

HSTS 451: The History of Outer Space (4 cr.)

Summer Session 1: June 20 – Sept 02

Oregon State University

Instructor: Robert Peckyno

Office: Milam Hall 322

Phone: 541-829-0718 (Skype video chat / Google Hangouts also avail)

E-mail: peckynor@oregonstate.edu

Office Hours: TBA

Classroom/Time: TR 2:00 - 3:50pm

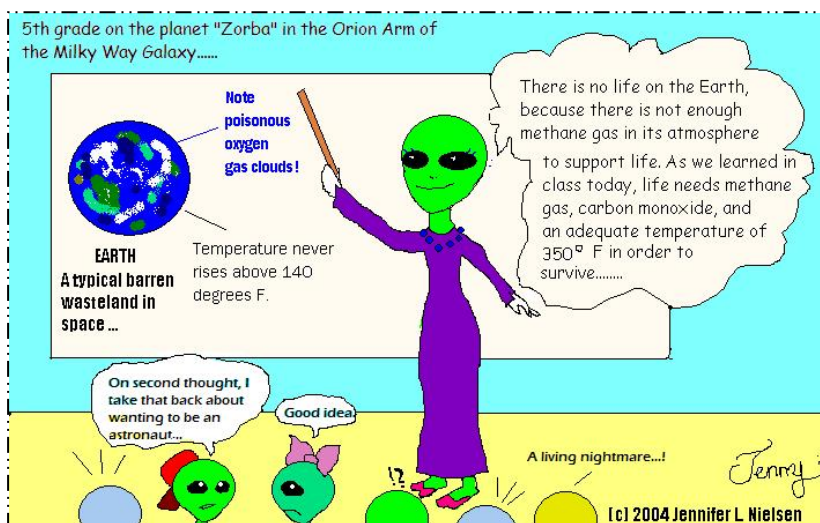
Class Website: All class PowerPoints, readings, assignments, etc. are available in Canvas

Earth began as the center everything, but slowly through time, scientists (aided by the development of technology and often resisted by society) have changed human understanding of our place in the solar system, galaxy, and universe. With commercial spaceflight expected to become a reality in this decade, robotic explorers on or around nearly every planet, and humans preparing to return to the Moon – as well as asteroids and Mars in the lifetimes of our students, now is an good time to look back at what we have learned (and how) and to look forward to where we might go and why. This course examines the historical political, social, and economic drivers behind the exploration and development of outer space.

This schedule of lecture topics, reading assignments and tests **is subject to change** and will include current events. Feel free to bring to class or to the blog any interesting space related topics or articles that you would like to discuss. If you have questions about the material – ASK!!! If you are having problems with the material or the assignments, don't wait until after you have already received a poor grade to come talk to me about it. This class can be as interactive as you are all willing to make it – you are paying for your education and you only get one shot – make the most of it.

“..space is for everybody. It's not just for a few people in science or math, or for a select group of astronauts. That's our new frontier out there, and it's everybody's business to know about space.”

Christa McAuliffe, December 6, 1985



“Space isn't remote at all. It's only an hour's drive away if your car could go straight upwards.”
Sir Fred Hoyle, (1915 - 2001)

“I've often wondered - if the world discovered that it was threatened by a greater power from outer space from another planet -- wouldn't we all of a sudden find that we didn't have any differences between us at all?”
President Ronald Reagan

ASSESSMENT AND EVALUATION

Two exams: (mid-term (wk5) & final (during finals week): (250 points)

Mixture of multiple choice, fill in the blank, matching, and essay questions.

Discussion Board Assignments: 5 * 30 points = 150 points

There will be five discussion board assignments during the term that require a written response.

Sharing and creative interaction are strongly encouraged.

(Weeks 1, 3, 8, 9, 10).

Group Mission Assignment: (Due week 7) (100 points)

Using historic mission data, your team will create a mission proposal to a target in the solar system (Earth included). Include proposed budget and sources of funding, scientific goals, mission payloads to achieve those goals (plus power, flight, comm, etc), where this mission fits into the larger scientific / engineering picture, etc. The outcome for this project will be a group paper and an online Presentation/Powerpoint that will be presented to the class.

500 total points (+11 bonus). (450=A, 400=B, 350=C, 300=D, < 300=F)

Incompletes

Incomplete (I) grades will be granted only in emergency cases (usually only for a death in the family, major illness or injury, or birth of your child), and if the student has turned in 80% of the points possible (in other words, usually everything but the final paper). If you are having any difficulty that might prevent you completing the coursework, please don't wait until the end of the term; let me know right away.

LEARNING OUTCOMES:

At the end of this course, you should be able to:

- Trace the development of astronomy/cosmology and know the important people who changed our understanding of our place in the solar system, galaxy, and universe.
- Trace the technological development of the telescope and how changes impacted what we know.
- Be able to describe and identify the components and structure of the known universe.
- Follow the historical development of rocketry and describe their dual use nature.
- Trace the history of robotic solar system exploration and the major discoveries made, illustrate the various components of a robotic mission and be able to do historic research on missions, components, subcontractors, costs, drivers, policy impacts, etc.
- Describe the political, economic, and social drivers behind - and impacts from - the human (and robotic) exploration of space.
- Compare and contrast the evolution and drivers of the Soviet, US, Chinese, Indian, European, and other major space programs.
- Describe the common nature of space, the multiple practical and military uses of space, the bureaucracy of space and the conflicting goals of each agency; the relevant international treaties and the ethics of space.
- Identify spin-off technologies originally developed for the space program.
- Detail the history of our search for other life in the universe and attempts at contact.
- Be able to identify and debunk popular misconceptions about space.

CLASS DETAILED SCHEDULE

Week

1. *The History of Cosmology*

It is not surprising that our ancestors looked up at the night sky with awe and reverence. This course begins with an examination of how and why humans began to explore the night sky. This journey mirrors the growth of rationality and the scientific enterprise as, piece by piece, knowledge and hypothesis began to replace fear and superstition. This week, we will follow this journey and meet a few of the key people, review some basic concepts of astronomy, and examine the first few steps of a journey that has given us unprecedented insight into our cosmos.

DUE: Pre-Quiz, Discussion Board Introductions, Observational Astronomy Assignment

2. *Looking Further: Stars, Galaxies, and Laniakea*

Humans progressively expanded their sight further with stronger telescopes, new technologies that opened new ways of seeing and led us to the dawn of time. We will examine the life of stars, the structure of galaxies, and sneak a peek at the largest scale structures in the Universe (that we know of so far...). I could not possibly give you a complete detailed tour through the entire universe in one week. There is, obviously, much much much much more, but I wanted to give you a basic smattering of what we know about the larger universe and how we learned it. That process started in our solar system, then moved on to the stars, then to galaxies, then on to... even more 'exotic' things....

SECTION 2: THE SPACE AGE

3. *The Evolution of Rocketry*

After thousands of years of looking up at the night sky, less than 100 years ago, humans began to find the scientific creativity and engineering ingenuity to pierce that realm themselves. For nations with indigenous launch capability, rocket technology is highly classified - bringing both national security and international prestige. This week we're going to take a look at early firesticks and rocket weapons, uncover discoveries about the motions of the planets, witness the largest man-made disasters...ever, hear about the early rocket pioneers, ridiculed for their fantasy but ultimately triumphant, and meet the modern entrepreneurs working right now to create reliable and affordable access to space.

DUE: Discussion Board / Rocket Failures Assignment

4. *The Space Age and the Moon Race*

In the stage of less than two decades, humanity went from hurling projectiles at the sky to landing a man on the moon. However, this is more than a story of technology or science... It is also story of politics, management, and economics. This week, we will look at the space race. We will send our first animals and humans into space and even land a few on the Moon... We will develop massive new rockets and organize on a level rarely seen... We will also lose several astronauts and cosmonauts in the process. When it is all over many will look back on humanities greatest achievement with wonder and disbelief.

5. *Space Stations and the Shuttle Era*

The space race is over and the Apollo program is winding down. America has stopped tuning in to the broadcasts and support is dwindling fast. What is the next step? Both the US and USSR realized that we need more information and practice before we could go to space to stay. We needed somewhere where astronauts could live and a way to build it. This week, we'll look at the Space Transportation System (a.k.a. the Shuttle), the evolution of Space Stations, and a bit about human adaption to space.

Mid Term

6.

7. **Weeks 6 & 7**

Robotic Explorers in our Solar System and Beyond

Starting with the first image of Earth from outside our atmosphere taken by a US made V-2 rocket in 1946 (above), engineered machines/robots have been at the vanguard of human exploration off planet Earth. In addition to being able to perform investigations in places that humans cannot visit due to technological limitations, for both cost and flexibility reasons, robotic missions are the primary way that we have learned about our neighborhood. For the next two weeks, we are going to explore our Solar System starting at the Sun and working outward. We will examine what we know about our solar neighborhood, and how that scientific understanding has developed through time. Concurrently, we will learn how robotic missions are proposed and developed and the myriad of factors that help to decide which projects do and do not get funded and how successful they will ultimately be.

Group Assignment is DUE by the end of Week 7

8. ***Commerce, Technology, and Tourism***

Space has become big business. The space economy represented some USD 256.2 billion in revenues in 2013, divided between the space manufacturing supply chain (33%), satellite operators (8.4%) and consumer services (58%), including actors who rely on some satellite capacity for part of their revenues, such as direct-to-home satellite television services providers. This doesn't even cover launch services. This week we will look at Communications, Global Positioning Systems, Weather, Remote Sensing, Spin-Off Technology and other 'on-Earth' uses of space.

DUE: Discussion Board / Companies and Contractors Assignment

9. ***Legal, Military, and Political Aspects***

This week we will explore the evolution of the legal, political, and military aspects of outer space then check out a case study on the asteroid impact hazard that touches all three. After that, you will have a chance to put it all into practice as we take sides and debate a hypothetical legal dispute in outer space.

DUE: Discussion Board / Moot Court Assignment

10. ***Science Fiction, Aliens, and Exobiology***

This week, we will explore the inspirational, but sometimes tenuous connection between Science Fiction and Science Fact. We will analyze the messages Earth has composed for extra-terrestrials and explore the history of our search for a second point of life. Finally, we will examine the concept of alien visitation to Earth from a religious studies perspective.

DUE: Discussion Board / Extra-Terrestrial Message Assignment

Final Exam (*comprehensive*)

Texts And Readings (Updated 1/19/2016):

This course will make extensive use of primary NASA and other US Governmental documents as well as peer reviewed journal publications, a select set of chapters from relevant texts, and online articles including (but not limited to):

- Coones, Paul. 1983. "The Geographical Significance of Plutarch's Dialogue, Concerning the Face Which Appears in the Orb of the Moon". *Transactions of the Institute of British Geographers* 8 (3). [Royal Geographical Society (with the Institute of British Geographers), Wiley]: 361–72. doi:10.2307/622050.
- Tully, R. Brent, et. al. The Laniakea supercluster of Galaxies. *Nature* 513, 71-73 (Sept. 2014)
- Burrows, William E. 1998. *This new ocean: the story of the first space age*. New York: Random House.
- Wright, Grego, and Gronlund. The Physics of Space Security: A Reference Manual. *The American Academy of Arts and Sciences Special Publication* 2005.
- The National Aeronautics and Space Act. Pub. L. No. 111–314
- Lambright, W. Henry. 1998. *Powering Apollo, James E. Webb of NASA*. John Hopkins University Press.
- This New Ocean: A History of Project Mercury, By Loyd S. Swenson Jr., James M. Grimwood, Charles C. Alexander. Published as NASA Special Publication-4201 in the NASA History Series, 1989.
- The Augustine Commission Report, December 1990
- Report of the Commission to Assess United States National Security Space Management and Organization (a.k.a. the Rumsfeld Report). 2001.
- Report of the Presidential Commission on the Space Shuttle Challenger Accident (aka the Rogers Commission Report), June 1986 and Implementations of the Recommendations, June 1987
- The Columbia Accident Investigation Board Report, 2003
- U.S. Commercial Remote Sensing Space Policy - Apr 25, 2003 OSTP
- The United Nations Outer Space Treaty of 1967, The Moon Treaty, The Rescue and Return Agreement
- 2013-2022-National Research Council Planetary Science Decadal Report
- Etc.

Note: We are covering a lot of material in a short time so we will not be reading for depth, but breadth, context, and integration. A vast majority of these publications are available for free online – a few select chapters may be handed out via Canvas. Where you are only supposed to read a subsection of a document, page numbers are noted.

STATEMENT REGARDING STUDENTS WITH DISABILITIES (updated 2/19):

Oregon State University is committed to student success; however, we do not require students to use accommodations nor will we provide them unless they are requested by the student. The student, as a legal adult, is responsible to request appropriate accommodations. The student must take the lead in applying to Disability Access Services (DAS) and submit requests for accommodations each term through DAS Online. OSU students apply to DAS and request accommodations at the [Getting Started with DAS page](#).

OSU BACC CORE: SCIENCE, TECHNOLOGY, AND SOCIETY:

Successful completion of this course partially fulfills OSU's Baccalaureate Core course requirements in the Science, Technology, and Society category. Here is the official OSU description of what STS courses do.

Given the immense impact that science and technology have had on all facets of modern civilization, a disciplined study of the interaction of science and technology with society is a necessary part of general education. Students should understand the political and economic dimensions of scientific or technological change, the nature of the scientific enterprise and its relationship to technology, and the complexity of major revolutions in science and technology. OSU mandates that all STS courses:

- 1. Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.*
- 2. Analyze the role of science and technology in shaping diverse fields of study over time.*
- 3. Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support. **

**Evidence based writing is an essential component of the Synthesis categories and the exclusively “upper-division” general education academic experience they offer to students. The Baccalaureate Core Committee and the Writing Advisory Board recommend the following to Schools/Departments/Faculty offering Synthesis courses to help students achieve the writing –related criteria and outcome in Science, Technology, and Society:*

Accessibility of Course Materials

Most materials used in this course are accessible with the exception of some of the online videos.

If you require accommodations please contact [Disability Access Services \(DAS\)](#).

Additionally, Canvas, the learning management system through which this course is offered, provides a [vendor statement](#) certifying how the platform is accessible to students with disabilities.

A Bit On MY Expectations:

Three general knowledge and synthesis tests will be given – a baseline (not graded), a mid-term and a final. **These tests will cover material from the lectures, Powerpoint slides and notes, reading assignments and videos.** Each test is worth 125 points. **Advanced notice and a valid excuse** must be given to the instructor if you are unable to take a test at the scheduled time. Advance notice means that you must call or e-mail the instructor before the beginning of class on the day the test is given or the assignment is due. **You will not be able to take the test at a later date or submit late papers unless you give the instructor advance notice. Tests must be made up and papers submitted within one week of the original due date.** (NOTE: Non-identifiable summaries and statistics on exam questions and assignments may be collected and used as part of ongoing research on space literacy.)

There will be two group projects. Again, advanced notice must be given to the instructor if you are unable to hand in your assignment on time. For group assignments, keep in mind that you are letting your peers down if you choose to do a poor job (and they almost always tell me). Papers should be uploaded to the class dropbox/forum/etc. by midnight on the due date. If you email me assignments, I STRONGLY recommend that you keep a copy of the sent message – if your paper gets lost in the mail, does not arrive, or something else happens, I will ask you for a copy of the original email including the original date stamp, **if you cannot provide it, I will not be able to give full points for the assignment – bottom line, cover your butt.**

Plagiarism in the writing assignments will not be accepted. For those that do not understand what this means...**you cannot copy and paste material from a book/website for your paper – we have the tools to check and do. I want YOUR interpretation of what it says.** (and, of course, properly cite your sources!!) Also, follow the instruction guide to the letter. These are very straightforward assignments if you follow the instruction guides to the letter. **Don't lose points because you didn't follow directions!!** Combined, the discussion assignments are worth approximately one test grade.

OSU EXPECTATIONS FOR STUDENT CONDUCT

Student conduct is governed by the university's policies, as explained in the [Student Conduct Code](#).

TECHNICAL ASSISTANCE:

If you experience computer difficulties, need help downloading a browser or plug-in, assistance logging into the course, or if you experience any errors or problems while in your online course, contact the OSU Help Desk for assistance. You can call (541) 737-3474, email osuhelpdesk@oregonstate.edu or visit the [OSU Computer Helpdesk](#) online.

Academic Integrity

Students are expected to comply with all regulations pertaining to academic honesty. For further information, visit [Student Conduct and Community Standards](#), or contact the office of Student Conduct and Mediation at 541-737-3656.

OAR 576-015-0020 (2) Academic or Scholarly Dishonesty:

- a) Academic or Scholarly Dishonesty is defined as an act of deception in which a Student seeks to claim credit for the work or effort of another person, or uses unauthorized materials or fabricated information in any academic work or research, either through the Student's own efforts or the efforts of another.
- b) It includes:
 - i) **CHEATING** - use or attempted use of unauthorized materials, information or study aids, or an act of deceit by which a Student attempts to misrepresent mastery of academic effort or information. This includes but is not limited to unauthorized copying or collaboration on a test or assignment, using prohibited materials and texts, any misuse of an electronic device, or using any deceptive means to gain academic credit.
 - ii) **FABRICATION** - falsification or invention of any information including but not limited to falsifying research, inventing or exaggerating data, or listing incorrect or fictitious references.
 - iii) **ASSISTING** - helping another commit an act of academic dishonesty. This includes but is not limited to paying or bribing someone to acquire a test or assignment, changing someone's grades or academic records, taking a test/doing an assignment for someone else by any means, including misuse of an electronic device. It is a violation of Oregon state law to create and offer to sell part or all of an educational assignment to another person (ORS 165.114).
 - iv) **TAMPERING** - altering or interfering with evaluation instruments or documents.
 - v) **PLAGIARISM** - representing the words or ideas of another person or presenting someone else's words, ideas, artistry or data as one's own, or using one's own previously submitted work. Plagiarism includes but is not limited to copying another person's work (including unpublished material) without appropriate referencing, presenting someone else's opinions and theories as one's own, or working jointly on a project and then submitting it as one's own.
- c) Academic Dishonesty cases are handled initially by the academic units, following the process outlined in the University's Academic Dishonesty Report Form, and will also be referred to SCCS for action under these rules.

Conduct in this Online Classroom

Students are expected to conduct themselves in the course (e.g., on discussion boards, email postings) in compliance with the [university's regulations regarding civility](#).

Tutoring

[NetTutor](#) is a leading provider of online tutoring and learner support services fully staffed by experienced, trained and monitored tutors. Students connect to live tutors from any computer that has Internet access. NetTutor provides a virtual whiteboard that allows tutors and students to work on problems in a real time environment. They also have an online writing lab where tutors critique and return essays within 24 to 48 hours. Access NetTutor from within your Canvas class by clicking on the NetTutor button in your course menu.

OSU Student Evaluation of Teaching

Course evaluation results are extremely important and are used to help me improve this course and the learning experience of future students. Results from the 19 multiple choice questions are tabulated anonymously and go directly to instructors and department heads. Student comments on the open-ended questions are compiled and confidentially forwarded to each instructor, per OSU procedures. The online Student Evaluation of Teaching form will be available toward the end of each term, and you will be sent instructions via ONID by the Office of Academic Programs, Assessment, and Accreditation. You will log in to “Student Online Services” to respond to the online questionnaire. The results on the form are anonymous and are not tabulated until after grades are posted.

BLOG/ FACEBOOK PARTICIPATION:

I encourage participation in the class discussion via the Canvas boards. Feel free to post space related items (can be news, research, opinions, thoughts, poetry, sci-fi, etc) and make comments on what others have posted. Try and leave questions for discussion or answer others. Please be respectful in your posts (disagreements are encouraged – but support your argument!). I will be monitoring all posts and hope that this can be a fun way for the class to have larger discussions and just talk.

AND FINALLY:

It is easy to think of humanity’s future in Outer Space as some far off crazy thing that only extreme geeks have the slightest chance of being a part of. I assure you this is not true. No matter what your major is, there are people today working in the space arena doing what you do. Accountants, Artists, Video Production Techs, Social Media Guru’s, Business Leaders, Industrial Fabricators, Chefs, etc. all have opportunities right now. If you have a genuine interest, there are a host of real and tangible opportunities for you to help create the future. Sometimes all it takes is one small step!