The Physics of Exotic Propulsion For Interstellar Space Travel [*The Society For UAP Studies*]

Sum/Fall '24, Mon. 2-5pm (Sept. 9-Oct. 28) Google Meet / Classroom

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Text: None required. All of the necessary information / documentation will be provided during class and via e-mail, which will include attachments + links to different websites.

Course Description: **If ET visitations are possible, how would aliens get here?** This course will briefly cover the history of human air and space travel first, with the historical claims that each were impossible. Then, after explaining Newtonian-physics-based propulsion, it will move on to describing the origins of Einstein's Theory of Special Relativity (1905), explaining why the speed of light must be a constant and why that causes time to dilate (Twin Paradox) and length to contract, helping interstellar travelers along. The course will also include General Relativity for handling gravity and acceleration, with a focus upon how this broader theory may allow for faster-than-light navigation of the cosmos, through the warping of the space-time fabric (gravitational waves and inflation will be discussed as examples) and Einstein-Rosen bridges, or wormholes. Lastly, the course will end with a discussion of non-relativistic solutions to observed UAP behavior using the classical mechanics of Newton / Galileo, emphasizing how Albert Einstein's work is but the icing on the cake.

Course Objectives: Students will learn how we know relativity to be correct. The formulas for relativistic mass and energy will be explained from a qualitative perspective for the non-mathematically-oriented students. Problematic side effects like mass increase and starlight Doppler blue-shifting will be covered, but students will learn suggested solutions of new fuel sources and propellants like dark matter or energy, and new types of shielding against radiation, for relativistic spaceflight (still sub-light). After completing this course, which will include case studies, students will be able to recognize and explain to others cases of UAP exhibiting high speeds / accelerations.

Grades: The course will be operated as an ungraded, pilot (test) program but there will be homework assignments consisting of weekly readings, including newspaper articles, scientific papers, and book excerpts. The reading will be necessary for the discussions.

All students are required to have their own personal computers they can use to access the internet, in order to be able to attend this remote-access-only class via Google, to read and answer e-mails, download files, and do assigned homework.

Weekly Class Topics: The following is a tentative chronological list of topics that will be covered in this course. It's natural to fall behind or get ahead or adjust topics, especially during the first time the course is taught (trial run). There are no tests/exams, quizzes, or other formal (i.e. scored) assessments. There are no written homework assignments.

Week 1. A Brief History of Human Air and Space Travel
Week 2. Intro to Einstein's Special Relativity and Time Dilation
Week 3. Relativistic Energy, and Doppler Shift
Week 4. Fuels and Shielding for Relativistic Travel
Week 5. UAP Case Studies of High Velocities or Accelerations
Week 6. Intro to General Relativity and Space-Time Warping
Week 7. Tachyons, Warp Drives, and Wormholes
Week 8. A Lack of Sonic Booms: Clever Engineering?

Readings:

* *New York Times* editorial on air travel (1903), & on rockets (1920) + retraction (1969)
* Exoplanets
- http://knuthlab.org/pmwiki.php/Exoplanets/ExoplanetStudies
- https://exoplanets.nasa.gov
* Relativity
- *The Physics of Superheroes* by James Kakalios, chapter on Special Relativity (Ch. 6 of https://www.amazon.com/Physics-Superheroes-James-Kakalios/dp/1592402429)
- *Hyperspace* by Prof. Michio Kaku, chapter on Special and General Relativity (Chap. 4) as two readings (https://www.amazon.com/Hyperspace-Scientific-Parallel-Universes-Dimension/dp/0385477058)
* Case Studies
- The *Nimitz* incident & similar encounters (https://www.mdpi.com/1099-4300/21/10/939)
- UAPx's first results (https://arxiv.org/abs/2312.00558)
- VASCO's seminal results (https://www.nature.com/articles/s41598-021-92162-7)
* GR: Warp Speed and "Portals"
- *Physics of the Impossible* by Kaku, chapter on FTL (Chapter 11 of https://www.amazon.com/Physics-Impossible-Scientific-Exploration-Teleportation/dp/0385520697)
- *Black Holes and Times Warps* by Prof. Kip Thorne, chapter about wormholes (the final chapter of https://wwnorton.com/books/9780393312768)
* Engineering the Future
- *The University in a Nutshell* by Stephen Hawking, chapter on the future (Chapter 6 of https://www.amazon.com/Universe-Nutshell-Stephen-William-Hawking/dp/055380202X)

Student Activities:

Debate: Is there anything truly impossible, versus just difficult?
Count the stars at night: exoplanet habitability statistics
When is "now" in Special Relativity? The lack of simultaneity
Critical Thinking: What would an iPad look like to Archimedes? A laptop to Faraday?
Using loose-leaf paper to model warp drives and wormholes
Sorting activities with pictures of possible types of spaceships and UFO shapes
Light clock activity with one student in a chair with a phone light and a friend pushing them around: inertial and non-inertial reference frames
Fire extinguisher or similar demo by the instructor to explain rocketry