

Microvision in cyanobacteria

José R. Donoso

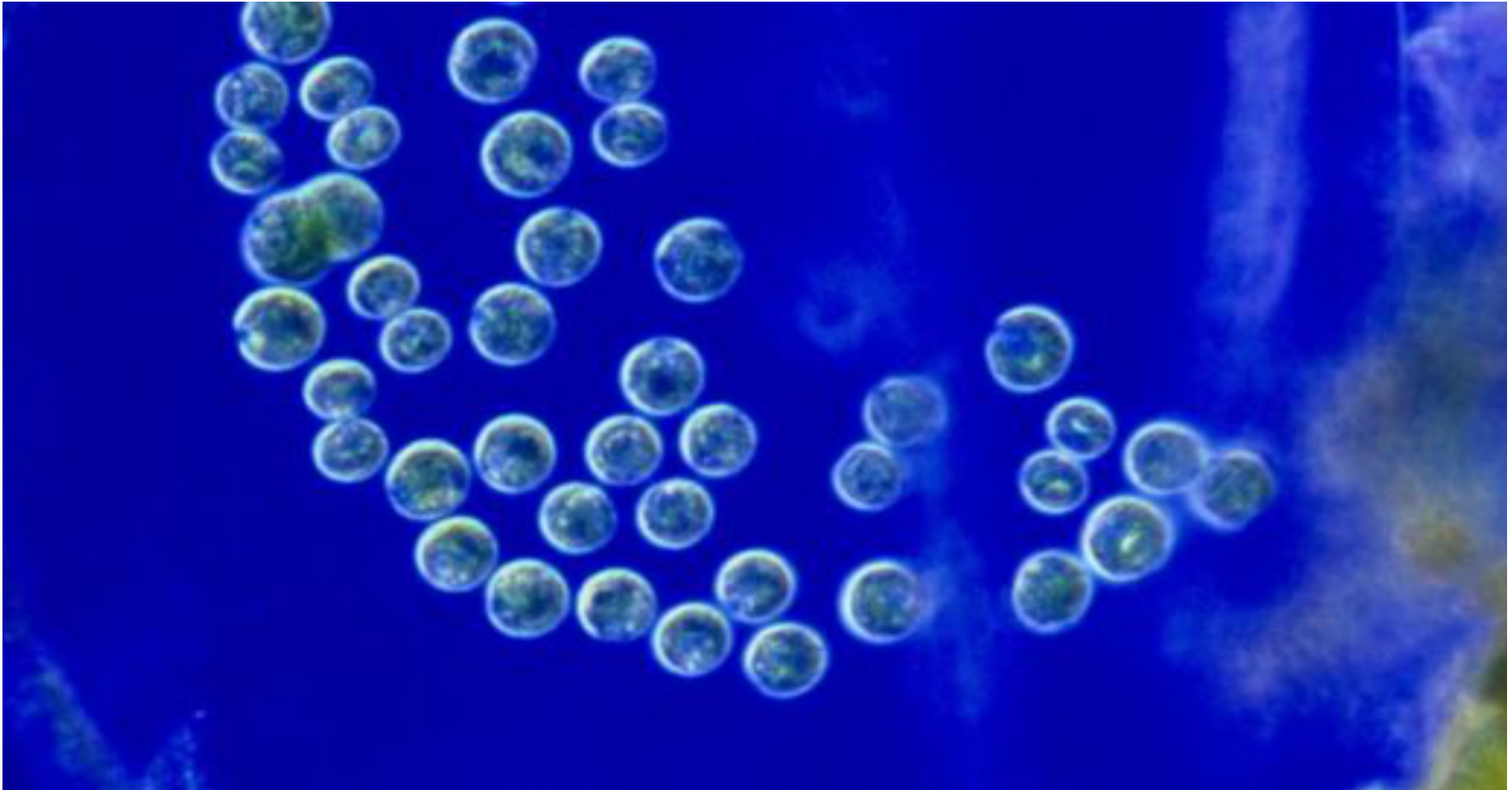
Theoretical Neuroscience Lab



Cyanobacteria use micro-optics to sense light direction

**Nils Schuergers^{1†}, Tchern Lenn², Ronald Kampmann³, Markus V Meissner³,
Tiago Esteves^{4,5,6}, Maja Temerinac-Ott⁷, Jan G Korvink³, Alan R Lowe^{8,9},
Conrad W Mullineaux^{2,7*}, Annegret Wilde^{1,10}**

Mechanisms of phototaxis in *Synechocystis*

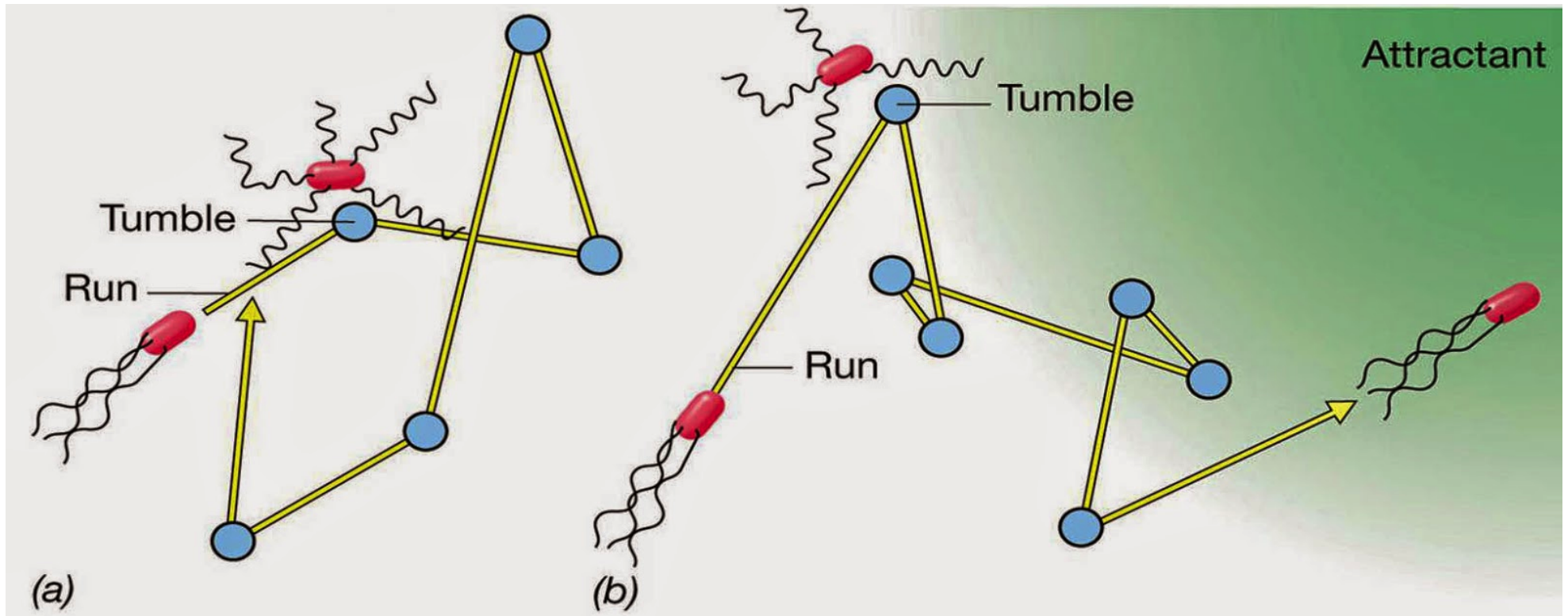


Phototaxis in Synechocystis

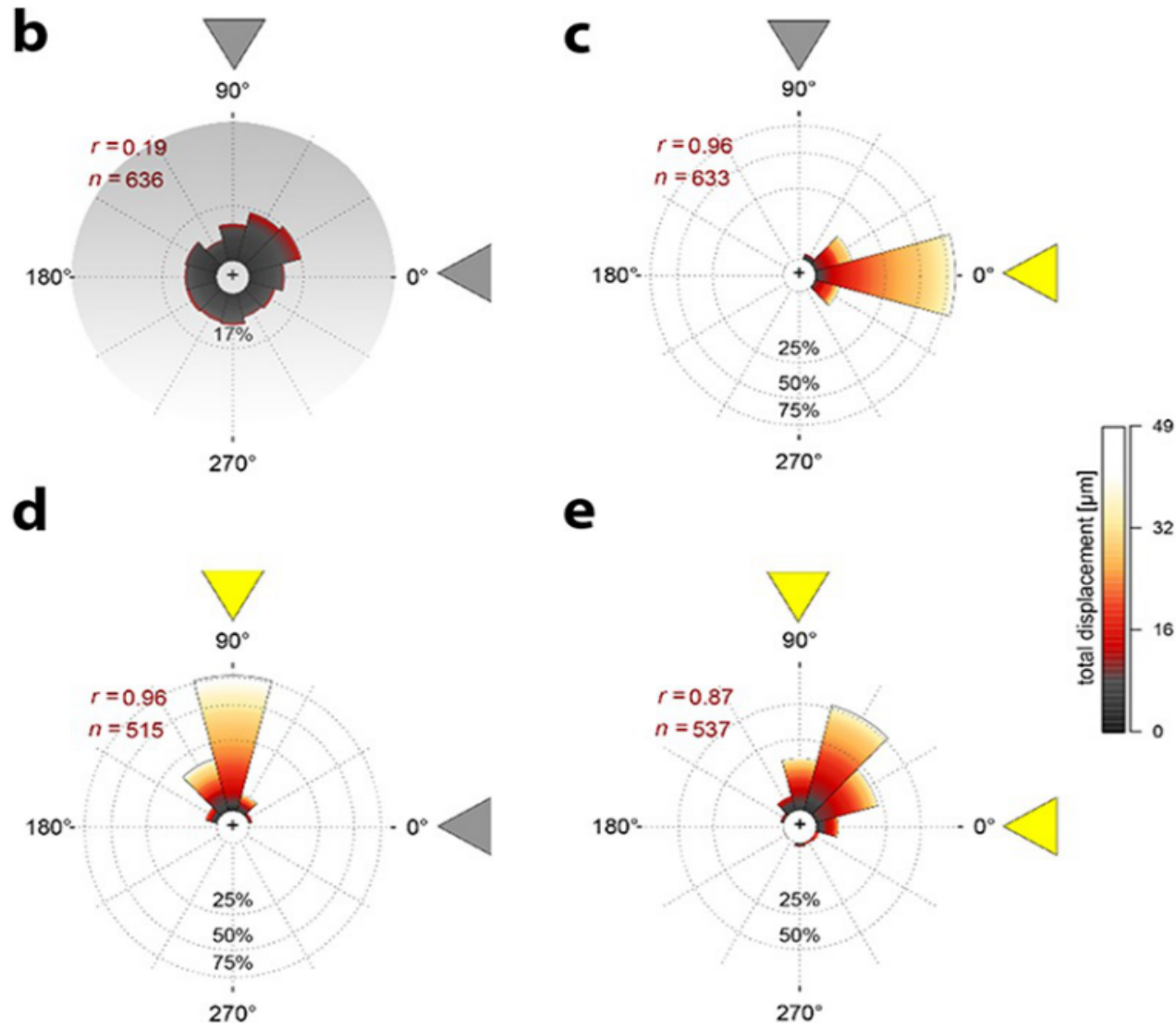
- Based on direct light perception, rather than a biased random walk
- Single cells act as spherical lenses
- Focused stimulation triggers photophobic response

Phototaxis based on biased random walk?

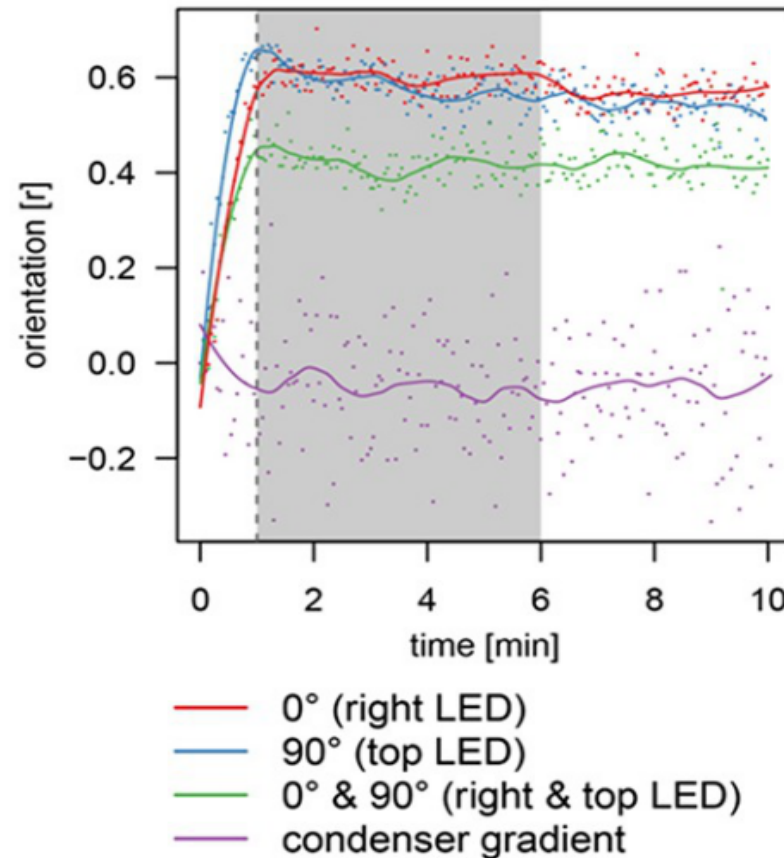
e.g. as in "Run and tumble" in E. coli



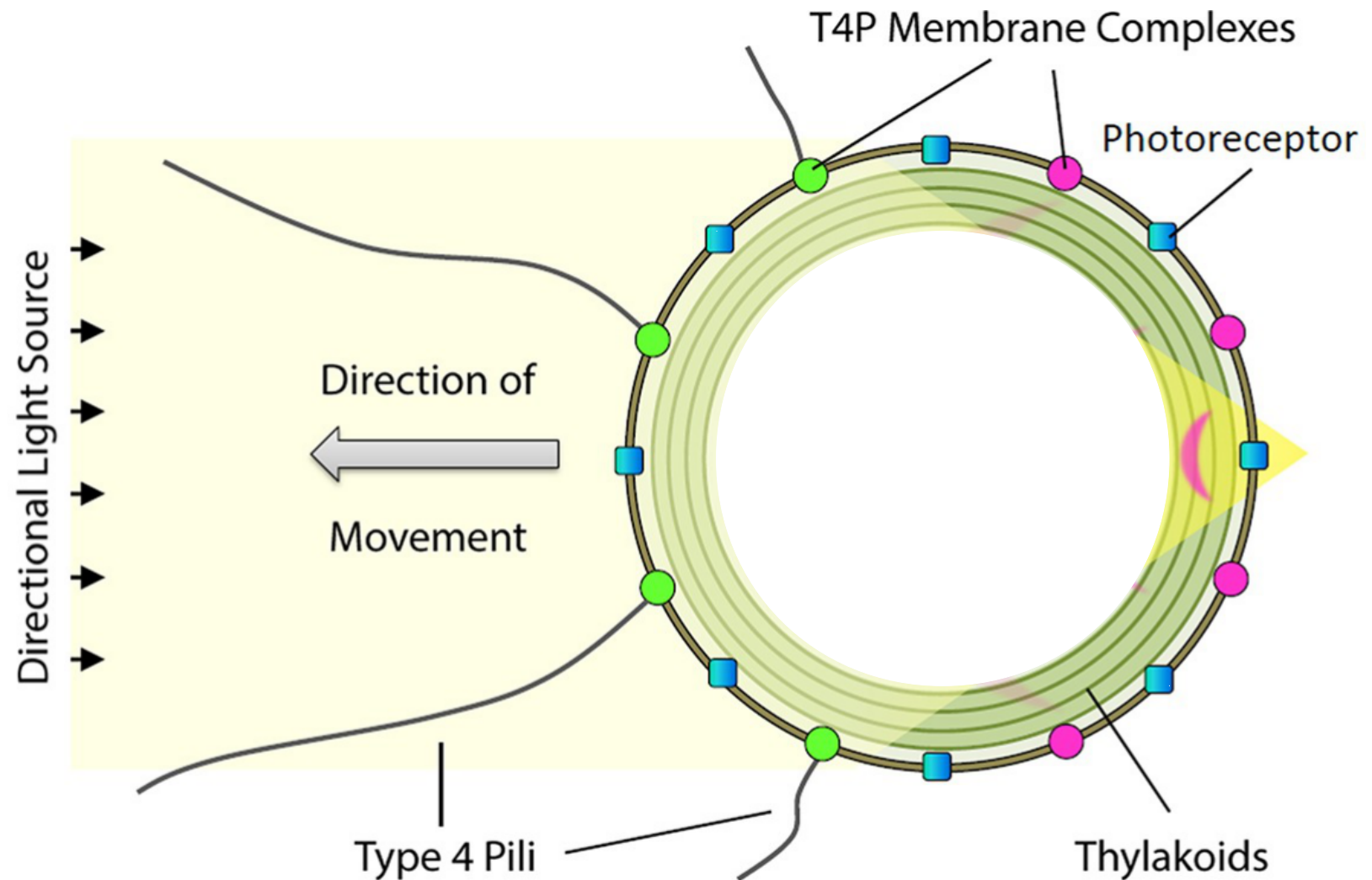
Phototaxis is based on direct light perception



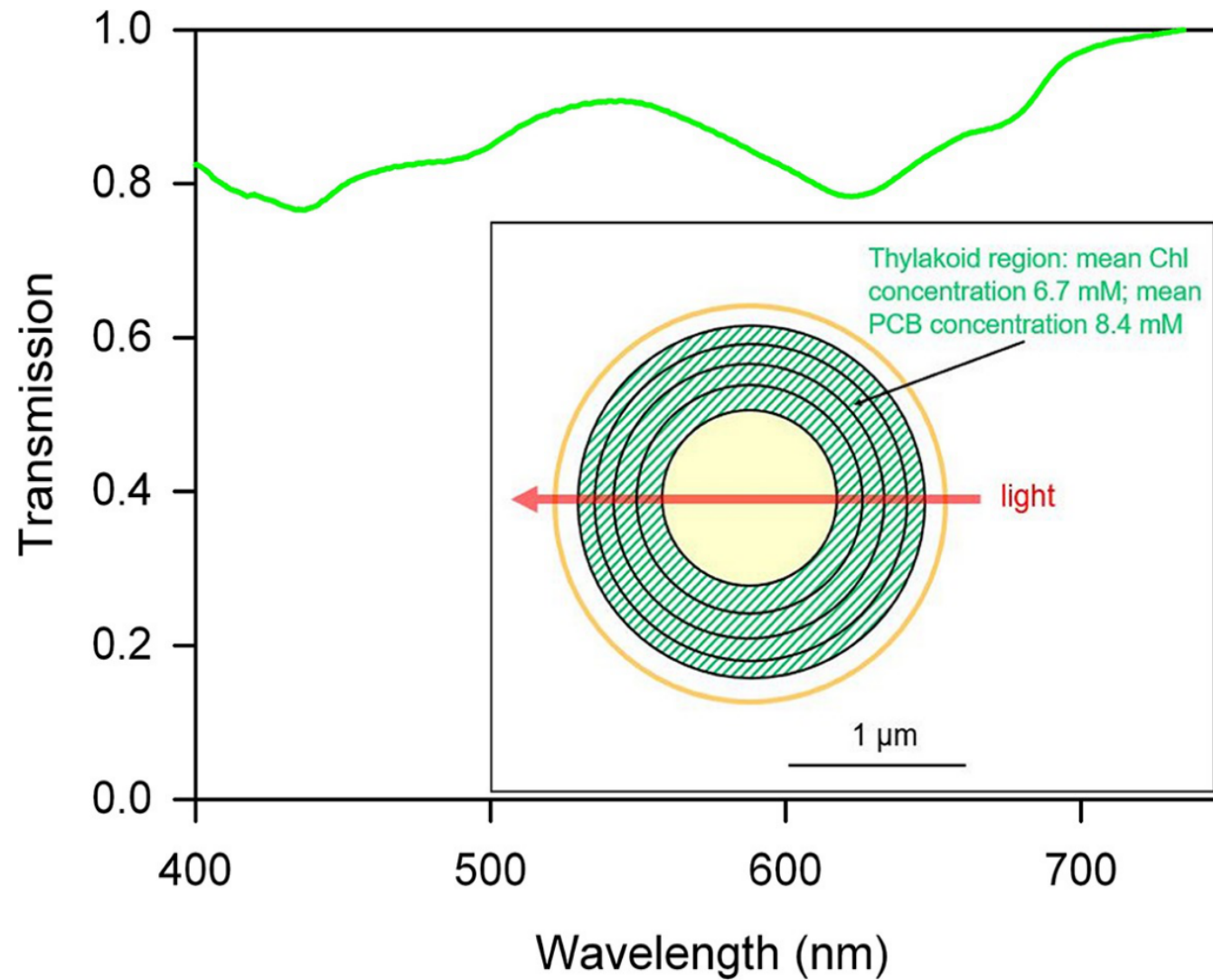
Phototaxis is based on direct light perception



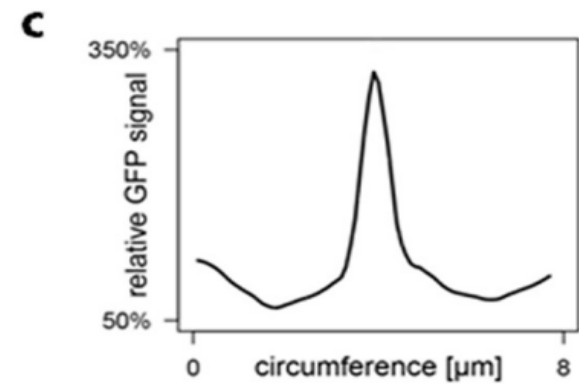
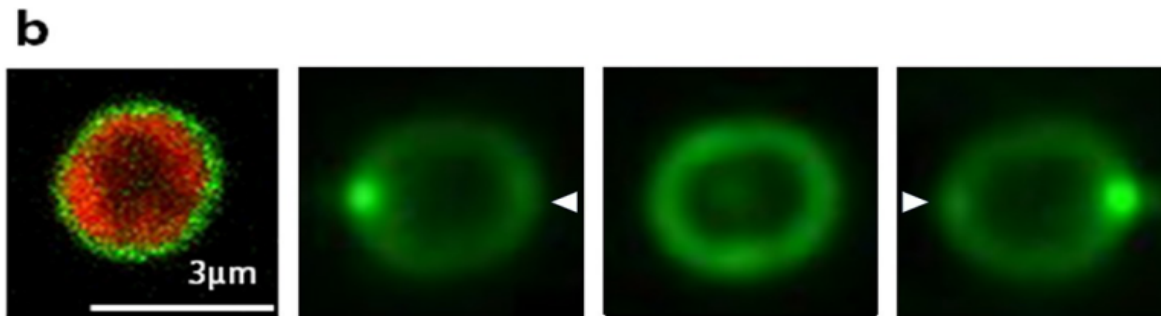
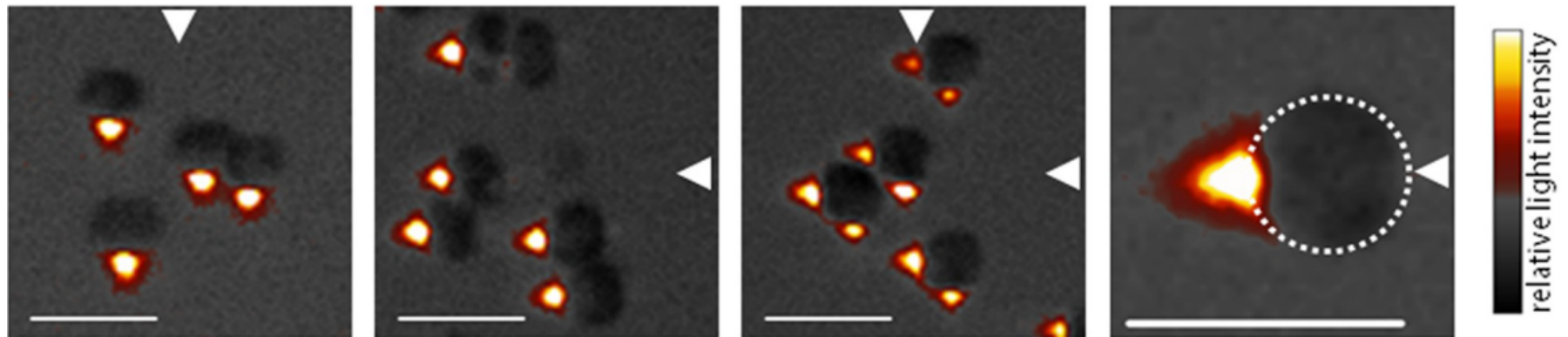
Mechanisms: Shading?



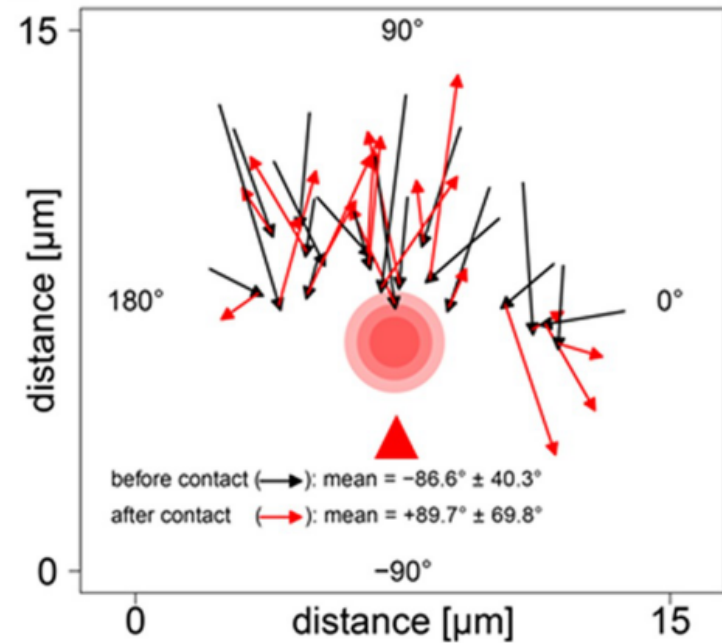
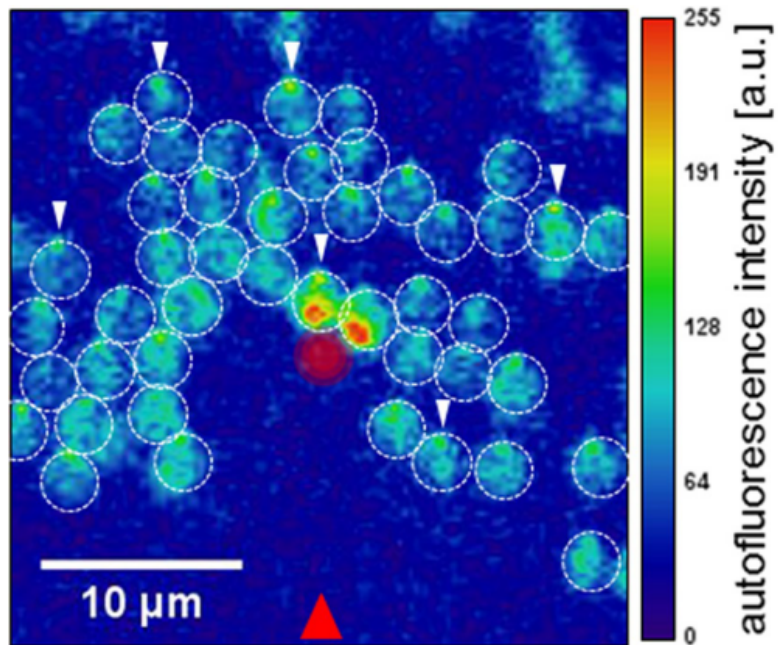
Shading? Rather not

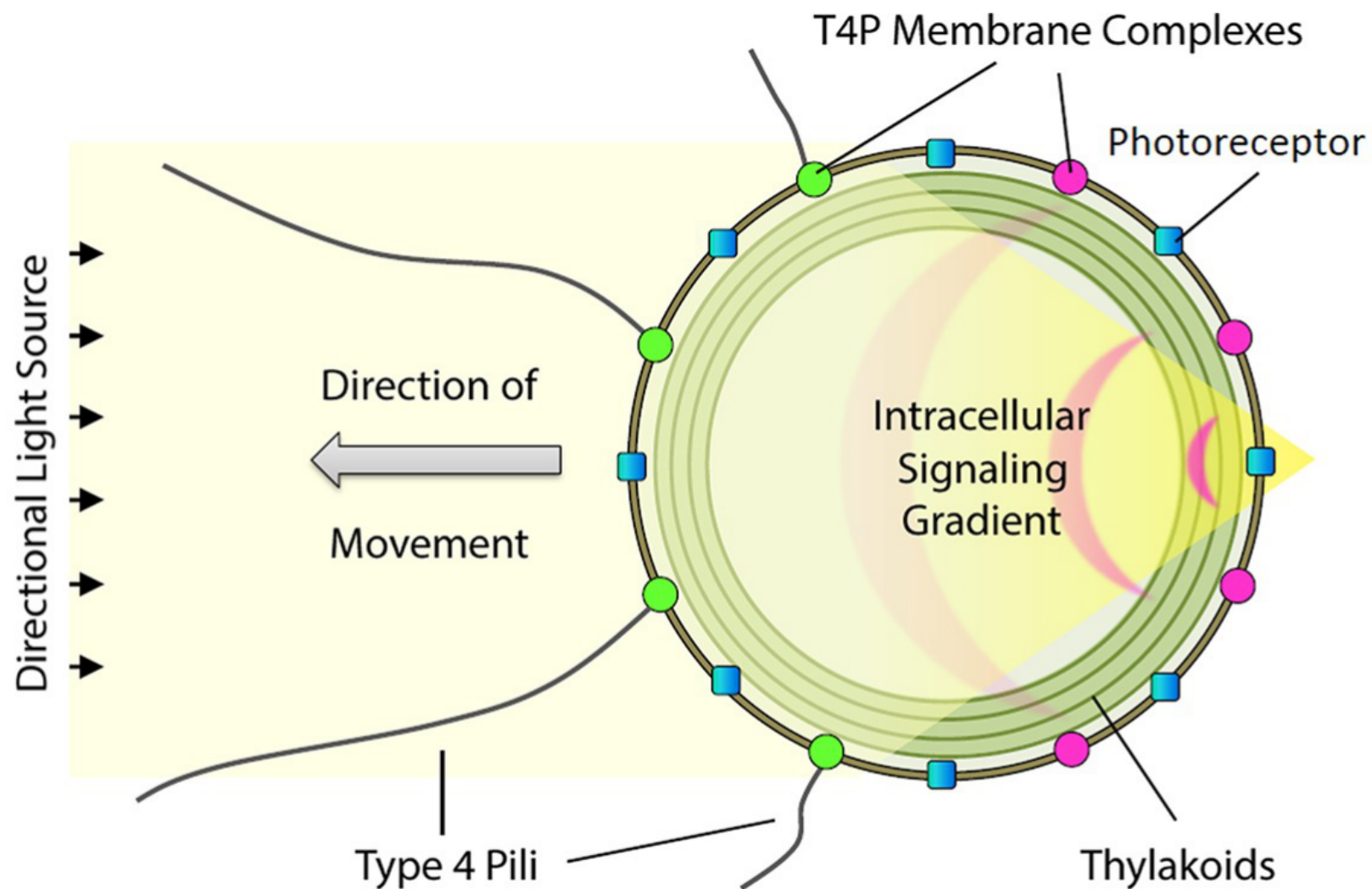


Single cells act as spherical lenses



Photophobic response to focused excitation





Take home...

A single Synechocystis cell acts like a tiny eyeball that optically processes the light input to generate a motor response