

Bi 410/510 LIFE IN EXTREME ENVIRONMENTS (4 credits)

Winter Term, 2014

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Tues. / Thurs. 12:00-1:20 lectures and 1 required discussion period (2:00-2:50 Thurs.)

Prerequisites: Bi 214 or 253 or consent of instructor [rooms will be posted later]

The lectures will be presented as Power Point slides and overheads (all will be available to the students). Each discussion period will include the presentation of two papers, usually from the primary literature, by enrolled student (the number of students for each paper will depend on the number in the class). From the several papers provided by the instructor the students will choose two related to the current subject each week. Lecture and discussion subjects will include biodiversity in various extreme environments and the physiological and genetic bases of tolerance or optimization in selected cases.

Tentative Schedule

Week and Topic

Week of Jan. 6

Introduction to extremophiles--Diversity of microbial metabolism;
multiple/simultaneous stresses

Discussion: review of environmental extremes and stresses.

Week of Jan.13

Thermophiles (hyperthermophiles)

Thermophiles of North American hot springs

Discussion: thermophiles (hyper- & moderate)

Week of Jan. 20

Halophiles

Halotolerant microbial mats of Baja Cal.

Discussion/Lab: thermophilic cyanobacteria &
hypersaline microbial microorganisms

Week of Jan. 27

High pH (alkaliphiles): soda lakes

Acidophiles (diversity and habitats)

Discussion: halophiles & acidophiles.

Week of Feb. 3

First term paper due by end of week (25 %)

Tolerance to high solar irradiance (UV)

Discussion: Adaptations of cyanobacteria & other organisms
to high UV radiation.

Week of Feb. 10

Xerophiles (crustal & endolithic)

Oligotrophs (adaptation to low nutrient environments)

Discussion: Xerophiles and oligotrophs

Week of Feb. 17

Psychrophiles and psychrotolerant species (life at low temp.)

Barophily (life under high pressure)

Discussion: psychrophiles

Week of Feb. 24

Second term paper due at end of week (30%).

Life in the deep earth; Long term survival of microbes

Discussion: barophiles; controversies
on long term survival

Week of March 3

The earliest microbial fossils & first evidence of life ,
Environment of early Earth, origins of life

Discussion: controversies, early life, true microfossils, etc.

Week of March 10

The relevance of extremophiles to early life
& extra-terrestrial life (past or present)

Discussion: extra-terrestrial life possibilities

Week of March 17 (final exam week)

**Third term paper due by end of the day of scheduled final exam (40%)
[Wed. March 19]**

**GRADES WILL BE BASED ON: classroom/discussion participation: -- 5%,
three papers: 25, 30, and 40% each. The discussion papers will be
selected by the instructor or in some cases by the students when there
are many to choose from.**