La Rivoluzione Microbica

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Biosaturdays 2018
Sulle tracce dell'invisibile. Il Microbioma

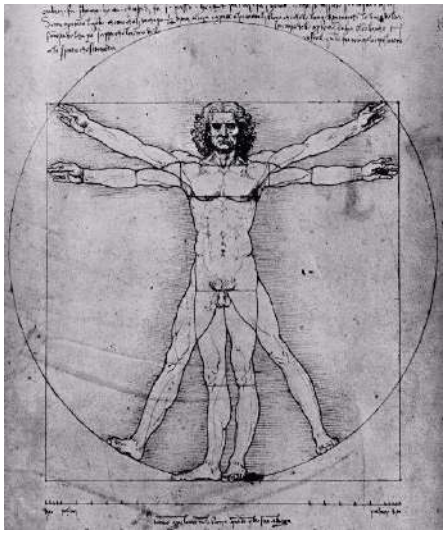
17 marzo 2018 - Firenze


Caos primordiale

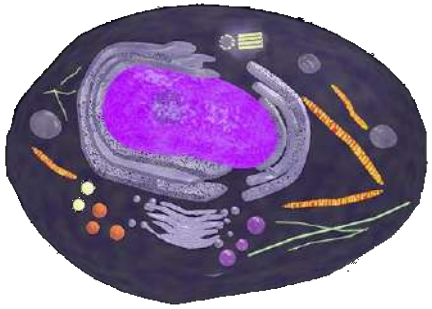
4 miliardi di anni fa

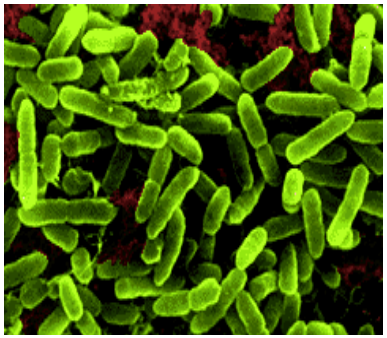
ORA !!!!

Il pianeta d'acqua



Eucarioti





Batteri

Archei


deoxyribose
thymine
guanine
adenine

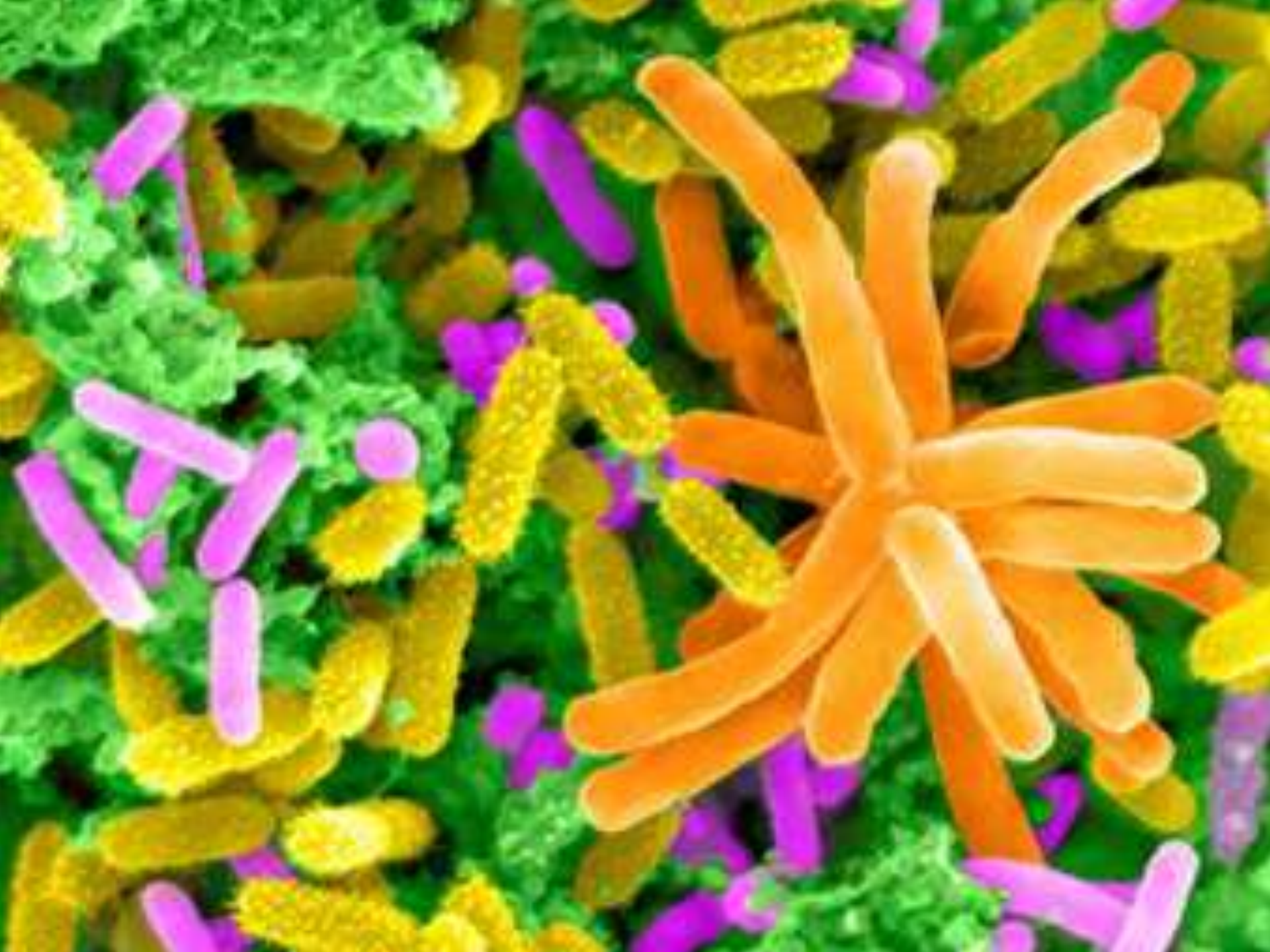

DNA
deoxyribose

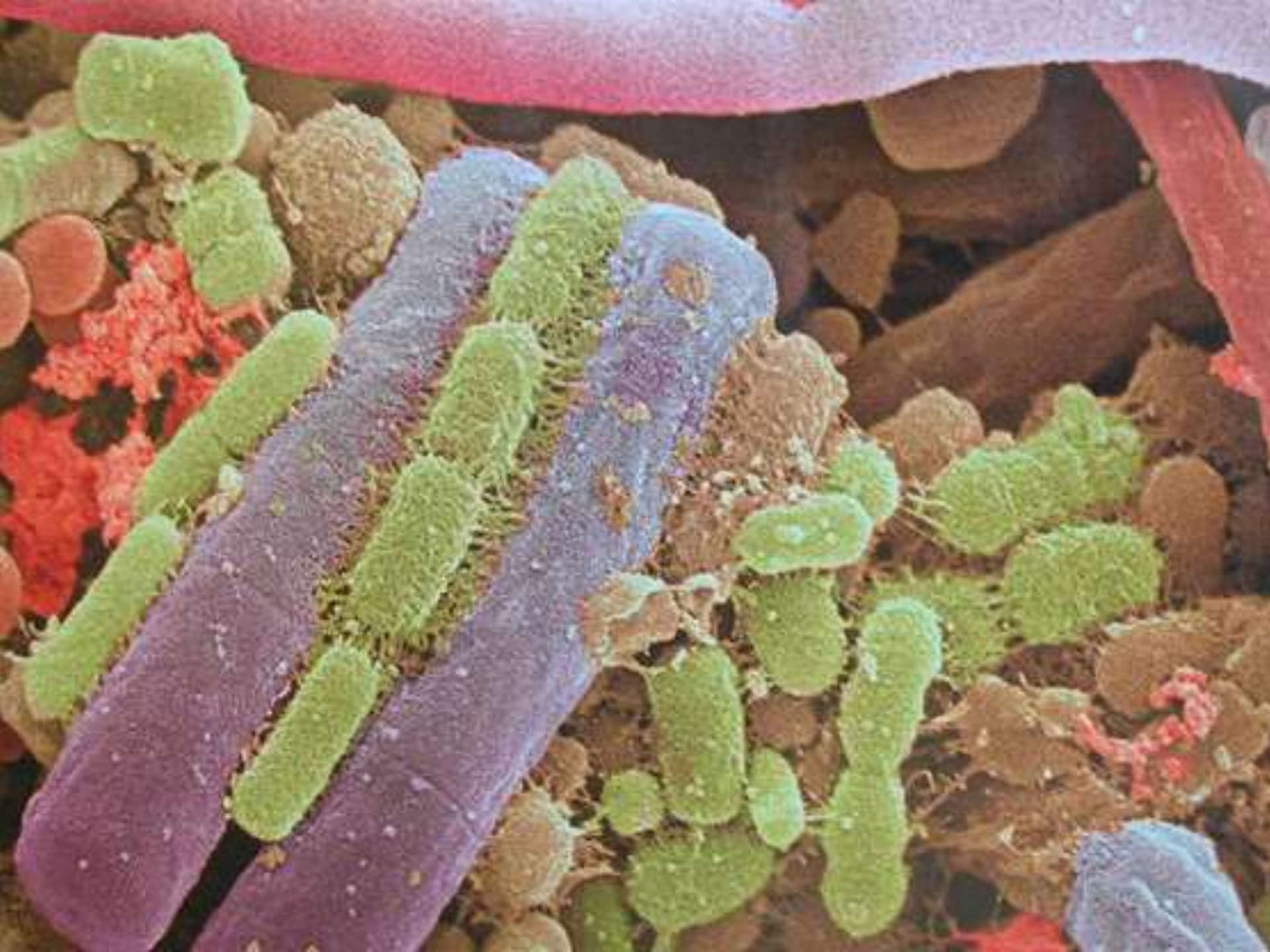
DNA

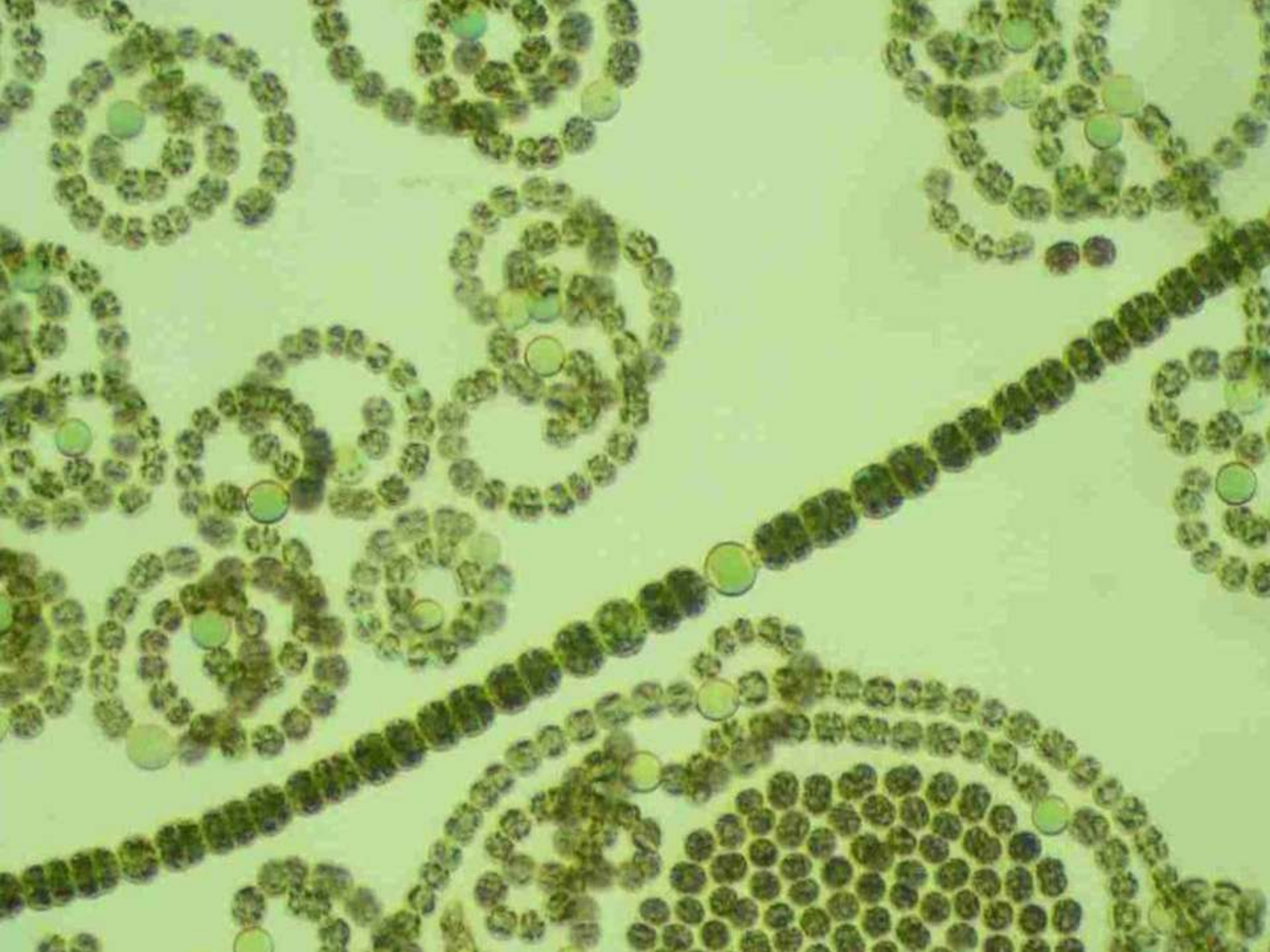
La molecola della **Vita**

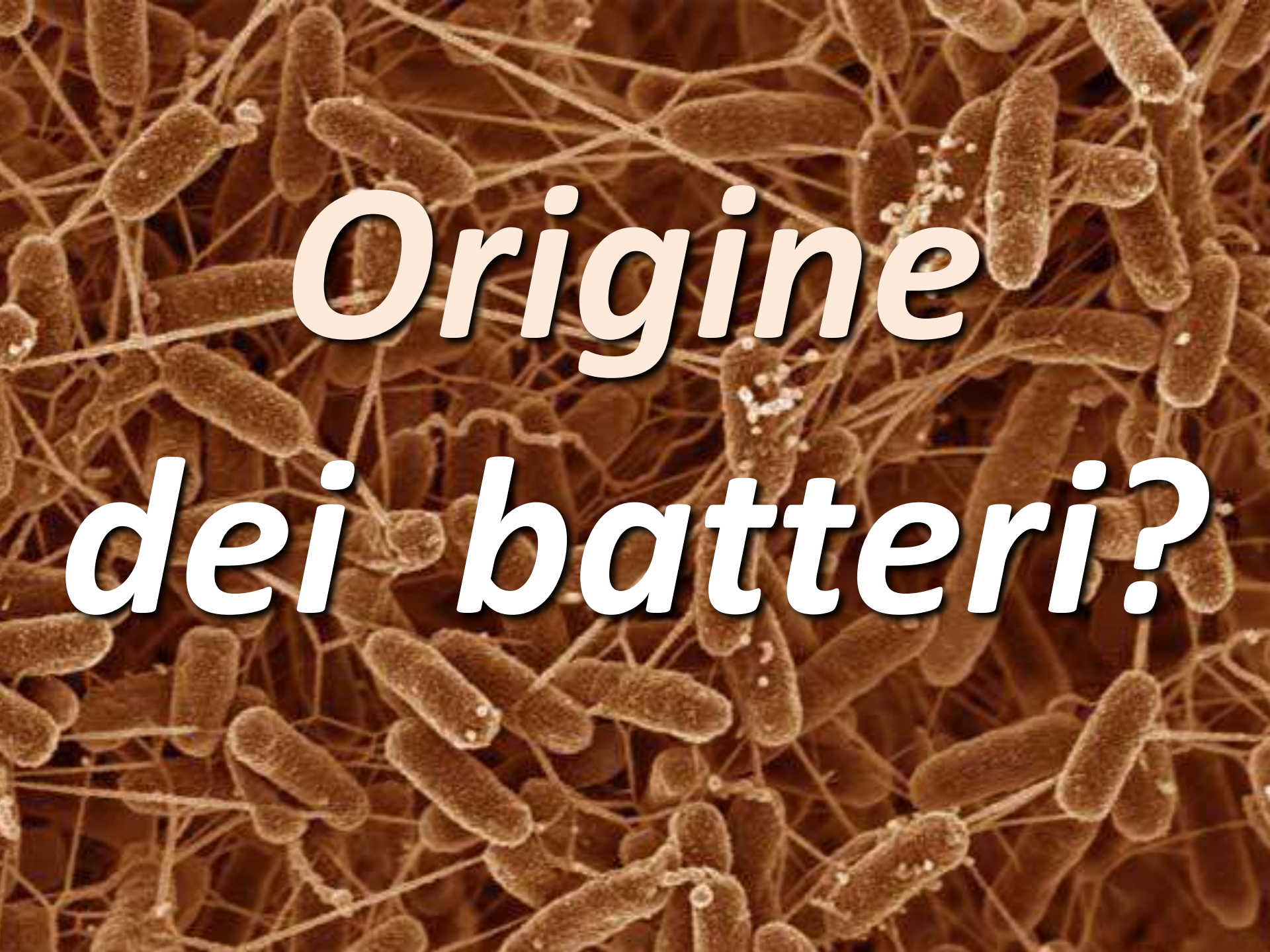

La Rivoluzione
Microbica

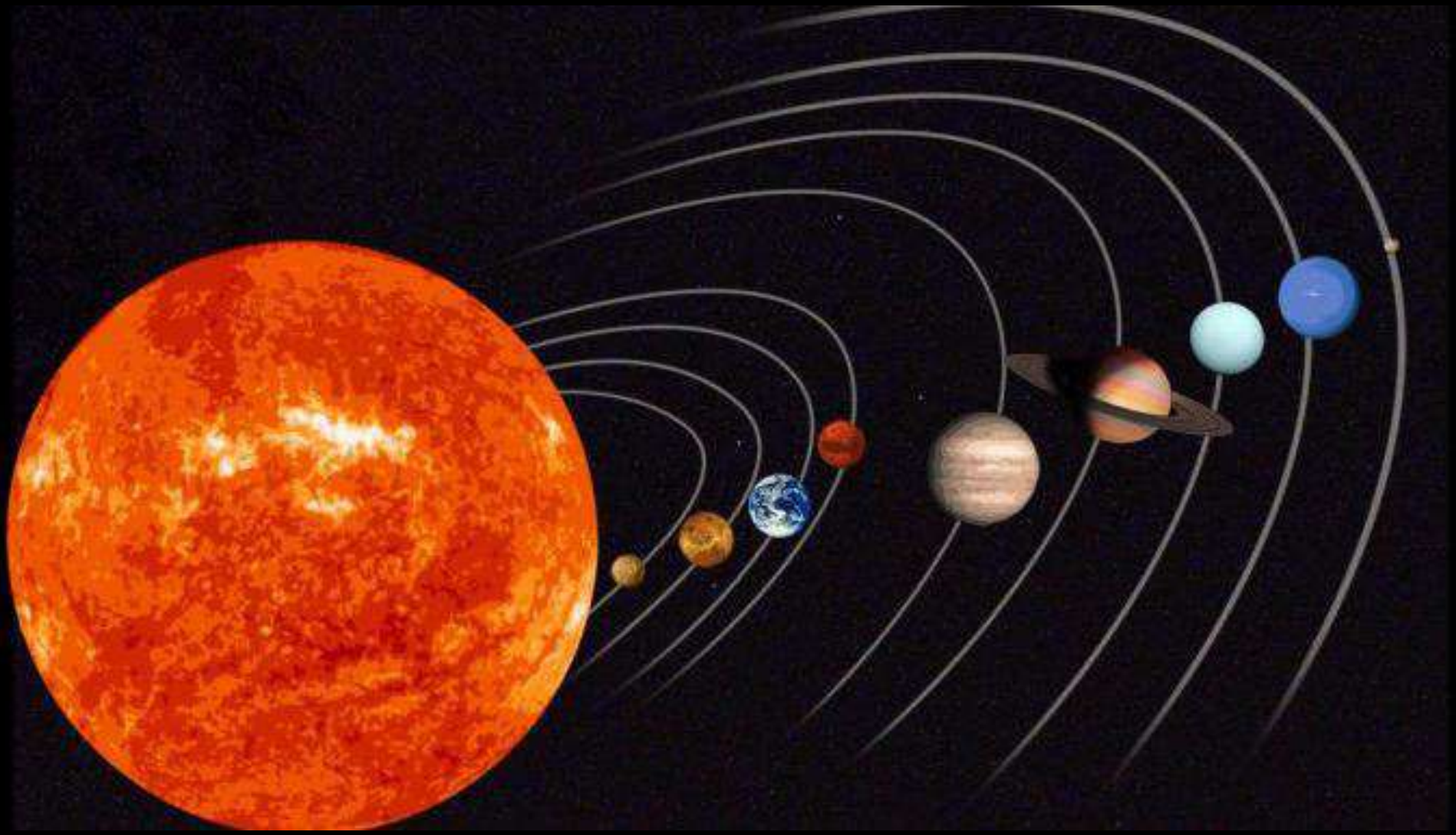

Chi sono i batteri?

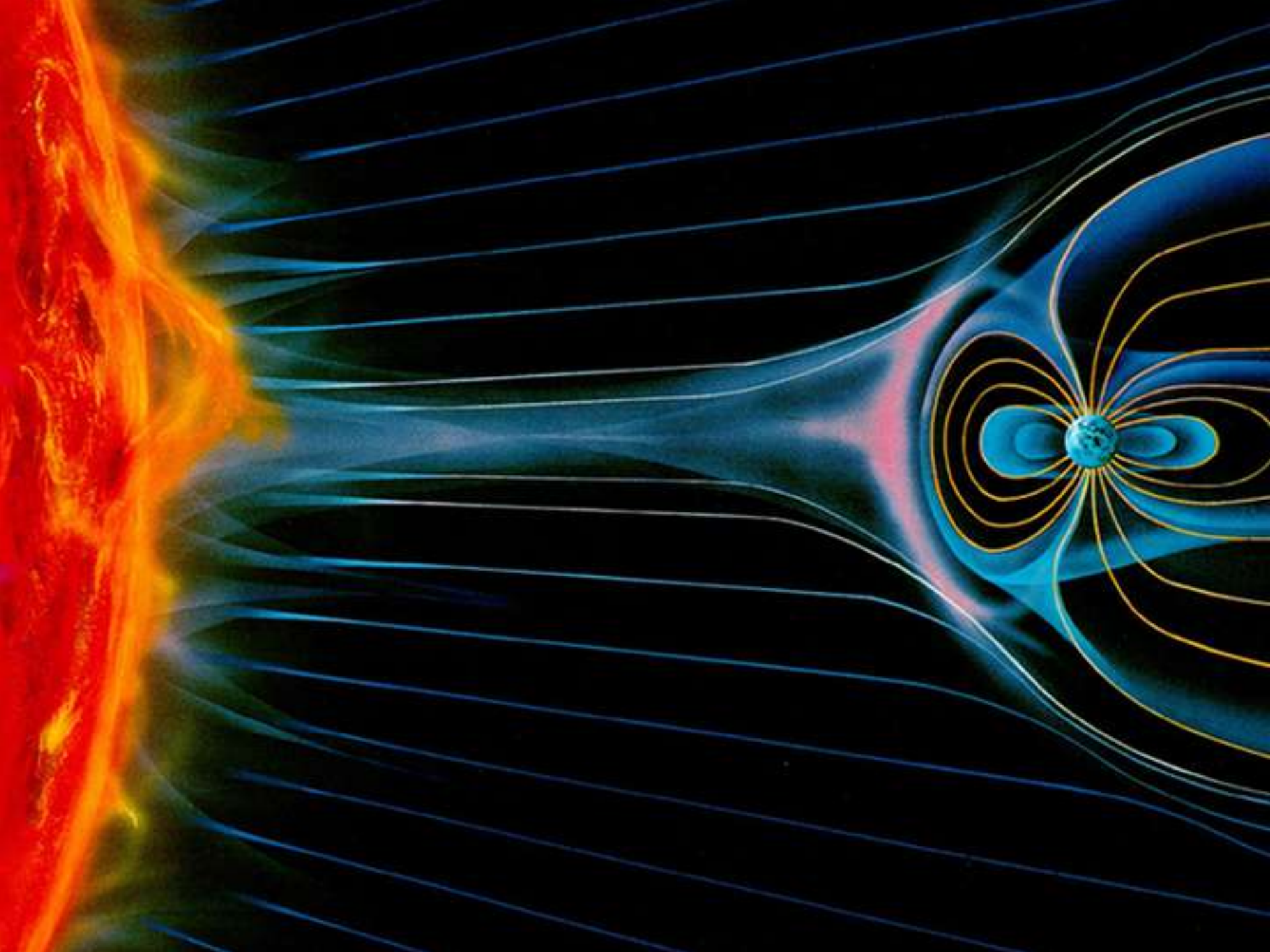




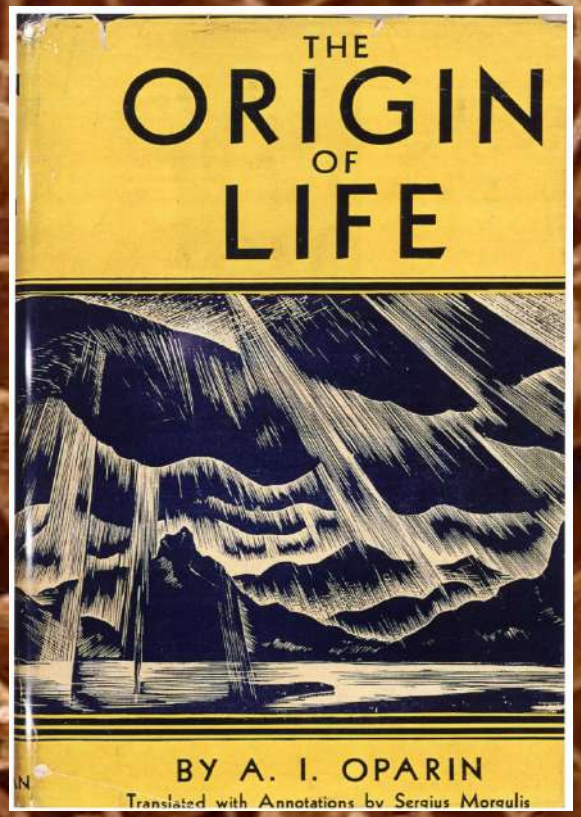


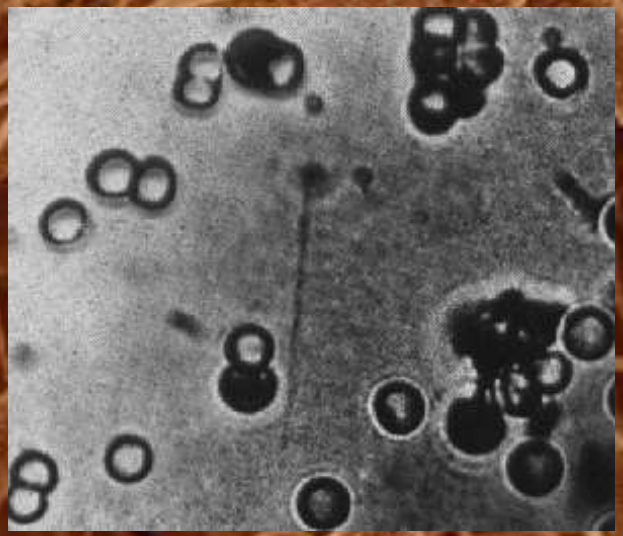

Origine
dei batteri?





Alexander I. Oparin





"*Proiskhozhdenie zhizny*" (The Origin of Life") 1924

Ipotesi di Oparin-Haldane

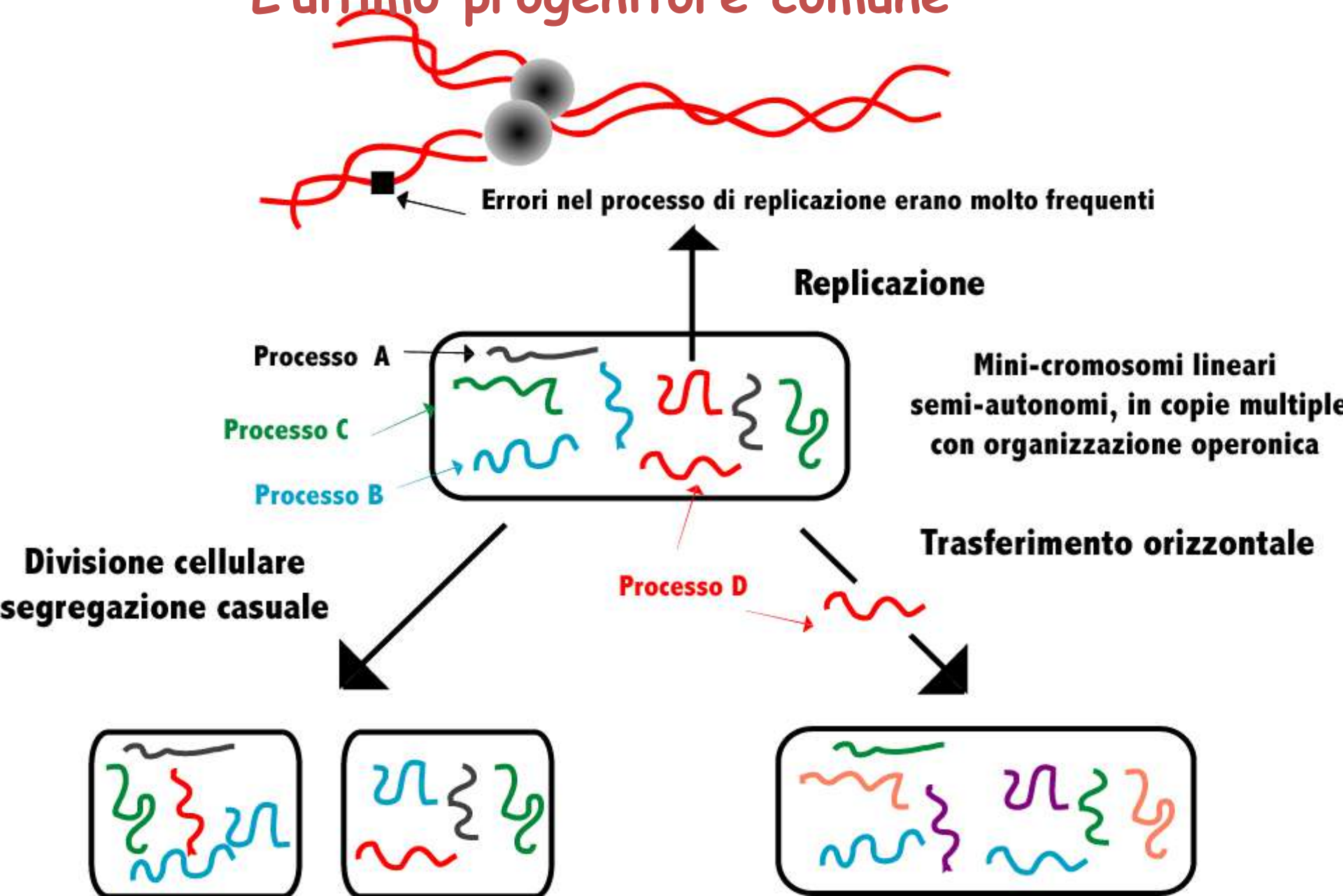
"Il Brodo Primordiale"

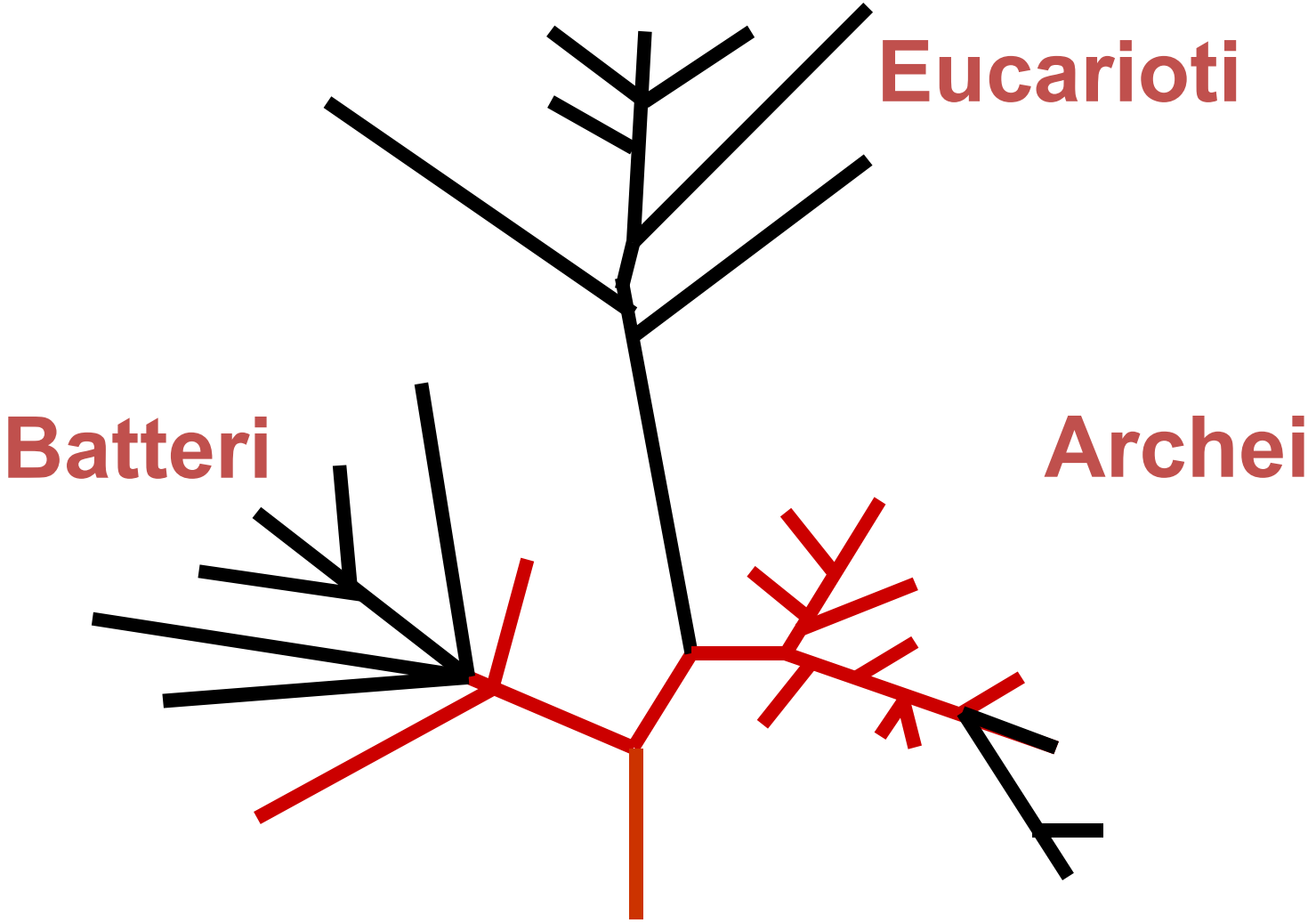
Le CELLULE PRIMORDIALI erano

ANAEROBIE e

ETEROTROFE

LUCA (Last Universal Common Ancestor)
L'ultimo progenitore comune



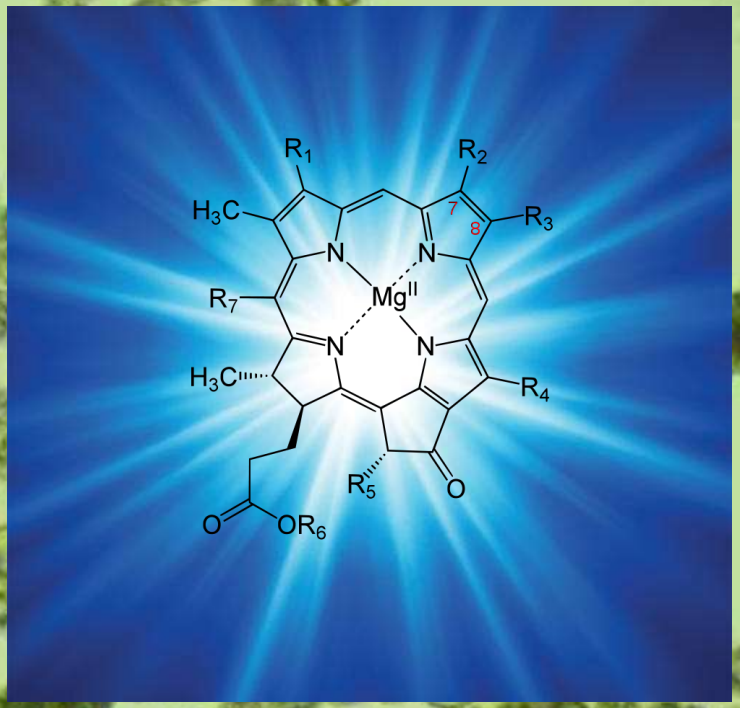

Eucarioti
Batteri
Archei
LUCA
Last Universal Common Ancestor

Qualcosa è successo

Qualcuno ha imparato!!!

A fare che cosa?

Clorofilla



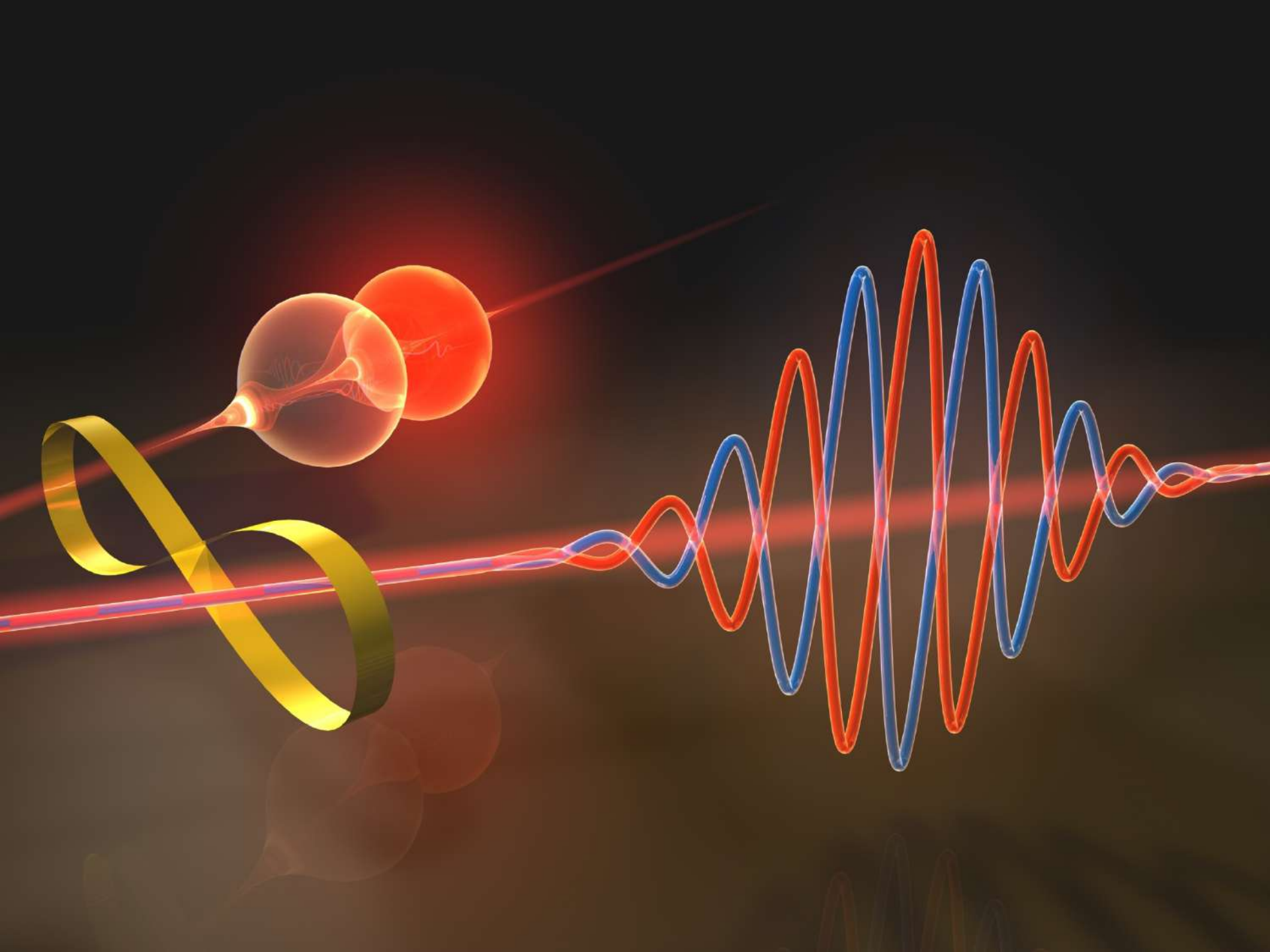
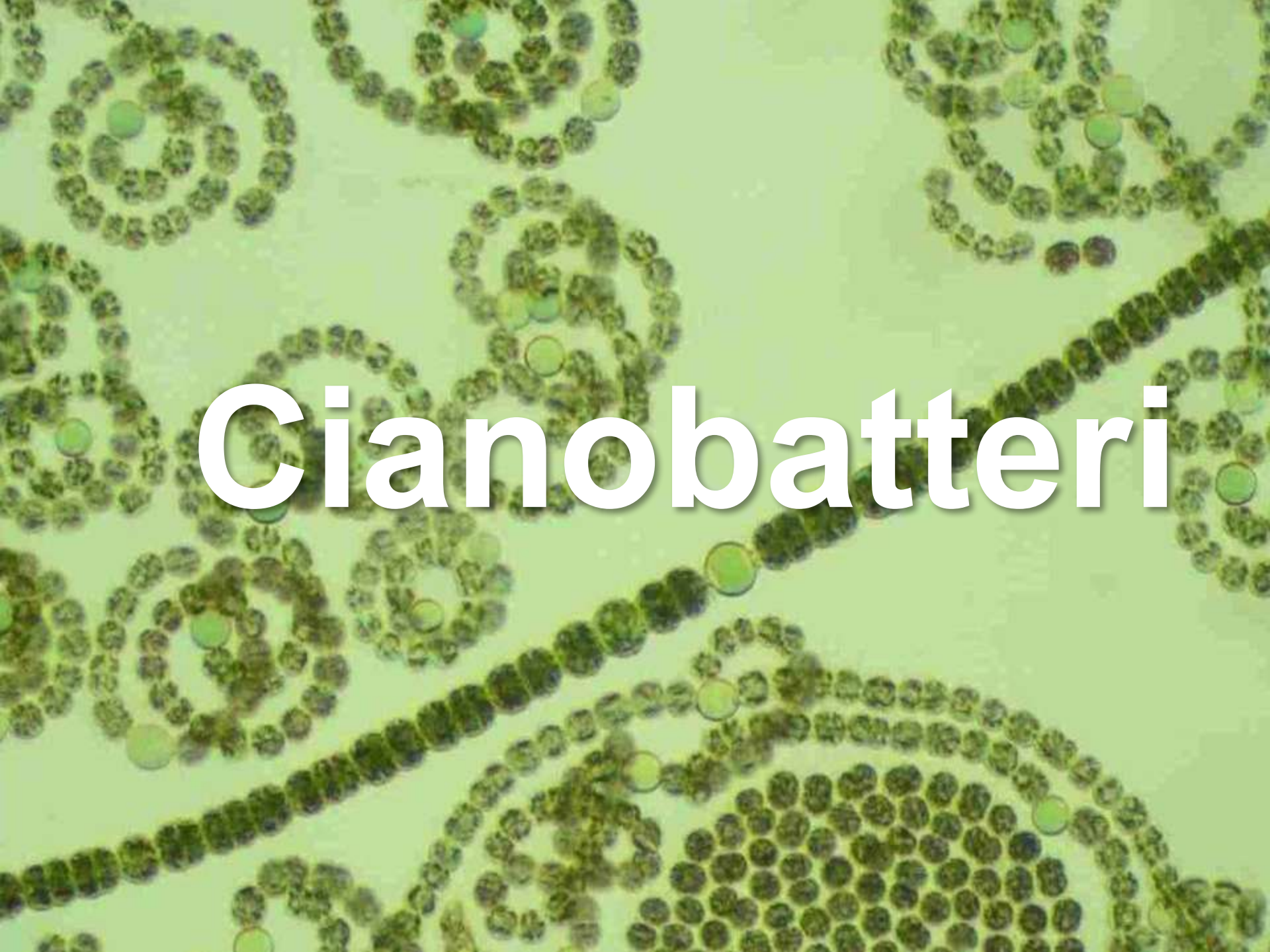


Foto-sintesi

I "mangiatori" di luce

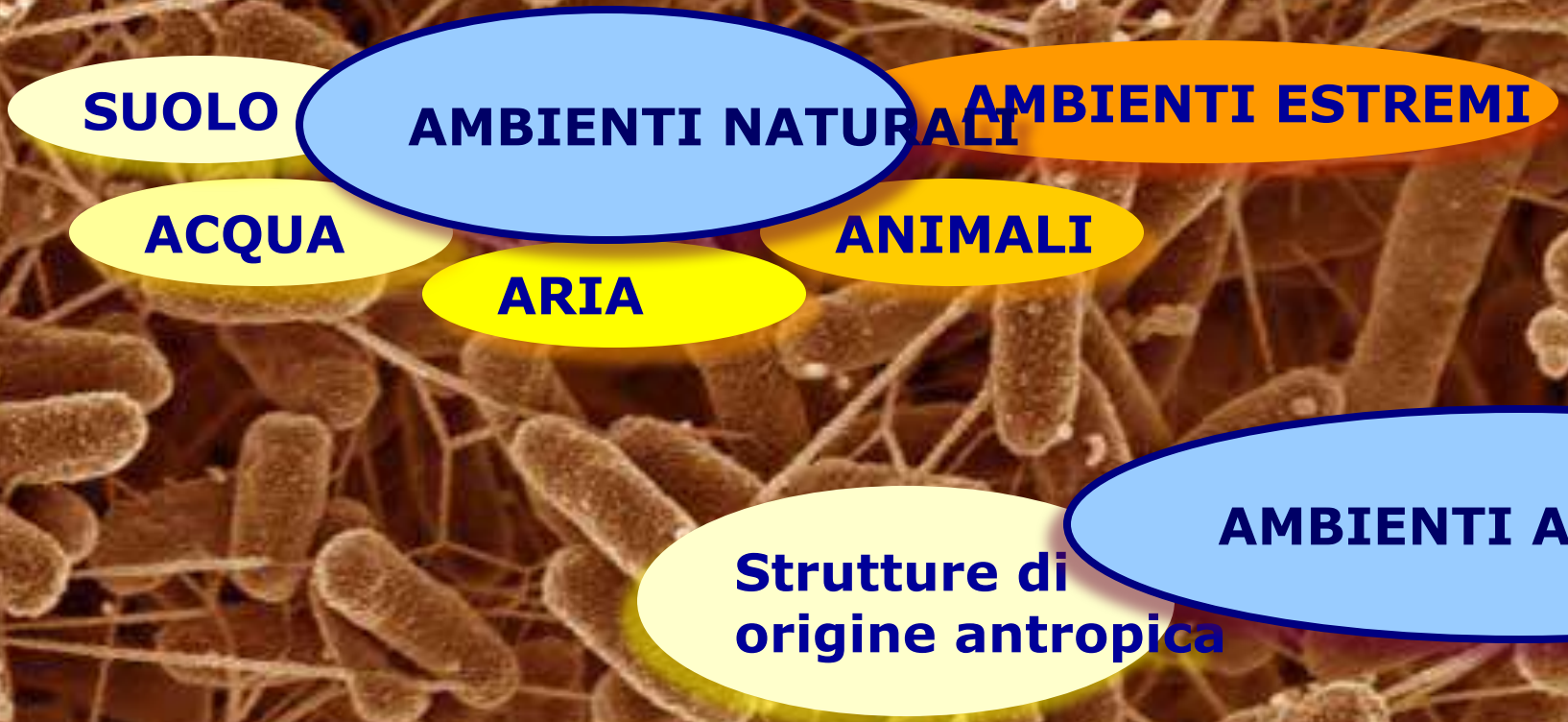

Cianobatteri


Si forma
lo strato di Ozono

Da allora i microrganismi hanno colonizzato tutte le nicchie ecologiche; le condizioni ambientali cambiavano e loro si adattavano a queste, colonizzando TUTTE le nicchie ecologiche

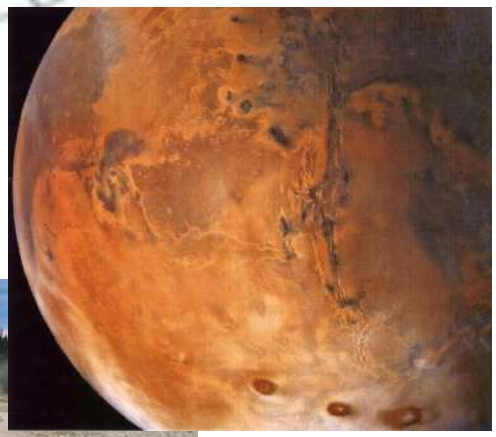

Dove vivono
i batteri?

I BATTERI SONO UBIQUITARI




Estremofili

Gli estremofili sono microrganismi in grado di colonizzare ambienti estremi e si suddividono in differenti classi:



Barofili 400 – 500 Atm

Acidofili pH < 1

Alcalofili pH > 9

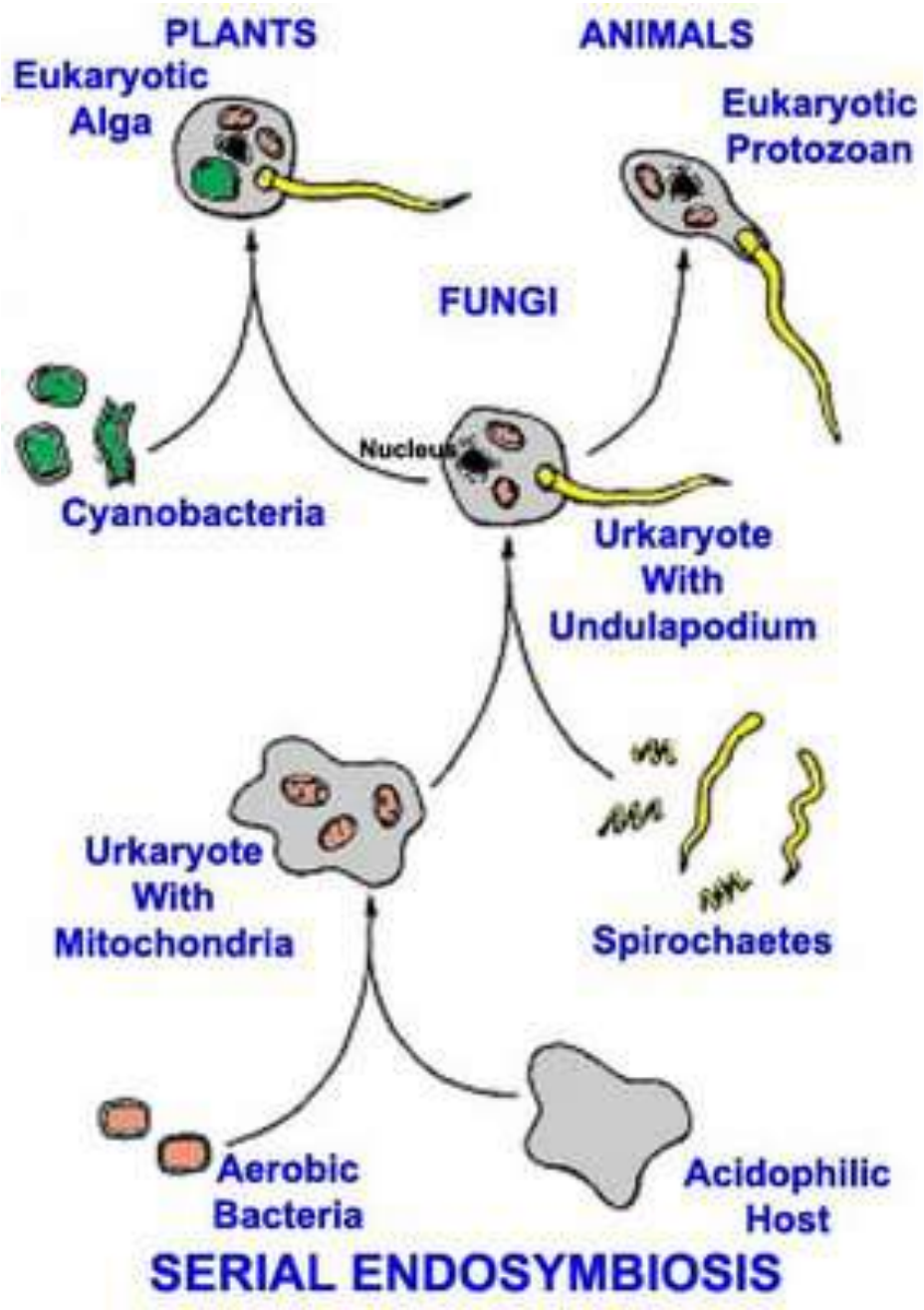
Psicrofili T < 15°C

Termofili T = 60- 80 °C

Iper-termofili T > 80°C

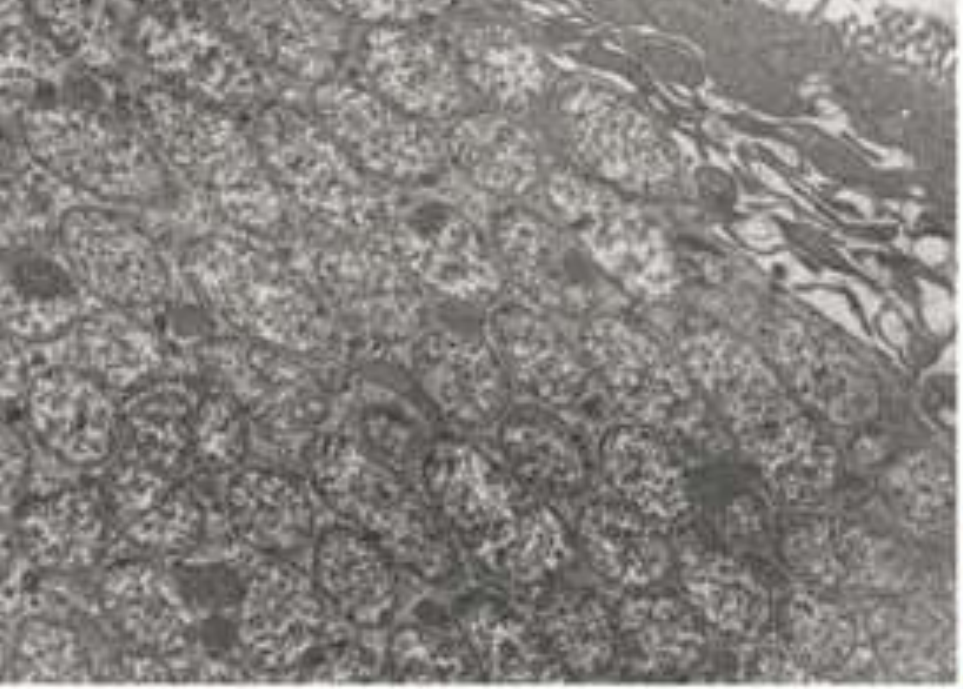
Endosimbionti

Organismi procarioti esterni che introducendosi nella cellula hanno dato origine agli organuli delle cellule eucariotiche



Lynn Margulis

ENDOSIMBIOSI

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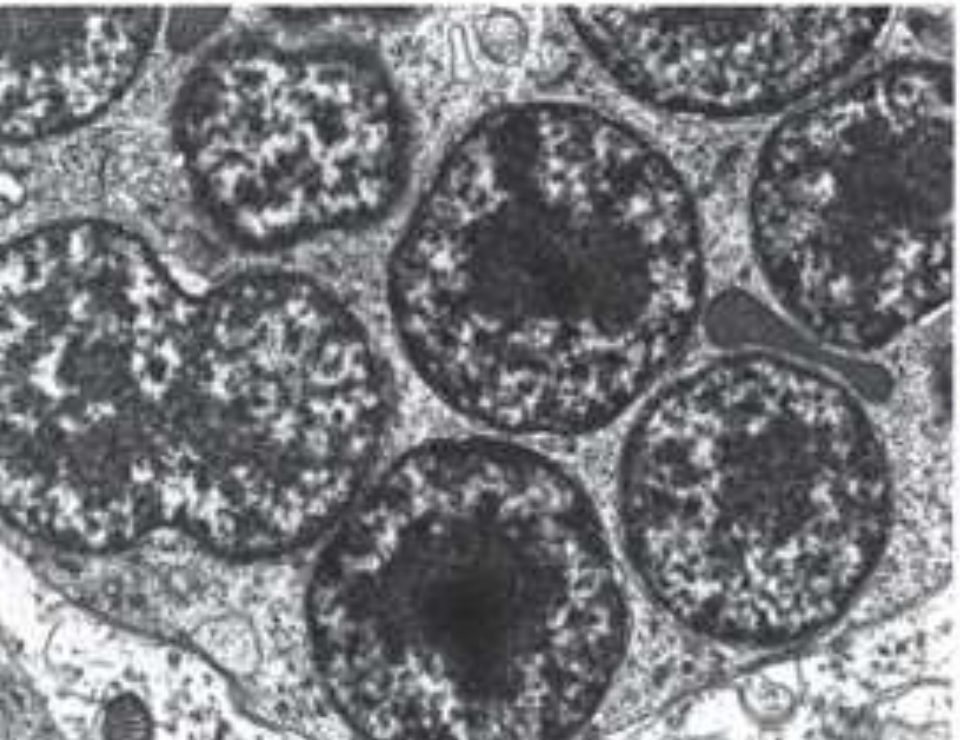


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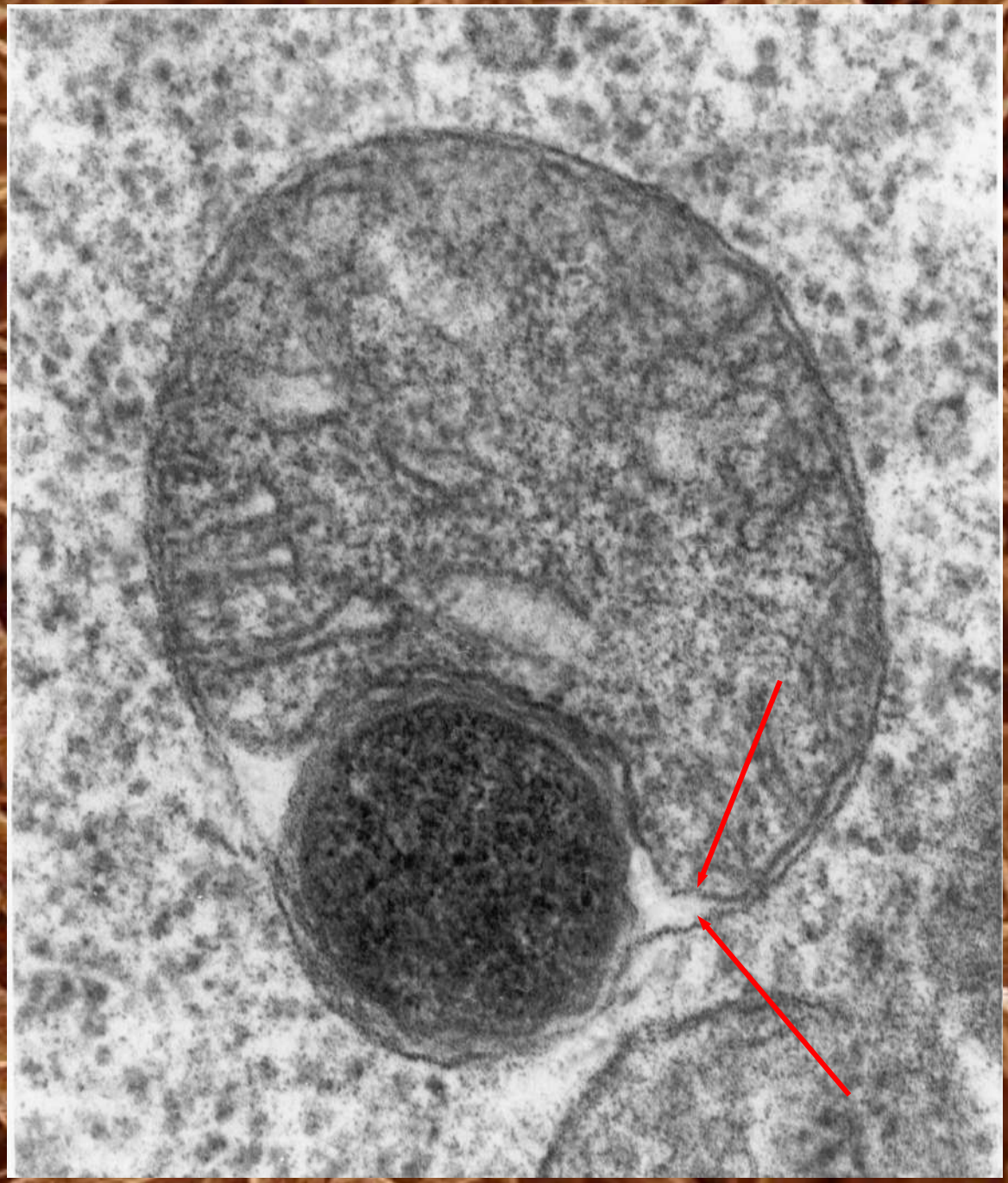
Dettagli al TEM …



Il nome generico *Midichloria* derivato da Star Wars

Il Maestro Jedi Qui-Gon spiega:

'Midi-chlorians are microscopic life-forms that reside within the cells of all living things and communicate with the Force.'

…

'We are symbionts with the midi-chlorians.'

(Terry Brooks Star Wars Episode I: The Phantom Menace)


E noi ?


Il microbiota
umano

N° di cellule di un organismo umano

↓

Diecimila miliardi

N° di cellule di un organismo umano

↓

Diecimila miliardi

*N° di cellule del **microbiota** umano*

↓

CENTOMILA miliardi

N° di cellule di un organismo umano

↓

Diecimila miliardi

*N° di cellule del **microbiota** umano*

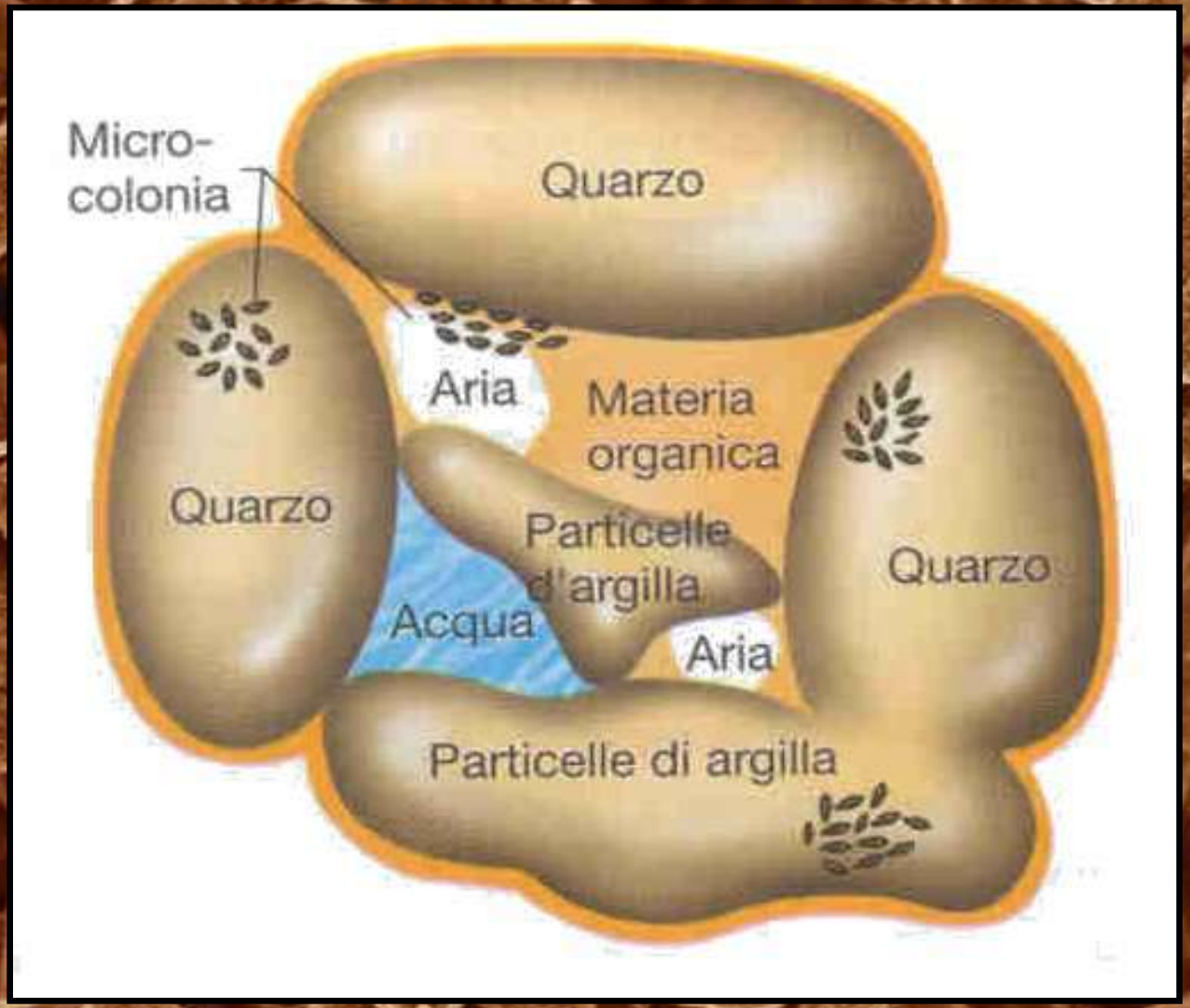
↓

CENTOMILA miliardi

Microbioma = insieme dei GENI microbici

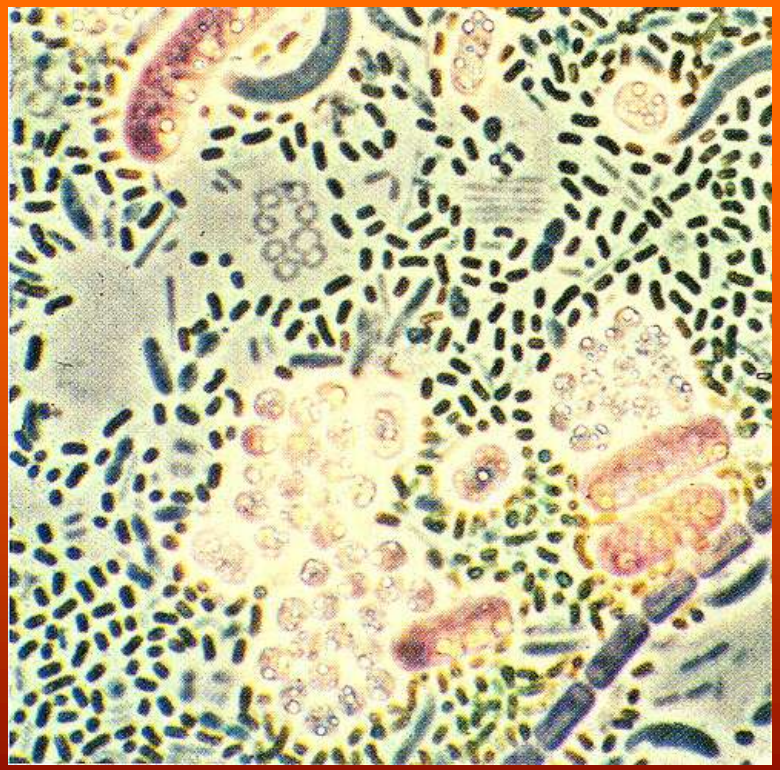

Non siamo soli!


Come vivono e come interagiscono ?



Si calcola che un <u>grammo di suolo</u> contenga almeno <u>5000 specie batteriche</u>, ma solamente una <u>percentuale</u> molto bassa (inferiore all'<u>1%</u>) è <u>coltivabile</u> in condizioni standard di laboratorio

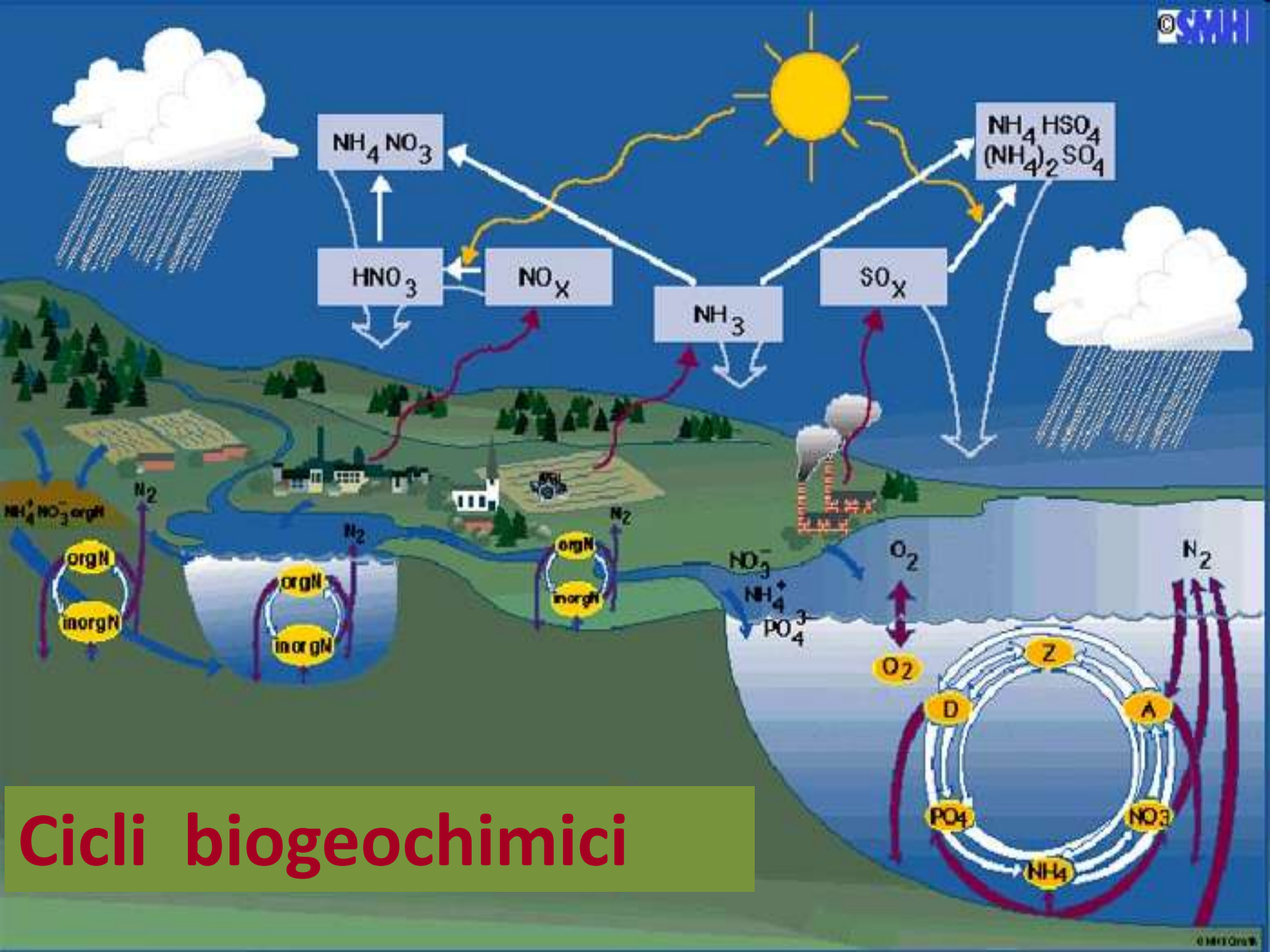
Negli ambienti naturali è raro trovare singole popolazioni



E’ molto più frequente trovare
COMUNITA’ MICROBICHE


Democrazia
e
Cooperazione


•Che cosa *fanno*
•Che *importanza* hanno nella *nostra biosfera*?



Cicli biogeochimici


Perché lo
fanno?

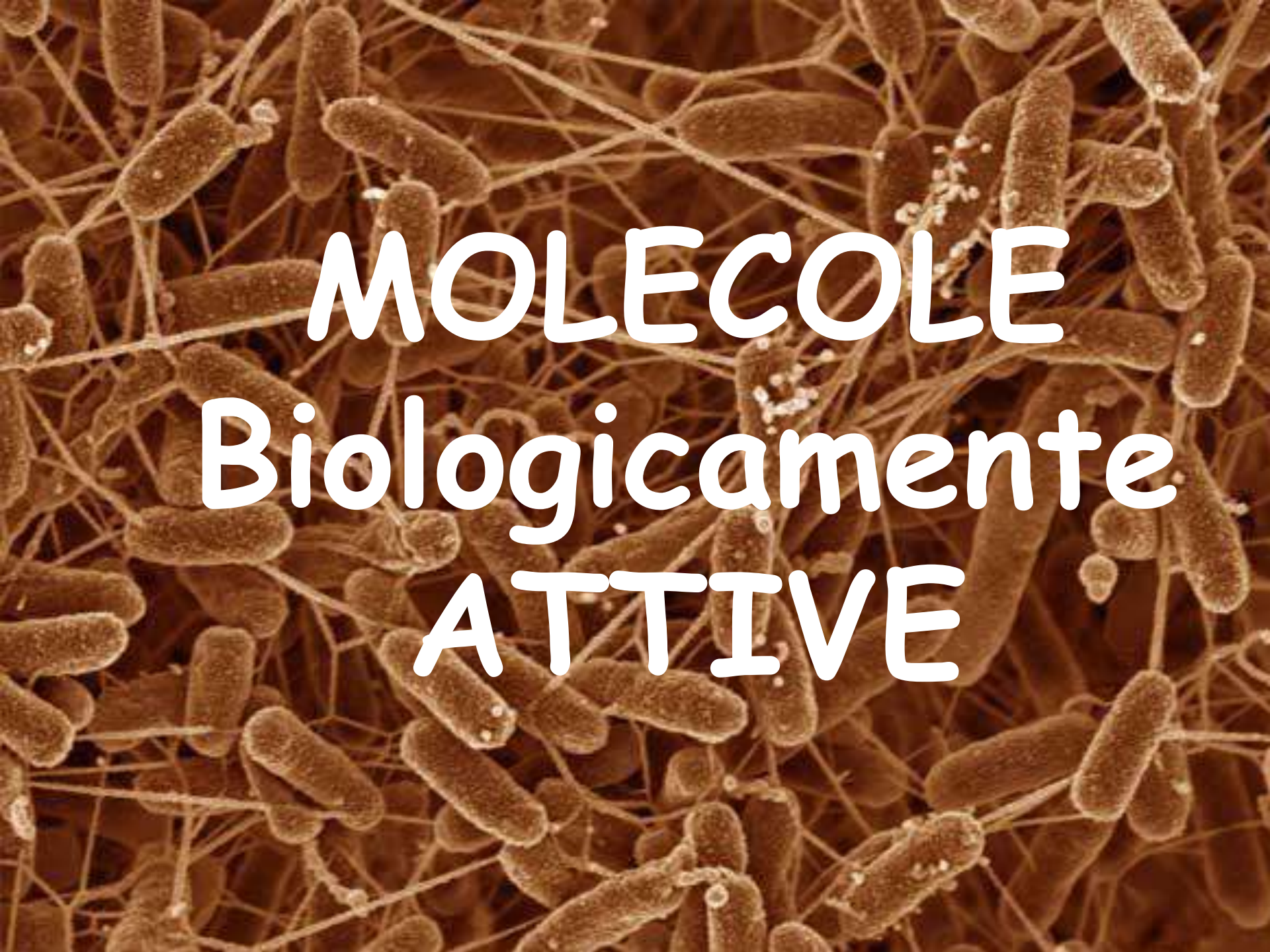

Per
sopravvivere
nell'ambiente
naturale


Il mondo batterico è inesplorato!!


Non conosciamo
tutti i processi
che possono
svolgere


Il sogno?


Potenzialità
metaboliche

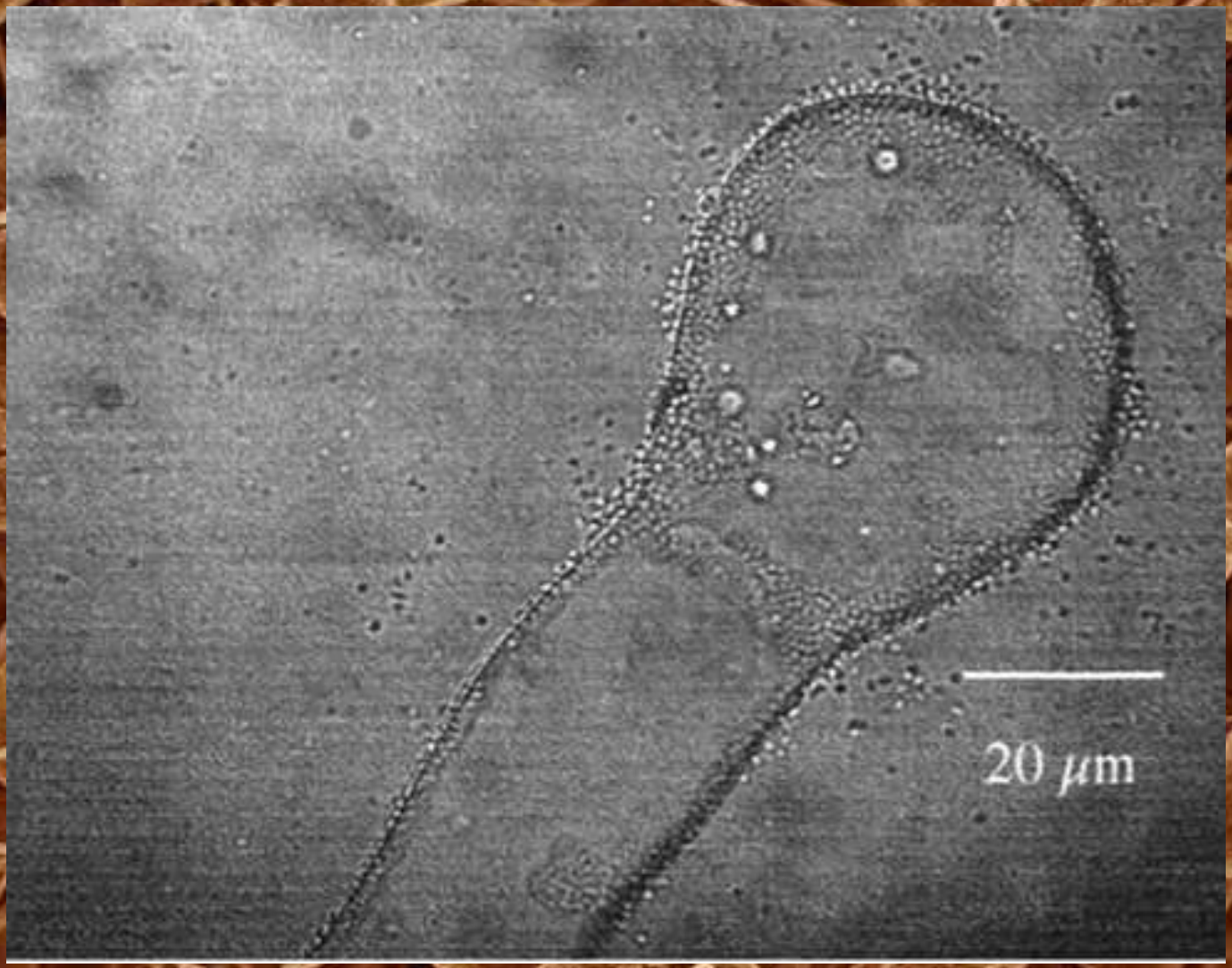

MOLECOLE
Biologicamente
ATTIVE


Come
"sfruttarle"?

Oil spill

Release of liquid hydrocarbon in the environment especially marine areas

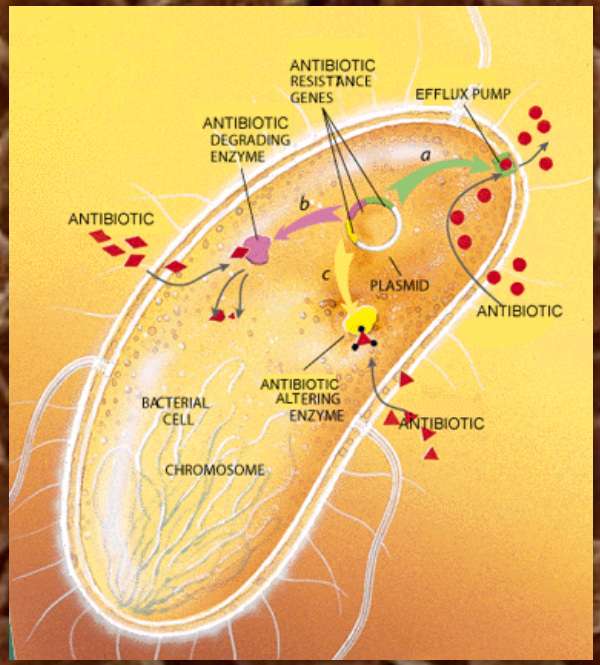
A. venetianus VE-C3




BIORISANAMENTO

Research efforts are now focusing on the discovery of

Novel natural **antibiotics**



Increase of antibiotic resistance evolving to multi-drug resistance (MDR) phenotype

Finding a new drug effective against *pathogenic bacterica*

Research efforts are now focusing on the discovery of

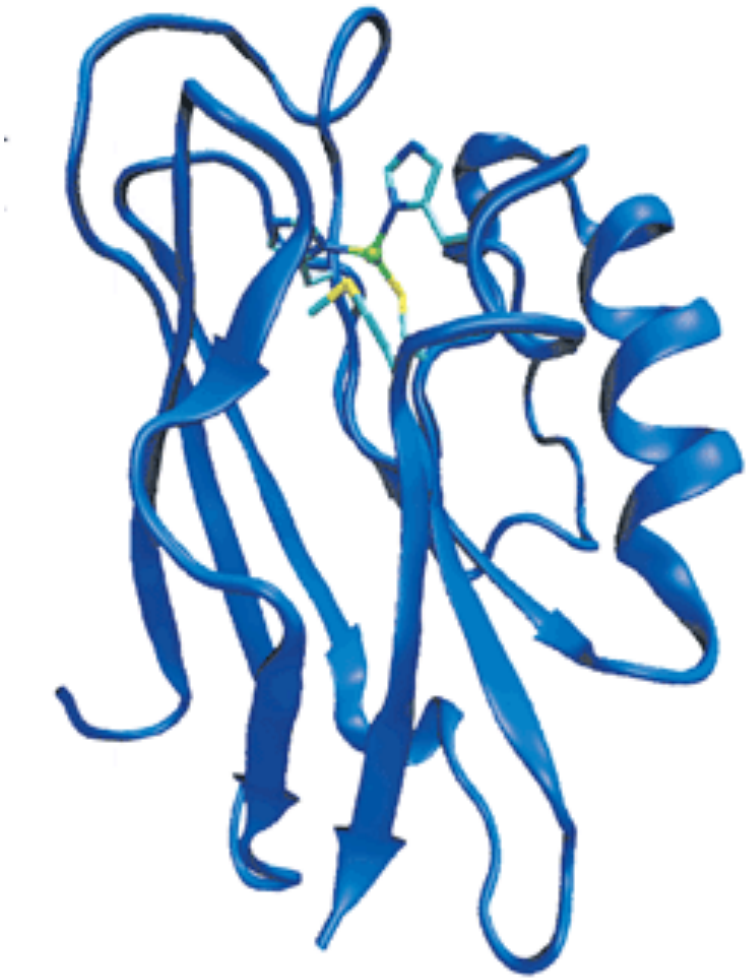
Dove cercarli ?

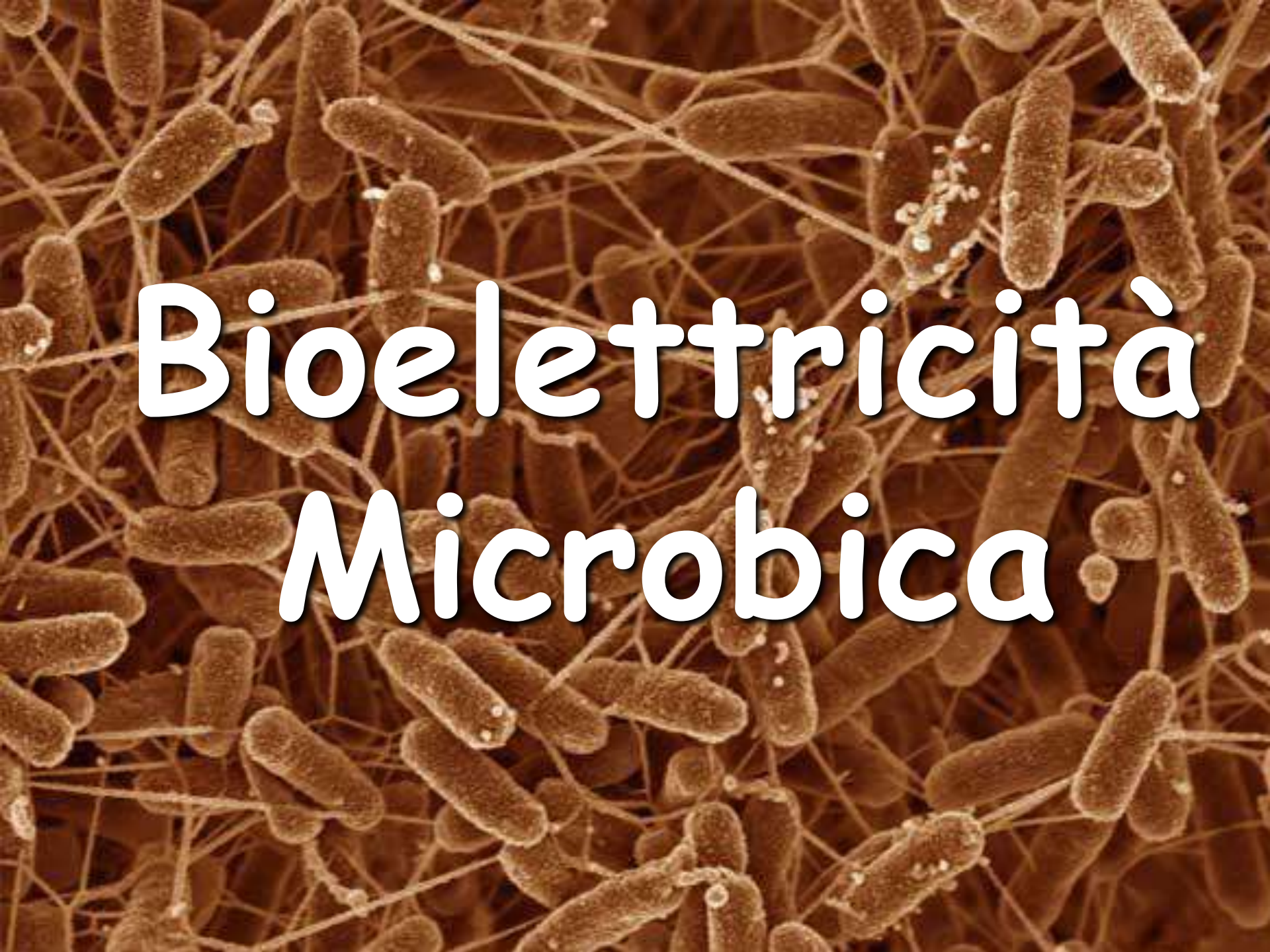
Research efforts are now focusing on the discovery of

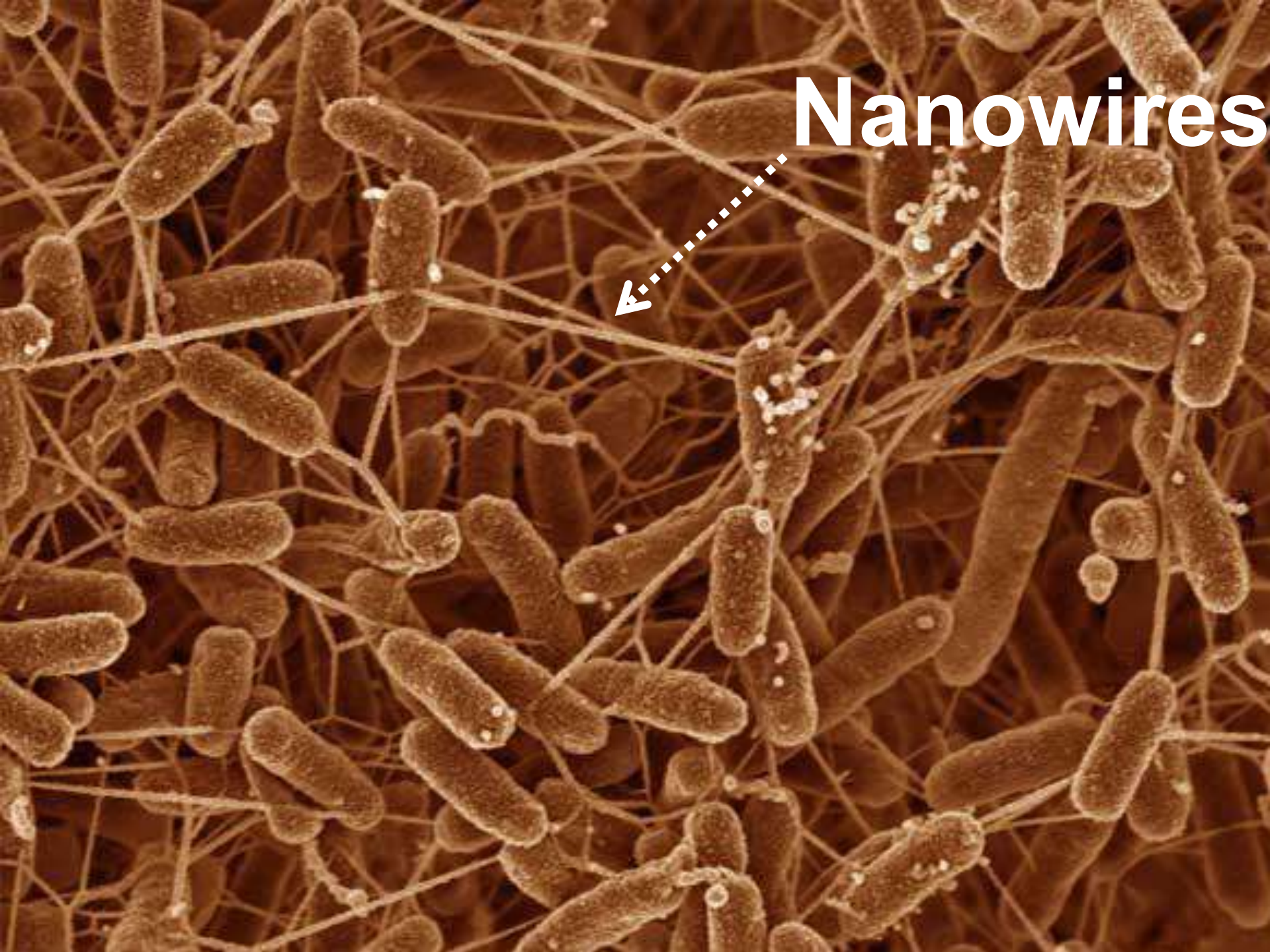
Novel natural **antibiotics** from **unusual sources**

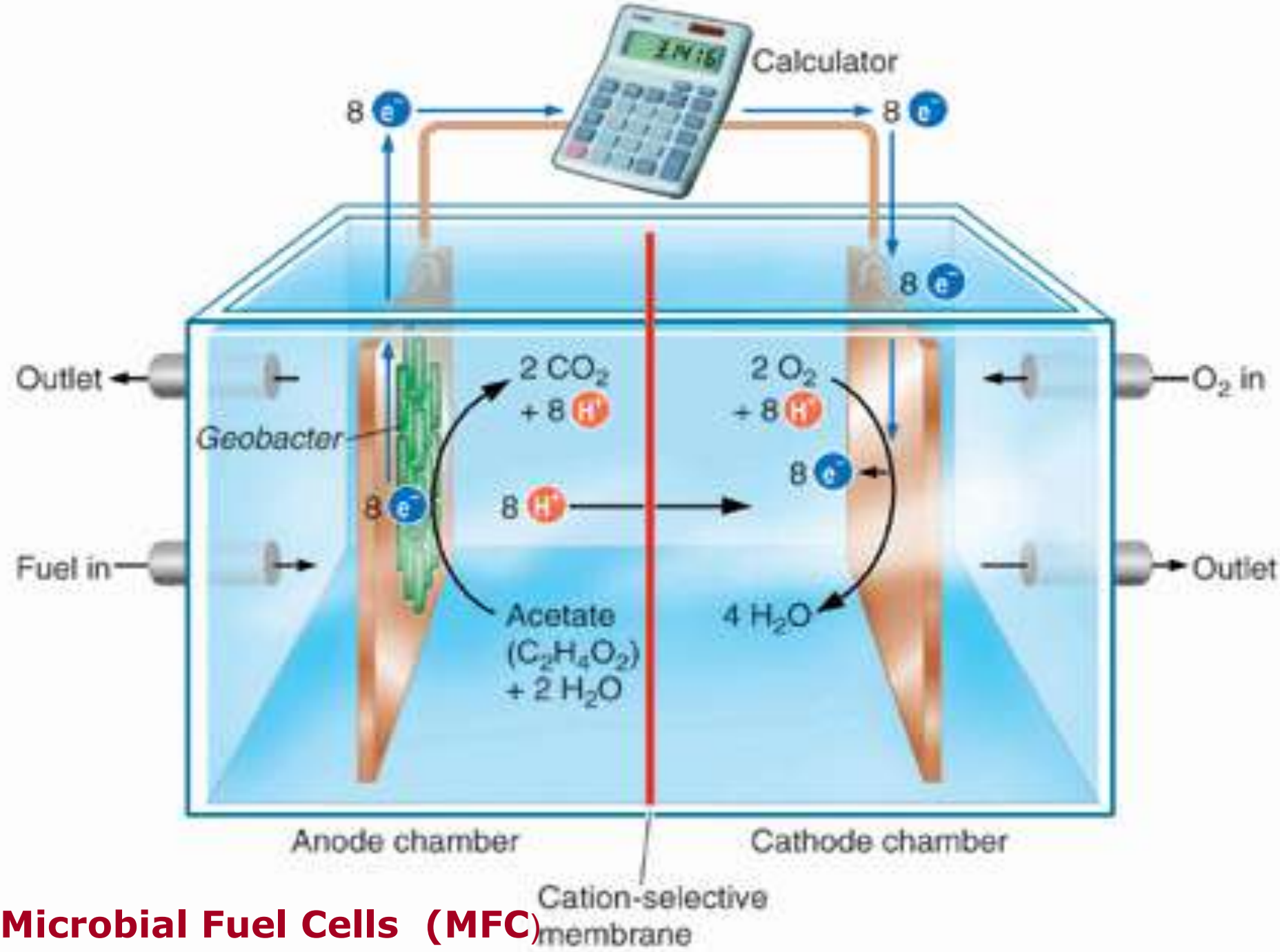

OCEANO ATLANTICO
OCEANO INDIANO
OCEANO PACIFICO
Mare di Weddel
Terra della Regina Maud
GRANDE ANTARTIDE
Polo Sud
PICCOLA ANTARTIDE
Monti Transantartici
Terra di Wilkes
Mare di Ross

Azurin




Bioelettricità
Microbica


Nanowires

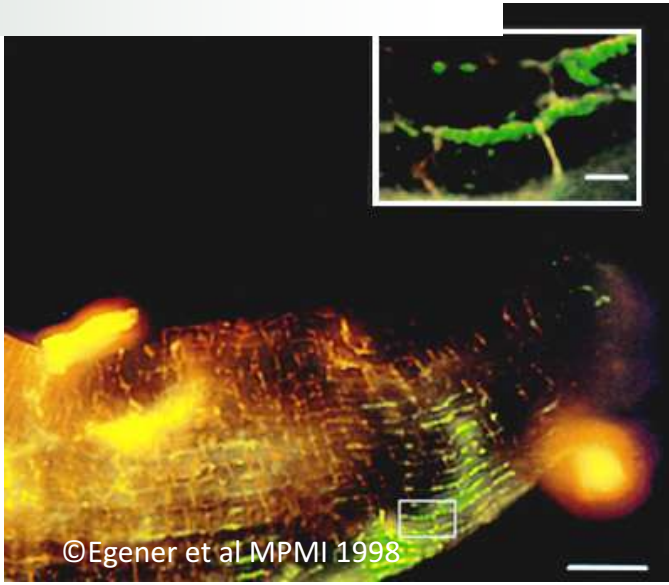


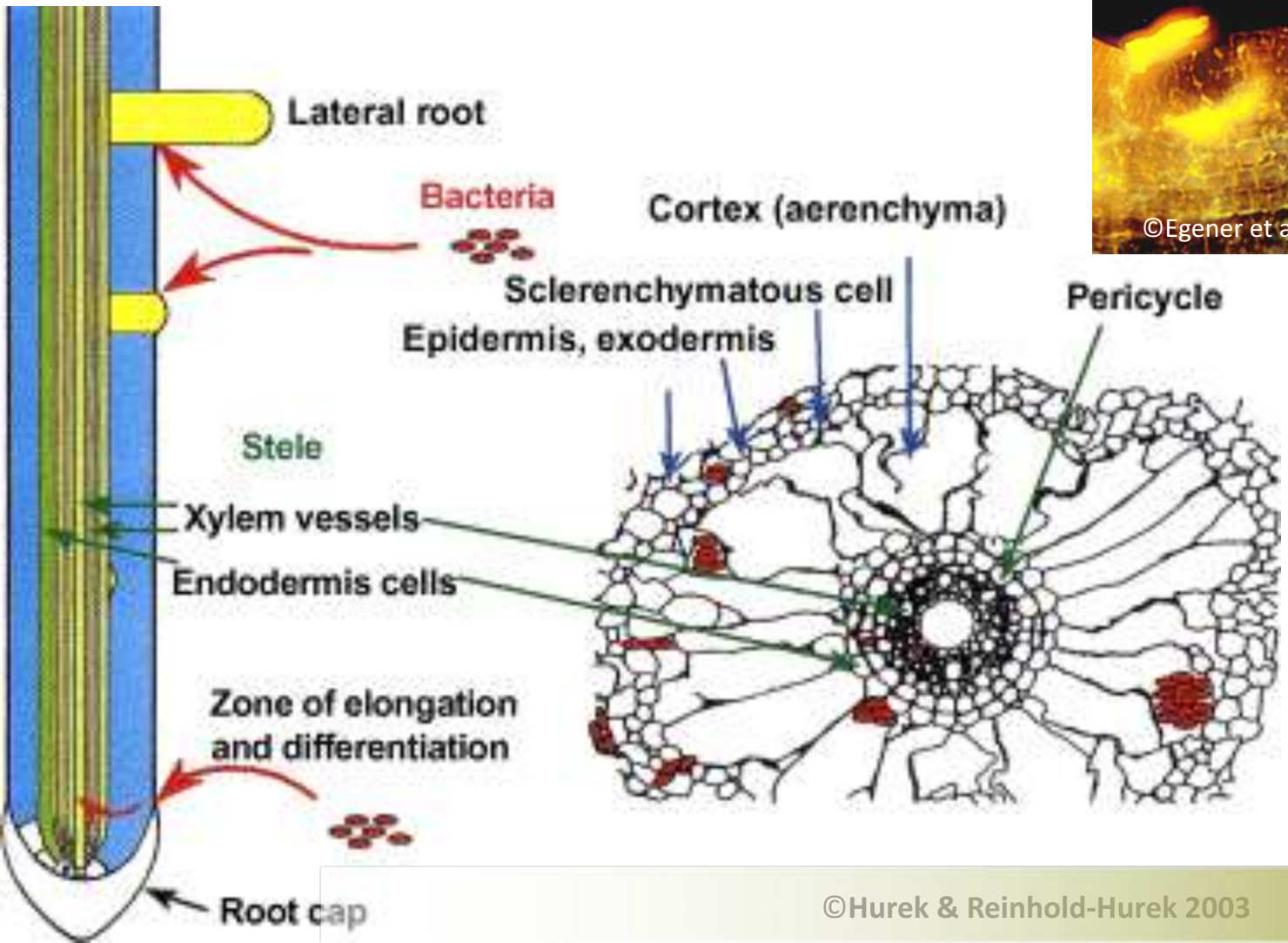
Microbial Fuel Cells (MFC)


Sangre
del Drago

Chi sono endofiti?

Endophytes, bacteria living inside plants





Il quesito?

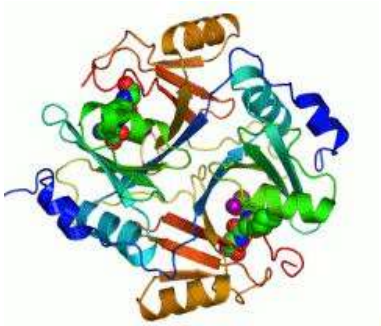
1. Are there endophytes in medicinal plants?
2. If yes, how many bacteria live inside the plant?
3. Which bacteria inhabit inside the plant?
4. Is it possible that endophytic bacteria living inside the medicinal plant might synthesize (some of) the molecules that are present in the essential oil?

Un oceano "infinito" di molecole potenzialmente utili

Un "tesoro metabolico" da un mondo invisibile

Il ventaglio delle applicazioni

- Medicina
- Ambiente
- Agricoltura
- Tecnologia




Grazie