Astrosociology (SPRING 2024)

ASTRON 5

Course Description

In an age of magnificent astronomical progress and discoveries, the increasing knowledge of the cosmos has manifold repercussions in society and culture. We will examine how outer space-related phenomena impact, or potentially impact, society and culture, and vice versa. Especially in light of the proliferating discovery of planets around distant stars, an intriguing topic of astrosociology is presented by the possibility of the existence of extraterrestrial civilizations, their detection, communication with them, and even contact, because each of these aspects has huge social ramifications. Considering alien civilizations also opens a novel perspective on our terrestrial civilizations and may thus help us take a clearer look at ourselves. We will also examine the changing social structure in which the work of astronomy is carried out.

In examining the social dimension of astronomy and space exploration, astrosociology is, on the one hand, tightly intertwined with the natural sciences, especially astronomy and physics; yet, on the other hand, it is also strongly connected with the humanities, particularly philosophy and science fiction literature. Hence, this course is addressed to a broad range of students, from those focusing on the social sciences to those pursuing the sciences or the humanities. All students are encouraged to follow their own unique interests, while benefiting from exposure to the diversity of perspectives brought to this course by students of different disciplinary backgrounds. There are no prerequisites.

Learning Objectives and Goals

The course challenges you to explore maximally strange phenomena and possibilities and thereby to understand and question your assumptions. The main goal is for you to develop a skilled mindset for dealing with the extraordinary in reasonable ways.

Work Load

Research paper (40% of final grade):

Students' primary efforts in the course will be devoted to producing a research paper. It is expected to be 10 to 12 pages and can be related to any of the themes of the course. Students will propose a topic and submit it to their TF for approval. Wide latitude will be given with regard to topic choice, methodological approach, and (inter)disciplinary grounding. To help you structure the process of writing the research paper, you need to complete three milestones (a one-paragraph proposal; a three-page outline and annotated bibliography; and a short in-class presentation) by the respective **deadlines noted in the syllabus**. Lateness in submitting these milestone elements or deficiency in content will impact the "paper milestones" component (10%) of your research paper grade. The quality of the research paper itself will count for 30% of the final grade.

Assignments (30% of final grade):

There will be three short assignments (two short papers and a group presentation), each worth 10%. All assigned papers should be submitted to your TF by the **deadlines noted in the syllabus**.

Participation (20% of final grade):
Students are expected to attend all classes unless prevented from doing so by illness or an emergency. Given the experiential nature of this course, your full engagement directly contributes to the depth and productivity of our class discussions and community. The extent and quality of your participation will count for half of your Participation grade (10%). Lateness or unexcused absences will impact the "absences and timeliness" component (5%) of your Participation grade. Most weeks, you will be expected to post a short paragraph about the week's readings on Canvas **before 5 pm on the day preceding class discussion** (see section on Discussions below)**.** Posts after 5 pm will be counted as missing and will impact the "posts" component (5%) of your Participation grade.

Co-Leading one class session (10% of final grade):
Each student selects one session for which they prepare thoroughly and will be called upon to co-lead the class discussion.

Discussions
Most course segments will include student-led class discussions about the readings. Students are expected to come to class prepared by completing all assigned compulsory readings. *All students are expected to come up with clarifying questions and/or at least one puzzle* (a confusion about, difficulty with, and/or curiosity regarding one of the texts that cannot be concisely answered) to share with the group beforehand on Canvas; these will structure our discussions. Especially thorough preparation is needed for the class for which students are designated co-leaders.

Readings
There are no required books to buy. All readings will be available on the course website. In addition, most journal articles are available through HOLLIS. *Students are not expected to read whole books, but only noted chapters*. The syllabus also lists supplementary readings marked by an asterisk (*****). These are optional.

Collaboration and Academic Integrity

Students are expected to work individually on the assignments (except the presentation) and on the final paper. You are responsible for understanding Harvard School policies on academic integrity available in the Harvard College Handbook for Students and how to use sources responsibly. Do not use ChatGPT or similar bots to create your work. Not knowing the rules, misunderstanding the rules, running out of time, submitting the wrong draft, or being overwhelmed with multiple demands are not acceptable excuses. To support your learning about academic citation rules, please visit the Resources to Support Academic Integrity (in the Harvard College Handbook for Students) where you will find links to the Harvard Guide to Using Sources (https://usingsources.fas.harvard.edu) and two free online 15-minute tutorials to test your knowledge of academic citation policy. The tutorials are anonymous open-learning tools.

Accommodations for Students with Disabilities

Harvard University is committed to providing an accessible academic community. The Accessibility Services Office offers a variety of accommodations and services to students with documented disabilities. Please refer to the Harvard College Handbook for Students for more information. Students needing academic adjustments or accommodations because of a

documented disability must present their Faculty Letter from the Accessible Education Office (AEO) and speak with the instructor by the end of the second week of the term. Failure to do so may result in the instructor's inability to respond in a timely manner.

Course Schedule and Readings

1. (Jan. 23, 25) Astrosociology: Context and definition

The framework: Social science – sociology – sociology of science. Definitions and the beginnings of astrosociology as a scholarly field.

Readings:

[General note: Readings marked with an asterisk (*) are supplementary and optional.]

Pass, J., Hearsey, C., & Caroti, S. (2010). Refining the definition of astrosociology utilizing three perspectives. AIAA SPACE 2010 Conference & Exposition.

Rees, M. (2017). Curtains for Us All?

*Dickens, P. (2009). The cosmos as capitalism's outside. *Sociological Review*, *57*(1_suppl), 66-82.

*Dickens, P., & Ormrod, J. S. (2007). Outer space and internal nature: Towards a sociology of the universe. *Sociology*, *41*(4), 609-626.

Assignment 1: 3-Page Observation Report (Due Feb. 3, 5 pm):

You are an extraterrestrial sociologist visiting Earth. Your task is to study human civilization and to keep a detailed journal of observations over a one-week period. After one week, you will compose a report, based on your observations, about one human habit or ritual and explain its function.

2. (Jan. 30, Feb. 1) Astronomy Past and Present

Cultural and social importance of astronomical phenomena in early societies. Astronomy misconceptions. Advances in astronomy and astrophysics.

Readings:

Hoskin, M. (2003). *The History of Astronomy: A Very Short Introduction*. Oxford University Press. Chapters 2-4

Lankford, J., & Slavings, R. L. (1997). *American astronomy: Community, Careers, and Power, 1859-1940*. *University* of Chicago *Press*. Chapter 3

Witze, A. (2020). How the fight over a Hawaii mega-telescope could change astronomy. *Nature, 577*(7791), 457-459.

*Durrani, H. (2019). Is Spaceflight Colonialism? Fifty years after Apollo 11, it’s time to revisit the laws of space. *The Nation*, July 19. https://www.thenation.com/article/world/apollo-space-lunar-rockets-colonialism/

*Tanigawa-Lau, M. (2022). The State's Kuleana: Deconstructing the Permitting Process for the Thirty-Meter Telescope and Finding Restoration through Systemic Validation of Native Hawaiian Rights. *UCLA Law Review, 68*(5), 1390-1445.

3. (Feb. 6, 8) Epistemological Issues

What is truth? What is reality? Truth theories and science. The "black swan" theory of unexpected, high-impact events.

Readings:

Popper, K. (1959). *The Logic of Scientific Discovery*. New York: Basic Books. Sections 1, 6, 43, 82.

Taleb, N. N. (2010). *The Black Swan: The Impact of the Highly Improbable*. New York: Random House Trade Paperbacks. Prologue, chapters 3, 6, 8.

*Duschl, R. A., & Grandy, R. (2013). Two views about explicitly teaching nature of science. *Science & Education*, *22*(9), 2109-2139. Sections 2.2 and 2.3

*"Truth" in *Stanford Encyclopedia of Philosophy*. http://plato.stanford.edu/

4. (Feb. 13, 15) Science Fiction

Influence of science on science fiction—and vice versa. Science fiction as cultural critique/commentary.

Readings:

Miller, R. (2014). How Jules Verne invented astronautics. http://io9.gizmodo.com/how-jules-verne-invented-astronautics-1493029901

Wilcox, D. (1940). The voyage that lasted 600 years. *Amazing Stories, 14(10),* 82-104.

Dery, M. (1994). Black to the Future: Interviews with Samuel R. Delany, Greg Tate, and Tricia Rose. In M. Dery, *Flame Wars* (pp. 179-222). Duke University Press.

*Roberts, A. (2016). The History of Science Fiction. London: Palgrave Macmillan. Chapter 1

*Verne, J. (1865/2011). *From the Earth to the Moon*. Hustonville, KY: Golgotha Press.

5. (Feb. 20, 22) Conceptions of the Other

Group formation and alienation. Historical contexts. Social and group reactions to threat.

Readings:

Simmel, G. (1964). *The Sociology of Georg Simmel*. Trans., ed., and introduced by K. H. Wolff. New York: Free Press, pp. 402-408.

Fritsche, I., Jonas, E., & Kessler, T. (2011). Collective reactions to threat: Implications for intergroup conflict and for solving societal crises. *Social Issues and Policy Review, 5*(1), 101-136.

*Tremlett, P. F. (2009). "The Self" and "The Other" in disciplinary anthropology. *Anthropology Matters*, *5*(2).

*Dickens, P. (2009). Alienation, the cosmos and the self. *Sociological Review*, *57*, 47-65.

Assignment 2: Group Presentations (on Feb. 27 or Feb. 29):

Pick a documented UFO or extraterrestrial contact account and evaluate it critically, using past readings. What evidence was brought forward pro and con? What evidence is convincing/ not convincing, and why? If you do not come to an unequivocal conclusion, what further evidence would you want?

6. (Feb. 27, 29) UFOs

Science, pseudo-science, secrecy and conspiracy theories.

Readings:

Pigden, C. (1995). Popper revisited, or what is wrong with conspiracy theories? *Philosophy of the Social Sciences, 25*(1), 3–34.

Jung, C. G. (1959). A visionary rumour. *Journal of Analytical Psychology*, *4*(1), 5-19.

*Sagan, C. (1996). *The Demon-Haunted World: Science as a Candle in the Dark*. New York: The Random House. Chapters 4, 12, 14.

*Pritchard, D. E. (1992). Physical analysis of purported alien artifacts. In *Anomalous Experiences & Trauma: Current Theoretical, Research and Clinical Perspectives: Proceedings of TREAT II* (pp. 183-190).

*Gordin, M. D. (2012). *The Pseudoscience Wars: Immanuel Velikovsky and the Birth of the Modern Fringe*. Chicago: University of Chicago Press. Introduction, 6, Conclusion.

Due March 7, 9 am: One paragraph proposal for final research paper.

7. (March 5, 7) Space Exploration (Part 1)

Space treaties and exploration, planetary protection and defense.

Readings:

McDougall, W. A. (1985). Sputnik, the space race, and the Cold War. *Bulletin of the Atomic Scientists*, *41*(5), 20-25.

United Nations Office of Outer Space Affairs. (1967). *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*. (Selections)

https://www.mars-one.com/mission (all sections in the 'Mission' tab)

http://www.marssociety.org/home/about/founding-declaration/ (founding declaration)

https://www.youtube.com/watch?time_continue=146&v=tdUX3ypDVwI (Elon Musk Making Life Multiplanetary Presentation)

8. (March 19, 21) Space Exploration (Part 2)

Thinking about Extraterrestrial Intelligence (ETI), History of ETI debate, Drake equation and Fermi paradox. Asteroid mining, and economies of the future.

Readings:

Crowe, M. J., & Dowd, M. F. (2013). The extraterrestrial life debate from antiquity to 1900. In D. Vakoch (Ed.), *Astrobiology, History, and Society* (pp. 3-56). Berlin: Springer.

Ward, P. D., & Brownlee, D. (2000). *Rare Earth: Why Complex Life is Uncommon in the Universe*. New York: Copernicus. Introduction, chapters 12, 13.

*Jones, E. M. (1985) Where is everybody? An account of Fermi's question. Los Alamos National Laboratory, LA-10311-MS, DE85 022898.

*Shklovskii, I. S., & Sagan, C. (1966). *Intelligent Life in the Universe*. San Francisco: Holden-Day. Chapters 2, 34, 35

*Drake, F. (1965). The radio search for intelligent extraterrestrial life. In G. Mamikunian & M. H. Briggs (Eds.), *Current Aspects of Exobiology* (pp. 323-345). Oxford, UK: Pergamon Press.

Due March 26, 9 am: Outline of research paper and annotated bibliography (3 pages)

9. (March 26, 28) Extraterrestrial Life and Civilization

What is life? Terrestrial examples. Extraterrestrial possibilities.

Readings:

Cohen, J., & Stewart, I. (2002). *Evolving the Alien: The Science of Extraterrestrial Life*. London: Ebury Press. Chapters 4, 5, 7.

Davies, P. C., Benner, S. A., Cleland, C. E., Lineweaver, C. H., McKay, C. P., & Wolfe-Simon, F. (2009). Signatures of a shadow biosphere. *Astrobiology*, *9*(2), 241-249.

*Bar-Yam, Y. (1997). Complexity rising: From human beings to human civilization, a complexity profile. http://www.necsi.edu/projects/yaneer/Civilization.html

*Wilson, E. O. (2012). *The Social Conquest of Earth*. New York: W. W. Norton & Company.

10. (April 2, 4) Problems of Communication

How would we communicate with extraterrestrials? *Could* we? How do we communicate with each other?

Readings:

Nagel, T. (1974). What is it like to be a bat? *The Philosophical Review*, *83*(4), 435-450.

Peters, J. D. (2012). *Speaking into the Air: A History of the Idea of Communication*. University of Chicago Press. Chapter 6

*Vakoch, D. A. (2015). Communicating with the other: Infinity, geometry, and universal math and science. In S. J. Dick (Ed.), *The Impact of Discovering Life beyond Earth* (pp. 143-154). Cambridge, UK: Cambridge University Press.

11. (April 9, 11) SETI: Listening for and Messaging Extraterrestrials

From the *Sentinel* project to the *Breakthrough Starshot* initiative. Radio messages and physical objects. Risks. Long-term ethical responsibility.

Readings:

Tarter, J., et al. (2010, September). SETI turns 50: five decades of progress in the search for extraterrestrial intelligence. In *Instruments, Methods, and Missions for Astrobiology XIII* (Vol. 7819, p. 781902). International Society for Optics and Photonics.

Haqq-Misra, J., Busch, M. W., Som, S. M., & Baum, S. D. (2013). The benefits and harm of transmitting into space. *Space Policy*, *29*(1), 40-48.

Shostak, S. (2015). Should we keep a low profile in space? *New York Times*, March 27.

*Sagan, C., et al. (1978). *Murmurs of Earth: The Voyager Interstellar Record*. New York: Random House. Chapters 1, 2.

Assignment 3: 2-Page Reflection (due April 16, 9 am):

Discuss your initial thoughts about the implications of contact with ETI. How have your thoughts changed? What has remained the same? How would you answer that question now?

PowerPoints of your final presentations (3 slides) should be sent to your instructors by Wednesday, April 17, 5 pm.

12. (April 16, 18) Sociological Implications of Detection and/or Contact

The ethics of contact. Scenarios between deliverance and catastrophe. Impact on world religion, culture, and economy.

Readings:

Schetsche, M. (2005). SETI (Search for Extraterrestrial Intelligence) and the consequences: Futurological reflections on the confrontation of mankind with an extraterrestrial civilization. http://www.astrosociology.com/Library/PDF/Contributions/SETIandConsequences_ENG.pdf

Baum, S. D., Haqq-Misra, J. D., & Domagal-Goldman, S. D. (2011). Would contact with extraterrestrials benefit or harm humanity? A scenario analysis. *Acta Astronautica*, *68*(11-12), 2114-2129.

Weidemann, C. (2016). Did Jesus die for Klingons too? In P. Levinson & M. Waltemathe (Eds.), *Touching the Face of the Cosmos: On the Intersection of Space Travel and Religion* (pp. 124-134). New York: Connected Editions.

April 18: ***Student Presentations of their Final Projects (Part 1)***

13. (April 23) <u>The Past, Present, and Future of Astrosociology</u>

Closing lecture + ***Student Presentations of their Final Projects (Part 2)***

Readings:

Arendt, H. (2007). The conquest of space and the stature of man. *The New Atlantis*, (18), 43-55.

Dick, S. J. (2012). Cosmic evolution: the context for astrobiology and its cultural implications. *International Journal of Astrobiology*, *11*(4), 203-216.

*Billingham, J., et al. (1999). *Social Implications of the Detection of an Extraterrestrial Civilization*. Mountain View: SETI Press. Chapters 2, 3, 4.

Final papers should be submitted to your Teaching Fellow at date TBD.