Modeling Microbial Populations I

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World


Greenland
Iceland
Finland
Sweden
Norway
United Kingdom
Poland
Germany
Ukraine
Kazakhstan
France
Spain
Italy
Turkey
Canada
United States
BOZEMAN
México
Pacific Ocean
North Atlantic Ocean
Afghanistan
Iraq
Iran
Pakistan
Algeria
Libya
Egypt
Saudi Arabia
Mauritania
Mali
Niger
Chad
Sudan
Nigeria
Ethiopia
Kenya
DR Congo
Tanzania
Venezuela
Colombia
Brazil
Peru
Bolivia
Angola
Namibia
Botswana
Madagascar
South Pacific Ocean
Chile
South Atlantic Ocean
South Africa
LIVINGSTONE
Argentina

Bozeman


LIVINGSTON
BOZEMAN
Bonners Ferry
National Park
Cut Bank
Havre
Malta
Glasgow
Whitefish
Shelby
Sandpoint
Kalispell
Conrad
Sidney
Polson
Coeur d'Alene
Great Falls
Lewistown
Glendive
Montana
Moscow
Lolo National Forest
Helena
Deer Lodge
Miles City
Anaconda
Butte
Billings
Hardin
Nezperce National Forest
Bitterroot National Forest
Bozeman
Laurel
Dillon
Gallatin National Forest
Sheridan
Salmon - Challis National Forest
Targhee National Forest
Cody
Buffalo
Gillette
Emmett
Sawtooth National Forest
Teton National Forest
Worland
Newcastle
Boise
Idaho
Idaho Falls
Rexburg
Thermopolis
Thunder Basin National Grassland
Nampa
Jackson
Mountain Home
Pocatello
Riverton
Wyoming
Casper
Douglas
Twin Falls
Bridger National Forest
Rawlins

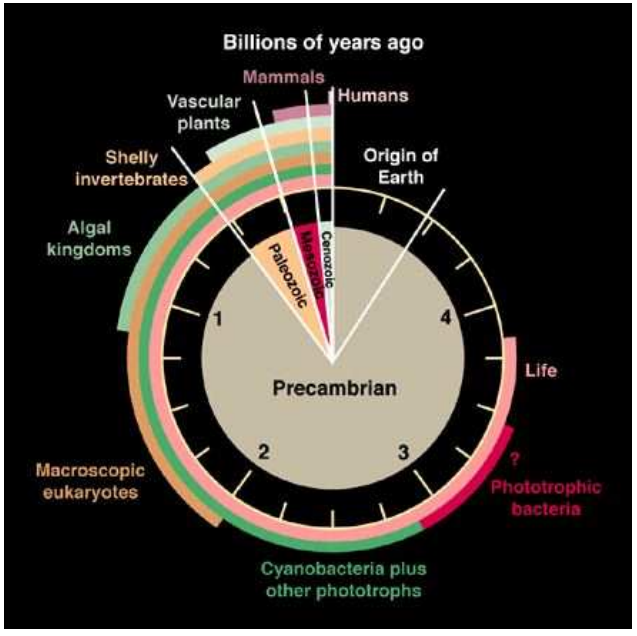
Yellowstone

Yellowstone Area

Bozeman

Some History

- Microbial community mats appear in the fossil record 3.5 BYA (near beginning of life).
- Microbes (largely in sessile communities) are efficient consumers of chemical free energy and play key roles in all geochemical cycles.



(From Des Marais, *Science* **289**, 1703-1705, 2000.)

Microbial Communities: Inhabitants

Ecology of biofilm ecosystems is poorly understood:

- Approximately 1/2 of earth's organic carbon is contained in microbes, mostly in biofilms.
- 1 gram of soil or marine sediment can easily have 10^4 different microbial species. This is probably an underestimate, because
- a "microbial species" is not clearly defined.
- Natural microbial ecology used to be difficult (relative to macro-ecology).
- Natural microbial ecology is (or soon will be) easy (relative to macro-ecology).

Remark: 3+ billion years to get it right!

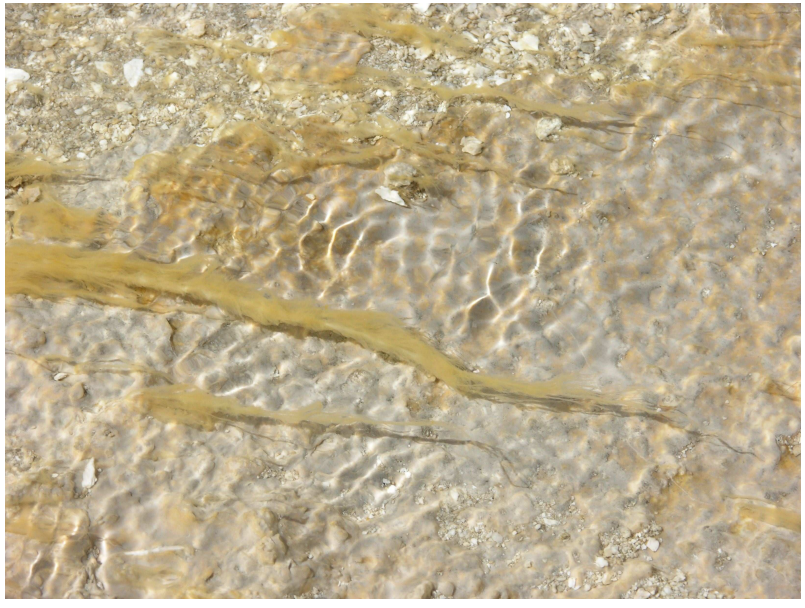
Microbial Natural History

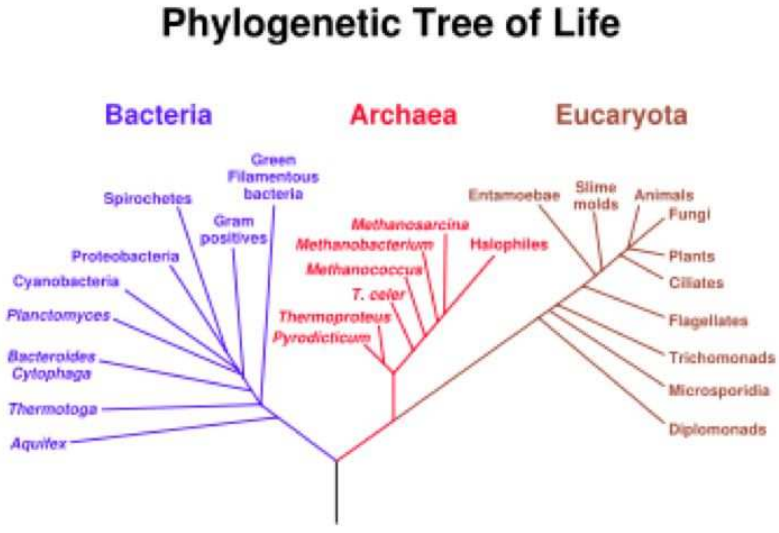
Mat fossils date to 3.75 bya and mats may have dominated life until 540 mya (Precambrian-Cambrian boundary).

Microbial communities drastically affected the chemistry of the earth's geosphere and atmosphere. They are still key parts of almost all ecological and geochemical cycles.

Biofilm Natural History

Ecology. Biofilm formation is widespread.



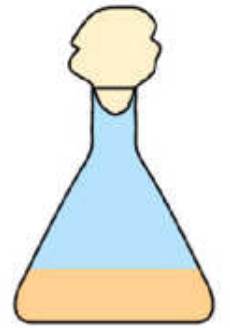


Aquificales streamers, YNP.

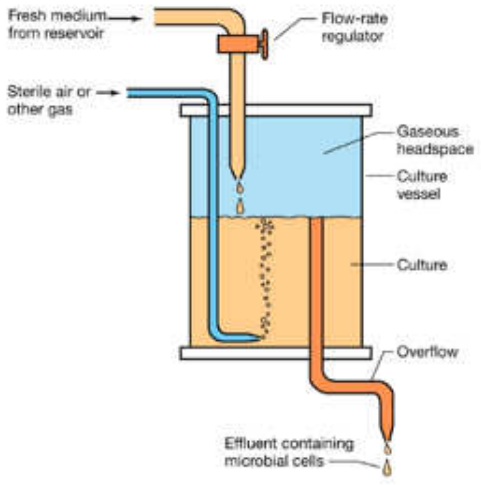
Modern Day Mat

Effluent channel cyanobacterial mat cross-section, Mushroom Spring, YNP (D. Ward).

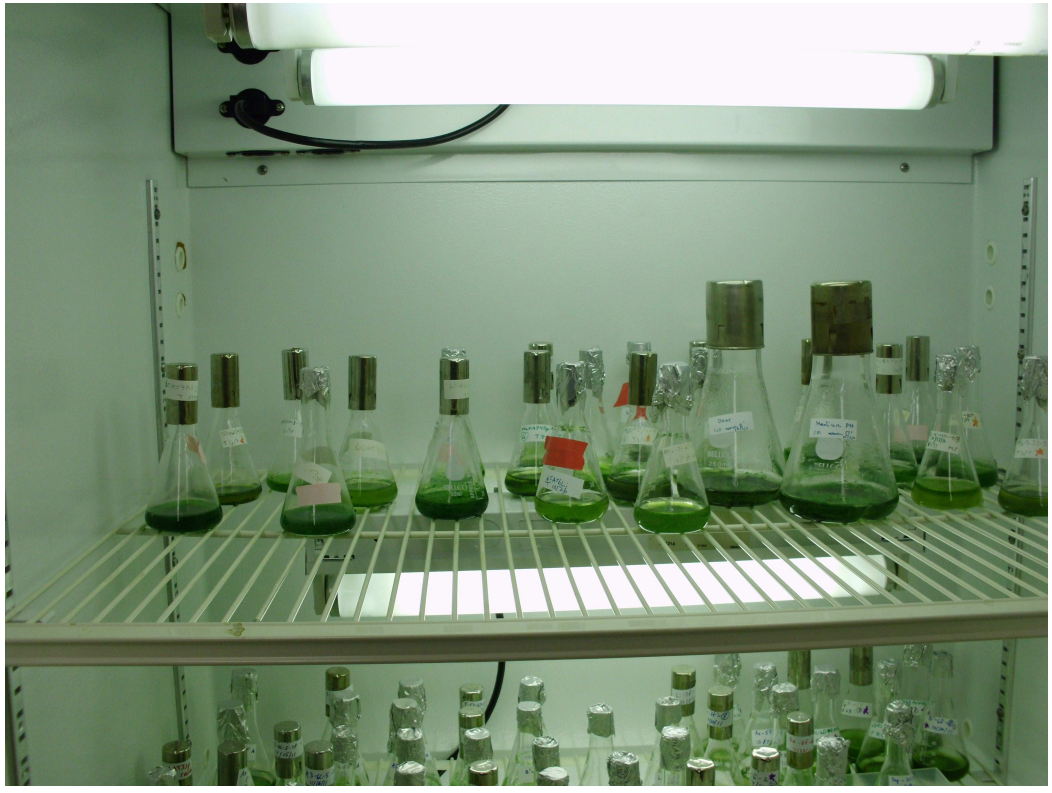
Microbial Populations in the Lab



Flask culture



Microbial Populations in the Lab: Batch Cultures



Shane Nowack's *Synechococcus* cultures