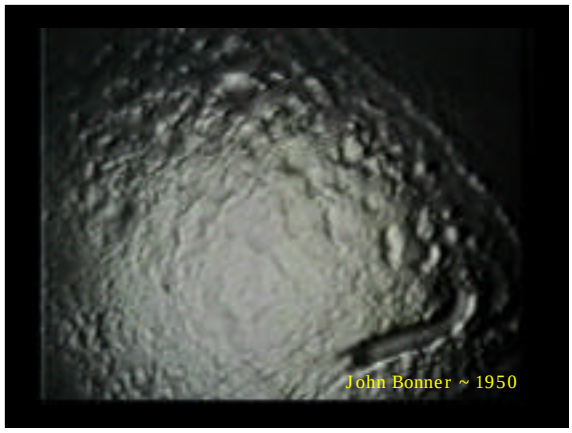
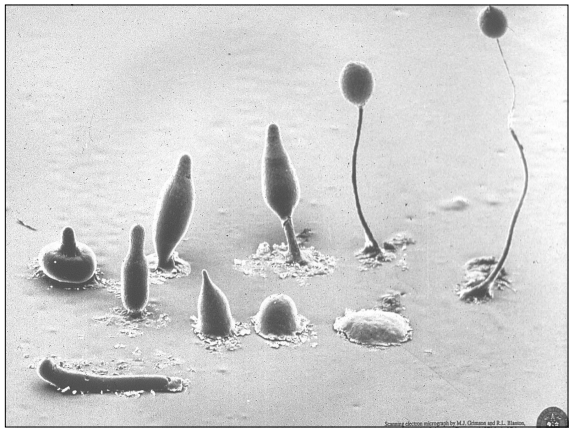
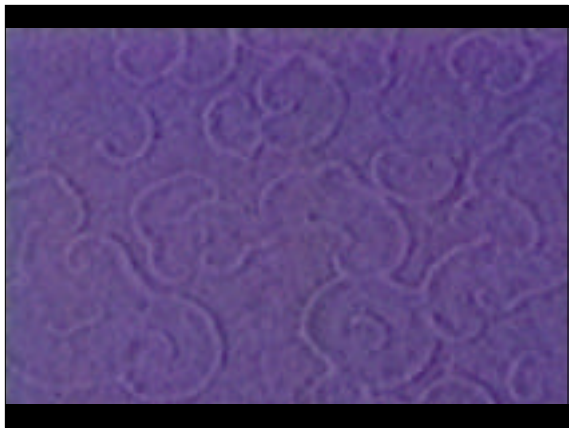
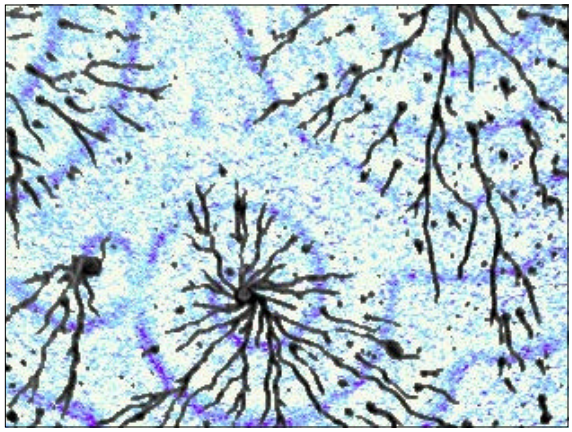
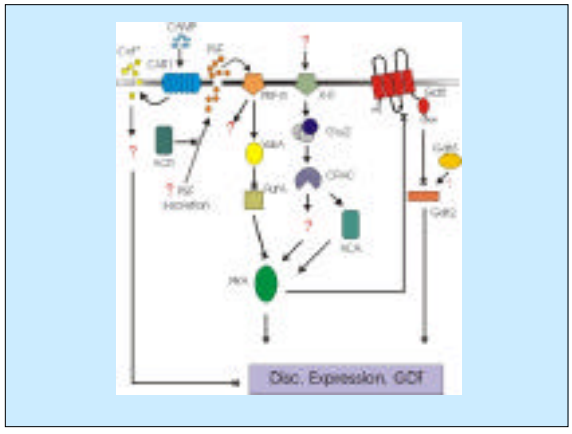

John Bonner ~ 1950



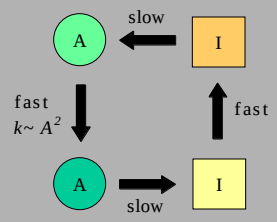

Spirals and Targets in *Dictyostelium*



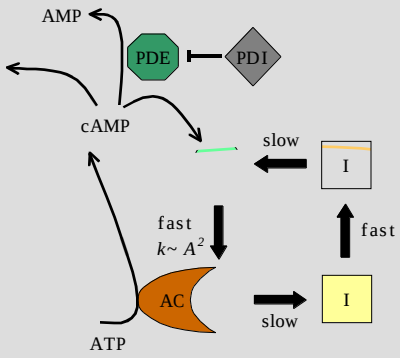


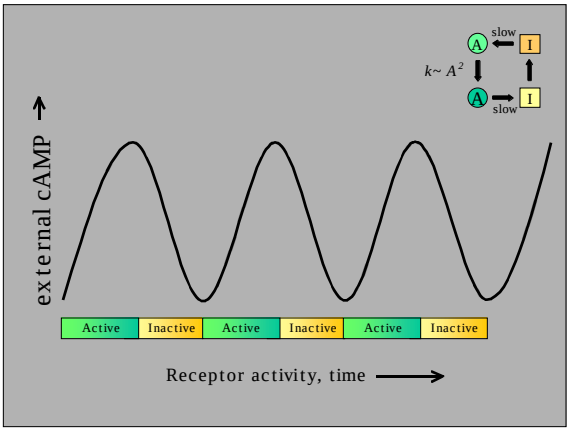

cAMP
Ca2+
CaR
PLC
PKA
Disc. Expression, GDF

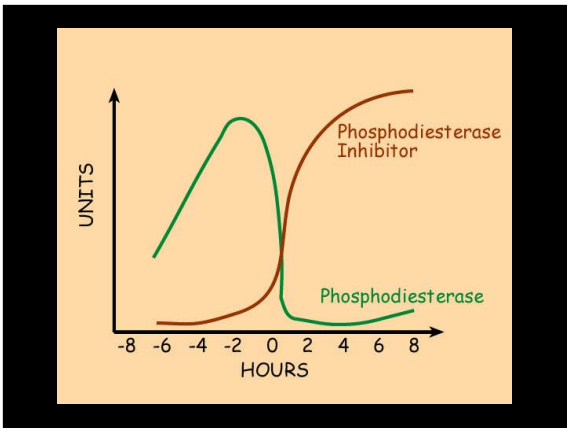
The cAMP receptor cycle



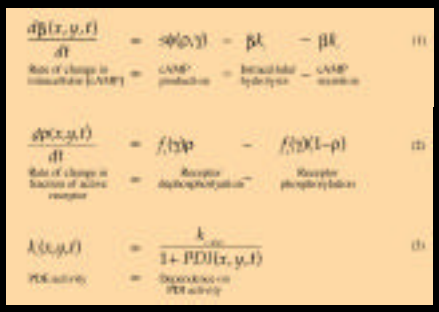
The signaling system in *Dictyostelium*



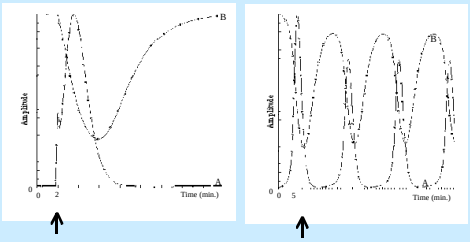




Modeling a cAMP oscillator



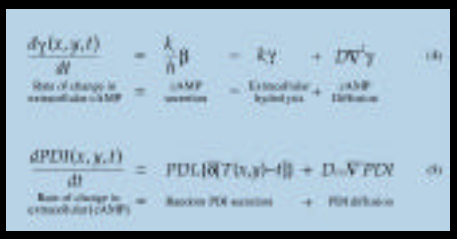
cAMP pulses and receptor occupancy



Subthreshold cAMP pulse

Suprathreshold cAMP pulse

Accounting for space



$$\frac{d\beta(x,y,t)}{dt} = s\varphi(\rho,\gamma) - \beta k_1 - \beta k_2 \quad (1)$$

Rate of change in intracellular [cAMP] = cAMP production − Intracellular hydrolysis − cAMP secretion

$$\frac{d\rho(x,y,t)}{dt} = f_1(\gamma)\rho - f_2(\gamma)(1-\rho) \quad (2)$$

Rate of change in fraction of active receptor = Receptor dephosphorylation − Receptor phosphorylation

$$k_1(x,y,t) = \frac{k_{1,max}}{1+PDI(x,y,t)} \quad (3)$$

PDE activity = Dependence on PDI activity

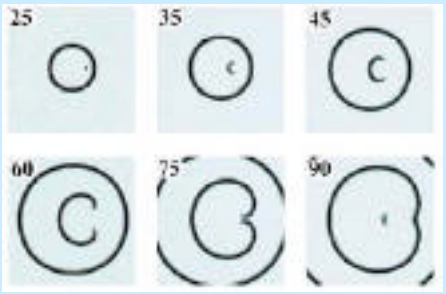
$$\frac{d\gamma(x,y,t)}{dt} = \frac{k_2}{h}\beta - k_3\gamma + D\,\nabla^2\gamma \quad (4)$$

Rate of change in extracellular cAMP = cAMP secretion − Extracellular hydrolysis + cAMP Diffusion

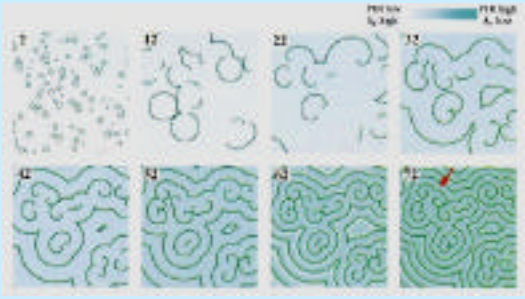
$$\frac{dPDI(x,y,t)}{dt} = PDI_s\{\delta[T(x,y)-t]\} + D_{PDI}\,\nabla^2 PDI \quad (5)$$

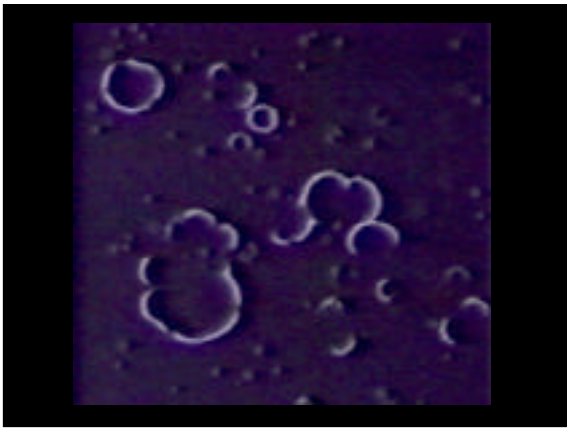
Rate of change in extracellular [cAMP] = Random PDI secretion + PDI diffusion

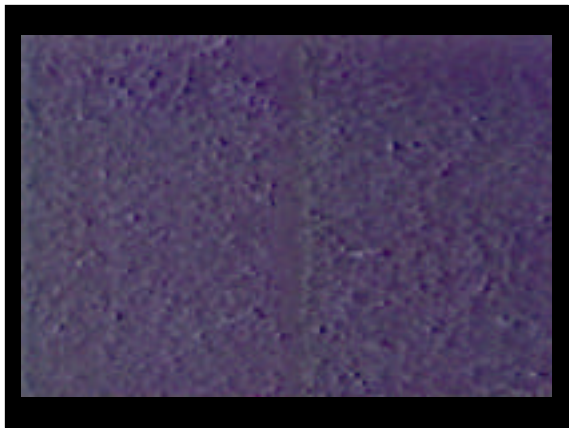
Spirals Originate from an Off-center PDI pulse

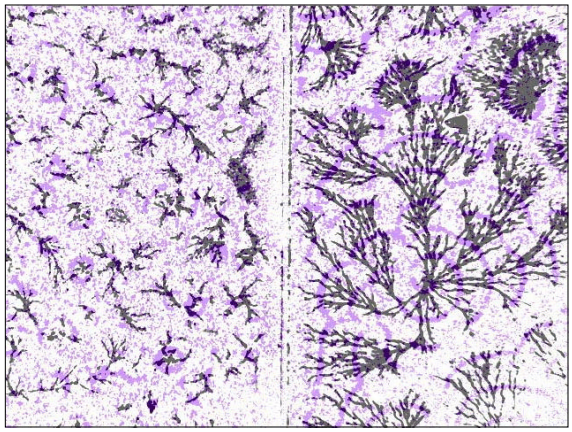


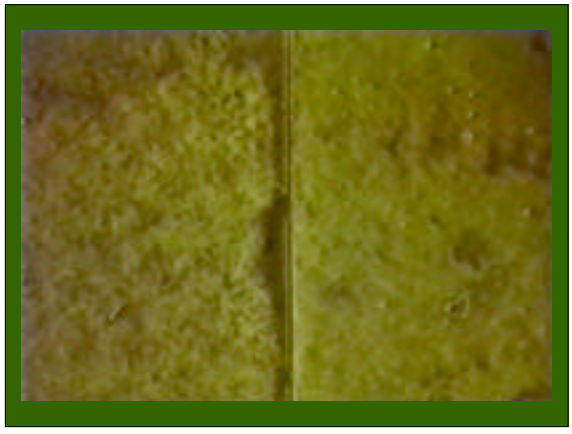
PDI Triggers Spirals and Tunes Frequency



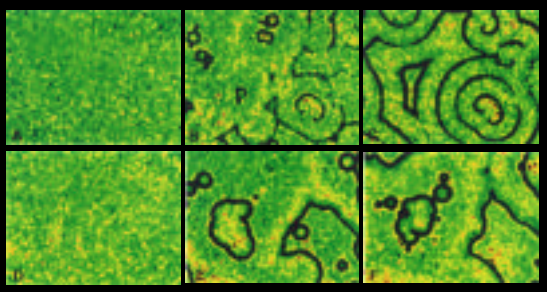




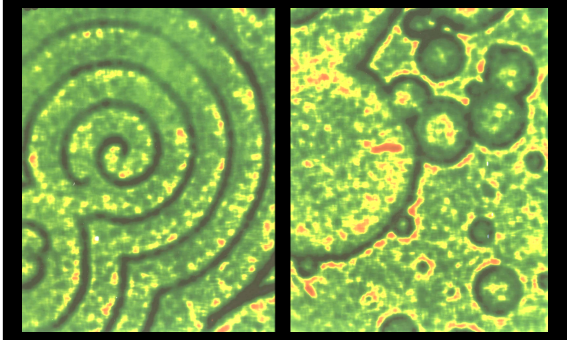


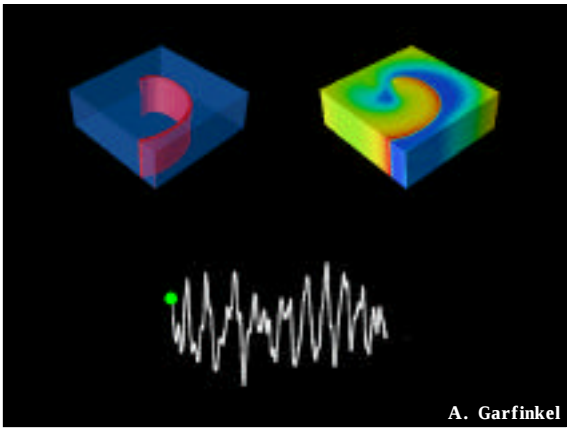


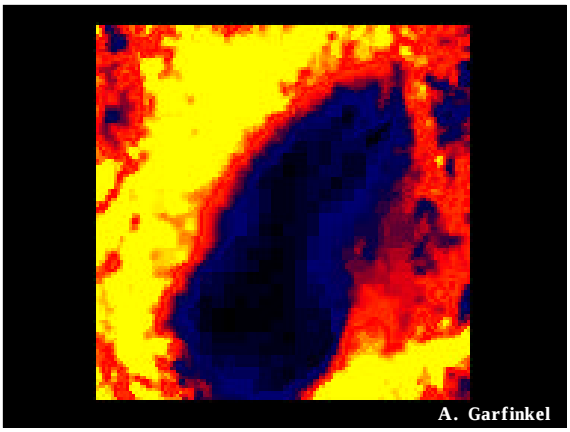
Defibrillating Spiral Waves with cAMP



Defibrillating Spiral Waves in *Dictyostelium*






A. Garfinkel