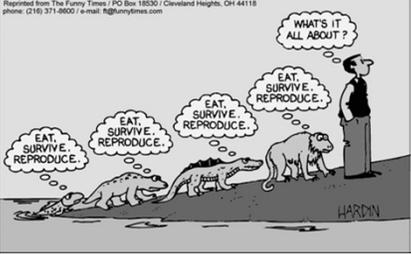


Lecture 38: Intelligent Life in the Universe

Lecture 38
Intelligent Life in the Universe

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Astronomy 141 – Winter 2012

This lecture is about how to define “intelligent life”.

Discovering intelligent life would be even more interesting than discovering simple life elsewhere.

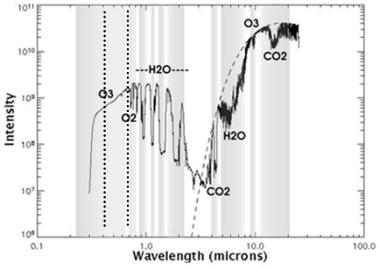
A working definition of “intelligent” includes self-awareness, use of tools, and use of language.

The Encephalization Quotient (EQ) appears to correlate with intelligence.

On Earth, human intelligence took nearly 4 Billion years to develop.

If living beings develop advanced technology, they can make their existence known to the Universe.

It would be interesting to find spectral biomarkers in the spectrum of an exoEarth.



However, finding *intelligent* extraterrestrial life would be even more interesting.

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Historically, much of the speculation about extraterrestrial life has focused on *intelligent* life.



War of the Worlds
1898



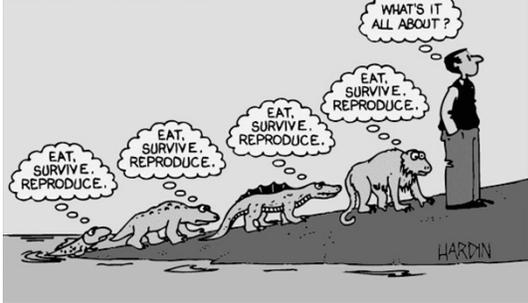
E.T. 1982



The Simpsons
1990 -

What does it mean to be "intelligent"?

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Defining "intelligent" is even more difficult and contentious than defining "living"...

A living being is intelligent if:

It has self-awareness: it asks the question "What's it all about?"

It uses tools to manipulate its environment.

It uses language to communicate with other intelligent beings.

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On Earth, different animals are intelligent to different extents and in different ways.



Dolphins communicate with contact calls and "signature whistles".

Chimpanzees & bonobos modify sticks and use them to fish for termites.



Intelligent beings develop a "culture" of behavior handed down from one generation to the next.

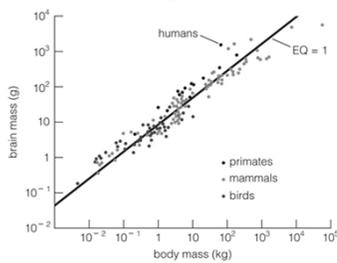


Dolphins teach their children how to use sponges to protect their snout.

Chimpanzees teach their children how to use stones to crack nuts.



On Earth, the Encephalization Quotient (EQ) can be used a proxy for intelligence.



EQ = an animal's brain mass divided by the average brain mass for other species with the same body mass.

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How does Earth life measure up in EQ?

EQ of humans = 7

EQ of dolphins = 4.5

EQ of chimpanzees = 2.5

EQ of cats & dogs = 1

EQ appears to correlate with complex behaviors of the sort we might describe as "clever".

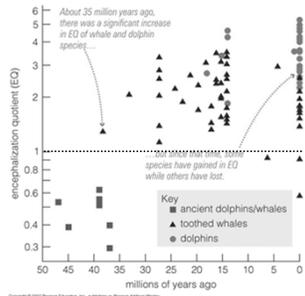


Some classes of animal show EQs that increase over many generations.

EQ is a partially heritable trait.

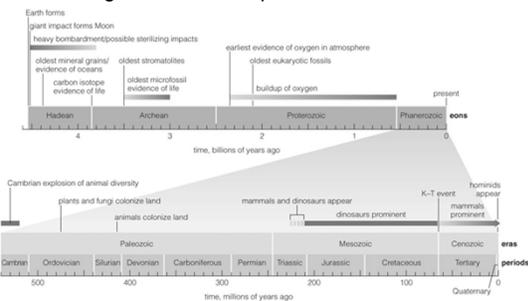
Intelligence appears to be correlated with EQ.

Intelligence is sometimes useful for survival.



Beware: Intelligence may grant an evolutionary advantage, but it is not a *guarantee* of evolutionary success...

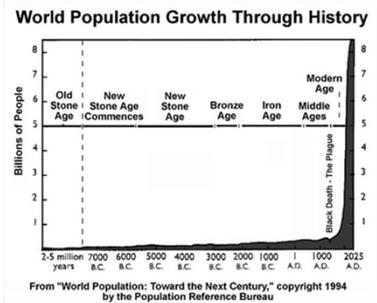
Intelligence as great as a human's (or a dolphin's) took a long time to develop on Earth.



Human life took nearly four billion years to emerge.

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So far, the human species has been spectacularly successful, as far as growth in numbers is concerned.



Score +1 for human intelligence!

An intelligent species that has developed advanced technology can make itself known to intelligent species elsewhere.

"Advanced technology" = the ability to send out radio signals and build interstellar spacecraft.



By this criterion, human technology only recently qualifies as "advanced".

Does high intelligence inevitably lead to advanced technology?



Appendages that can manipulate objects and make tools are useful if you want to develop technology.
