

La Rivoluzione Microbica

The background is a dark, swirling composition of colors. On the left, a bright yellow and orange galaxy-like spiral is surrounded by blue and purple nebulae. A red and white DNA double helix is positioned in the upper center. On the right, there are clusters of yellow and green spheres, resembling microorganisms or cells, and a complex network of blue and green structures that look like a microscopic organism or a molecular model.

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*Biosaturdays 2018
Sulle tracce dell'invisibile. Il Microbioma*

17 marzo 2018 - Firenze



Caos primordiale

4 miliardi di anni fa

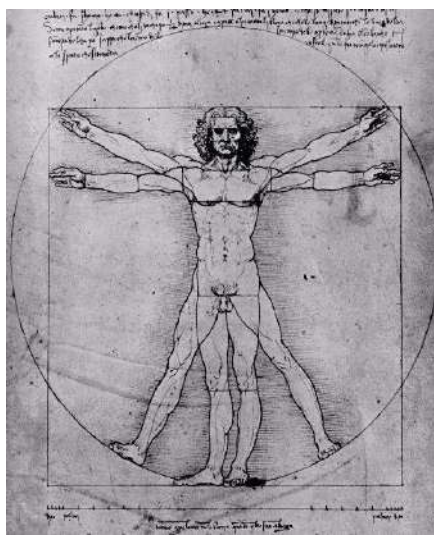


ORA !!!!

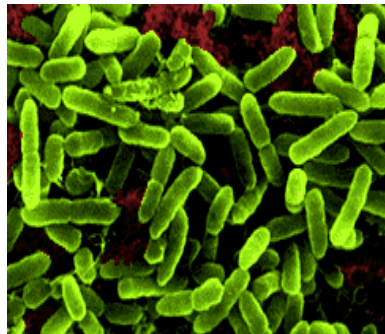
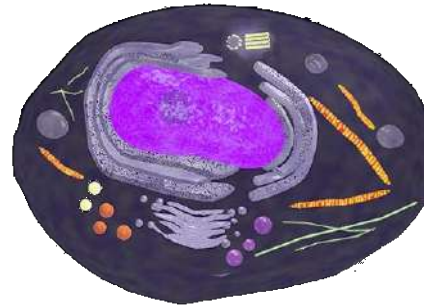
Il pianeta d'acqua







Eucarioti



Batteri

Archei





deoxyribose

DNA



DNA



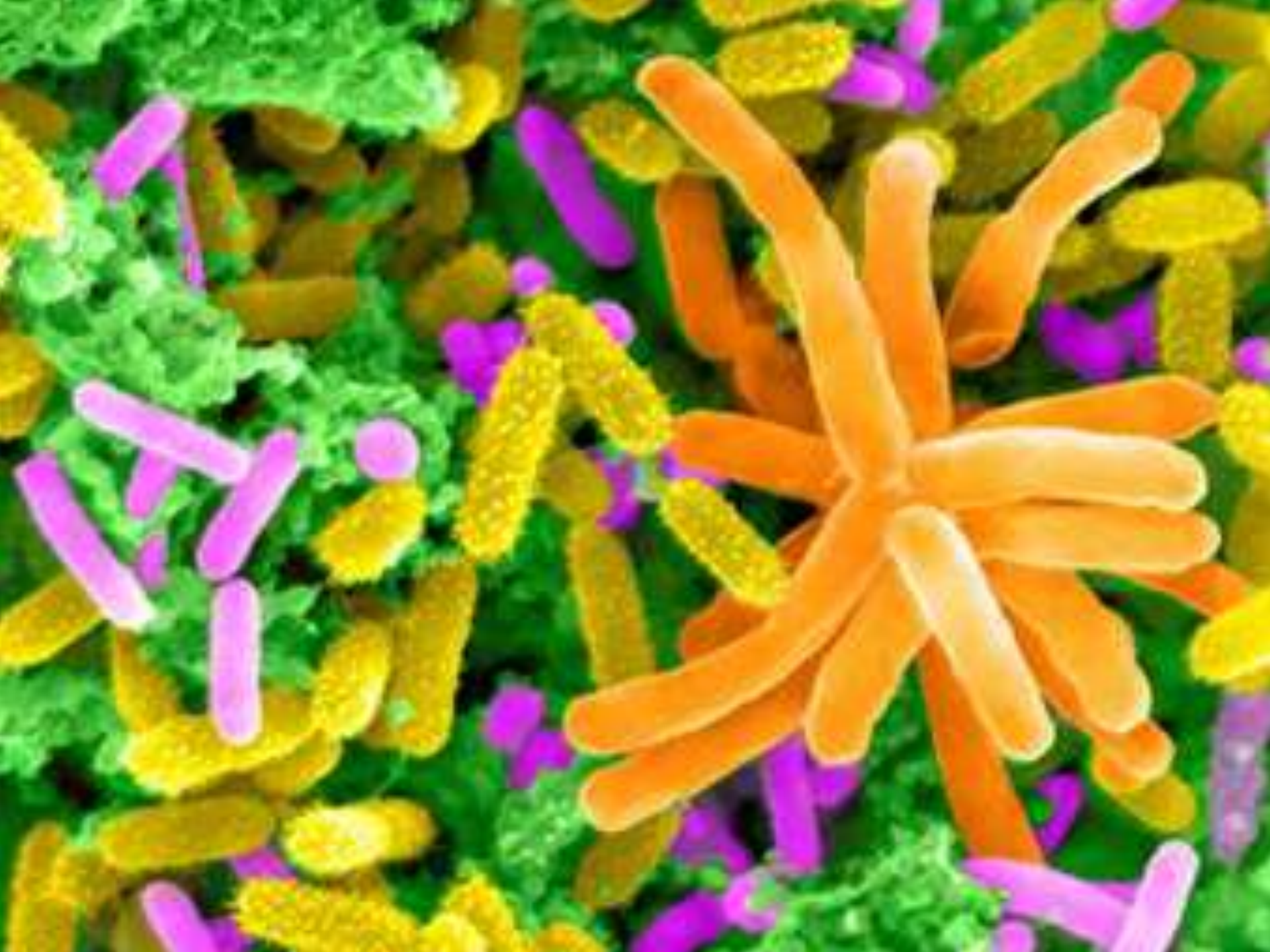
La molecola della **Vita**

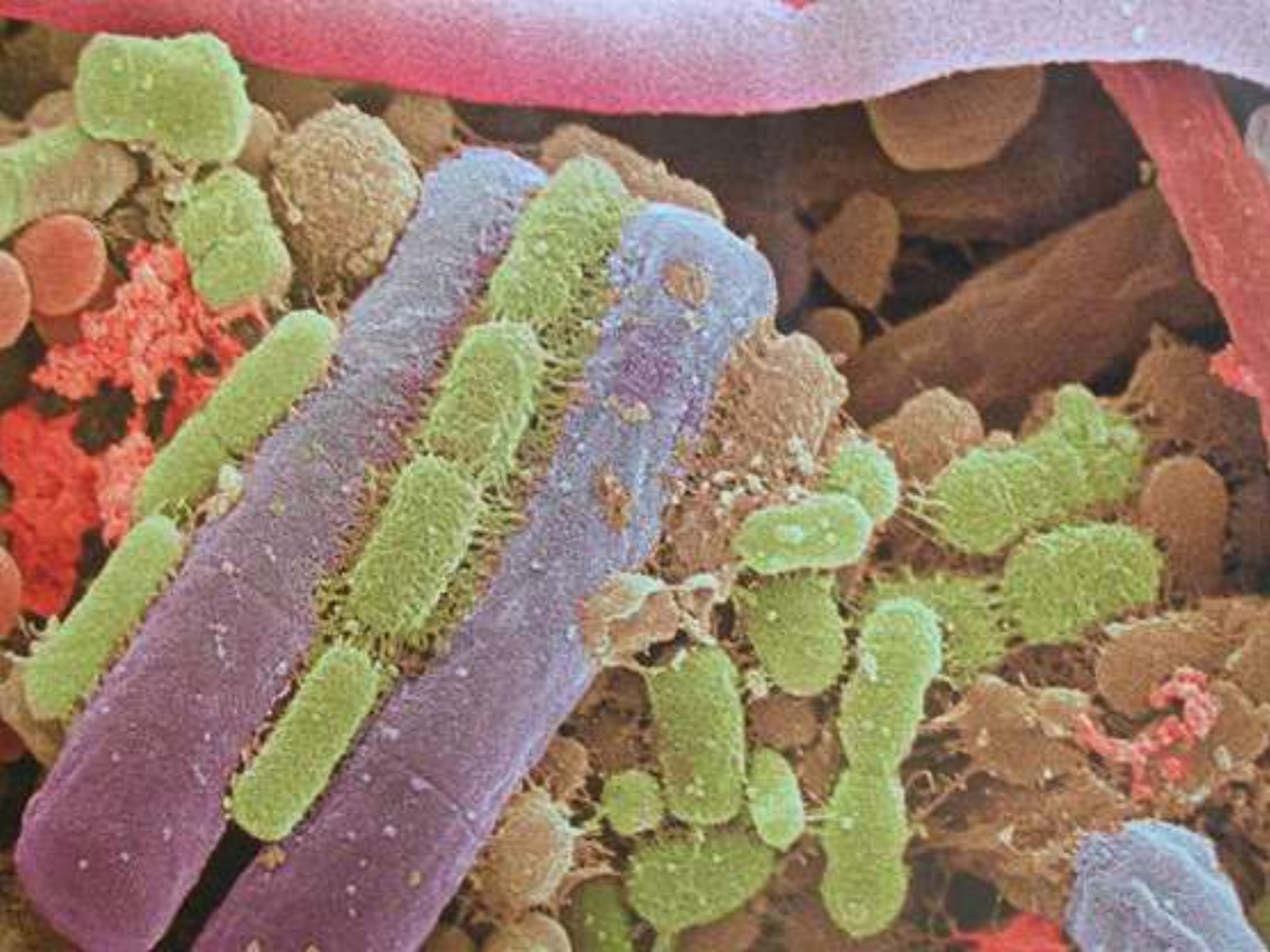


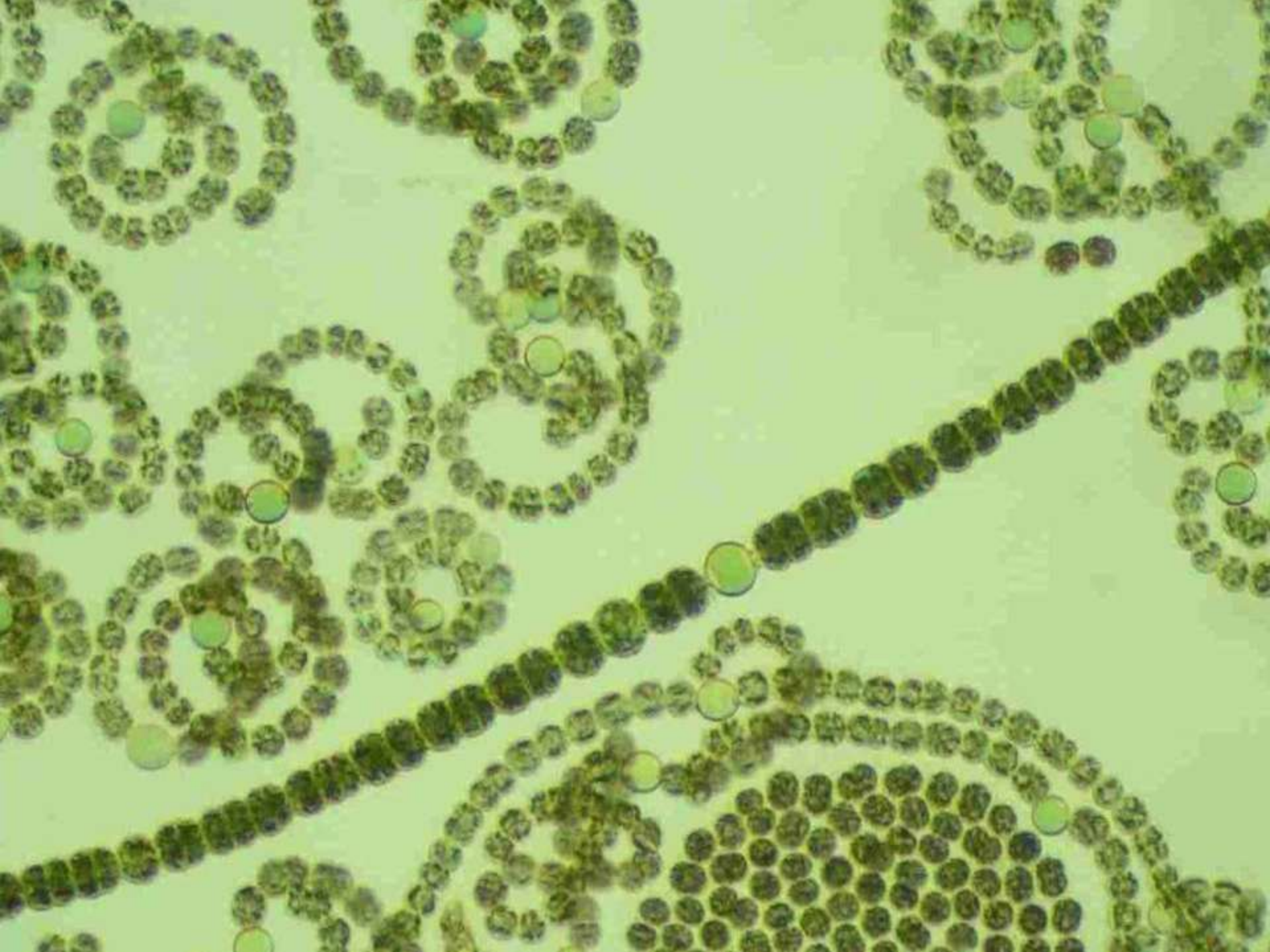
***La Rivoluzione
Microbica***

A scanning electron micrograph (SEM) showing a dense population of rod-shaped bacteria. The bacteria are interconnected by a complex network of thin, fibrous structures, likely flagella or pili. The overall appearance is a tangled mass of brownish, textured rods.

*Chi sono i
batteri?*

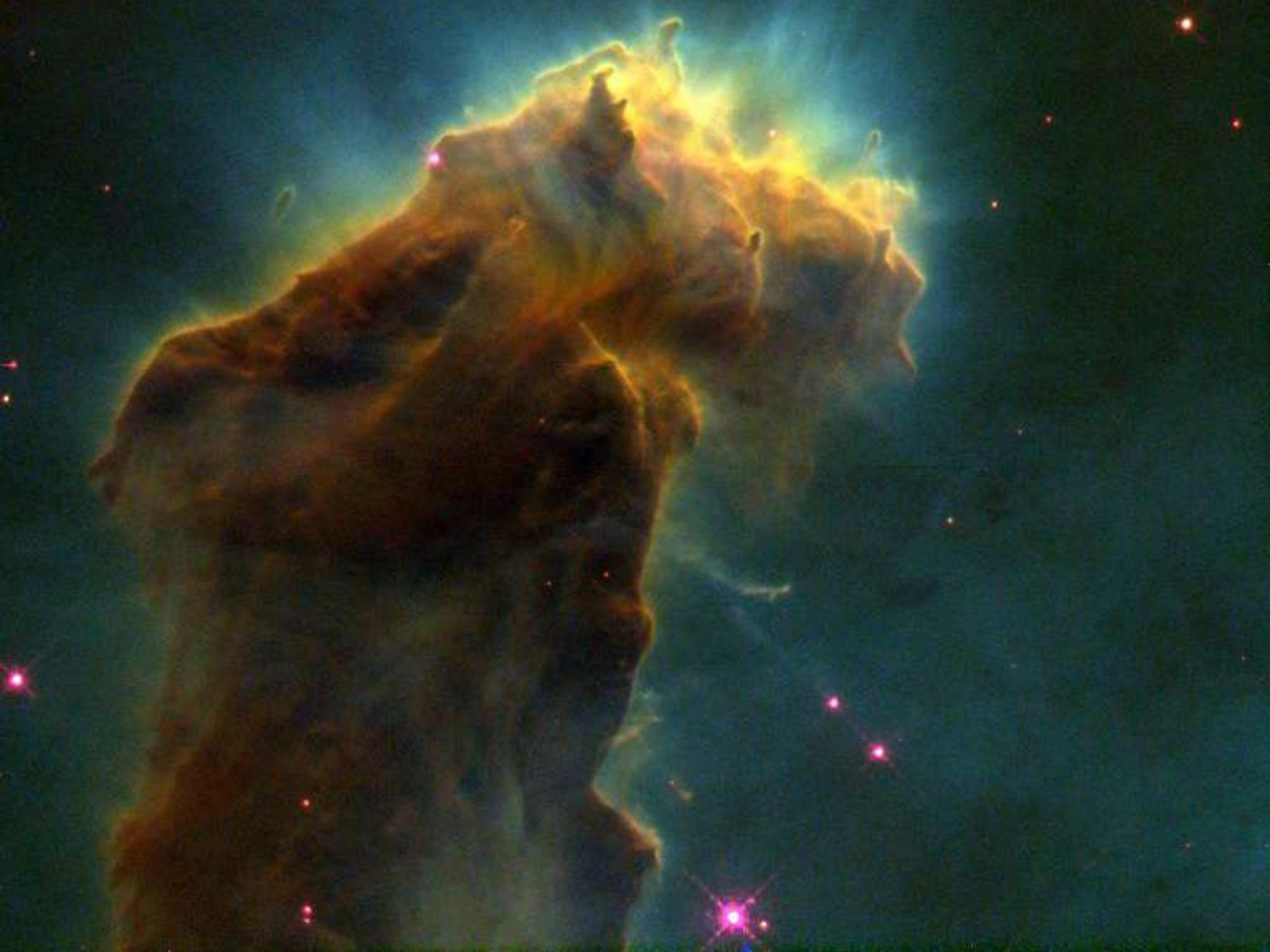


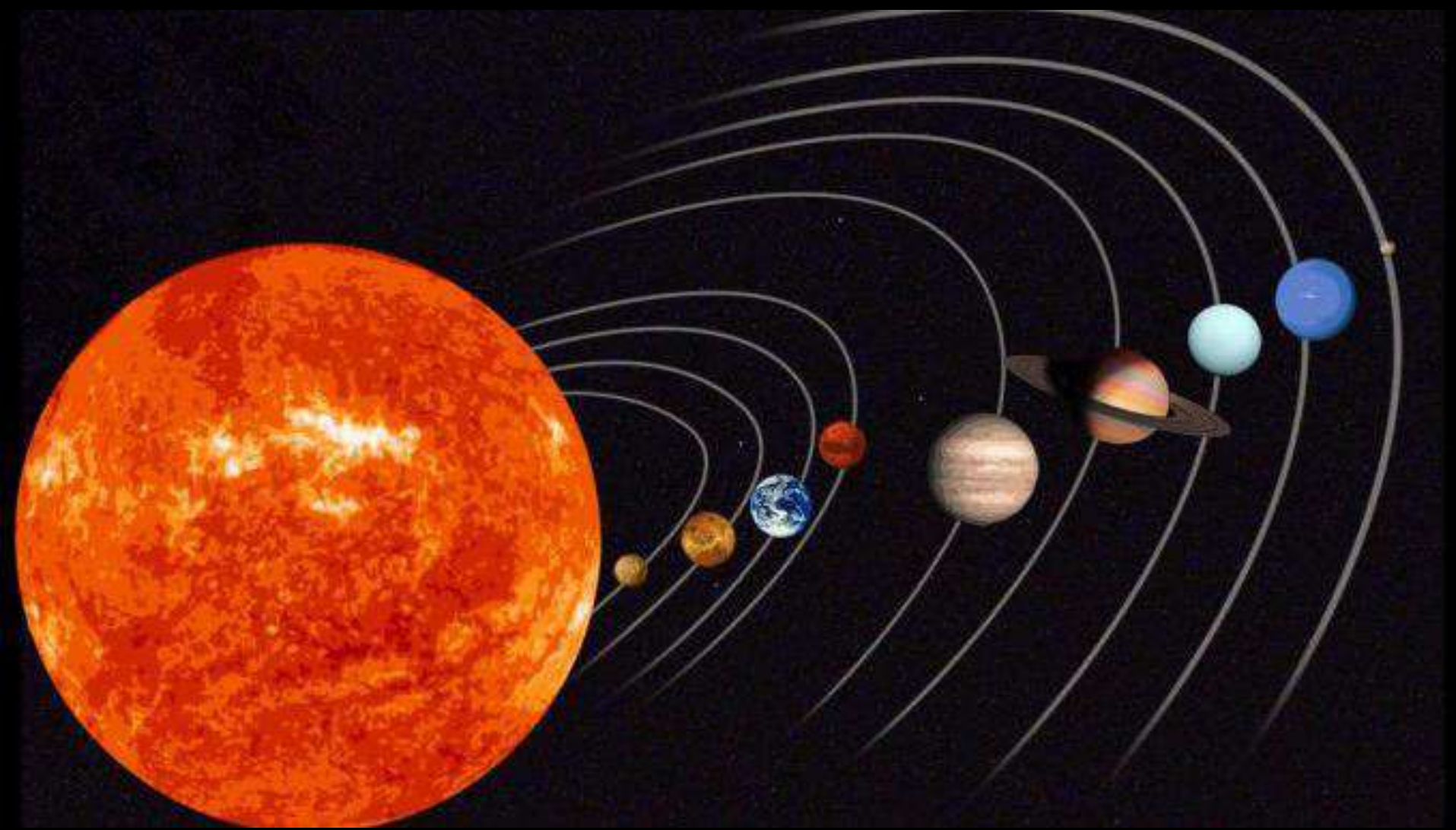


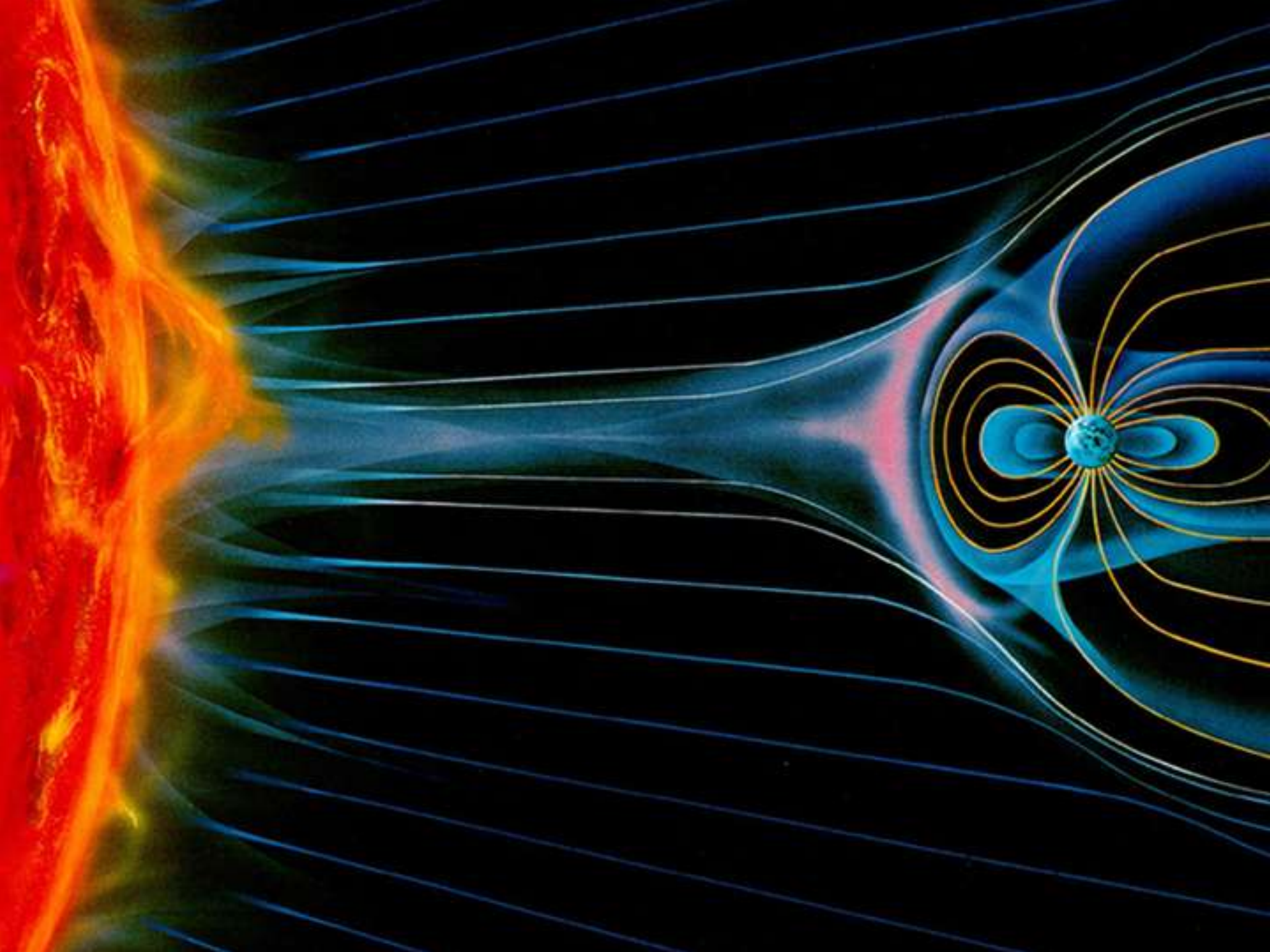


A scanning electron micrograph (SEM) showing a dense population of rod-shaped bacteria. The bacteria are brownish in color and are interconnected by a network of thin, fibrous filaments. The overall appearance is that of a complex, interconnected microbial community.

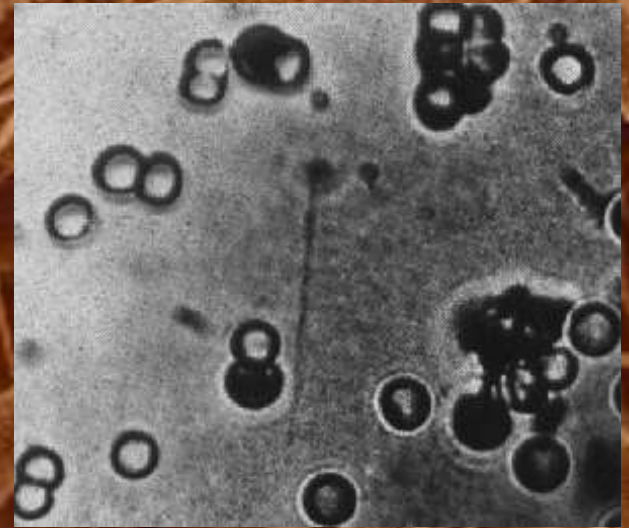
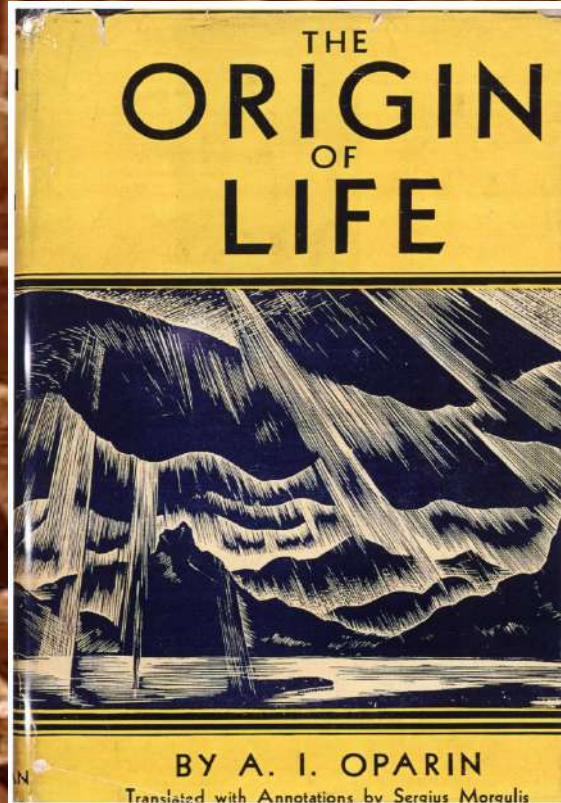
*Origine
dei batteri?*







Alexander I. Oparin



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

Ipotesi di Oparin-Haldane



“Il Brodo Primordiale”



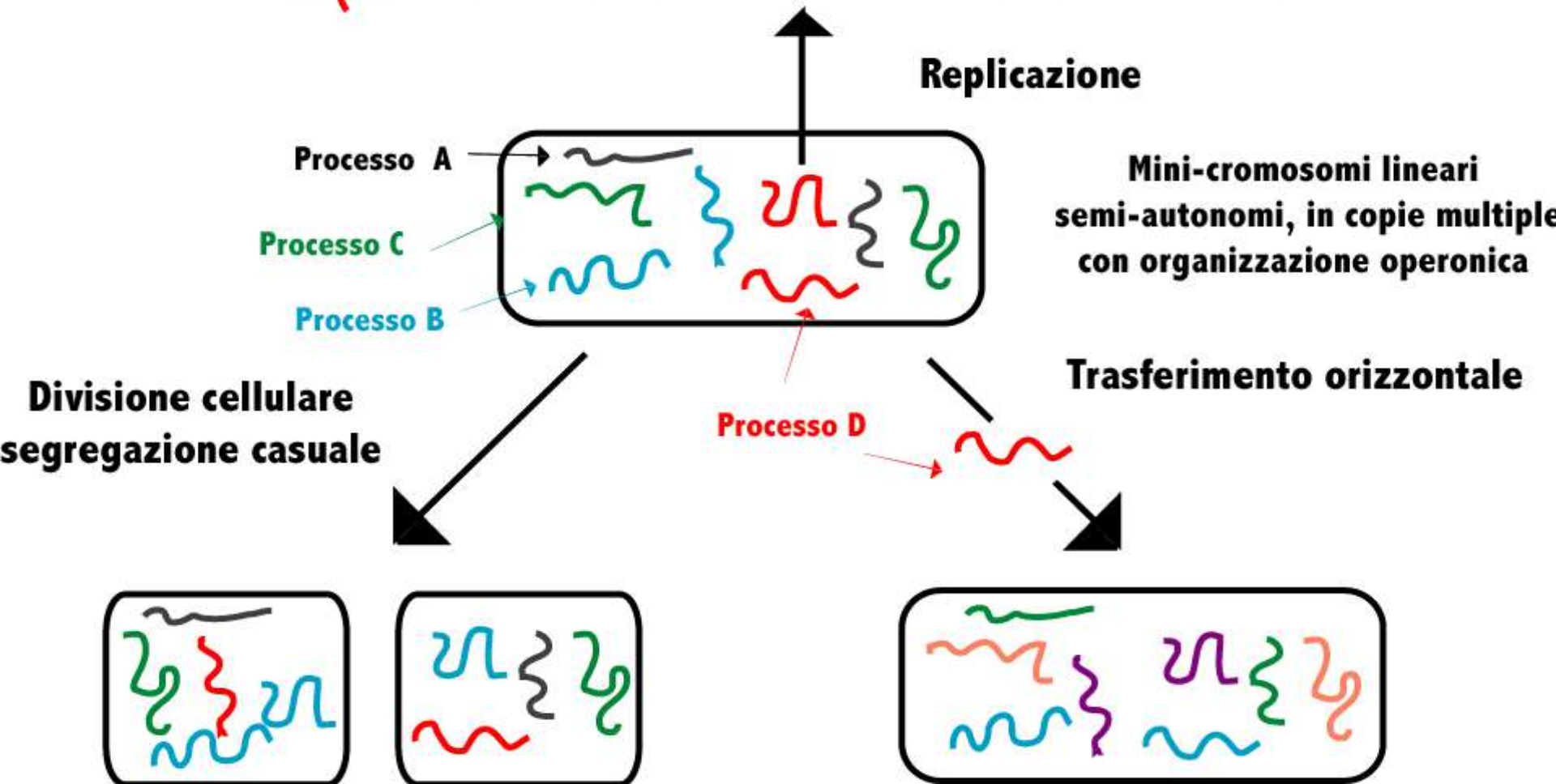


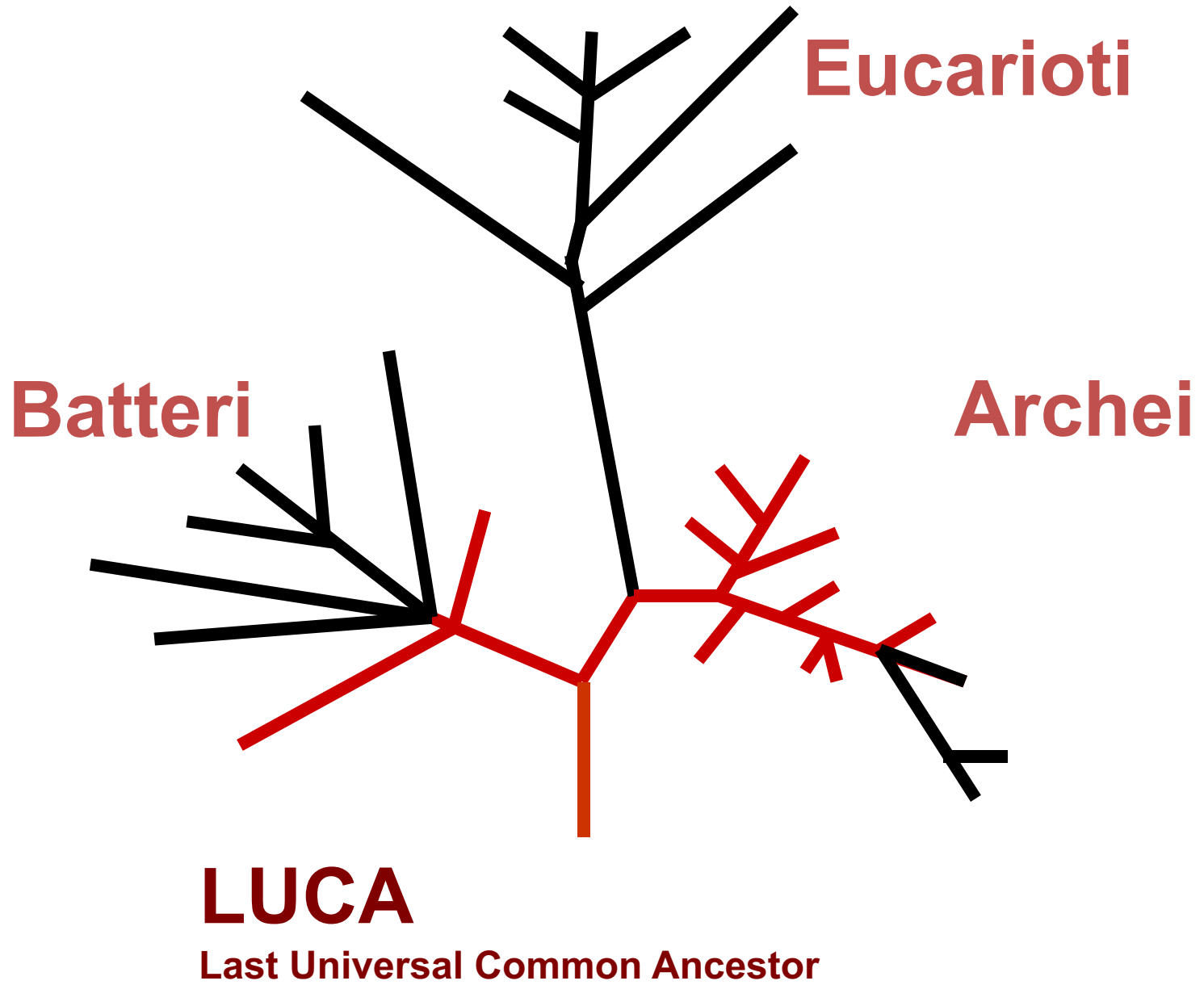
**Le CELLULE PRIMORDIALI
erano**

**ANAEROBIE e
ETEROTROFE**

LUCA (Last Universal Common Ancestor)

L'ultimo progenitore comune






A microscopic view of green algae, showing several long, curved chains of small, spherical cells. The cells are arranged in a regular, repeating pattern, forming a helical or zigzag structure. The background is a light, pale green color.

***Qualcosa è
successo***

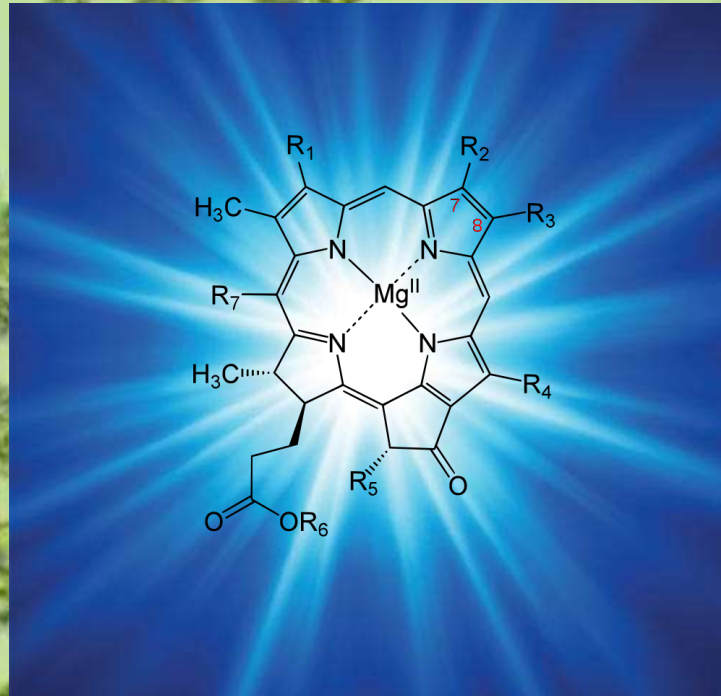


***Qualcuno
ha
imparato!!!***

A microscopic view of green algae filaments, showing several chains of small, round, green cells. The cells are arranged in various patterns, including straight lines and curved arcs. The background is a light, yellowish-green color.

***A fare che
cosa?***

Clorofilla



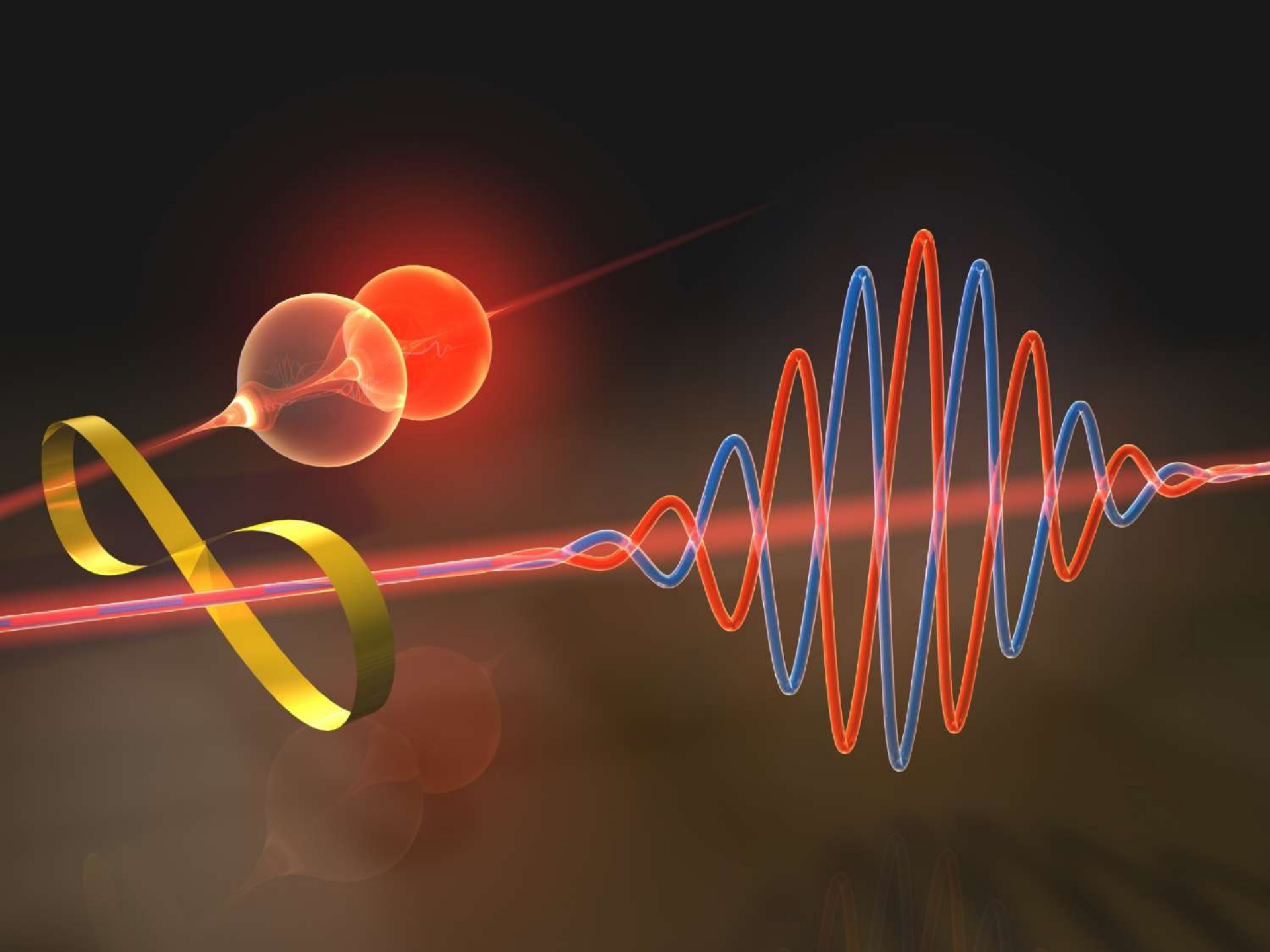




Foto-sintesi


I “mangiatori” di luce

A microscopic image showing several chains of cyanobacteria. The chains are composed of small, spherical cells, some of which are larger and more prominent, likely representing heterocysts. The chains are arranged in various orientations, including curved and straight lines. The background is a light, pale green color.

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

A scanning electron micrograph (SEM) showing a dense population of rod-shaped bacteria. The bacteria are interconnected by a complex network of thin, fibrous structures, likely extracellular polymeric substances (EPS) or biofilm matrix. The overall appearance is a textured, brownish-gold surface.

*Dove vivono
i batteri?*

I BATTERI SONO UBIQUITARI

SUOLO

AMBIENTI NATURALI

AMBIENTI ESTREMI

ACQUA

ANIMALI

ARIA

**Strutture di
origine antropica**

AMBIENTI ARTIFICIALI

A scanning electron micrograph (SEM) showing a dense network of brown, rod-shaped bacteria. The bacteria are interconnected by a complex web of thin, fibrous structures, likely extracellular polymeric substances (EPS) or biofilm matrix. The overall appearance is that of a highly organized, interconnected microbial community.

Extremofili

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

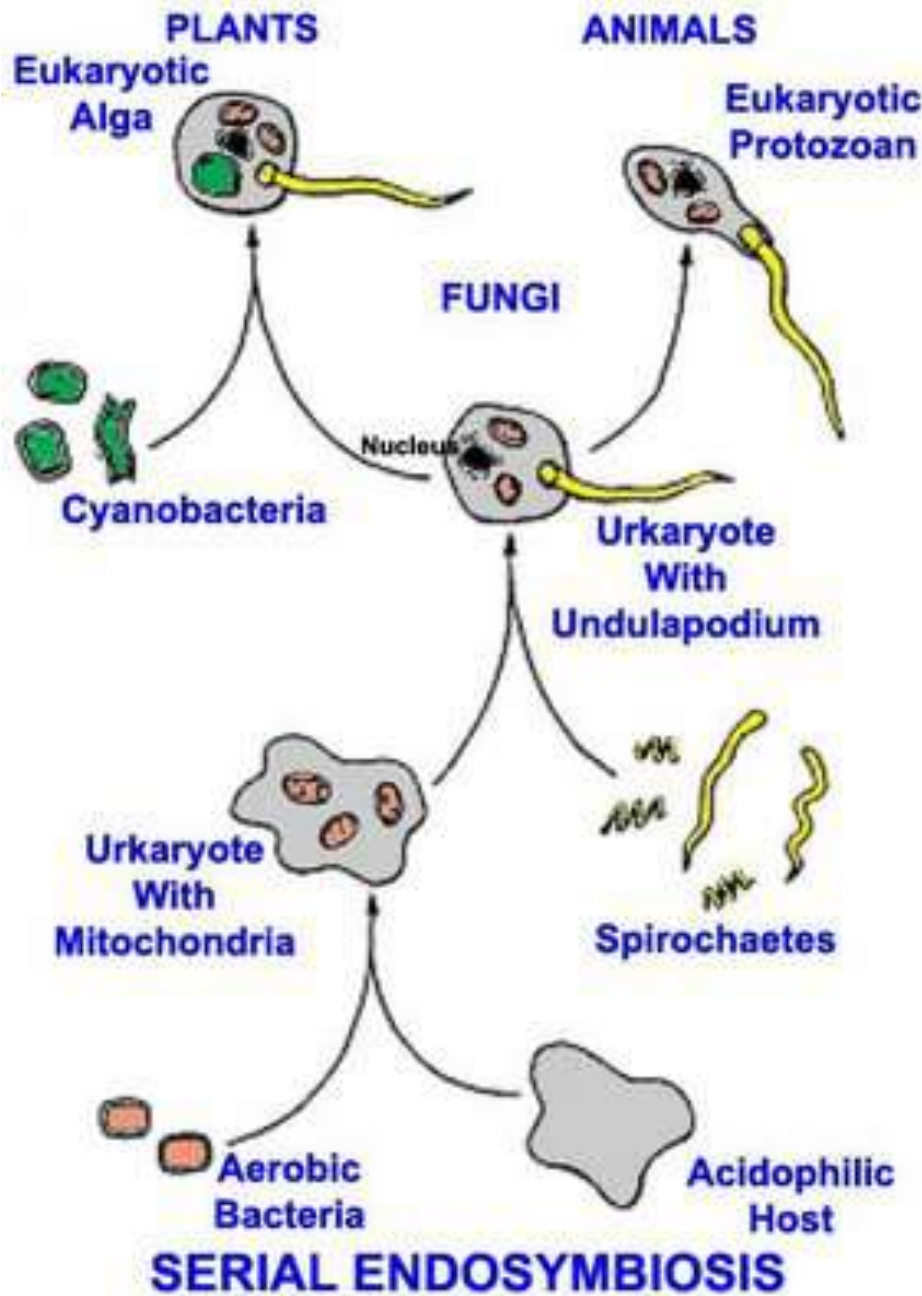
T = 60- 80 °C

Iper-termofili T > 80°C

A microscopic image showing a dense population of brown, rod-shaped bacteria. Many of these bacteria have numerous thin, hair-like flagella extending from their surfaces, giving them a fuzzy or filamentous appearance. The bacteria are scattered across the field of view, with some appearing in small clusters.

Endosimbionti

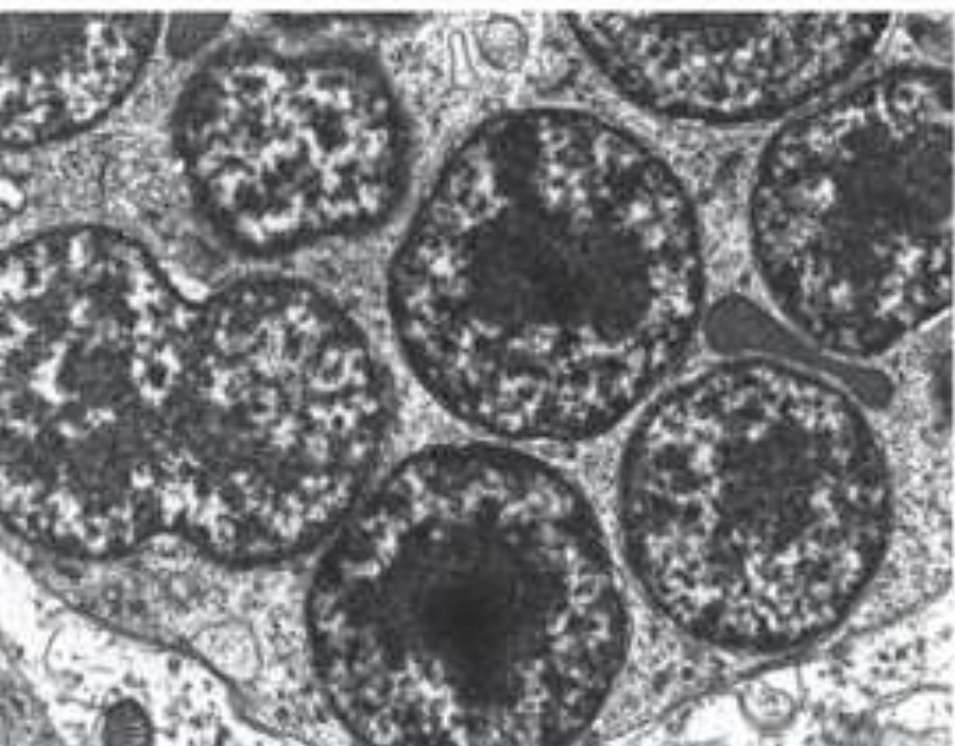
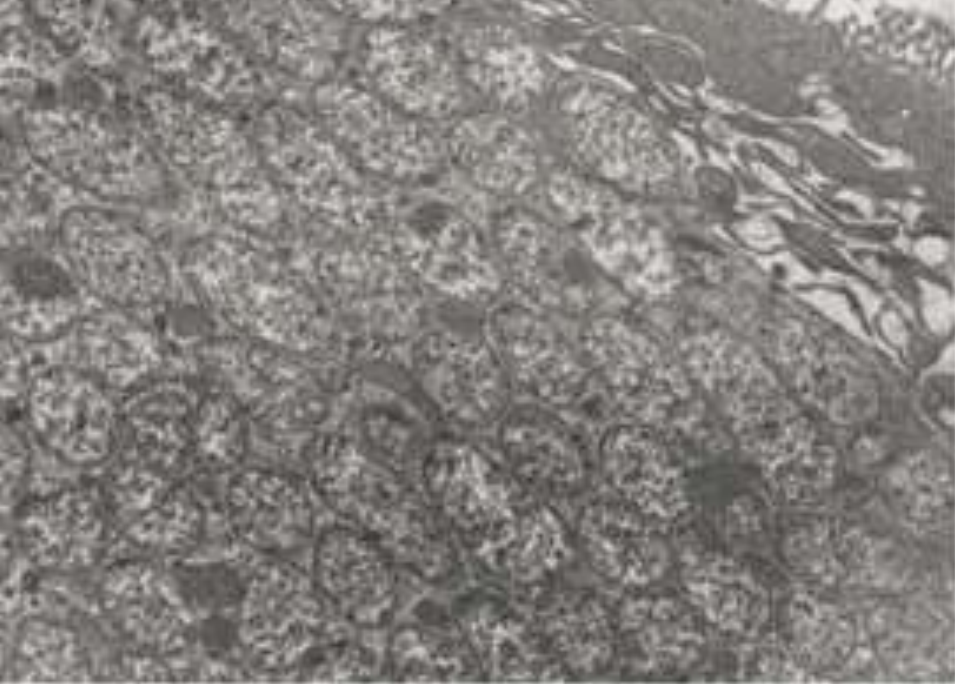
Organismi procarioti esterni
che introducendosi nella
cellula hanno dato origine agli
organuli delle cellule
eucariotiche



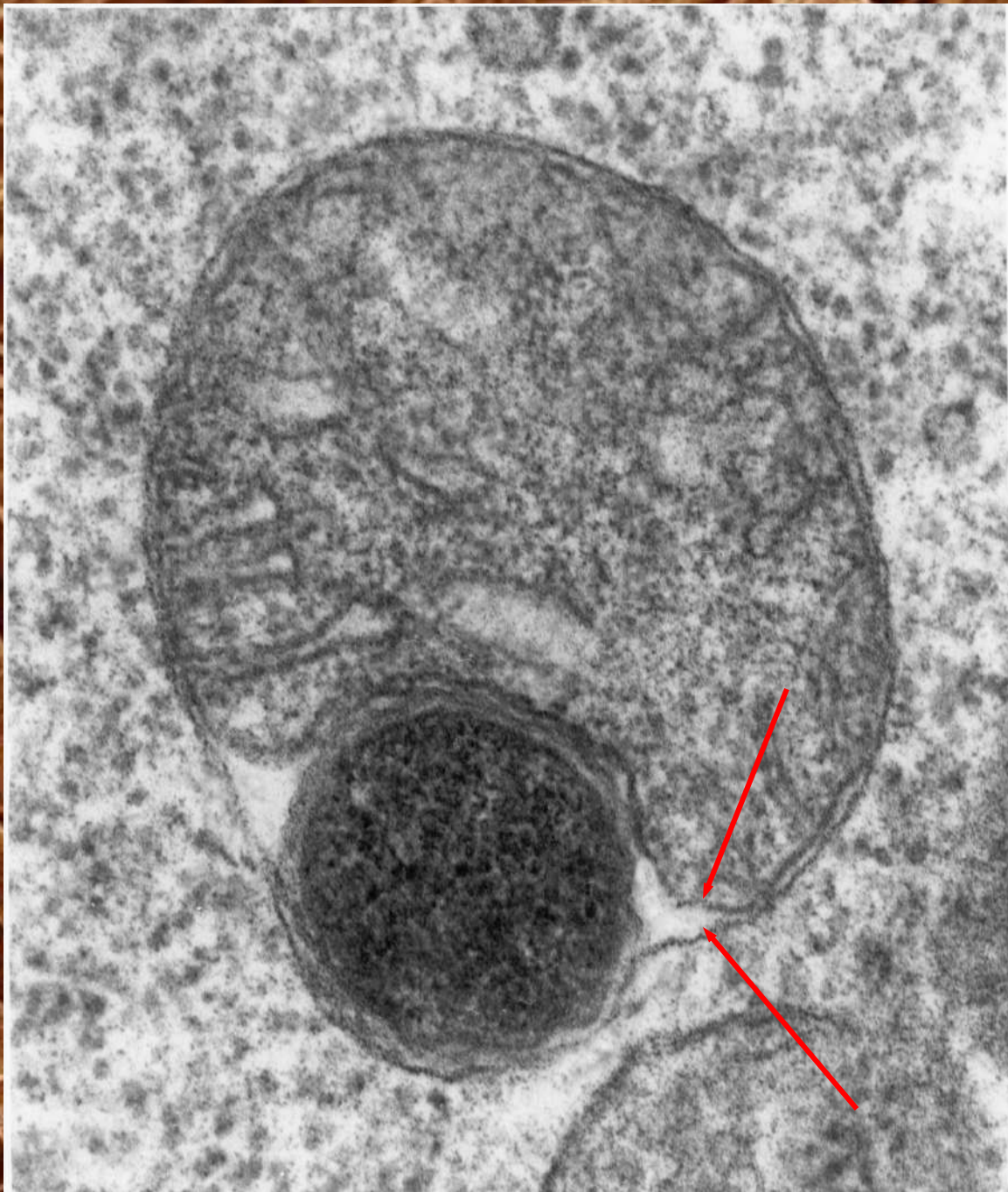
Lynn Margulis

ENDOSIMBIOSI





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)



A dense, multi-colored microscopic view of a microbial community. The organisms are small, rod-shaped and circular, appearing in various colors including green, blue, red, and white. They are scattered across a dark background, with a central area showing a higher concentration of white and light-colored organisms.

E noi ?

A dense, colorful field of microscopic organisms, likely bacteria, in various shapes and sizes, including rods, cocci, and spirals, set against a dark background. The colors range from green and blue to red and yellow.

***Il microbiota
umano***

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

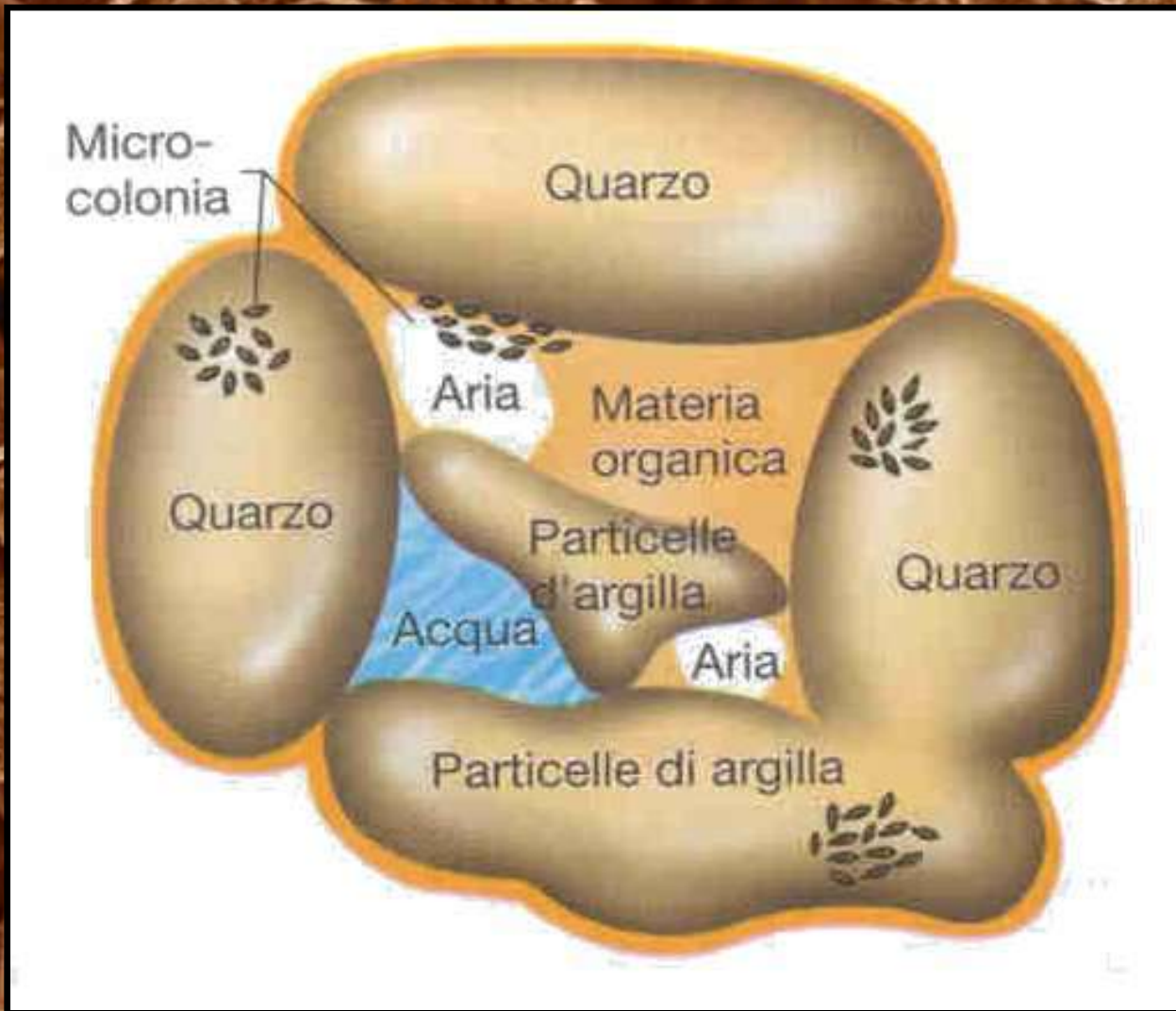




*Non siamo
soli!*



*Come vivono e
come
interagiscono ?*



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

Negli ambienti naturali è raro trovare singole popolazioni



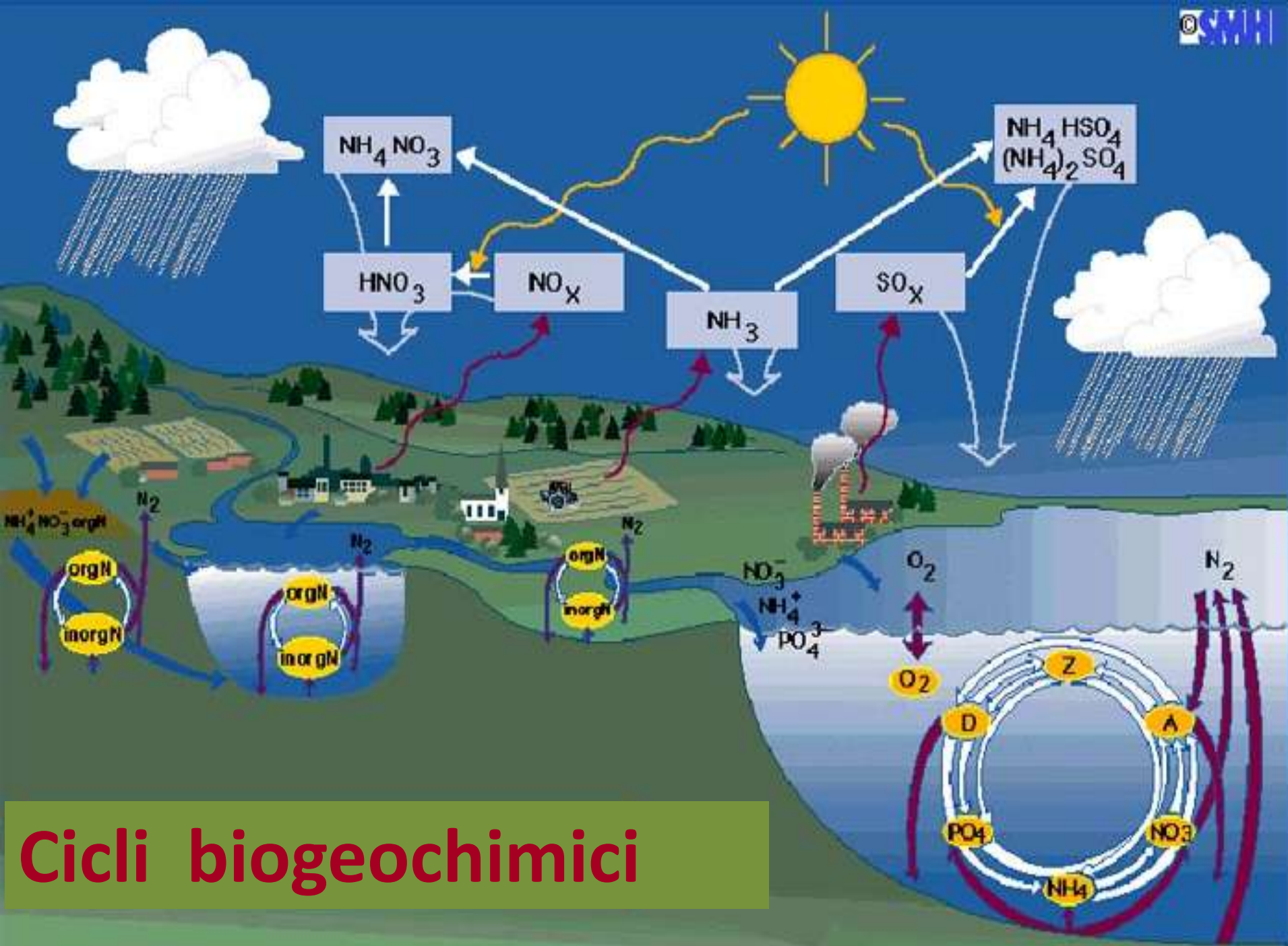
E' molto più frequente trovare
**COMUNITA'
MICROBICHE**





**Democrazia
e
Cooperazione**

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



A scanning electron micrograph (SEM) showing a dense network of brown, rod-shaped bacteria. The bacteria are interconnected by a complex web of thin, fibrous structures, forming a biofilm. The overall appearance is a tangled, porous structure. The text "Perché lo fanno?" is overlaid in the center in a white, sans-serif font with a slight shadow.


*Perché lo
fanno?*

The background of the image is a dense field of microscopic, brown, rod-shaped bacteria. Each bacterium has several long, thin, hair-like flagella extending from its ends. The bacteria are scattered across the frame, creating a complex, textured pattern. The overall color is a warm, brownish-orange.

Per
sopravvivere
nell'ambiente
naturale

A scanning electron micrograph (SEM) of a bacterial biofilm. The image shows a complex, three-dimensional network of interconnected bacterial cells and extracellular polymeric substances (EPS). The cells are stained in various colors, including red, green, and blue, highlighting different components or structures within the biofilm. The overall appearance is that of a dense, porous, and highly textured community of microorganisms.

**Il mondo
batterico
è inesplorato!!**



**Non conosciamo
tutti i processi
che possono
svolgere**

The background is a dark, swirling composition of various elements. On the left, a bright yellow and orange galaxy core is surrounded by blue and purple nebulae. A red and blue DNA double helix structure is positioned in the upper left. To the right, there is a cluster of glowing green and yellow spheres, some resembling cells or molecules. Below this, a globe of the Earth is shown with various green plants and small blue spheres. The overall effect is a sense of dynamic energy and interconnectedness.

Il sogno?



Potenzialità metaboliche

A scanning electron micrograph (SEM) showing a dense population of rod-shaped bacteria. The bacteria are brownish in color and have numerous flagella extending from their surfaces. They are arranged in a complex, interconnected network. The background is a dark, textured surface.

MOLECOLE
Biologicamente
ATTIVE



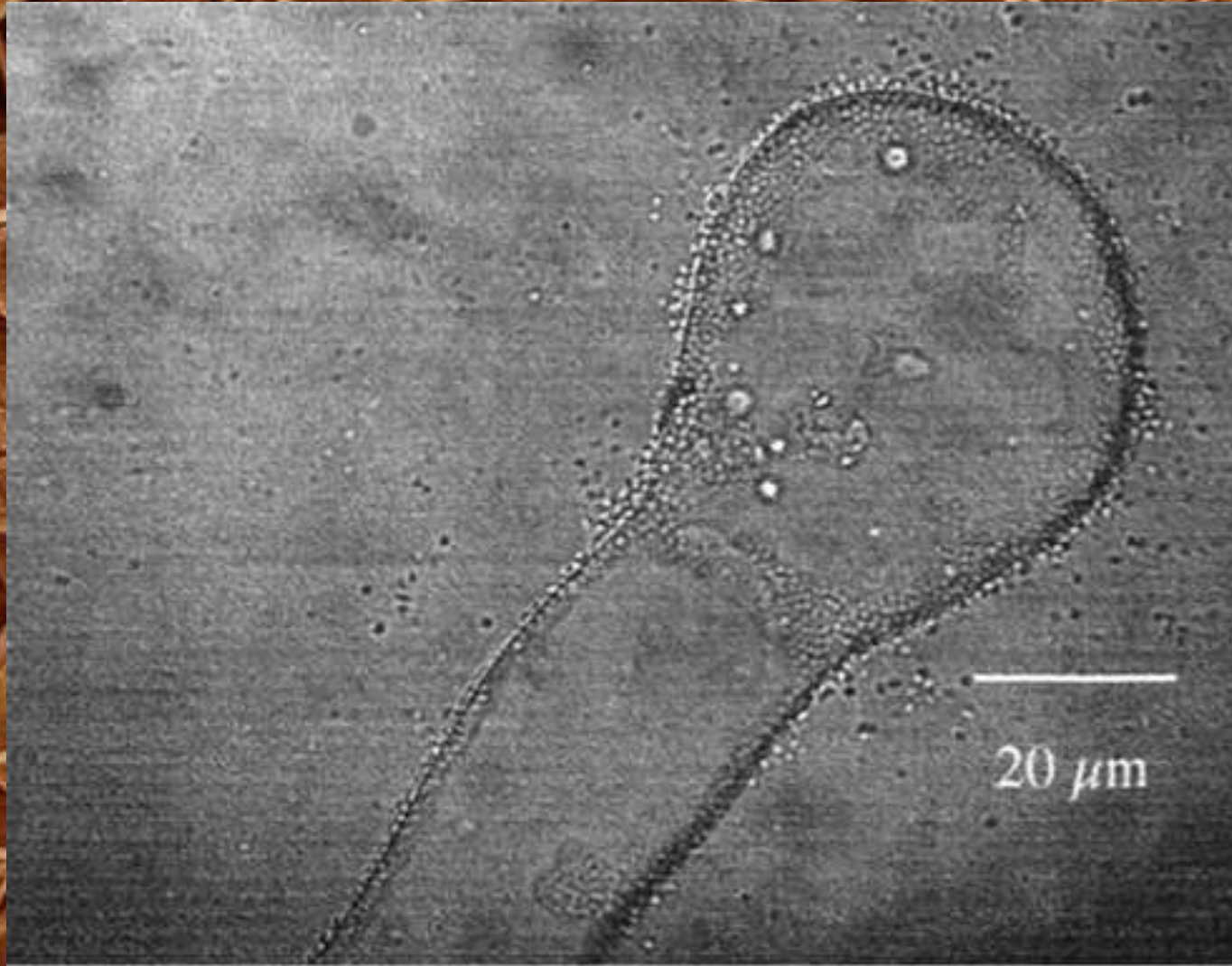
Come
"sfruttarle"?

Oil spill



Release of liquid hydrocarbon in the environment especially marine areas

A. venetianus VE-C3



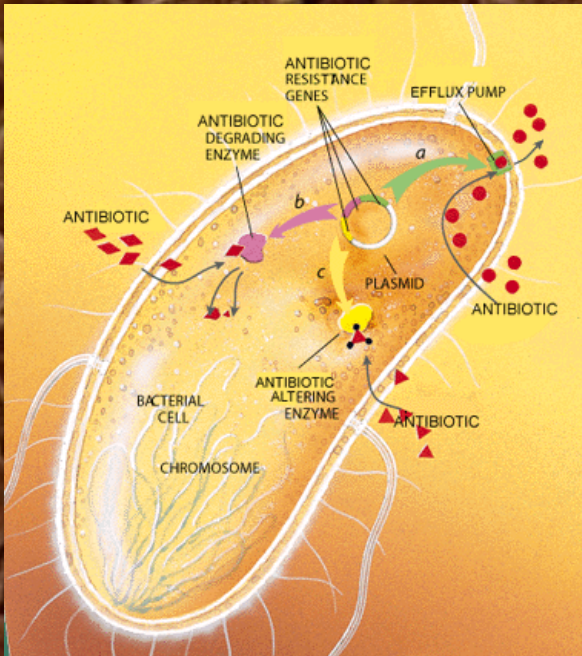
BIORISANAMENTO

The image is a complex digital composition. On the left, a bright yellow and orange spiral, resembling a galaxy or a biological structure, is surrounded by swirling blue and purple patterns. In the upper center, a red and white DNA double helix is visible. To the right, there is a cluster of green and yellow cells, some of which are glowing. Below this, a small globe with green plants is shown. The overall background is dark with various abstract shapes and colors, creating a sense of depth and movement.



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 bacteria*

COMBAT DRUG RESISTANCE

DRUG RESISTANCE

LACK OF RESEARCH, NO COMMITMENT, WEAK SURVEILLANCE, POOR DRUG QUALITY, IRRATIONAL DRUG USE, NO INFECTION CONTROL

No action today, no cure tomorrow

7 APRIL 2011 WORLD HEALTH DAY

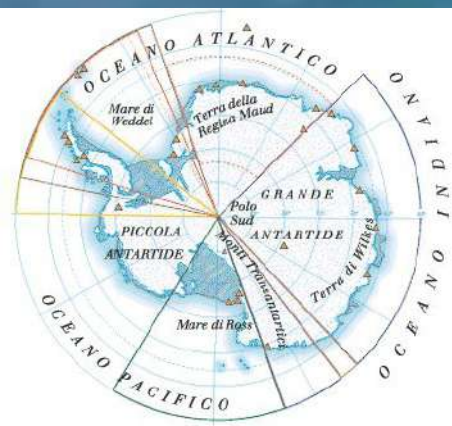
World Health Organization

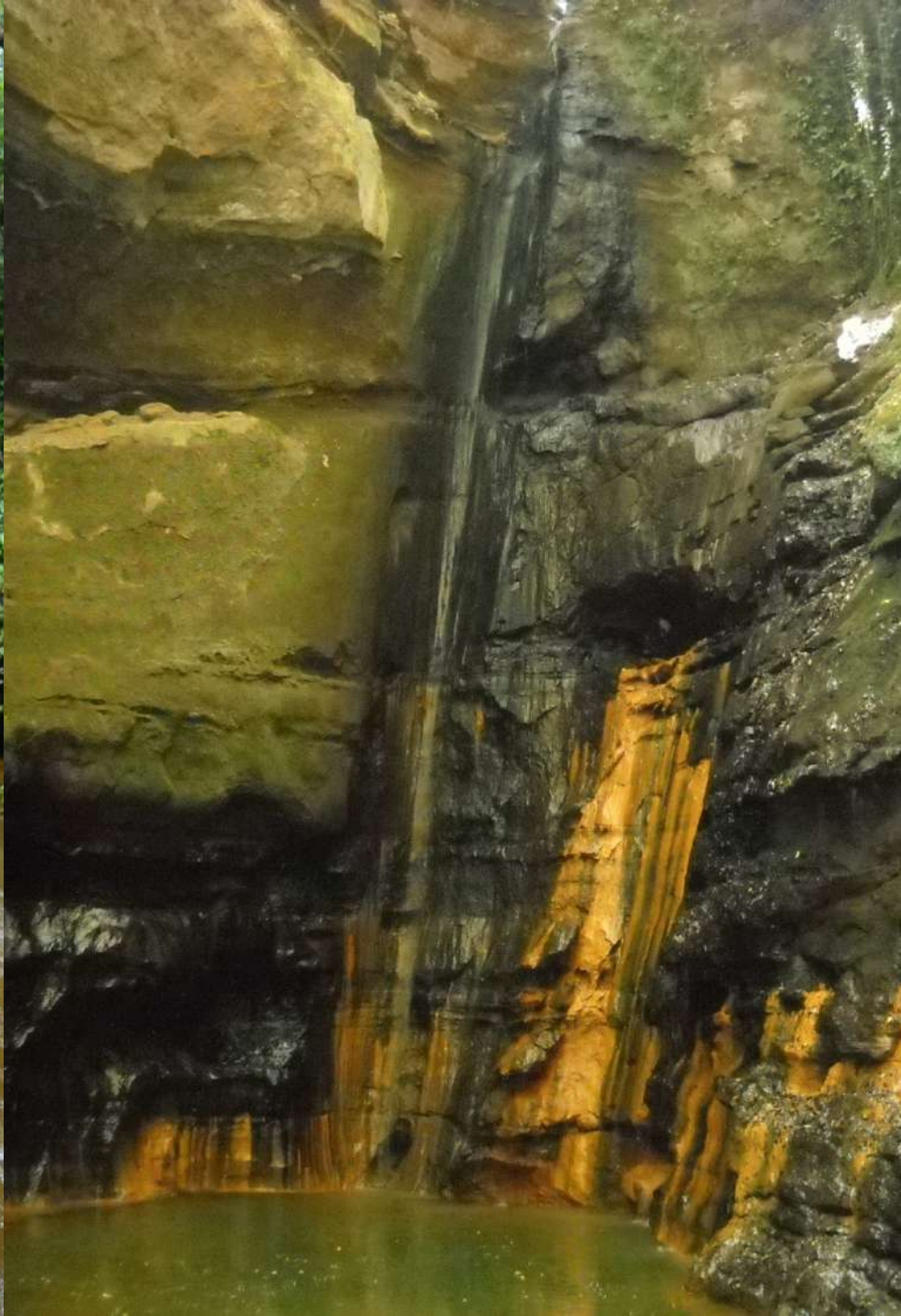
Research efforts are now focusing on the discovery of

Dove cercarli ?

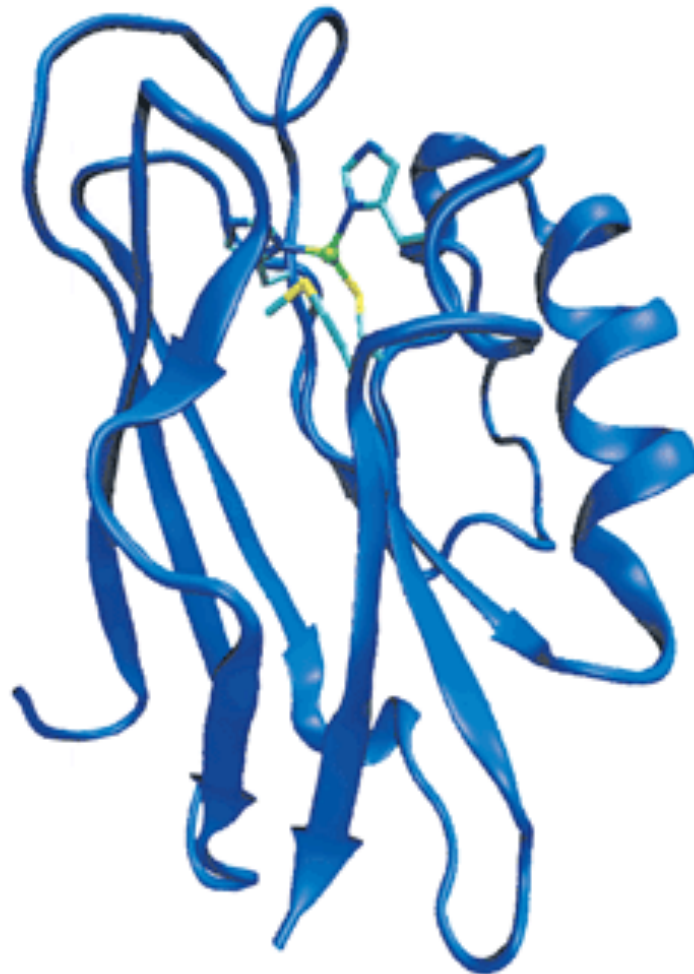
Research efforts are now focusing on the discovery of

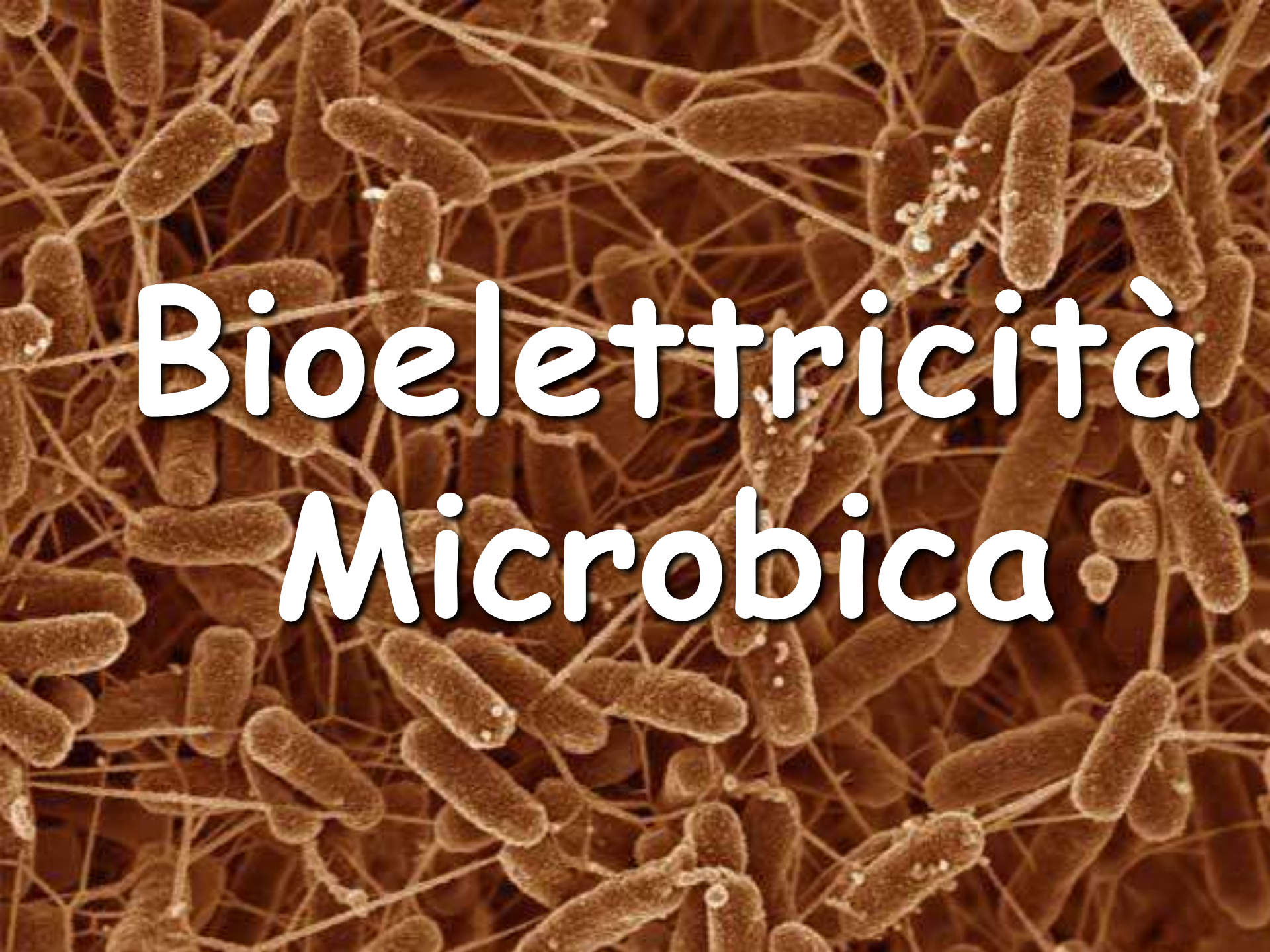
**Novel natural
antibiotics** from
unusual sources





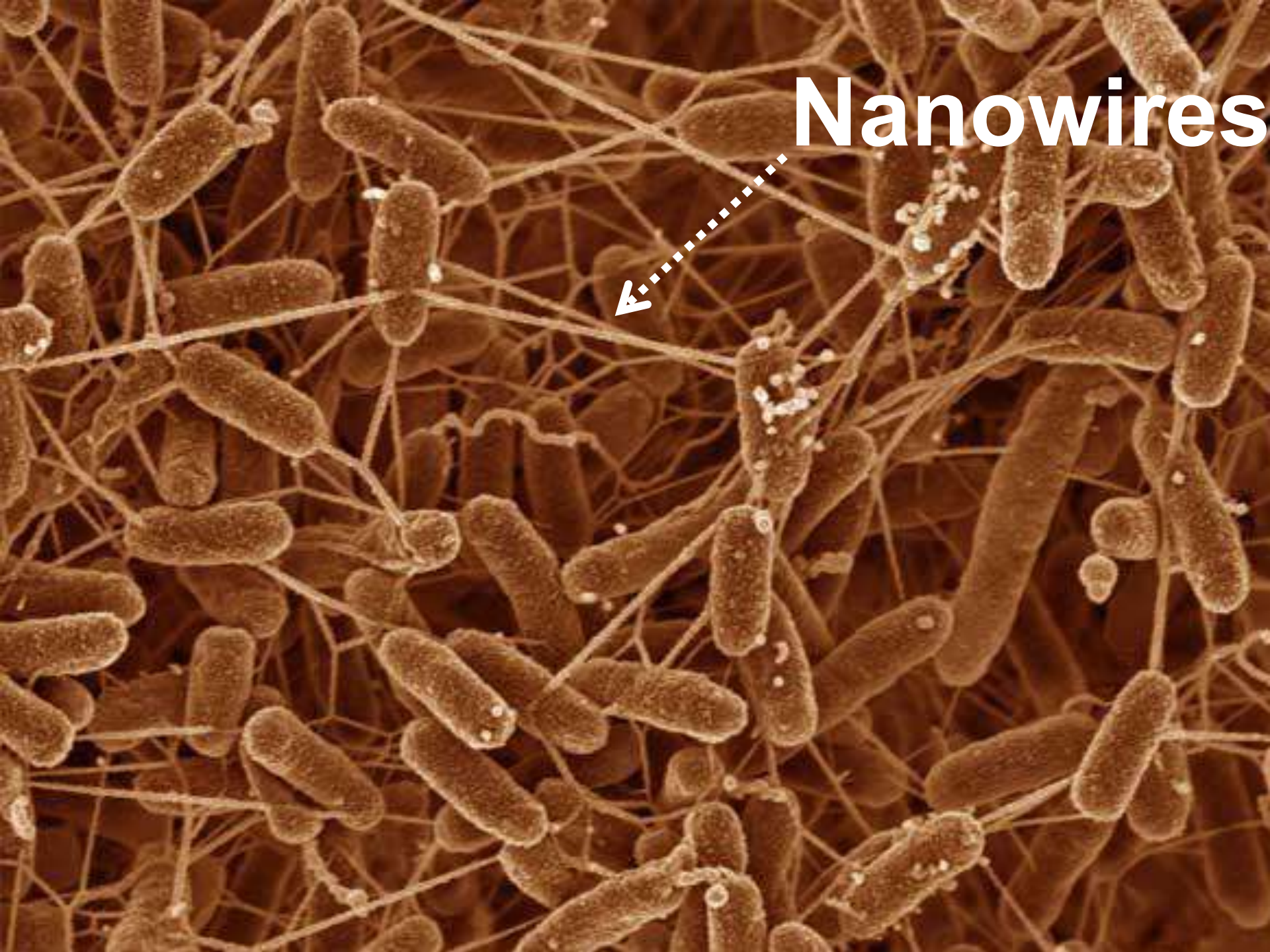
Azurin

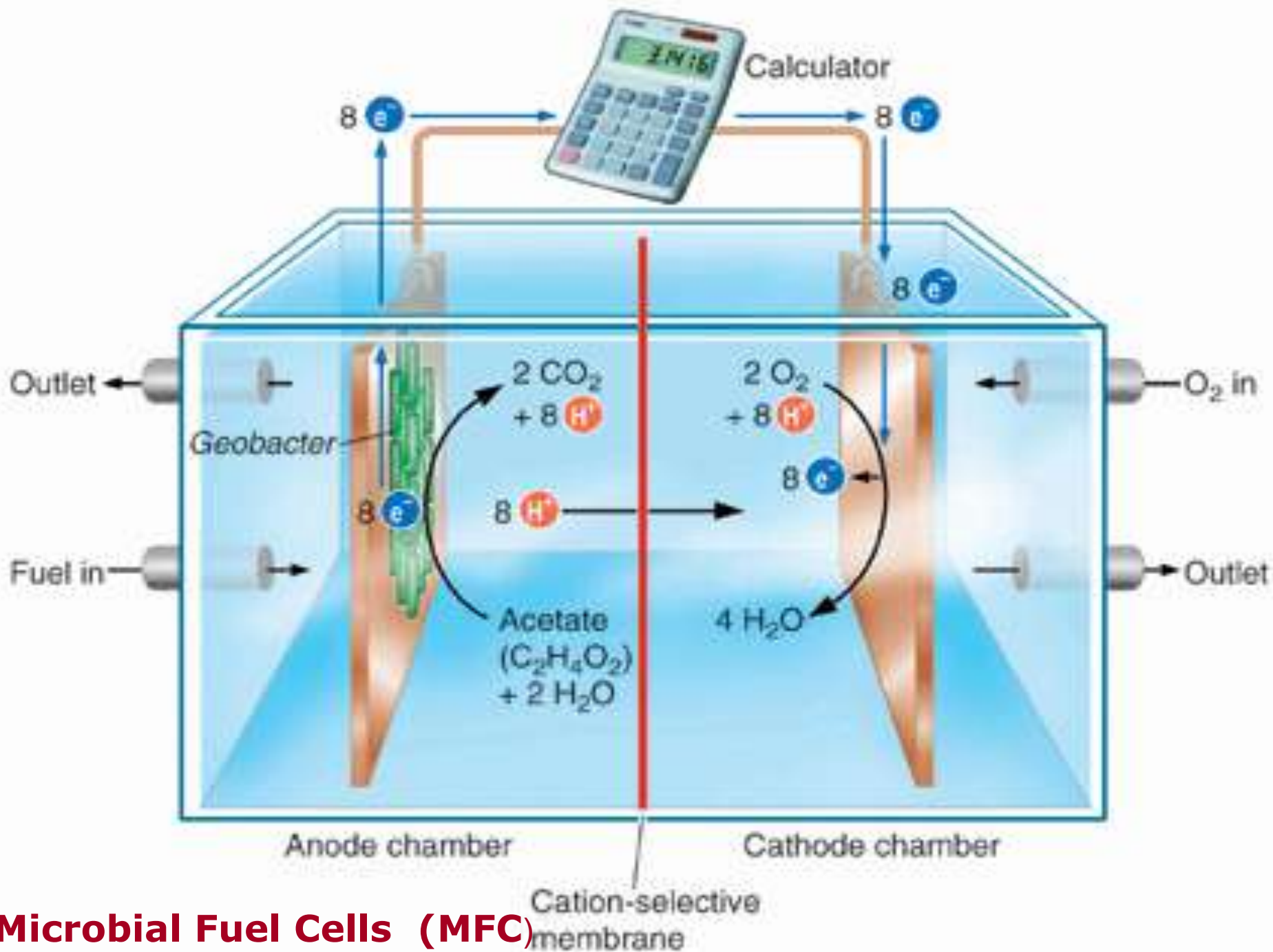


The image shows a dense network of brown, filamentous structures, likely a microbial biofilm. The filaments are interconnected and form a complex, mesh-like pattern. The overall color is a warm, brownish-orange. Overlaid on this background is the text "Bioelettricità Microbica" in a large, white, sans-serif font with a slight drop shadow.

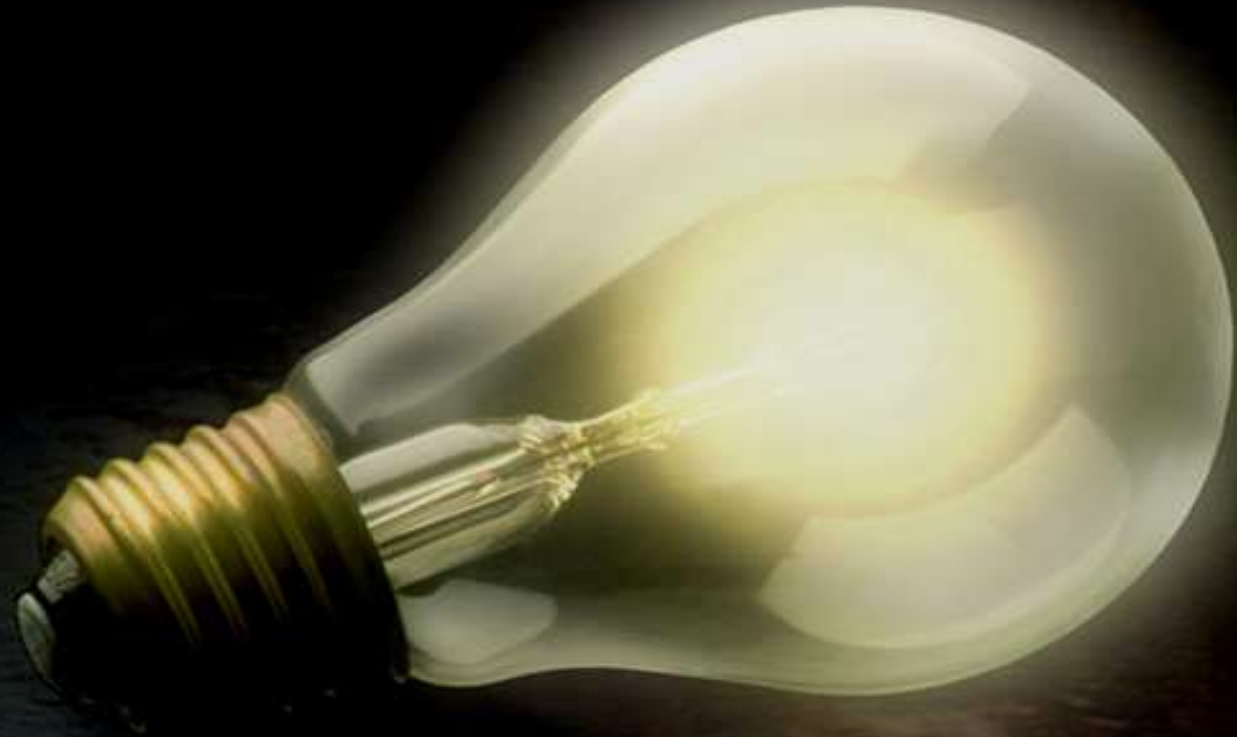
Bioelettricità Microbica

Nanowires





Microbial Fuel Cells (MFC)







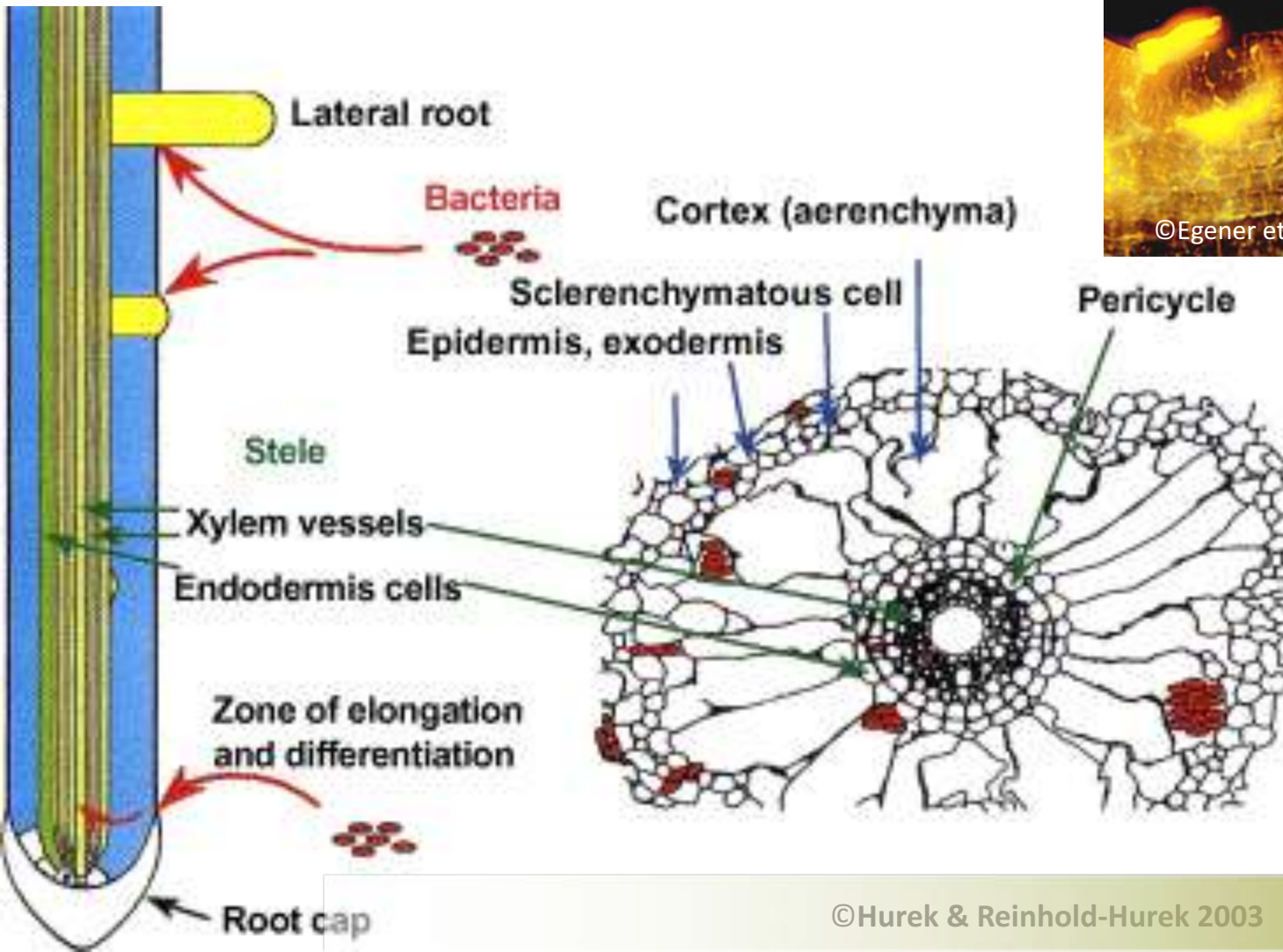
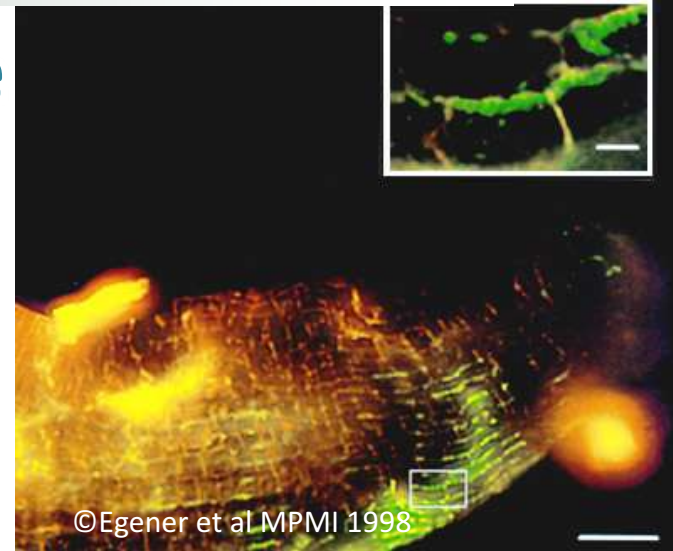
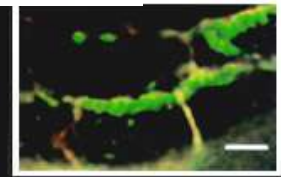


***Sangre
del Drago***

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

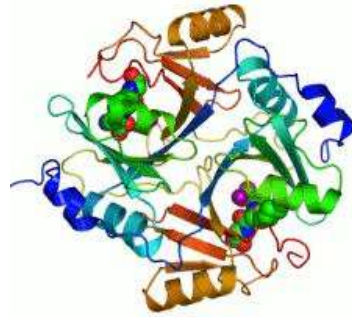
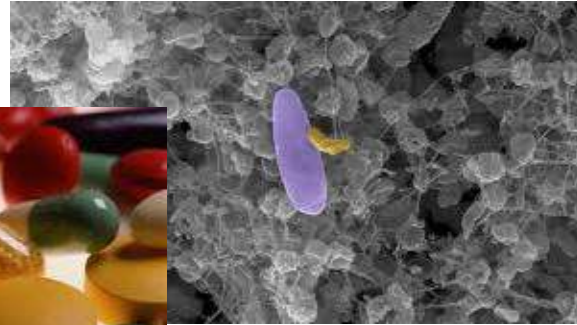
Il ventaglio delle applicazioni

Medicina

Ambiente

Agricoltura

Tecnologia





Grazie