

Systemary Travel

By: Ethan Fonarev, Lucy Mogan, Maddie Cinelli,
Nicholas Lloyd

What's been done so far

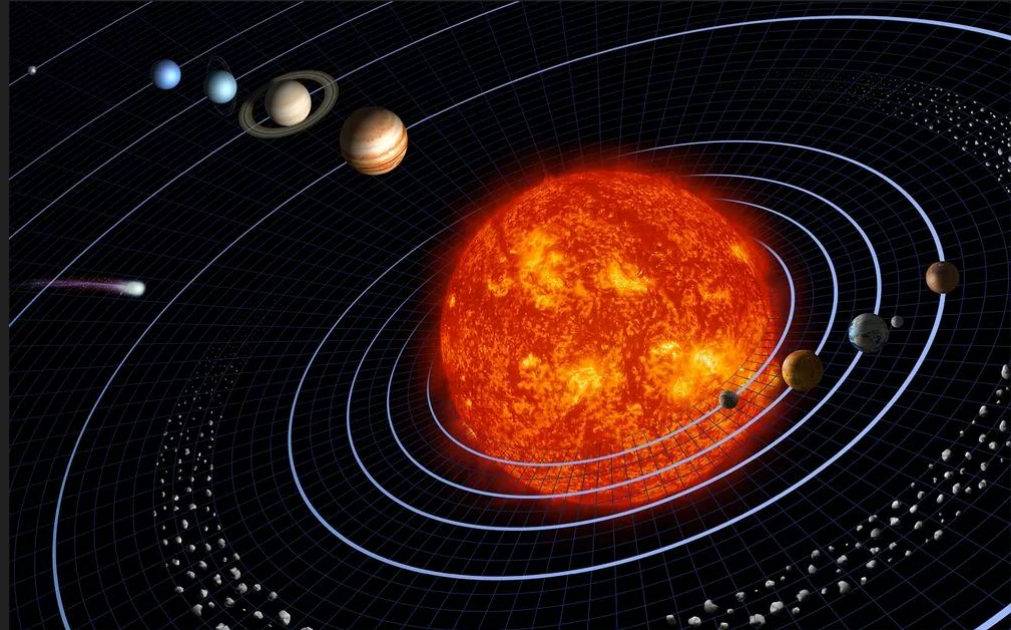
- Right now-propelled with liquid hydrogen/oxygen
- Apollo 11 and the Endeavor used that method
- Our spacecraft don't go fast enough to get very far

What's been done so far

- New theories-nuclear fusion and solar sails
- Solar sails tested on Ikaros probe and NanoSail-D demonstrator
- Nuclear fusion used in projects Daedalus and Icarus

Reasons for Interplanetary travel.

- Save the human race from overpopulation
- Explore space to harvest resources
- New opportunities for scientific discovery
- Establish colonies
- Establish new launch pads



Solar Sails

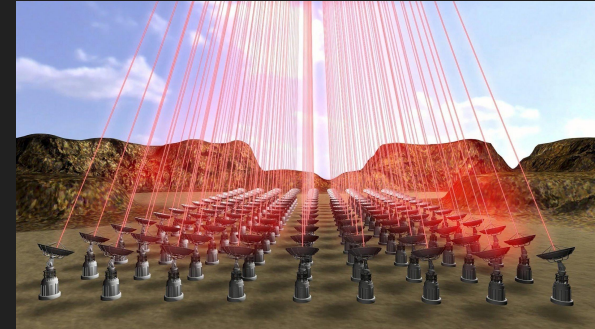
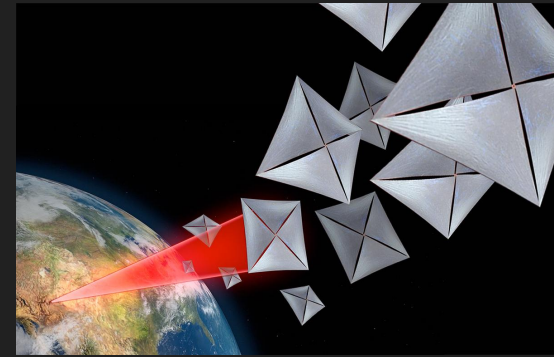
- Travel up to 37,300 km per second
- Reach Pluto in hours
- 1 square kilometer, or around 3281 square feet

Solar Sails

- Aluminized Mylar, reflective/heat resistant.
- Reflect sunlight-propels the spacecraft forwards.
- Each photon has momentum, and during the collision it transfers that momentum to the sails.

Breakthrough Starshot

- Designed to explore and gather data from interstellar neighbors
- Powered by a laser grid array on the surface
- Laser grid propels 1000 nanobots attached to solar sails
- Bots go at 12.5% of c
- Stephen Hawking approved



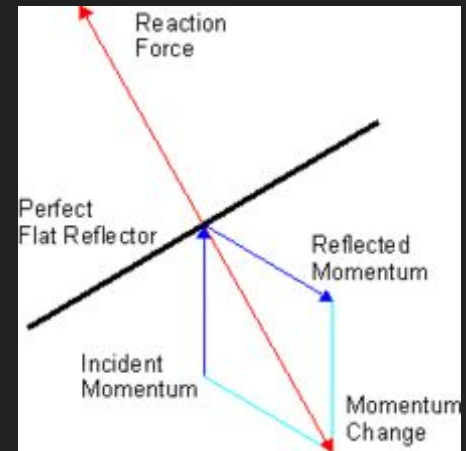
The Journey

- 1000 nanobots sent by laser at 12.5 of c
- nanobots slow down using neighboring star's gravity
- arrives at Proxima Centauri
- takes pictures and sends them back



How it works

- solar radiation exerted onto sail
- pressure sends sail forward
- all due to reflection and absorption of light



Pros & Cons of a Solar Sail Propulsion System

Pros:

Uses sunlight (infinite source of energy)

Consistent

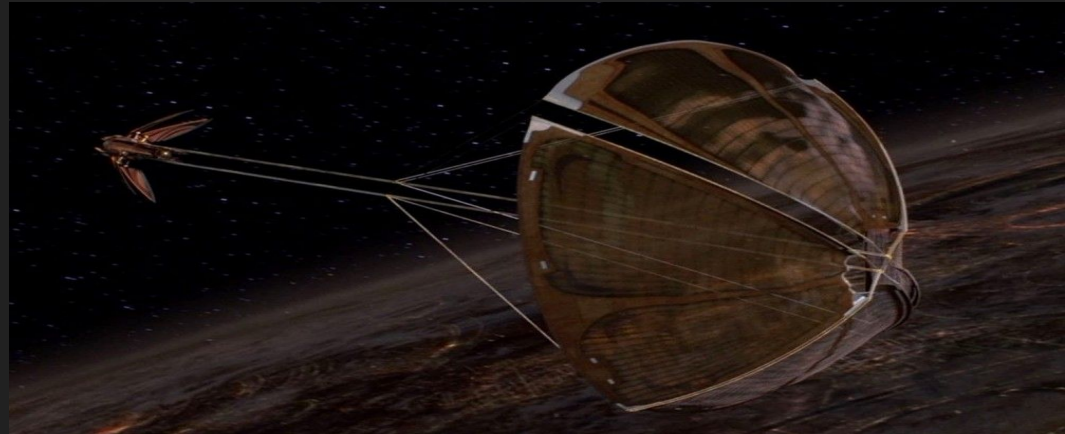
Technology is available

Cons

vulnerable to cosmic debris

Relies on the sun

High speed may tear sail



Nuclear Fusion

-2 nuclei come together to form a larger element

-conversion to element isn't perfect

-remaining mass converts to energy



1kg
Hydrogen

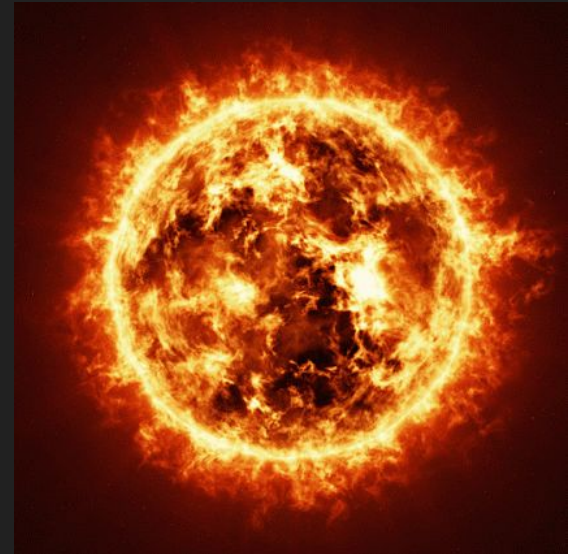
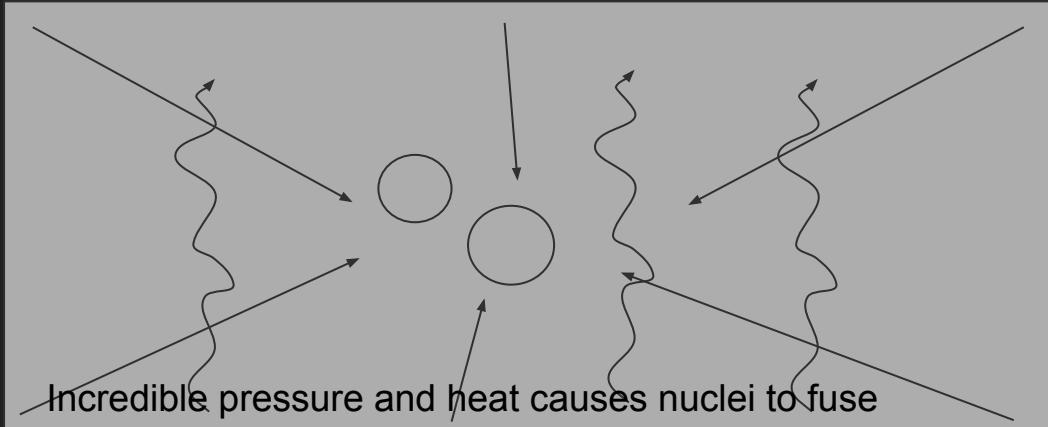
1kg
Hydrogen

1.8kg
Helium

Remaining kg
converts to
energy

Thermonuclear fusion

- Nuclear fusion caused by extreme heat
- Controlled (incapable) vs uncontrolled (atom bombs and stars)
- Requires 1.2 billion kelvins of heat



Project Icarus

- Developed in 2009 by BIS and ZTF
- Unmanned probe
- Controlled thermonuclear fusion as propulsion system



Pros & Cons of a Nuclear Fusion Propulsion System

Pros:

Ideal for deep space travel

Does not produce radioactive waste

can travel at high speeds

Cons:

ideal fuel source on other planets

limited fuel reserve

extreme temperatures and

pressure required

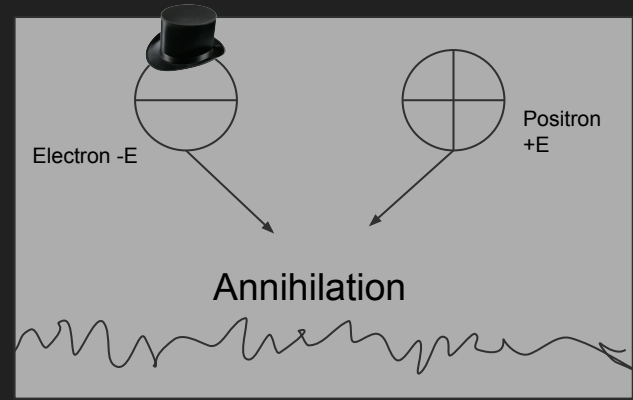


**NEW CHALLENGER
APPROACHING**



Annihilation

- antimatter and matter
- combination=complete conversion to energy
- can't be contained



Fact: Just a gram of antimatter is worth trillions of dollars and has the same destructive capabilities as a the Tsar Bomba.



Project Daedalus

- developed between 1973 to 1978
- Atomic hydrogen bombs propel spacecraft
- Uses deuterium and helium-3 pellets



Conclusion

- Make a full blueprint/model of our spacecraft.
- Use solar sail technology for more research and smaller scientific payloads
- Find more controllable nuclear fusion solutions
- Use nuclear fusion for sending larger payloads and people
- Contact SpaceX Headquarters