Doctorado en Filosofía

The Fermi paradox

Periodo Académico	: Second semester 2022
Créditos	: 6
Requisito	: –
Horario	: Tuesday, 15:00–18:00
Fechas	: August 30 to November 29
Horario Atención Estudiantes	: Thursday, 15:00–17:00
Profesor	: Wolfhart Totschnig <wolfhart.totschnig@mail.udp.cl>

I. DESCRIPTION

On the one hand, we have reason to believe, on theoretical grounds, that there are many other forms of life in the universe and that a good part of them are more advanced than we are. On the other hand, we haven't seen or heard anything from these other, more advanced life forms; for all we know, we might be alone in the universe. The tension (or apparent contradiction) between these two thoughts is known as "the Fermi paradox".

Let me explain the two sides of the paradox in more detail.

Given the vastness of the universe, it seems very likely that life arose not only on Earth, but also in many other places. There are billions of galaxies besides ours, each with billions of stars. Each of these stars probably harbors several planets. That adds up to quadrillions of planets altogether. On some—maybe just a tiny fraction, but probably still a huge number—of them, the environmental conditions must be similar to those on Earth (moderate temperatures, abundant water, a thick atmosphere, a strong magnetic field, etc.). We do not exactly know how likely it is for life to develop under such conditions. But since it happened here on Earth, we may reasonably assume that it can and did happen elsewhere. Besides, maybe life does not require an Earth-like environment, but can originate and evolve under other, very different conditions. This line of reasoning leads to the thought that life should be common in our galaxy and the universe at large.

Furthermore, since our Sun is a relatively young star—it formed about five billion years ago, which is nine billion years after the Big Bang—and Earth hence a relatively young planet, life could have arisen in other places long before it did here. Therefore, if the above line of reasoning is correct, there should be quite a few more advanced life forms out there, life forms that have had much more time to evolve than humans.

So where are they? Why don't we see any sign of them?

There are several reasons for why we *may expect* to see signs of them, if indeed they exist. For one, they could have explored the universe by now and hence visited Earth, leaving some artifact or trace. Also, they could have built, for various purposes, structures big enough to show up in our telescopes. Lastly, they could be using means of communication that we might detect with our antennas.

If we take seriously the estimate that the universe is teeming with life forms, some of them more advanced than us, then the fact that no such signs have so far been discovered is puzzling. This puzzle is called "the Fermi paradox" because Enrico Fermi, an Italian-American physicist, expressed it in 1950 while having lunch with his colleagues.

Ever since Fermi put forward the paradox, there has been a lively debate about how to resolve it. Various solutions have been proposed: the “rare Earth” hypothesis, the “Great Filter” hypothesis, the “transcension” hypothesis, the “zoo” hypothesis, to name a few of the most prominent. These hypotheses are attempts to respond to the philosophical questions that the paradox poses: How common is life in the universe? How probable is it that a form of life will develop intelligence and, subsequently, advanced technology? If it develops advanced technology, how probable is it that it will destroy itself with that technology? If it does not destroy itself, how probable is it that it will use the technology to explore—or even colonize—the universe? If it does explore the universe, how will it behave when it encounters less advanced life forms?

The aim of this seminar is to raise these questions, to discuss the various answers that have been given to them, and thus to assess which solution to the paradox is the most plausible.

In order to offer the students an opportunity to practice and improve their (academic) English, the course will be entirely in that language: The readings are in English, the discussions in the classroom will be in English, and the assignments are to be written in English too.

II. OBJECTIVES

The main objectives of this course are

- to confront the students with a philosophical topic of great interest, namely the Fermi paradox;
- to make them acquainted with the most important writings on this topic;
- and to help them improve their (academic) English in reading, writing, and speaking.

III. METHODOLOGY

The course will comprise 12 sessions, one per week, starting on August 30 and ending on November 29. The sessions will begin with a brief introductory presentation by the professor in which the historical and philosophical context of the text to be discussed in the session will be laid out. This introductory presentation will then give way to a joint discussion, animated and led by the professor, of the principal ideas and arguments of the text.

Throughout the course, the students will practice academic writing in English. They will write five short “think pieces” (one every two sessions) and a longer final essay (see section “Assignments” below for details).

The professor will be available two hours per week, on Thursday from 15:00 to 17:00, for individual consultations.

IV. CONTENTS

See section “Description” above.

V. ASSIGNMENTS

The students will be expected to complete the following assignments:

- Five short “think pieces” (one page or 400 words *maximum*), one every two sessions, on some aspect of the readings that the student finds particularly interesting or questionable.

- A final essay of 6 pages or 2000 words *maximum* on a topic chosen by the student. The students are invited to consult with the professor about their topic before writing the essay.

VI. SCHEDULE

Note: This schedule is tentative. The order and readings of the first sessions may change, and the topics and readings of the last sessions are still to be determined.

1. Tuesday, Aug. 30	Topic: Introduction to the topic and organization of the seminar Reading: –
2. Tuesday, Sept. 6	Topic: The “rare Earth” hypothesis Reading: Ward & Brownlee, *Rare Earth*, selections.
3. Tuesday, Sept. 13	Topic: The “Great Filter” hypothesis, part 1 Reading: Hanson, “The Great Filter”. **Submission of the first think piece**
4. Tuesday, Sept. 27	Topic: The “Great Filter” hypothesis, part 2 Reading: Bostrom, “Existential risks”; Bostrom, “The vulnerable world hypothesis”.
5. Tuesday, October 4	Topic: The “Great Filter” hypothesis, part 3 Reading: Cooper, “Bioterrorism and the Fermi Paradox”; Sotos, “Biotechnology and the lifetime of technical civilizations”. **Submission of the second think piece**
6. Tuesday, Oct. 11	Topic: The “transcension” hypothesis, part 1 Reading: Moravec, *Robot*, selections.
7. Tuesday, Oct. 18	Topic: The “transcension” hypothesis, part 2 Reading: Smart, “The transcension hypothesis”. **Submission of the third think piece**
8. Tuesday, Oct. 25	Topic: The “zoo” hypothesis Reading: Clarke, “Where’s everybody?”; Ball, “The zoo hypothesis”; Bisson, “They’re made out of meat”.

9. Tuesday, Nov. 8	Topic: To be determined Reading: To be determined **Submission of the fourth think piece**
10. Tuesday, Nov. 15	Topic: To be determined Reading: To be determined
11. Tuesday, Nov. 22	Topic: To be determined Reading: To be determined **Submission of the fifth think piece**
12. Tuesday, Nov. 29	Topic: Review and conclusion Reading: –
Sunday, December 15	**Submission of the final essay**

VII. BIBLIOGRAPHY

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Moravec, Hans. 1999. *Robot: Mere machine to transcendent mind*. Oxford: Oxford University Press.

Smart, John M. 2012. "The transcension hypothesis: Sufficiently advanced civilizations invariably leave our universe, and implications for METI and SETI." *Acta Astronautica* 78: 55–68.

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Zuckerman, Ben, and Michael H. Hart, eds. 1995. *Extraterrestrials: Where are they?* Cambridge: Cambridge University Press.