

# Astronomy 230



off the mark by Mark Parisi  
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This class (Lecture 21):

Cultural Evolution

Jeffery Ungrund  
Ian Gentile  
Chris Blim

Next Class:

Evolution of World View

Jake O'Keefe  
Brandon Eckardt  
Kevin Quinn

**Nov 14:**

**Ken Sampson**

Music: *Human* – Human League

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# HW 3



- **Brandon Roel:**

<http://www.cropcircleconnector.com/index2.html>

- **Brandon Eckardt:**

<http://www.crystalinks.com/ets.html>

- **Sandor Van Wassenhove:**

[http://www.ufoarea.com/lloyd\\_tuatha.html](http://www.ufoarea.com/lloyd_tuatha.html)

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# Presentations



- Jeffery Ungrund:  
Sociological View of Advanced Civilizations
- Ian Gentile: Terraforming Mars
- Chris Blim: Ancient Astronauts

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# Outline



- From intelligence to communication
- Will a civilization develop that has the appropriate technology and worldview?
- Requires knowledge of quantum mechanics and astronomy.

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## $f_i$ Considerations



- Complexity leads to intelligence, but complexity seems to require a benign environment. Harsher environments have simpler organisms.
- Perhaps life may exist on harsh planets, but more intelligent life?
- Remember, human intelligence took 4.5 billion years.
- Systems too near the center of the galaxy are more likely to be hit with supernovae event in that time.
- 4.5 Byrs is about half the age of our galaxy. Were we fast or slow? Fast: severely limits ETs. Slow: there can be multiple ETs.

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## $f_i$ Considerations



- Intelligent life is a very recent development on Earth with the emergence of the primates, hominids, and H. sapiens.
- Everyone agrees that this particular evolution will not occur on other planets.
- But, will the characteristics of H. sapiens be common to human-like intelligence?
  - Manipulative organs– hands
  - Walking upright?
  - Is tool use and larger brains associated with walking upright?
  - Pair bonding?
  - Human brains quadruple in size after birth compared to other primates which double.

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## $f_i$ Considerations



- How unique is our intelligence?
- Teaching sign language to chimps and gorillas have shown they are more intelligent than we thought.
- Whales and dolphins are speculated to be of high intelligence.
- With all of this in hand, we are ready to make the next estimate in the Drake equation.
- This term is only intelligent life that can communicate abstract thought to each other, not technological able to communicate.

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## What is $f_i$



- What is the fraction of life that forms human or better intelligence in less than about 4.5 billion years?
- If you think that it always does, then  $f_i = 100\%$
- If you think that it is a statistical fluke or required supernatural invention then you could use 1/billion or  $10^{-7}\%$ .
- Anywhere in between is fair game.

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# Backdrop of Civilization



- Origin of modern H. sapiens is disputed, but the genetic and linguistic evidence points toward a spread of humans across Eurasia then the Americas.
- We share a common gene pool, but genetic drifts and selection for local environments created genetic differences among groups.
- These differences have little to do with the concept of race, which has been showed by genetic studies to be a meaningless concept.
- The greatest genetic and linguistic variations are found in Africa, supporting the “out of Africa” idea.



<http://www.popular-science.net/img/out-of-africa.jpg>

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# Cultural Evolution



- Once humans spread across the globe, the primary method for evolutionary change shifted from biological to cultural evolution.
- Anatomically modern H. sapiens evolved 100,000 yrs ago, but the first modern behavior did not appear until 40,000 yrs ago— e.g. cave painting.
- Regardless, there has not been any significant biological evolution for the last 40,000 yrs— e.g. brain increase.



[http://www.codcottage.freemove.co.uk/images/hand\\_castillo\\_spain.jpg](http://www.codcottage.freemove.co.uk/images/hand_castillo_spain.jpg)

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# Cultural Evolution



- The rest is cultural— from hunter-gathers to cell-phone-users.
- Cultural evolution was fast.
- Is cultural evolution needed for ET? Why would a ET culture try to communicate?
  - Capability (suitable technology) and interest (worldview?).



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# Hunting and Gathering



- Until 10,000 years ago, H. Sapiens functioned completely as hunter-gathers.
- Small nomadic tribes with few possessions.
- Except for shortages, a fair and easy life
  - No midterms
  - Only working about 4 hours a day
  - But, no way to create surpluses or free members for other roles.
  - When things go bad, they really go bad.



[http://www.cnn.com/WORLD/9511/safrica\\_bushmen/](http://www.cnn.com/WORLD/9511/safrica_bushmen/)

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# Agriculture



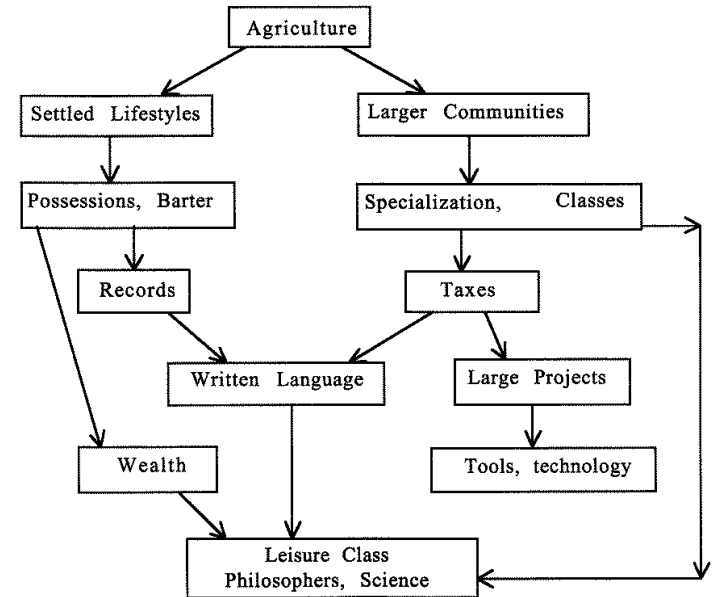
- Tribal societies– 100s of people into villages
- Due to agriculture, larger and larger communities and new societal organizations.
- Began about 10,000 yrs ago, around the dead sea.
  - Mixed hunting with harvesting of wild wheat and barley.
  - Storage, planting, and seed selection.
  - Mutant varieties took over and hunting decreased.
  - 1000 years later, animal domestication.
- Provided long-term settlements for cultural evolution, information, tools, and energy sources.

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<http://www.ffa.org/media/comm/index.html>

# The Importance of Agriculture



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