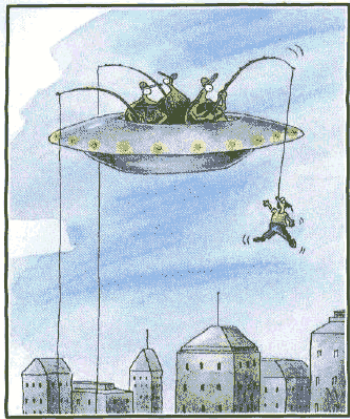


# Astronomy 330



**HW#9 due tonight.  
Paper Draft due now!**

**Next Week Presentations:**

**Emily Hayes & Dan Carson  
Kevin DeHoff & Krie Millin**

Music: *For Science-* They Might Be Giants

# Presentations



• **Frank Cartwright & Steve Pitula:**

[How to get off this rock!](#)

• **Peter Kim & Adam Musto:** [Religion](#)

# Drake Equation

**That's 8.2 intelligent systems/century**

Frank Drake



$$N = R_* \times f_p \times n_e \times f_l \times f_i \times f_c \times L$$

# of advanced civilizations we can contact in our Galaxy today	Star formation rate	Fraction of stars with planets	# of Earthlike planets per system	Fraction on which life arises	Fraction that evolve intelligence	Fraction that communicate	Lifetime of advanced civilizations
9	stars/yr	0.29	1.03 x 0.22 = 0.23	0.46	0.3	comm./intel.	yrs/comm.
	stars/yr	systems/star	= 0.23 planets/system	life/planet	intel./life		

# f<sub>c</sub> Your Guess!



- Given that an intelligent civilization exists, what is the likelihood that it can (technologically advanced) and will want to (knows astronomy and thinks that its chances are good) communicate?
- Cultural evolution to **technology** and **worldview** are essential components of f<sub>c</sub>
  - Extra-somatic storage of info crucial.
  - Technology and innovation– quantum mechanics
  - Copernican revolution played an important role.
  - ET has to realize that they are not the center of the Universe and that there might be other life.
  - How fast were these accomplishments? What is fast?

## Big Questions for $f_c$



- Our capacity for interstellar communication arose at the same time as our interest in it. Coincidence?
- Can a society have a highly developed technology with an incorrect astronomy?
- What if the skies were constantly cloudy?
- What if their solar system had no other planets?
- What if they lived in a molecular cloud?
- What if they lived in a huge cluster of galaxies?

## $f_c$ Development



- Are we typical?
- Is it inevitable  $f_c = 100\%$  or a fluke  $1/10000$ ?
- Remember civilizations come and go, but in general the gains (technology/worldview) aren't lost.
- Picked up by the next civilization.
- Even if one civilization goes dark for centuries, eventually another rekindles the technology/worldview.
- We are talking about the ability to communicate, not that the civilization is communicating.