

## Role of bacteria on the biodegradation of polluted sites



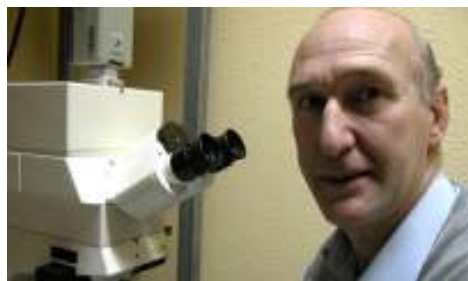
**Ramon Rosselló-Móra**



**IMEDEA**



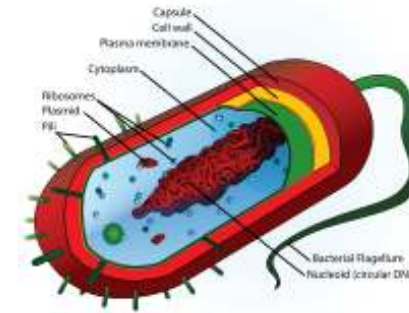
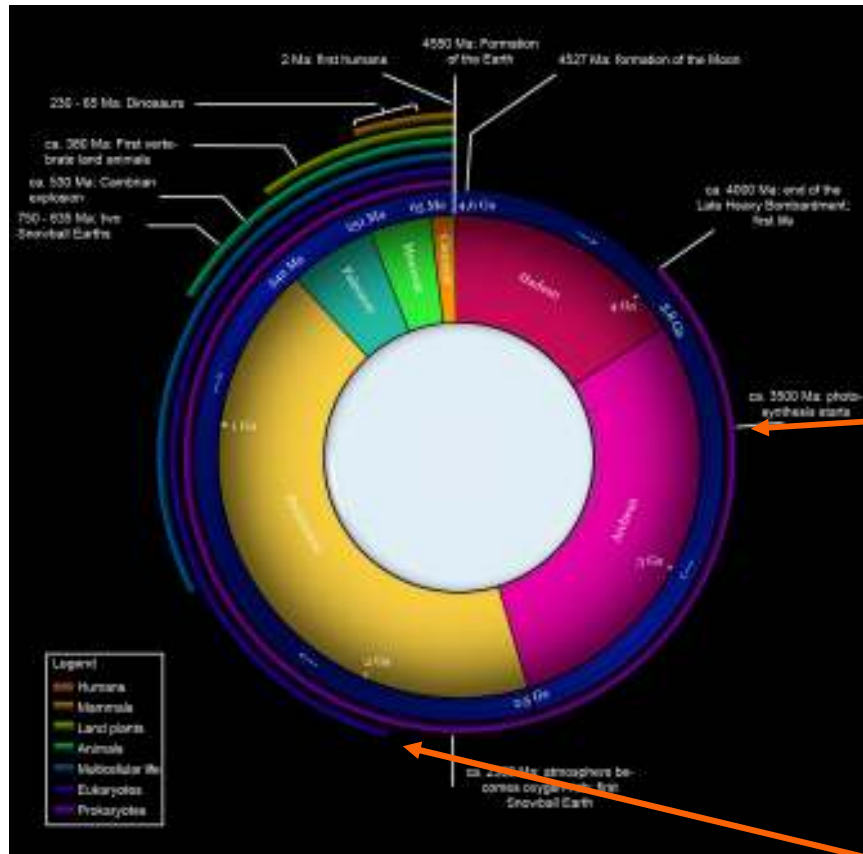
**Arantxa López-López (Postdoc); Michael Richter (Postdoc)  
Ana Suárez-Suárez (Ph-D); Jocelyn Brito-Echeverría (Ph-D);  
Mercedes Urdiain (TA)**



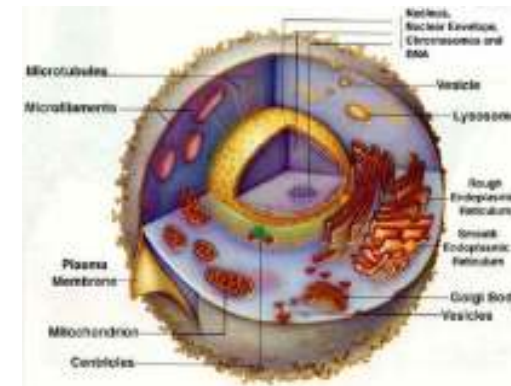
**Universitat de les  
Illes Balears**

**Jorge Lalucat  
Elena García-Valdés  
Rafael Bosch  
Balbina Nogales  
Antoni Bennasar**

## Relevance of prokaryotes on earth



Prokaryotes originated **3500** million yr



Eukaryotes originated **2000** million yr

Prokaryotes remained alone on the earth **1500** million yr

Double of time than the eukaryotes!!

# Prokaryotes are the most abundant individual organisms on the earth

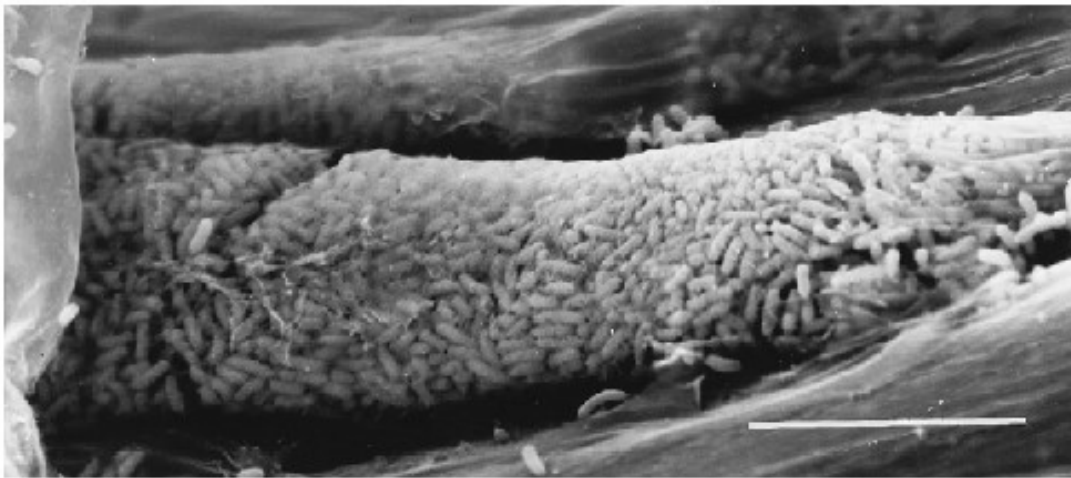
On earth there are about:

$6 \times 10^{30}$  prokaryotes

$10^{20}$  eukaryotes

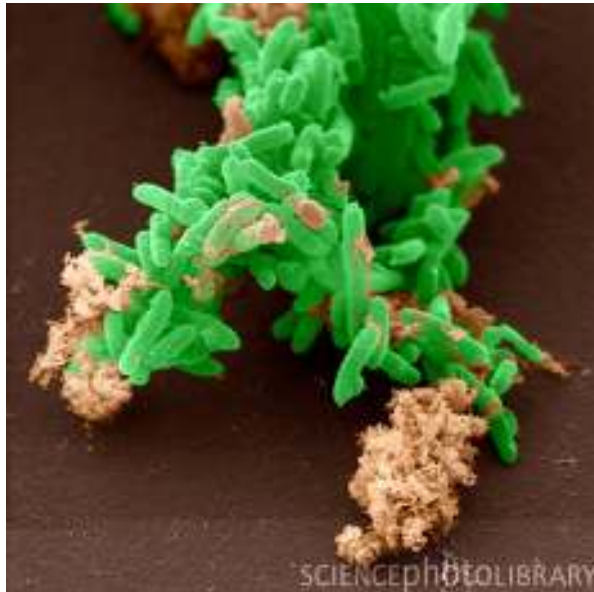
6.000.000.000.000.000.000.000.000.000.000

100.000.000.000.000.000.000



However, we do not see them!!!

## The prokaryotic biomass is equivalent to that of plants



Prokaryotes  
 $5 \times 10^{15}$  g of C

Nearly equivalent to that of the  
photosynthetic biomass

**They rule most of the biogeochemical cycles**

# Prokaryotes colonize all environments in where life is possible



soils  
100.000 milion  
cm<sup>3</sup>

Air  
1000 m<sup>3</sup>



In one cubic centimeter!

Marine waterbodies  
0.1 milion cm<sup>3</sup>



Sediments  
1000 milion  
cm<sup>3</sup>





Universitat de les Illes Balears

O<sub>2</sub>

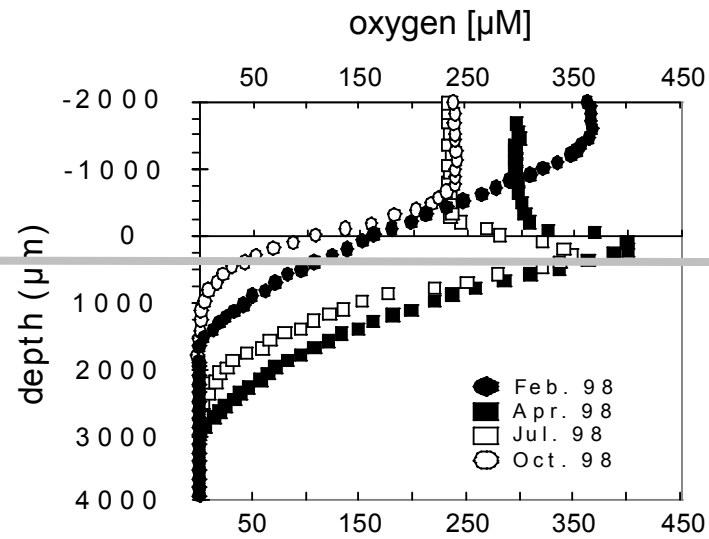
Aerobic biosphere



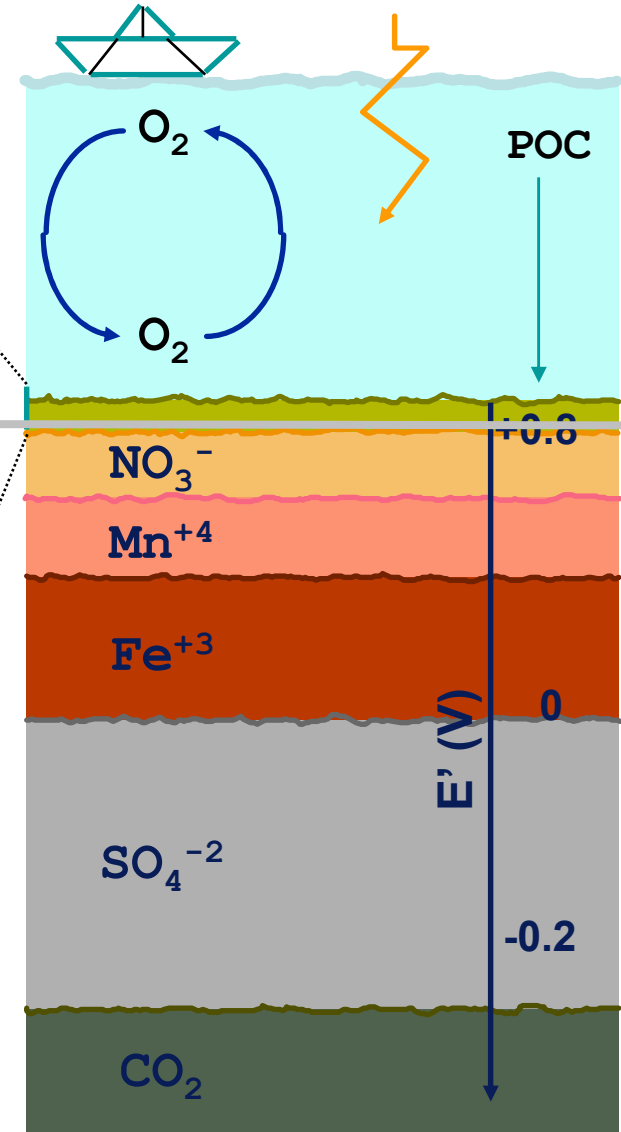
Anaerobic biosphere



10% of the prokaryotes



light



90% of the prokaryotes

## Majorcan Microbiologists study PAHs and crude oil degradation



Oil spills may occur in large and small scales, coastal ecosystems suffer from constant input of oil derivatives

<http://www.iim.csic.es/>



**Main aim:**  
Understanding the autochthonous microbial capabilities to face antropogenic contamination

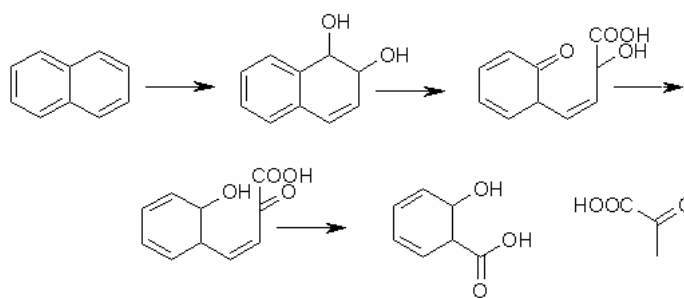
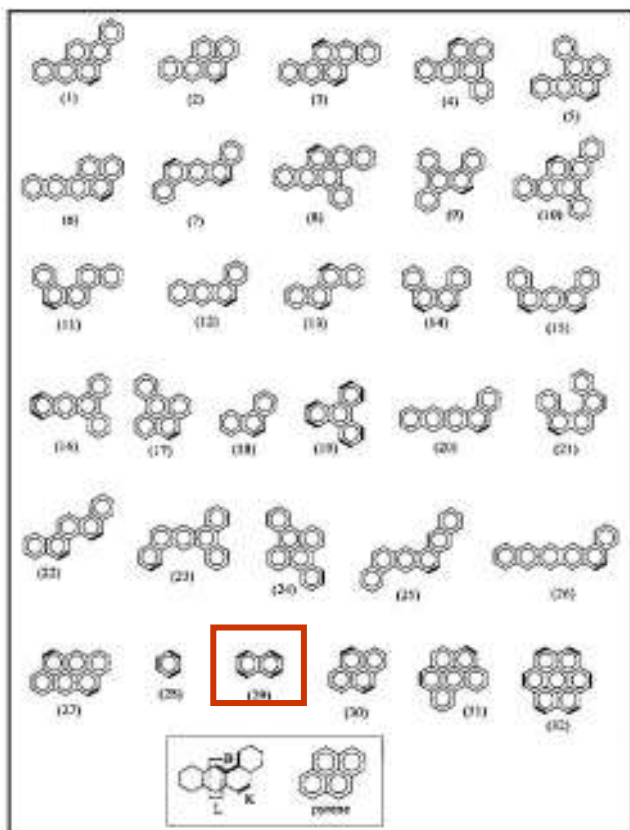
**From organisms to genes**



Universitat de les Illes Balears

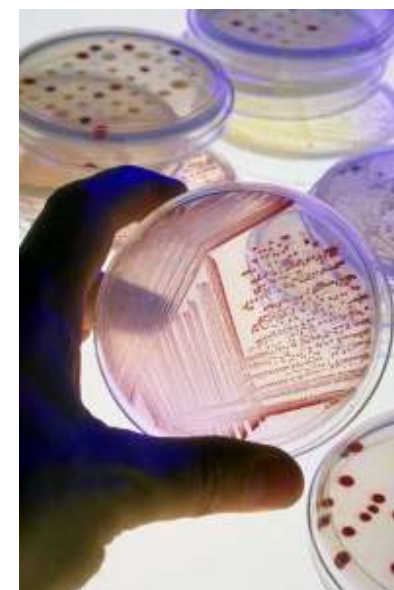
Microbiology area  
Biology department  
Sciences Faculty  
University of the Balearic Islands

## Aerobic biodegradation of aromatic contaminants



**Naphthalene** is the model compound

Collection of isolates that undertake degradation coupled to oxygen respiration



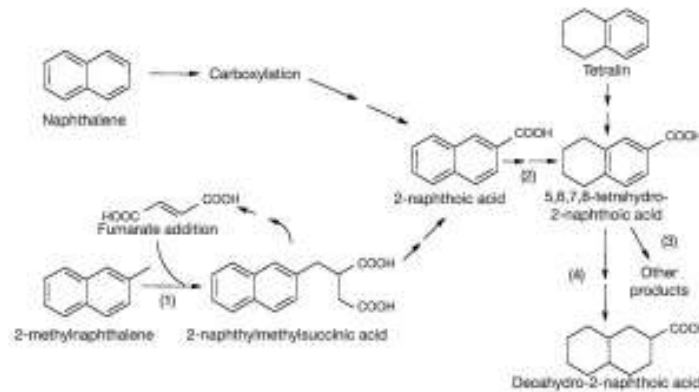


IMEDEA



# Marine Microbiology Group (MMG) Dep. of ecology and marine resources IMEDEA (CSIC – UIB)

## Anaerobic biodegradation of aromatic contaminants



### Crude oil & naphthalene degradation

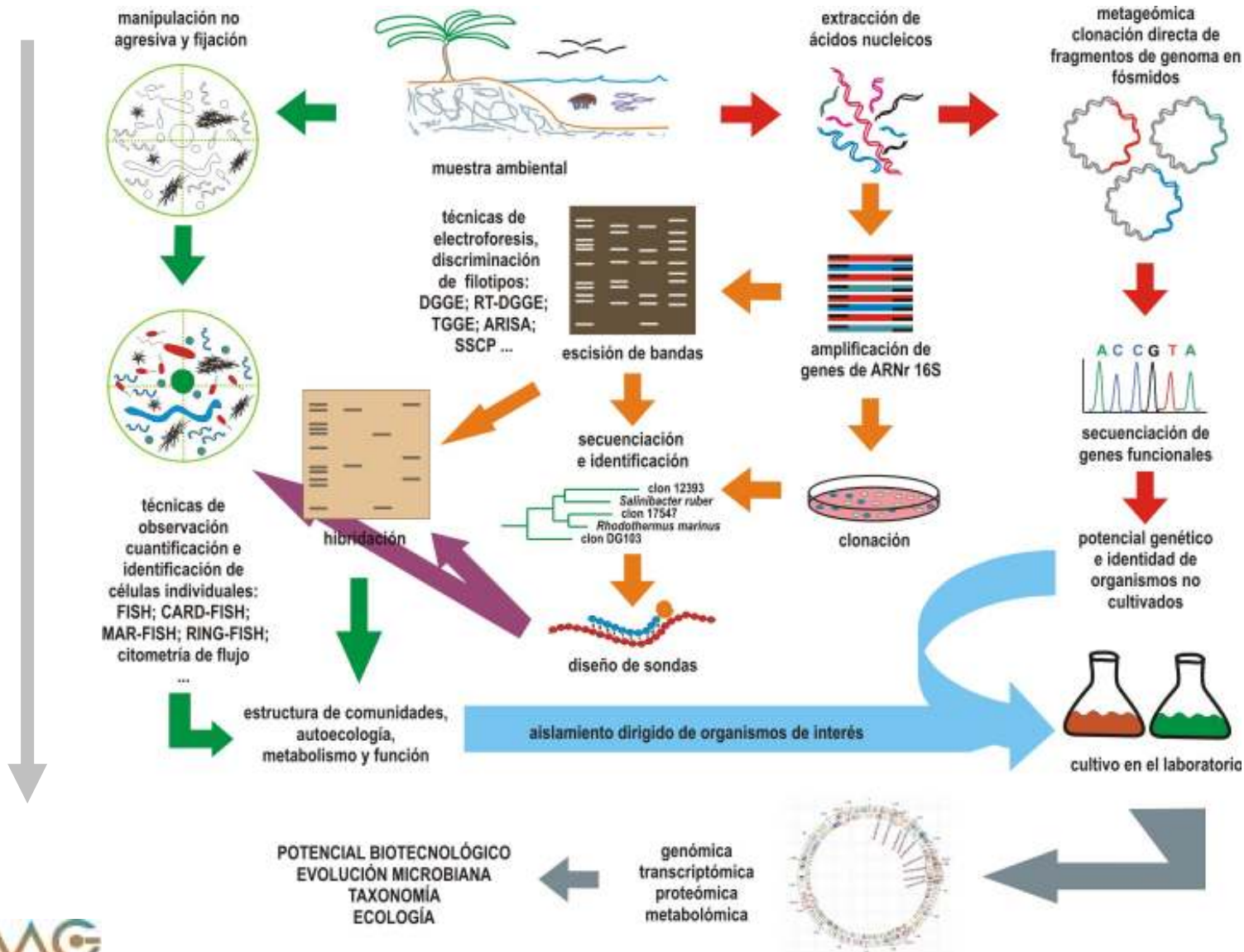
Contaminated marine sediments  
and evaluation of autochthonous  
capabilities



# Molecular tools to study microbial ecology

Microscopy

DNA technology



## goals

- ⇒ **Isolation of new organisms** with degrading capabilities (new culturing techniques)
- ⇒ Understanding **hidden diversity**
- ⇒ Understanding the **genetic potential** by metagenomic approaches
- ⇒ Understanding **catabolic pathways**
- ⇒ Understanding **autochthonous potential** to face contamination

## We are open for collaborations

- ⇒ Exploration of **new environments**
- ⇒ Technology **know-how exchange**
- ⇒ **Common efforts** in studying environments



Universitat de les  
Illes Balears



IMEDEA

