Syllabus

To Boldly Belong: Space Exploration and Environmentalism as Sustainable Quests

COR 432 Winter Term 2016 - Dr. Martin C. Fowler
8:30 am – 11:30 am Monday – Friday
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Phone: 336 278 5250 Office Hours: After 12:30 p.m. M-F and by appointment.

Course Goals. This is how the sky looks just after sunset (or just before dawn) on Mars. In COR 432, you will see space exploration and environmental stewardship from fresh perspectives by exploring ways to “leave Earth behind,” even to save the Earth. As you make new connections, you will experiment in ways to belong in unfamiliar terrains. One unfamiliar terrain will be the new planet which our dear Earth is becoming under climate disruption: less user-friendly and a tougher climate. Other unfamiliar terrains to explore are deep space and Mars. In fact, your future after Elon is also an exciting and uncertain unfamiliar terrain of its own, right? In this global capstone course, you will reflect upon and integrate your Elon CORE courses and experiences (including study abroad, volunteerism, service projects, and ELR) to articulate how your learning, practice, and growth has shaped your identity and provided ways for you to belong in the world, even in unfamiliar terrains.

1. Personal and social responsibility. Unlike bystanders who watch space exploration from afar, and, unlike mere victims amidst unfolding climate disruption, you can take
ownership of these ventures: as space advocates, by influencing policy, by meeting human needs under the stresses and challenges of climate disruption, and using these issues to crystalize your values and what you’ve learned at Elon. You may never go into space. You may think that the “environment” or “climate change” are too immense for meaningful individual action. Think again! These very different topics both provoke and guide you to figure out your personal and social responsibility in unfamiliar terrains.

2. **Ethical reasoning.** Deep space is not an ethics-free zone. Even in that vacuum, people choose, decide, and they are accountable for what they make of their lives and surroundings. Likewise, you are not limited to being helpless bystanders as Earth’s average temperature increases, its sea level rises, and vulnerable populations must adapt and/or relocate as refugees to secure life’s necessities. There are new and challenging ethical issues as humanity strives to survive, adapt, and belong in unfamiliar terrains on Earth and elsewhere. Whether we colonize Mars and/or re-green the Earth, we want to secure and protect habitat, manage humanity’s migratory relocations; and find the wisdom to handle our collective fear while inspiring collective hope.

3. **Global Citizenship.** We often think of environmentalism and space exploration as exclusively American ventures such as NASA and the EPA, but we forget that these are global ventures. For example, 20 nations have space agencies and at least 52 countries have space interests. Over 50 countries have environmental ministries and this figure does not include many global NGOs working on environmental issues. Global climate disruption can increase food and habitat insecurity for both humans and nonhuman life. As the rapidly melting ice of the cryosphere demonstrates, changes can be rapid and extreme in global climate’s interlocking feedback system. No credible international climate policy tucks extreme weather and disruptive climate neatly inside one nation’s borders for political convenience. Caring about Earth and humanity as a spacefaring species, means stepping up to transnational global citizenship on many different levels.

**Course objectives.** Student objectives in COR432 are as follows:

(a) 1. You will explore the assumptions of 5 frameworks for thinking about space exploration and environmentalism: (a) the false dilemma of space exploration vs. “problems right here on Earth (spoiler alert: there are ALWAYS problems right here on Earth),” (b) a new possible framework of uniting space and ecology as a single joint venture rather than as competing quests, (c) the view that environmentalism makes no sense beyond our biosphere, (d) Space exploration and environmental stewardship share common ground: both profess to seek out and cherish life, and (e) pragmatic scientific and technological collaboration between space exploration and environmental sustainability to make habitats in unfamiliar terrains. Are you an optimist, pessimist or some kind of “realist” about humanity’s capacity to engineer its future on Earth and other worlds?
2. You will do intensive writing and advance critical inquiry into what these frameworks offer and the questions they raise about science, not just as a body of knowledge, but as a normative dynamic of discovery, technological inquiry, and as ways of meeting human needs.

3. You will think and discuss with imagination and confidence prospects for belonging in unfamiliar terrains. The terrain may be distant Mars, climate-shaky Earth, or your world beyond Elon when you graduate. Figuring out belonging in unfamiliar terrains is a skill we can all use.

4. You will complete a Capstone Project for the Elon Core Curriculum (40 points) This is a substantial interdisciplinary project, which integrates and applies what students have experienced through their studies at Elon, from first-year courses to this course (examples include reflective portfolios, integrative research, fellowship/grant proposals, research-based multimedia projects, etc.). The Capstone Project provides opportunities for reflection on the components of the larger mission of the Elon Core Curriculum.

**Course outcome:** The goals and objectives of this course will guide you to achieve this outcome: you will better reflect upon and integrate your Elon CORE courses and experiences (including study abroad and ELR) to articulate what this learning, practice, and growth has meant for your own identity and view of the world.

**Grading.** The assignments for our 13 class periods together can be described aeronautically and environmentally. *Aeronautics:* The assignments are stacked upon each other like a multistage launch vehicle delivering a payload beyond Earth orbit. *Environment:* Think of the assignments as successive phases of biological adaptation: rapid growth, conservation, release, and reorganization. You have three writing assignments (1st essay, 2nd essay, and 3rd essay), and a 40 pt. capstone project which includes pecha kucha presentation of your integrative work on the day of the final exam. You also operate in class as four smaller book club.

Here is a summary of the grading;

1. Capstone project: 40 points – four (4) 10 point assignments
2. 3 papers (10 pts. each) = 30 pts.
3. Facilitate 3 discussions in class with another book club. Your book club also presents its chosen book to the class. (20 pt.) (5 pts. x 4 sessions)

**TOTAL:** 100 points
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<th>FIRST ESSAY</th>
<th>Description</th>
<th>Due date</th>
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<td>(a) Initial booster and rapid acceleration.</td>
<td>(900 words) YOUR FIRST ESSAY: This is your best (first) answer to the question:</td>
<td>Due before 11:55 P.M. on Friday the 8th of January 2016.</td>
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<td>&quot;How do you evaluate the assumptions and 5 frameworks for thinking about the relationship between space exploration and environmental stewardship in terms of credibility, desirability, ethical value, and scientific grounding? (see description of 5 frameworks on syllabus) Which do you favor? How would you rank their credibility and prospects? Can you thin of a 6th framework you can articulate?. Use the films we've seen so far in class to illustrate your points.</td>
<td>10 points</td>
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<td>(b) This is also the first stage of rapid growth: consuming energy to quickly increase size and complexity.</td>
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<th>SECOND ESSAY</th>
<th>Description</th>
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<td>(a) Booster drops 1st stage and accelerates to reach stable Earth Orbit.</td>
<td>YOUR SECOND ESSAY. (1200 words) This is your response to three (3) FIRST STAGE ESSAYS about key questions raised in the texts we read and discuss. These papers (not your grade or my comments) will be visible on Eli software that is a peer-review platform for this course. Use the films we've seen so far in class to illustrate your points. Devote at least 400 words to each FIRST ESSAY you respond to. Begin by noting its strengths, insights, reasoning, or research. Identify the paper's claim or conclusion with which you disagree, and give your reasons. You may disagree with truth of claims, whether claims are relevant to the conclusion, or whether the evidence is sufficient for the conclusion.</td>
<td>Due before 11:55 P.M. on Friday, the 15th of January, 2016.</td>
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<td>(b) This is also the conservation phase of growth: stabilizing and maintaining size and complexity of the organism or colony in response to pressures.</td>
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<th>THIRD ESSAY</th>
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<td>(a) This 3rd stage is the heavy lifter – boost to leave Earth and its gravity well behind.</td>
<td>(1500 words) THIRD ESSAY: This is your individual argumentative essay supporting your own thesis about the best most promising, or most credible relationship between space exploration and environmentalism. If you have no thesis, write about “leaving Earth behind” as a kind of loss for both deep space excursions and a generation living through climate disruption. Be sure that your paper satisfies the 3 writing goals for COR 432: substantial content, coherent reasoning and persuasion, and thoughtful insight. Use the films you've seen in class to illustrate your points.</td>
<td>Due before 11:55 P.M. on Friday, the 24th of January 2016.</td>
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<td>(b) Biologically, this is the release phase: (omega) surrender present status and structure for the sake of a new status. Your argumentative essay is a new structure. (10 points)</td>
<td></td>
<td>10 points</td>
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| 2 book clubs Facilitate Group Discussion and sharing your Book Club’s book with the class. Each book club presents its book club selection to the class. | (10 Pts.) Each book club will facilitate 3 class discussions with another book club on scheduled dates. A guide to class discussion is on the Moodle class website. | Facilitate three class discussions in collaboration |
Alpha and Bravo – Thurs. Jan. 7
Charlie and Delta – Fri. Jan. 8
Alpha and Delta – Mon. Jan. 11
Charlie and Delta – Thurs. Jan. 14
Bravo and Delta Fri. Jan. 15

with other book clubs
(5pts. X 3 discussions)
(15 pts.)
Skillfully present a book to class
(5 pts.)
Total: 20 pts.

Trip to Morehead Planetarium and reflection session
Immersion in a virtual starscape. You evolved as a stargazing animal. So evolution has prepared you for deep learning and quality time with starscapes.

10 points

**Capstone Project for the Elon Core Curriculum** (40 points)

This is a substantial interdisciplinary project that **which integrates and applies what students have experienced through their studies at Elon**, from first-year courses to this course (examples include reflective portfolios, integrative research, fellowship/grant proposals, research-based multimedia projects, etc.). The Capstone Project provides opportunities for reflection on the components of the larger mission of the Elon Core Curriculum.

**Note:** I will keep your hard copy degree audit as you have marked it. I will return it to you on the last day of class for you to assess whether you have changed or added to any of your initial choices of relevant courses, or the courses and experiences which have mattered most for you at Elon. The most challenging part of this AUDIT is to state clearly and with insight (not vaguely or in generalities) what matters most for the synthesis you hope that this course can provide.

State why you’re enrolled in this COR 432 class (other than you liked the topic or it worked out for our schedule) is trickier. What experiences or Elon courses have pointed you in this direction?

Meeting with me will probably work best if we schedule a lunch together with your book club sometime during January.

**INITIAL AUDIT and Capstone PLANS**

(10 points) Submit a degree audit of the courses you have taken at Elon.

1. Provide a hard copy of your degree audit at Elon university.

1. On this hard copy of your degree audit, circle the courses from which you learned a great deal (not necessarily courses for your major). Use the COR 432 checklist to identify those courses, which pertain to topics, covered in this course. Note: there are a wide range of disciplines and curriculum topics, which are related, directly or indirectly, to either space exploration (and its offshoots) and environmental awareness and policy in the world.

Due before 11:55 pm on Wed. 6th of January, 2016.

10 points.
I will provide five (5) essay questions to you, based upon your INITIAL AUDIT. Your Integrative Response devotes at least 100 words to answering each question – that’s a minimum, not a maximum no. of words. The questions will be different for each student because this is for YOUR integrative response, based on what has brought you to this course and your hopes for what you will learn and accomplish.

**YOUR INTEGRATIVE RESPONSE**

1. Respond to each of the 5 questions, which the instructor asks in response to your INITIAL AUDIT and CAPSTONE PLANS. One question will be about how your book club’s chosen book contributes to integrating your CORE learning and experience at Elon.

**YOUR PROPOSAL** (10 points) Prepare and submit an individual 300 word proposal for your own pecha kucha presentation about how this course has integrated your CORE learning and experience at Elon by belonging in unfamiliar terrains. Be prepared to do a pecha kucha presentation on the day of the final exam (Tues. Jan. 25).

**PRESENTATION of your pecha kucha in class on Monday January 25, 2015.**

For your presentation on the day of our final exam (Mon. Jan. 25, 2015), you will learn and perform the Japanese pecha kucha style of slide presentations – twenty slides presented nonstop for 20 seconds each (for a total of 6 minutes and 40 seconds). That’s enough time for all 25 students. Every slide contains an idea notation and/or an appropriate graphic. The slides are on a timer rather than being advanced manually by the student, so the presenter(s) must rehearse carefully to keep the presentation on track with the slide. Think of

**YOUR PECHA KUCHA PRESENTATION:**

1. Preface your presentation by acknowledging the other presenters. Explain how your presentation has been influenced by discussion and commentary from your classmates. In particular, be sure to acknowledge the previous presenter by name and commend something positive or insightful in that person’s presentation.

2. THEN you begin your 6 min. 40 sec. pecha kucha presentation. Have your technology set up properly.
the twenty slides as a storyboard.

A simple technique for doing this using Power Point is described at https://www.youtube.com/watch?v=l9zxNTpNMLo.

Here are tips on doing the presentation: http://blog.indezine.com/2012/05/10-tips-to-create-and-present-pecha.html

Remember: practice, practice, and practice. You cannot do a good pecha kucha presentation without plenty of practice. Yes, it’s only 6 minutes and 40 seconds

For moral support and global community, and loads of examples, go to http://www.pechakucha.org/

When you finish your presentation, submit a hard copy of your narration script to the instructor. You are responsible for being present and attentive to all the presentations to receive credit for this part of the assignment.

BEFORE you present, respond appreciatively to the presenter and the presentation given right before yours. This is part of the assignment. Acknowledge the presenter by name and talk about any insights or aspects of that presentation which you thought worth commending. Only then can you commence your own presentation.

Again, for pecha kucha / PowerPoint tips

See https://www.youtube.com/watch?v=l9zxNTpNMLo

How to set pecha kucha slide show in PowerPoint.

See https://www.youtube.com/watch?v=YGVCkcn6ijBc

Setting 20 sec. limits on PowerPoint slides

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**Course Texts for COR 432**

In our course, we have two required texts: the novel *2312* by Kim Stanley Robinson, and *Paradise Regained: The Regreening of Earth* by Les Johnson, Greg L. Matloff, and C. Bangs (2010).
However, you will chose a THIRD text along with several of your classmates, to form a “book club” for 3.5 weeks. Look at the list of recommended texts and pick a book, which you’d like to study in depth with other students. When you meet during class or outside class as a “club,” each book club member is ready to lead a discussion (facilitator), or take notes on a discussion (recorder). Each club member is responsible for bringing at least one great discussion question about its reading to the club for each meeting.

You form a book club with classmates who have chosen that book to supplement the two required texts for COR 432. Your club is responsible for knowing the text, and you will be graded on your comprehension and thinking about that book when you present it to the class during our last week. Your club selects and schedules readings during January to finish the book you’ve chosen. In your book club, you can research a specific topic and deal with that topic in greater depth and detail. You’ll be acquainted with the other book club texts from class discussion, but those books are not your responsibility. If you quote or cite another book, be accurate. However, you are not graded on knowing texts other than our two shared texts and your book club’s text. Your club’s effective dedication to one book is what’s rewarded.

These are available in the Campus Book Store or online. Paperback editions – including used copies – are cheaper than new hardback copies. You can also buy a less expensive e-copy of a text and download it on Kindle or other e-reader. Amazon.com can be your friend.

Two Required Texts:

**2312** by Kim Stanley Robinson (2012) (paperback) Little, Brown, Young Readers, ISBN-10: 184149996X and ISBN-13: 978-1841499963. Novelist Kim Stanley Robinson sets the framework for our course with his grand speculative history (a.k.a. "science fiction") in which space exploration and environmentalism build a surprising new relationship 300 years from now. 2312 is your ticket to becoming solarian during winter term, whether you travel downsystem to Venus and Mercury, upsystem to Mars, Jupiter, and Saturn or settle down in one of thousands of asteroid-terraria in between. Sad planet Earth will get a new and unexpected lease on life as environmental rescue and space exploration collide in a worldwide re-wilding.

**Paradise Regained: The Regreening of Earth** by Gregory Matloff, Les Johnson, and C. Bangs Copernicus Books, Praxis Publishing, Ltd., 2010. The authors offer a scenario for re-greening Earth, beginning with description of what our planet was like before the advent of modern civilization, followed by summary of the effects of that civilization on our planet, culminating with a discussion of how humans might use the resources of the solar system for terrestrial benefit, resulting in Earth becoming a place for a human civilization to live in synch, if not in harmony, with the environment that gave us birth.
Recommended Texts for Book Clubs

Here are texts to choose among for your book club. NOTE: If you all wish to choose a text not listed here, that is possible but clear your book choice with the instructor first. You can download these as e-books to save time. Agree on text, and then download it.

1. *Space on Earth: Saving Our World by Seeking Others* by Charles S. Cockrell (2007) (paperback) ISBN 023000752X Publisher: Palgrave Macmillan. Cockrell makes the argument that environmentalism and space exploration are two facets of the same quest and need each other. This is a good basic articulation of the “partners for progress” framework. Theme: We need space exploration to save Earth.

2. *Choice, Not Fate: Shaping a Sustainable Future in the Space Age* by James A. Vedda (paperback) Xlibris Corporation (2009) ISBN-10: 1450013481 and ISBN-13: 978-1450013482 James Vedda, in *Choice, Not Fate: Shaping a Sustainable Future for Space Exploration*, maintains that space exploration should not fixate on destinations (e.g. “put a man on Mars”) but should instead develop capabilities which bring direct benefits to Earth. In short, Vedda thinks that space exploration should pay its own way to be sustainable. This belongs mainly in the framework of “space exploration vs. problems right here on Earth” framework, but seeks reconciliation. Theme: politics and economics – what would make long-term space exploration sustainable?

3. *Every Living Thing: Man’s Obsessive Quest to Catalog Life, from Nanobacteria to New Monkeys* by Rob Dunn (2010) Hardcover Smithsonian; 1 edition (December 2, 2008) ISBN-10: 0061430307 and ASIN: B003D7JTTA Rob Dunn describes the brave, relentless, and downright obsessive quest of scientists to find and label every living thing...and ends up pondering life on other worlds. Notwithstanding, much of Earth’s life has never been studied. Every generation that imagined itself possessing a definitive knowledge of life on Earth has been humbled by successive quantum revelations about Earth’s biodiversity. This is an examination of the viriditas framework: taking the value of life (finding, protecting and extending it) as unconditional value. Theme: This relates directly to the 4th FRAMEWORK about the value of seeking and cherishing life.

4. *Mobilizing the Green Imagination: An Exuberant Manifesto* by Anthony Weston (paperback) (2012) New Society Publishers ISBN 978-0-86571-709-1 In this work, philosopher Anthony Weston challenges the reader to bring inspiration and imagination to rethinking the field of environmental ethics to include not only cities that welcome the rising waters, but a Great Second Chance to move beyond exploitation of Earth and towards a green space program.

5. *How We’ll Live on Mars* by Stephen L. Petranek (TED Books, Simon and Shuster, 2015) Award-winning journalist Stephen Petranek says humans will live on Mars by 2027. Now he makes the case that living on Mars is not just plausible, but inevitable. Consider this a book an optimistic engineering version of framework. Petranek is clearly one of the cheerleading optimists. Theme: You could call this jumping on the fast track to putting humans on the
surface of Mars. **This book relates direction to the 5th Framework about pragmatic scientific and technological collaboration.**

REVIEW: “It sounds like science fiction, but Stephen Petranek considers it fact: Within twenty years, humans will live on Mars. We’ll need to. In this sweeping, provocative book that mixes business, science, and human reporting, Petranek makes the case that living on Mars is an essential back-up plan for humanity and explains in fascinating detail just how it will happen. The race is on. Private companies, driven by iconoclastic entrepreneurs, such as Elon Musk, Jeff Bezos, Paul Allen, and Sir Richard Branson; Dutch reality show and space mission Mars One; NASA; and the Chinese government are among the many groups competing to plant the first stake on Mars and open the door for human habitation. Why go to Mars? Life on Mars has potential life-saving possibilities for everyone on earth. Depleting water supplies, overwhelming climate change, and a host of other disasters—from terrorist attacks to meteor strikes—all loom large. We must become a space-faring species to survive. We have the technology not only to get humans to Mars, but also to convert Mars into another habitable planet. It will likely take 300 years to “terraform” Mars, as the jargon goes, but we can turn it into a veritable second Garden of Eden. And we can live there, in specially designed habitations, within the next twenty years. In this exciting chronicle, Petranek introduces the circus of lively characters all engaged in a dramatic effort to be the first to settle the Red Planet. How We’ll Live on Mars brings firsthand reporting, interviews with key participants, and extensive research to bear on the question of how we can expect to see life on Mars within the next twenty years.”

6. **Don’t Even Think About It: Why Our Brains are Wired to Ignore Climate Change** by George Marshall Bloomsbury, USA, (2014) This text is excellent for exploring a tough issue in ethical reasoning and taking personal and social responsibility in the midst of climate change. **Theme: You may not agree with the book’s thesis, but humanity’s largely dithering response to climate crisis begs for some kind of explanation.**

REVIEW: “In this deeply researched and surprising book, Marshall helps us understand the true nature of climate change and why it’s so hard for us to act on something that threatens to destroy us. His points are surprising and force us to reframe our entire understanding of the issue. Here are a few examples, many of which don’t make sense until you get the benefit of Marshall’s full explanation:

* Climate change is not a tame problem, but a "wicked" one.
* Climate change is not an environmental problem.
* Fossil fuel companies must be stopped, but they are not the enemy.
* Polar bears and our grandchildren are not the ones who need to be saved.
* Conservatives are not the enemies of climate change action, but essential allies.
* Guilt over our personal contributions to climate change and fear of what will happen are our biggest opponents.
* Climate change is not in any sense a religion, but evangelical churches may be our best models for learning how to communicate about it.”

8. *Extinction Dialogues: how to Live With Death in Mind* by Carol Baker and Guy McPherson (2014) Within the “optimistic engineering vs. pessimistic resignation” framework, this is at the far end of pessimism, predicting the extinction of humanity in this century. It is a dark view of the future. **Theme:** This is a controversial “worst case scenario” book that many climate change activities dispute.

9. *Life in Space: Astrobiology for Everyone* by Lucas John Mix, Harvard University Press (2009). This text integrates the sciences within the viriditas framework guided by the normative value of life. **Note:** This book is primarily a scientific primer to astrobiology and it provides some empirical support for the Framework about seeking, cherishing, and valuing life in environmentalism and space exploration.

**REVIEW:** Life is a property of the universe. We may not know how it began or where else it exists, but we have come to know a great deal about how it relates to stars, planets, and the larger cosmos. In clear and compelling terms, this book shows how the emerging field of astrobiology investigates the nature of life in space. How did life begin? How common is it? Where do we fit in? These are the important questions that astrobiology seeks to answer. A truly interdisciplinary endeavor, astrobiology looks at the evidence of astronomy, biology, physics, chemistry, and a host of other fields. A grand narrative emerges, beginning from the smallest, most common particles yet producing amazing complexity and order. Lucas Mix is a congenial guide through the depths of astrobiology, exploring how the presence of planets around other stars affects our knowledge of our own; how water, carbon, and electrons interact to form life, as we know it; and how the processes of evolution and entropy act upon every living thing. This book also reveals that our understanding and our context are deeply intertwined. It shows how much astrobiology can tell us about who we are—as a planet, as a species, and as individuals.

10. *The Case For Mars: The Plan to Settle the Red Planet and Why We Must* by Robert Zubrin and Arthur C. Clarke Free Press (2011) This is the classic manifesto for the exploration and settlement of Mars. This is well argued for optimistic engineering rather than pessimistic resignation, but it does take other considerations into account. **Theme:** This is one of the best-known pro-Mars manifestos, and it has been updated in several editions to incorporate new scientific evidence about the credibility of exploring and settling the planet Mars.

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Background for COR 432 - 5 frameworks for thinking about space exploration and environmental stewardship: In our hearts, reaching for the stars feels different than embracing the Earth. Those dedicated to either venture have, at times, ignored or derided the other as a waste of money. But this old turf war now has fewer working scientists to fight it. Whatever their research specialty, scientists know that science and technology are not confined within cultural or vocational boundaries. Isaac Newton showing that the same mechanical laws governed Earth and the heavens should have shattered the imaginary line between everything beneath and beyond Earth orbit. But our feelings are slow to give up that imaginary barrier. We still feel that earthbound matters can have little or nothing to do with deep space.

When people think about the relationship between environmental stewardship and space exploration, they often resort to frameworks containing basic assumptions about humanity and progress. Here are 5 frameworks to think about:

1st FRAMEWORK: “Problems right here on Earth” such as employment, security, and human needs should be prioritized over devoting resources to space exploration and environmental goals.

2nd FRAMEWORK: Environmental Stewardship and Space Explorations are two ways of dealing with unfamiliar terrains. They may have much in common.

3rd FRAMEWORK: It makes no sense to extend environmental stewardship into unfamiliar terrains such as alien worlds and deep space.

4TH FRAMEWORK: Space exploration and environmental stewardship share a value: both profess to seek out and cherish life. That is common ground, but humans are also brutal to nonhuman life.

5TH FRAMEWORK: Do not debate values. Instead, let space exploration and environmentalism pragmatically combine their respective scientific engineering and habitat expertise to make functionally and structurally viable homes for life in unfamiliar terrains.

1st FRAMEWORK: “Problems right here on Earth” such as employment, security, and human needs should be prioritized over resources for space exploration and environmental goals.” Since the first rockets launched, the public has had a rhetorical habit of prioritizing “problems right here on Earth” over space exploration (or over environmental regulations). This dilemma has shaped and stalled public discussion about environmental stewardship and space exploration. This dualistic framework (even when both options are jointly affordable) is often a false dilemma either because space exploration and environmental stewardship HELP SOLVE certain problems “right here on Earth,” or else these ventures are jointly affordable along with addressing those problems here on Earth. At times, there is no genuine dilemma. But priorities must be honestly considered and new projects and regulations should be argued case by case.
2\textsuperscript{ND} FRAMEWORK: Environmental Stewardship and Space Explorations are two ways of dealing with unfamiliar terrains. Climate disruption makes the challenges of space exploration and environmental stewardship more similar than we anticipated. Despite the very different challenges of settling Mars and coping with climate disruption on Earth (an unfamiliar terrain in the making), space advocates and environmental stewards do have one thing in common. \textit{They need to equip humanity to “leave Earth behind” (or abandon outdated assumptions about Earth) to survive and belong in unfamiliar terrains.} Perhaps there is a narrative about humanity’s future can affirm both environmentalism and space exploration. This is one possibility. Can we understand how life might \textit{boldly belong} both on Earth and in the stars? Life needs to belong wherever it lives. Otherwise, humans along with all living things are always on probation as tourists, interlopers, invaders or specimens of a not-yet-extinct species in a cold universe. Without a story, they don’t really belong where they live. Can you tell the story?

For example, The \textit{Earth and Space Foundation} argues that environmentalism and space-exploration are especially complementary and mutually necessary endeavors, envisioning \textit{Earth as an oasis cared for by a space-faring society}. See \url{http://www.earthandspace.org/}. Charles Cockrell argues for this in our course text, \textit{Space on Earth: Saving Our World by Seeking Others.}. The Earth and Space Foundation claims that technology for living in space will help humans to live cleaner and more sustainably on the Earth. Space satellites have contributed enormously to environmental science. Green building design and space stations are both about creating sustainable dwelling, though “sustainable” may have different meaning outside Earth’s biosphere. Earth’s ancient evolutionary and diverse cultural history of habitats is \textit{vastly different} than engineering new habitats off world. Not all Earth-bound habitat practices are portable. Science is unified enough to make the remotest discovery relevant, and space technology serves environmental science, but saving Earth and exploring stars are different though related quests.

3\textsuperscript{RD} FRAMEWORK: It makes no sense to extend humanity’s environmental stewardship into unfamiliar terrains such as alien worlds and deep space. On this view, any environmental ethos is necessarily and exclusively Earthbound. Stewardship of natural resources and the health of the biosphere are entirely about Earth’s life and wellbeing. Therefore, it makes no sense to project those environmental values beyond low Earth orbit. These values do not apply to unfamiliar terrains.

Can and should humanity extend its environmental values and policies into space? For example, we need to clean up junk in the low Earth orbit because those high-speed ninja shards will never biodegrade. Should we see other worlds as unspoiled wilderness, or is that a silly framework for alien environments? Ryder W. Miller gives you an introduction to environmentalism gone cosmic in \textit{Astro-environmentalism: The Case for Space Exploration as an Environmental Issue} \url{http://escholarship.org/uc/item/2d37b8cx?page-1} There is a related unsettling question: How much does our current ethos of sustainability presume climate-stability? \textit{Does it make sense to extend environmental stewardship into unfamiliar}
terrain when that terrain is a climate-changed earth? For example, a value of sustainability is the world we leave to future generations. But this may be a terrain that no one foresaw.

4TH FRAMEWORK: Space exploration and environmental stewardship share a value: both profess to seek out and cherish life. “All creatures great and small” seems to bond environmentalism to space exploration. Science fiction author Kim Stanley Robinson revived the word "viriditas" to describe this value:

"The green force of life, expanding into the Universe...Look at the pattern this seashell makes. The dappled whorl, curving inward to infinity. That's the shape of the universe itself. There's a constant pressure, pushing toward pattern. A tendency in matter to evolve into ever more complex forms. It's a kind of pattern gravity, a holy greening power we call viriditas, and it is the driving force in the cosmos." (Green Mars, by Kim Stanley Robinson)

Humanity both protects endangered species but also drives thousands of species to extinction. Astro-biologists seek life in deep space and alien worlds (e.g. the Martian regolith.) Gregory Matloff, Les Johnson, and C. BANGS COPERNICUS BOOKS, PRAXIS PUBLISHING, LTD., 2010, expound this framework of life’s value in Paradise Regained: The Regreening of Earth. One assumption behind this framework is that life is sacred and to be cherished, placing life on a high pedestal. But our actual relationships with life are more murky, dark, and messy than that. We might cherish life when it is scarce, difficult, or struggles in extremis. Otherwise, humans consume, exploit, and destroy a great deal of life. Contamination and back-contamination are risks when venturing to new worlds, as is terraforming an alien environment. Should we terra-form Earth itself?

5TH FRAMEWORK: Do not debate values. Instead, let space exploration and environmentalism pragmatically combine respective scientific engineering and habitat expertise to make functionally and structurally viable homes for life in unfamiliar terrains. This is the optimistic streamlined version of Framework (b). The assumption for this pragmatic framework is that a great deal of progress and collaboration is possible without debating the values of environment and space exploration. These two ventures are contributing a great deal to each other. However, this assumption about “get the job done” begs the question of whether human insistence on altering environments is wise, good, or possible. One could argue that the beauty and intact integrity of alien places should be respected. Darker still, ask: why venture anywhere if you can’t belong except by changing things? Engineering is not a blanket entitlement to avoid all questions of value and worth, even if it can defer some of those questions.
Monday, January 4, 2016

**CALENDARS and TIMEKEEPING:** If you go to Mercury, reset your downsysten clocks. Mercury takes 88 days to revolve around the sun. But a solar Mercurian day is 176 Earth days long. So, a day on Mercury is MUCH longer than its year. Play the "day on Mercury" at [https://www.youtube.com/watch?v=OJrl733eyfY](https://www.youtube.com/watch?v=OJrl733eyfY)

This is a very odd relationship between "year" and "day" for terrestrials. In 2312, the moving Terminator City rolls on tracks to keep ahead of sunrise in the habitable Terminator zone of Mercury. **See** [http://www.dw.com/en/nasa-spacecraft-messenger-ends-its-voyage-on-the-planet-mercury/a-18422700](http://www.dw.com/en/nasa-spacecraft-messenger-ends-its-voyage-on-the-planet-mercury/a-18422700) or **SEE:** [https://www.youtube.com/watch?v=m3ZUhpisWeQ](https://www.youtube.com/watch?v=m3ZUhpisWeQ)

**Read** Paradise Regained Introduction and Ch. 1 “Space Utilization”
**Read** 2312 (pp. 1-40) in which you meet Swan Er Hong and Fritz Wahram. You visit the moving city of Terminator on Mercury, learn about the unexplained death of Swan's grandmother Alex, meet serious sun-worshippers, and learn the art of hollowing out asteroids to make new terrarium words. **Choose membership in book clubs: Alfa, Bravo, Charlie, or Delta.**

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Tuesday January 5, 2016

Read Paradise Regained: Part I: Mythical Paradise (pp. 9-26)

**Finalize your book club today and your chosen book club text.**

Read 2312 (pp. 41-88) In which you meet Swan's implanted qube named “Pauline,” confront an unexplained attack on Io, and cruise in total darkness aboard a solarian blackliner. Learn small group discussion facilitation. Plan out-of-class lunch discussions during the term. **Film:** Finding Life and Love on Mars

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Wednesday, January 6, 2016

Read Paradise Regained, Part II: Paradise Lost? Chapter 4 – “The Environmental Dilemma: Progress or Collapse?” and Chapter 5 “Exploding population” (p. 27-38)

Read 2312 (pp. 89-127) in which Swan visits the urban canals of NYC to find her ex, meets Kiran who saves her from mugging, and becomes Swan's eyes and ears to investigate intrigue on Venus. **Book clubs meet independently today.**

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Thursday, January 7, 2016

Read Paradise Regained, Chapter 6 – “Climate Change” and Chapter 7 – “Vanishing Life” (pp. 49-
Friday, January 8, 2016
1st Stage Rapid Growth Essay due before 11:55 P.M.!
Read *Paradise Regained*, chapter 8: “Diminishing Energy” and Chapter 9 “Humans Before the Industrial Age: A Desirable Ecological Goal?”

*Read 2312* (pp. 128-184) in which Swan and Wahram attend a concert on Mercury only to narrowly miss an incoming explosion aimed at Terminator. They get to know each other well in a *very, very long* pseudo-iterative trek through access tunnels beneath the surface of Mercury. One step after another, one song after another, a relationship is born. **Book Clubs CHARLIE and DELTA lead discussion.**

Monday January 11, 2016
Book Clubs ALPHA and DELTA lead discussion.
Read *Paradise Regained*, Part III: *Paradise Regained*: Chapter 10 “Power From the Sun”
*Read 2312* (pp. 185-242) in which Inspector Jean Genette investigates that suspicious explosion near Terminator. Was it an attack? If so, an attack by humans or even by qubes? Kiran scopes out Chinese Venus. Swan and Genette board the terrarium *Moldava* and Genette’s ship, *Swift Justice*.

Tuesday, January 12, 2016
Don’t bother changing clocks on Venus. A solar calendar for Venus is a waste of time. Its orbit is almost perfectly circular, and Venus has no axial tilt, hence, no seasons. Like Mercury, Venus turns slowly on its axis, so a Venusian day is 117 Earth days. Think of it as one unchanging time zone.

Read *Paradise Regained*, chapter 11: “Power from the Sun” (pp. 89-106)
*Read 2312* (pp. 243-297) in which we get a brief history of the previous 300 years, Wahrum returns to Saturn (Swan bodysurfs its rings), and Kerran sleuths the treacherous Lakshmi who seems to control Venus, and we get a holiday recipe for making life.
**Book Clubs CHARLIE and ALPHA lead discussion.**
Wednesday, January 13, 2016
Read *Paradise Regained*, Chapter 12 “Environmental Monitoring from Space” (pp. 119-132)

*Read 2312* (pp. 298-346) in which we board the terrarium *Bantian Kongzhong Yizou Men* and take a longer trip to Earth, The Planet of Sadness, visit the far reaches of the solar system, and Pauline gives serious qube-time to revolution on Earth.

**Book Clubs BRAVO and CHARLIE lead our discussion.**

Thursday January 14, 2016
Read *Paradise Regained*, Chapter 13: “Protecting Earth” (pp. 133-144)

*Read 2312* (pp. 347-394) in which we visit the hotter-than-hot Vulcanoids for X-treme solar power, travel with Wahram and Swan on a goodwill mission to terraform Earth. And it seems that all eyes are upon Kiran... 😊

**Book Clubs CHARLIE and DELTA lead our discussion**  
*Film: Mission to Mars*

Friday, January 15, 2016
Read *Paradise Regained*, Chapter 14 “Mitigating Global Warming” (pp. 145-156)

**Book Clubs BRAVO and DELTA lead discussion.**

Your 2ND Essay is due before 11:55 P.M. on Friday, January 15, 2016.

Monday January 18, 2016
MLK Day – *No class today*
Read 2312 (pp. 395-440) when it starts raining cats and dogs during the global reanimation and re-wilding of Earth, a qube gets cornered.

Tuesday, January 19, 2016

Read *Paradise Regained*: Chapter 15 – “Settling the Solar System” (pp. 157-168)

” *Read 2312* (pp. 441-500) in which qubical humanoids appear, and our trio of Saw, Wahram, and Genette speed to Venus to intercept an impending attack.  
**BOOK CLUB ALPHA reports on its chosen book.**

Wednesday, January 20, 2016

**Book Club BRAVO reports on its chosen book.**
Read 2312 (pp. 501-534) Genette rounds up the plotters, and Swan Er Hong must make an important decision about her future.
Read *Paradise Regained*: Chapter 16 - “Paradise Regained: An Optimistic Future” and Afterword: “Why Space Advocates and Environmentalists Should Work Together” (pp. 169-176)

**Thursday, January 21, 2016**
**Book Club CHARLIE reports on its chosen book.**
Read 2312 (pp. 535-561) Marriage on Mars, and this is for Life!
**Film: The Arrival**

**Friday, January 22, 2016**- Last Day of Class
**Book Club DELTA reports on its chosen book.**
**Your 3rd Essay due before 11:55 P.M. on Fri. Jan. 22, 2016.**
**Watch: The Martian** – 141 minutes: 2 hours and 21 minutes

8:15 am – Book Club DELTA report.
8:45 am – 11:10 am THE MARTIAN
11:10 debrief before pecha kucha on Monday.

**MONDAY, JANUARY 25, 2016**  Pecha Kucha class presentations today (8:30 am – 11:30 am)