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**Astrobiology & Natural Sciences:  
Finding Life On Other Planets &  
Studying Natural Sciences**

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What are the most significant issues  
facing society?

# Why?



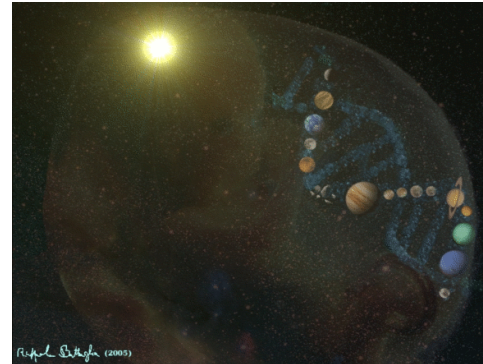
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## Climate Change



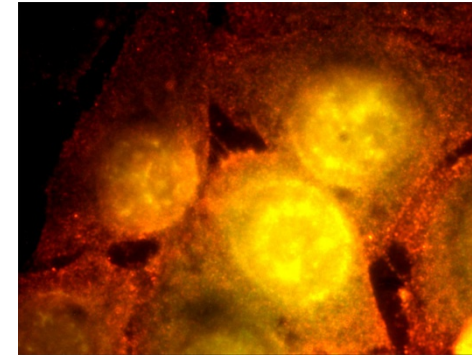
- Is the climate changing?
- Are we responsible?
- Can anything be done?

## Astrobiology



- Is there life in the universe besides our own?
  - If so, where?
- How could we find it?
- What might it be like?

## Nanoscience



- How do tiny things affect the macroscopic world?
- What use might we have for them?

# Problem solving across disciplines

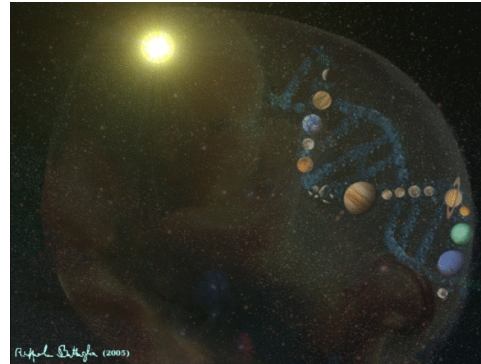


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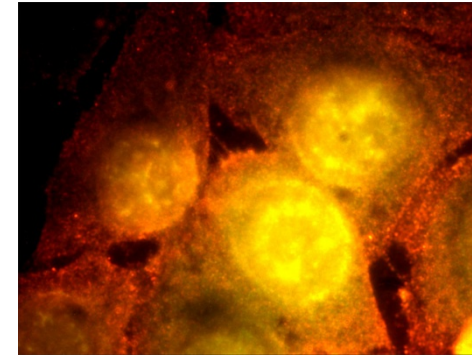
## Climate Change



## Astrobiology



## Nanoscience



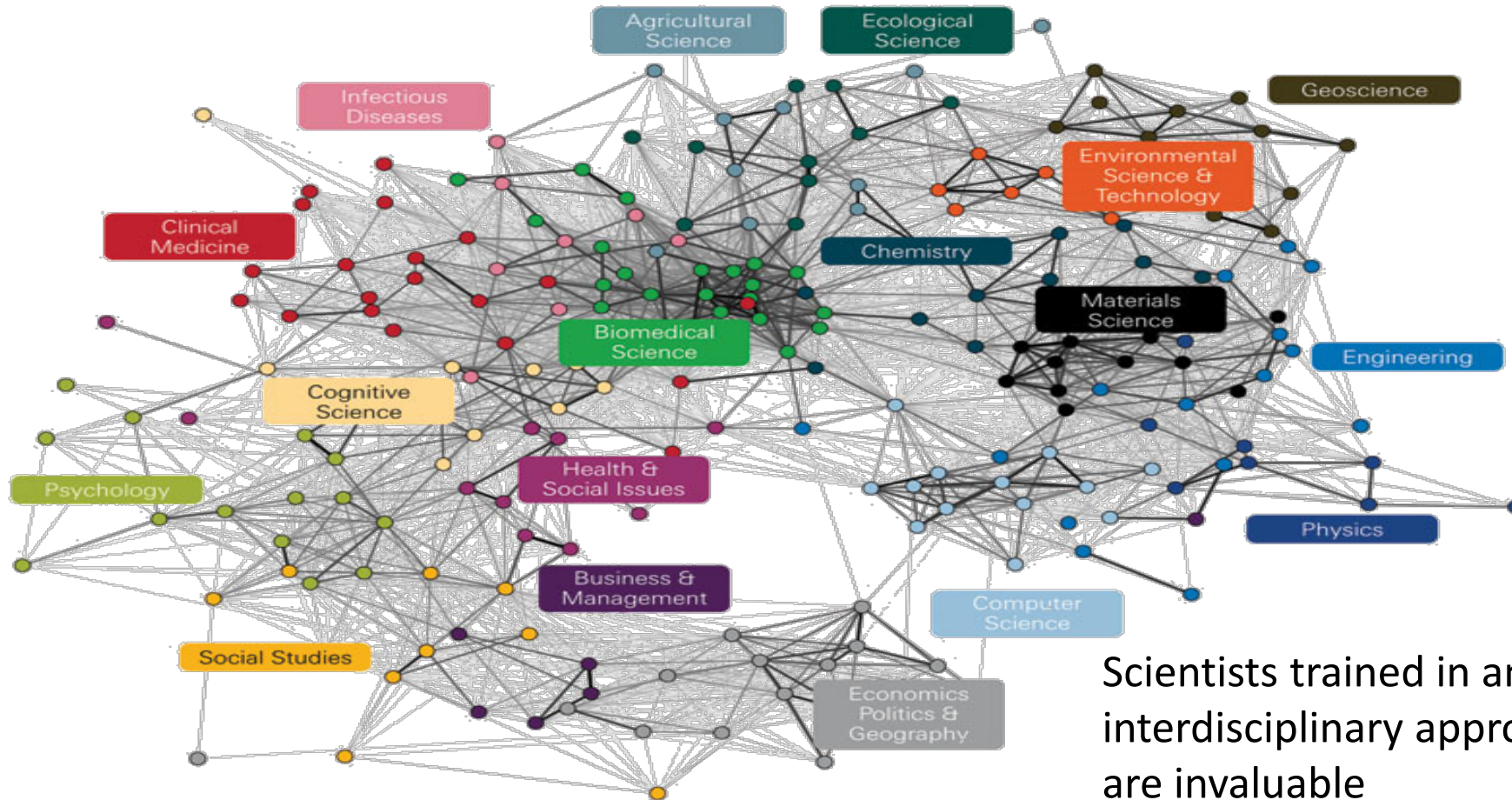
These questions – and most cutting edge scientific research – cannot be solved by one discipline alone

# Why?



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*“Forget biology, chemistry or physics – the most exciting research is happening at the interface of the disciplines”* New Scientist



Scientists trained in an interdisciplinary approach are invaluable



## TODAY' S RESEARCH CHALLENGE:

- Find a partner and spend 3 or 4 minutes discussing the following questions
  - What do we need for life?
  - If life exists how do we detect it?



# DRAKE EQUATION



$$N = R^* f_p n_e f_l f_i f_c L$$



- $N$  = The number of civilizations in The Milky Way Galaxy whose electromagnetic emissions are detectable.
- $R^*$  = The rate of formation of stars suitable for the development of intelligent life.
- $f_p$  = The fraction of those stars with planetary systems.
- $n_e$  = The number of planets, per solar system, with an environment suitable for life.
- $f_l$  = The fraction of suitable planets on which life actually appears.
- $f_i$  = The fraction of life bearing planets on which intelligent life emerges.
- $f_c$  = The fraction of civilizations that develop a technology that releases detectable signs of their existence into space.
- $L$  = The length of time such civilizations release detectable signals into space.



$R^*$  = The rate of formation of stars  
suitable for the development of  
intelligent life

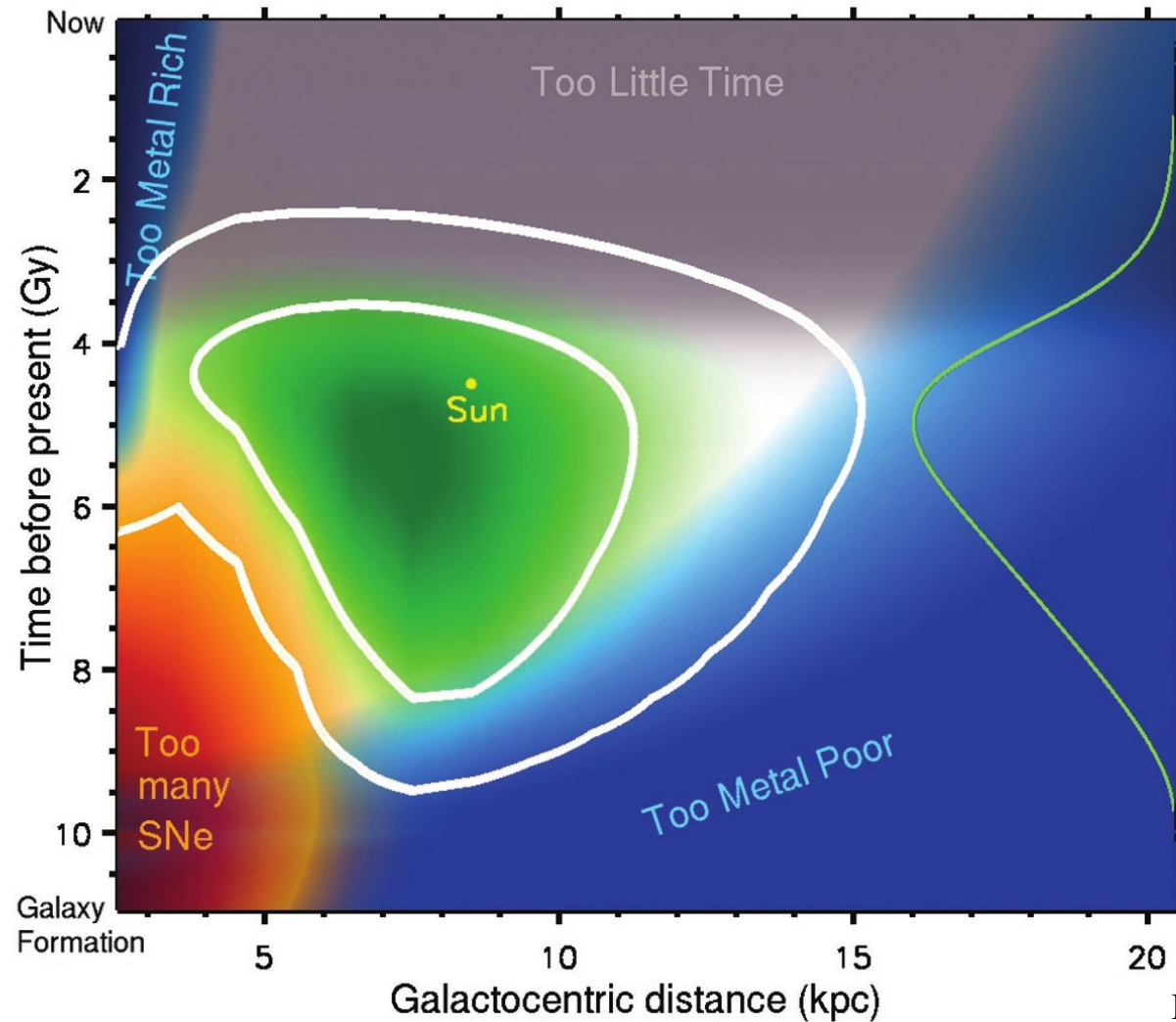
$R^*$  = THE RATE OF FORMATION OF STARS  
SUITABLE FOR THE DEVELOPMENT OF  
INTELLIGENT LIFE.



QuickTime™ and a  
Cinemascope decompressor  
are needed to see this picture.

- The number of stars in the galaxy = 400 billion
- The age of the galaxy = 13.2 billion years
- An average of 30 stars formed every year
- Recent calculations for the current rate of star formation: ~7.5 stars a year

$R^*$  = THE RATE OF FORMATION OF STARS *SUITABLE FOR THE DEVELOPMENT OF INTELLIGENT LIFE*



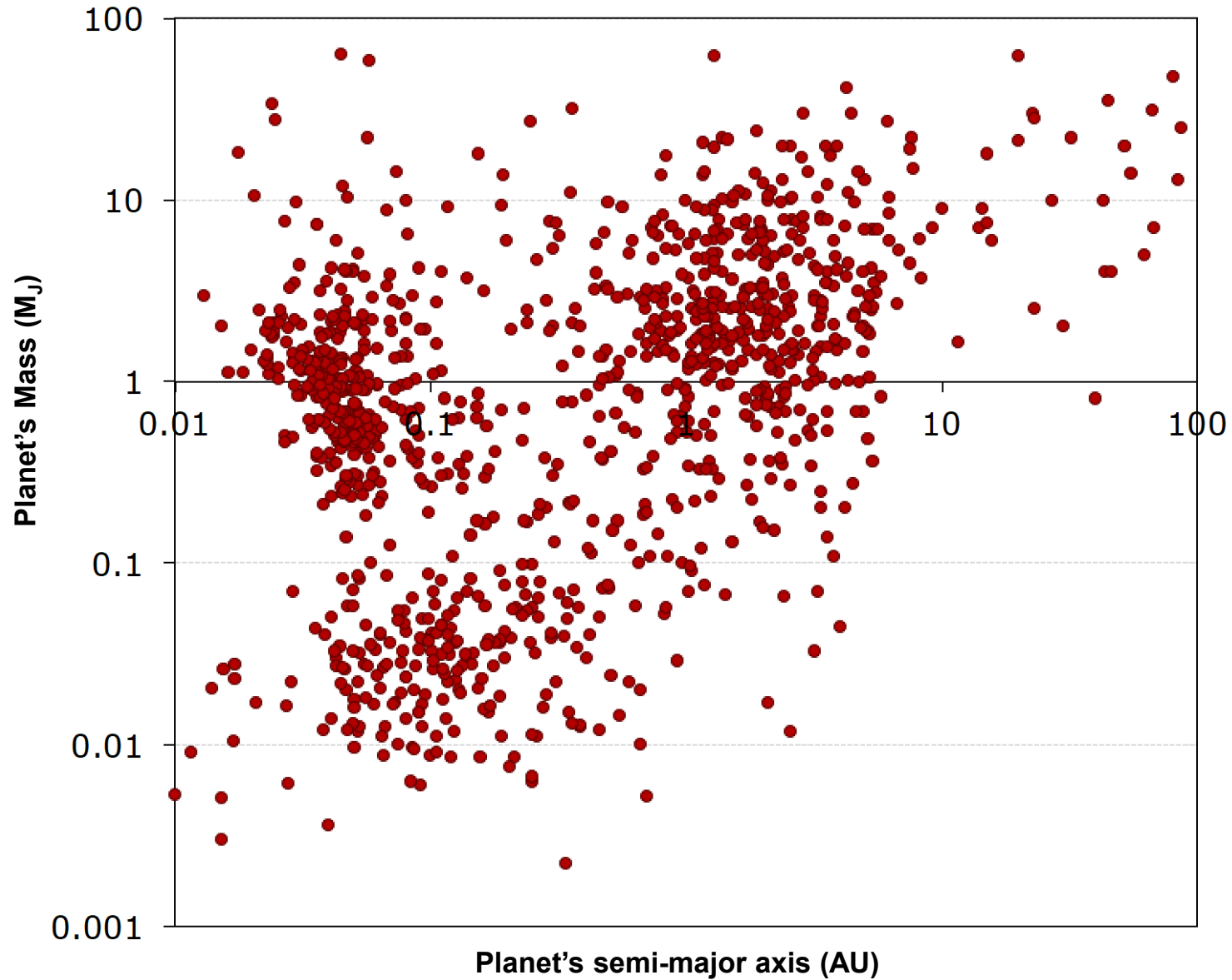


$f_p$  = The fraction of those  
stars with  
planetary systems



# 2062 exoplanets + 8 (9?) planets

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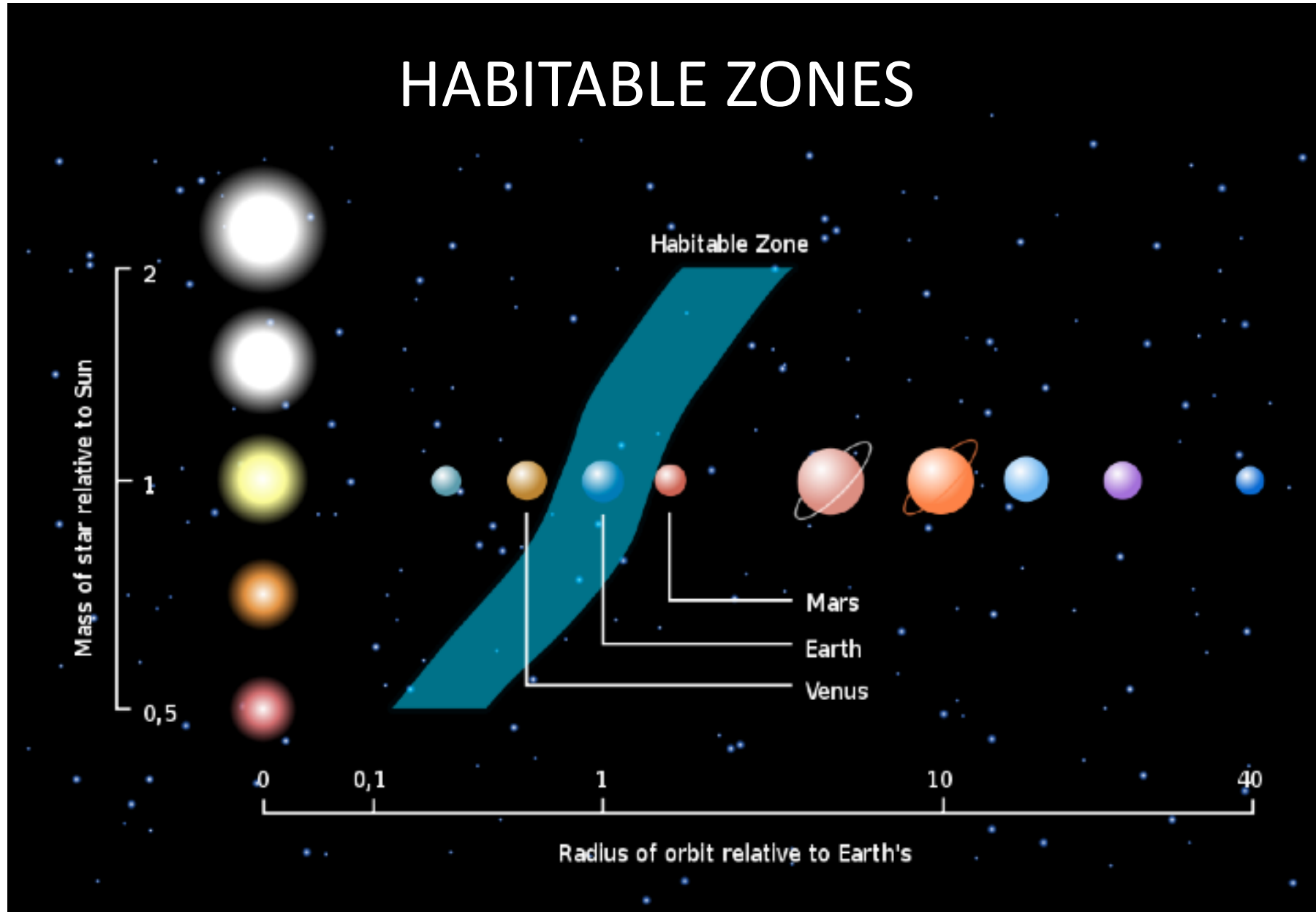




$n_e$  = The number of planets, per  
solar system,  
with an environment suitable  
for life



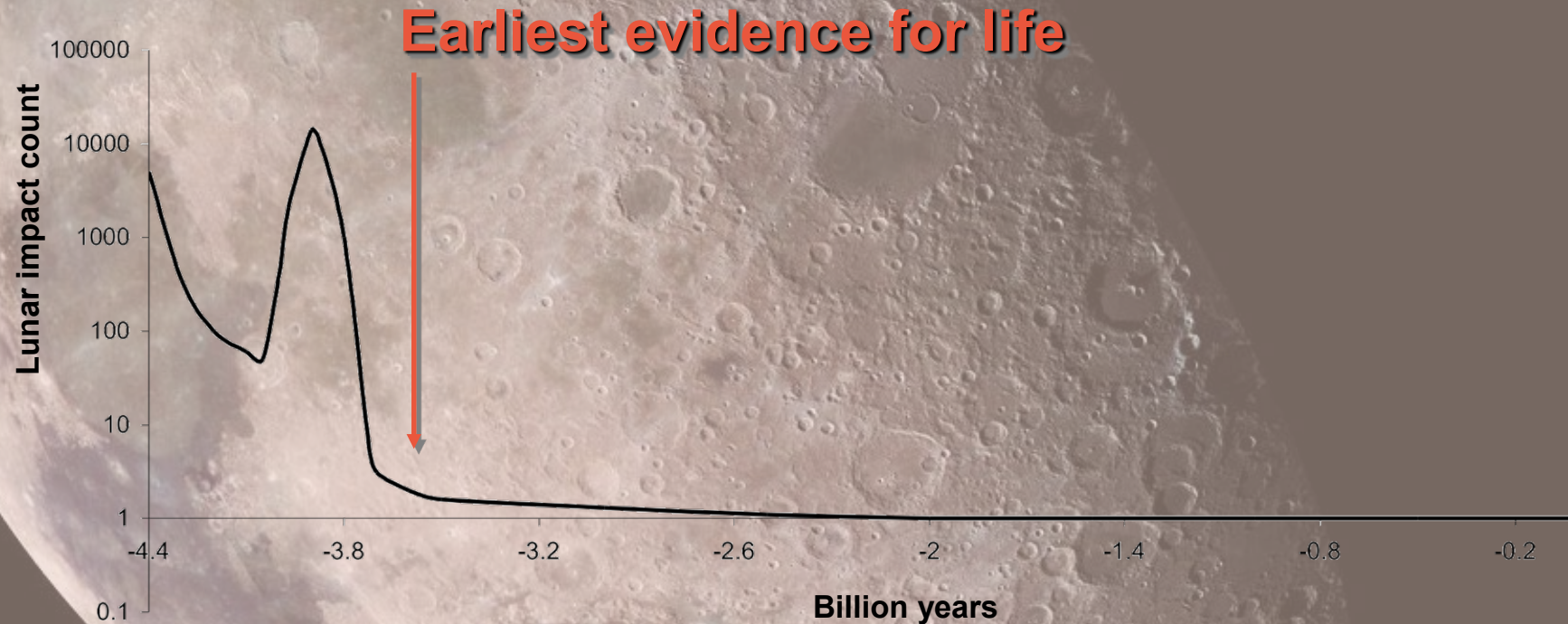
# HABITABLE ZONES





$f_l$  = The fraction of suitable planets on which life actually appears.

$F_L$  = THE FRACTION OF SUITABLE PLANETS ON WHICH LIFE  
ACTUALLY APPEARS.



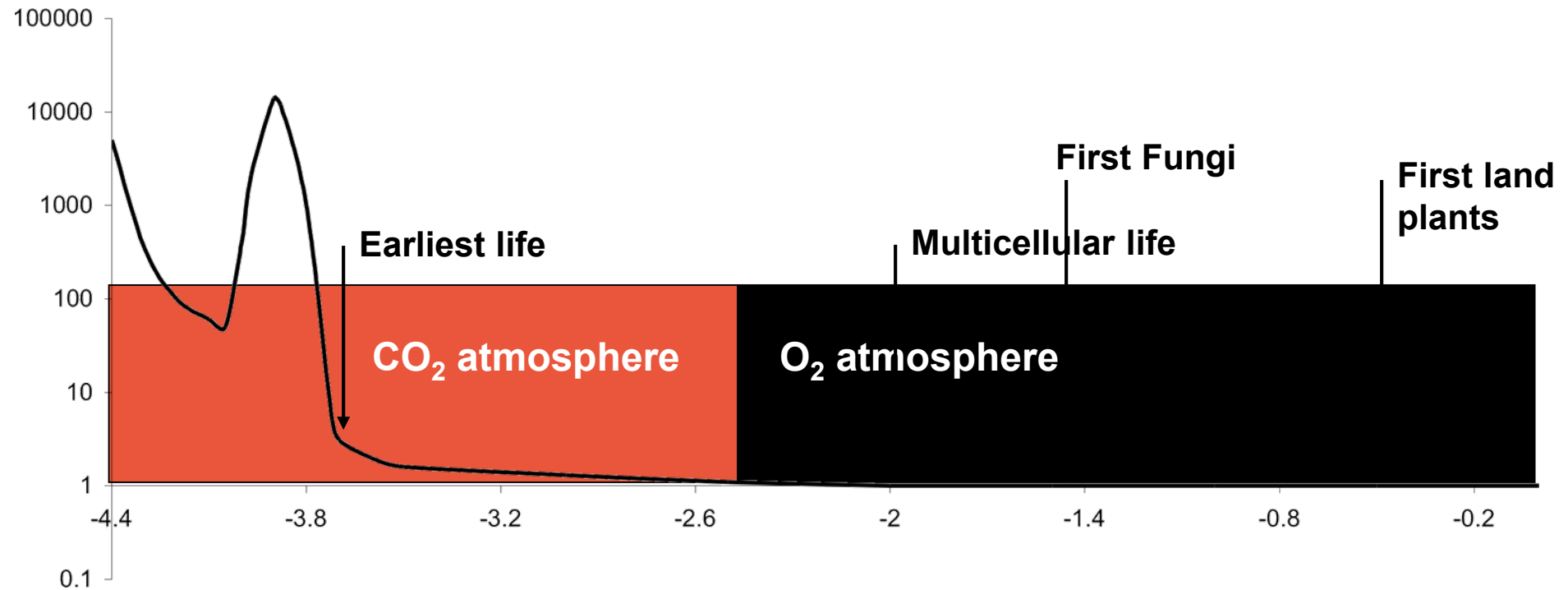


$f_i$  = The fraction of life bearing  
planets on which intelligent  
life emerges





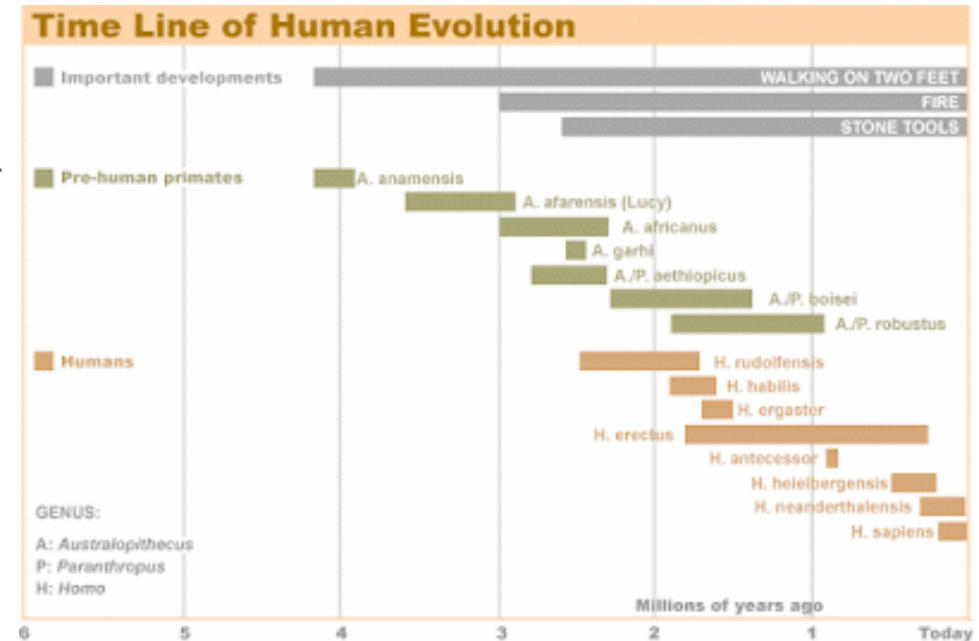
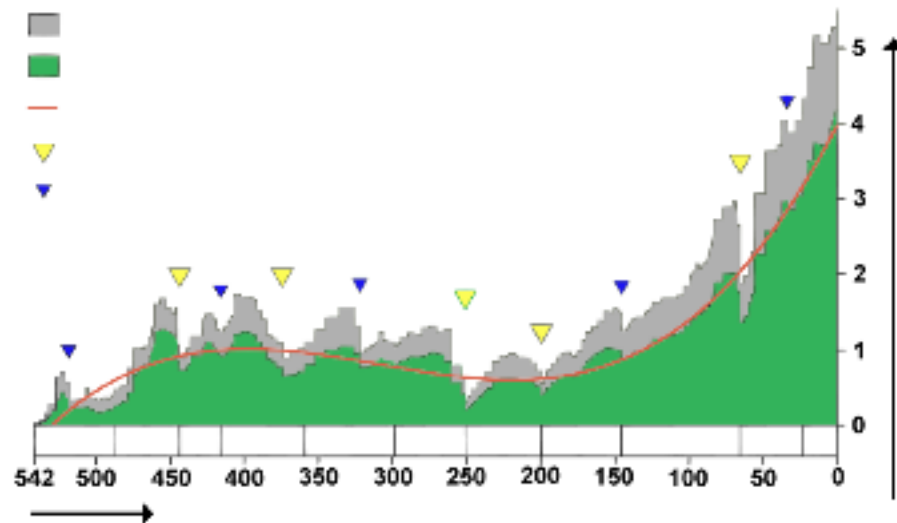
- $f_i$  = The fraction of life bearing planets on which intelligent life emerges



$F_I$  = THE FRACTION OF LIFE BEARING PLANETS ON WHICH INTELLIGENT LIFE EMERGES



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$f_c$  = The fraction of civilizations that develop a technology that releases detectable signs of their existence into space

$F_C$  = THE FRACTION OF CIVILIZATIONS THAT DEVELOP A TECHNOLOGY THAT RELEASES DETECTABLE SIGNS OF THEIR EXISTENCE INTO SPACE.

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$L$  = The length of time such  
civilizations release detectable  
signals  
into space



Interested in more  
scientific challenges?

Could Natural Sciences be the  
course for you?





# What?

- Natural Sciences:
  - Biological Sciences
  - Physics and Astronomy
  - Chemistry
  - Earth Sciences



# Why?



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- Numeracy
- Computational skills
- Communication
  - across disciplines
- Research Skills
  - independent research
  - self-motivation
  - confidence with primary literature
  - interaction with researchers



# Careers for Natural Scientists

- **Interdisciplinary research**
  - **Academic**
    - Geophysics
    - Computational Evolutionary Biology
    - Neurophysiology
  - **Industrial**
    - Clinical Research Associate
    - Infrastructure analyst
- **Public communication of science**
  - Publishing (*Nature* publishing)
  - Science Communicator (National Space Centre)
- **Management in scientific industries**
  - Sales
  - Finance
  - Recruitment
- **Teaching**
- **Further study**
  - Post-graduate medicine
  - Global Environmental Change
  - Forensic Science
- **Consultancy**
  - KPMG
  - Environmental Consultancy



# Things to consider...

- Grade offers
- Be prepared for online events/visit days/ Interviews
- What do YOU want from your degree?
  - Programme content
  - Quality and style of teaching
  - Student experience/ Type of institution
  - Employability



# How? Typical offers

	BSc/MSci	Foundation
Cambridge	A*A*A	
Bath, Durham, Leeds, Nottingham, York, Lancaster, UCL, Southampton, UEA,	A*AA	
Exeter, Leicester	A*AA – AAB	BCC (Leics)
Loughborough	AAB	BBB
Keele	ABB	CC
Open University	not published	

Note -some programmes have a requirement for a post GCSE Maths qualification

# Programme content:

- Mix of subjects
- Range of subjects over the years
- Modules options- check whether all advertised options are available – timetabling/prerequisites
- Options to specialise
- Laboratory time
- Research background of university:- final year project options





# Existing student experience :

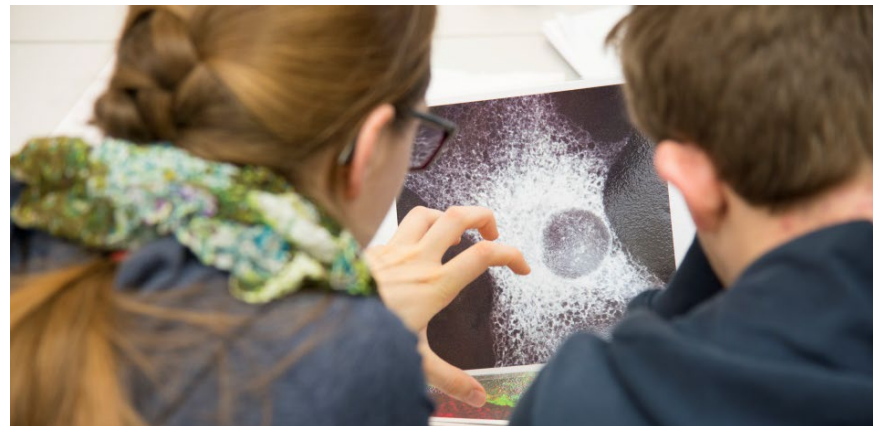
- University Life- consider:
  - Location
  - Campus or city based
  - Facilities: accommodation, Student Union, library, student societies, sports club, gym etc.
  - Field trips
  - Study abroad
- Research via:
  - Talk to existing students on Open/UCAS days
  - Student societies/groups on Facebook
  - The Student Room



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# Employability:

- What to graduates do next – ask?
- Employability figures
- Do they offer
  - Year in industry
  - Integrated Masters (MSci)



Any questions?





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