

HONR 289V: Exploring Mars Spring 2019



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Office Hours: Drop
by Anytime!

Class Webpage: <http://www.astro.umd.edu/~hamilton/HONR>

HONR289V Course Description

We live at an exciting time for planetary exploration. Our robotic spacecraft have journeyed to all of the planets and to a number of asteroids and comets as well. Our probes have orbited other planets, dipped into their atmospheres, and driven across alien landscapes. We have brought samples back from the Moon and from nearby asteroids. Humans have safely traveled in space for half a century and have walked and driven on the surface of the Moon. As our nearest potentially habitable planetary neighbor, Mars has been a prominent target for the full history of space exploration, and its importance only increases when we contemplate the potential for future human visits. This course will address big questions in Mars exploration. What have we learned from the past 50 years of spacecraft visits? What is the proper balance between robotic and human exploration today, and for the next decades? And finally, what long term Mars exploration goals should our society be working toward?

This subject lies at the intersection of many areas of human endeavor. On the one hand, science discoveries refocus our attention in new directions, inform engineering design, and allow for ever more capable space vehicles. Policy decisions, fiscal realities, and international collaborations and rivalries interact in complicated ways to affect what we actually choose to do as a society. In HONR289V, we will explore these important issues by first tracing the history of Mars exploration over time, understanding its costs, benefits, and the forces that drive it forward. We will then look at mission plans

for the near future, the next twenty years or so, to get a sense of where we are headed. Are we headed in the right direction? If not, what can be done to change the direction? Finally, we will consider what Mars exploration might look like over your lifetimes. Should the ultimate goal of our exploration program be human visitations, a permanently manned base, or full colonization?

I have several objectives in teaching HONR289V. First, I want you all to gain a greater appreciation of the exciting history of the unmanned Mars program. Along the way, we will learn a great deal about Mars as a planet, and the basics of spaceflight. We will relive the glorious successes of the past and see some spectacular failures. Space flight is inherently dangerous and not for the faint of heart! Second, building on a solid understanding of the fundamentals, I would like you to form informed opinions on a number of Mars exploration issues. What should be our near and long term priorities? There are many differing opinions on these question and no single path forward. You will get the chance to discuss your opinions openly with others who may disagree with you. Through discussion and debate, I would like you to come to consensus on some of the simpler questions, and to paint a clear picture with both pros and cons for the more complicated issues. Once we have as a firm a grasp of the issues involved as possible, we attempt to chart our own vision for our Mars exploration policy. This is our overall goal as a class.

Assignments and Grading

Student evaluation will be based on participation in animated discussions, debates, a group project, short quizzes, reading responses, and midterm and final exams.

- **Quizzes:** There will be several quizzes to test your knowledge of the reading and topics covered in class. We will have a practice quiz question in class before the quizzes start, and I will also warn you in advance of the first quiz. Subsequent quizzes, however, will be unannounced.
- **Reading Responses:** Each week, you will submit a 1-page summary of i) your reaction to the week's reading ii) your investigation of a related topic of interest to you.
- **Final Project:** At the end of the semester, you will have the opportunity to research a project of interest to you, write up a paper, and present the topic to the class. Evaluation will be based on your individual 5-6 page writeups (60%) and your in-class presentation (40%).
- **Midterms:** The midterms will consist of a mix of questions based on topics covered in class and the reading. The tests will include some qualitative short answer questions, some quantitative questions, and some short written responses.
- **Participation:** A large part of each class period will be devoted to a discussion of the assigned reading and/or relevant current events. These discussions are more fun, more interesting, and more relevant if you take an active role in contributing to them. Informed participation in the debates will also count toward your participation grade. Maximum participation scores will be awarded to students who keep up with the reading, regularly bring interesting topics and questions to class, actively help to shape discussions, and do well in debates.

I grade on a point scale with different assignments weighted as shown in this table.

ASSIGNMENT	Quizzes	Reading Responses	Final Project	Midterm Exam I	Midterm Exam II	Participation	Total

POINTS	About 50	195	100	100	100	About 50	600
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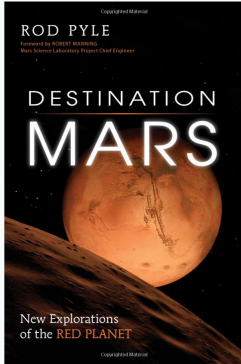
This class is not designed to be an "easy A" - if you are seeking such a class, now is the time to move on. My expectation is that roughly half of you will earn As, half will earn Bs, and no one who puts in a sincere effort and keeps up with the workload will get a lower grade. The number of points required to get a given grade will depend on the class average, however, getting 90%, 80%, 68%, of the total possible points guarantees you at least an A, B, or C, respectively. You can monitor my current estimate of your grade as the semester progresses from the *What's my Grade Right Now?* link on the class webpage.

Class Policies

This course will conform to all applicable [Campus Policies](#). In addition, I have a specific policy on laptops and cell phones. In principle, laptops can allow you to take notes faster and access the class website but, in practice, they are most often used for other distracting purposes. I prefer that you don't use laptop in class, but please come talk to me if you have a good reason to. And as a courtesy to others, please turn off your cellphones while in class.

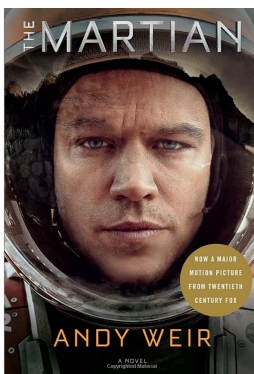
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HONR289V Textbooks



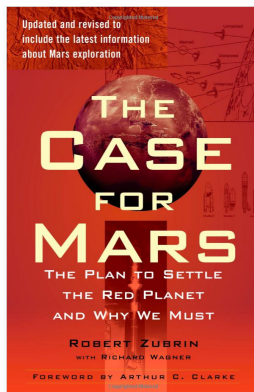
Required:

[Destination Mars](#) Rod Pyle (2012), About \$15.



Required:

[The Martian](#), Andy Weir (2014). About \$15.



Required:

[The Case for Mars](#) (Revised Edition), Robert Zubrin (2011). About \$15.



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HONR LECTURE SCHEDULE

Lecture Date	Lecture Topic	Reading
Mon. Jan. 28	Introduction to Mars	Also, Always Read Weblinks Posted on the Class Website
Mon. Feb. 4	Early History of Mars Exploration	Destination Mars; Chapters 1-9
Mon. Feb. 11	Early History of Mars Exploration; Practice Quiz	Destination Mars; Chapters 10-15
Mon. Feb. 18	Recent History of Mars Exploration; First Quiz	Destination Mars; Chapters 16-21
Mon. Feb. 25	Recent History of Mars Exploration; Practice Debate	Destination Mars; Chapters 22-26
Mon. Mar. 4	Midterm	Destination Mars; Chapters 27-32
Mon. Mar. 11	Current Mars Exploration	The Martian; Chapters 1-5
Mon. Mar. 18	Spring Break!	
Mon. Mar. 25	Future Planned Missions	The Martian; Chapters 6-16
Mon. Apr. 1	Future Planned Missions	The Martian; Chapters 17-26
Mon. Apr. 8	Midterm	The Case for Mars; Prefaces, Foreword, Chapters 1-3
Mon. Apr. 15	Future Manned Exploration	The Case for Mars; Chapters 4-5
Mon. Apr. 22	Future Manned Exploration	The Case for Mars; Chapters 6-7
Mon. Apr. 29	Future Manned Exploration	The Case for Mars; Chapters 8-9
Mon. May 6	Future Manned Exploration	The Case for Mars; Chapter 10, Epilog, Addendum, Appendicies
Mon. May 13	Final Papers and Presentations	

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HONR 289V Assignments

Reading Responses

Each week, except as noted in the lecture schedule, there will be a reading assignment. Before the relevant class, please read the selections from our books as well as any supplementary websites listed on the HONR289V homepage. Follow up on one of the topics raised by the assigned reading that interests you and research it using at least one additional online source. Write one single-spaced typed page on your reaction to the assigned reading. A good essay will include a concise description of the topic covered, as well as your reaction to it. What did you learn and what do you still find confusing? Your reaction should be honest and it may be emotional (was the reading interesting? exciting? tedious?), but must be well argued and must include your thoughts instead of just being a straight summary of the reading. In a separate paragraph, indicate and discuss a relevant webpage not listed on the reading list and give your response to it.

Turn in Reading Responses here each Sunday by 6pm: [Take My Reading Response, Please!](#) Please turn save your rreading responses in PDF format before submitting. I will return the hardcopy to you with comments and will keep the electronic copies as a record of your responses.

Final Paper

At the end of the semester there is an opportunity for a short research project with a 5-6 page writeup (double-spaced) and a short class presentation (see below). The paper is due on the last day of class. Try to write at a level that can be understood by non-experts (that means define any terms that you did not know before taking this class). Undertake your research by finding multiple sources (at least 3-4) that discuss your topic (magazine articles, newspaper articles, web sites, etc.). Try to fully understand your topic and summarize it in your paper, citing your sources as appropriate. Your paper should be a factual summary which reports differences of opinions (if you find any) and gives your own opinion, if appropriate. Grading will be more stringent than for the reading responses (it is hard to be less stringent!). If you have questions about the appropriateness of a particular topic, please feel free to ask me.

Some Possible Topics:

- NASA's plans for a Mars sample return mission
- NASA's plans for human missions to asteroids
- Aspects of Terraforming Mars
- The Mars Society
- The Planetary Society
- The National Space Society
- The Space Frontier Foundation
- SpaceX Mars plans
- Mars One
- The Mars 500 Project

- Inspiration Mars Foundation
- George H.W. Bush's plans for Space Exploration
- George W. Bush's plans for Space Exploration
- Barack Obama's plans for Space Exploration
- Choose a theme from Zubrin's writings (p 356)
- The current status of solar sail technology
- The current status of ion propulsion
- The martian meteorite controversy
- The Aldrin Cyclor concept
- Code up Zubrin's Terraforming Mars equations, reproduce some of his plots, and extend his work!
- Any topic that you studied for a reading response that you'd like to know more about
- Any topic relevant to the human exploration of space
- Trump's Space Policy
- Ion Propulsion
- Legal Issues in Space Exploration
- Health Aspects of Space Travel
- 3D Printing in Space
- Time Keeping on Mars
- Food Production on Mars
- Venus Colonies
- Interstellar Propulsion

Turn in papers here by the due date: [Take My Paper, Please!](#)

Class Presentation

In lieu of a final exam, you will have the opportunity to describe to the class what you learned in your research. Your presentation should be a summary of your most interesting findings and should take 4-5 minutes, with 1-2 minutes for questions. Your goal is to cover your topic as clearly and completely as possible, both in this presentation and in your written paper. Turn in a PDF copy of your presentation the Sunday before the actual actual talks so that all talks can be presented from my computer with minimum time lost for setting up. To avoid technical issues, no movies allowed! Movies are not a good choice in a short talk anyway. Your goal as an audience is to ask interesting questions that help you and others understand the presented material. I will grade your talk on the quality of your content, the effectiveness of your presentation, and your speaking style. Prof. Cole Miller gives some excellent advice on giving a talk [here](#).

Turn in your presentations here by the due date: [Take My Presentation, Please!](#)

Class Debates

We will have several formal debates during the class and I will usually inform you of the debate topic about a week in advance. As you will normally have prior knowledge of the topic, I will expect you to prepare in advance. The debate will take about 45 minutes and its structure will follow the outline below.

- Divide into four or five groups of 4-5 students.
- Group discussion of major points for and against each side (10 min.)
- Random drawing to determine group roles: Side 1, Side 2, Judges

- Further group discussion of specific arguments (5 min.)
- Random drawing to determine roles: Lead Speaker, Rubutter, Note Takers
- Random drawing to which side goes first
- Lead Speaker for Side 1 (3-5 min.)
- Lead Speaker for Side 2 (3-5 min.)
- Discuss Strategy for Rebuttal (5 min.)
- Rebuttal from Side 1 (3-5 min.)
- Rebuttal from Side 2 (3-5 min.)
- (Occasionally) Second Rebuttal from Side 1 (3-5 min.)
- (Occasionally) Second Rebuttal from Side 2 (3-5 min.)
- Discussion amongst Judges to decide which side won (5 min.)
- One sentence statements and votes from each Judge (5 min.)
- Prof. breaks any ties

I will allocate times for you to discuss collectively the major points for and against the proposition. The role of your group and your role within the group will be determined by random drawing. For example, in an early debate, one group would argue for expanding Mars exploration at the expense of other Solar System opportunities while the other group would argue for the reverse, and the remaining groups would judge. Unlike in competitive debates, we are not looking for rapid presentation of many points, but rather a clear presentation of the key points. Each side begins with an opening argument and then responds to the other side with one or more rebuttals. After the debate, each of the judging groups confers separately, and then each individual judge decides who he or she thinks won the debate. A judge should select as winner the group that he or she feels presented their side best, and not necessarily the group whose arguments he or she agrees with. I will poll the judges individually for their statements and votes. I will arrange things so that all students take on at least one and no more than two speaking roles in the debates. These count toward your participation score.

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