

Dale Kaiser - Evolutionary Origin of Multicellular Development

Steps to Developmental Cell Interaction

① Operons to respond to environment

- Stringent Response

- similar to GCN4 system in yeast

- regulator = (pppGpp)

- stimulus = deficit in any aa

- response = inhibit rRNA, tRNA, riboprot synthesis

stim. aa synthesis

stim. protein breakdown

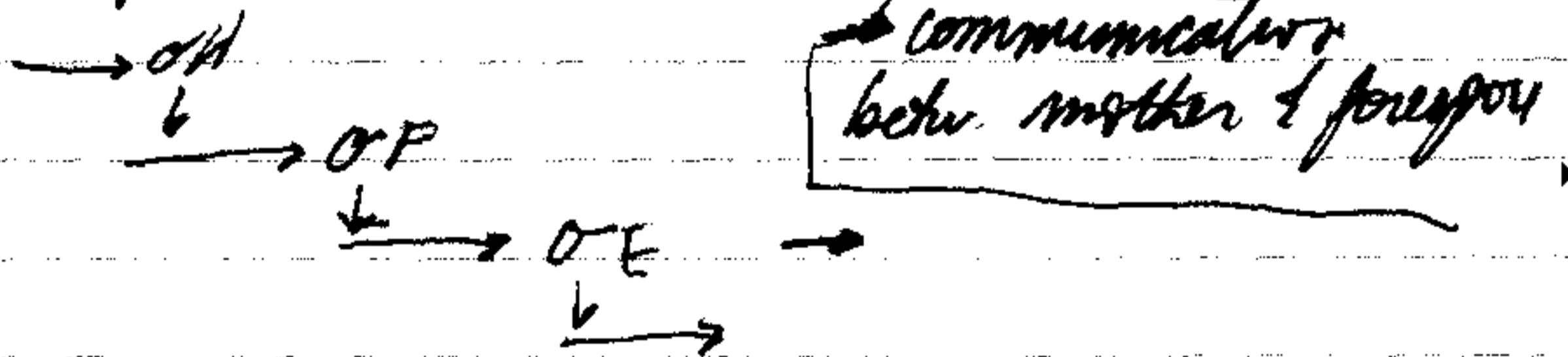
inhib. prot. synthesis; phospholipid syn

② secretes a molecule which can respond



③ cascade (allows for timing regulation)

B. subtilis sporulation



④ combine 1, 2, & 3

- got a system in which a ^{devlop} response is guided by environ. Δ'

Myxococcus



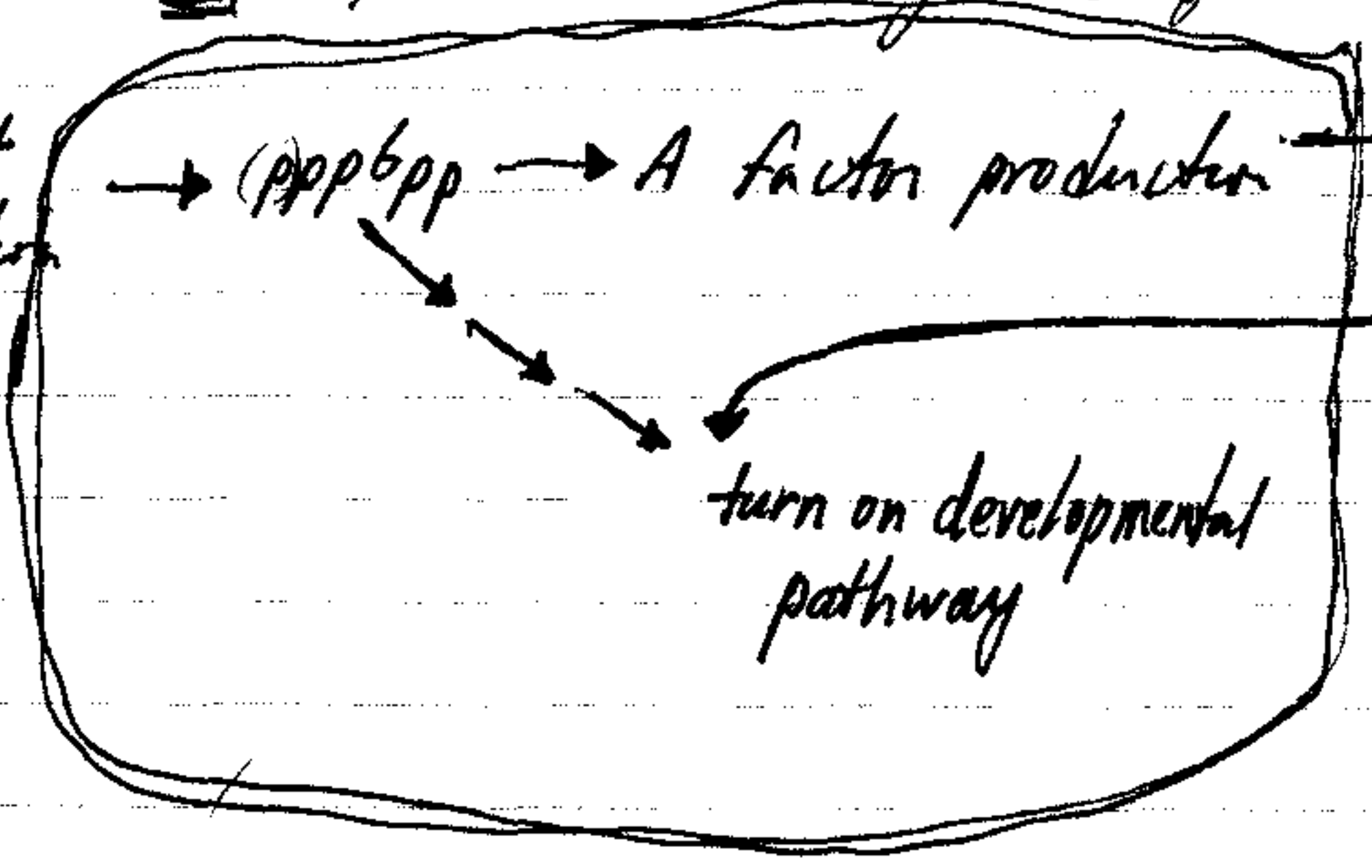
starvation → aggregation → symmetrization → sporulation/differentiation

- two extracellular signals required

A - six aa released by cells after starvation induced

Cells far apart
so need soluble
signal

nutrient
limitation



lets cells know there
are others around to
allow for development

E - hydrophobic cell surface bound 20kDa protein

- leads to Δ's in cell movement (ridges or waves of cells form)
- regulates its own tx

- isolated Tn5 insertions w/ phenotypes like those of C signalling mutants

- two classes of mutants

- I = frz locus (homologs of chemotaxis genes)
- II =

link to motor
gliding

Multicellular origins

- apparently multiple origins
- both within & between major groups

Slime Molds

- grow in sim. environs to Myxococci
- many other similarities to Myx. dev.

- So why the similarities?

① both need same thing

② but even the dev. programs very similar

Similarities

① aa starvation is signal in both

② detect starvation → aggregate → sort → sporulate

③ use intercellular signals to activate sets of genes

④ both use quorum sensor

* ⑤ travelling waves

- CORN

- BANANA SLUGS

- Rattus
rattus

- Ponghoms