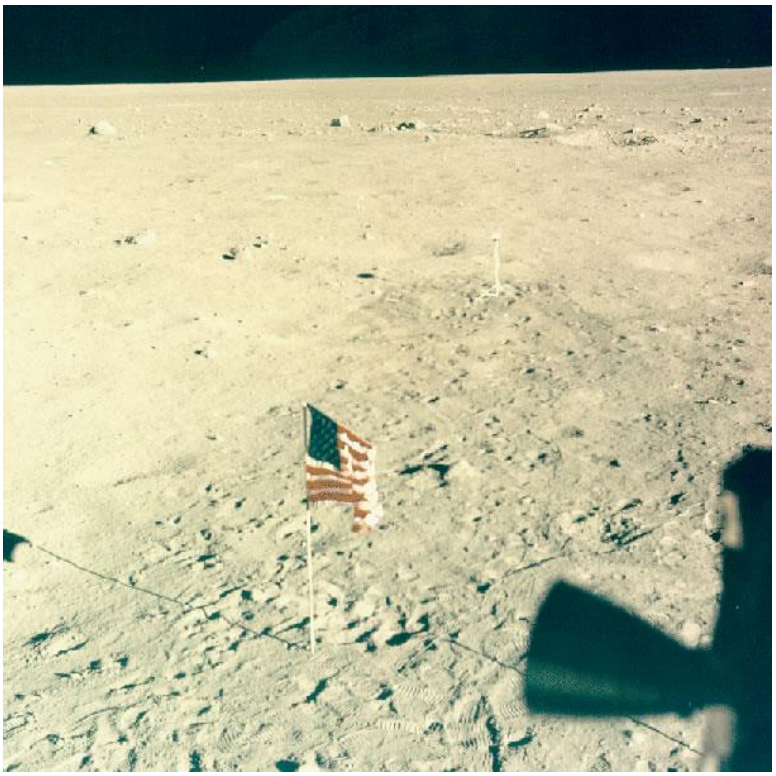

Figure 7.2. Looking north from landing site, showing boulder field that Armstrong navigated around before landing (http://www.lpi.usra.edu/lunar/missions/apollo/apollo_11/images/n_boulders_lg.gif)

Figure 7.3. Image from LM before reaching the landing site, which lies near right center of the photograph. The crater in right foreground measures 23 kilometers in diameter, and is 210 kilometers from Tranquility Base. (http://www.lpi.usra.edu/lunar/missions/apollo/apollo_11/images/approach_lg.gif)

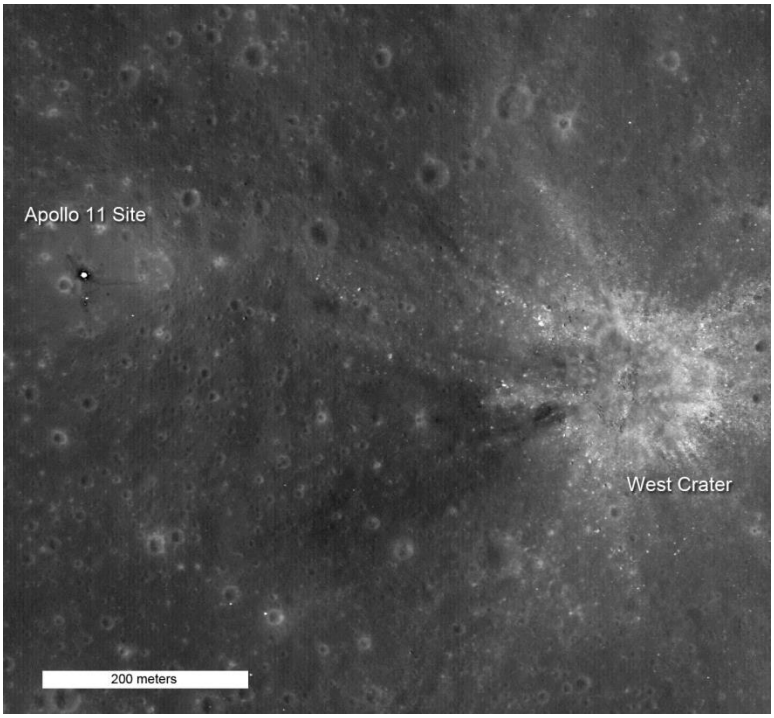

Figure 7.4. West crater, 400 meters east of Tranquility Base, is the source of the boulder field that Armstrong manually navigated around to land the LM (http://lroc.sese.asu.edu/news/uploads/lm_westcrater.png)

Spatial Organization

Activities at Tranquility Base were loosely centered around the LM, with most experiments being set up on the northwest side of the LM, and two being placed on the south. The astronauts explored Little West Crater, approximately 54 meters east of the LM, creating an expansion of the area of the site to the edge of the crater. Highlands exist to the south and west of the site. The overall layout of experiments and areas explored creates an “L” shaped area of direct human interaction that is approximately 50 meters by 75 meters in its largest dimensions.

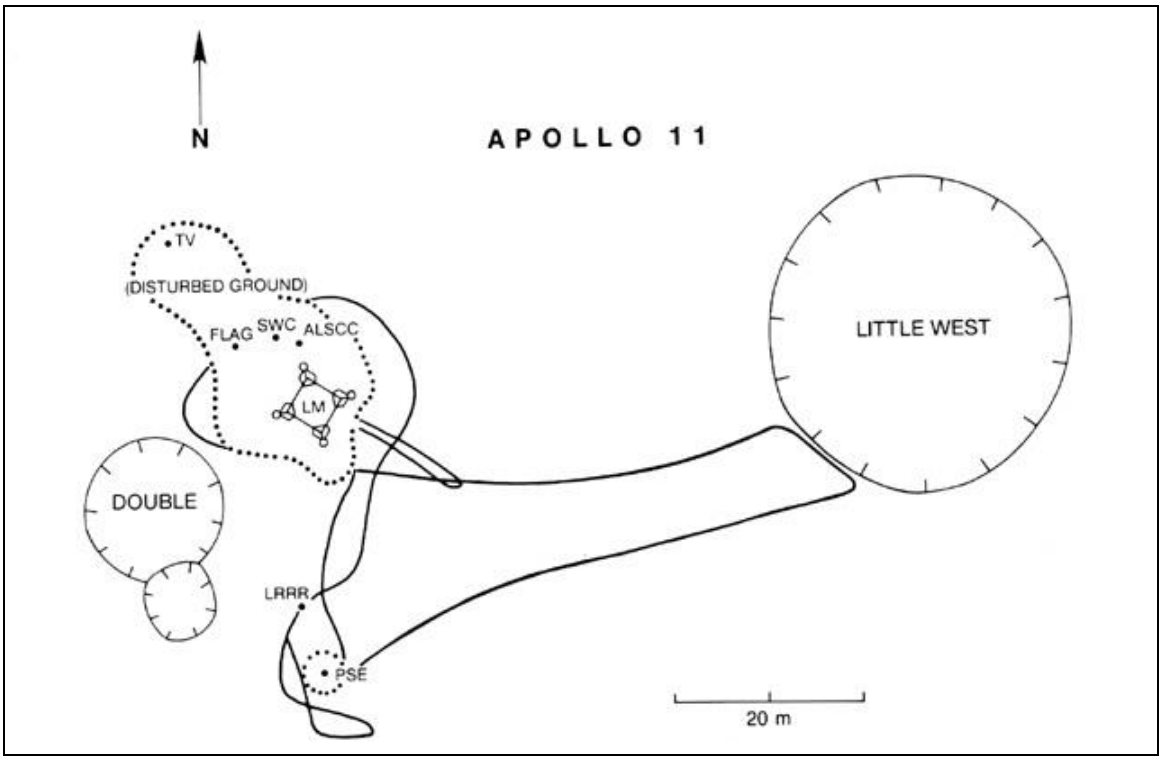

Figure 7.5. Apollo 11 site map showing extent of human-influenced landscape (http://www.lpi.usra.edu/publications/slidesets/apollolanding/ApolloLanding/slide_07.html)

Land Use

No direct human interaction with Tranquility Base has occurred since the landing party of Armstrong and Aldrin departed at 1:54 pm EST on July 21, 1969. (NASA 2012c, NP) The site remains an area of active scientific experimentation however, as the Lunar Ranging Retroreflector (LRR) placed at the site is still in use, providing specific details of the Moon's orbit, as well as the speed with which the Moon is currently moving away from Earth. (LPI 2013a, NP)

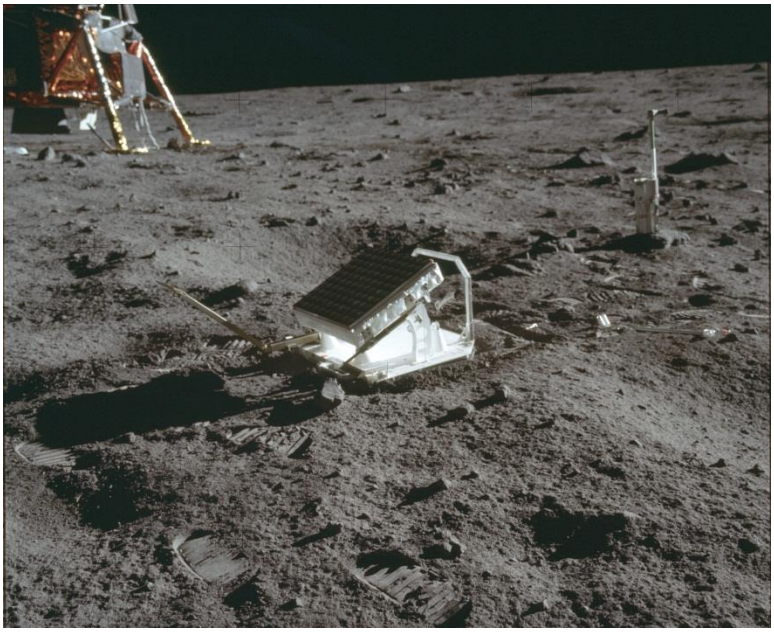

Figure 7.6. The Laser Ranging Retroreflector at Tranquility Base is a functioning scientific experiment (http://www.lpi.usra.edu/resources/apollo/images/print/AS11/40/5952.jpg)

Cluster Arrangement

The scientific experiments at Tranquility Base are arranged in two clusters, one on the northwest side of the LM, and one on the south side of the LM, creating two concentrations of artifacts. The two crater features, Double Crater on the west and Little West Crater on the east, create two other concentrations of activity at the site, as both were approached by the astronauts. (see Figure 7.2)

Circulation

Astronauts Armstrong and Aldrin travelled approximately 250 meters on foot around Tranquility Base, leaving a trail of footprints in the powder-like regolith (lunar soil). (NASA 2012c, NP) This route remains visible as a footpath in the aerial images provided by NASA's Lunar Reconnaissance Orbiter, launched in 2009.

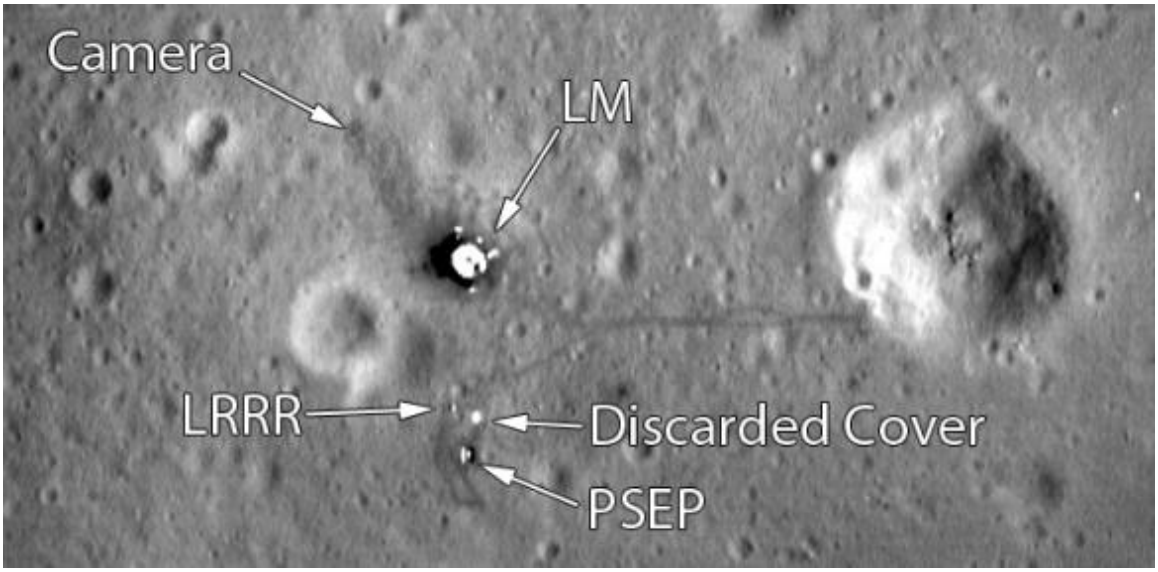

Figure 7.7. Apollo 11 landing site aerial photograph taken by NASA's Lunar Reconnaissance Orbiter sometime between July 11-15, 2009, showing larger artifacts and footpaths (http://www.nasa.gov/images/content/628459main_Apollo_11.jpg)

Topography

The Tranquility Base site is relatively flat, as this was a primary factor in the decision of Armstrong to land at this location. There are three craters that are a part of the immediate site area (see Figure 7.2), two connected craters called Double Crater on the west of the site, and the larger Little West Crater on the east of the site.

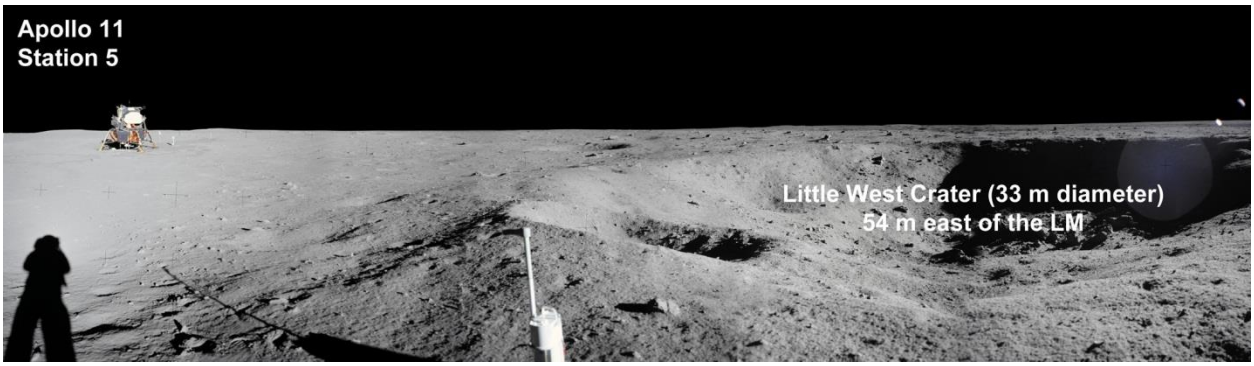

Figure 7.8. Apollo 11 site, looking northwest from Little West Crater, LM at left, showing relative flatness of the terrain outside of the adjacent craters, and distant hills west of the LM. Neil Armstrong's shadow at left (http://www.lpi.usra.edu/resources/apollopanoramas/images/print/annotated/JSC2008e040725.jpg)

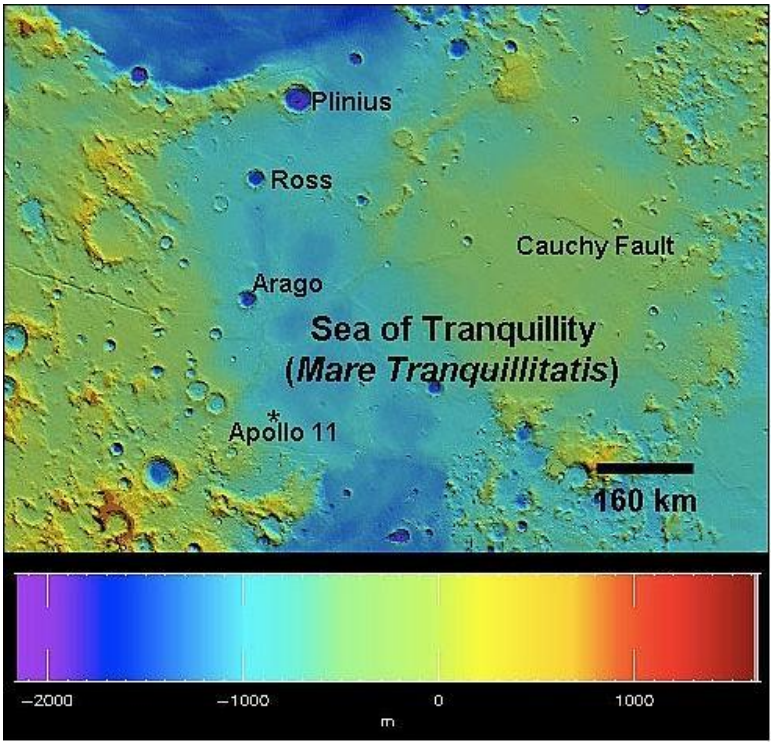

Figure 7.9. Tranquility Base area topography in meters, as measured by NASA's Lunar Reconnaissance Orbiter (https://directory.eoportal.org/image/image_gallery?uuid=02f30b19-cea9-4df5-969f-7d8fb9bb38fe&groupId=163813&t=1349252205306)

Vegetation

The present or former existence of vegetative life at the site is unknown.

Buildings and Structures

The bottom portion, or descent stage, of the LM remains at Tranquility Base. The 3.23 meter tall aluminum base structure sat 1.5 meters above the surface on four legs whose extended diameter at the ground is 9.4 meters. The top portion, or ascent stage, of the LM housed the crew during their time on the Moon, separating from the descent stage upon liftoff to return the crew to the orbiting Command Module (CM) Columbia. The descent stage weighs 2,034 kilograms, and initially held 8,212 kilograms of propellant.

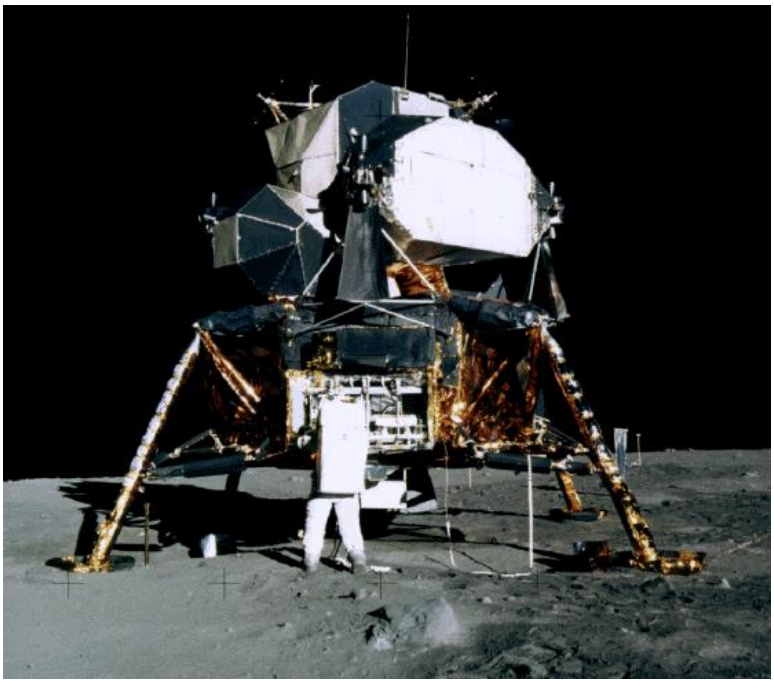

Figure 7.10. Apollo 11 Lunar Module, ascent and descent stages, the lower descent stage remains at Tranquility Base (http://www.lpi.usra.edu/lunar/missions/apollo/apollo_11/images/lm_lg.gif)

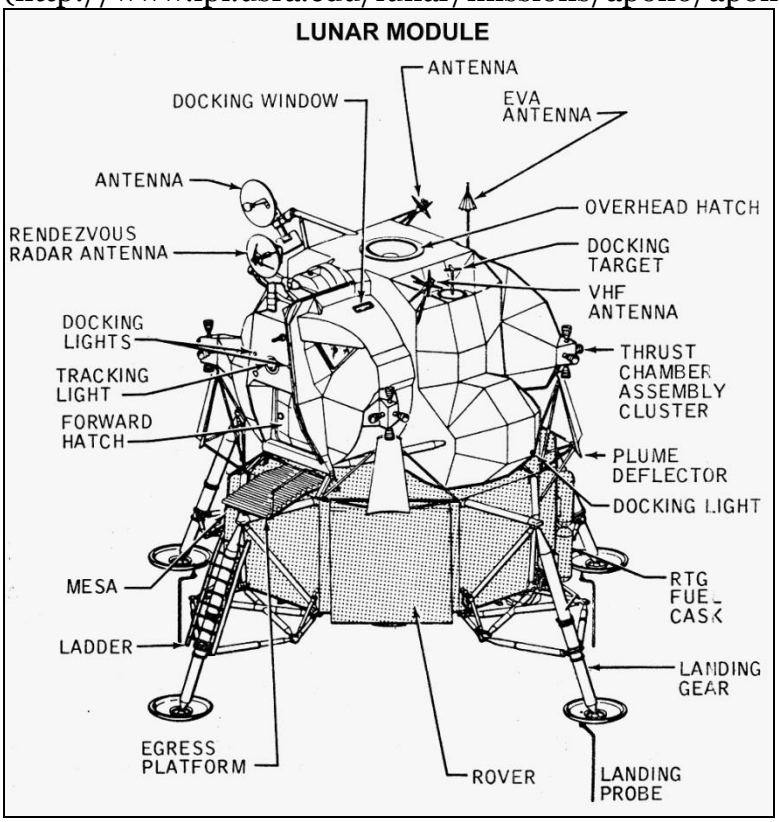

Figure 7.11. Lunar Module diagram, with shaded pattern identifying the descent stage that remains on the Moon (http://nssdc.gsfc.nasa.gov/image/spacecraft/apollo_lm_diagram.gif)

Figure 7.12. Image from Apollo 17 camera, showing separation of ascent and descent stages of the LM upon liftoff. The LM's for all Apollo missions were very similar (http://lroc.sese.asu.edu/news/uploads/A17LEMMomentofLiftoff.png)

Views and Vistas

The views from Tranquility Base in all directions on the surface and out into space are some of the most unique and least seen in all human experience. Bill Anders, an astronaut on the Apollo 8 mission, took the iconic image of the Earth rising above the arc of the Moon that would later be placed on a U.S. Postal Service stamp. (Judd 2012, NP) Anders relayed the significance of that view when he said "[w]e came all this way to explore the moon, and the most important thing is that we discovered the Earth." (Judd 2012, NP) Neil Armstrong, the first human to walk on the Moon and a person known for modesty of speech, relayed the unique qualities of the views on the Moon when he said "I was surprised by the apparent closeness of the horizon," (NASA 2001, 84) and "[i]t's a brilliant surface in that sunlight. The horizon seems quite close to you because the curvature is so much more pronounced than here on earth. It's an interesting place to be. I recommend it." (Millis 2013, NP) Views from Tranquility Base to the horizon reveal

a stark contrast to views on Earth, inspiring astronaut Buzz Aldrin's description of "magnificent desolation" when he first descended the ladder from the LM to the surface, as seen in the NASA transcription of that moment:

> 109:43:08 Aldrin: That's a good (last) step.
> 109:43:10 Armstrong: Yeah. About a 3-footer. (Pause)
> [Buzz jumps back down to the footpad.]
> 109:43:16 Aldrin: Beautiful view!
> 109:43:18 Armstrong: Isn't that something! Magnificent sight out here.
> 109:43:24 Aldrin: Magnificent desolation. (NASA 2012h, NP)

Figure 7.13. 'Earthrise' photograph taken by Bill Anders from Moon orbit on the Apollo 8 mission (http://seattletimes.com/ABPub/2012/11/29/2019792341.jpg)

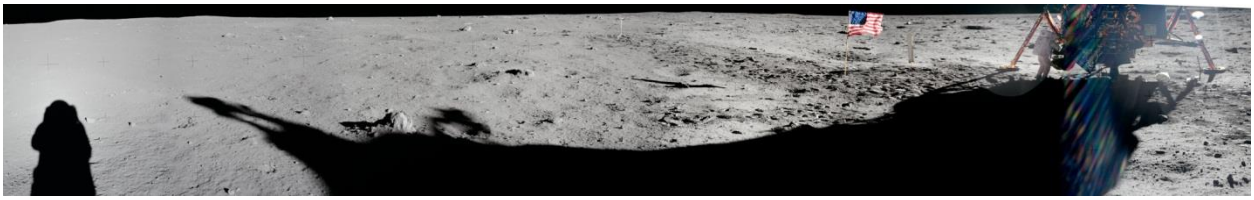

Figure 7.14. Panoramic view from Tranquility Base (http://www.lpi.usra.edu/resources/apollopanoramas/images/print/original/JSC2007e045375.jpg)

Small-Scale Features

The small scale features at Tranquility Base are the items that were planned to be left at the site—such as the flag, the LRR and the solar wind experiment shaft—and the items that were discarded in an effort to lighten the load for liftoff after Armstrong and Aldrin gathered over 21 kilograms of samples, such as their boots, camera lens caps, and food and equipment storage bags. A full listing of the items at Tranquility Base includes the LM descent stage structure, and 105 other artifacts and small-scale features:

1. Apollo 11 Lunar Module Descent Stage (1)
2. U.S. 3' x 5' Flag (1)
3. Laser Ranging Retroreflector (LRRR) (1)
4. Passive Seismic Experiment (PSE) (1)
5. Neil Armstrong's Apollo Portable Life Support System (PLSS), Model A7L (1)
6. Neil Armstrong's Apollo Space Boots, Model A7L (2)
7. Edwin (Buzz) Aldrin Jr.'s Apollo Portable Life Support System (PLSS), Model A7L (1)
8. Edwin (Buzz) Aldrin Jr.'s Apollo Space Boots, Model A7L (2)
9. Empty Food Bags (2+)
10. A Silicon Disc Carrying Statements from Presidents Nixon, Johnson, Kennedy, Eisenhower, and from Leaders of 73 Other Nations. (1)
11. A Gold Replica of an Olive Branch, Traditional Symbol of Peace (1)
12. Mission Patch from Apollo I of Virgil I. Grissom, Edward H. White 11, and Roger B. Chaffee. (1)
13. Commemorative Plaque attached to the Lunar Module Descent Leg. "Here men from the planet Earth first set foot upon the Moon. July 1969, A.D. We came in peace for all mankind." The plaque is signed by the Apollo 11 crew and President Richard M. Nixon. (1)
14. TV Camera (1)
15. Spring Scales (2)
16. Tongs (1)
17. Small Scoop (1)
18. Scongs (1)
19. Bulk Sample Scoop (1)
20. Trenching Tool (1)
21. Camera (Hasselblad El Data) (1)
22. Armrests (4)

23. Mesa Bracket (1)
24. Solar Wind Composition Staff (1)
25. Handle of Contingency Lunar Sample Return Container (1)
26. Medals Commemorating Two Dead Cosmonauts (2)
27. Document Sample Box Seal (1)
28. Storage container (empty) (1)
29. Hasselblad pack (1)
30. Film Magazines (2+)
31. Filter, Polarizing (1)
32. Remote Control Unit (PLSS) (2)
33. Defecation Collection Device (4)
34. Overshoes, Lunar (2)
35. Covers, Pga Gas Connector (2)
36. Kit, Electric waist, Tether (1)
37. Bag Assy, Lunar Equip. conveyor & waist tether (1)
38. Conveyor assy, Lunar Equipment (1)
39. Bag, Deployment, Life line (1)
40. Bag, Deployment, Lunar equipment conveyor (1)
41. Life line, Lt. wt. (1)
42. Tether, Waist, EVA (4)
43. Food Assembly, LM (4 man days) (1)
44. TV subsystem, Lunar (1)
45. Lens, TV wide angle (1)
46. Lens, TV lunar day (1)
47. Cable assembly, TV (100 ft.) (1)
48. Adapter, SRC/OPS (2)
49. Cannister, ECS LIOH (2)
50. Urine collection assembly, small (2)
51. Urine collection assembly, large (2)
52. Bag, Emesis (4)
53. Container assembly, Disposal (1)
54. Filter, oxygen bacterial (1)
55. Container, PLSS Condensate (1)
56. Antenna, S-Band (1)
57. Cable, S-Band antenna (1)
58. Bag, Lunar Equipment Transfer (1)
59. Pallet assembly #1 (1)
60. Central Station (1)
61. Pallet Assembly #2 (1)
62. Primary structure assembly (1)
63. Hammer (1)
64. Gnomon (Excludes mount) (1)
65. Tripod (1)
66. Handle/cable assembly (cord for tv camera) (1)
67. York mesh packing material (1)
68. SWC bag (extra) (1)
69. Core tube bits (2)
70. SRC seal protectors (2)
71. Environmental sample containers "O" rings (2+)
72. Apollo Lunar Surface Close-up Camera (1)
73. Lunar equipment conveyor (1)
74. ECS canister (1)
75. ESC bracket (1)
76. OPS brackets (2+)
77. Left hand side stowage compartment (1)
78. Footprint
79. Extension Handle
80. Stainless steel cover (9 x 7 5/8 inches x 1/16 inch thick)
81. Plastic covering for Flag
82. 8 foot aluminum tube
83. 2 + retaining pins for flag and staff storage
84. Insulating blanket
85. Small aluminum capsule
106+ items left on the lunar surface.

(Lunar Legacy Project 2002b, NP)

These artifacts are the tangible connection to the first moon landing made by Neil Armstrong and Buzz Aldrin, as are the footprints left around the site of Tranquility Base. The trail of footprints around the site remains in place (see Figure 7.7), recording every step made by the astronauts during the EVA.

Figure 7.15. The Apollo 11 flag at Tranquility Base remains, although likely blown down upon liftoff
(http://www.lpi.usra.edu/resources/apollo/images/print/AS11/37/5544.jpg)

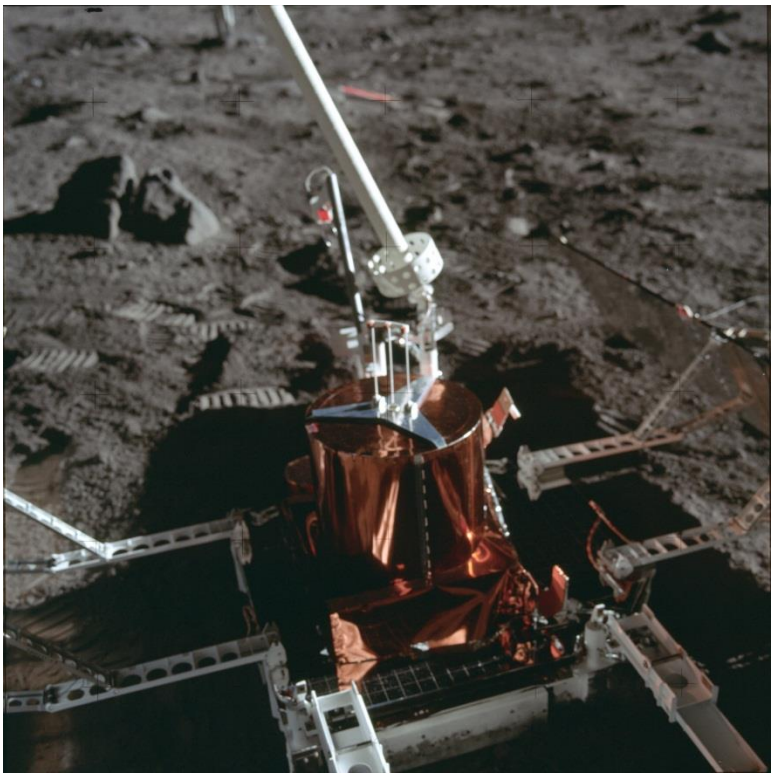

Figure 7.16. Seismic experiment equipment remaining at Tranquility Base (http://www.lpi.usra.edu/resources/apollo/images/print/AS11/40/5953.jpg)

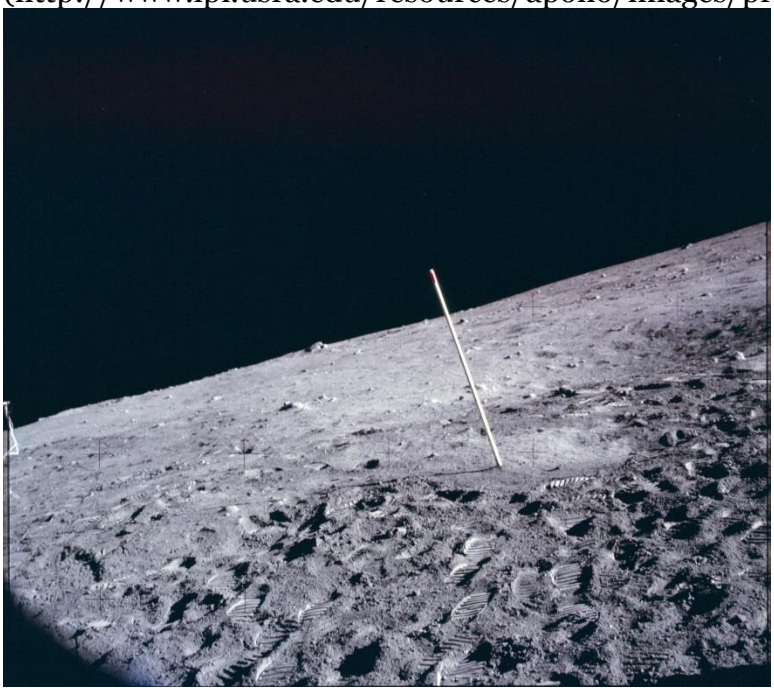

Figure 7.17 Solar wind experiment staff that remains at Tranquility Base (http://www.lpi.usra.edu/resources/apollo/images/print/AS11/40/5968.jpg)

Figure 7.18. Commemorative plaque remains on the LM descent stage at Tranquility Base (http://www.lpi.usra.edu/resources/apollo/images/print/AS11/40/5899.jpg)

Figure 7.19. Footprints remain at Tranquility Base
(http://www.lpi.usra.edu/resources/apollo/images/print/AS11/40/5951.jpg)

Figure 7.20. Detail of footprint
(http://www.lpi.usra.edu/resources/apollo/frame/?AS12-57-8447A)

Archaeological Sites

The entirety of Tranquility Base may be considered a site for archaeological exploration of the historic human event of the Apollo landing. The existence of sites of archaeological interest prior to human visitation has not yet been determined.

Chapter 8: Toward an Ethic

> In terms of the preservation of artifacts on the moon, I hope Neil's [Armstrong] passing will raise the priority in everyone's mind the need to preserve this critically significant history…
> —Roger Launius, Senior Curator, Smithsonian National Air and Space Museum, Division of Space History (David 2012, NP)

The term ethic or ethics is defined as "…judgments as to righteousness or wrongness…" in the traditional philosophical sense, and is also seen as a way of "…establishing or recommending certain courses of action, ends, or ways of life as to be taken or pursued…" (Runes 1960, 98) It is this latter version of ethic that applies in the definition of a preservation ethic for off-planet resources in this thesis, with the intention being the creation of a series of actions that taken together create a strategy that moves toward a plausible plan for the identification, evaluation and management of these cultural resources that reside somewhere other than on planet Earth.

The main challenge to overcome in the preservation of off-planet cultural resources is the lack of a direct legal course that leads to the ability to recognize the resources within the established national preservation regime in the U.S., and the established international preservation regime via UNESCO and the WHL, due to a restriction on claims of territory in space and on celestial bodies. To create an ethic of preservation for off-planet resources, a legal avenue must be created to address this challenge.

This legal avenue must have broad support not only in its application, but also to engender its creation. This was seen in the creation and passage of the NHPA in the

U.S., with grassroots movements led by activists who understood the value of cultural heritage to the population. These movements began when people saw threats to the built resources that represent that heritage and the story of place, perhaps most evident in the creation of the Mount Vernon Ladies Association of the Union to protect and advocate for the long-term survival of the home of America's first president. The movement grew and a cultural impetus for preservation was created, leading to the creation of the National Trust for Historic Preservation (NTHP) in 1949 and the passage of the NHPA in 1966. This cultural impetus pushed the development of the laws that enabled preservation, as well as the national interest and understanding of the need for preservation so that the movement was embraced as more than a congressional mandate.

A similar movement on a global scale led to the creation of the World Heritage Convention (WHC), when in 1959 people around the world realized that the creation of Aswan High Dam in Egypt was going to inundate and likely destroy the ancient Abu Simbel Temples. The WHC was created by UNESCO and ICOMOS in 1972 in large part due to the international cultural movement that ultimately resulted in the relocation of these temples. (UNESCO WHC 2013b, NP) More recently, the international outcry over the destruction of the Bamiyan Buddha statues in Afghanistan by the Taliban in 2001 brought together people from a variety of backgrounds and nationalities who expressed unified rage at this 'cultural war-crime' and sought ways to strengthen heritage protection. (Rashid 2001, NP) To create an ethic of preservation for off-planet resources, a cultural impetus must exist.

Once the NHPA was passed there was an immediate need for the creation of methods to follow to carry out the intentions of the law. The NHPA included basic

directions to guide preservationists, but also left many points to be worked out between the Secretary of the Interior and "…national historic and archaeological associations…" (NHPA 1980) among others. The methods have evolved over the years, and guidelines have been created by the NPS and other organizations that practitioners follow that have established and standardized the process of cultural resource identification, evaluation and management. To create an ethic of preservation for off-planet resources, a philosophical and technical method for addressing these resources must exist.

Thus the ethic takes shape. As a formula, the Preservation Ethic = Legal Avenue + Cultural Impetus + Method. In mathematical terminology, the components of an additive equation are referred to as addends, and the commutative property applies, such that changing the order of the addends does not change the result. The same applies to this preservation ethic; all three addends depend upon and relate to each other equally for the creation of a successful strategy to preserve off-planet cultural resources.

Addend 1 - Legal Avenue

The restrictions currently in place that prohibit claiming territory on the moon and other celestial bodies must be addressed to make the preservation of off-planet cultural resources an achievable goal. Currently no nation, or citizen or organization of a nation, may lay claim to or sovereignty over any territory off of planet Earth, per the stipulations of the OST and MT. In the U.S., the precedent set to date is that a state must be able to call an area their own to nominate a cultural resource to the National Register of Historic Places (NR) and as a National Historic Landmark (NHL). Similarly the World Heritage List (WHL) nomination process requires that a member state of the

U.N. be able to claim sovereignty over an area at least to the level that some protections are enacted in order to place a cultural resource on the WHL. Additionally, the *Operational Guidelines for the Implementation of the World Heritage Convention* includes language in paragraph 15.a that includes the descriptor "…cultural and natural heritage found within their territory…" (UNESCO 2012b, 13) in relation to the duties of state. (NHPA 1980, NP)

This is a significant hindrance, at least in the U.S. and with regard to the Apollo landing sites. In 2000, in response to requests from O'Leary's Lunar Legacy Project, NASA Deputy General Counsel Robert Stephens clarified the position of the agency on the legality of declarations of NHL listings in space, which resulted in a statement by the Keeper of the NR Carol Shull that correspondingly implies a lack of territorial jurisdiction:

> I must inform you that we cannot support your proposal to have Tranquility Base declared a [NHL]. The Treaty [OST] declares that there can be no claims of sovereignty or territory by nations over locations in space…The listing of lunar areas as NHL's is likely to be perceived by the international community as a claim over the Moon.
> – Robert Stephens (O'Leary 2009b, 775)

> Tranquility Base meets all eligibility criteria for a [NHL] under US federal preservation law, but when queried relevant preservation authorities stated that taking steps to preserve it would be perceived as a US claim of sovereignty over the Moon and they do not consider the US government to have sufficient jurisdiction…nor consider it appropriate… – Robert Stephens (Launius 2010, NP)

> It has been determined as a matter of policy that it would not be appropriate to designate [NHL's] on the Moon. Even if, as a matter of policy, we did not consider it inappropriate to nominate Landmarks on the Moon, we do not consider that we have sufficient jurisdiction and authority over the land mass of the Moon to exercise our nominating authority over resources on the Moon. – Carol Shull (O'Leary 2009b, 775)

This is a matter of perception, but the fact remains that the perception of claiming territory in space by placing objects in space on the NR is the limiting factor. This was

confirmed on a call with Ms. Shull on February 26, 2013, when she confirmed that the U.S. process as it exists today is not the right model or vehicle for addressing this heritage; rather, an international approach must be agreed upon to overcome the issues related to ownership of territory. Similarly, on a call with NASA Federal Preservation Officer Jennifer Groman on March 5, 2013, the issue of jurisdiction arose; artifacts physically located outside of the U.S. are outside of the purview of our federal preservation regime.

The fear of giving the appearance of violating the intent of the OST or the MT is keeping these unique and irreplaceable cultural resources off of the resource recognition and protection radar, at least in the U.S. A change to the international treaties is required so that off-planet heritage recognition can become a reality, and as was seen in the last negotiations of the LOSC package, these changes are entirely achievable. In the case of the LOSC, the negotiations over mineral resources created an environment that allowed for international agreement over the limited use of the international commons by organizations under control of the state and an international authority that was created for that purpose, as well as to ensure compliance with CHM principles. Similarly, article eleven of the MT calls for the use of natural resources on the Moon under the control of the state and an international authority that will be created for that purpose, as well as to ensure compliance with CHM principles. Once natural resource extraction on the Moon becomes economically viable, as happened with the seabed, this will create a similar environment for new negotiations based on the OST and MT. These negotiations must include similar accommodations for limited ownership of cultural resources.

There is a need for a way to address the ban on claims of territory in the OST, and by extension the MT; to meet this challenge the existing treaties must be altered to allow for some small claims of heritage area territory. A simple addition to the OST that allows for claims of territory upon which rest artifacts of historic significance would allow states in the U.S. to nominate sites off-planet to the NR or as a NHL, and would allow member-states of the U.N. to list these sites on their respective national cultural registers, as well as allowing member states worldwide to nominate these sites for listing on the WHL. These claims would be administered in the same way that scientific sites in Antarctica are today, and as per article 12 of the OST, with inspections freely allowed by all member-states so that the purpose of heritage protection, and only heritage protection, is furthered at these sites. An agency housed within the UNOOSA would be created to serve as an administrator for these sites, handling all aspects of heritage territory claims, and would be a base for UN inspectors who regularly monitor these heritage sites to ensure compliance with all treaties, similar to Castro's Lunar Heritage Agency. (Castro 2012) A plan could be put in place that allowed for long-term leases of portions of celestial bodies, similar to Shackelford's plan for the use of natural resources, as opposed to simple and seemingly eternal ownership. (Shackelford 2009) This renewable system would allow for member-states of the U.N. to claim heritage areas for a designated period of time, during which their activities and actions would be reviewed periodically for compliance with all treaties, and claims would be revoked if non-compliance were confirmed.

Legal Avenue Summary

The first component of the three-part ethic is therefore achievable by addressing the ownership issues in the OST and MT. A model for this kind of treaty amendment exists in the LOSC example, in which an authority was created to oversee the use of an area of the international commons. The MT calls for the creation of a similar authority, and negotiations over the language of the MT (Bini 2010) are on-going, in many ways similar to the process that led to the approval of the LOSC package. As has been seen in the ATS, the OST, and the LOSC, these agreements tend to follow the precedent set by one another. The MT, as a component of the OST, will need to continue this evolution to enable the preservation of off-planet cultural resources.

Addend 2 - Cultural Impetus

The second component of the three-part ethic for the preservation of off-planet cultural resources, an interest shared by many people so that the movement to preserve these resources has active participants, is a much more nebulous issue to analyze, but is quite apparent. One measure can be seen in the interest of those who have developed the preservation regimes in place today in the U.S. and internationally. Professor W. Brown Morton, former chair of the US ICOMOS committee, indicated his interest in this topic on a call on February 26, 2013, and stated the need to engage the public and practitioners with compelling information that makes the need for this preservation apparent. Another measure of this interest is the quantity of literature and activity surrounding space archaeology and preservation. When the popular interest seen in newspaper and magazine coverage is added to the materials covered in chapter two of this thesis, the international academic, professional and personal interests in space

preservation become clear, and the movement is seen to have widespread support similar to that seen in the build-up to the creation of the NTHP and the passage of the NHPA, and the creation of the WHC.

The interest in this movement is generally focused on Tranquility Base, and is succinctly explained by Buzz Aldrin, who believes that "…appropriate measures should be taken not to disrupt the historic nature of Tranquility Base." (Donaldson 2012, 2) Tranquility Base is the face of the movement, and the logical beginning point, just as Mount Vernon was for the Ladies Association mentioned above. Tranquility Base was the reason for the creation of the Lunar Legacy Project, as well as the listing of objects on the state registers of California and New Mexico. (O'Leary 2009b, 757-780) NASA's Recommendations to Space Faring Entities grew from concerns about Tranquility Base raised by teams competing for the Google X Prize, as did the Handbook of Space Engineering, Archaeology, and Heritage. Additionally, articles discussing the preservation of Tranquility Base and celebrating the state register listing of Tranquility Base artifacts by California and New Mexico have been written for periodicals ranging from archaeological and preservation interests (Donaldson 2010) (Capelotti 2004), to space interests (David 2012) (Launius 2012), to general newspapers and magazines including the New York Times (Chang 2012) and USA Today, (Vergano 2011) and Smithsonian magazine. (Milstein 2008) The cultural push for the preservation of cultural resources in space is strong; the movement has its Mount Vernon in the artifacts remaining at Tranquility Base.

Addend 3 – Method

The historiography of cultural landscape study, in the U.S. and internationally, reveals a strategy of taking appropriate methodology from the body of heritage study in general, and further modifying and making appendices to that methodology to address particulars of the landscape. This can be seen in the development of NPS guideline documents on cultural landscapes that have evolved over the years for more direct applicability to landscapes. (as in Birnbaum and Peters 1996) The study of space heritage will require this same adjusting, appending, and codifying to some extent, but in large part the framework for this study is apparent in the NPS cultural landscape model.

In *The Cultural Landscape of Interstellar Space* and *Cultural Landscape of Space,* Gorman argues for the cultural landscape conceptualization, although her focus is on issues of emerging heritage in archaeological study. She appropriately describes the interconnectedness of sites on Earth, in orbit, on other celestial bodies and beyond as being a part of one human "landscape" in terms of heritage studies, and proposes the cultural landscape conceptualization for this heritage.

The distinction that moves this discussion of space heritage from the conceptualization as 'a cultural landscape' to the 'cultural landscape model' as a method is the use of landscape characteristics as a method of identification, evaluation, and management of these resources in space. When Gorman's three aspects of space heritage—space landscapes on Earth, landscapes in orbit or on other celestial bodies, and areas beyond our solar system— (Gorman 2005, 88) are used as a locational descriptors, the applicability of the landscape characteristics approach to describe the heritage value of cultural resources in any realm of space is evident. Additionally,

landscape characteristics can be used to describe resources whether operating within the U.S. preservation regime leading to listing on the NR or as a NHL, or within the regime of any other nation wishing to nominate sites to the WHL. The use of landscape characteristics was seen as a viable method, as long as an appropriate international focus is maintained, in correspondence received from Dr. Eric MacDonald on February 22, 2013. The Canadian heritage system recommends the use of similar landscape characteristics, as does the Cultural Landscape Committee of the International Federation of Landscape Architects, showing international support for this conceptual model of landscape. A hybrid system whereby landscape characteristics create the basic matrix for the consideration of off-planet cultural resources is the final component of the preservation ethic formula.

Preservation Ethic = Legal Avenue + Cultural Impetus + Method

The preservation ethic for off-planet cultural heritage is based on three components; a legal avenue to preservation that addresses the issues of territorial sovereignty that prevent recognition of off-planet sites today; a cultural impetus that drives the movement to preserve these aspects of our cultural heritage; and a philosophical and technical method for the consideration of this cultural heritage. A strategy to achieve each of these three goals is presented herein, with the intention of raising the issue to the status of other preservation concerns with which we as cultural resource managers concern ourselves. The benefits gained from efforts to understand the story of our history are not limited by the geographic location of that history.

Chapter 9: Conclusion

> Stakeholders decide what makes the place significant to their community. That significance can be at odds with traditional definitions of heritage significance.
> —Gustavo Araoz, from lecture at UGA on October 21, 2010

This thesis explores one aspect of life in a space-faring civilization. In less than one generation humanity has progressed from launching small spherical 'baby-moon' novelty satellites to exploring the edges of our solar system and the launch of missions to the Moon and Earth orbit by private space companies. A generation from now it is entirely likely that humans will be living and working off planet, and advances in propulsion and understanding of the nature of space-time will certainly create the expansion of the human cultural landscape to parts of the galaxy far beyond humanity's current ventures to the edge of the home star's planetary system. Technologically, physically and culturally we will be citizens of a larger cosmos. In many ways this seems strange and foreign, but when one considers the way that the cosmos is incorporated as a part of life by cultures that predate modern society, it is in actuality within the shared experience of humanity to consider existence that has the surface of the Earth as one part of a more comprehensive human cultural landscape.

The identification, evaluation and management of the varied and overlapping values embodied in cultural heritage will continue to be the task of cultural resource managers, as it is today. That heritage may be embodied in a lunar footprint from some of humanity's earliest visitation, or an orbiting satellite that speaks to the dawn of the expansion of global communications, or it may be the intangible connection of a site on

earth to Tranquility Base on the moon through the shared memory of the technicians who assembled the antennae array. There may be one set of values to manage in which the technological prowess and heroic exploration efforts of society are seen in a lunar base, and another set that sees the human suffering of tens of thousands of concentration camp forced laborers who died in the development of V2 rockets that brought about the ability for humans to leave the Earth. The work of cultural resource managers to tell the stories will exist, just as it does today.

This is unlike any such program humanity has yet attempted, and while parallels to terrestrial preservation regimes are clear, a successful lunar and outer space program will require a more substantial agreement between space-faring nations for the management of these resources, as well as an agreement between space-faring nations and those who have yet to reach this state of development for the equitable sharing of the decision-making and management of this aspect of heritage.

Future Research

Several areas for further study present themselves in the development of this ethic. One area is the details of the new body within UNOOSA that will administer natural resource use and cultural resource management on the Moon and on other celestial bodies. The Enterprise created to administer and oversee mining operations and the sharing of information and benefits within the International Seabed Authority is a model for this new body within UNOOSA, although the Enterprise is a somewhat new venture that will need to be refined as issues arise over time. The new authority for space natural and cultural resource management will require a system that oversees the extraction and use of natural resources, including where and how they are extracted,

how they are transported and how the natural environment of the Moon and other celestial bodies is protected during the process, as well as a system that makes the protection of cultural resources a component of this natural resource use. This could take the form of a fund for cultural resource management that natural resource operations support through licensing fees or taxation, which in turn is used to finance the work of off-planet cultural resource managers. For mining operations to begin on the Moon, for example, some form of long-term claim of an area is required. A system could be put into place that requires licensing fees for this territory, creating the necessary funds for oversight of natural resource extraction and protection of cultural resources. This system could also cover the protection of places of natural beauty and uniqueness on other celestial bodies, including the surveys necessary to find and document these places. The overall goal of incentivizing protections and management as a component of natural resource extraction and use requires further study.

Space tourism will likely become a threat to cultural resources in a similar manner as natural resource extraction. The new authority created within UNOOSA for natural and cultural resource management seems the likely body to oversee this use of celestial bodies as well, with a similar use of licensing fees or taxation to fund its operations.

The Outer Space Treaty has been a successful international agreement because the member states have upheld their obligations and abided by the tenets of the treaty. Once humanity establishes a long-term presence off-planet, it may become more difficult to ensure treaty adherence. As people spend more time on the Moon, for example, there will likely be the need for some enforcement of United Nations treaties and agreements. In this case, one misstep by a miner exploring on a day away from work

or a tourist on a solo hike could destroy the first footprint of Neil Armstrong on the Moon. One overzealous application of explosives to access a vein of ore could cause irreparable damage to the equipment remaining at any of the six Apollo landing sites. The need for enforcement of UN treaties and agreements in remote locations such as on the Moon may require a permanent human presence on the Moon, either in person or through a digital intermediary in some fashion. This requires further study.

The use of the cultural landscape model for the evaluation, documentation and management of off-planet cultural resources requires some modification so that scientific access to—and examination of—the artifacts remaining at sites on the Moon and other celestial bodies is maintained, even as these objects are managed as cultural resources. One potential component of this scientific use will be the need to allow for natural deterioration of some or all of the cultural resources, as exposure to the environment of space, the Moon and other celestial bodies is a part of the scientific study that will be conducted. This can be compared to the change over time that is a management objective of terrestrial cultural landscapes, whether through vegetative lifecycles or changing uses of active landscapes. Appropriate use will be a management objective and challenge for these resources, and the development of a model for the management of cultural landscapes that are active scientific research sites is a subject for future study.

The further development of the 'ethic' presented herein presents a unique opportunity for cultural resource managers, a *tabula rasa* for the creation of a system of heritage management prior to the immediate threat of loss or damage to a specific type of cultural resource. The management of cultural resources thus far has been a reactionary measure in response to impending alteration or destruction of aspects of the

built and natural environment that contribute to the story or spirit of a place. Humanity is at the beginning of the commercial space age. The first supply trip to the orbiting International Space Station by a private space flight company was completed during the writing of this thesis. The ability of private industry to reach the Moon and other celestial bodies will be achieved in the coming few years. Cultural resource managers have an unparalleled opportunity, before immediate threats to sites such as Tranquility Base are realized, to develop a system that does more than react to threats to aspects of cultural heritage. This is perhaps the primary goal for future research in the management of off-planet cultural resources.

The development of this new system of heritage management will not only enable the preservation of off-planet aspects of cultural heritage, it will also serve as a point of comparison for the evaluation of terrestrial systems now in place, providing an opportunity for critical analysis of cultural heritage regimes that have developed over time, generally in response to pressing threats. The focus on traditional cultural heritage management issues can be fine-tuned by expanding the field of vision to include aspects of heritage that have thus far existed in the edges of perception. As the first views of Earth from orbit and the Moon changed humanity's understanding of the fragility and interconnectedness of the home planet, so too can the first efforts toward protecting off-planet cultural heritage positively impact the understanding of cultural heritage management as it currently exists on Earth, leading to a more informed and comprehensive way to tell the story.

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