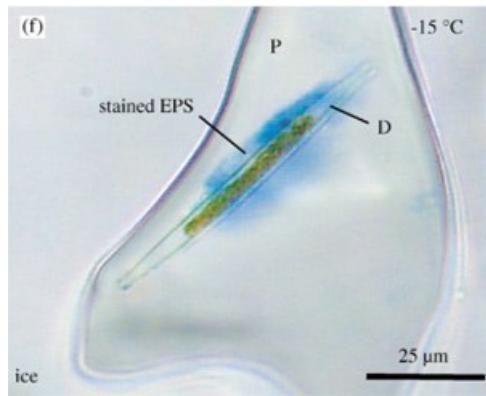
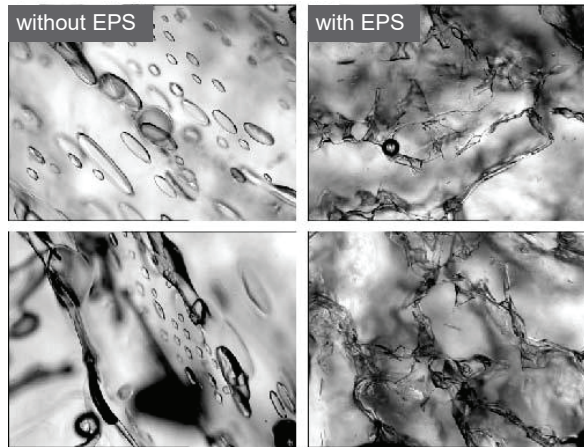


# Sea ice algae secrete extracellular polymeric substances (EPS) affecting evolution of brine microstructure.

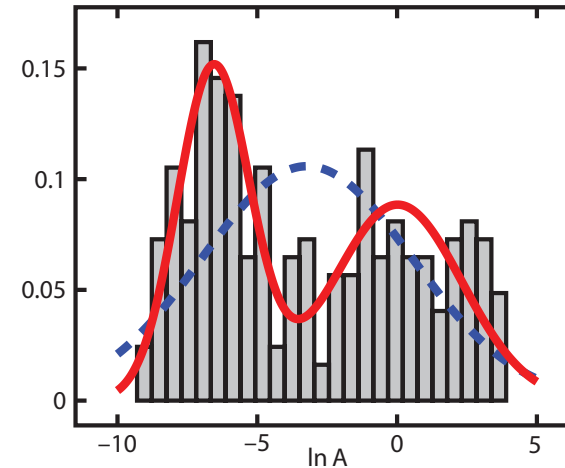
How does EPS affect fluid transport? How does the biology affect the physics?



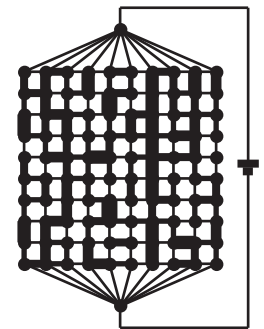
Krembs



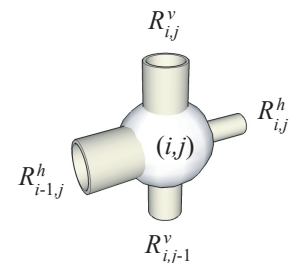
Krembs, Eicken, Deming, PNAS 2011



**RANDOM  
PIPE  
MODEL**



- 2D random pipe model with bimodal distribution of pipe radii
- Rigorous bound on permeability  $k$ ; results predict observed drop in  $k$



Steffen, Epshteyn, Zhu, Bowler, Deming, Golden  
*Multiscale Modeling and Simulation*, 2018

Zhu, Jabini, Golden,  
Eicken, Morris  
*Ann. Glac.* 2006