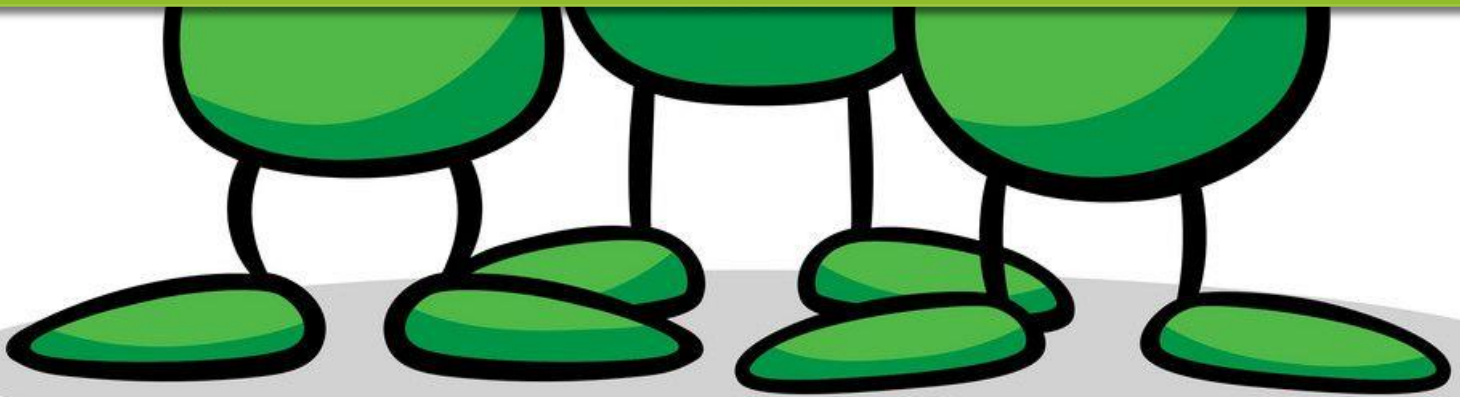
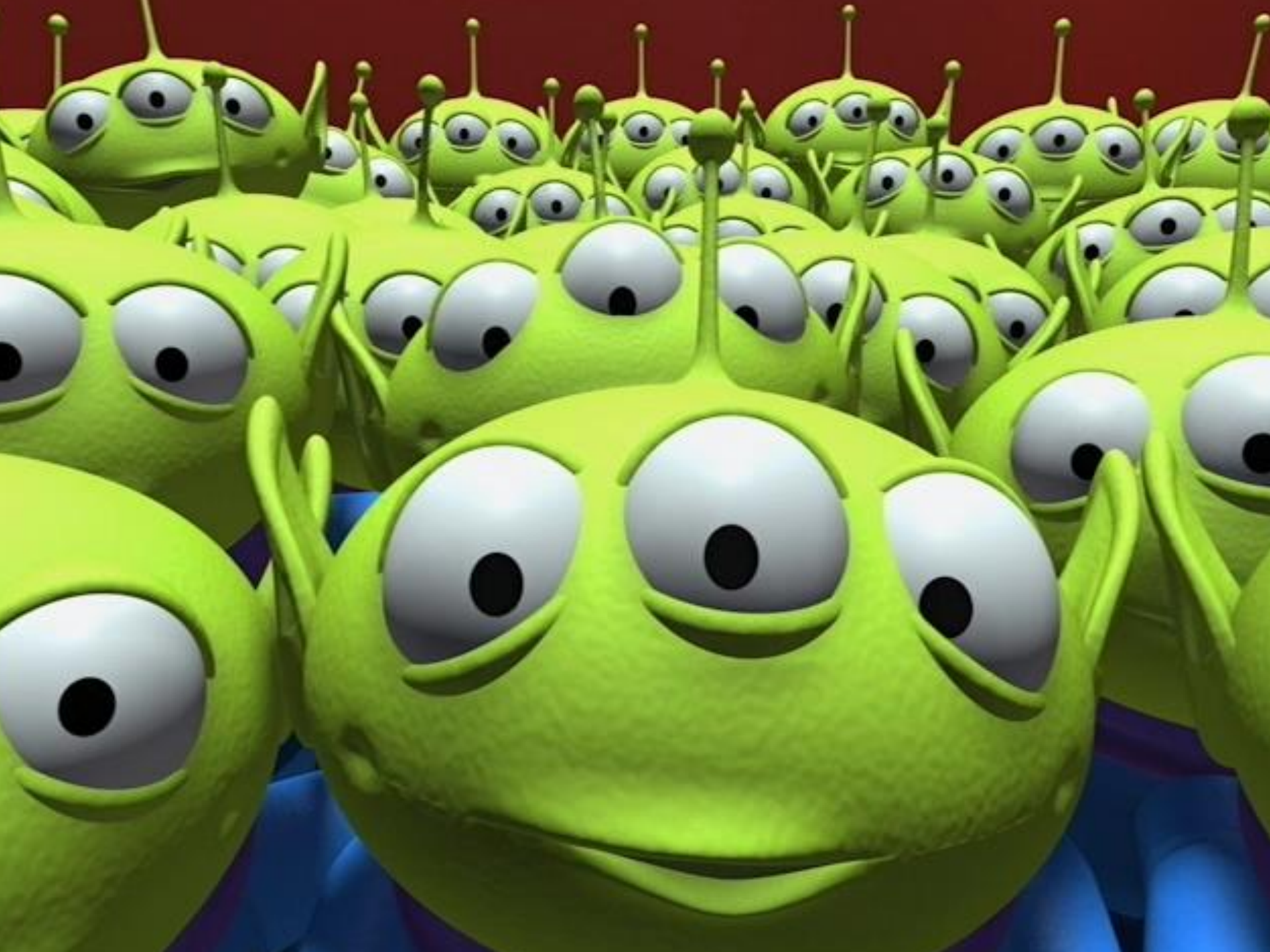


ALIENS



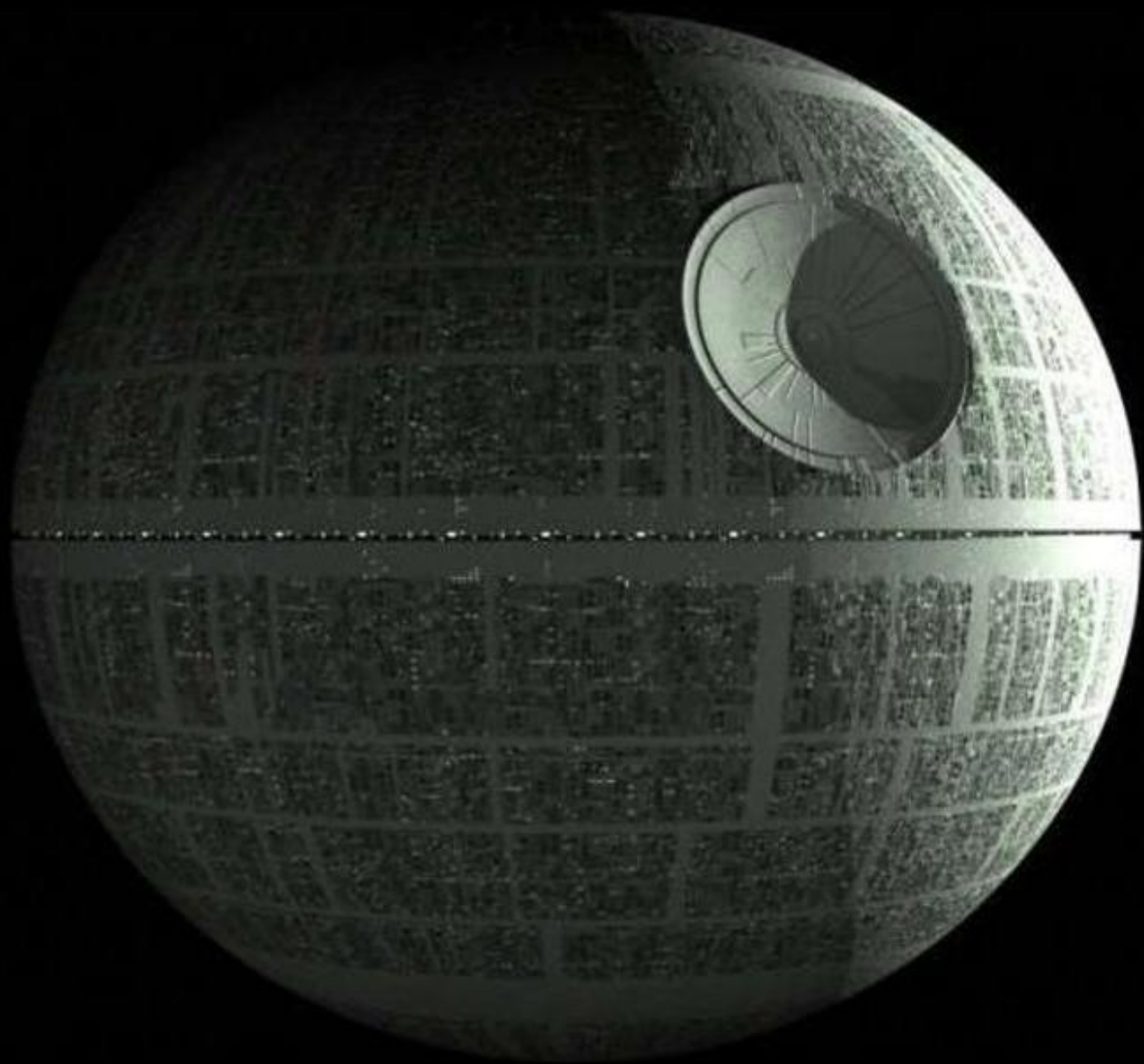














DO ALIENS EXIST?

- 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

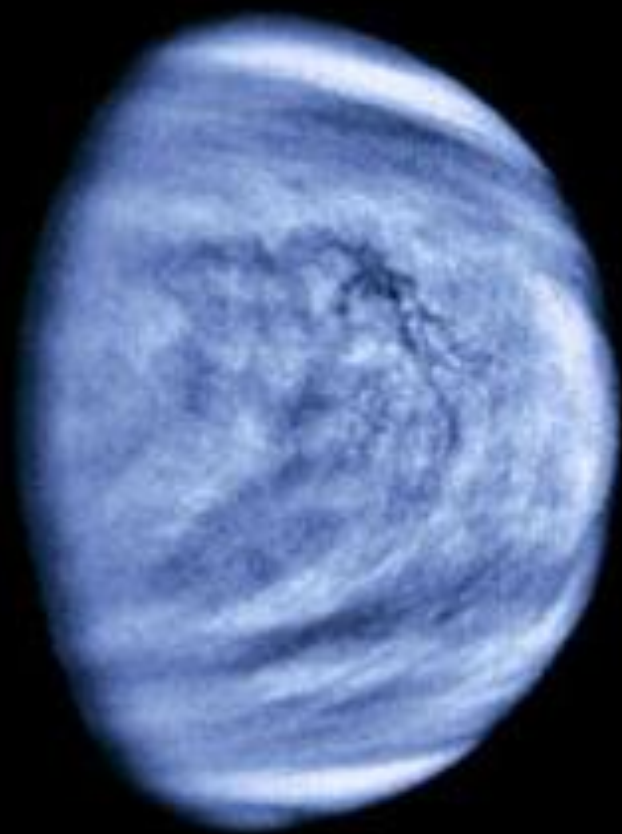
- Are they here?
 - Probably Not
 - Difficulty in keeping secret
 - Not seen by astronomers
- Why do people see UFO's















"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

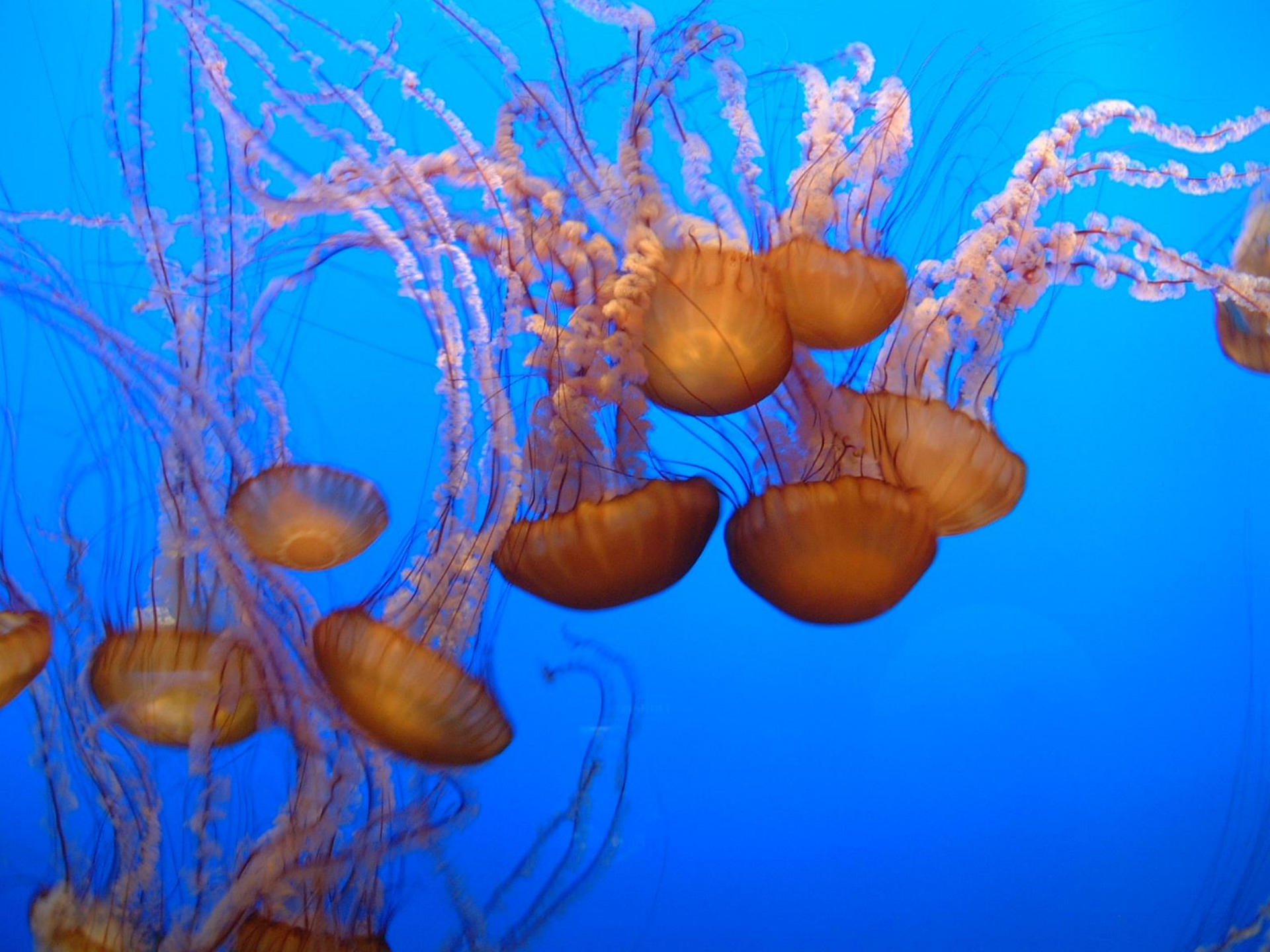
- Self-replicating material which is present in all living organisms on Earth
- It is the software program that defines living things
- All life on Earth uses DNA

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

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





TARDIGRADE



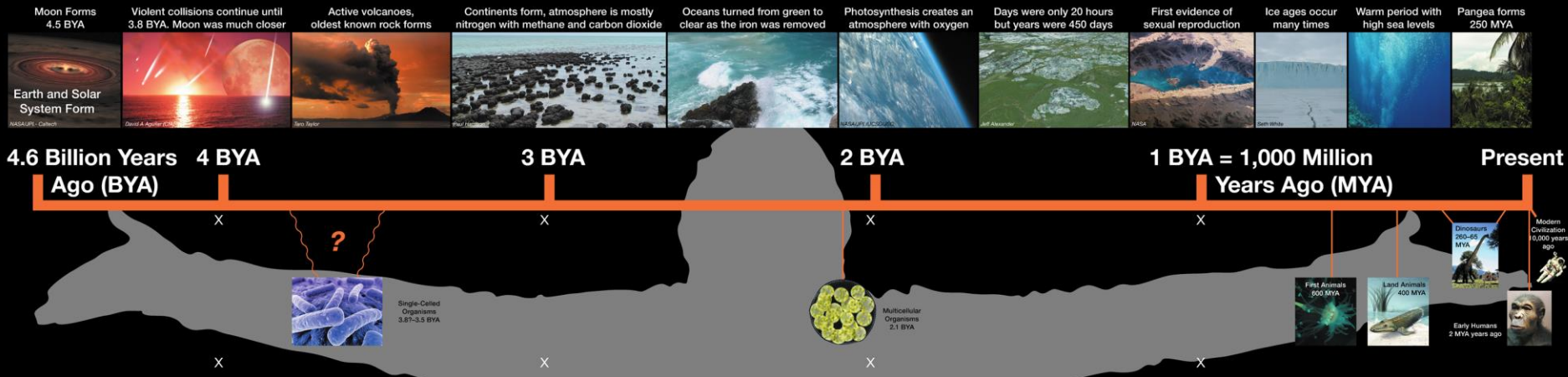




HISTORY OF LIFE ON EARTH



Earth Timeline



INTELLIGENT LIFE

- Human ancestors have been around about 1 Million years - .02% (99.97%)
- Modern Humans have been around about 200,000 years - .004% (99.996%)
- Civilization has been around for about 10,000 years - .0002% (99.9998%)

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 single-cell.
- 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.







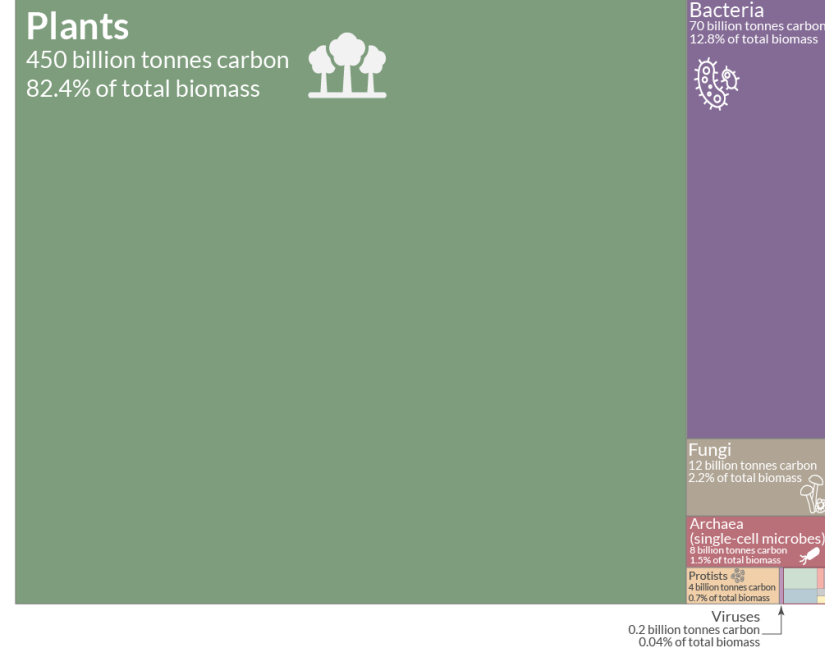




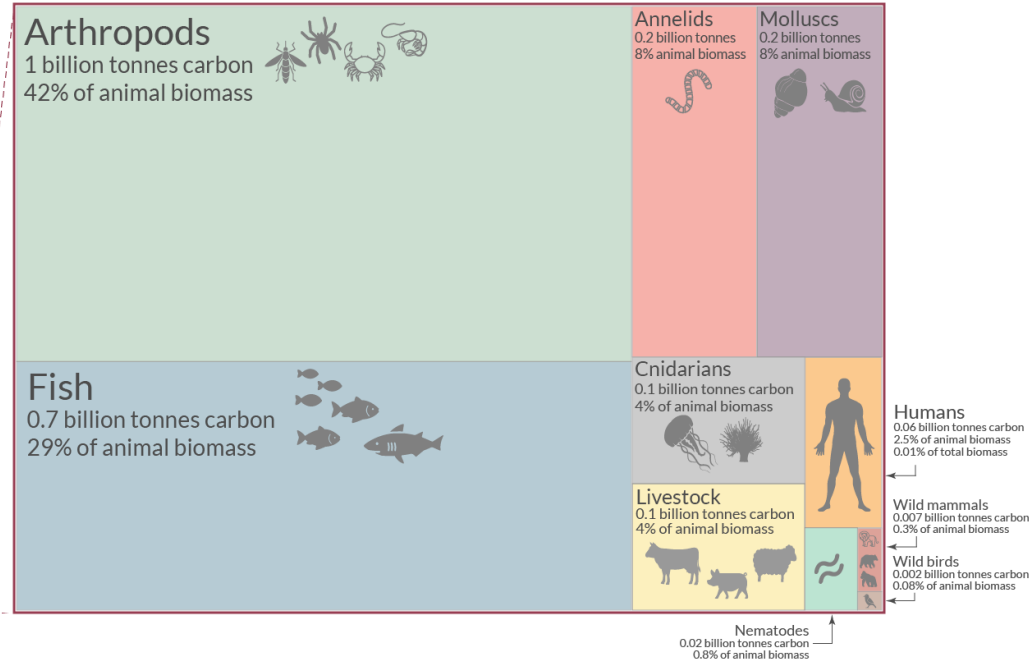
Life on Earth: the distribution of all global biomass

Biomass is measured in tonnes of carbon. The global distribution of Earth's biomass is shown by group of organism (taxa).

Global biomass: 546 billion tonnes of carbon



Animal biomass: 2 billion tonnes of carbon (0.4% of total biomass)



Data source: Bar-On, Y. M., Phillips, R., & Milo, R. (2018). The biomass distribution on Earth. *Proceedings of the National Academy of Sciences*. Icons from Noun Project.
OurWorldinData.org - Research and data to make progress against the world's largest problems.

Licensed under CC-BY by the authors Hannah Ritchie and Max Roser.

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.

HOW WILL WE KNOW IF WE FOUND LIFE?

- Life on other planets might not use DNA
- A lot of chemical reactions would work
- Many things move that are not alive
- Scientists cannot agree on whether or not a virus is alive

ALIEN LIFE IN OUR SOLAR SYSTEM

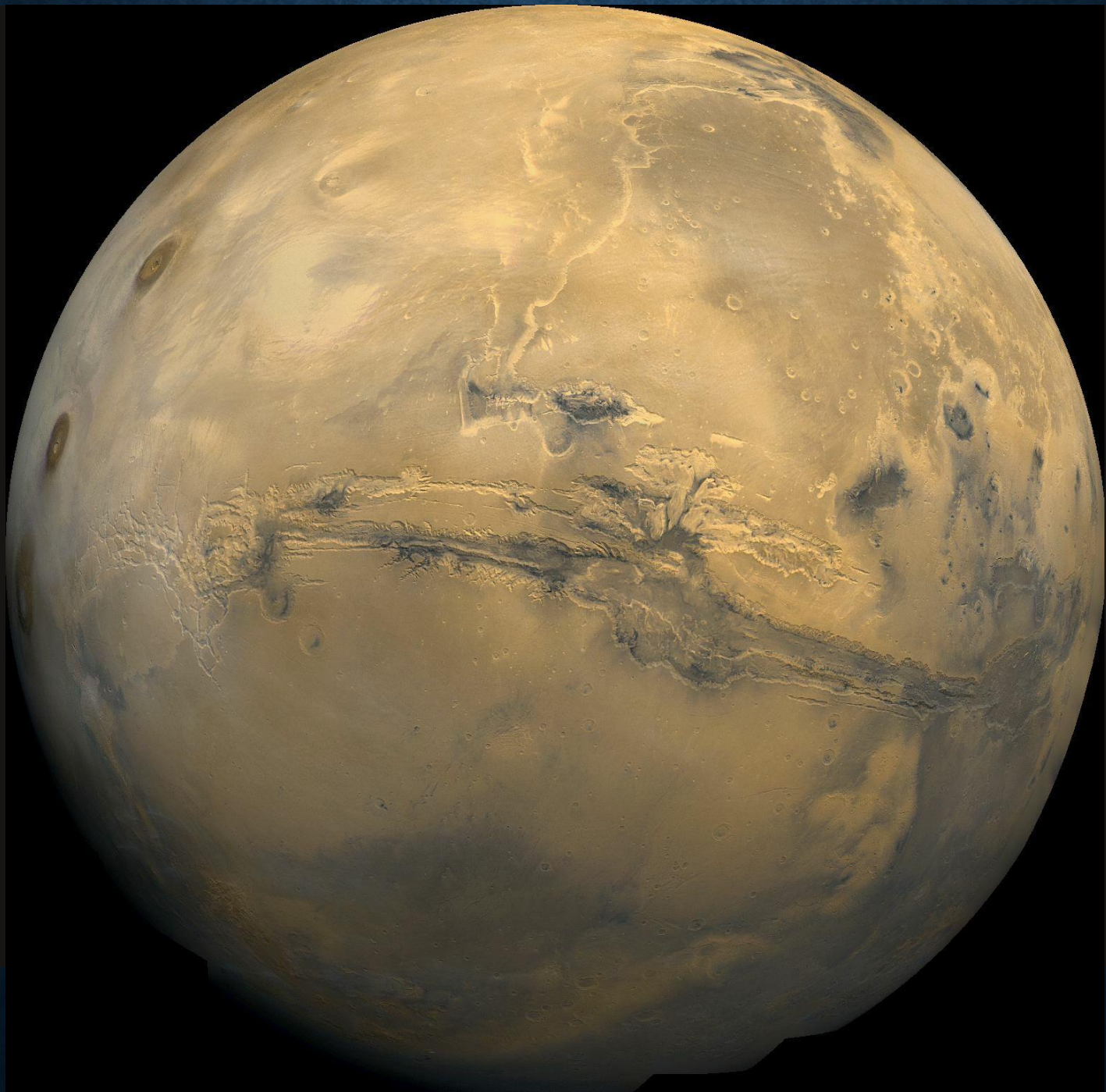
- All known forms of life on Earth require:
 - Liquid water
 - An energy sources
 - A supply of carbon

ALIEN LIFE IN OUR SOLAR SYSTEM

- The only other planet that seems capable of supporting (as we know it) life is Mars
- There are moons of giant planets where there is enough tidal energy to sustain liquid water and that might support life.

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







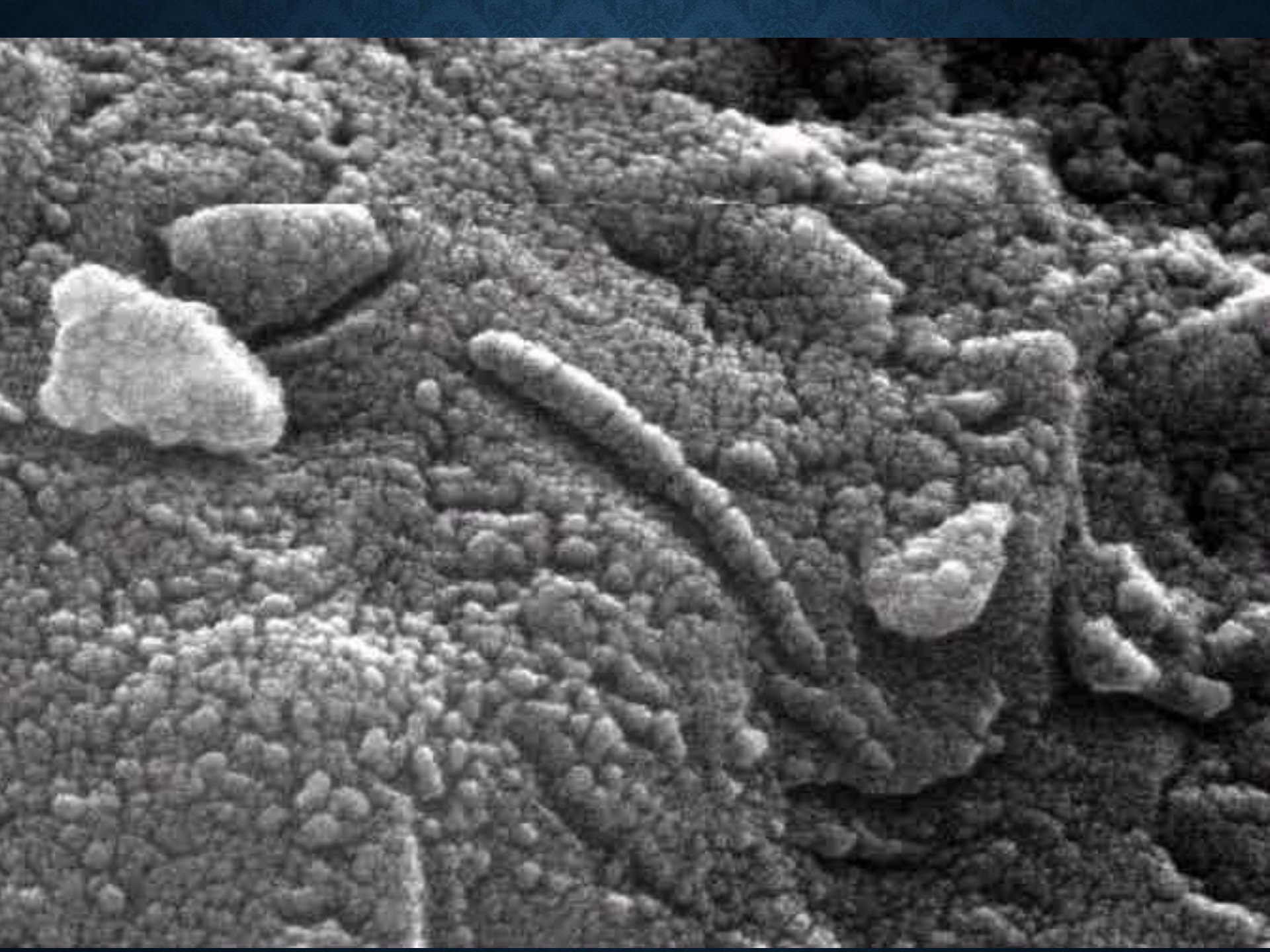


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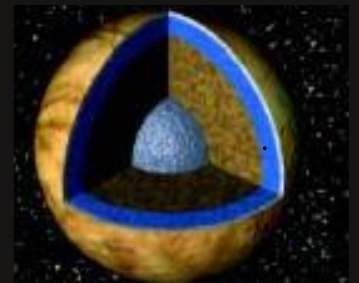
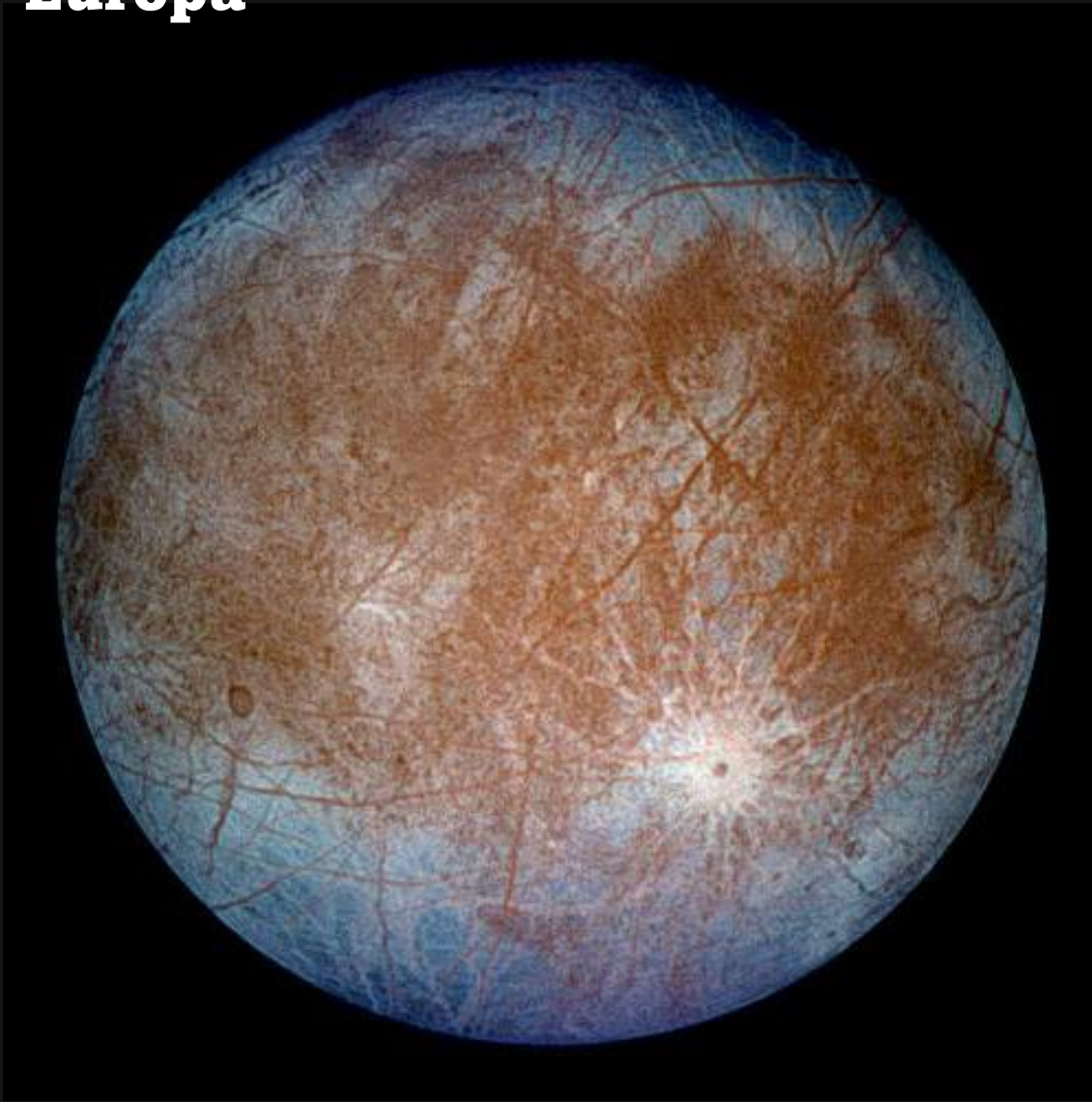




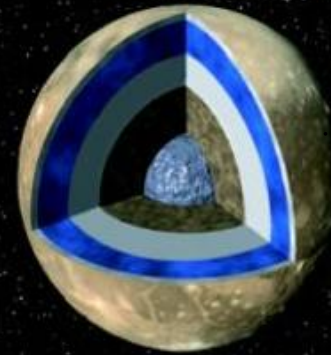
POSSIBLE MOONS WITH LIFE IN OUR SOLAR SYSTEM

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

Europa



Ganymede

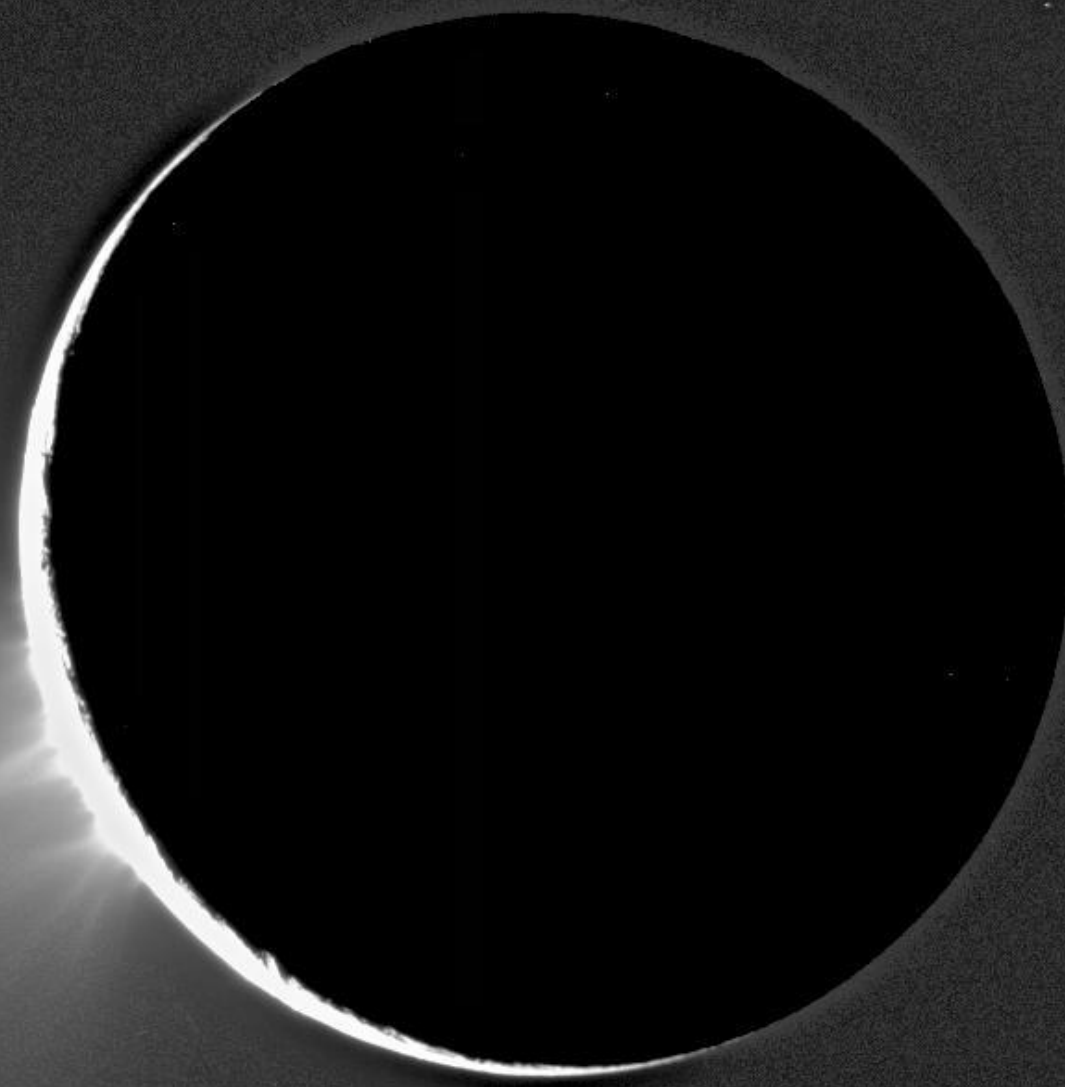


1000 km

Callisto



Enceladus

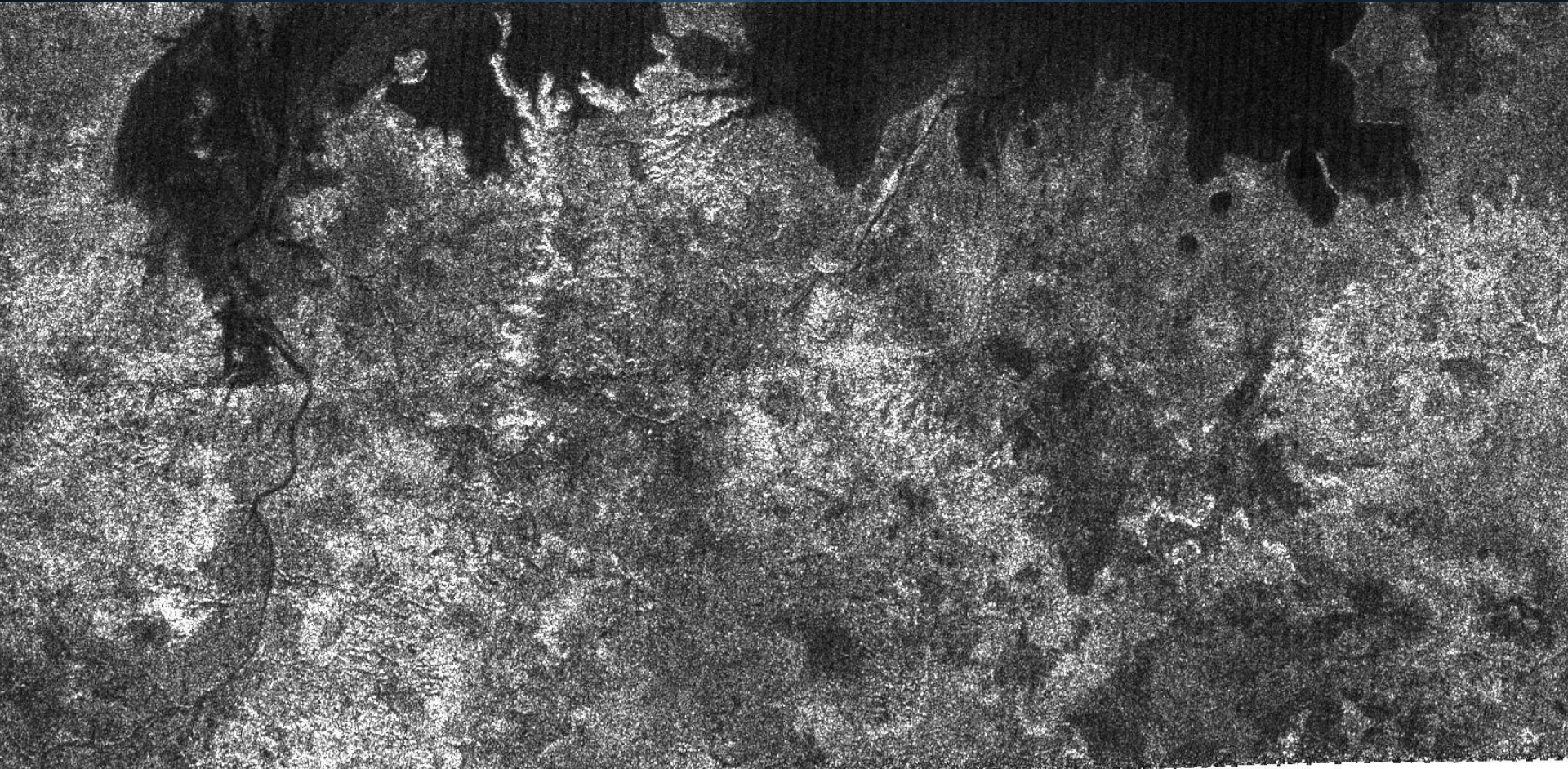


Titan



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 **5,272** planets in **3,764** solar systems.
- We estimate that most of the stars in the galaxy have planets, making about **400,000,000,000** 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.



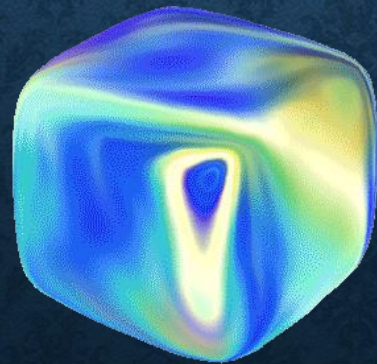
THE WORLD'S FIRST ANT COLONY TO ACHIEVE SENTIENCE CALLS OFF THE SEARCH FOR US.

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

ARTHUR C. CLARK



QUESTIONS



END