SETI -

Search for Extra-terrestrial Intelligence -

Perspectives of an Earth Scientist

Donna M. Jurdy
Northwestern University

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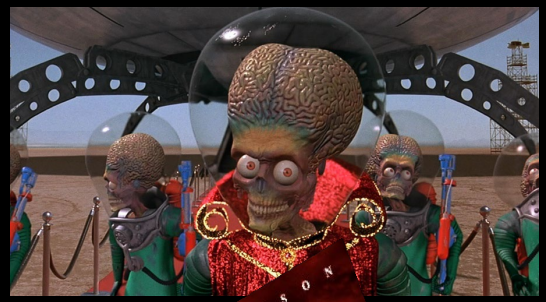



MEL GIBSON
M. NIGHT SHYAMALAN'S
SIGNS

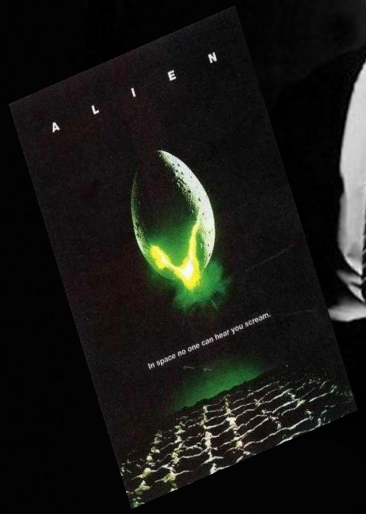

The ultimate in alien terror.
THE THING


WHO'S UP FOR A CLOSE ENCOUNTER?
SIMON PEGG
NICK FROST
SETH ROGEN
PAUL
FROM THE PRODUCERS OF HOT FUZZ
VALENTINE'S DAY 2011


INDEPENDENCE DAY


CLOSE ENCOUNTER
of the third kind
Contact
CLOSE ENCOUNTERS
OF THE THIRD KIND

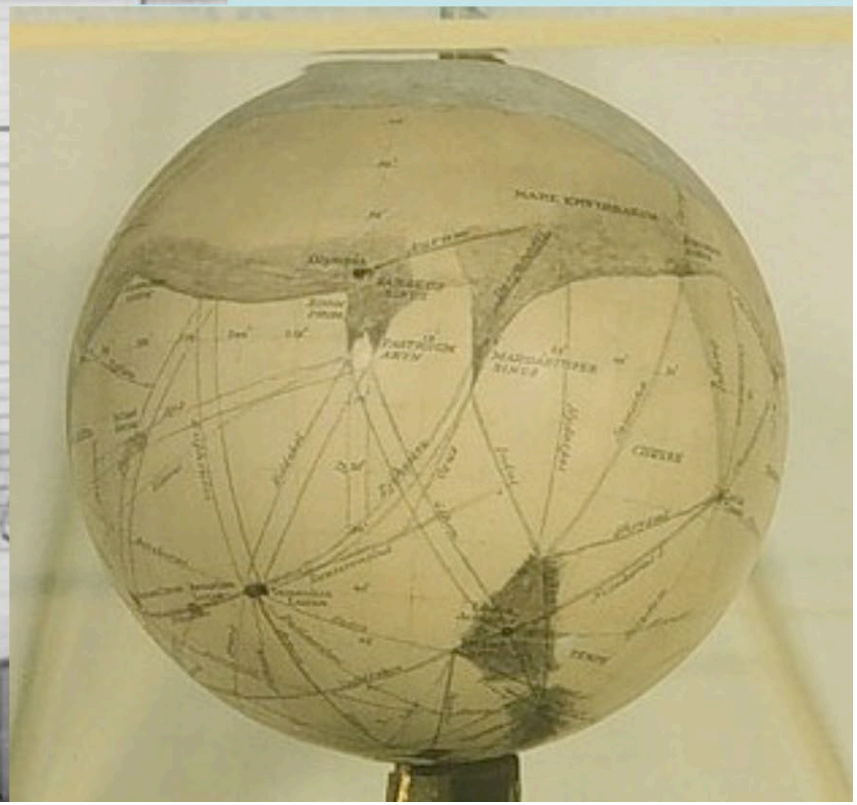

STAR TREK
THE NEXT GENERATION

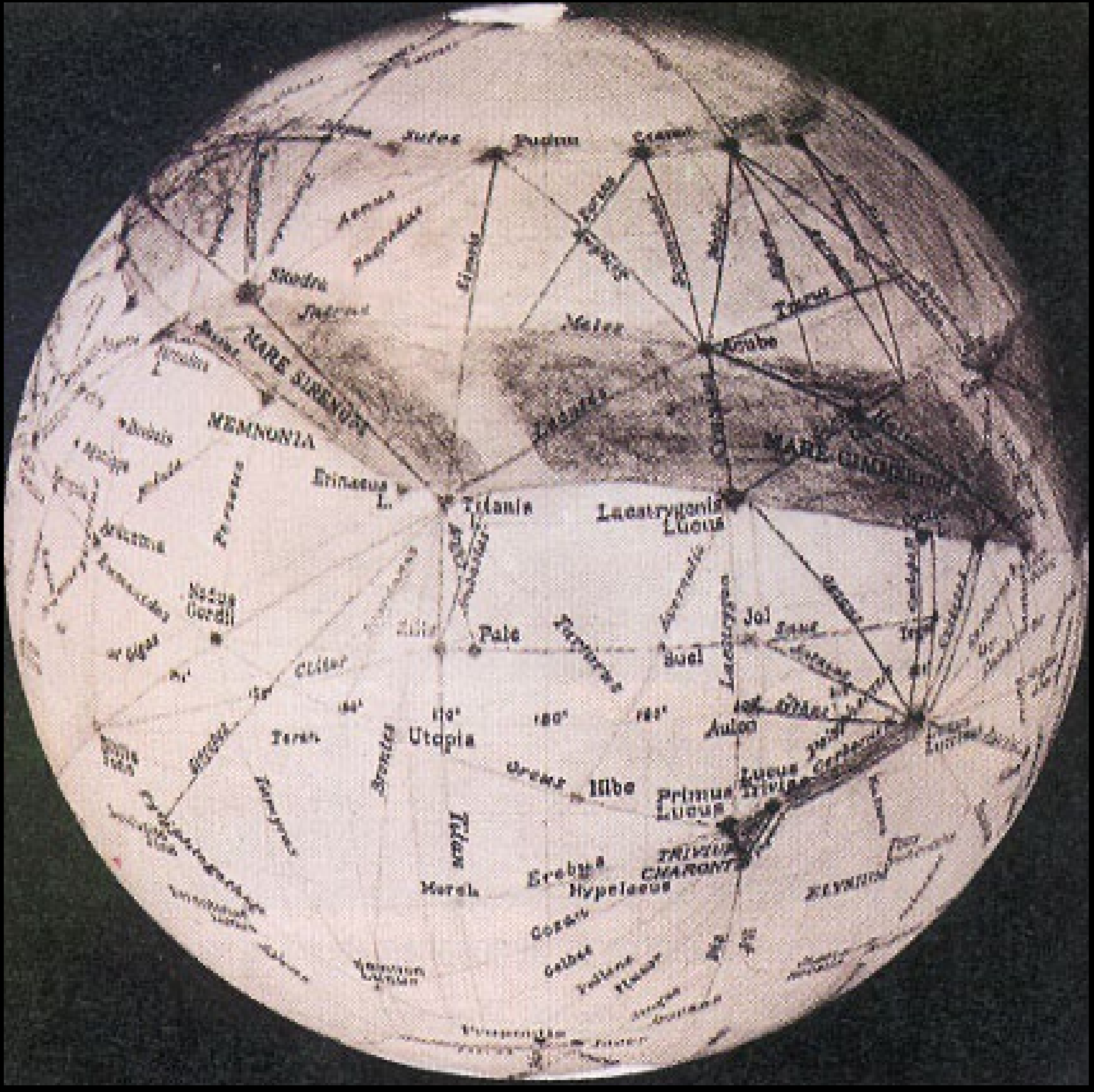

ALIEN
In space no one can hear you scream.


Mars • Global Dust Storm
June 26, 2001
September 4, 2001
Hubble Space Telescope • WFPC2

PERCIVAL LOWELL
at his 24” Refractor,
Flagstaff, Arizona observing
Mars during the favorable
perihelic opposition, 1894.

Below, a globe constructed
from his sketches.

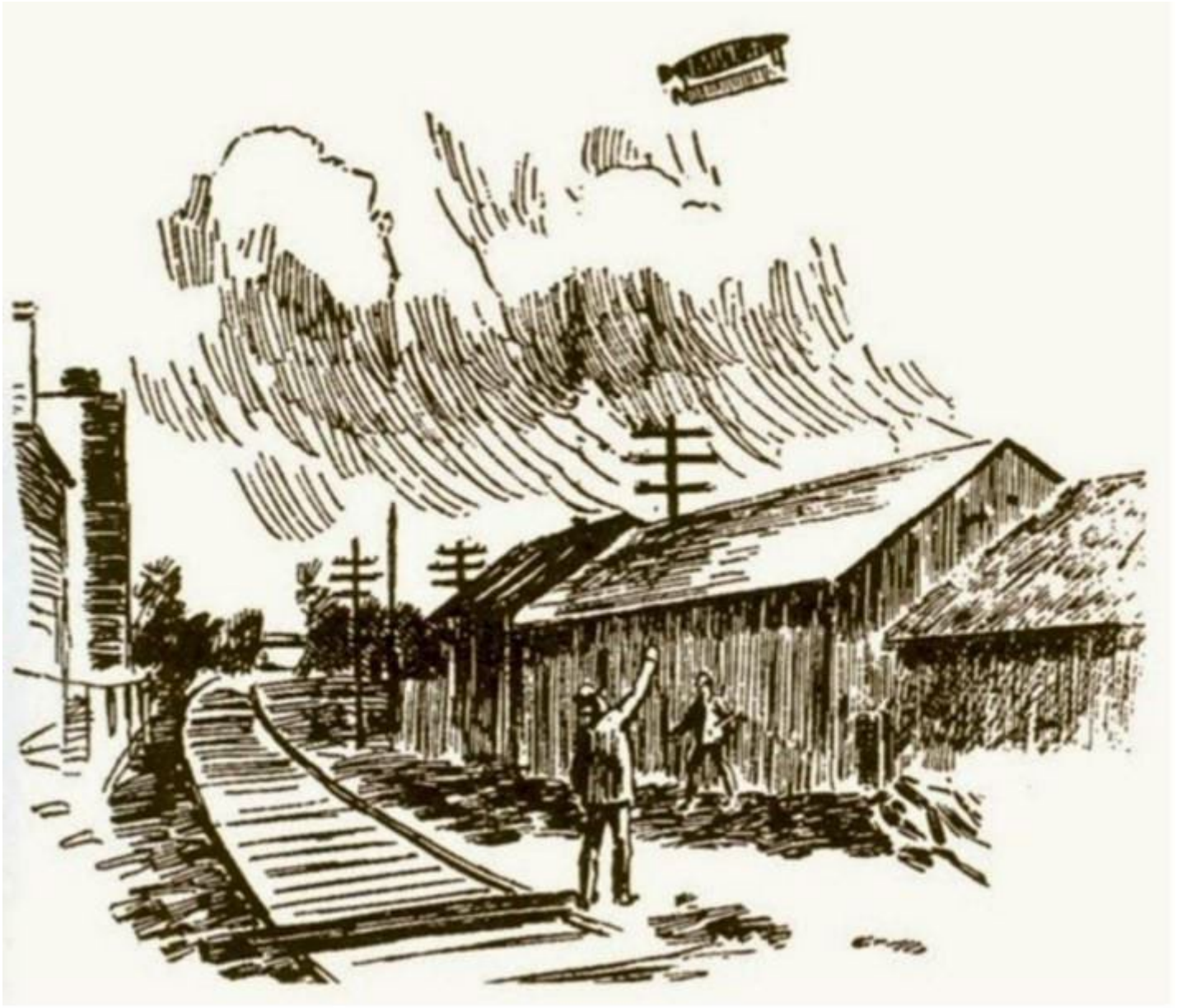



MARE SIRENUM
MEMNONIA
Erinaceus L.
Titania
Laestrygonia Lucus
Nodus Gordii
Pale
Jol
Utopia
180°
Primus Lucus
TRIVIUM CHARONTIS
Erebus
Hypelaeus

The WAR of the WORLDS

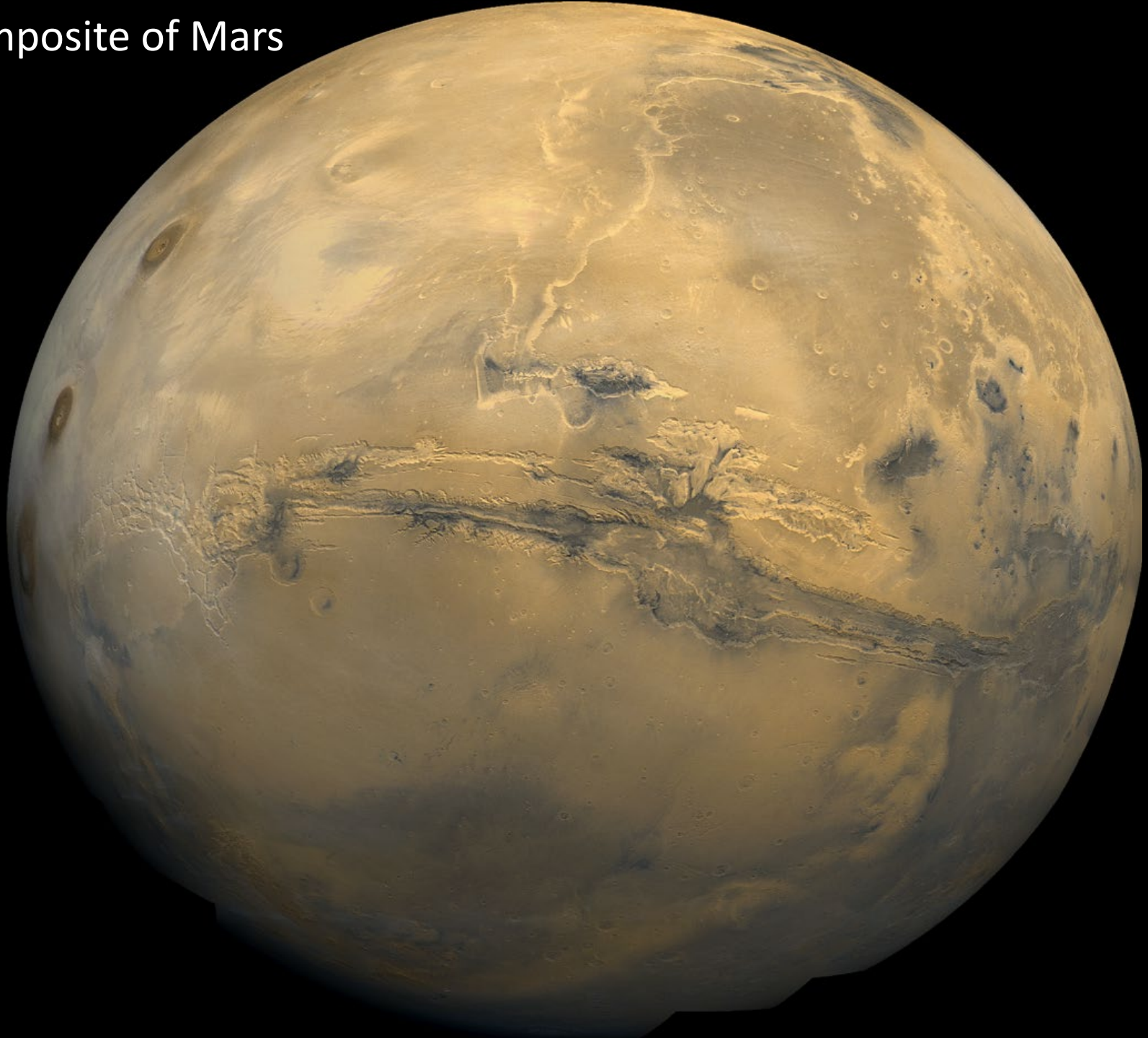
By H. G. Wells

Author of "Under the Knife," "The Time Machine," etc.

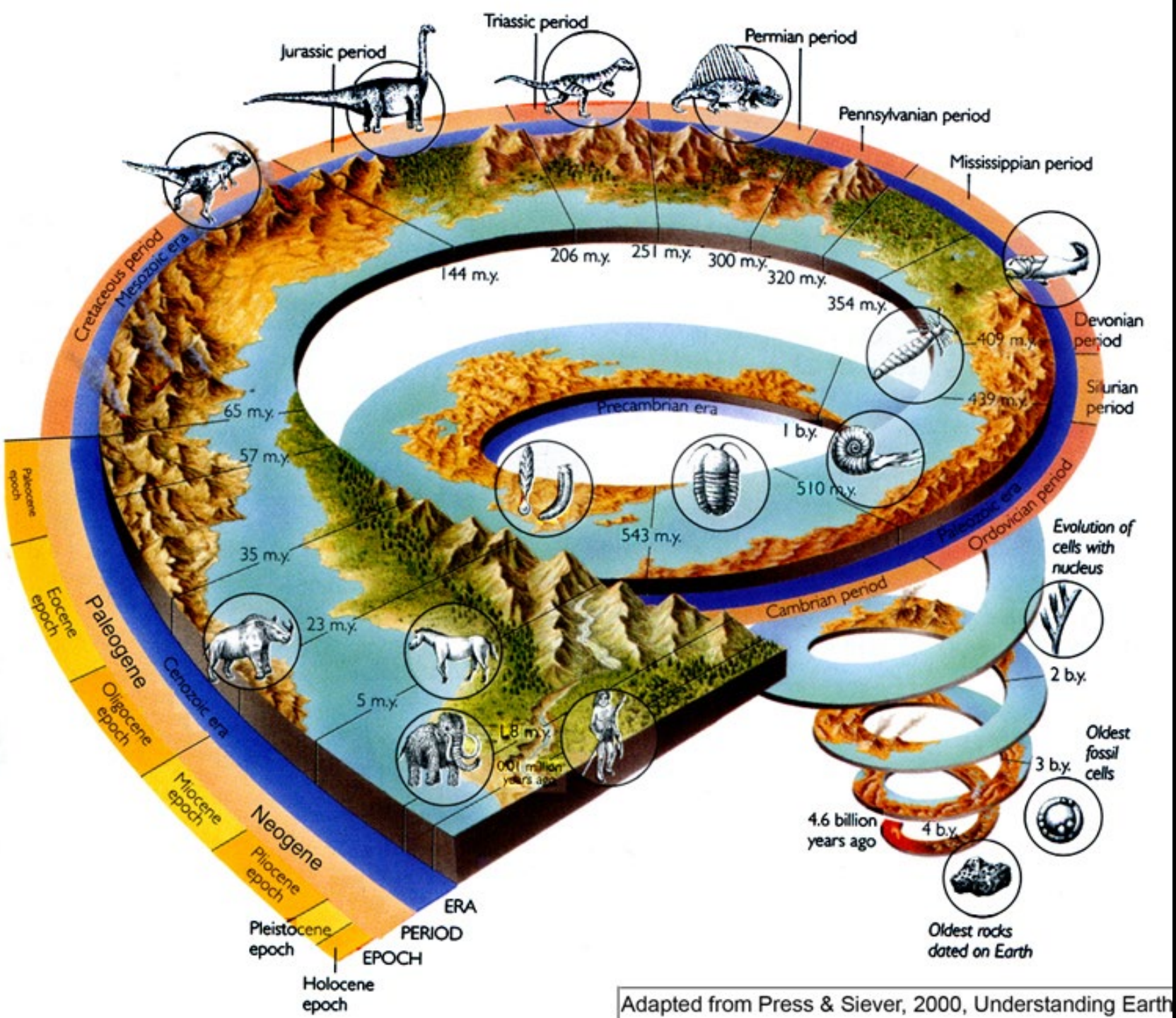


Viking composite of Mars

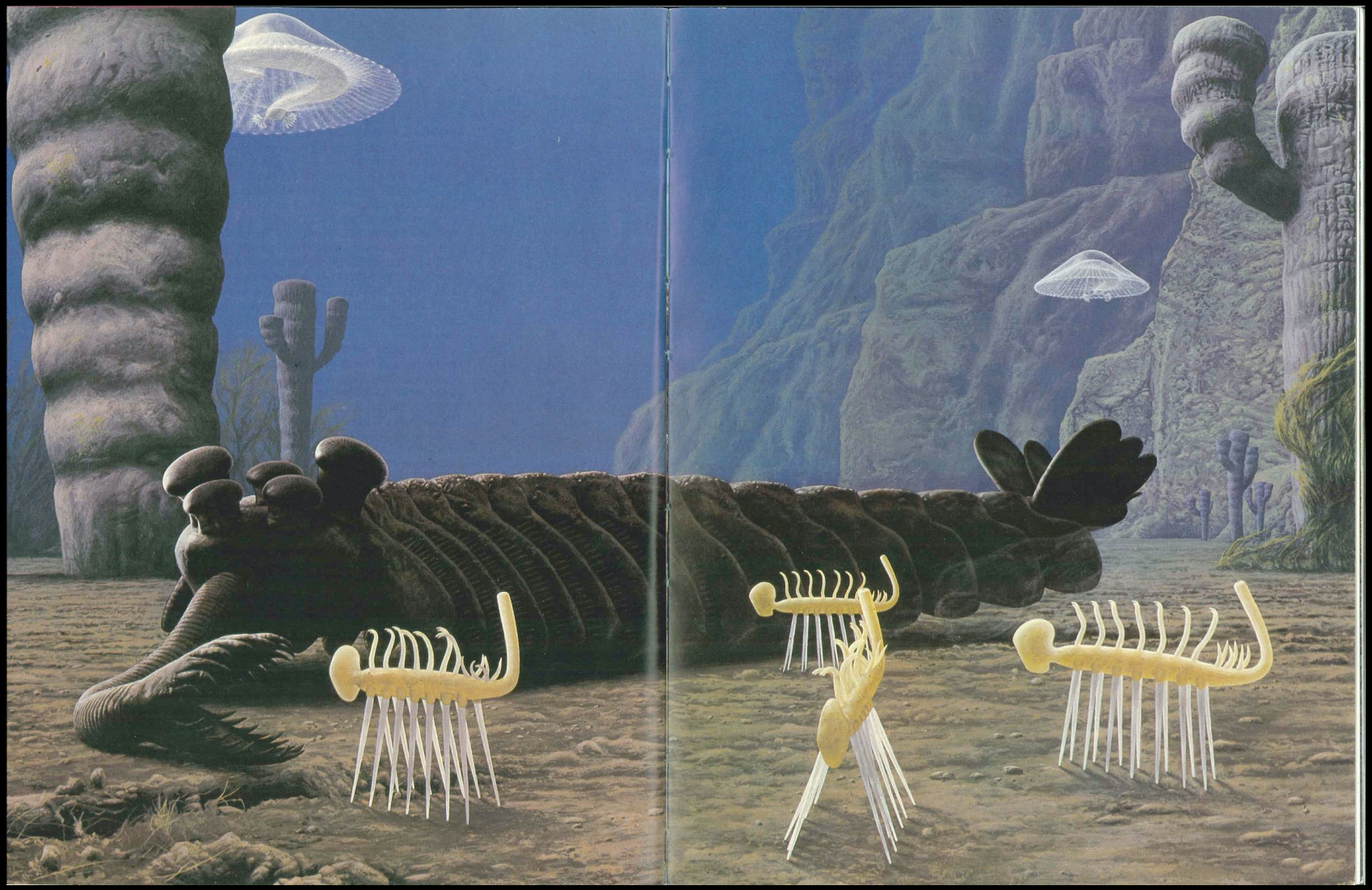
mid 1970's




ALH84001,0
N
1 cm



Adapted from Press & Siever, 2000, Understanding Earth



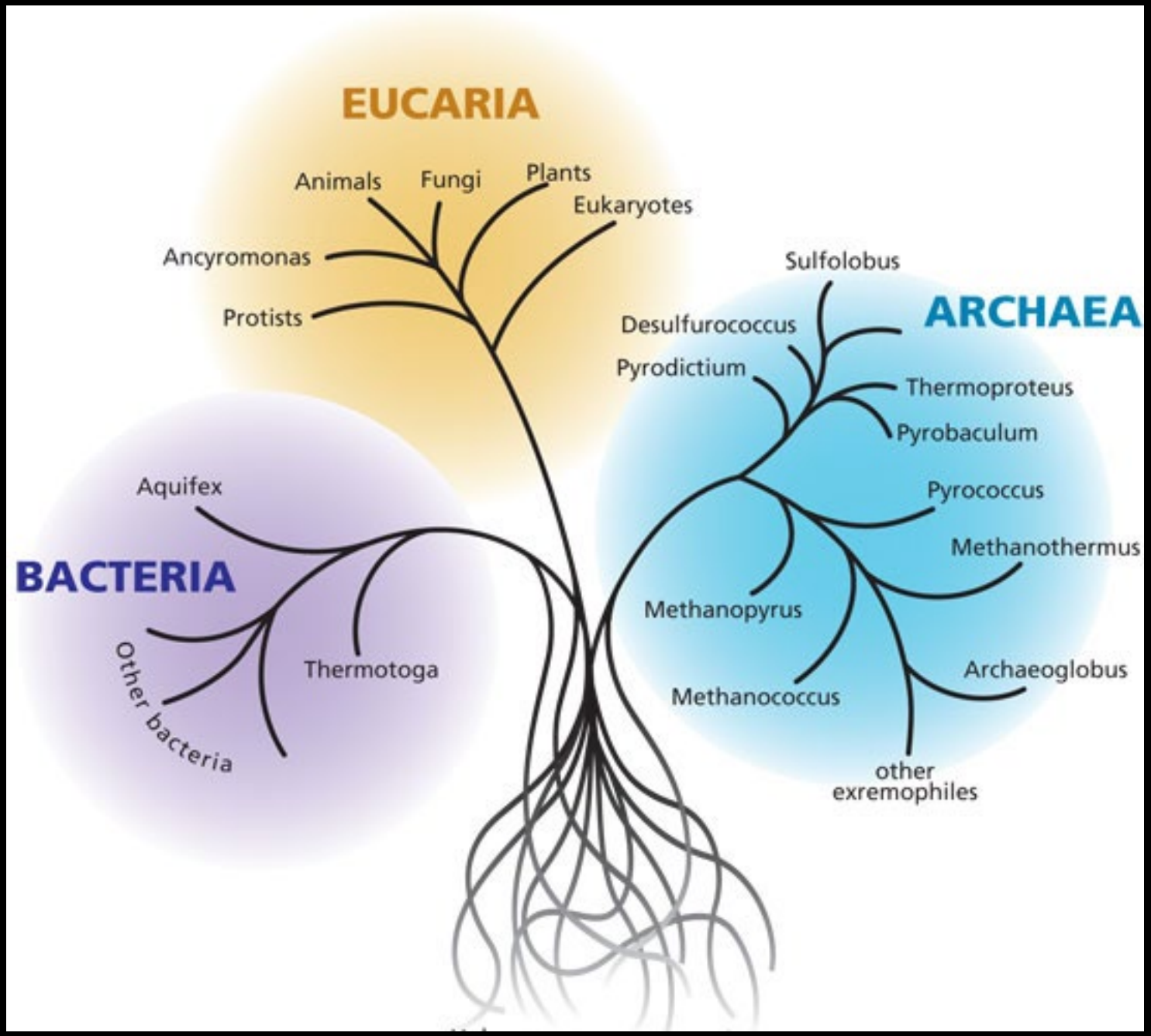


Image Credit: Woods Hole Oceanographic Institution

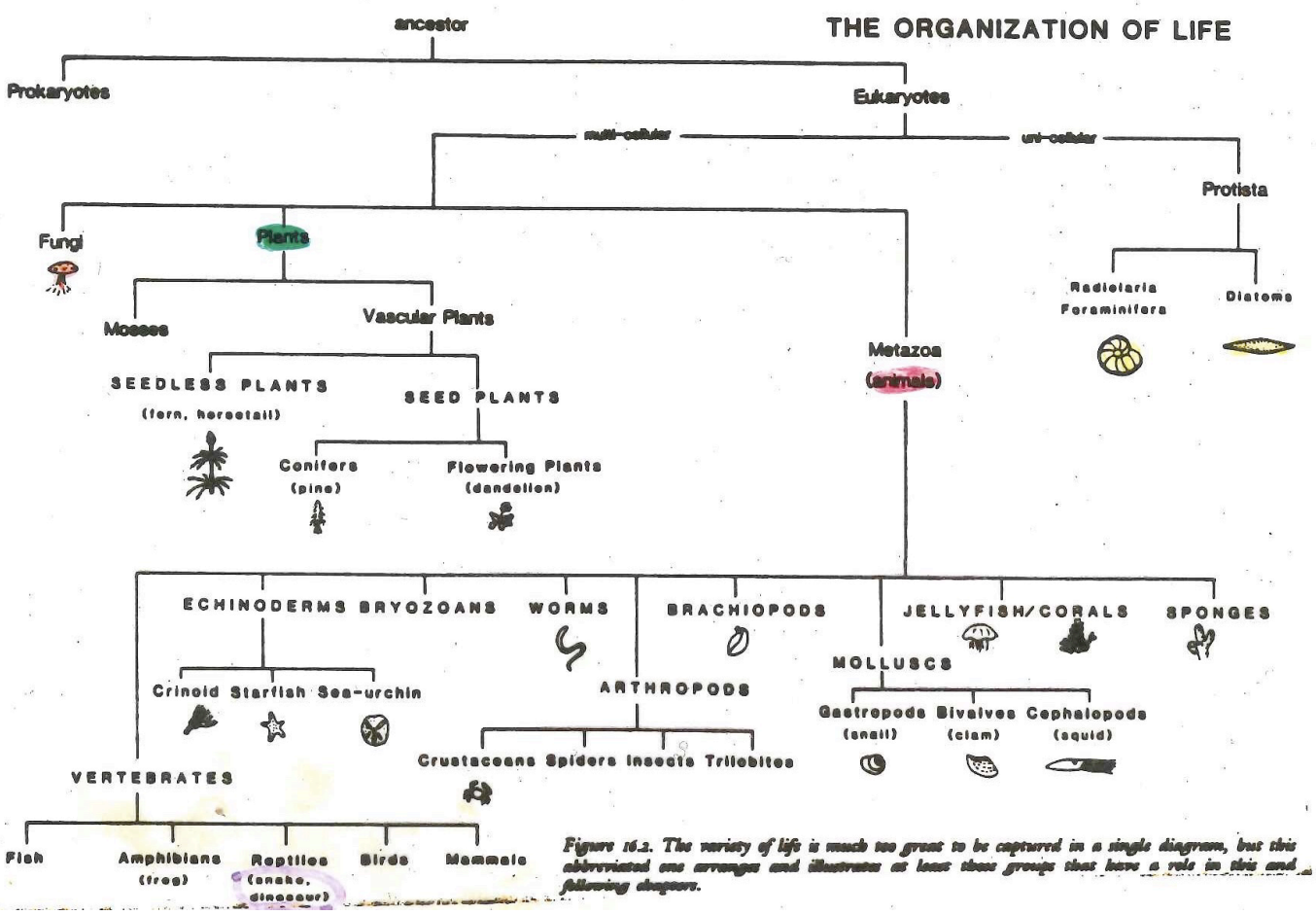
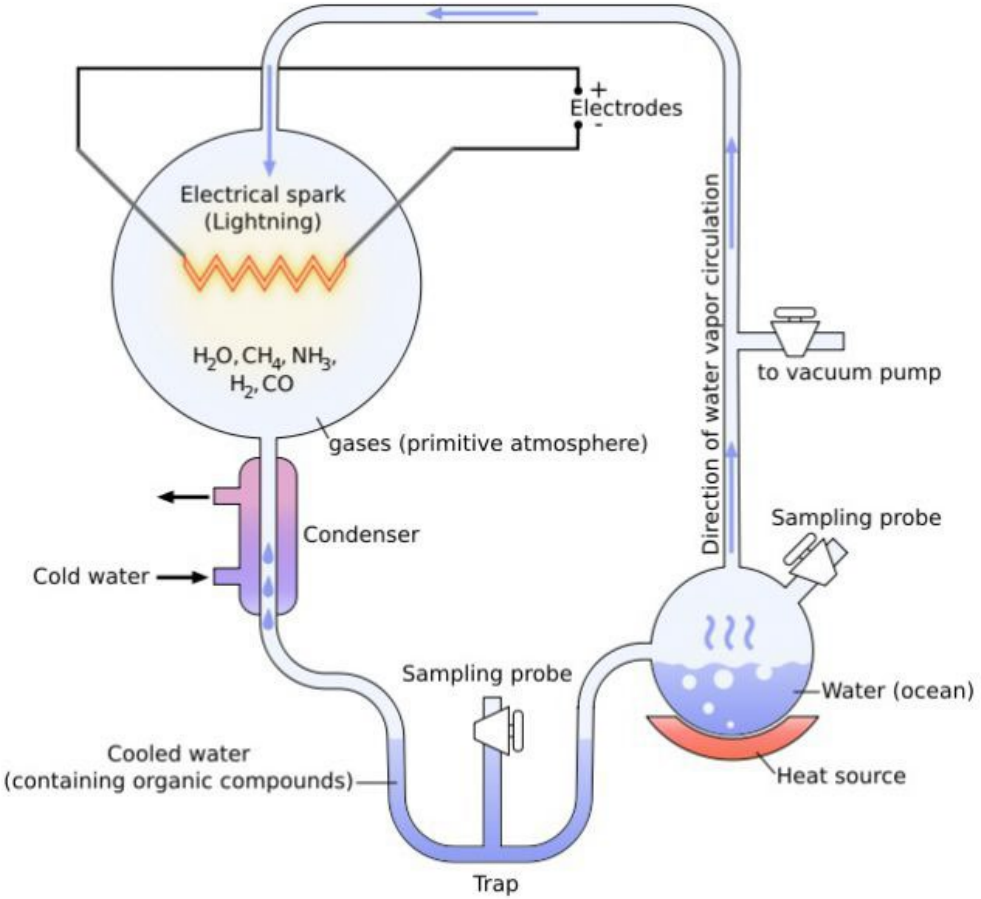
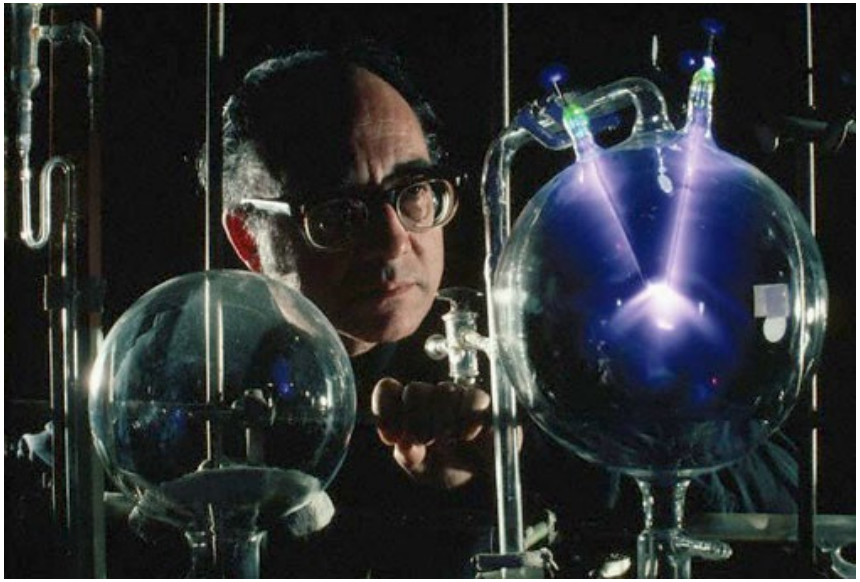


Figure 16.2. The variety of life is much too great to be captured in a single diagram, but this abbreviated one arranges and illustrates at least those groups that have a role in this and following chapters.

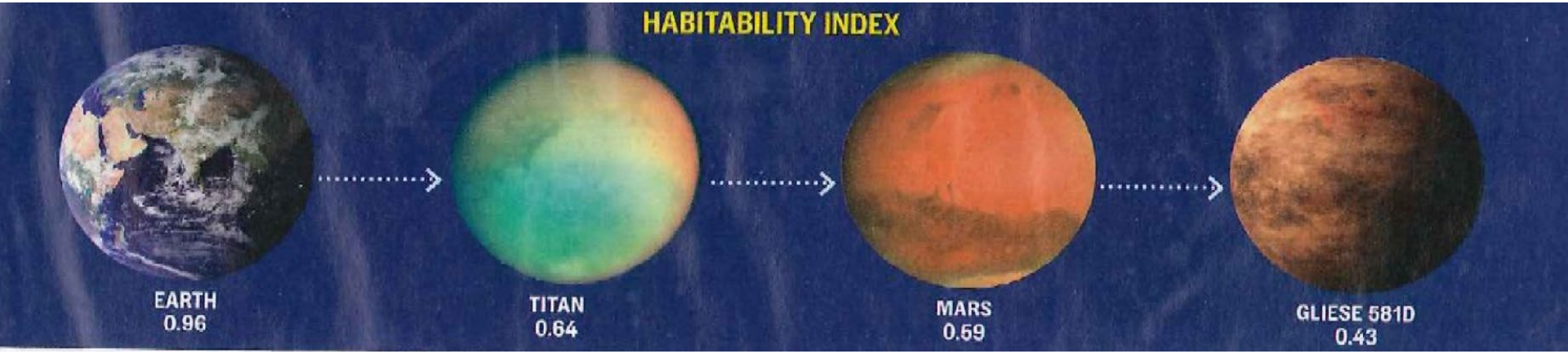

+
Electrodes
-
Electrical spark
(Lightning)
$H_2O, CH_4, NH_3,$
H_2, CO
gases (primitive atmosphere)
Direction of water vapor circulation
to vacuum pump
Sampling probe
Condenser
Cold water
Sampling probe
Water (ocean)
Cooled water
(containing organic compounds)
Heat source
Trap

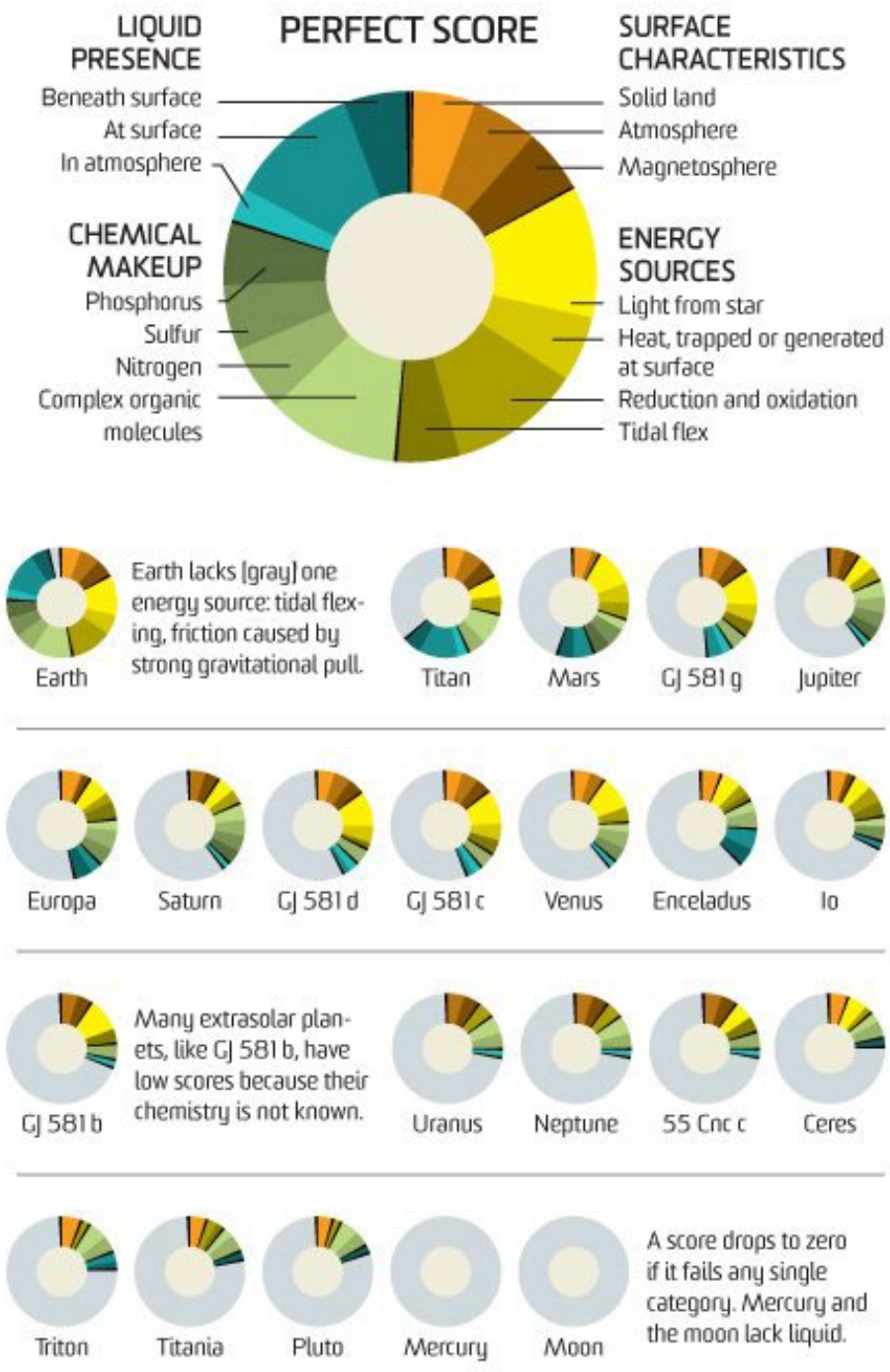


Needed for Habitability?

- Solid surface
- Atmosphere
- Liquid on surface:
- Need not be water

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





Habitability Index

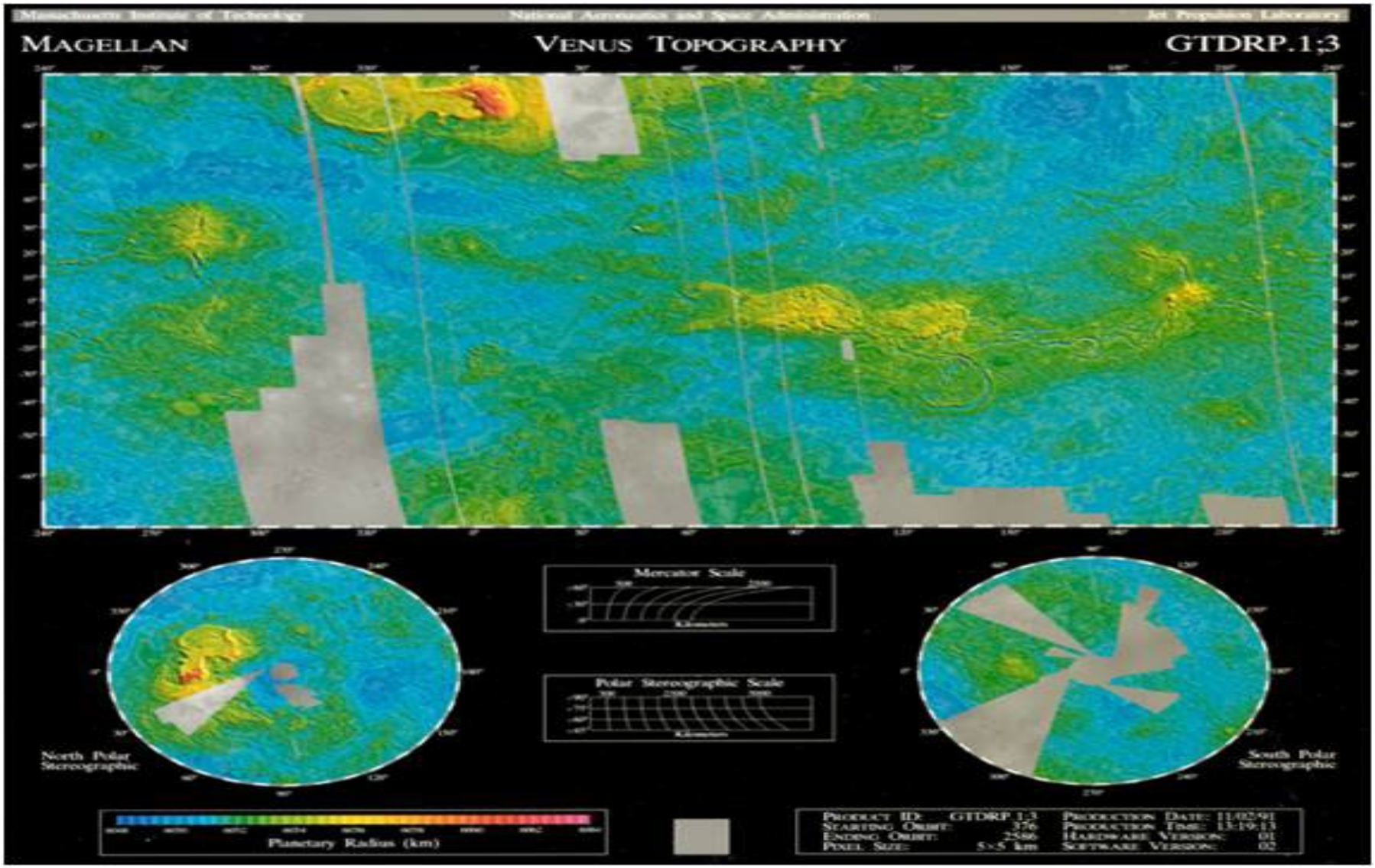
Earth = 0.96

Titan = 0.64

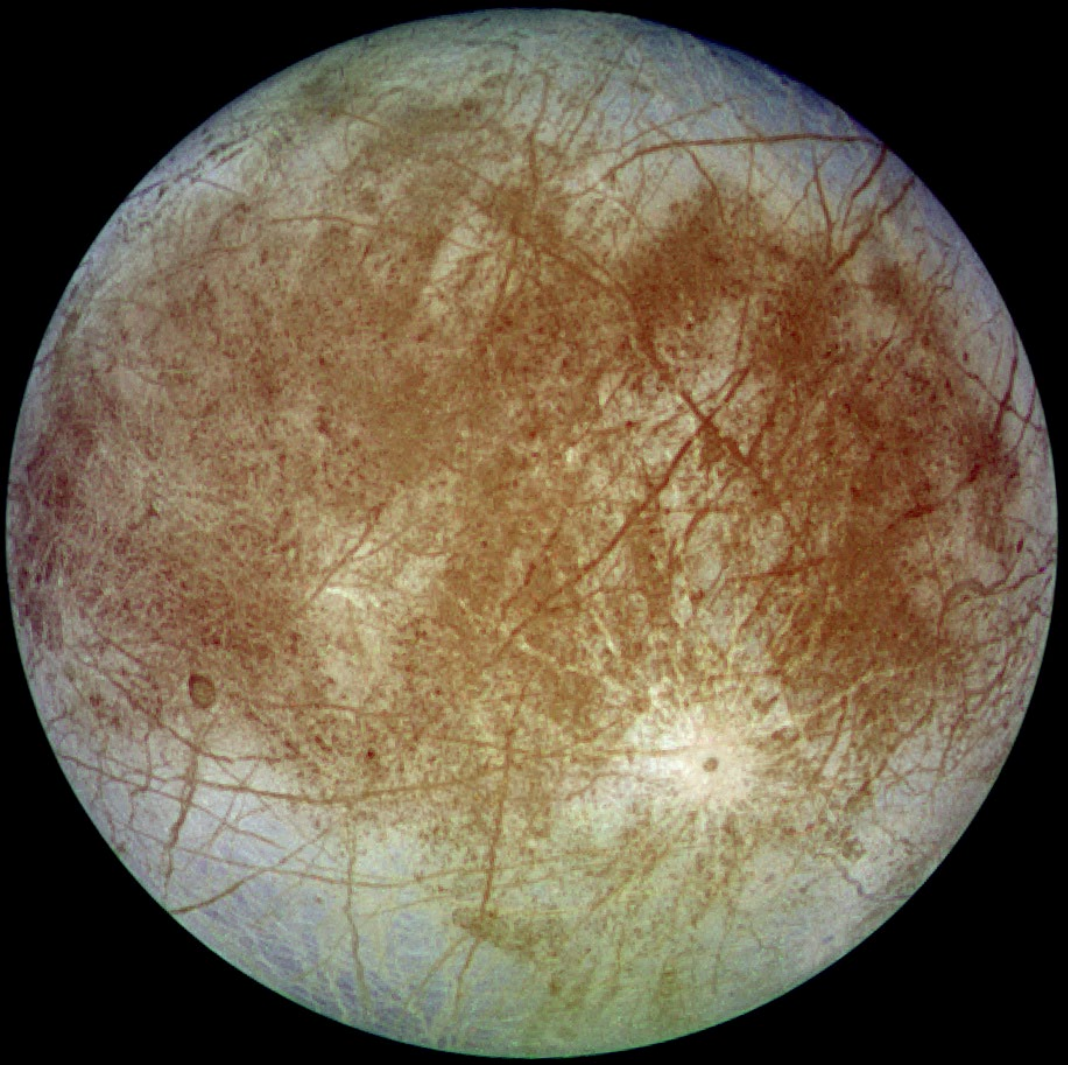
Mars = 0.59

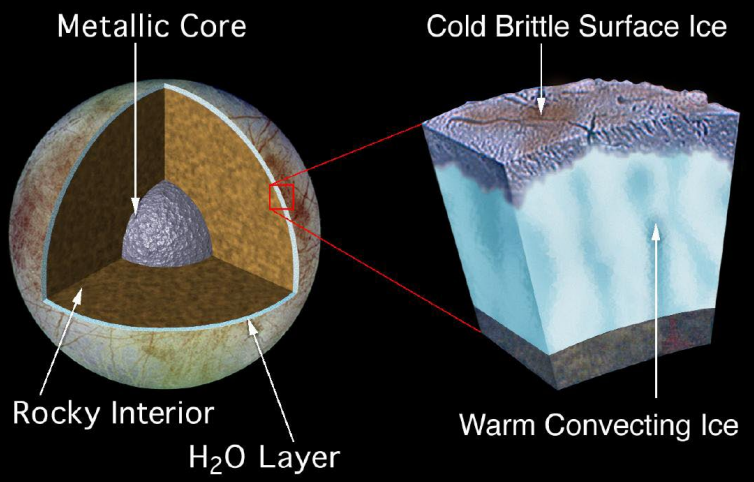
Gliese 581d = 0.43

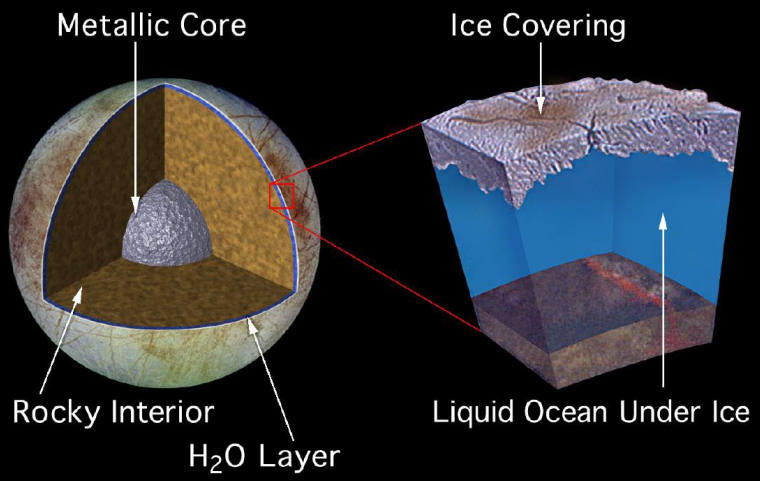
Credit: *Popular Science*

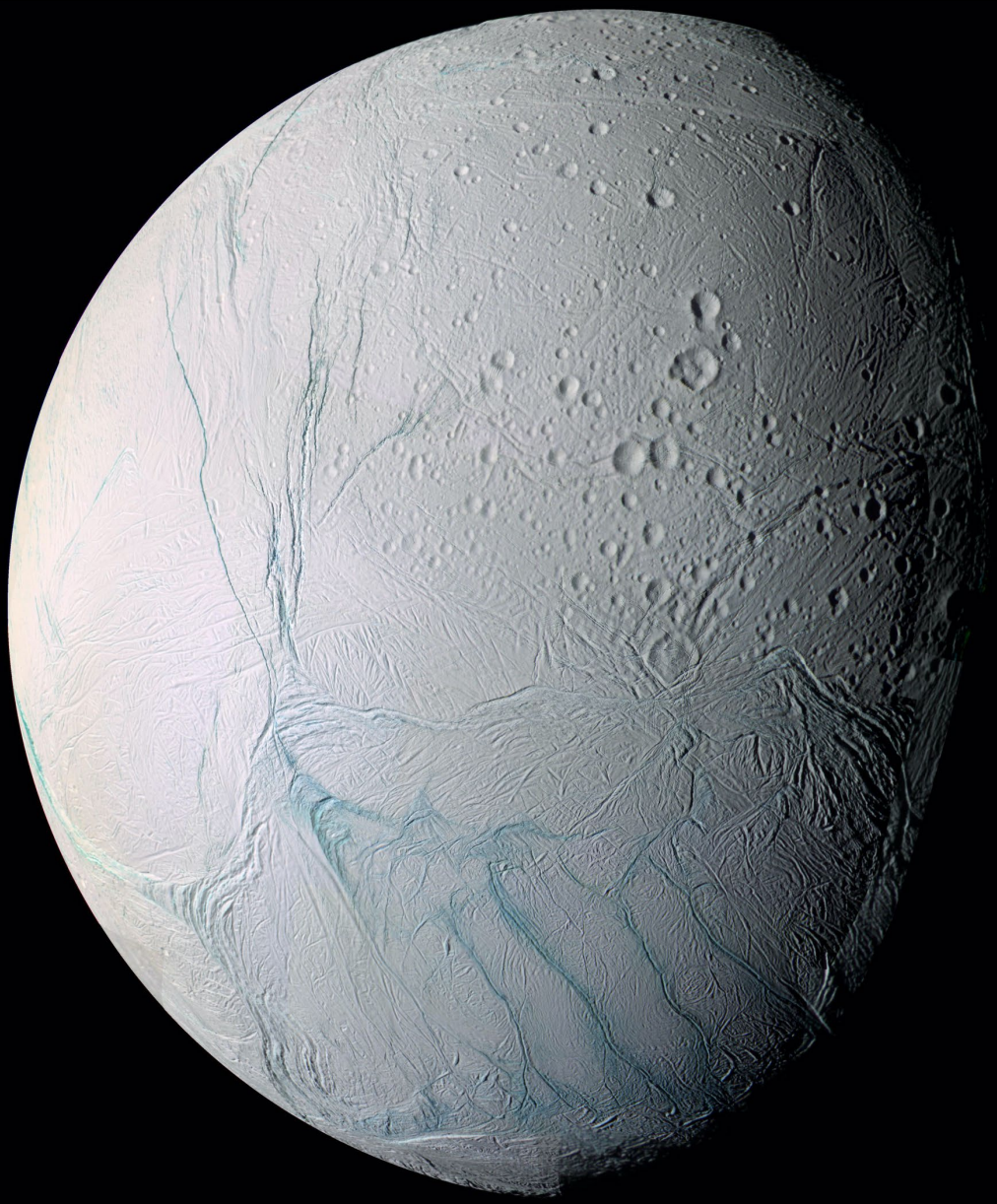

Massachusetts Institute of Technology
National Aeronautics and Space Administration
Jet Propulsion Laboratory
MAGELLAN
VENUS TOPOGRAPHY
GTDRP.1;3
Mercator Scale
Polar Stereographic Scale
North Polar Stereographic
South Polar Stereographic
Planetary Radius (km)
PRODUCT ID: GTDRP 1;3
STARTING ORBIT: 376
ENDING ORBIT: 2586
PIXEL SIZE: 5×5 km
PRODUCTION DATE: 11/02/91
PRODUCTION TIME: 13:19:13
HARDWARE VERSION: 01
SOFTWARE VERSION: 05

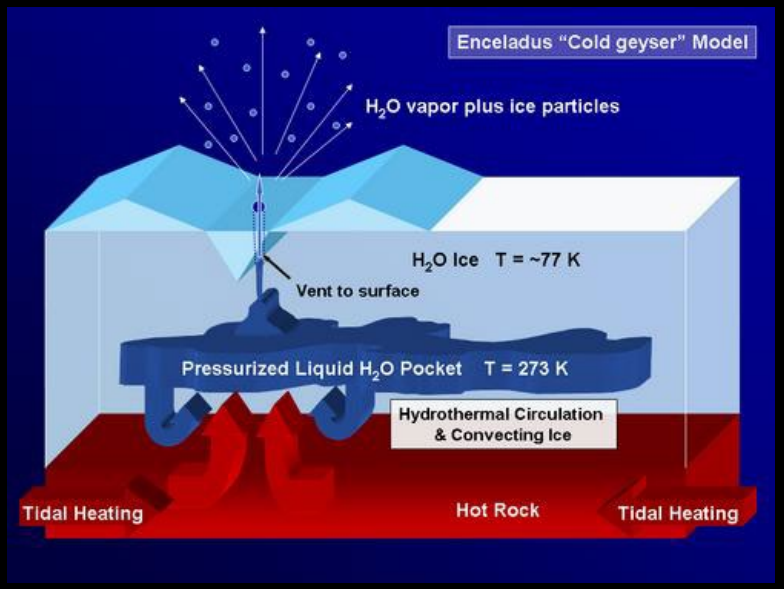
Early View of Venus

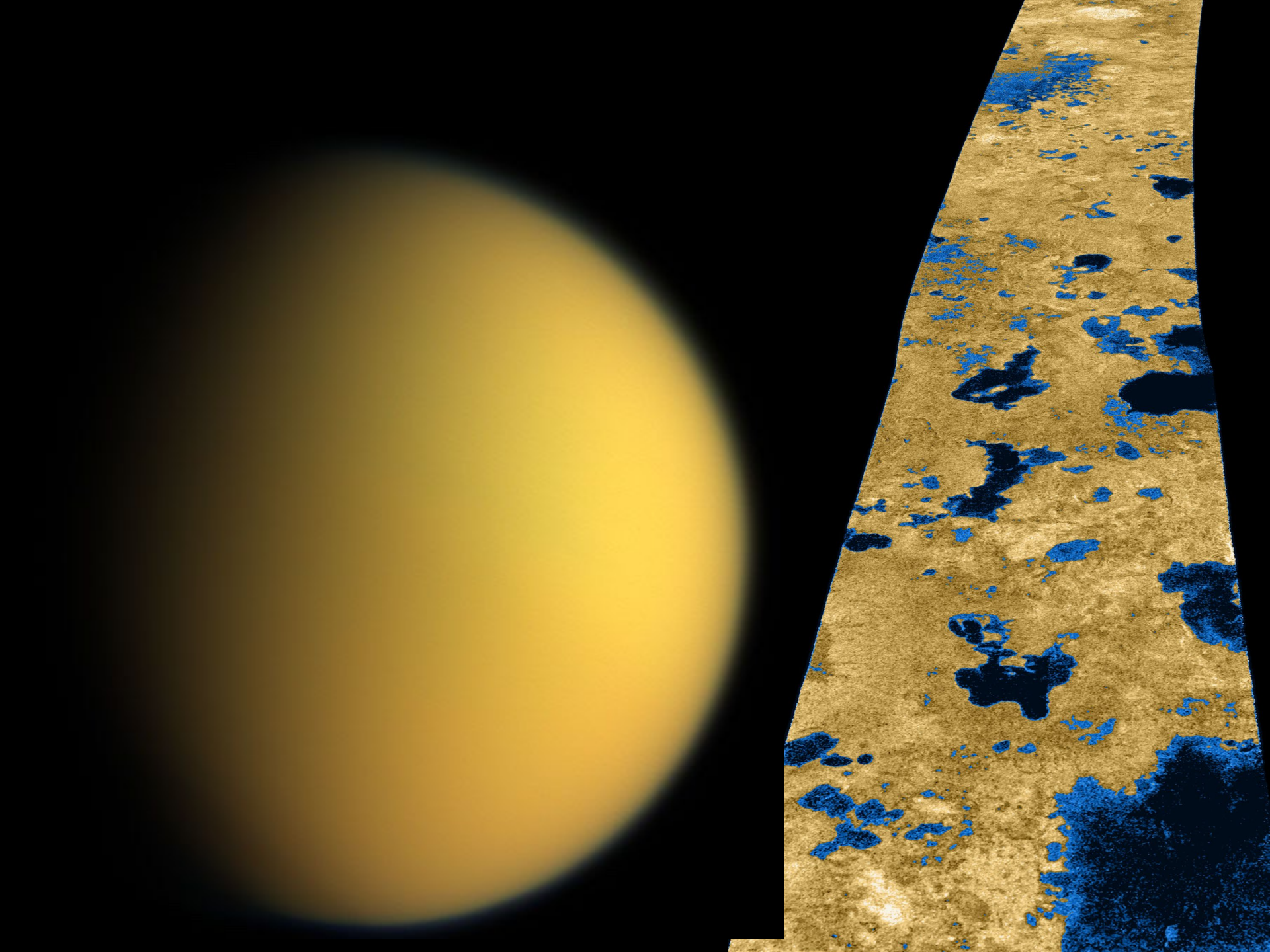



Metallic Core
Cold Brittle Surface Ice
Rocky Interior
H_2O Layer
Warm Convecting Ice


Metallic Core
Ice Covering
Rocky Interior
H_2O Layer
Liquid Ocean Under Ice




Enceladus "Cold geyser" Model
H_2O vapor plus ice particles
H_2O Ice T = ~77 K
Vent to surface
Pressurized Liquid H_2O Pocket T = 273 K
Hydrothermal Circulation & Convecting Ice
Tidal Heating
Hot Rock
Tidal Heating



Huygens Landing Site

Landed January 14, 2005 at 10.2S, 192.4W

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

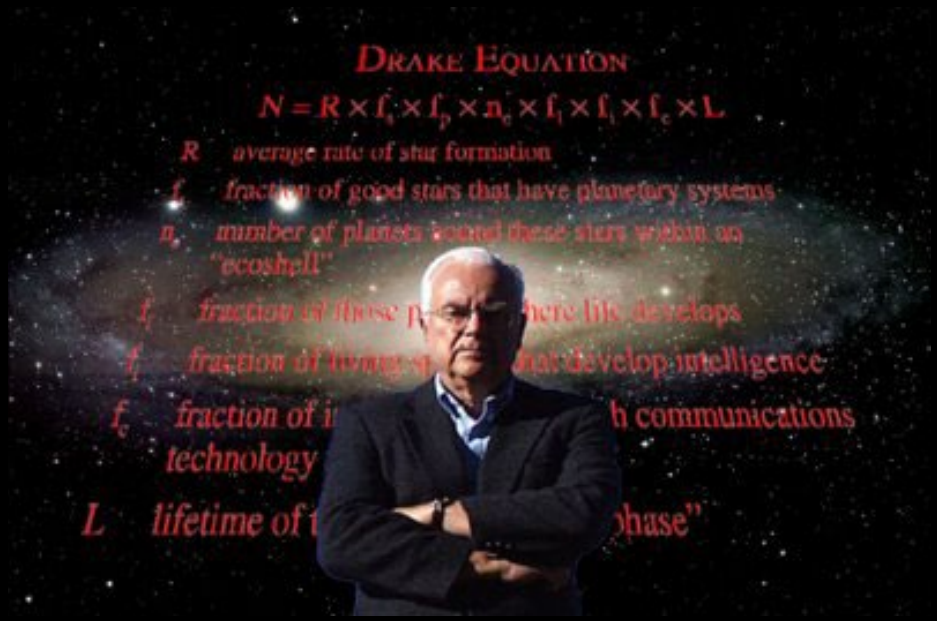
Fluvial activity (methane?)

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

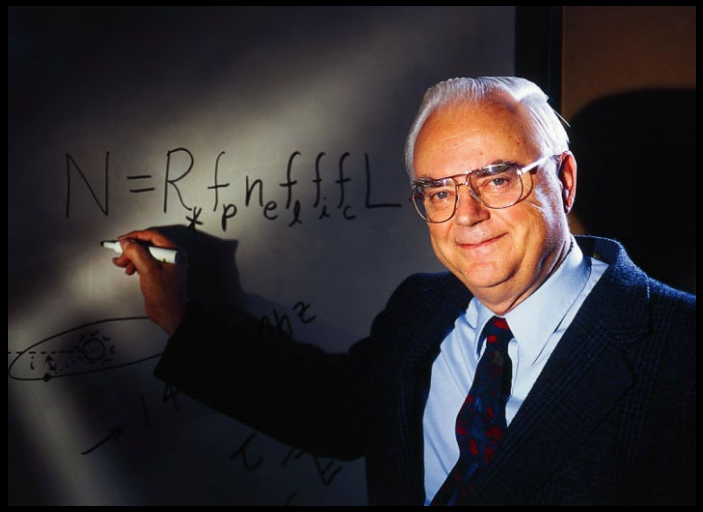
Titan Earth

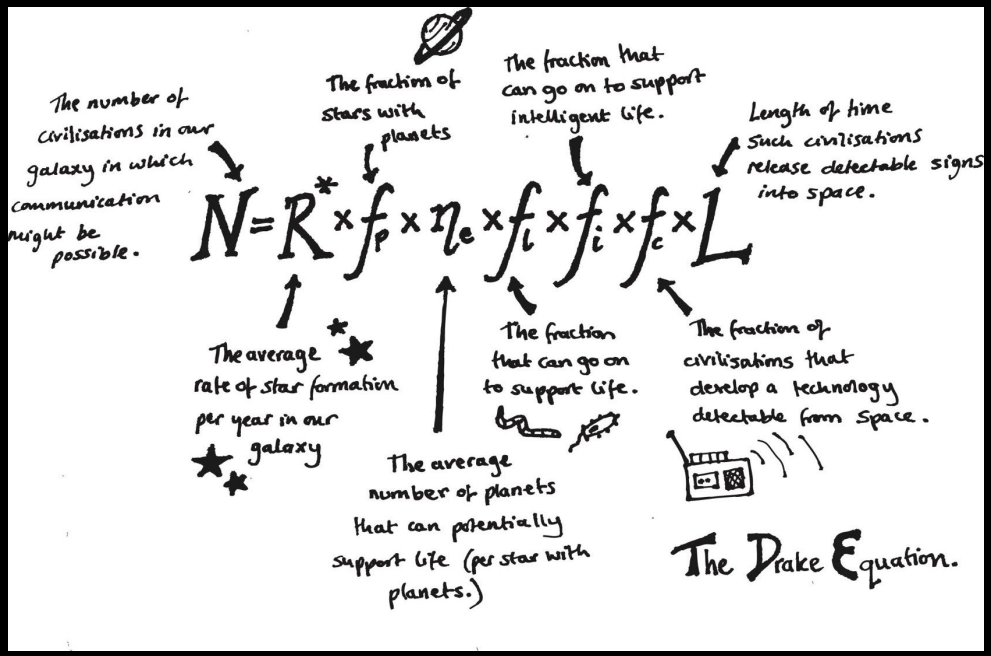
Image Credit: NASA

The Drake Equation



How many civilizations are out there?






UFO
INFORMATION
CENTER

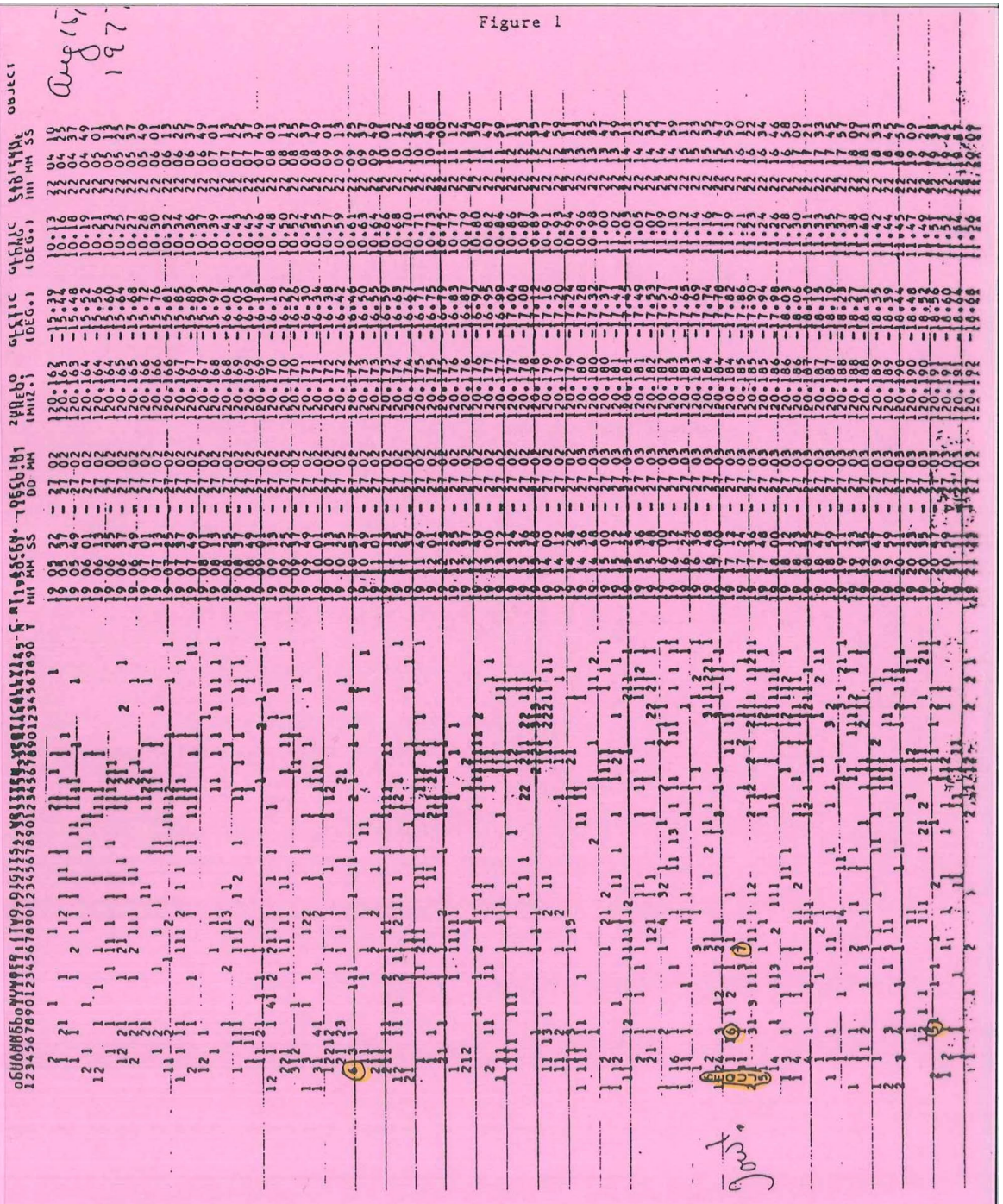
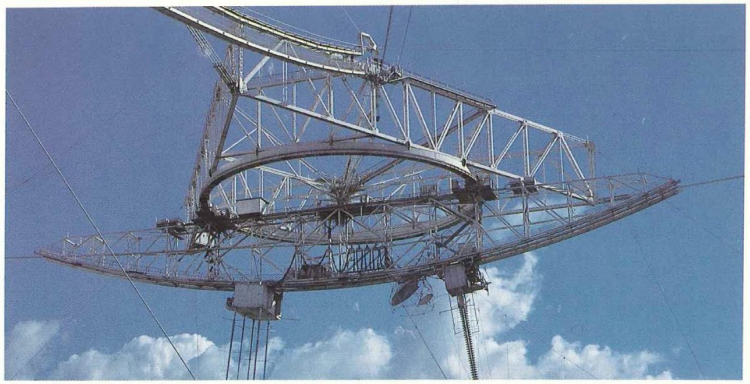
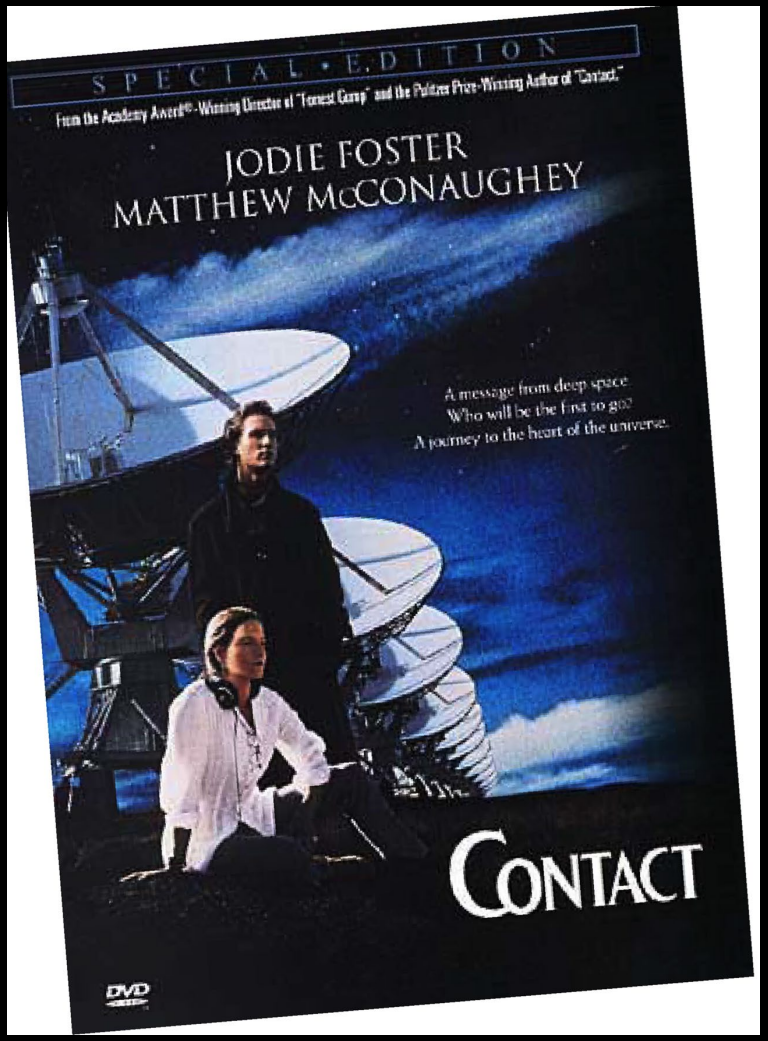


Figure 1. The "Wow!" signal. It was recorded on a computer printout of radio noise intensity from 50 frequency channels (digits and letters at left) at varying sky positions. *(Photo: Courtesy Robert Dixon; Ohio State University Radio Observatory.)*

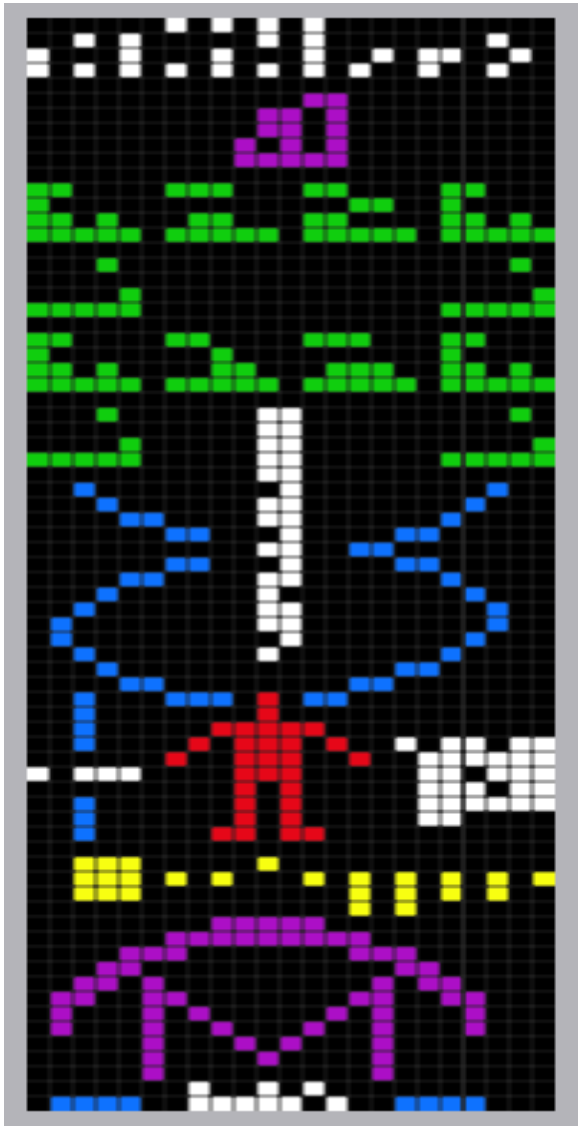
ARECIBO OBSERVATORY
ARECIBO, PUERTO RICO

NATIONAL ASTRONOMY
AND IONOSPHERE CENTER
OPERATED BY CORNELL UNIVERSITY
UNDER COOPERATIVE AGREEMENT
WITH THE
NATIONAL SCIENCE FOUNDATION




SPECIAL EDITION
From the Academy Award®-Winning Director of "Forrest Gump" and the Pulitzer Prize-Winning Author of "Contact."
JODIE FOSTER
MATTHEW McCONAUGHEY
A message from deep space.
Who will be the first to go?
A journey to the heart of the universe.
CONTACT
DVD

Arecibo Message

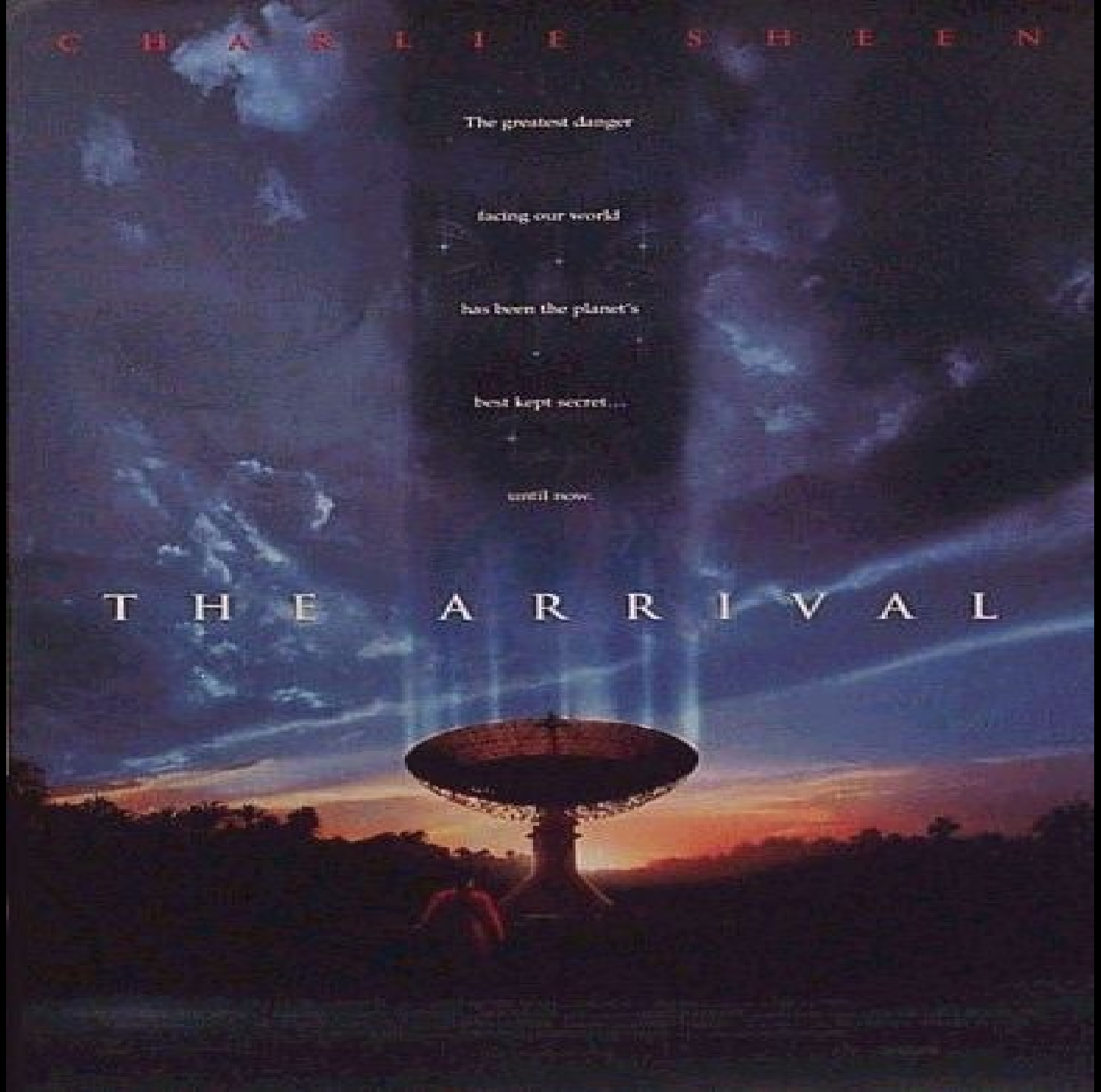


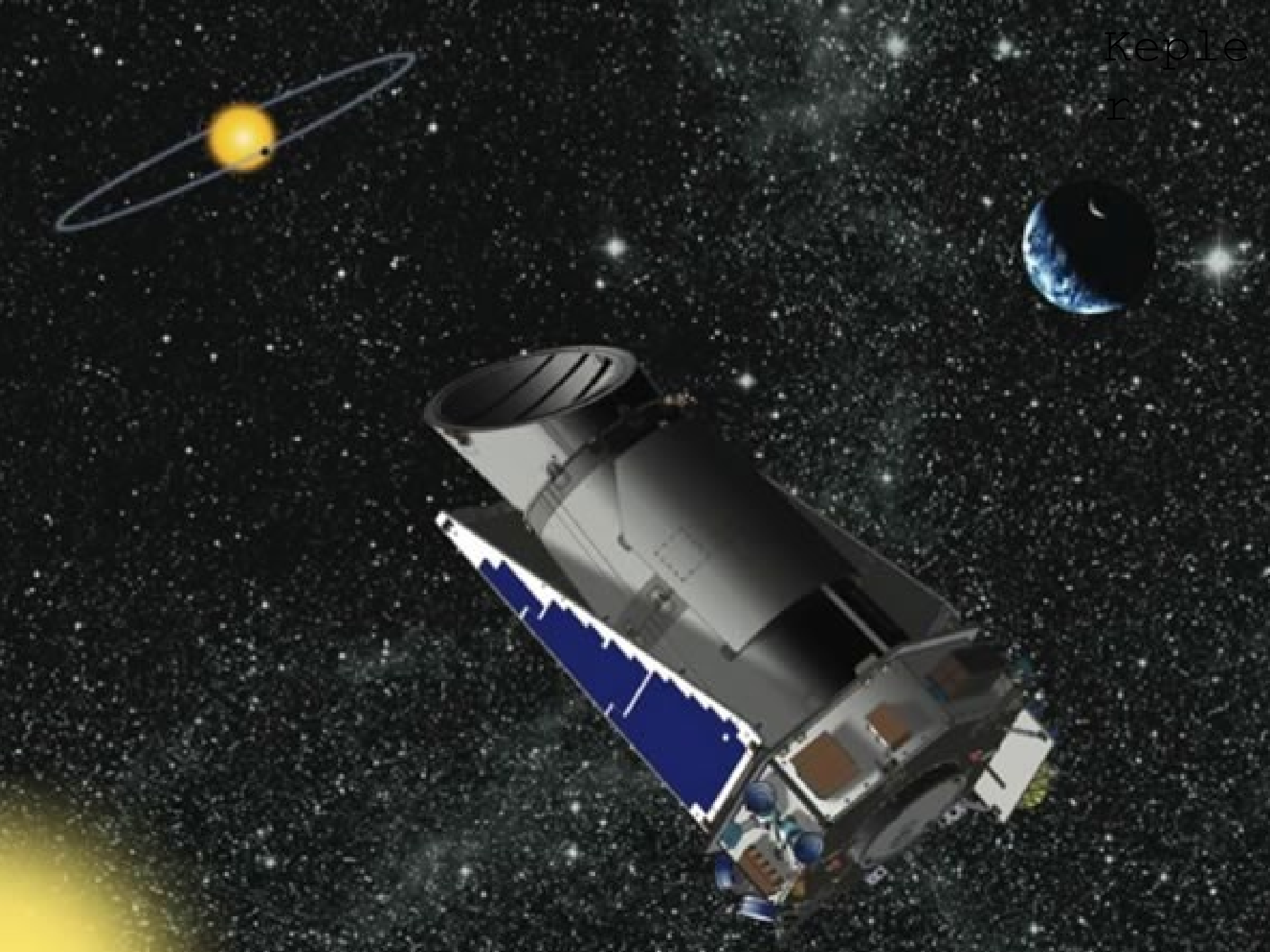
Broadcast on November 16th 1974 from the Arecibo radio telescope.

Aimed toward globular star cluster M13.

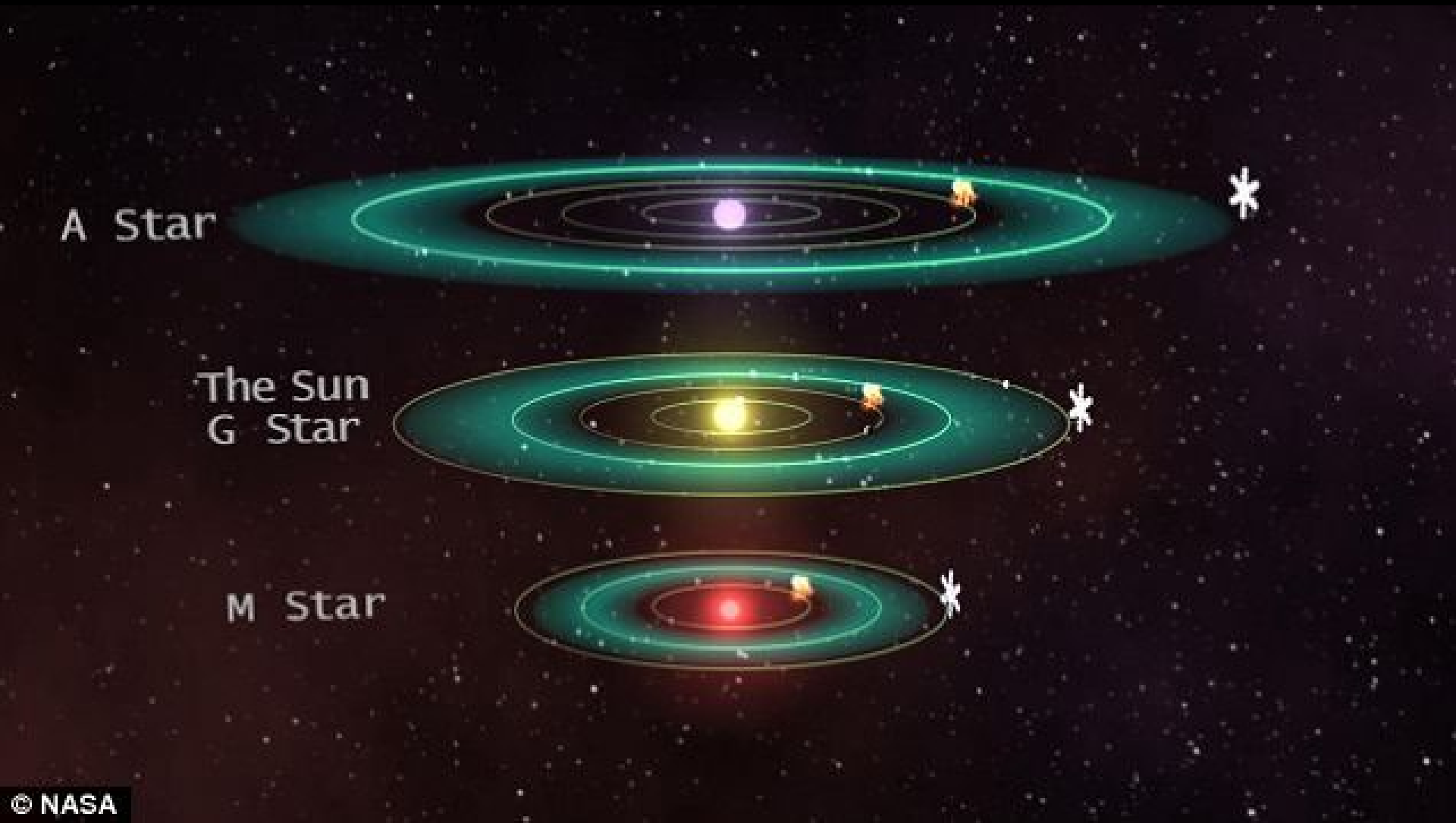
M13 is 25,000 light years away.

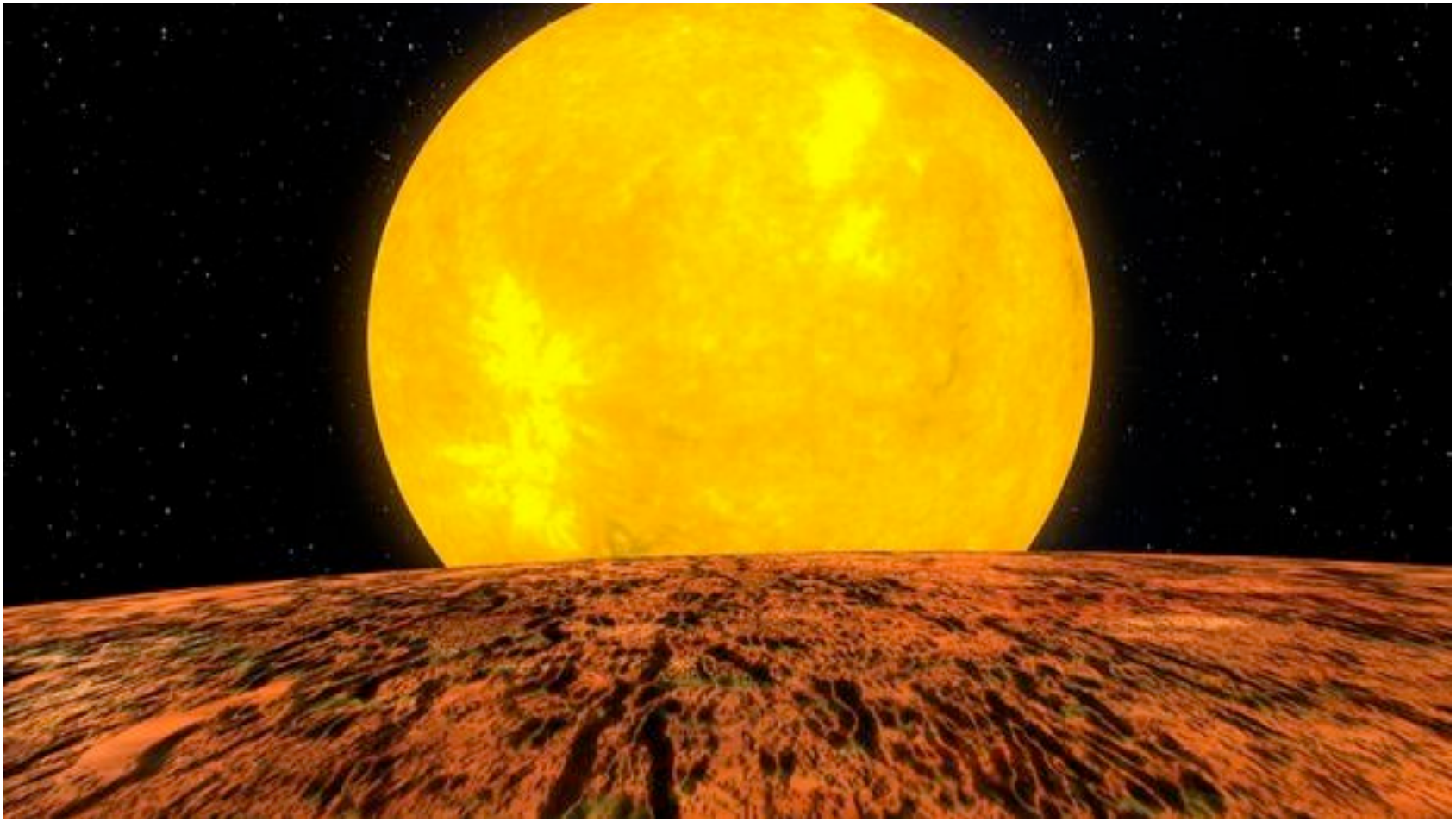
ATA - Allen Telescope Array


CHARLIE SHEEN
The greatest danger
facing our world
has been the planet's
best kept secret...
until now.
THE ARRIVAL


Kepler

Life Around Other Stars



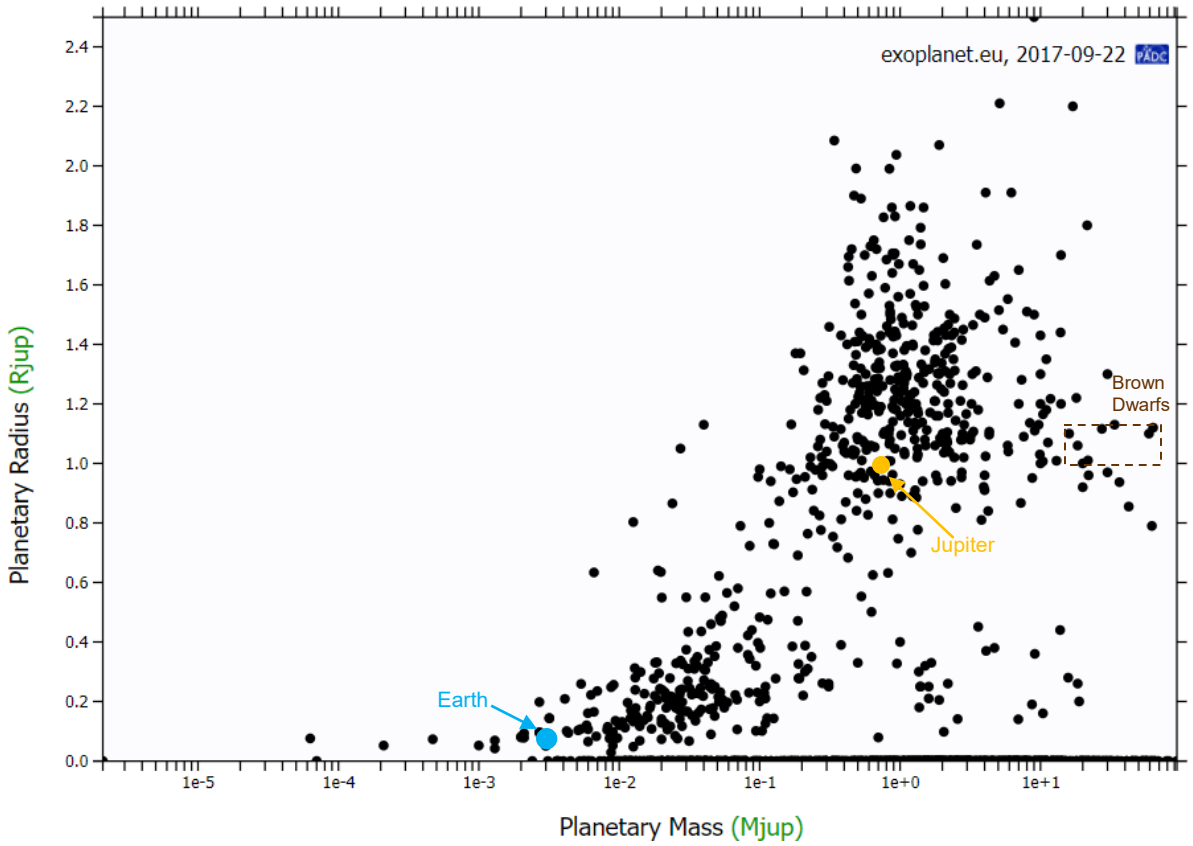


Imagined View from Planet Kepler-10b (Artist's Depiction)
Credit: NASA/Kepler Mission/Dana Berry

Diagrams: scatter plot

Histogram plot →

Status | Detection | "confirmed" in planet_status



X axis
Planetary Mass
show error bars
log scale
min max

Y axis
Planetary Radius
show error bars
log scale
min max

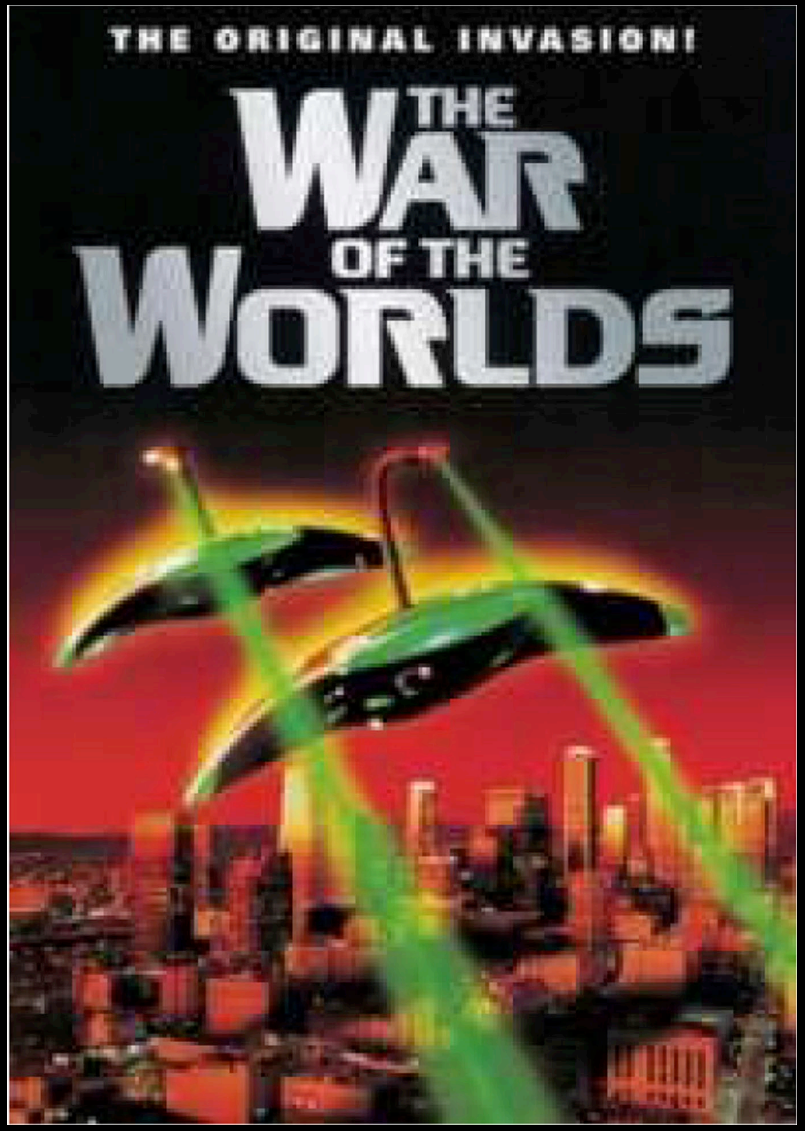
Color
Size
Set grid
Manual Pan/Zoom
Set labels
Selection mode

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."

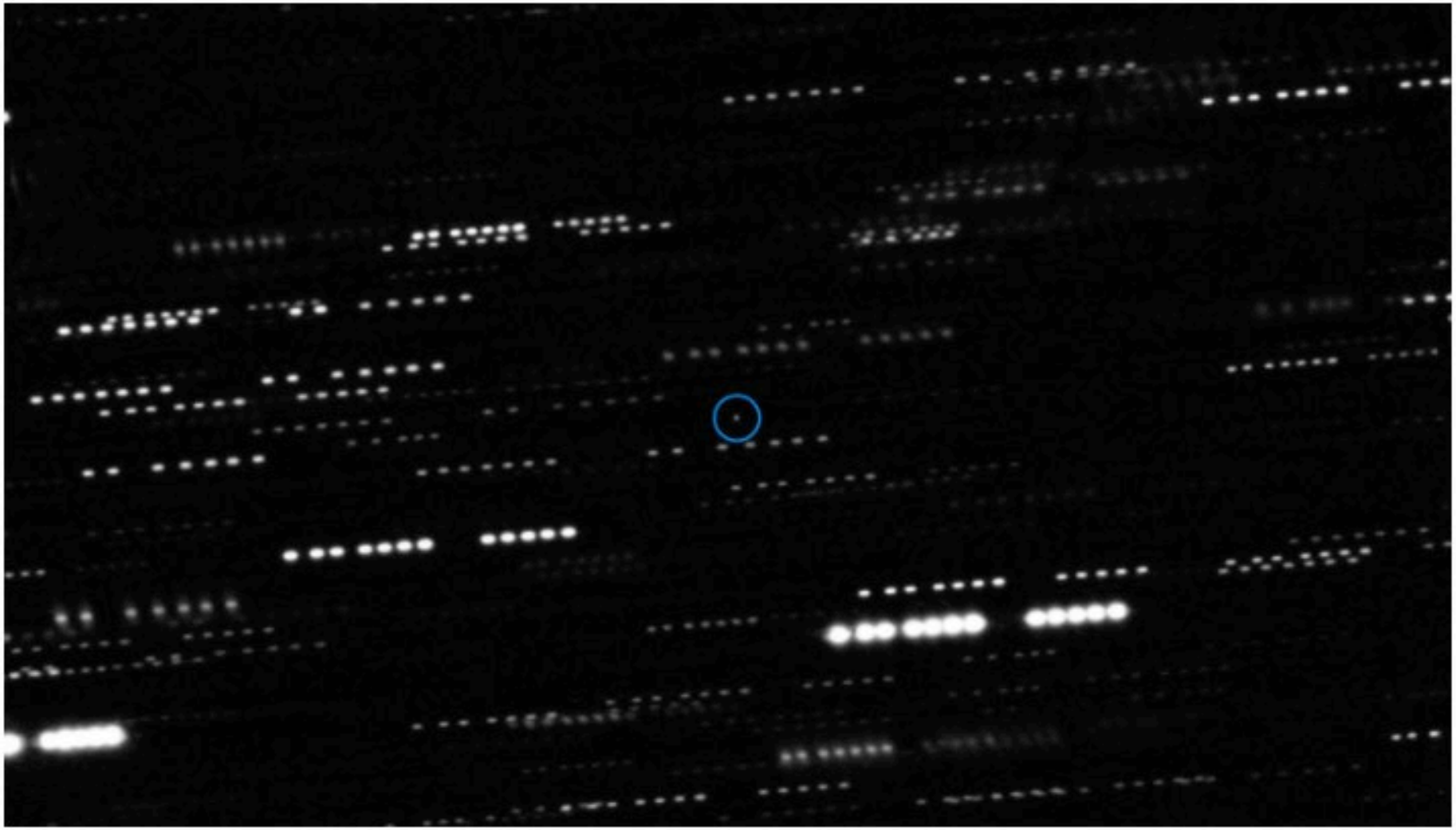
Rarity of Panic

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)


THE ORIGINAL INVASION!
THE WAR OF THE WORLDS

Artist's concept of interstellar object1I/2017 U1 ('Oumuamua) as it passed through the solar system after its discovery in October 2017. The aspect ratio of up to 10:1 is unlike that of any object seen in our own solar system. Image Credit: European Southern Observatory / M. Kornmesser

Originally classified as an asteroid, Oumuamua is an object estimated to be about 230 by 35 meters (800 ft x 100 ft) in size, travelling through our solar system. (Getty Images/Aunt_Spray)



This very deep combined image shows the interstellar object ‘Oumuamua at the center of the image. It is surrounded by the trails of faint stars that are smeared as the telescopes tracked the moving comet. Credit: ESO/K. Meech et al.