SETI -

Search for Extra-terrestrial Intelligence -
Perspectives of an Earth Scientist

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PERCIVAL LOWELL AT THE 24 INCH REFRACTOR, FLAGSTAFF, ARIZONA OBSERVING MARS DURING FAVORABLE OPPOSITION (PERIHELIC OPPOSITION) OF 1894

BELOW IS A GLOBE CONSTRUCTED FROM HIS DRAWINGS
The WAR of the WORLDS
By H.G. Wells
Author of "Under the Knife," "The Time Machine," etc.
Viking composite of Mars
mid 1970’s
The Miller-Urey Experiment

Left: Stanley L. Miller (1930-2007) with a reproduction of the experimental setup he first used in the 1950's to study pathways to the origin of life.
Life in the Solar System?

Pole-to-Equator Temperature Difference on Other Planets

- ~ 0 K
- ~ 4 K
- a few 10 K
- a few (more) 10 K

Thicker Atmosphere
Needed for Habitability?
Solid surface
Atmosphere
Liquid on surface: Need not be water

PHI – Planetary Habitability Index:
Schulze-Makuch et al., 2011

HABITABILITY INDEX

EARTH 0.96
TITAN 0.64
MARS 0.69
GLiese 581D 0.43
Habitability Index

Earth = 0.96
Titan = 0.64
Mars = 0.59
Gliese 581d = 0.43
Landed January 14, 2005 at 10.2S, 192.4W

Discovered small “rocks”, possibly made of water ice, at the landing site.

Fluvial activity (methane?)

Images taken during descent showed no open areas of liquid, but indicated liquid had once flowed
Possible Shoreline

100 km
Phase diagrams of H$_2$O, CH$_4$, and N$_2$

- Water vapor (steam)
- Liquid water
- Solid water (ice)
- Methane vapor
- Solid methane
- Liquid methane
- Nitrogen vapor
- Solid nitrogen
- Liquid nitrogen

Temperature in Kelvin vs. Pressure in bars

- Mars
- Titan
- Pluto/Triton

Image Credit: William Hubbard, UA LPL
Life Around Other Stars
The Drake Equation

How many civilizations are out there?
Arecibo Message

Broadcast on November 16th 1974 from the Arecibo radio telescope.

Aimed toward globular star cluster M13.

M13 is 25,000 light years away.
1679 = 73 x 23 (both primes)
10 bits per sec = 3 min

Figure 8.10. Diagram of the Arecibo radio message directed toward the Great Cluster in the constellation (1974).

$OC_5H_7 = D_{glyceraldehyde}$

$ON_5C_5H_7 = Guanine$

$OH_3C_4H_5 = Cytosine$
2 sets of base pairs

While 1 human genome.

\[ \text{C}_5 \text{H}_7 \text{O} \rightarrow \text{C}_6 \text{H}_8 \text{N}_2 \text{O}_2 \rightarrow \text{C}_7 \text{H}_8 \text{N}_3 \text{O} \rightarrow \text{C}_8 \text{H}_7 \text{O} \]

\[ \text{PO}_4 \]

\[ \text{C}_5 \text{H}_7 \text{O} \rightarrow \text{C}_6 \text{H}_8 \text{N}_2 \text{O} \rightarrow \text{C}_7 \text{H}_8 \text{N}_3 \text{O} \rightarrow \text{C}_8 \text{H}_7 \text{O} \]

\[ \text{PO}_4 \]
CONTACT

A message from deep space
Who will be the first to go?
A journey to the heart of the universe.

JODIE FOSTER
MATTHEW MCCONAUGHEY
Launch of the Kepler Spacecraft

Videos:
- 31 Mb AVI (best for PC)
- 2.5 Mb MPEG (best for fast download)
- 17 Mb QuickTime (best for Mac)

SUCCESSFUL LAUNCH:
2009 March 6 at 10:49 pm EST.

Media from Kennedy Space Center (KSC)
- Press Conference
- Media Resources
- Full Press Kit (3 Mb pdf)

Mission Manager's Updates

NASA Kepler webcasts

Imagined View from Planet Kepler-10b (Artist's Depiction)
Credit: NASA/Kepler Mission/Dana Berry
In Disasters, Panic Is Rare; Altruism Dominates

*ScienceDaily* (Aug. 8, 2002) — WASHINGTON, DC — Group panic and irrational behavior did not occur at the World Trade Center on September 11, 2001. Instead the event created a sense of "we-ness" among those threatened, says Rutgers University sociology professor Lee Clarke. In his article, "Panic: Myth or Reality?", in the fall 2002 edition of Contexts magazine, he explains that 50 years of evidence on disasters and extreme situations shows that panic is rare, even when people feel "excessive fear."

**Rarity of Panic**

Because this combination of conditions is so uncommon in disasters, panic is also quite rare. (6, 7) When panic does occur, it usually involves few persons, is short-lived, and is not contagious. (21) In studies of more than 500 events, the University of Delaware's Disaster Research Center found that panic was of very little practical or operational importance. (21, 22) A number of systematic studies of human behavior in disasters have failed to support news accounts of widespread panic. (5, 8, 23–26)