

Extremophile environments

Hypersaline lakes are good places to search for “primitive” model organisms.



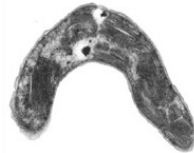
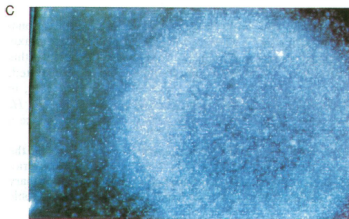
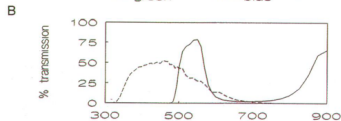
Wadi Natrun, Egypt. Inhospitable for most life: pH 10.5, 36% salt [wt/vol]

Probably pining for the fjords



Good for mummification thanks to high quantities of natron (soda ash and salt mixture), an excellent desiccating agent. Photo credit: Nick Brandt.

Home of extremophile bacteria *H. halophila*



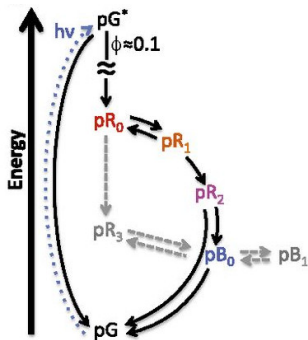
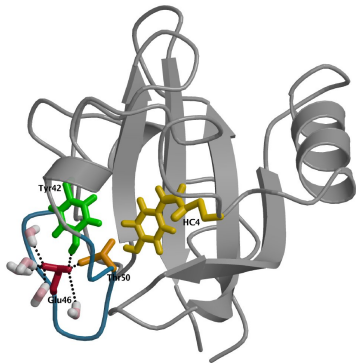
Sprenger *et al.*, J. Bacteriol. (1993):

These bacteria have a mechanism to swim toward **green light**, a photon frequency useful for photosynthesis.

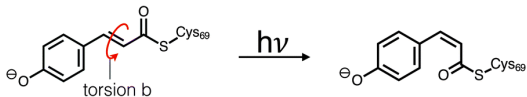
They swim away from large intensities of **blue light**, possibly because exposure to higher energy photons (> 2.5 eV or $100 k_B T$) may be damaging.

Photoactive yellow protein (PYP)

The bacterial flight response from blue photons is due to PYP, which has become a model system for photosensitive proteins.



Change in *p*-coumeric acid on absorption of blue photon:



Visualizing the photon-induced protein motions

Time-resolved x-ray diffraction: seeing atomic-scale motions at 100 ps time steps, from $t = 100 \text{ ps} - 1 \text{ s}$ [Schotte *et al.*, PNAS (2012)].

