

April 2021

Reflective Essay for MARS: A SECOND HOME

The project our team is submitting for the Hannon Library Undergraduate Research Award 2021 is a group class assignment for the First Year Seminar: Becoming a Multi-planetary Species instructed by Prof. Claire Leon and Michael Noltemeyer. The purpose was to use our knowledge on the challenges of the space environment and space travel, and conduct research in the field of space exploration in order to create an original space mission of our own design.

Our strategy to a successful research project was clear to us from the start: brainstorm ideas for space missions, set specific mission goals, conduct pre-liminary research on the topic, create a structure to divide up various critical aspects for research (later becoming phases and sub-chapters in our report), distribute the tasks to the team according to the interests and strengths of the group members, regularly meet and update each other on research and writing progress, peer-review each other's work and provide feedback before presenting.

The final space mission proposals were to be pitched to the rest of students and faculty in the form of presentations delivered in-class. However, due to the outbreak of COVID-19, the campus had to close back in March 2020, and we proceeded with working remotely.

The pandemic however, did not stop our research efforts, nor did it stop us from coming together as a team to produce an in-depth report for a full space program to colonize Mars. Like astronauts on a mission ourselves, scattered around the globe, we had to remain cool-headed and swiftly adapt to the circumstances at hand.

Using access to the library resources virtually, we continued doing research online as an international student team, connecting across time zones. We met weekly on Zoom meetings to discuss our research findings and shared them on a Padlet (this helped to lay out our research and make connections between sources to organize our paper) as well as Google documents. Whenever we required access to a book or troubleshoot on how to gain access to academic journals using LMU credentials, the librarian was always fast to respond to our queries on the chat 24/7.

During the time of the pandemic, we primarily relied on JSTOR and OneSearch+ for finding peer reviewed journal articles and publications. This offered a fast gateway to scholarly research on topics that directly related to aspects of our space mission. During the research process, we would also look at the authors behind the articles and how much a specific paper was already cited in other academic publications in order to verify its credibility. When we came upon unfamiliar topics (such as use of Hoffman transfer orbits to optimize travel costs), we cross-checked source information with other sources where possible.

For our report, we needed an optimal balance of contemporary sources that would focus on available space technologies, together with theoretical and sometimes purely hypothetical solutions. To inspire some of the elements in our space program, we turned to 3D renderings and digital artworks to illustrate our research. Sometimes, online queries into databases of science-fiction artist portfolios turned into hints at possible technologies that spiked our interest. This would consequently lead us to consider the portrayed sci-fi technology, and look for more concrete studies undertaken by scientists, engineers or architects from the field (as is the case for example, with the planetary magnetic dipole research paper cited in Phase 3 of our report).

When discussing our findings, we often had to tackle conflicting approaches to developing a space program and colonizing Mars: Is it more feasible to land in Hebrus Valles, Arcadia Planitia

or Jezero Crater? Should we have over-ground or under-ground habitat structures to protect crew from radiation? Sometimes we settled the discussion by weighing out the pros and cons of either option, or pulled in more research. At other times, we decided to go with research that had a more reputable source (we decided to rely on space agency papers that directly referred to their primary source instrument data as much as it was possible). Prior to submitting our research, we also discussed our ideas with a specialist in the field. This happened to be our professor, Claire Leon, who has spent her life in the aerospace industry, and worked at the U.S. Airforce as the Director of the Launch Enterprise Directorate, Space and Missile Systems Center, Air Force Space Command as well as Los Angeles Air Force Base, and also at Boeing as the Vice President of Navigation and Communications Systems. Her feedback on our research kept us on track with the mission-critical elements to focus on, as well as provided suggestions and personal insight on the latest solutions we could study further to tackle the challenges of our space program. Whilst our goal to colonize Mars remained the same throughout our research process, the solutions that we incorporated to get there adapted as new research came in.

Researching about becoming a multi-planetary species gained on significant meaning as we were all on lockdown during the pandemic. With support from our professors, virtual access to the library at our disposal, and librarians always ready to assist, the research process went very smoothly. Together with my team, we practiced skills in efficient communication and collaboration, and learned to manage a relatively large research endeavor by breaking it up into smaller constituents. This approach ensured that we maintained both adequate depth and scope throughout our mission report. The skills we have gained through this project continue to inform our research practices today, and we fondly look back at our time developing the space program.