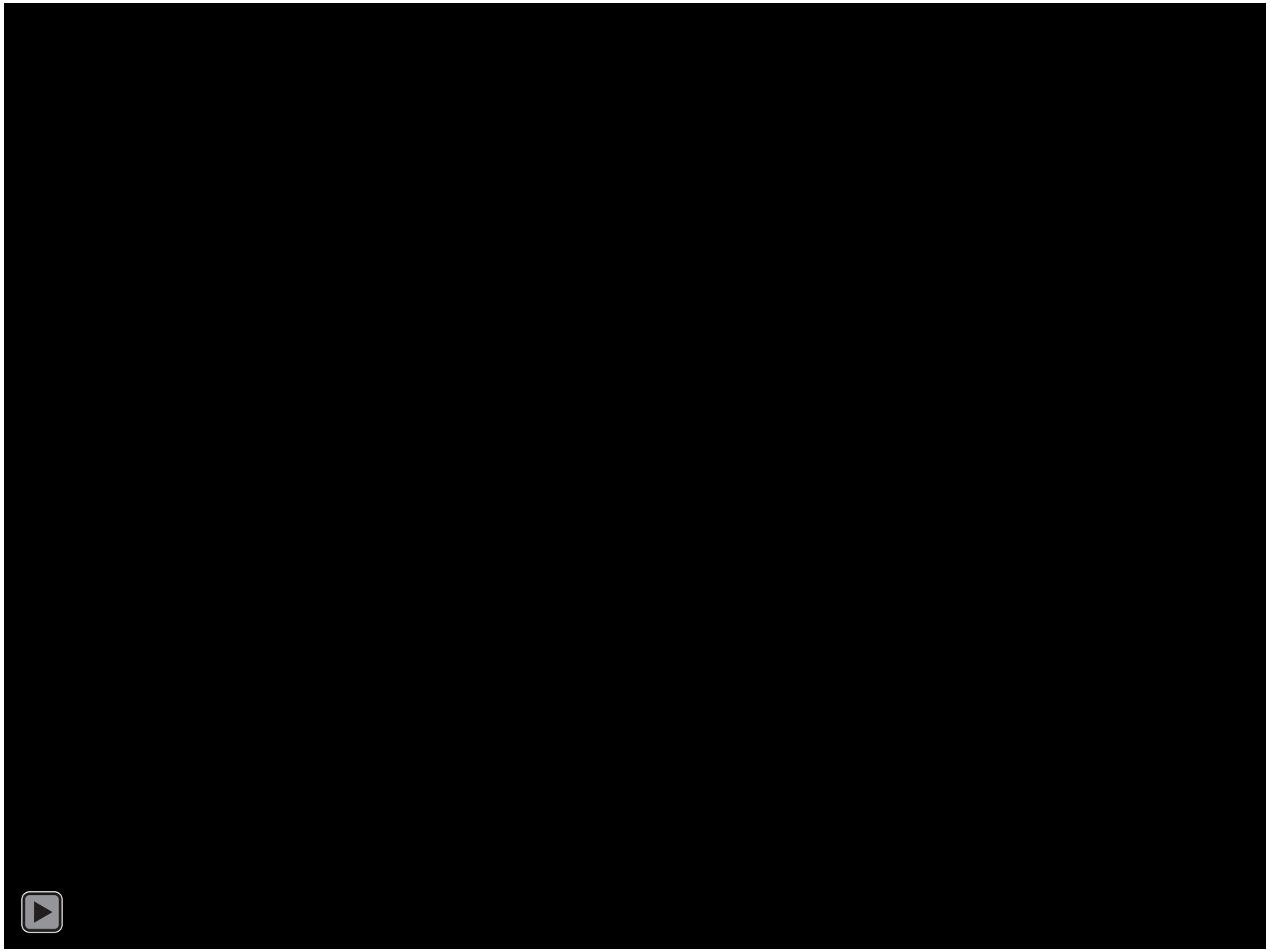
How does a bacteria find it’s center?

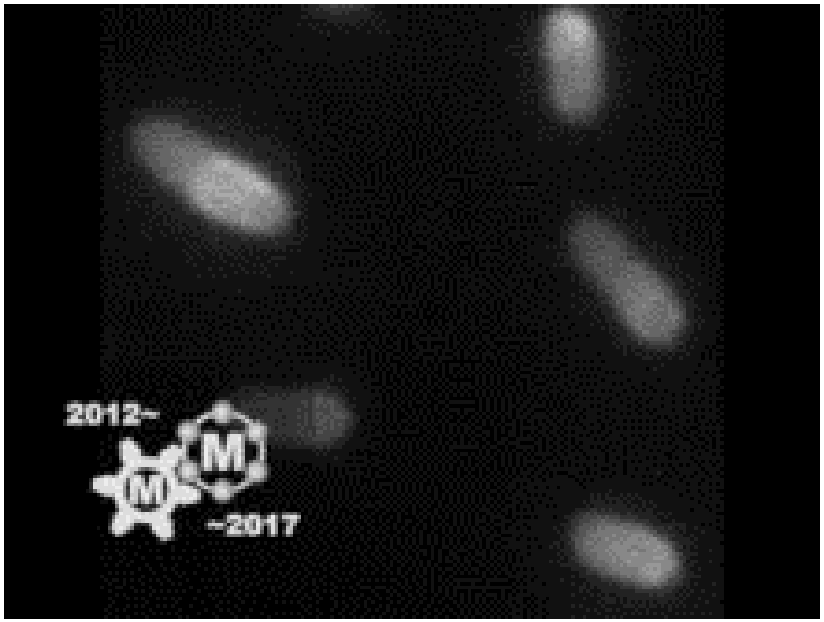


Wissenschaftliche Filme Göttingen

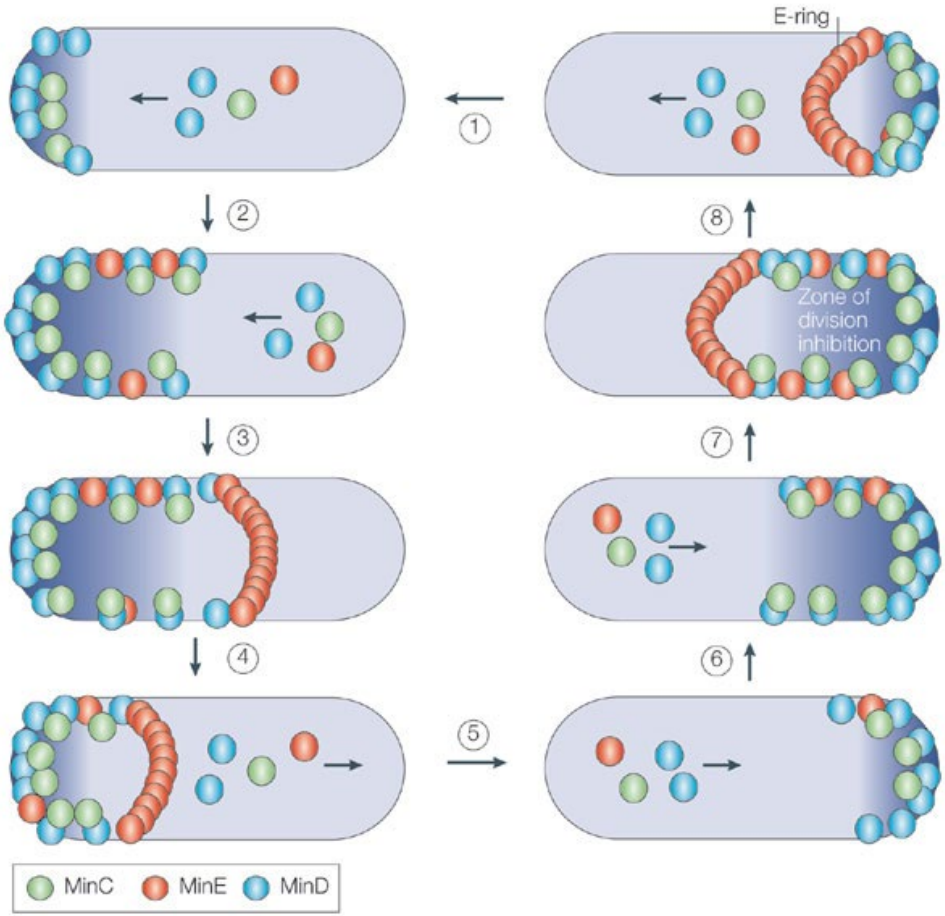
How does a bacteria find its center?

4 Proteins involved:
MinC, MinD, MinE
And Ftsz, which forms the ring.

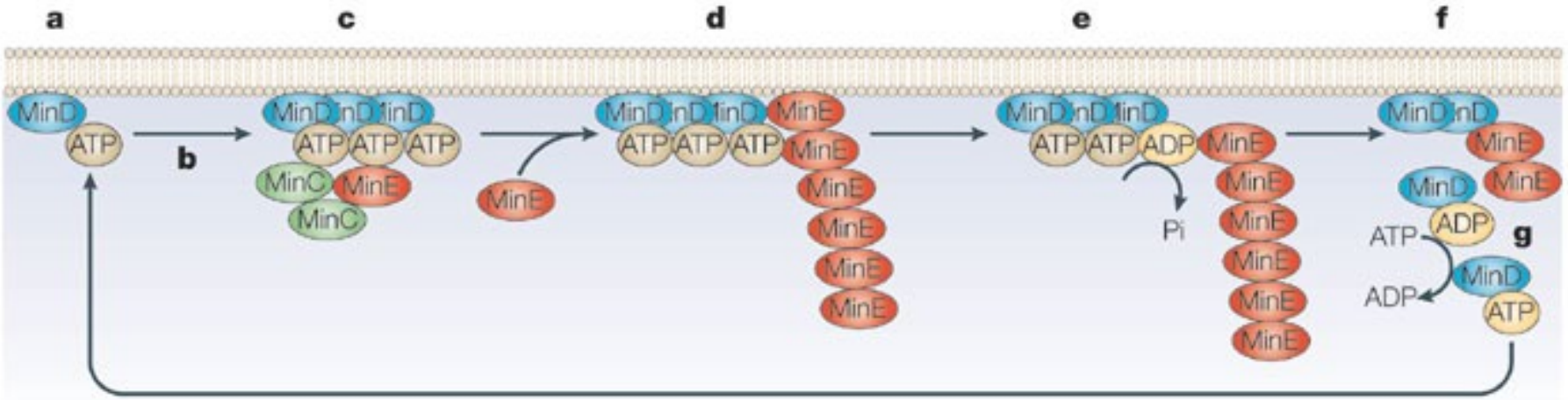
Oscillations of the Min proteins inhibit the ring formation at the poles.



Motility machinery (YouTube)



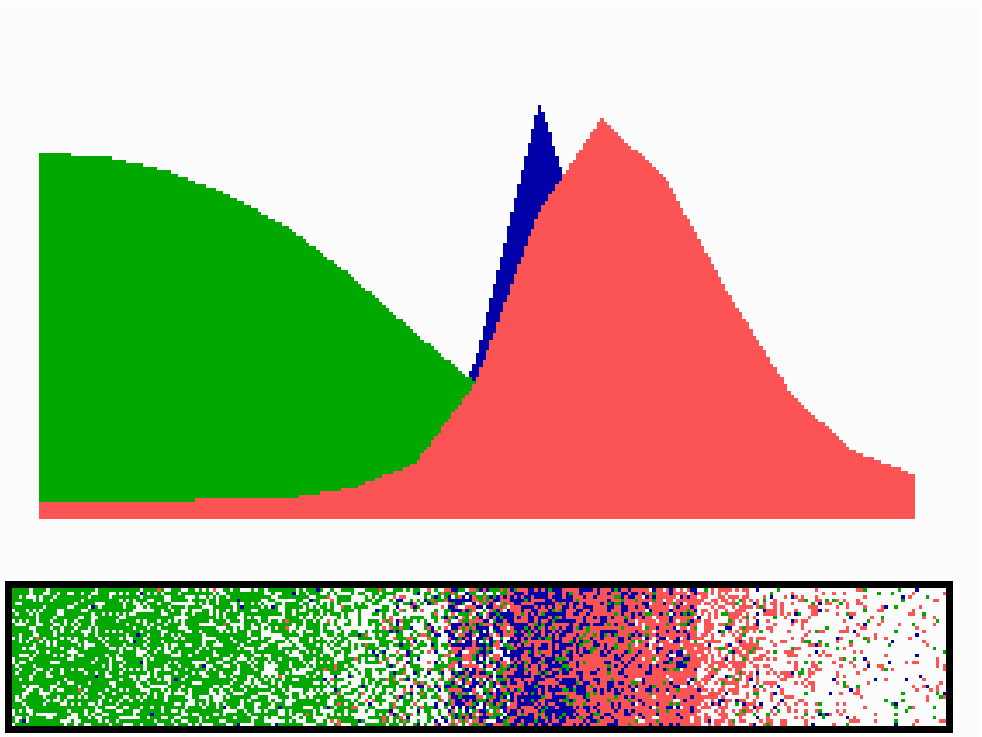
How does a bacteria find its center?



4 Proteins involved:
MinC, MinD, MinE
And Ftsz, which forms the ring.

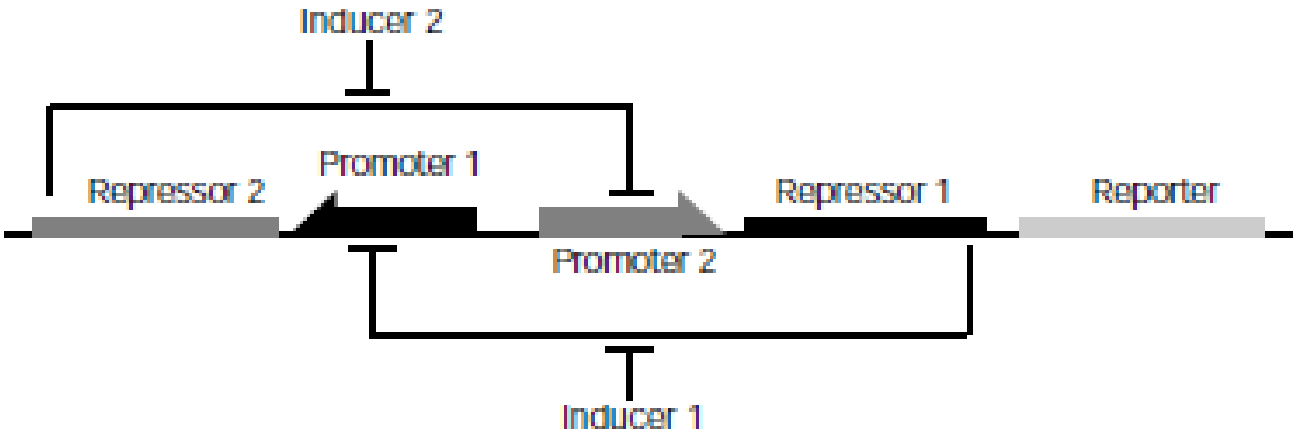
How does a bacteria find its center?

Dynamic quation allow to simulate the movement of MinC (green), MinE(red) and FtsZ (blue)



Turning genes on and off: Genetic expression switch in bacteria
The toggle switch

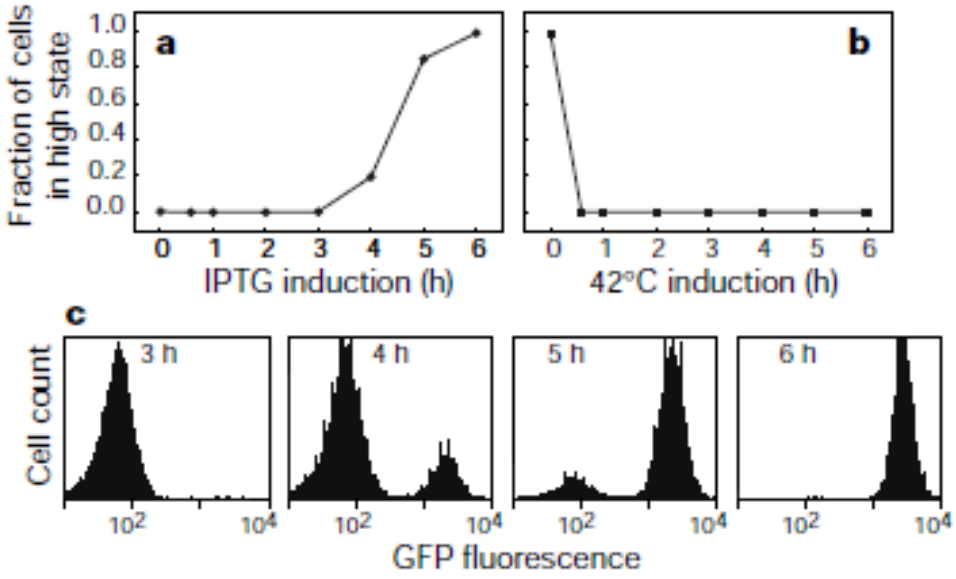
Main idea: simple genetic network that switches between 2 states (on/off) depending on an external signal



Gen on promoter 1 will produce the repressor of the promoter 2.

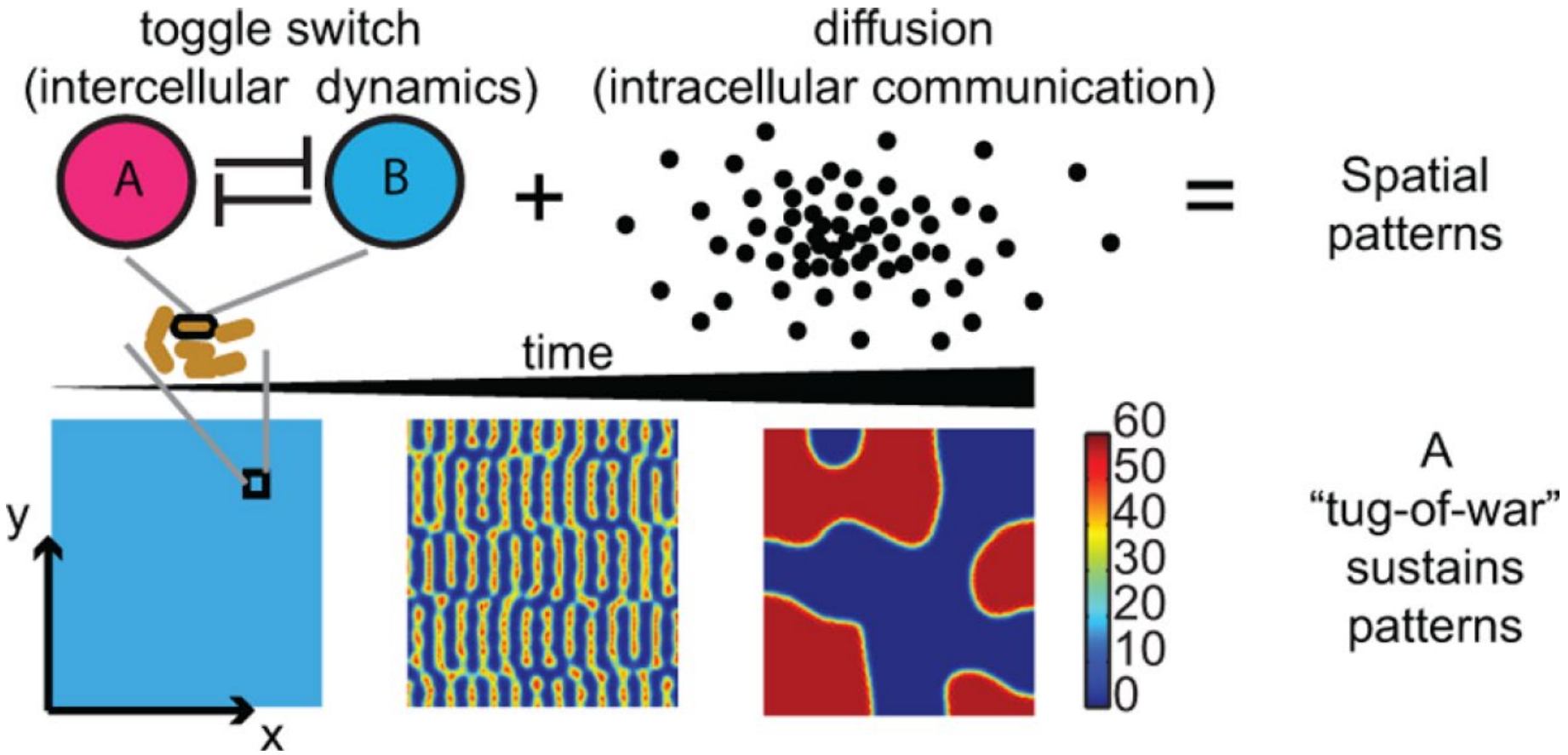
Toggle switch (inter-cell communication)

Switching can be induced by a singal of a chemical IPTG, or a thermal shock.



Toggle switch (inter-cell communication)

Including communication (if switched on, each cells wants to switch the neighbours).



Toggle switch (inter-cell communication)

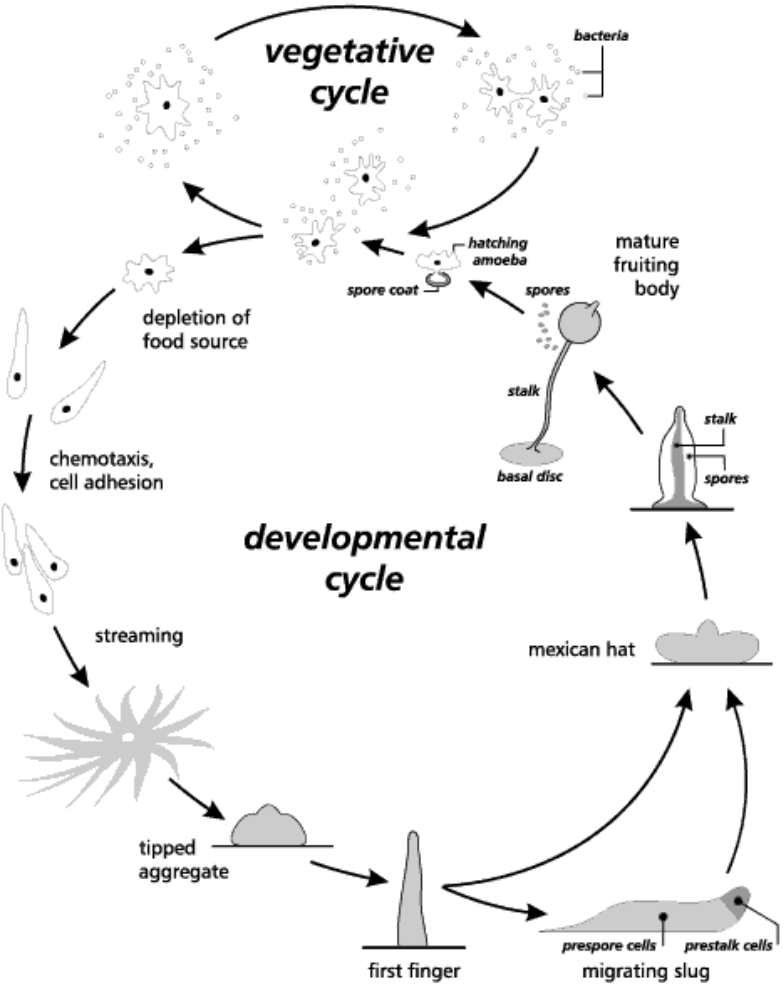
Project idea:

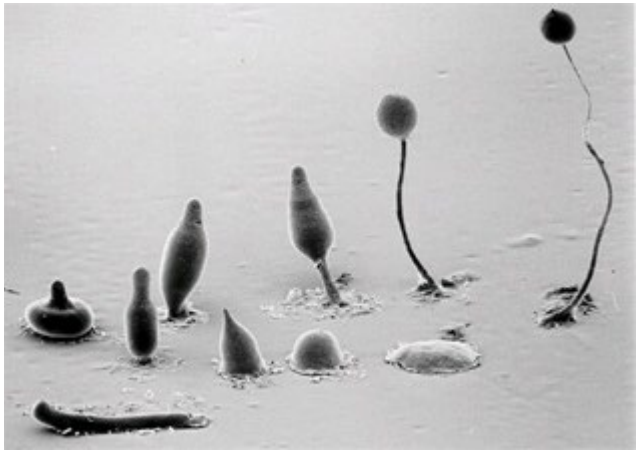
- Reproduce the dynamics of this system.

-Introduce a next neighbor interaction between cells. (one cell makes the neighbor to change state).

-Study possible pattern formation results that emerge from the interaction between neighbors.

From single cell to multicellular organization: cAMP signalling in Dictyostelium

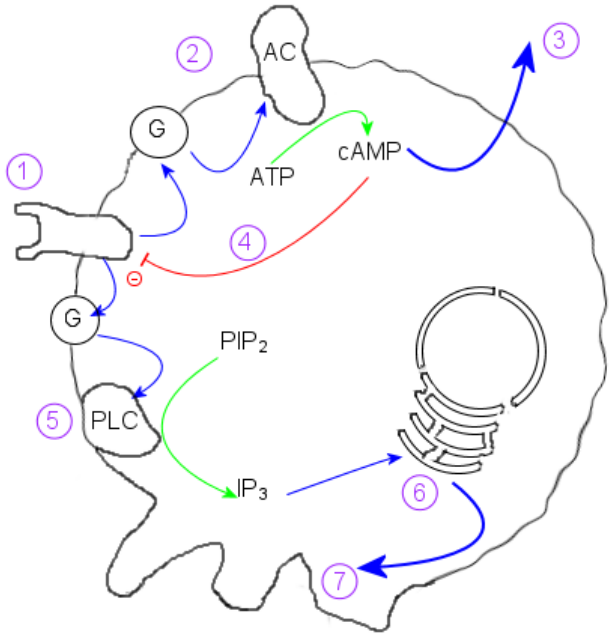




From single cell to multicellular organization: cAMP signalling in Dictyostelium

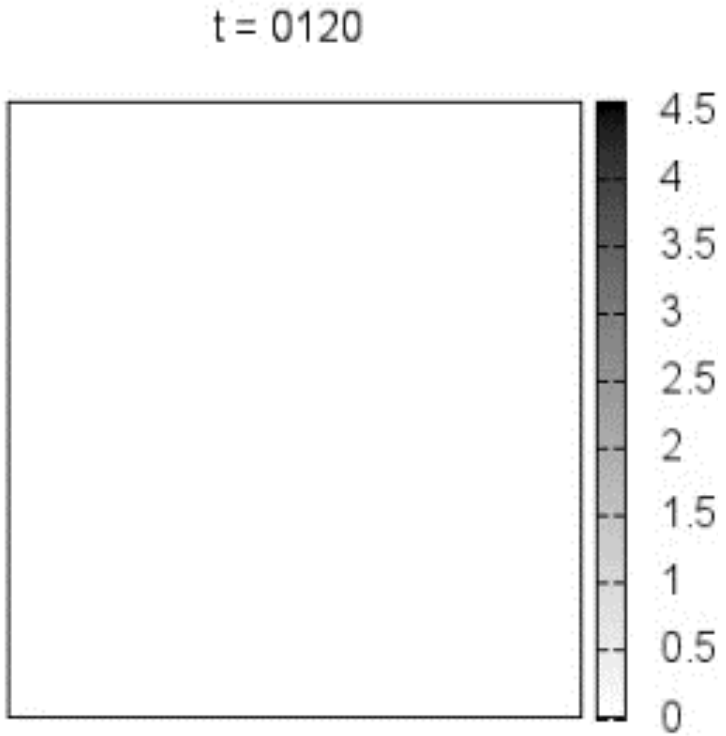
Chemotaxis of Dictyostelium to cAMP

From single cell to multicellular organization: cAMP signalling in Dictyostelium



Chemotaxis and cAMP release!

From single cell to multicellular organization: cAMP signalling in Dictyostelium

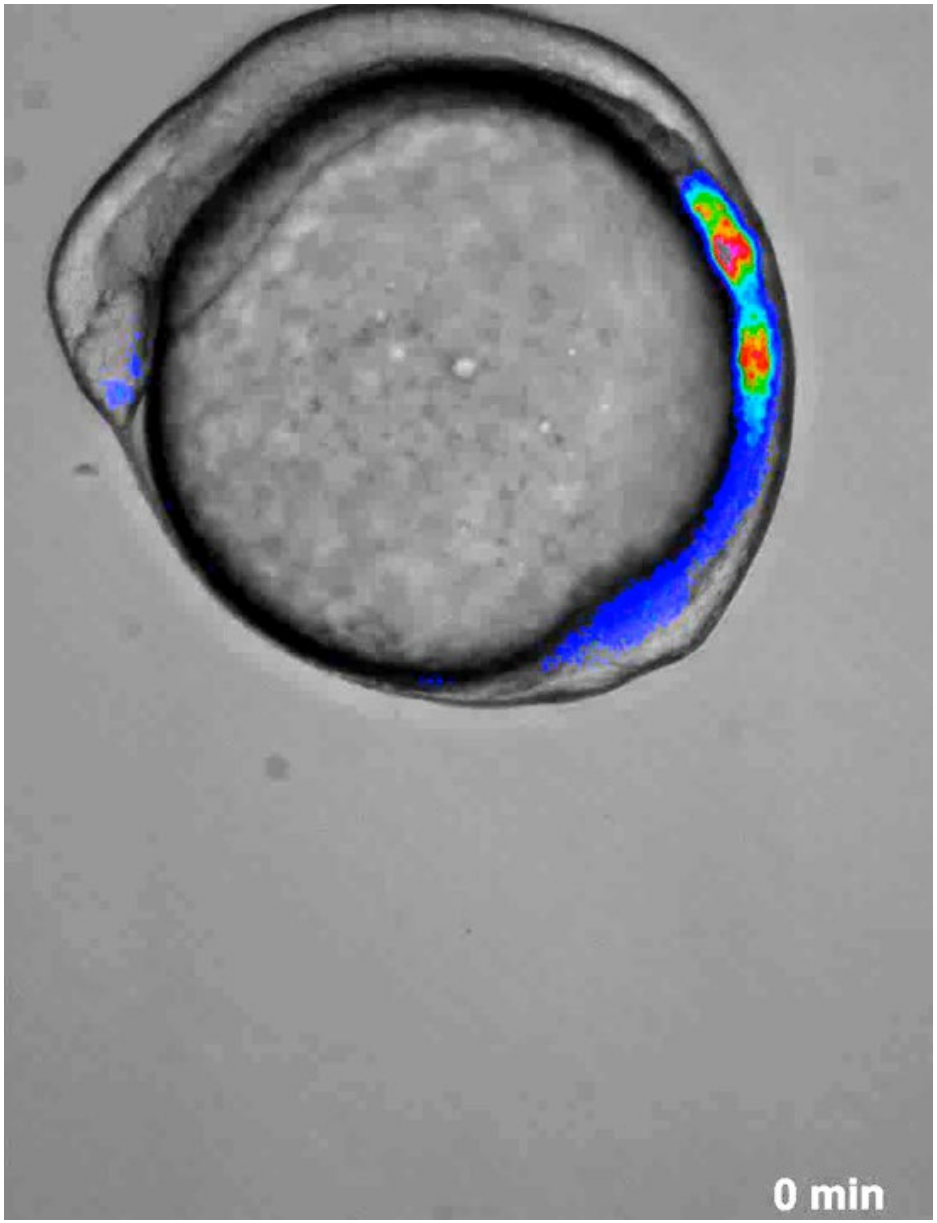


These can be simulated

Chemotaxis and cAMP release results in waves

Oscillations in the developing zebra fish

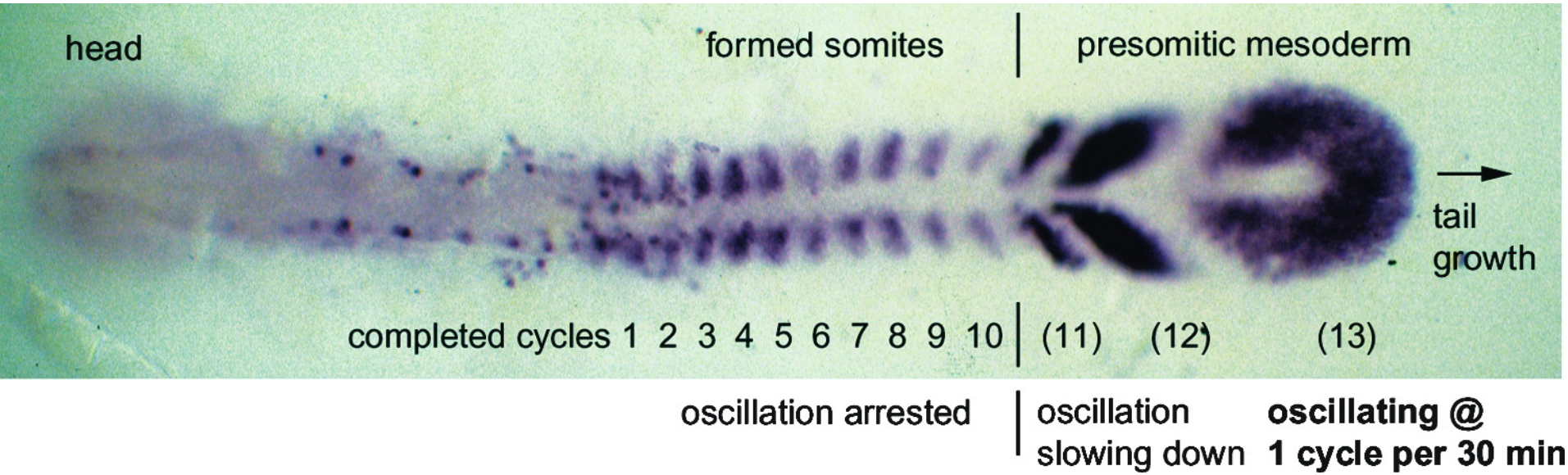
Oscillations in the developing zebra fish: The base for segmentation during development



Oscillations in the developing zebra fish

Oscillations in the developing zebra fish:

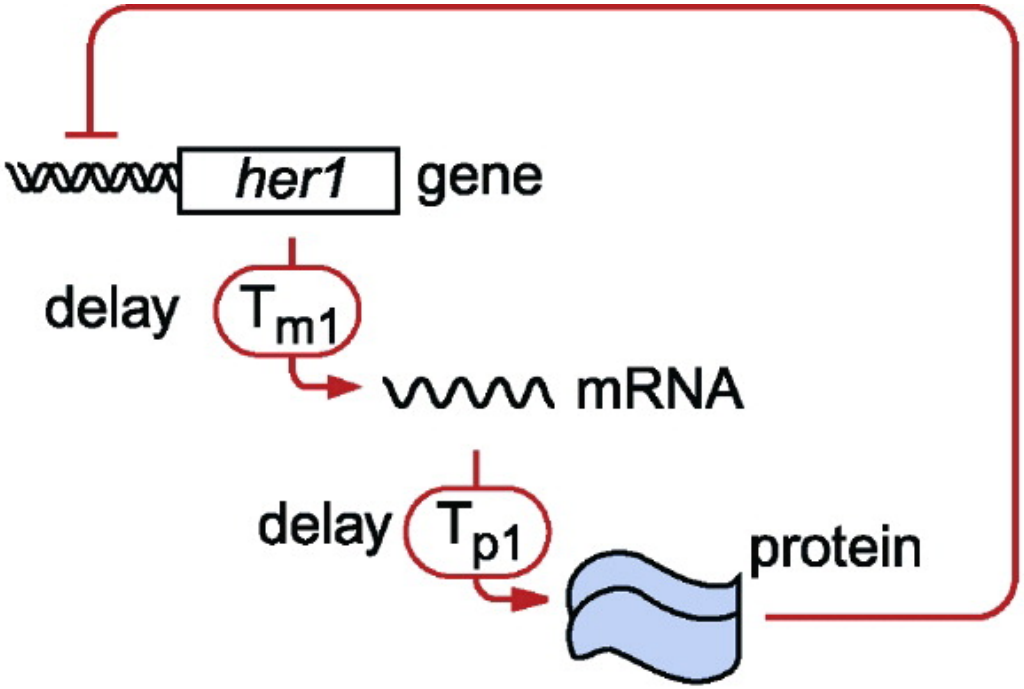
This is the base for segmentation during development



Oscillations in the developing zebra fish

Oscillations in the developing zebra fish:

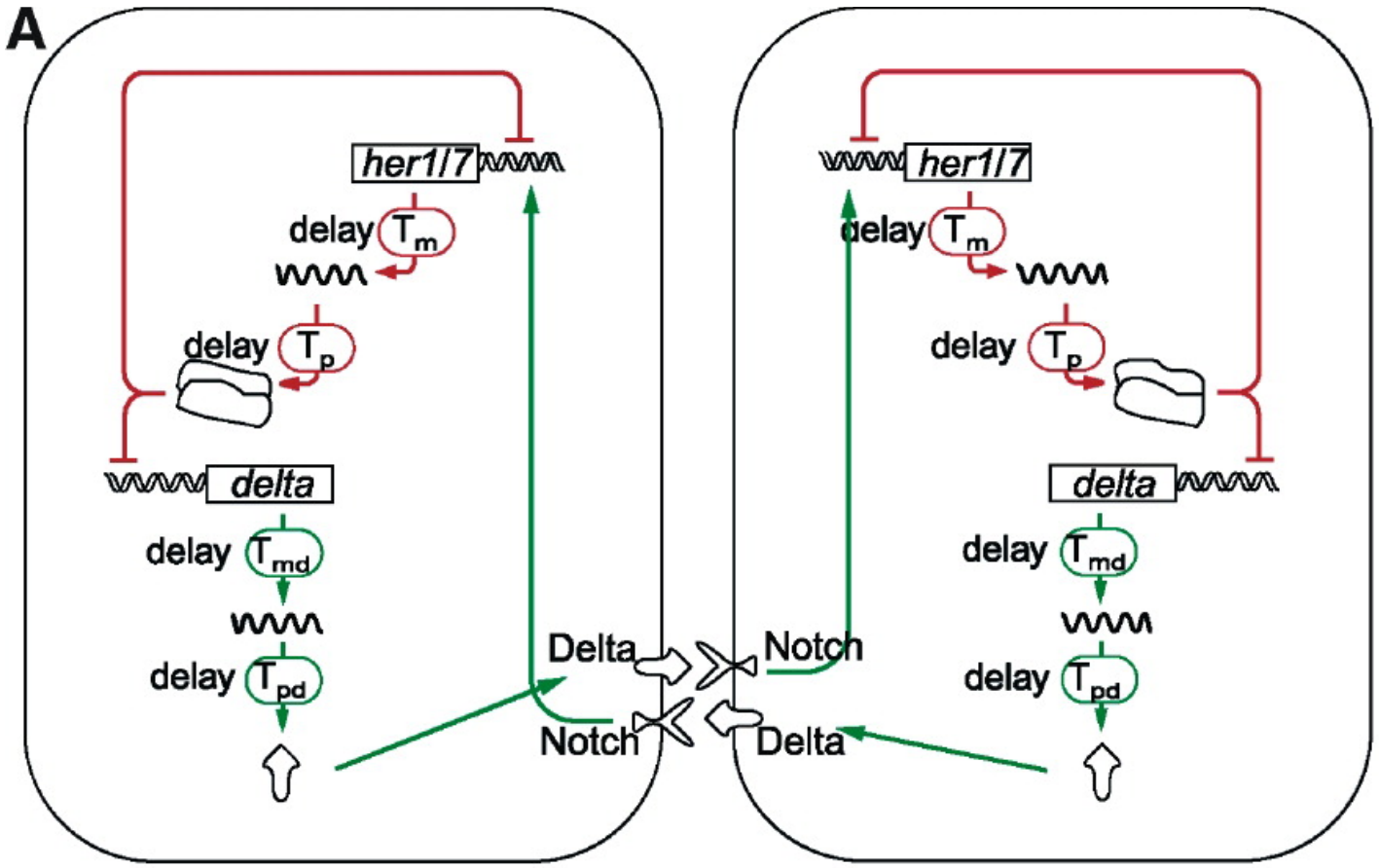
Negative feedback in the her1 protein



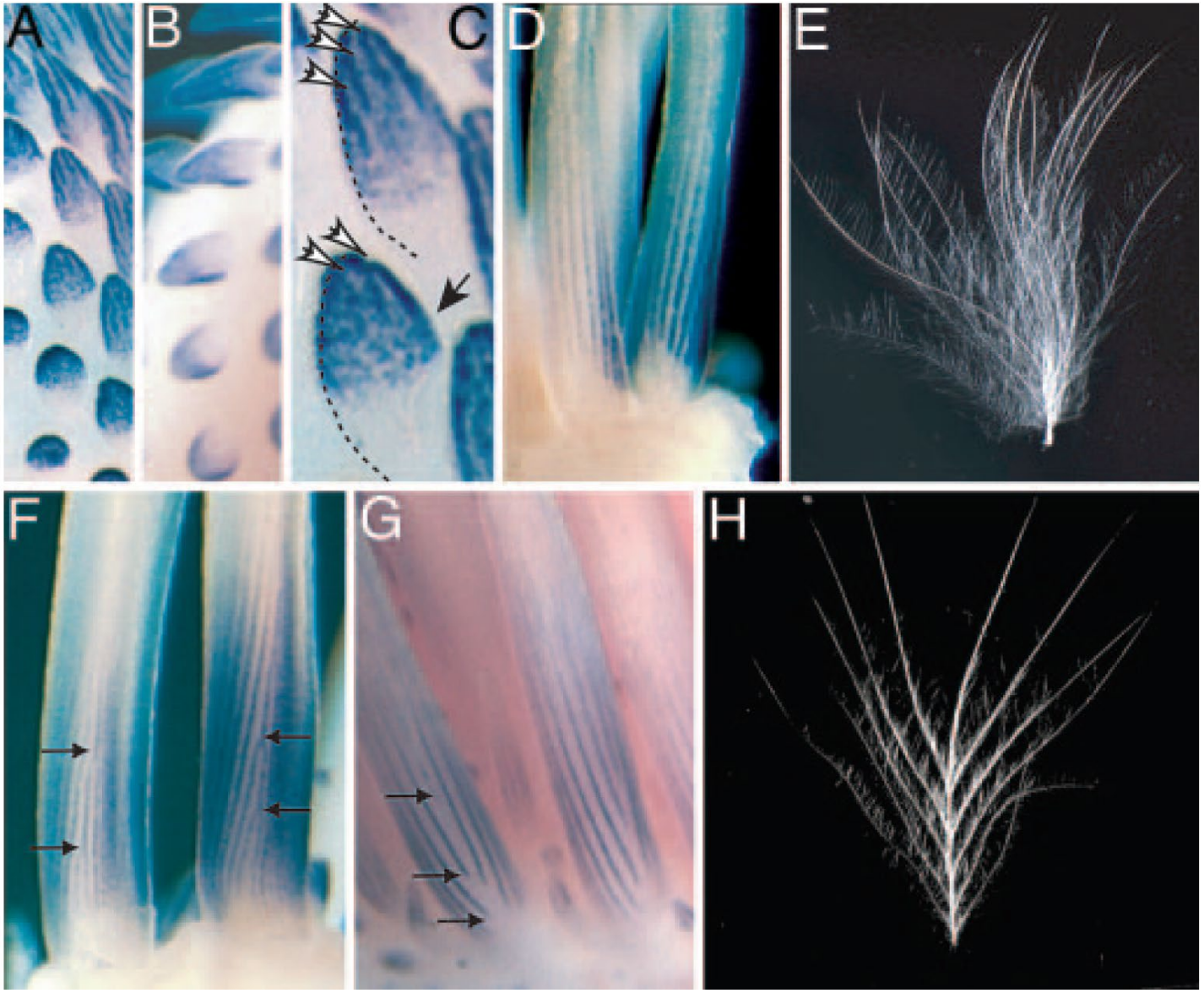
Oscillations in the developing zebra fish

Oscillations in the developing zebra fish:

Cell – Cell coupling lead to synchronous oscillations



Development of feathers



Development of feathers