



LIFE IN THE UNIVERSE

NO THING

ALIENS













WHAT DO ALIENS LOOK LIKE?

- Movie aliens mostly look like men in rubber suits
- They almost all have two eyes, one nose, one mouth two arms and two legs.
- Faces are usually human enough to be frightening, the “Uncanny Valley.”

DO ALIENS EXIST?

- Very likely
- Size of the universe.
 - 100,000 Stars for every grain of sand on Earth.
- We don't know if any alien life is close enough for us to ever learn about it.
- We need to understand the parameters of life on Earth to know where to look.

ALIEN VISITORS

- Are they here?
 - Probably Not
 - Difficulty in keeping secret
 - Not seen by astronomers
- Why do people see UFO's

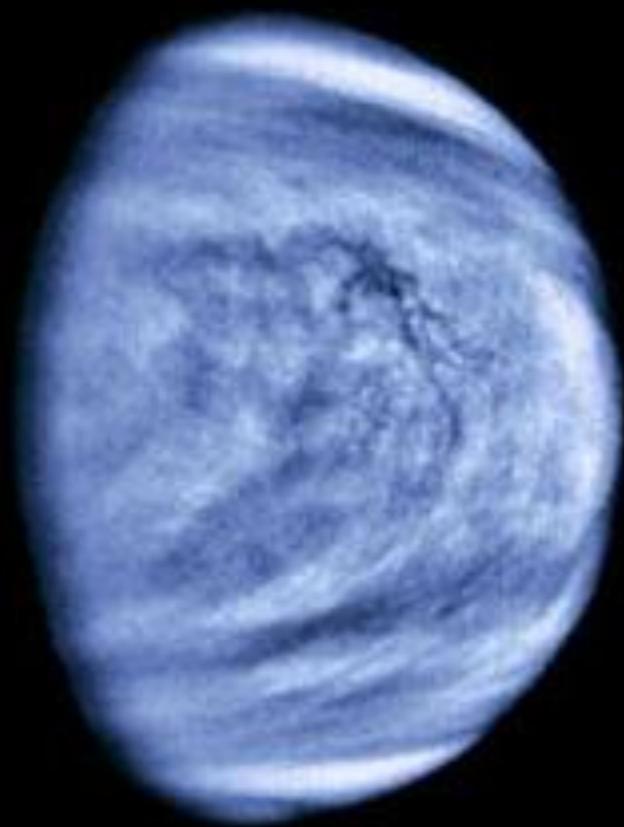


© Jonathan Burnett, used with permission









UNIDENTIFIED AERIAL PHENOMENA (UAP) TASK FORCE

- Pilots and Observers see some strange things
- Many can be explained, mostly as optical effects, reflections, refractions and diffractions can occasionally appear strange.
- Rocket launches, space debris reentering and meteors can appear unexpectedly.
- There are also atmosphere disturbance like Aurora or Sprites that may not be recognized.

"Extraordinary claims require extraordinary evidence." ¹

-Sagan



ALIENS

- What do we know for sure about Alien life?

NOTHING!

- How many examples of Alien life do we have?

ZERO!

WHAT DO ALIENS REALLY LOOK LIKE?

- We won't know until we see one
- Probably not much like us
- Probably not much like any Earth creature

WHAT DO WE KNOW ABOUT LIFE

- We have only one example of life to draw upon – life on Earth.
- By studying the life on earth we can begin to understand how life might develop on other planets.

DNA

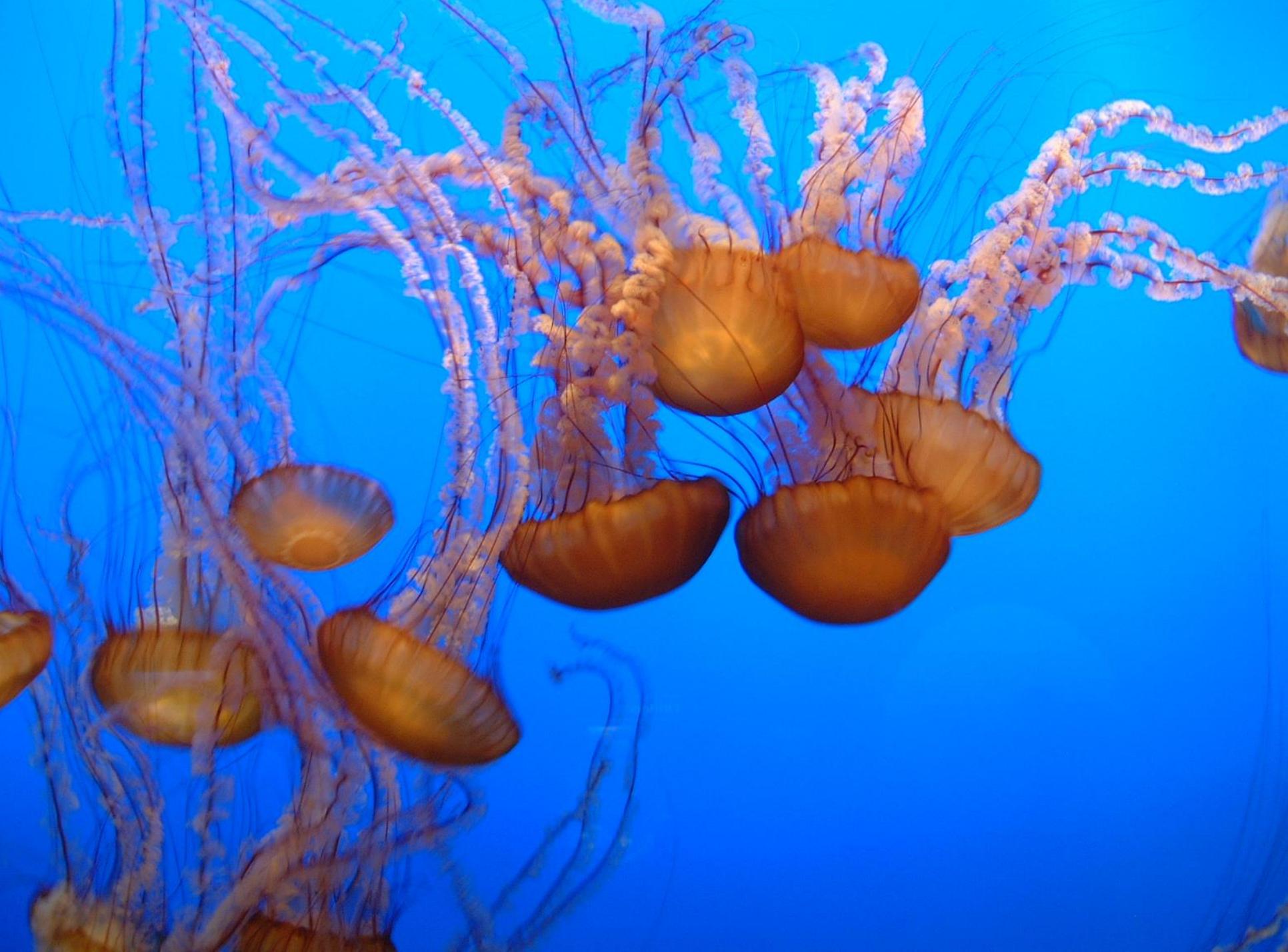
- Deoxyribonucleic acid
- Self-replicating material which is present in all living organisms on Earth
- It is the software program that defines living things
- All life on Earth uses DNA

LIFE ON EARTH

- Life arose very soon after Earth cooled enough for the chemicals to form.
- All life on Earth has a common ancestor.
- Life only arose once.

ALL LIFE HAS A COMMON ANCESTOR

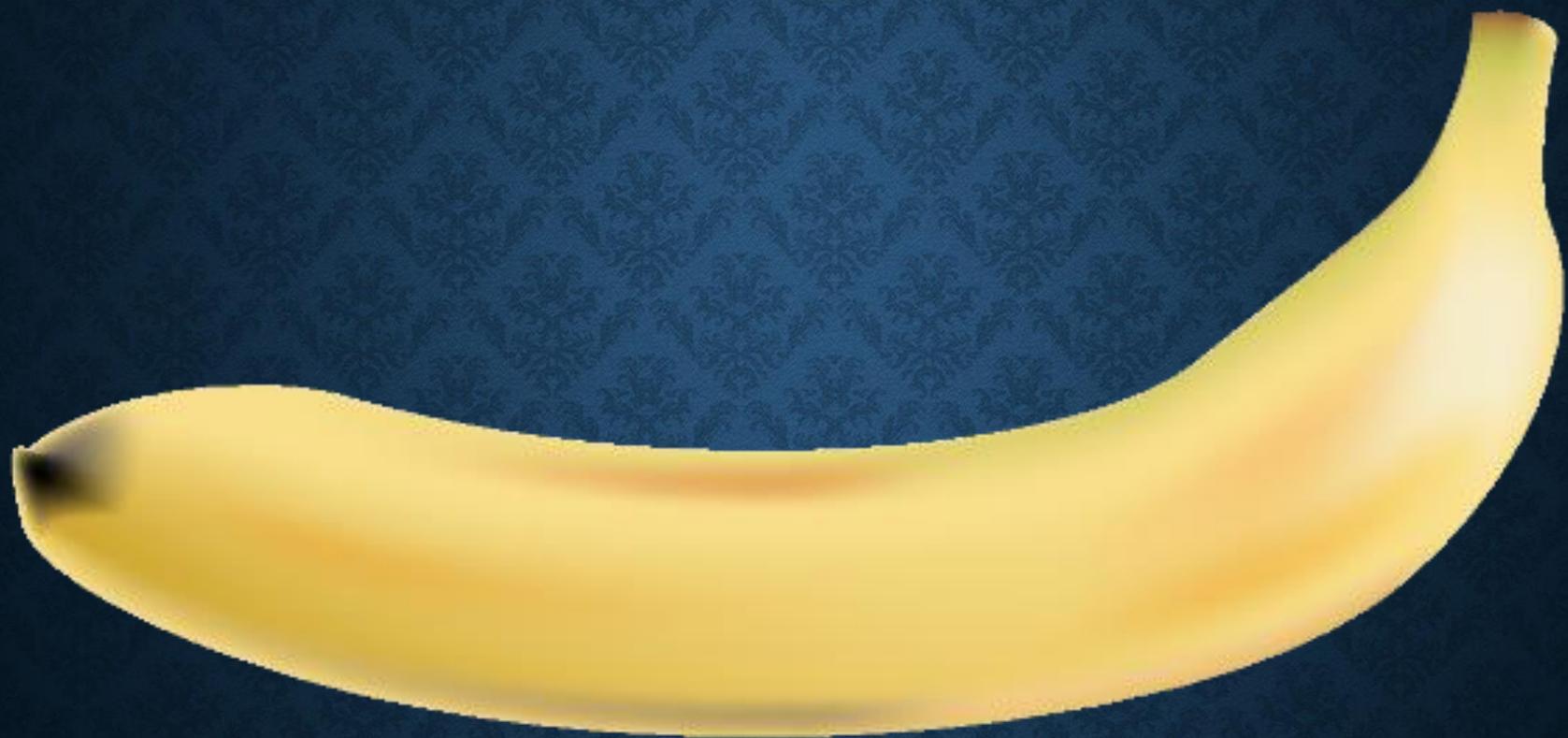
- All of the amino acids used by Earth life are all “left-handed”
- All of the sugars used by Earth life are all “right-handed.”
- DNA uses only 4 bases although several others could work.
- There is no fossil evidence of any life other than the type that lives today.





TARDIGRADE



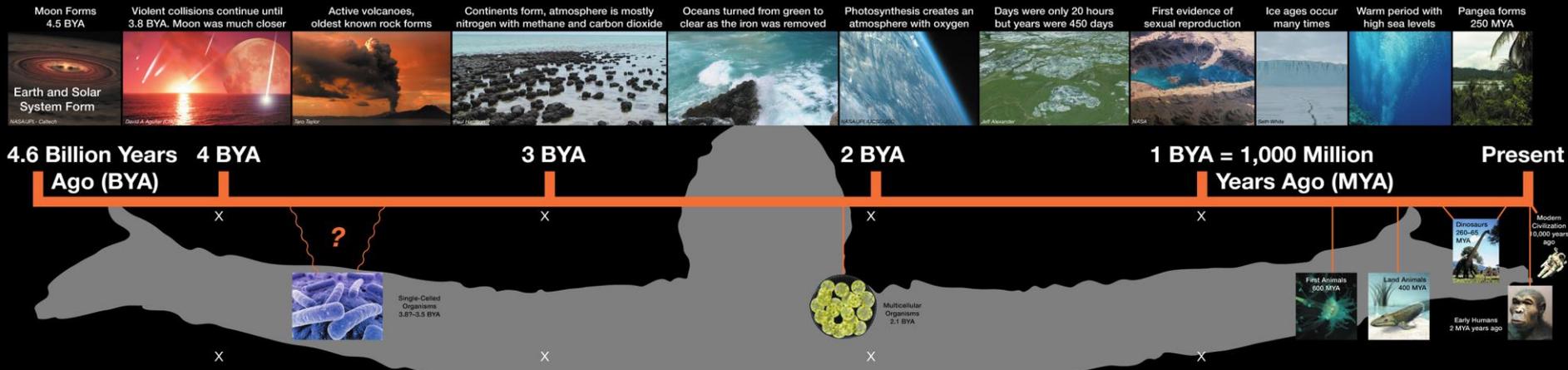




HISTORY OF LIFE ON EARTH



Earth Timeline



INTELLIGENT LIFE

- Human ancestors have been around about 1 Million years - **.02%**
- Modern Humans have been around about 200,000 years - **.004%**
- Civilization has been around for about 10,000 years - **.0002%**

IF THE ASTEROID DIDN'T HIT



IF THE ASTEROID DIDN'T HIT



WHAT DO WE KNOW ABOUT LIFE

- It arose soon after Earth cooled
- It only arose once
- For $\frac{3}{4}$ of the time life was on Earth it was single celled.
- Intelligent civilized life has only existed on Earth for a very short time.
- Life on Earth requires liquid water.
- Wherever there is liquid water on Earth, there is life.











ALIEN LIFE IN OUR SOLAR SYSTEM

- If not in our Solar System, it may be a long time before we can study it.
 - Need faster ships - 70,000 Years for our fastest spaceship to reach the nearest star.

ALIEN LIFE IN OUR SOLAR SYSTEM

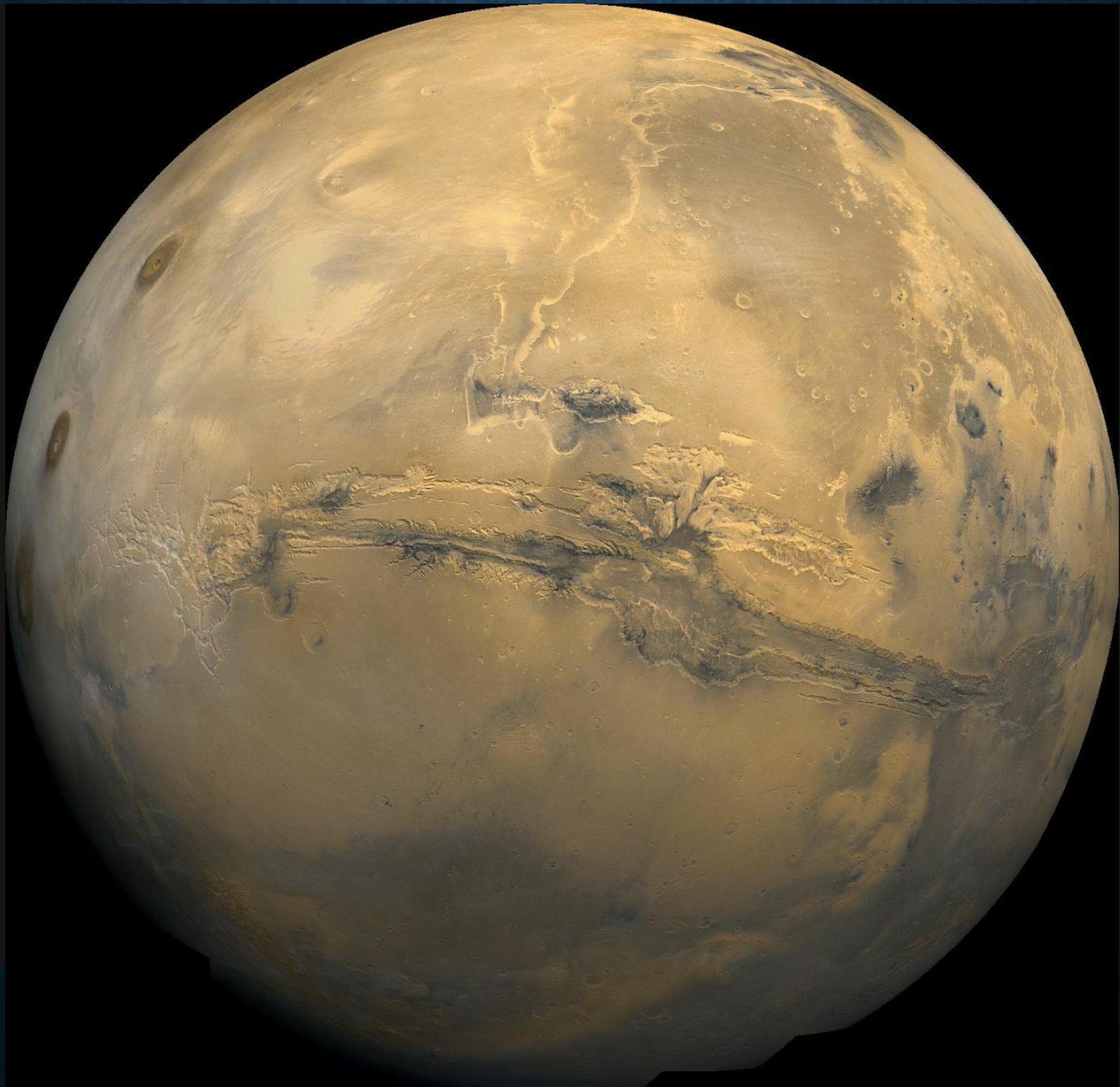
- All known forms of life require:
 - Liquid water,
 - An energy source
 - A supply of carbon

ALIEN LIFE IN OUR SOLAR SYSTEM

- Where are we looking in our Solar System
 - The only planet that seems capable of supporting life is Mars
 - Another possibility are moons of giant planets where there is enough tidal energy to sustain liquid water.

WHAT DO WE KNOW ABOUT MARS?

- Mars once had oceans
- There is a lot of water ice in the ice caps
- There is a mysterious source of Methane
- There may still be liquid water underground





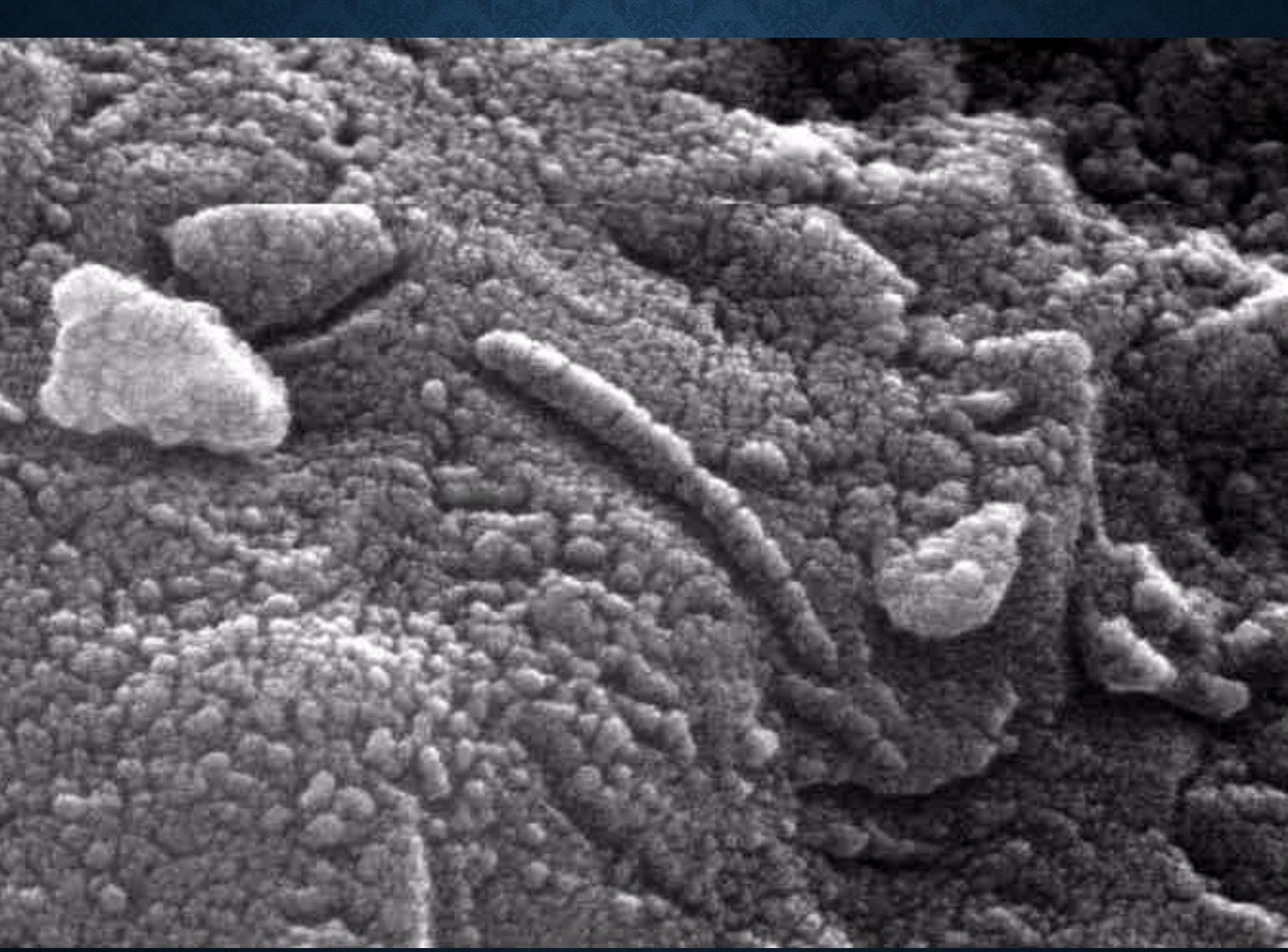




ALH84001,0

1cm

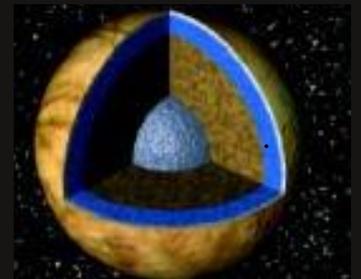
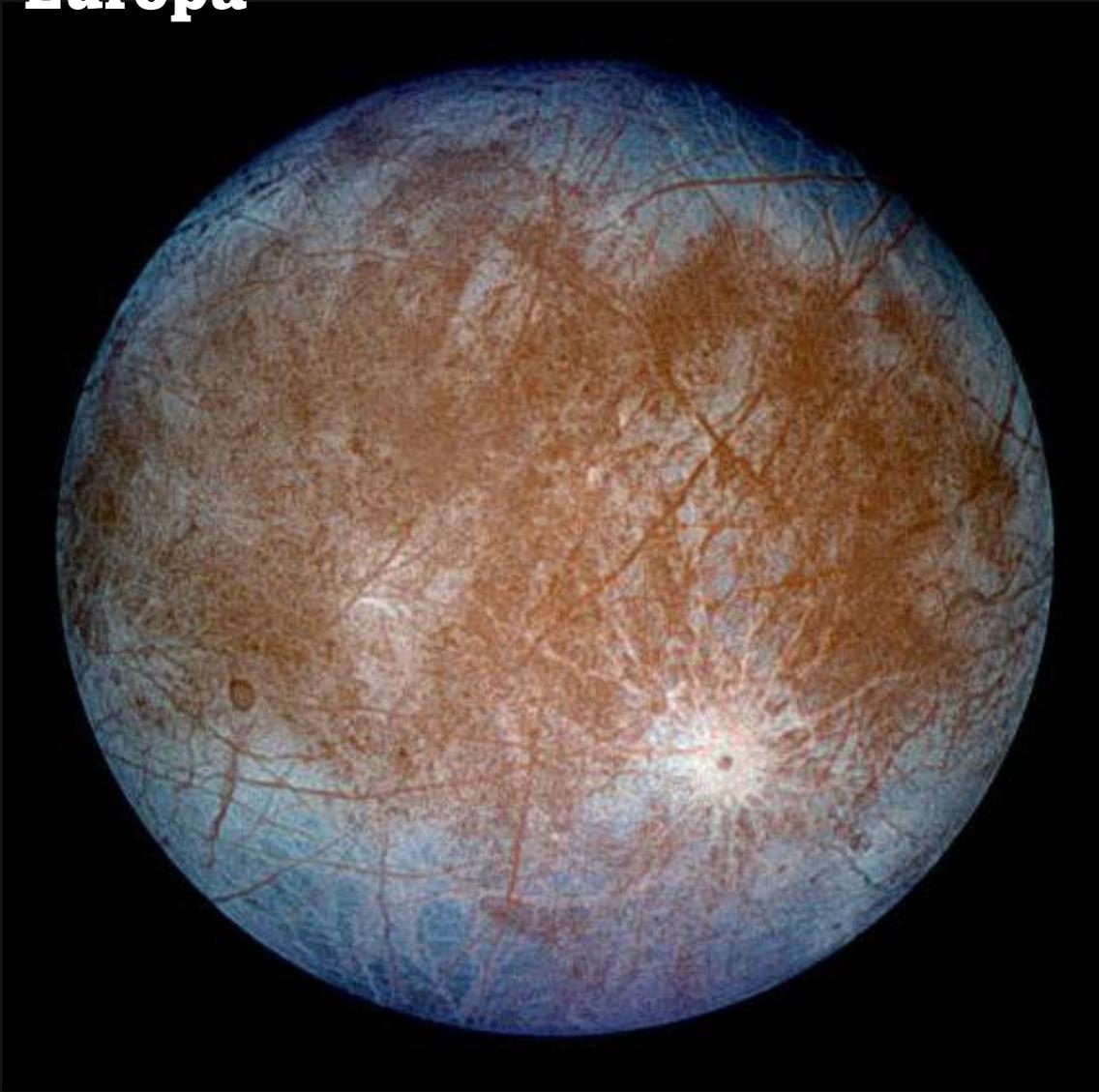




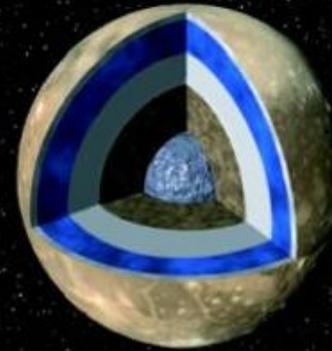
POSSIBLE MOONS WITH LIFE IN OUR SOLAR SYSTEM

- Europa
- Ganymède
- Callisto
- Enceladus
- Titan (not water based)

Europa



Ganymede

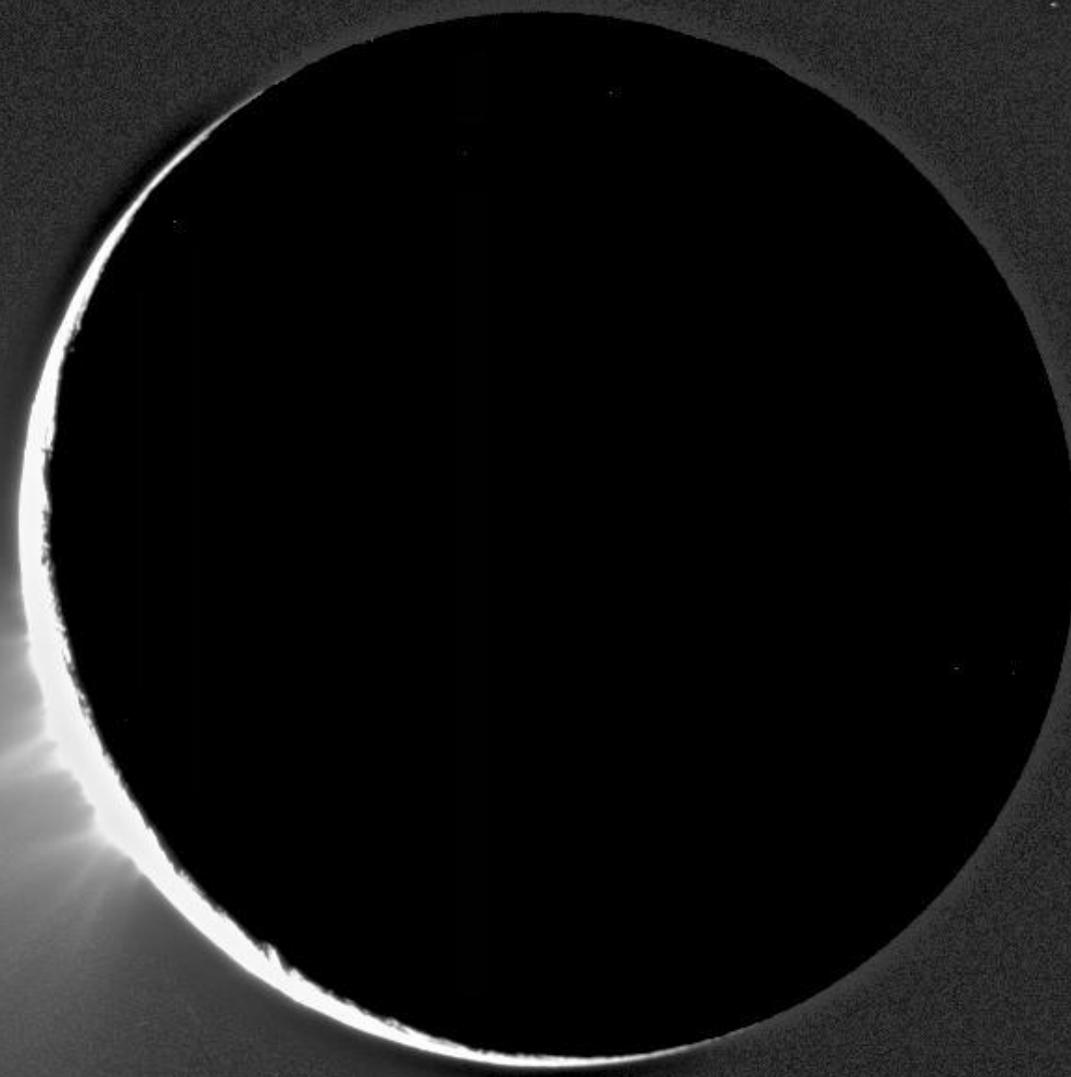


1000 km

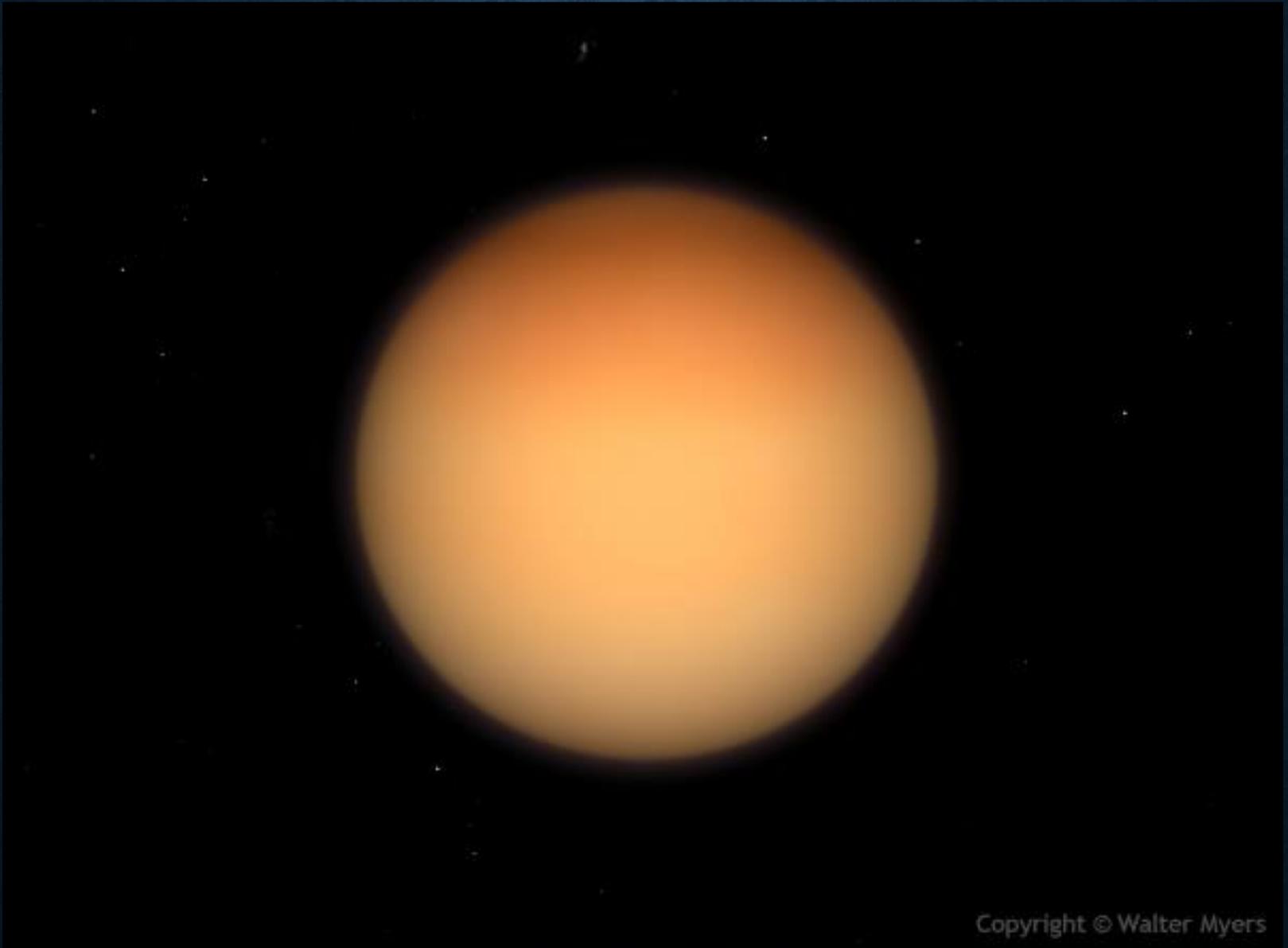
Callisto



Enceladus

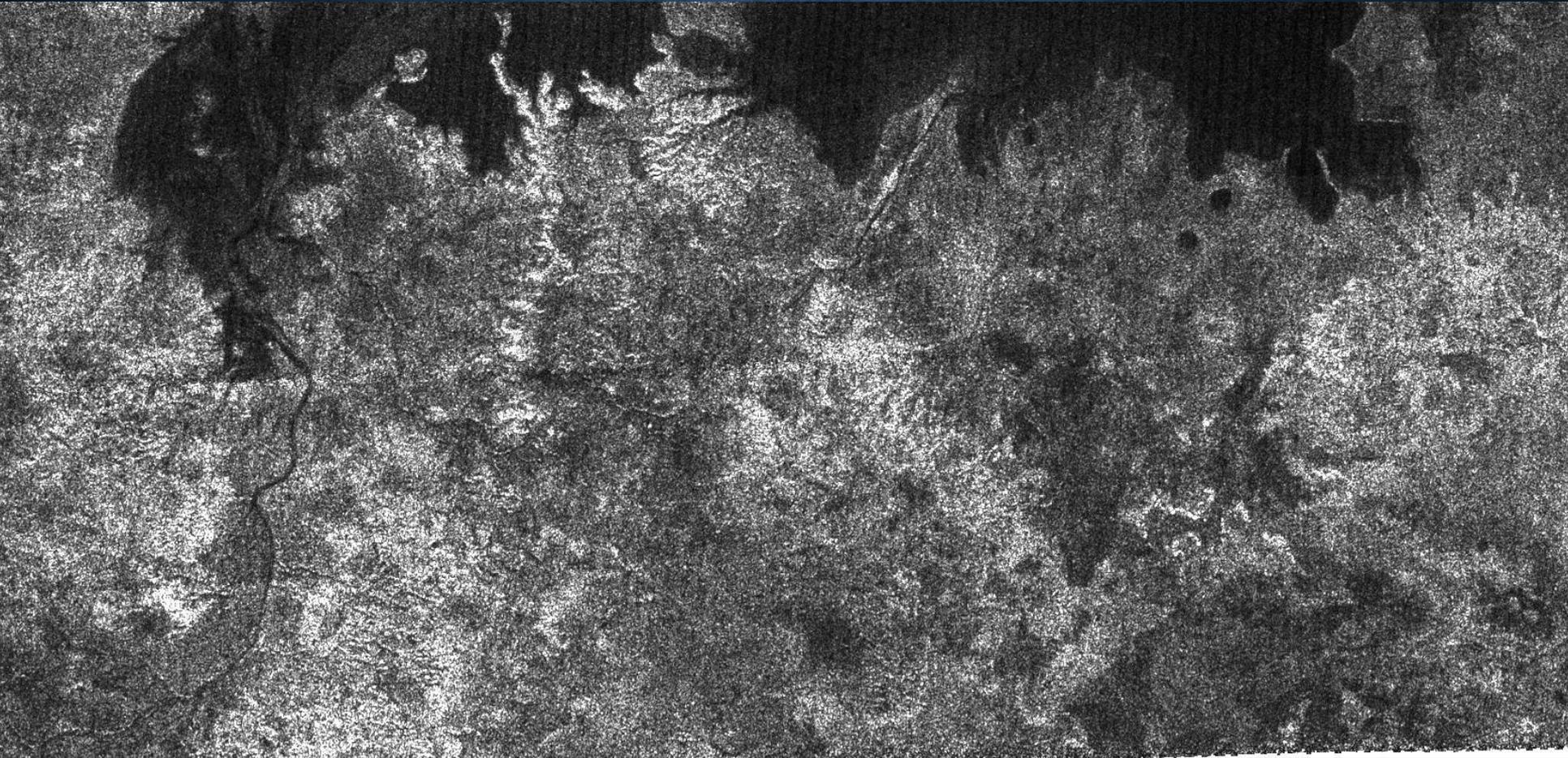


Titan



Copyright © Walter Myers

Titan



WHAT IF WE FIND ALIEN LIFE IN OUR SOLAR SYSTEM?

- The life we find will not have civilizations or technology.
- Most likely we would find only single cell creatures.

-BUT-

- It will either be the same or not the same as Earth life.

SEARCHING FOR PLANETS

- We have found **4,401** planets in **3,271** solar systems.
- We estimate that most of the stars in the galaxy have planets, making over **200,000,000,000** solar systems.
- We have no proof that life exists on any of these, or anywhere else.

SETI (SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE).

- An effort to find other intelligent beings
- Searches for radio signals which might be used for communications by alien intelligence.
- Odds of success are low but..
 - If found it would be the most profound discovery in history.
 - How can we not look?



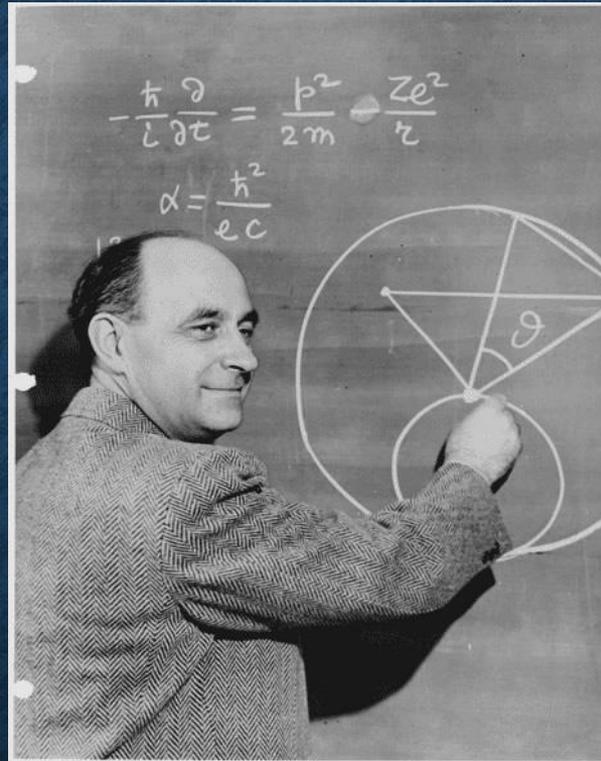
WE'VE SEARCHED DOZENS OF THESE FLOOR TILES FOR SEVERAL COMMON TYPES OF PHEROMONE TRAILS.

IF THERE WERE INTELLIGENT LIFE UP THERE, WE WOULD HAVE SEEN ITS MESSAGES BY NOW.



THE WORLD'S FIRST ANT COLONY TO ACHIEVE SENTIENCE CALLS OFF THE SEARCH FOR US.

THE FERMI PARADOX



Where is everybody?

INTERSTELLAR COLONIZATION

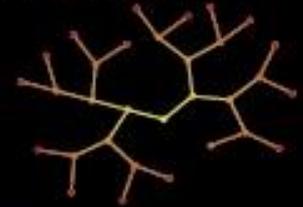
March to the Stars

- It takes 500 years to establish two colonies.
- In the next 500 years each colony establishes two new colonies
- The Galaxy would be filled in 3.75 Million Years.
- This is only 0.375% of the age of the Galaxy.

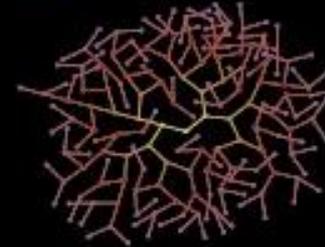
STEP 1: 500 Years



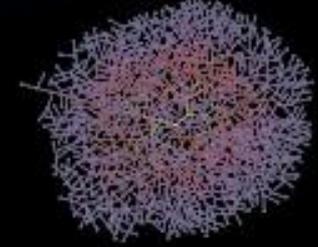
STEP 4: 2,000 Years



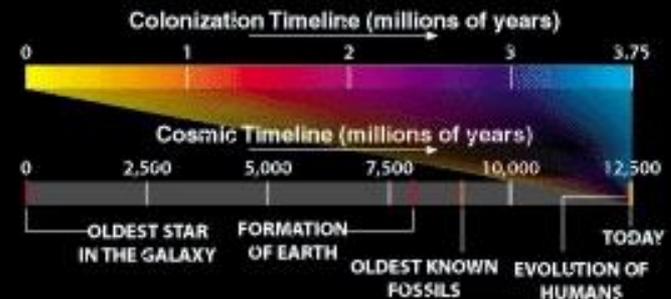
STEP 7: 3,500 Years



STEP 10: 5,000 Years



STEP 7,500: 3.75 Million Years (Galaxy Completely Colonized)



THE FERMI PARADOX

- If any civilizations have been around in our Galaxy for several million years, they should have colonized the entire Galaxy by now.
- We should have been visited many times over.
- But we have no evidence of extraterrestrial visitation, nor have we found any alien artifacts on Earth.

Where is everybody?

FERMI PARADOX

Several solutions have been proposed to explain the Fermi Paradox:

- We are alone... and always have been
 - Life only happened on Earth.
 - Advanced civilizations always destroy themselves.
 - Nature eradicates civilizations
- The Galaxy has not been colonized
 - because it's hard .
 - because they advanced civilizations don't want to .

THE FERMI PARADOX

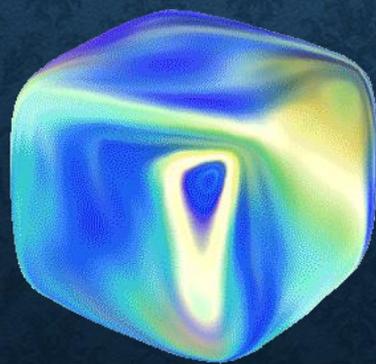
- Civilizations have colonized the Galaxy, but we don't know it
 - They aren't telling us
 - We can't tell they are there
- We do have evidence of their existence but the government won't tell us
- They are here and we are them.

**“ANY SUFFICIENTLY ADVANCED
TECHNOLOGY IS
INDISTINGUISHABLE FROM MAGIC.”**

ARTHUR C. CLARK



QUESTIONS



END