

# The origin of life

Paul Davies  
The Beyond Center  
Arizona State University  
<http://beyond.asu.edu>



# Origin of species



“It is mere rubbish thinking at present of the origin of life; one might as well think of the origin of matter.”

Charles Darwin

# *The origin of life*

When?

Where?

How?

3.5 billion years old







stromatolites

# Shark Bay, Western Australia



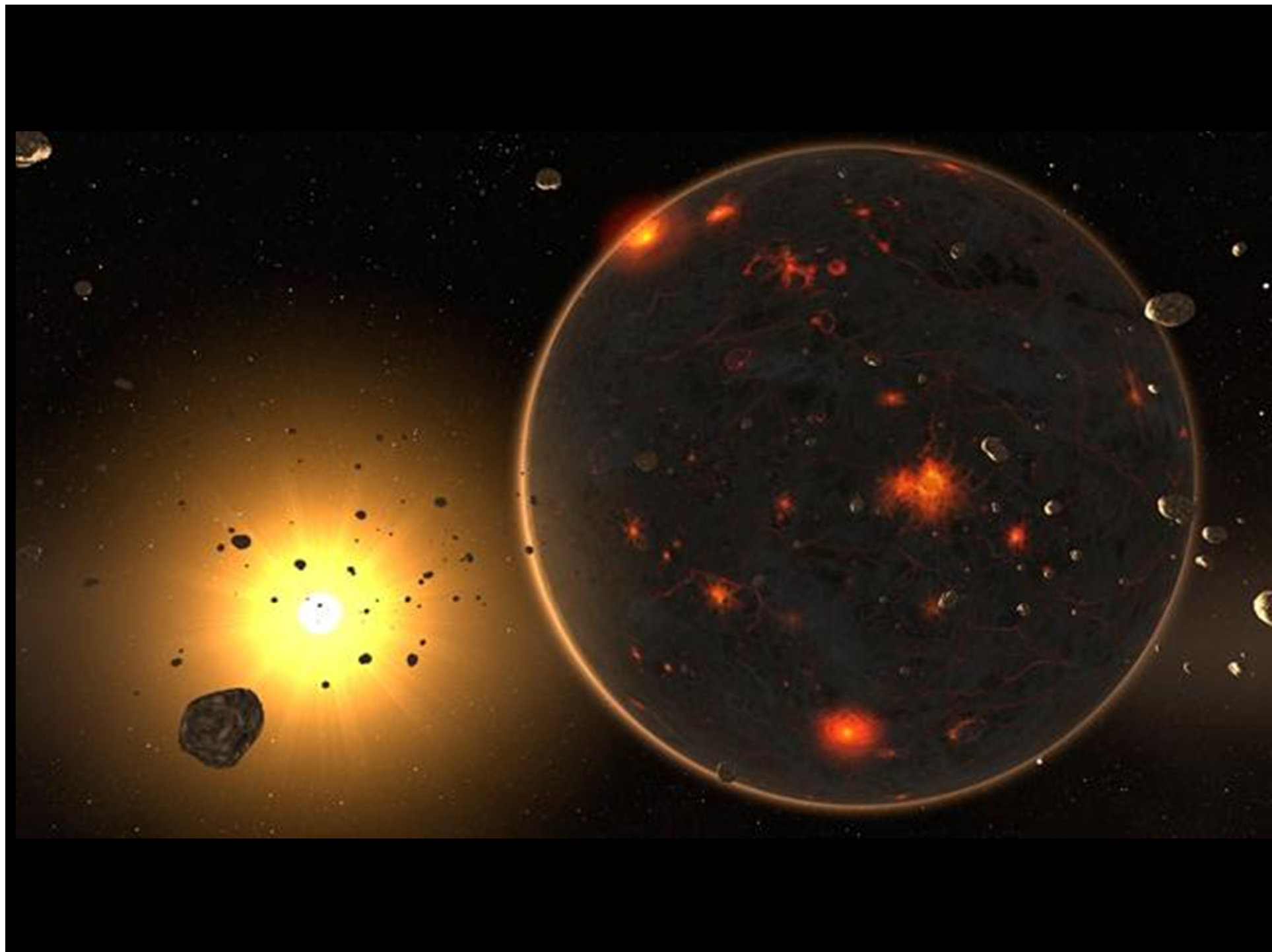
Universe is 13.7 billion years old





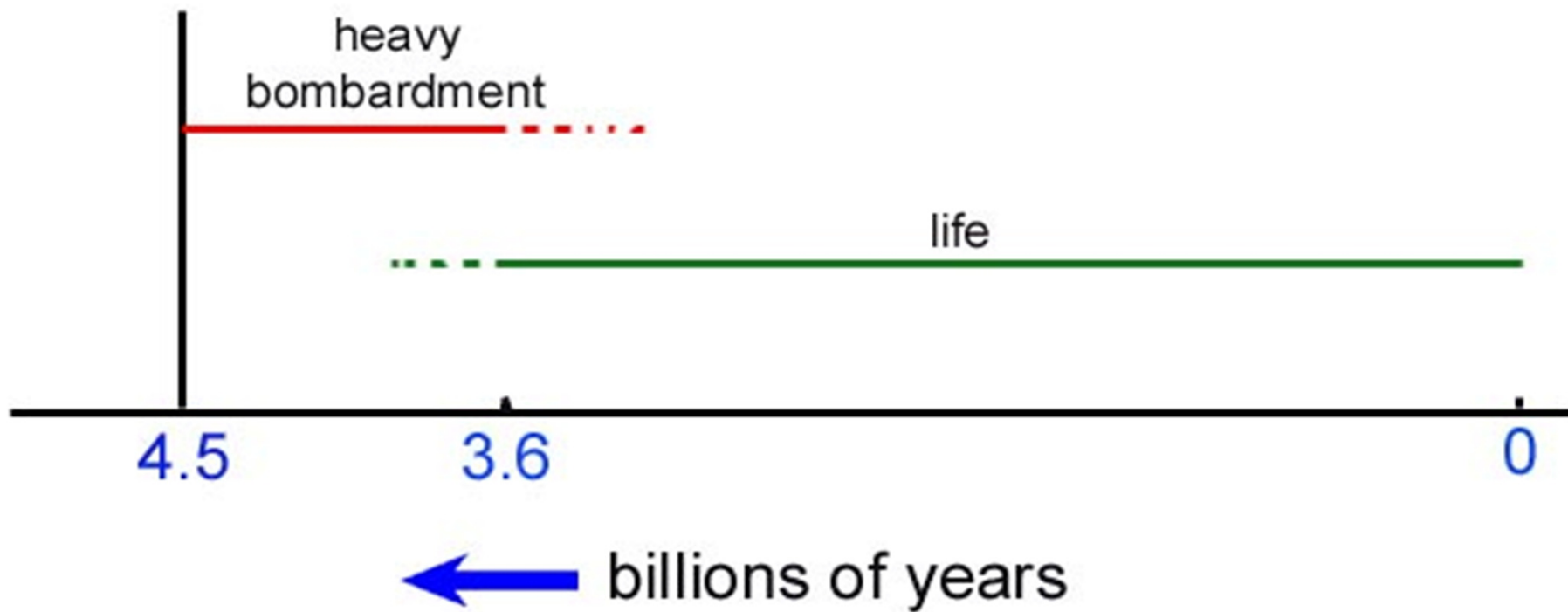
Formation of solar system  
4.55 billion years ago





*Cosmic bombardment!*

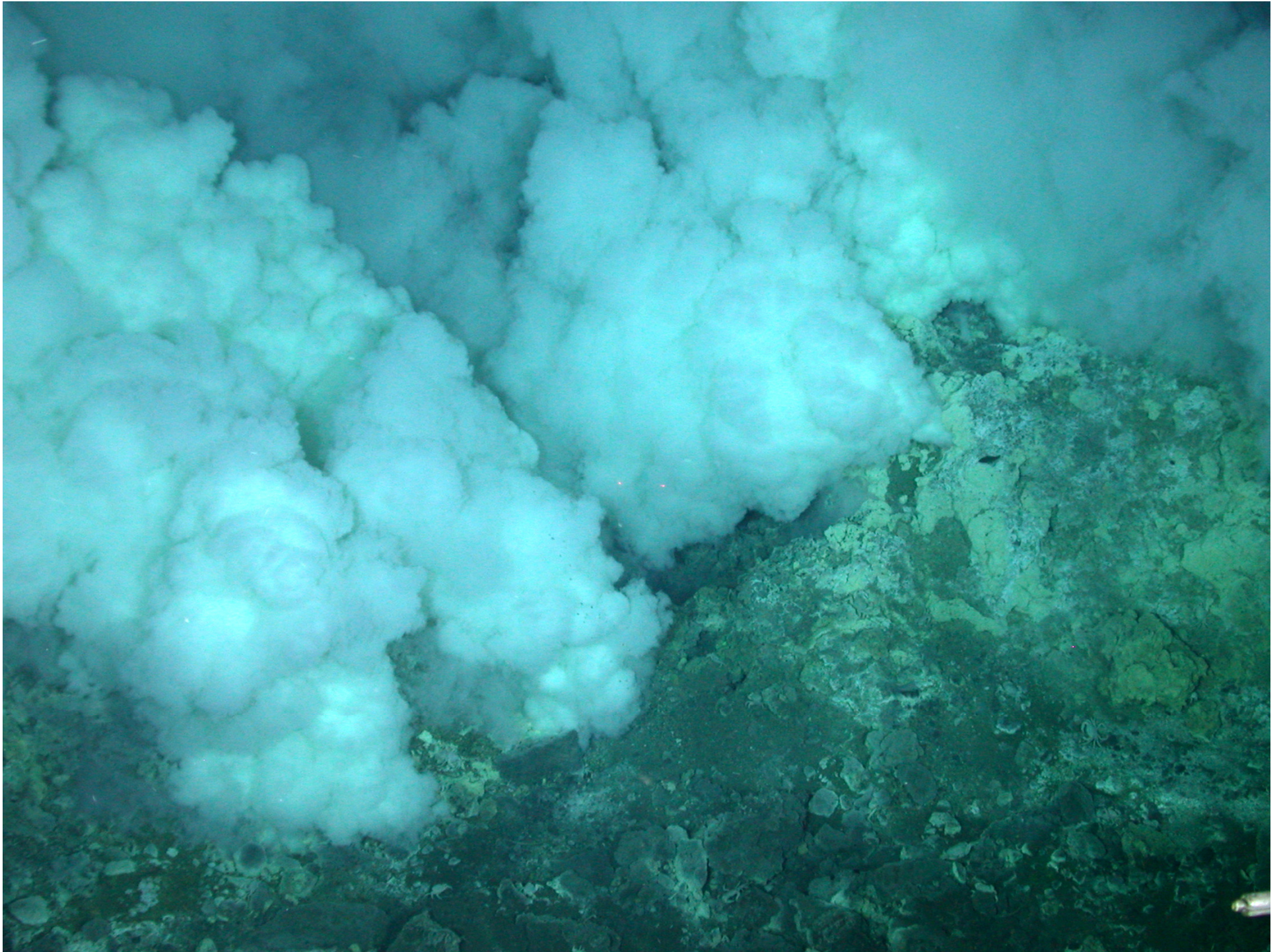




# *The origin of life*

When?

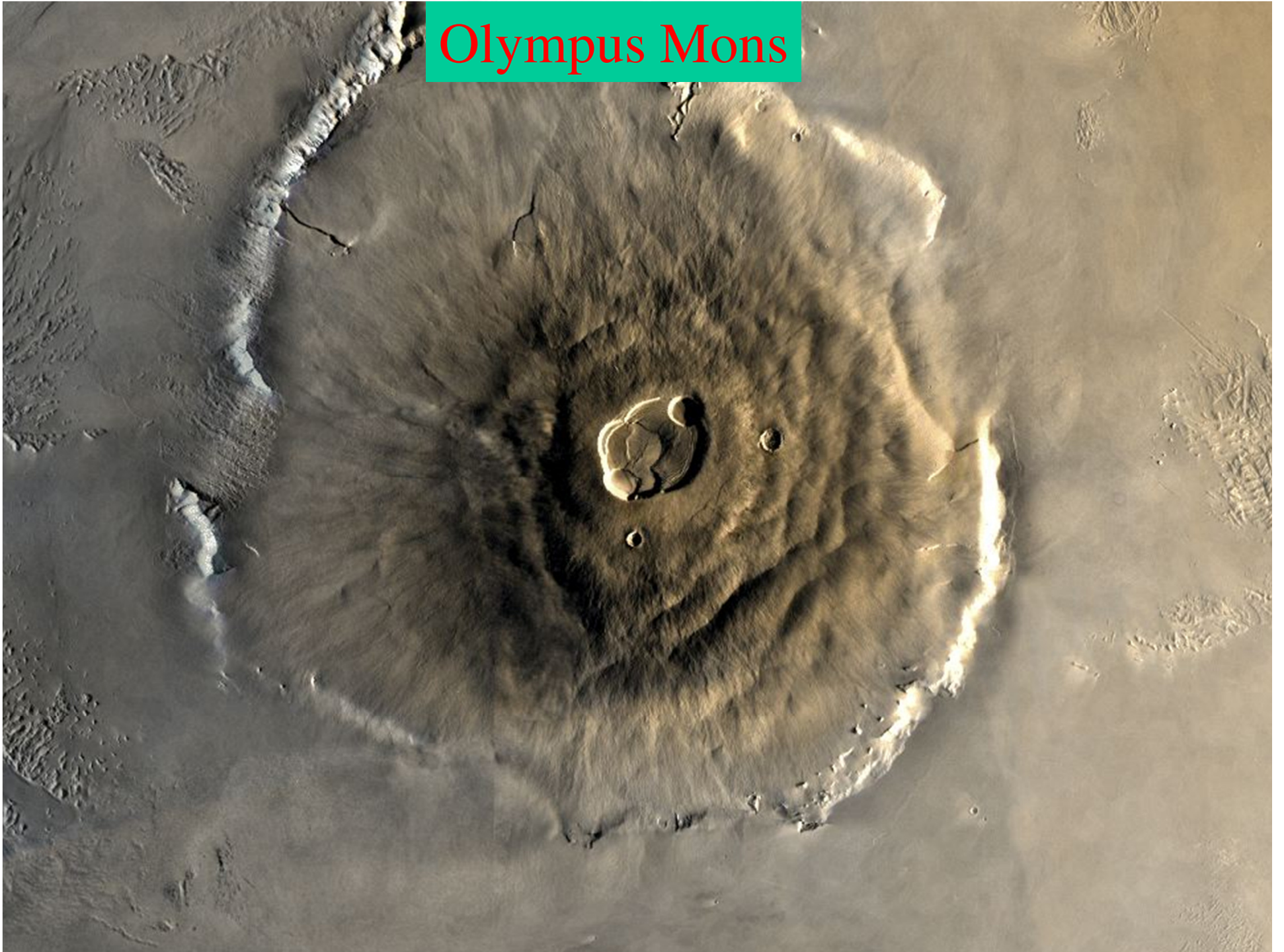
Where?



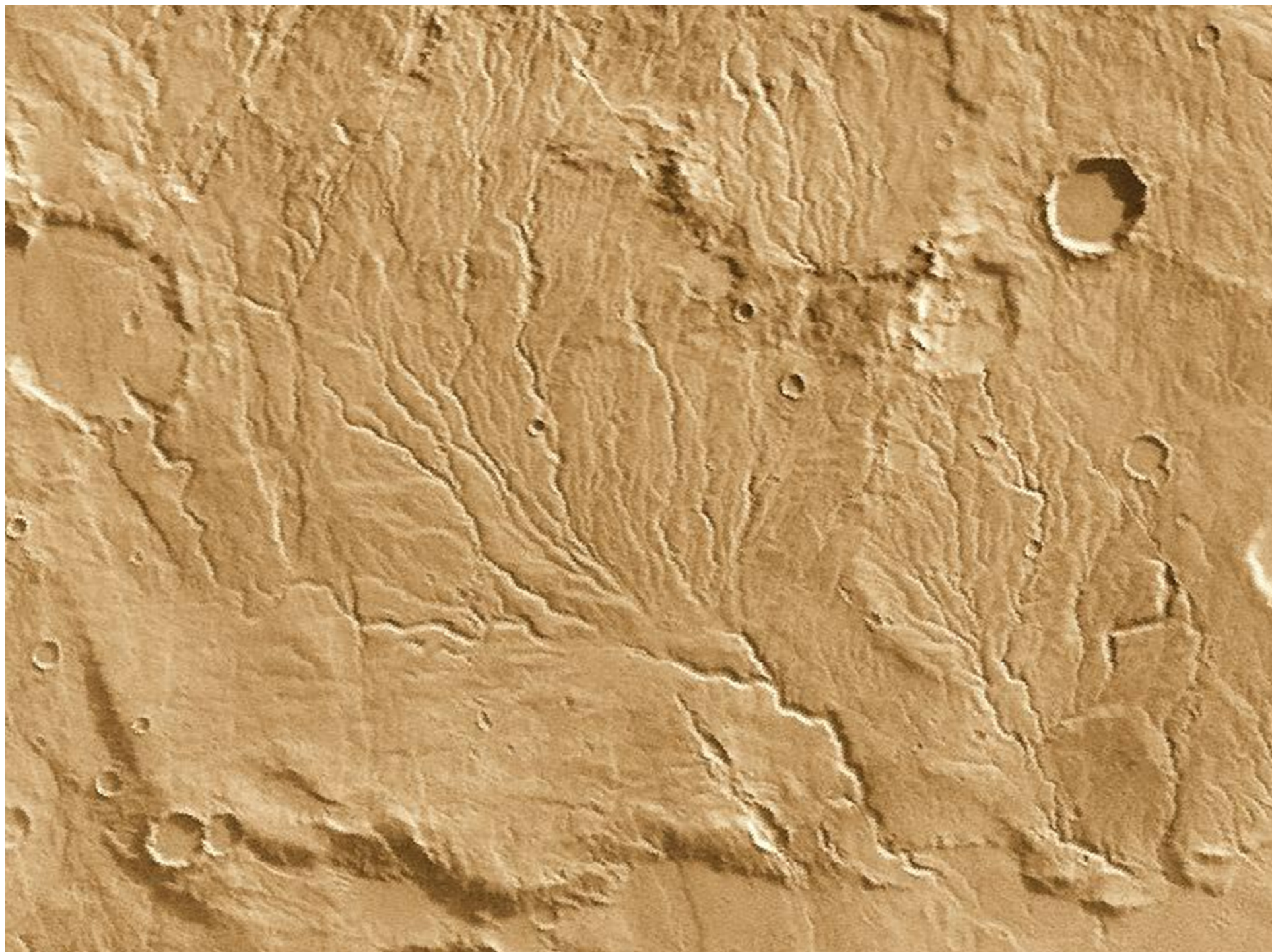


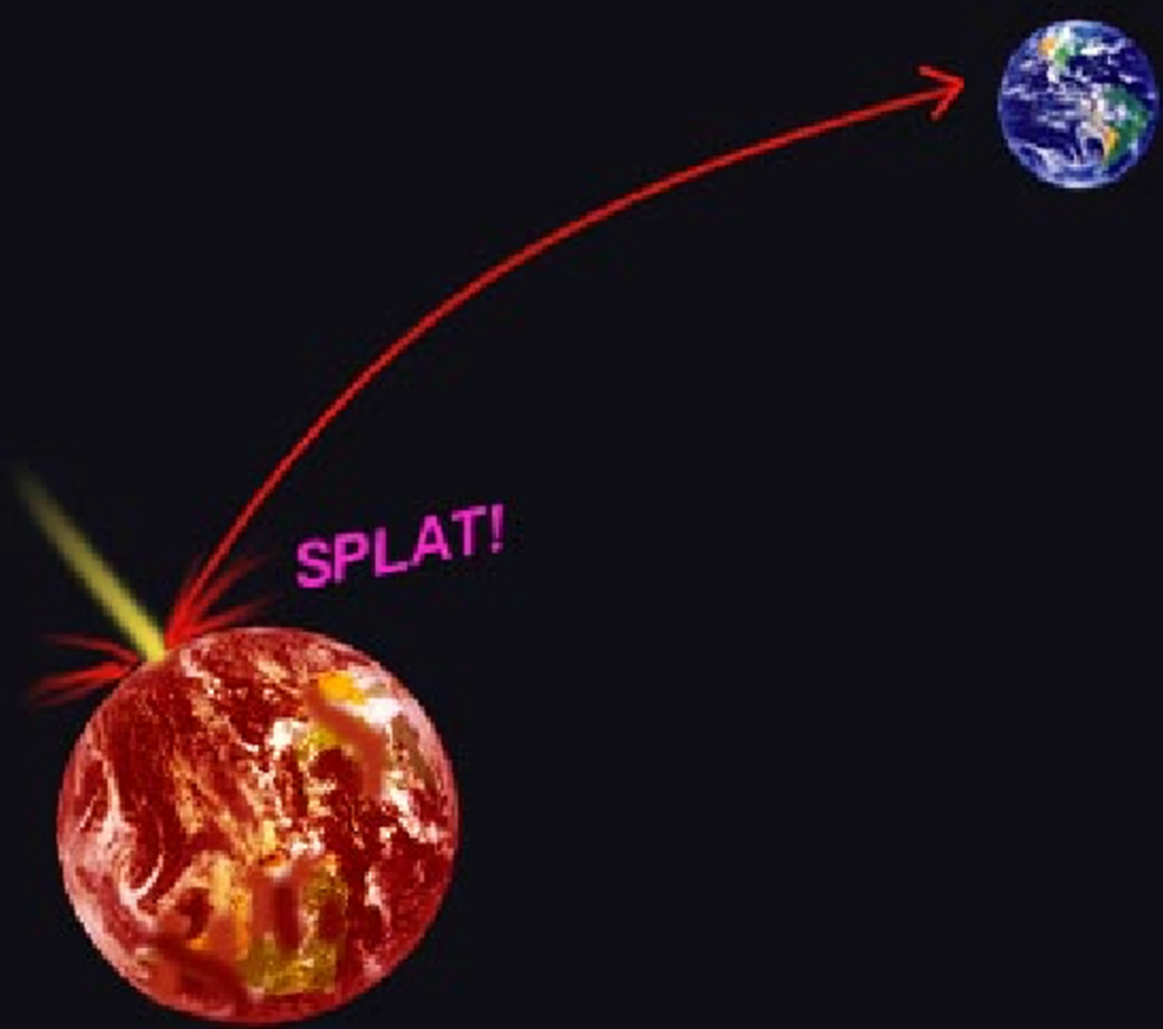
Did life on Earth come  
from Mars?

# Olympus Mons









# *The origin of life*

When?

Where?

How?

# How did life begin?

*If we do not know the process that transformed non-life into life we cannot estimate the probability for it to happen*

Bizarre fluke? Or chemical inevitability?

# Kepler mission



# New Estimate: Billions of Earth-like Planets in our Galaxy

The European Southern Observatory estimates there are tens of billions of habitable planets orbiting red dwarf stars

By [Sean Patterson](#) · March 29, 2012 · [Leave a Comment](#)

 **SUBSCRIBE FREE** 400K+



## Watch Videos



Face.com:  
Facial  
Recognition Not  
Just For



Kentucky  
Wildcats Win  
National  
Championship



FTC Privacy  
Report: What It  
Means

 **CUSTOMER  
MAGNETISM**  
internet marketing agency

Analyze. Optimize. Monetize.™

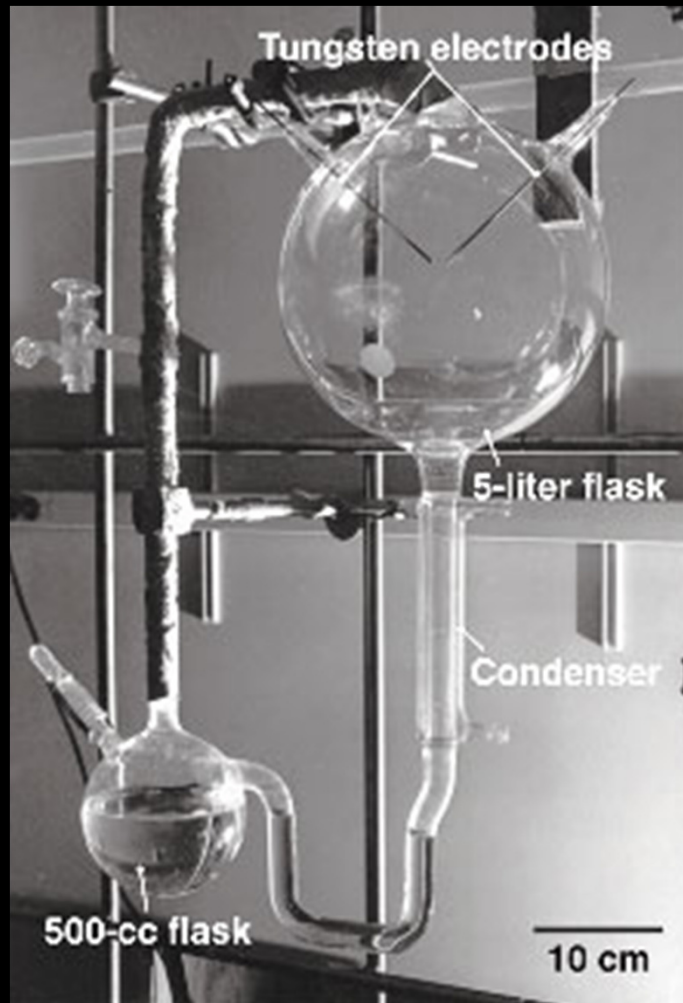
**FREE QUOTE AND WEBSITE ANALYSIS**

- ✓ SEO/SEM
- ✓ Social Media
- ✓ Email Marketing
- ✓ Video Marketing
- ✓ Mobile Marketing
- ✓ Affiliate Marketing



# Miller-Urey experiment 1952

Water, methane ( $\text{CH}_4$ ), ammonia ( $\text{NH}_3$ ) and hydrogen ( $\text{H}_2$ )



Stanley Miller



How can we test the hypothesis that  
life starts easily?

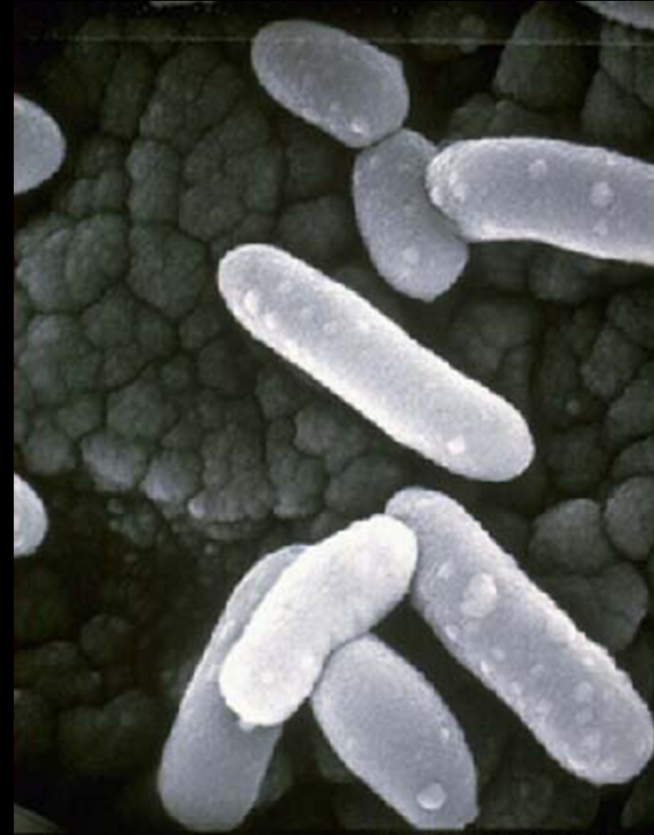
Look for a *second* genesis of life –  
search for Life 2



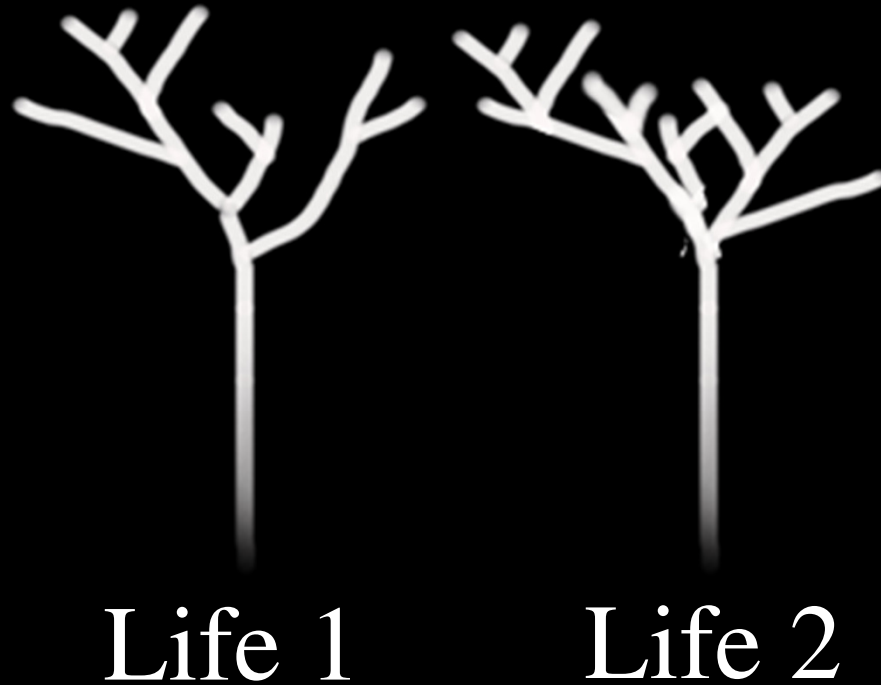
What is the most earthlike planet we know?



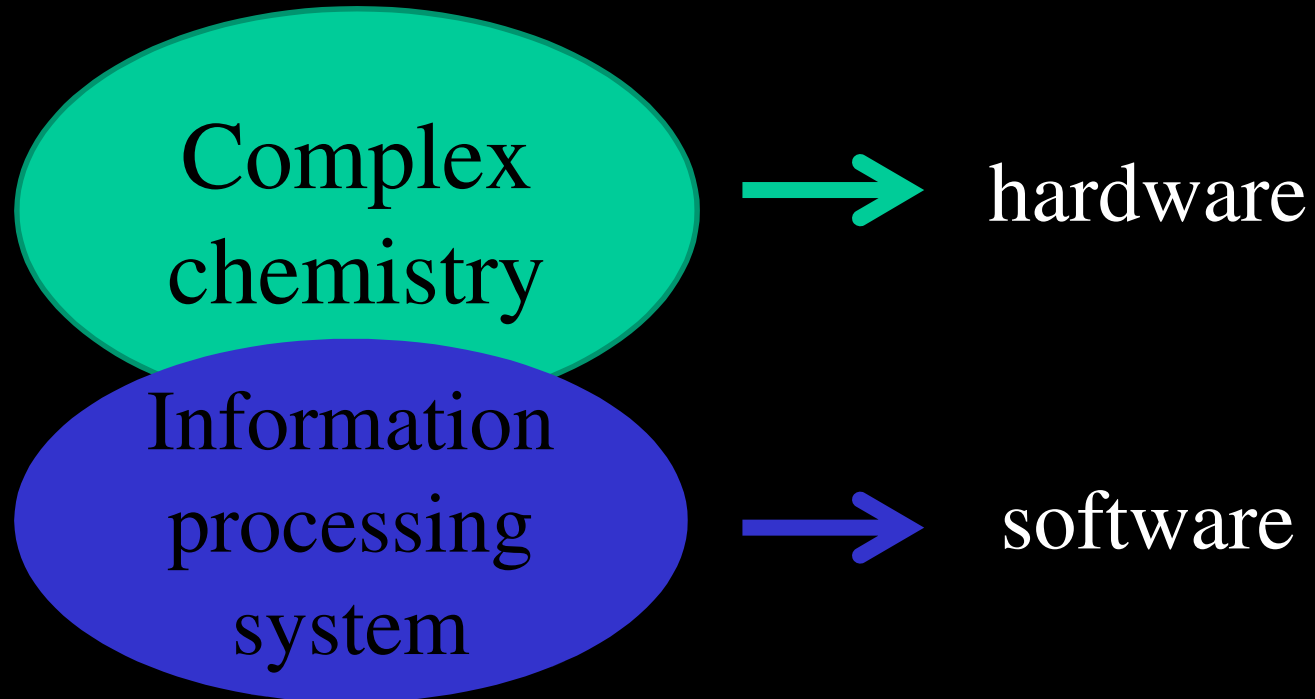
# Aliens under our noses?



Did life on Earth start more than once?



# What is life?



# Conclusion

- If Earth has/had a shadow biosphere, life will be widespread in the universe
- Life will be a *fundamental* and therefore significant cosmological phenomenon, as opposed to a trivial local aberration
- We will not be “freaks” but an expected product of an intrinsically bio-friendly set of physical laws (“at home in the universe”)