

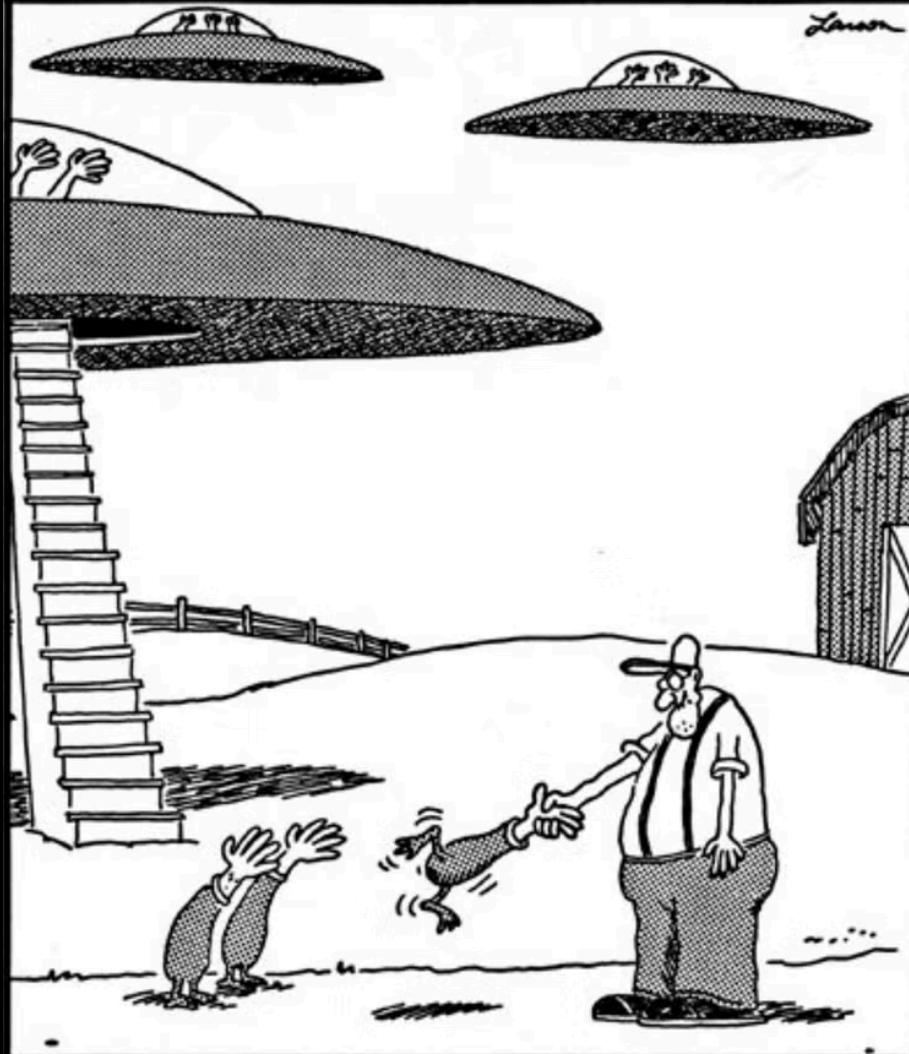
Is There Anyone Out There?



Peterborough Astronomical Association
Novice Astronomy Class
February 6, 2026
Brett Hardy

UFO Phenomena

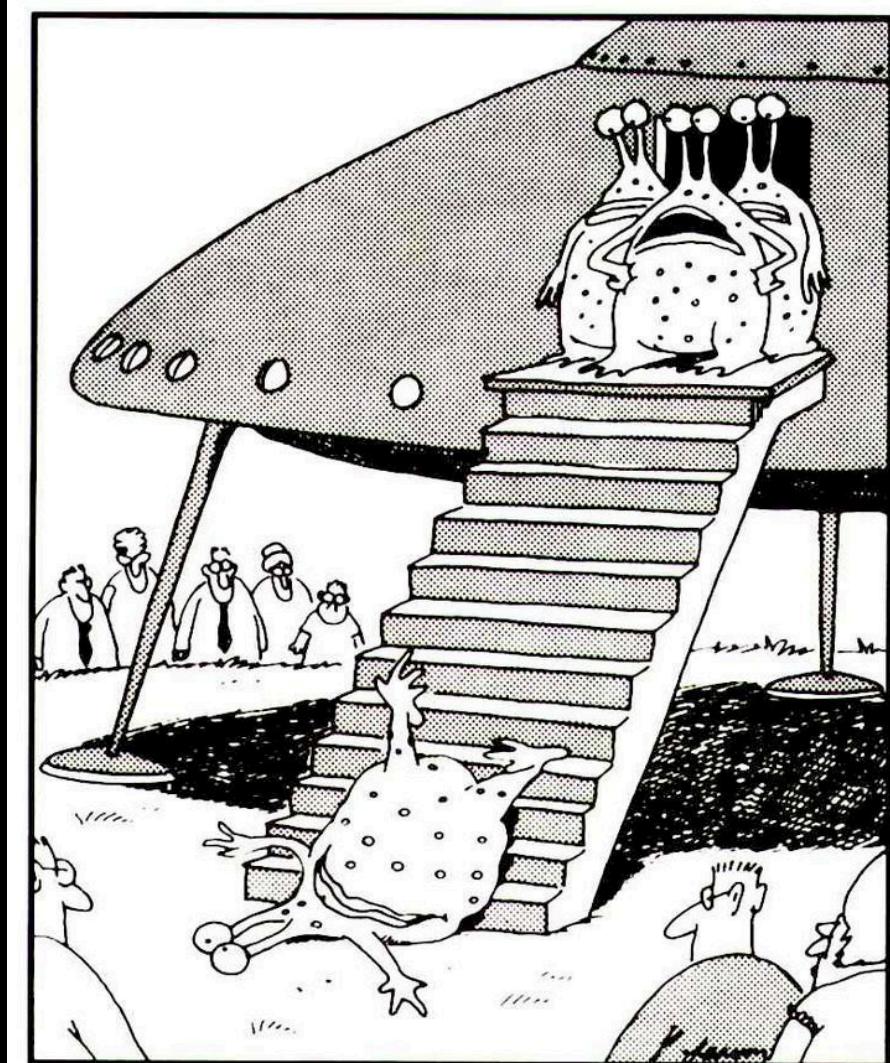
- Roswell incident June 14, 1947
- June 24, 1947 & Kenneth Arnold
- Are *they* already here?



Inadvertently, Roy dooms the entire earth to annihilation when, in an attempt to be friendly, he seizes their leader by the head and shakes vigorously.

Fermi's Paradox

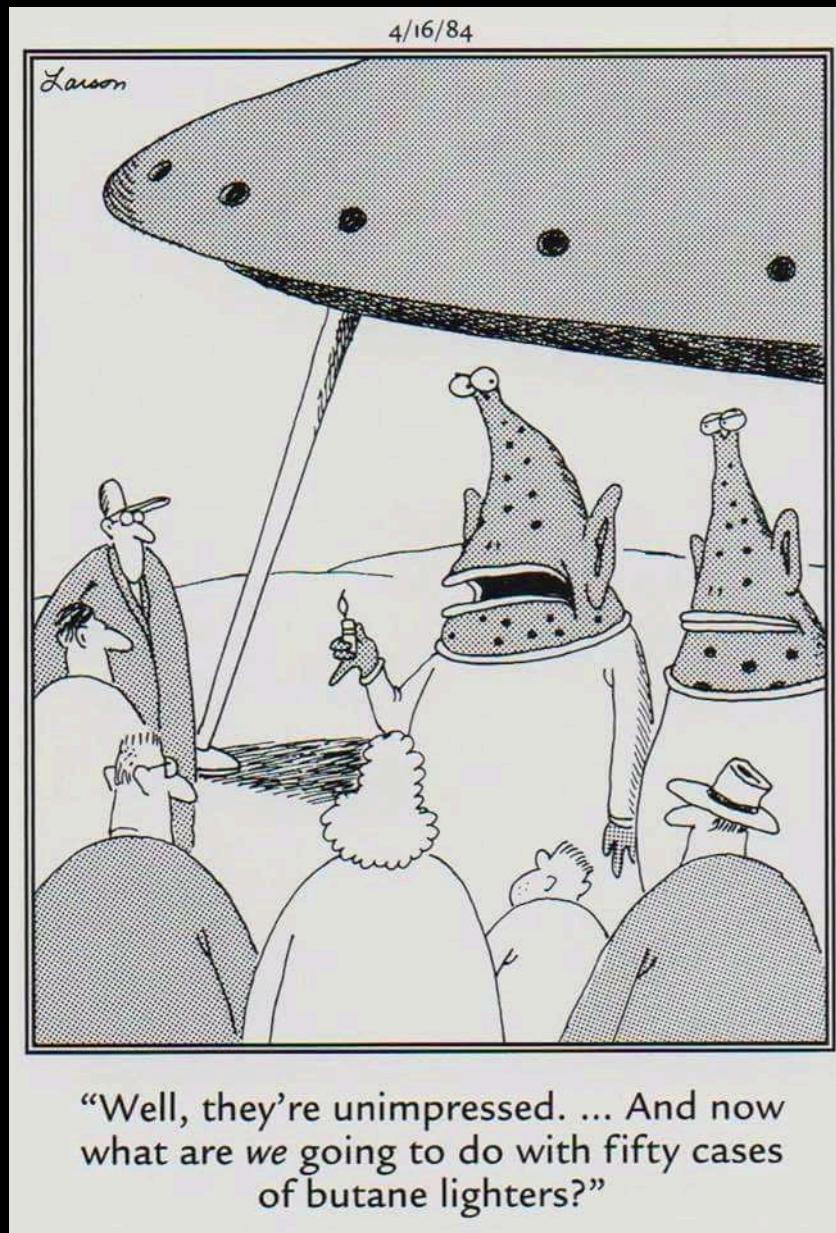
- Los Alamos, New Mexico 1950
- “But where is everybody?”



“Wonderful! Just wonderful! ... So much for instilling them with a sense of awe.”

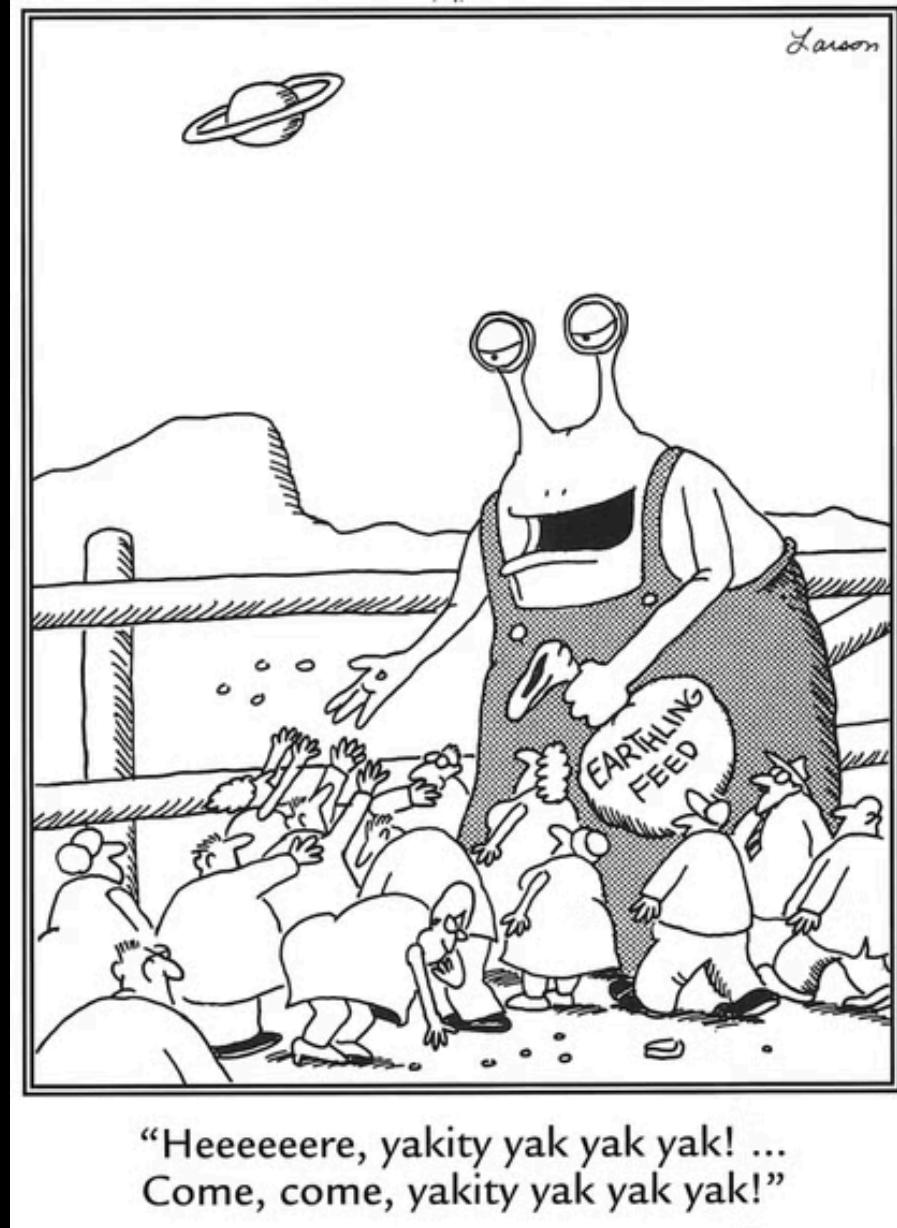
The Drake Equation

- Frank Drake
- Project Ozma 1960 (April – July)
Green Bank Observatory, West
Virginia
- National Academy of Sciences
1961
- How many advanced
technological civilizations are
there in the Milky Way Galaxy?
- $N = R_* \cdot f_p \cdot n_e \cdot f_l \cdot f_i \cdot f_c \cdot L$
- Search for Extraterrestrial
Intelligence - SETI



Cosmological & Geological Accidents

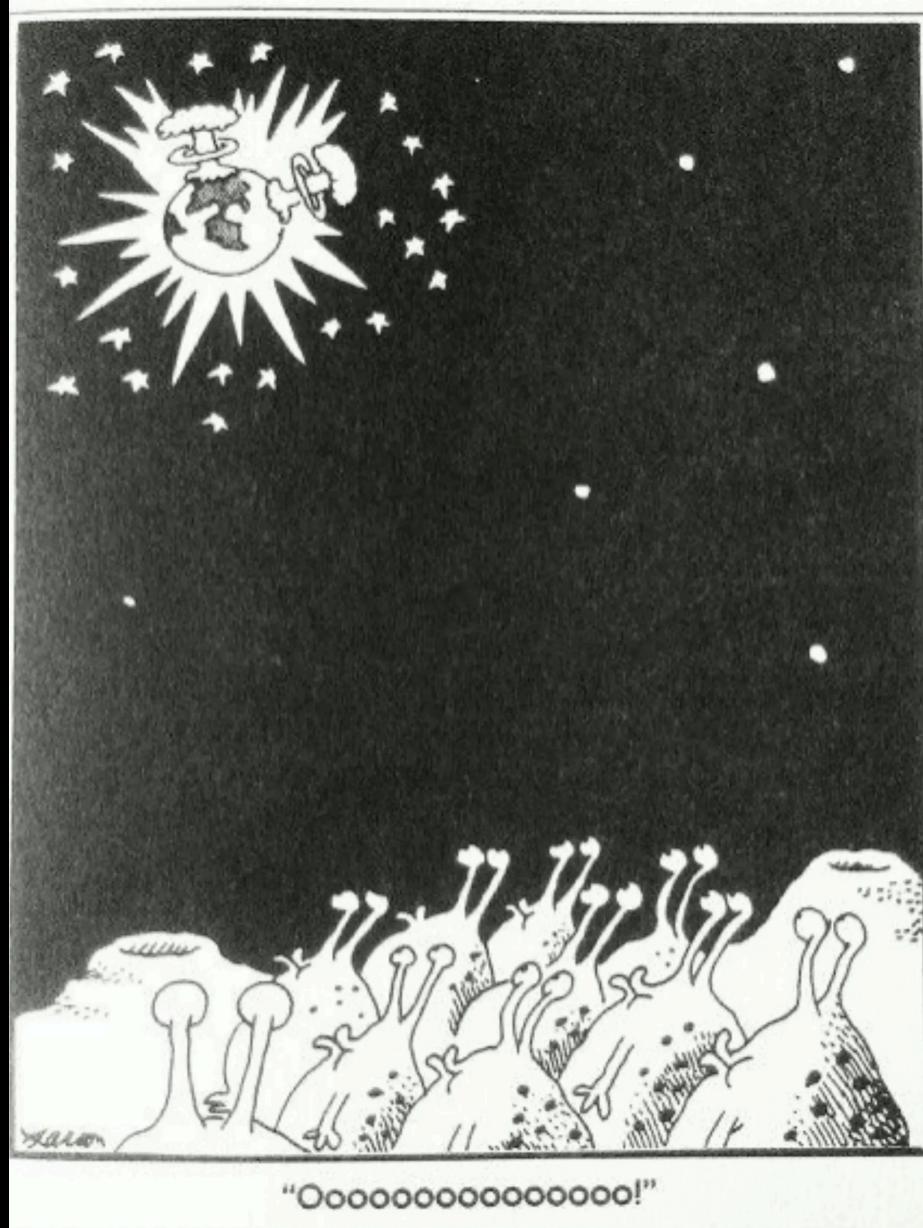
- Galactic Location
- Solar system formation
- Solar activity
- Volatile delivery
- Orbital evolution
- Metallicity
- UV shielding
- Atmospheric composition
- Interior composition
- Plate tectonics
- Mass extinctions
 - Volcanism
- K – Pg boundary



“Heeeeeere, yakity yak yak yak! ...
Come, come, yakity yak yak yak!”

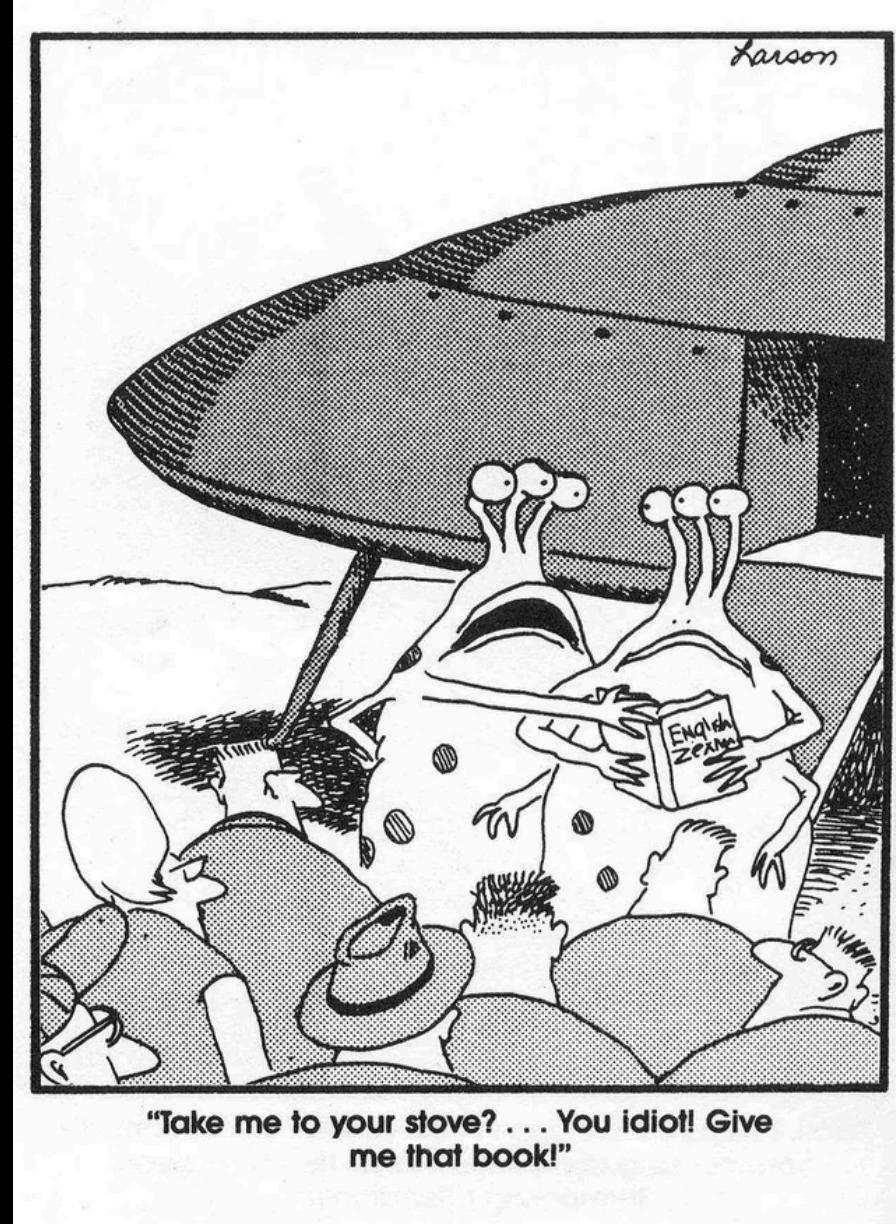
The Great Filter

- Barriers to technological civilization longevity
- Are we one of the luck few – **ONLY** one?



A Universe Primed for Life

- Physical constants
- Periodic table of elements
- A place for life to take hold
- Abiogenesis
- Time



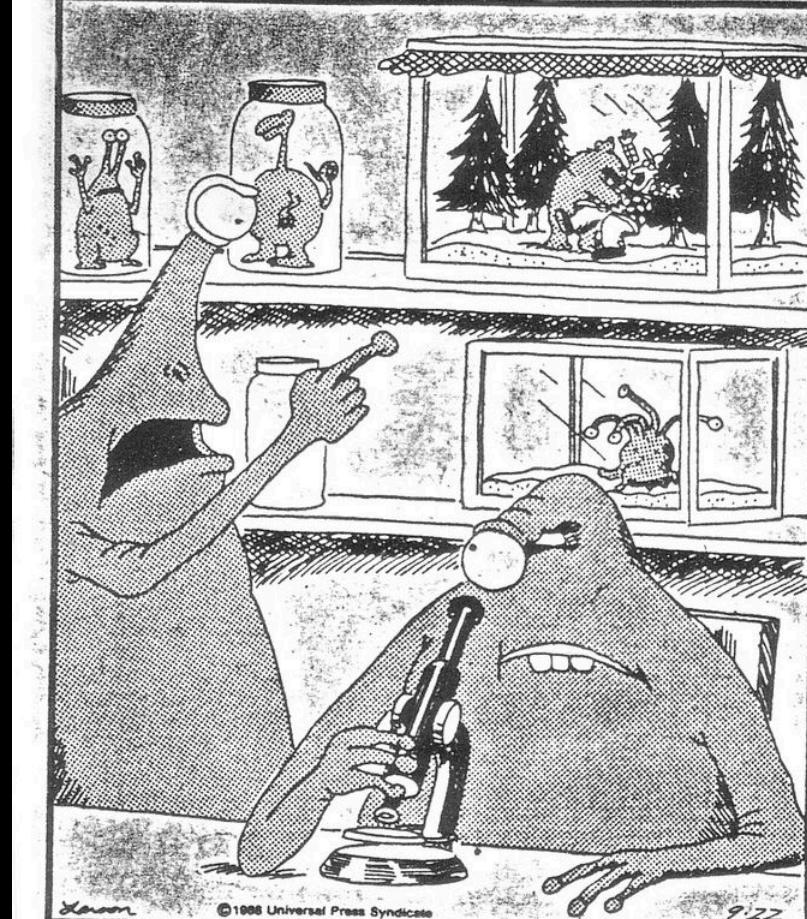
A Change in Direction

- The giggle factor
 - UFOs
 - SETI
- What brought about this change?
- Astrobiology

ay, Sept. 22, 1988

THE FAR SIDE

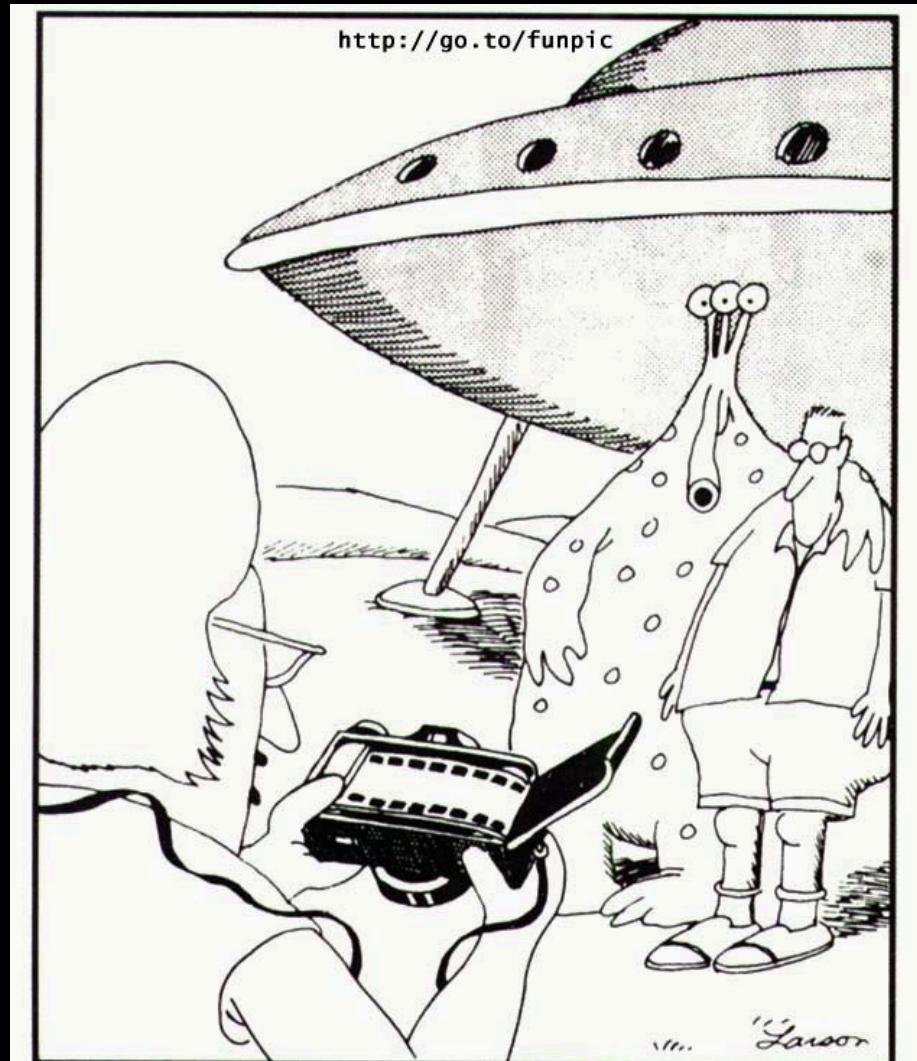
By Gary Larson



"Zorak, you idiot! You've mixed incompatible species in the earth terrarium!"

Exoplanets

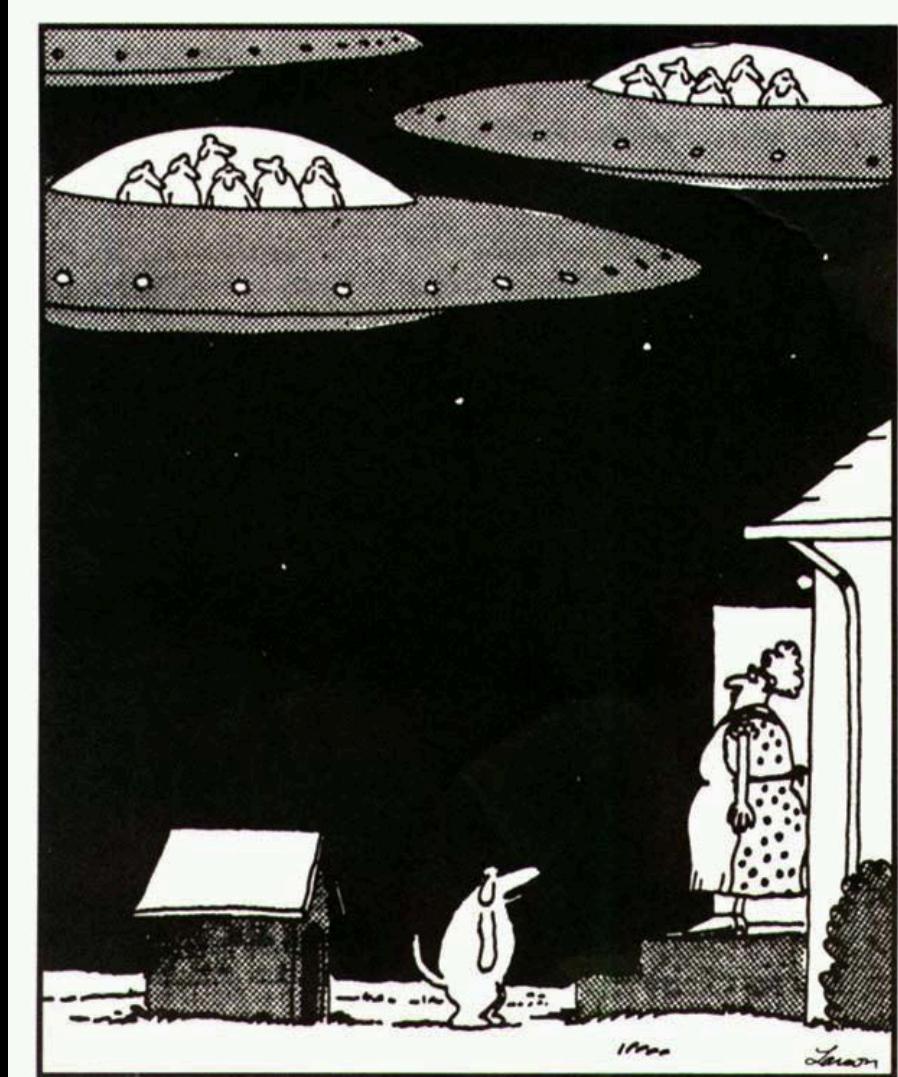
- First exoplanet discovery 1995
- Radial velocity method
- transit method
- Ground based telescopes
- Habitable Zone
- Space telescopes
 - Hubble
 - Kepler
 - TESS
 - Gaia
 - JWST
 - Habitable Worlds
- Where to look?
 - small rocky worlds
 - hycean (water) worlds
 - heat source
 - atmosphere
 - water



"Yes, yes, already, Warren! ... There is film in the camera!"

Atmospheric Modeling

- Characterization of exoplanet atmospheres
- Transit spectroscopy
 - Hubble – water vapour only
 - JWST – H₂O, CO, CO₂, CH₄, H₂S

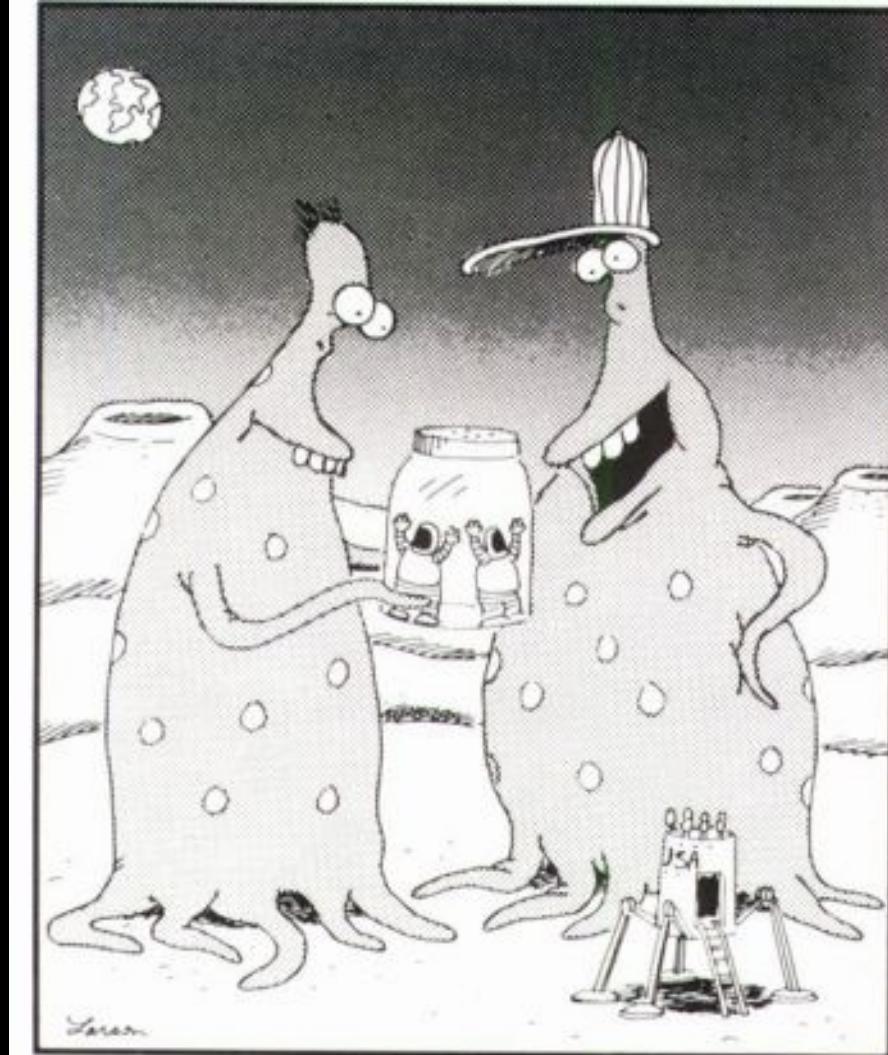


“Well, they finally came. ... But before I go,
let's see you roll over a couple times.”

<http://go.to/funpic>

Biosignatures

- How life hijacks and changes atmospheres
- photosynthesis
 - oxygen
- Does habitability = inhabited?
- Does life always evolve complexity over time?

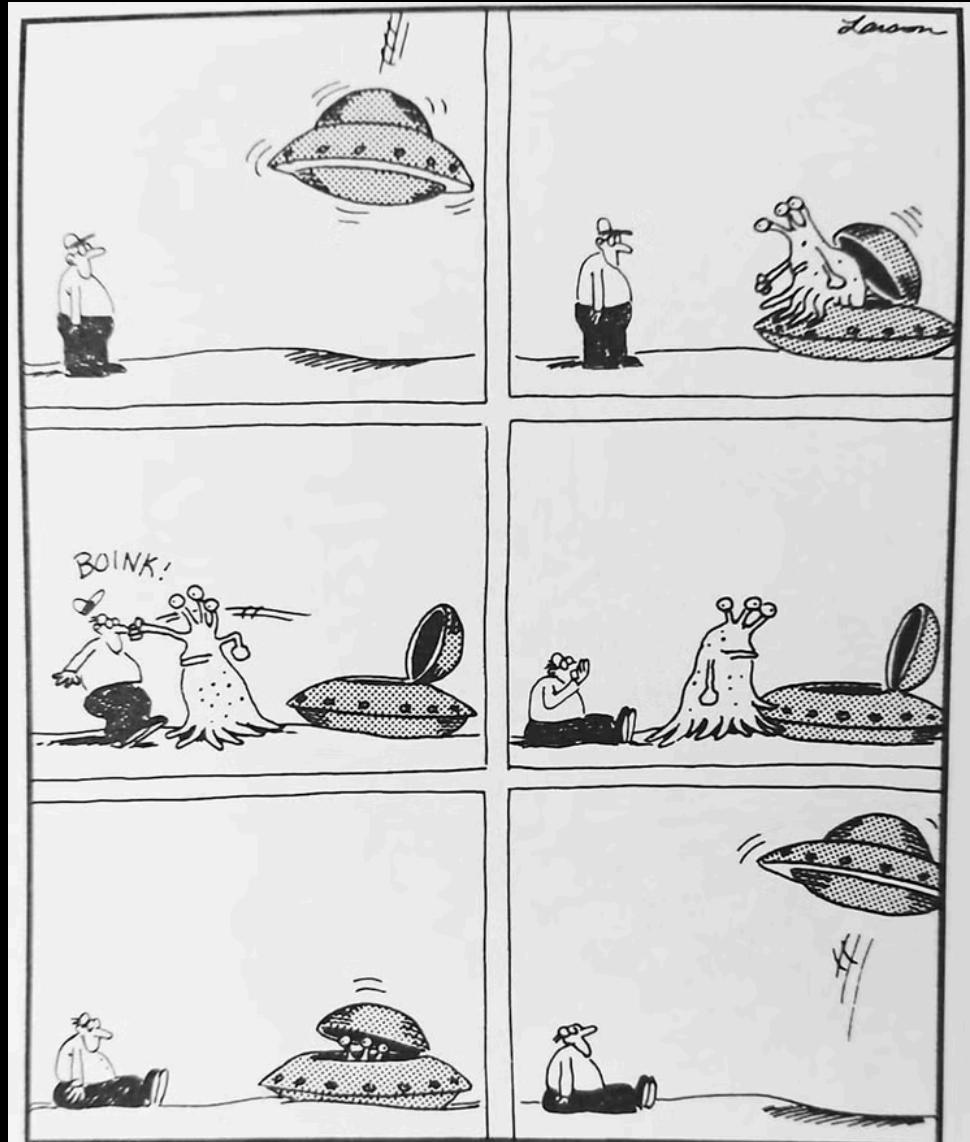


"Pretty cool, Dewey... Hey! Shake the jar
and see if they'll fight!"

<http://go.to/funpic>

Technosignatures

- Technospheres
- pollution
- CFCs

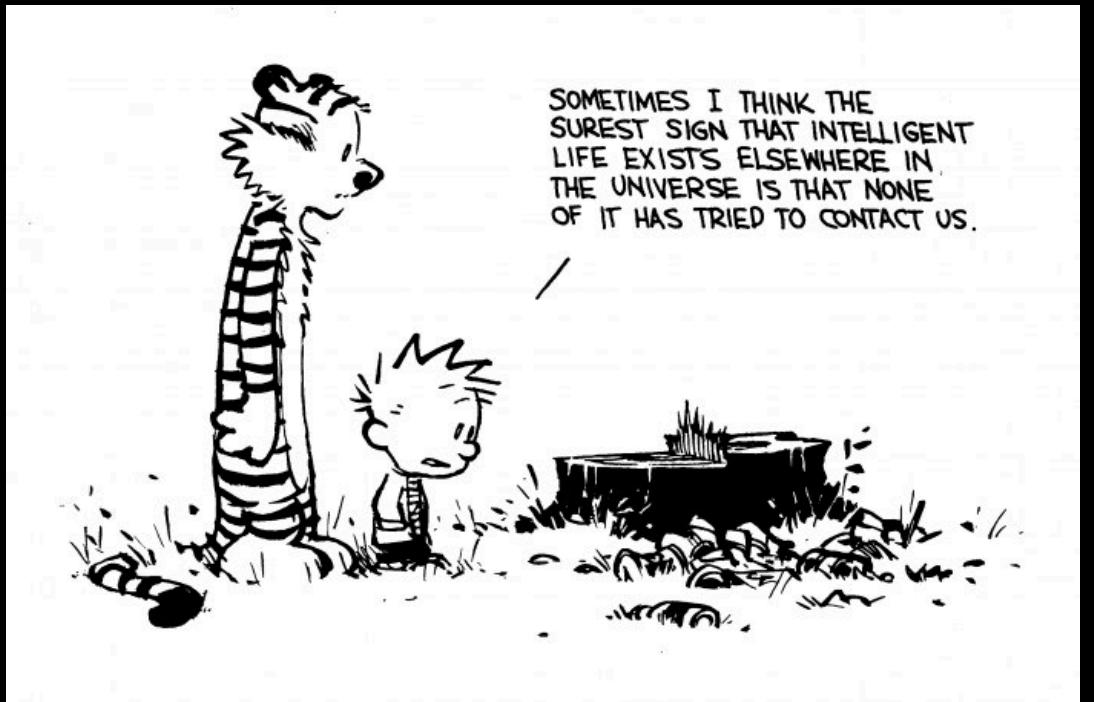


Henry never knew what hit him.

If life is easy we will find it soon.

If it is rare, it will take a long time.

If we do not find evidence for life elsewhere, that does not mean that it does not exist.



SOMETIMES I THINK THE SUREST SIGN THAT INTELLIGENT LIFE EXISTS ELSEWHERE IN THE UNIVERSE IS THAT NONE OF IT HAS TRIED TO CONTACT US.



Novice Astronomy Class
March 6, 2026
Solar System Series: The Asteroid Belt