

Computational Embryology: *translational tools for modeling in vitro data*

Thomas B. Knudsen, PhD

Developmental Systems Biologist

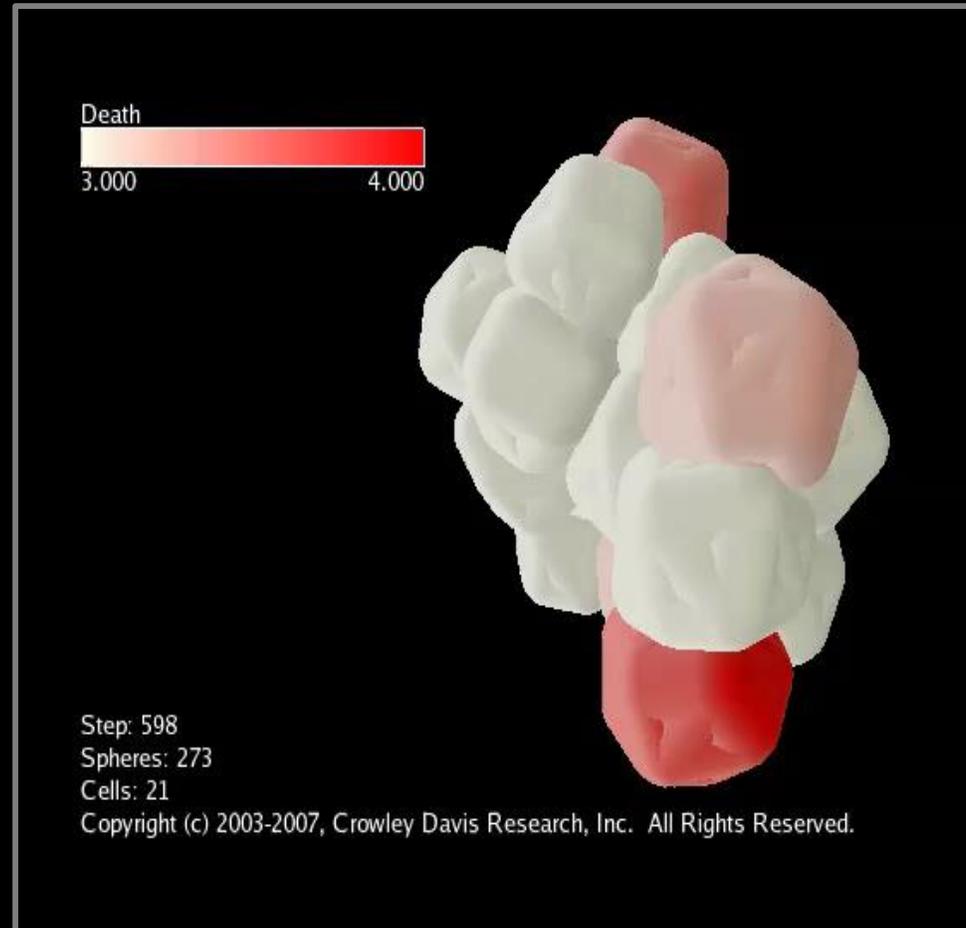
US EPA, National Center for Computational Toxicology

knudsen.thomas@epa.gov

[ORCID 0000-0002-5036-596x](https://orcid.org/0000-0002-5036-596x)

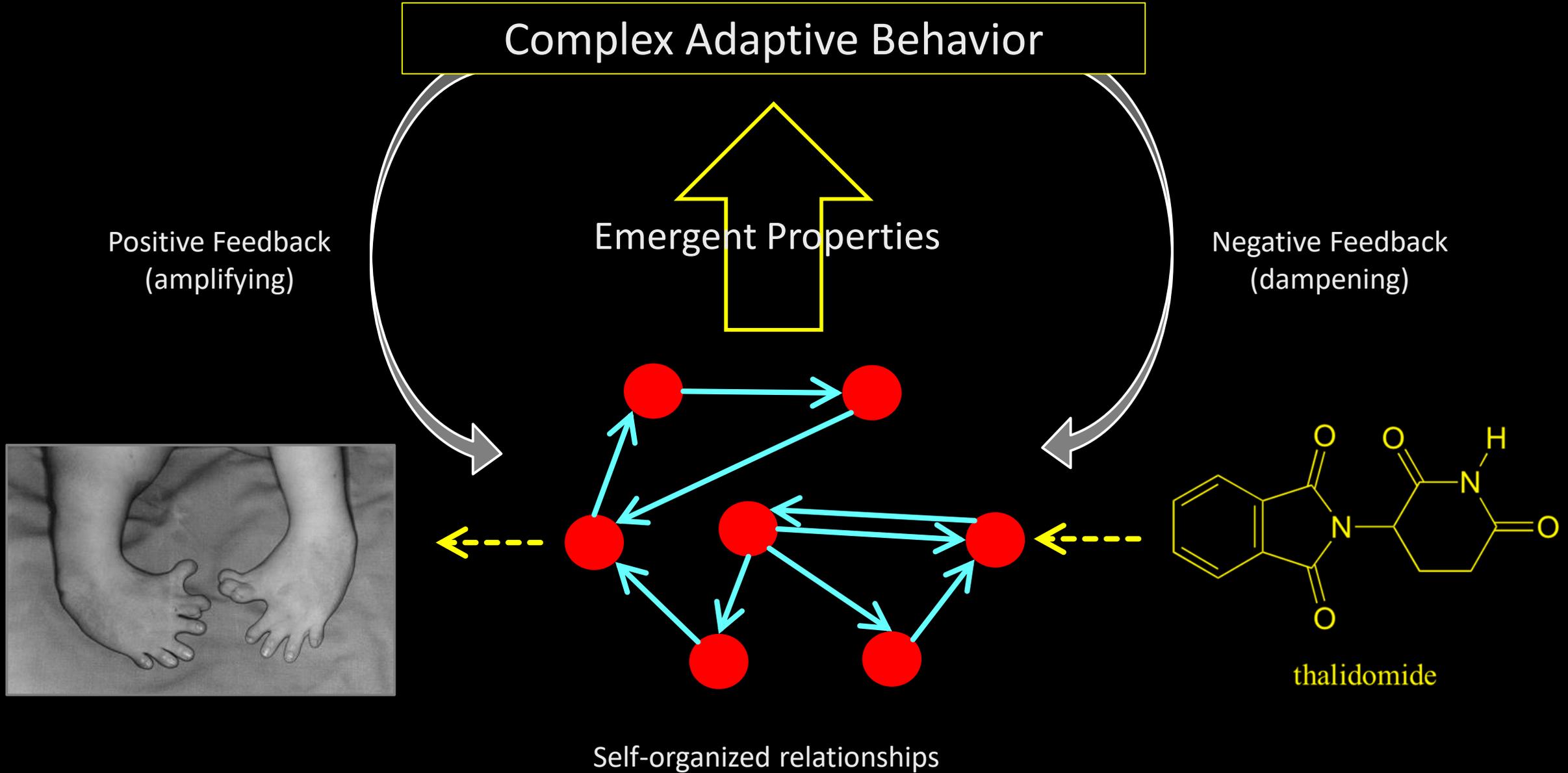
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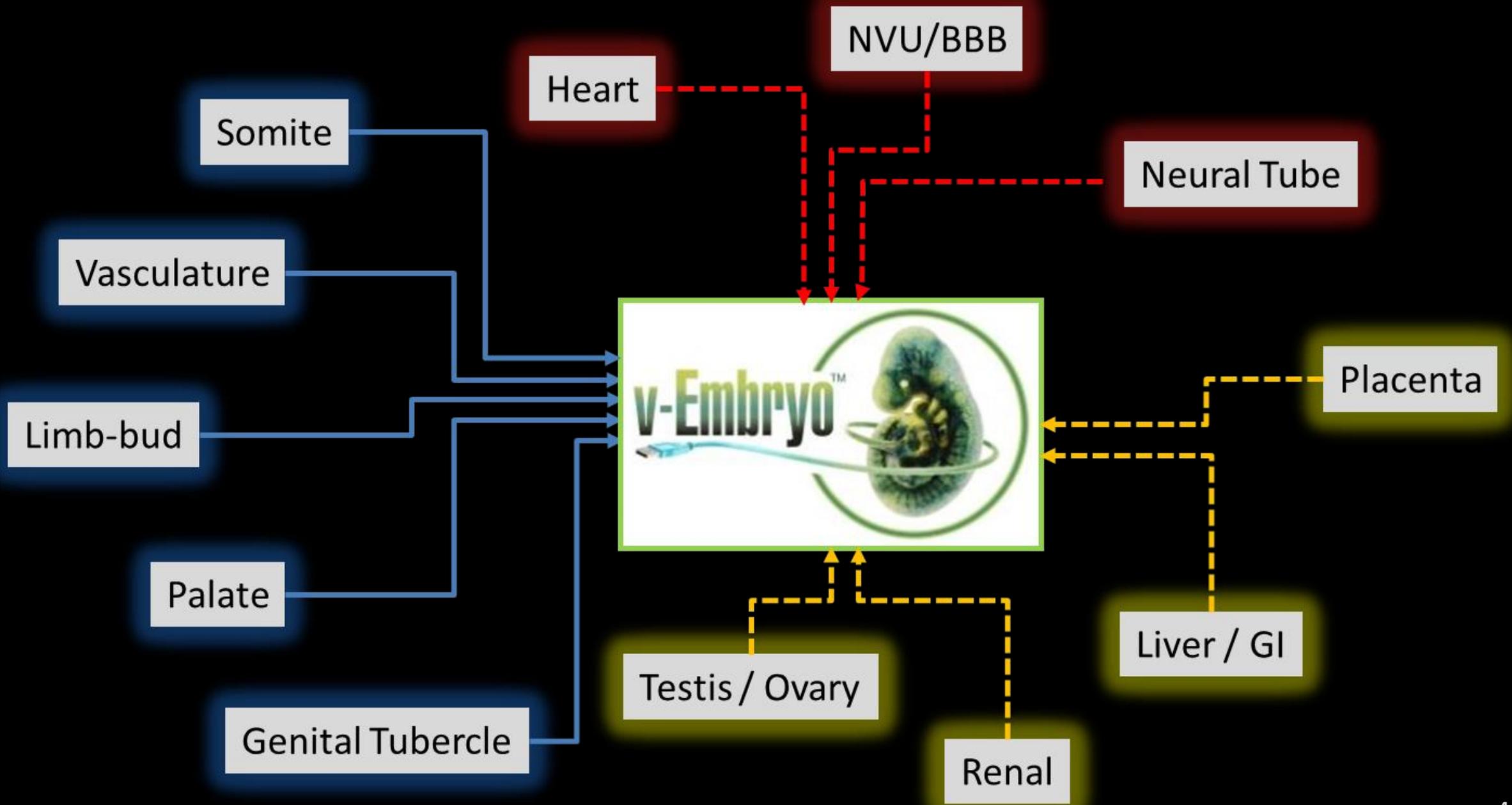
Anatomical homeostasis in a self-regulating Virtual Embryo



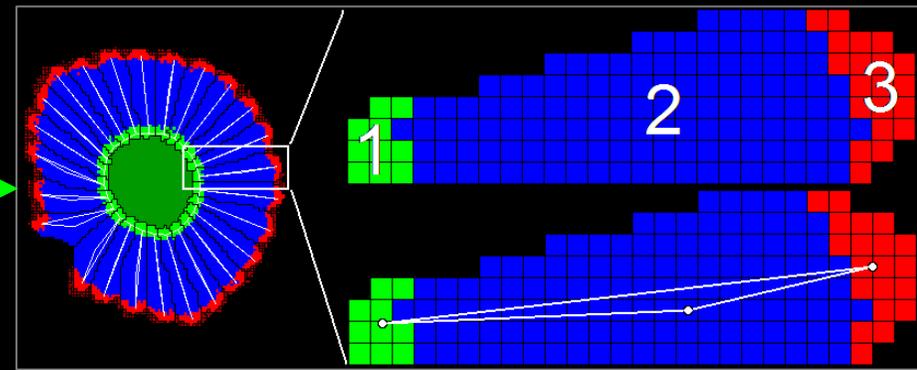
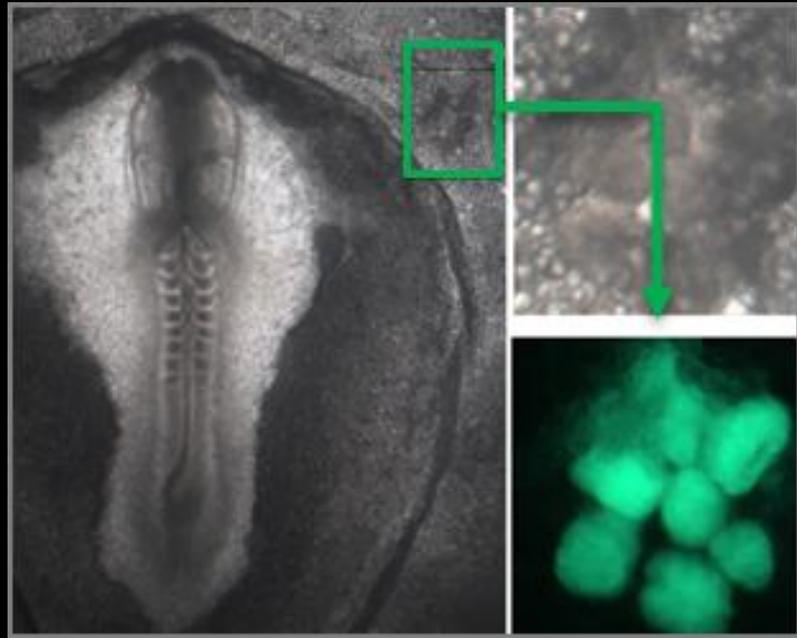
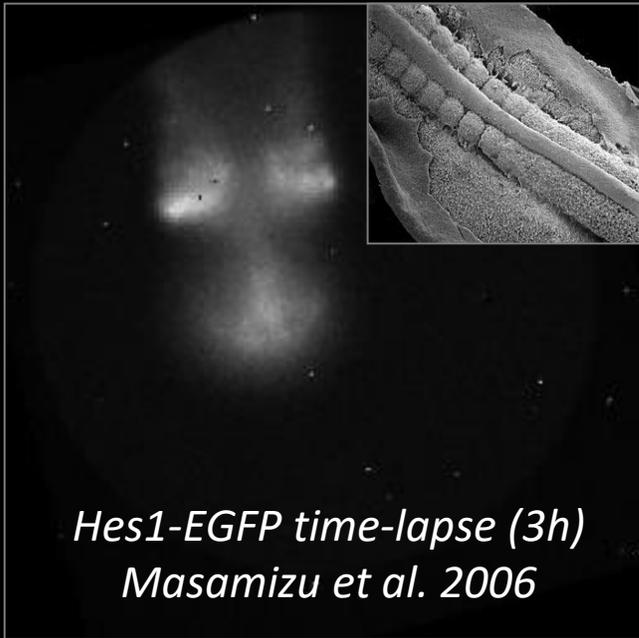
*SOURCE: Andersen, Newman and Otter
(2006) Am. Assoc. Artif. Intel.*

Complex Adaptive Behavior



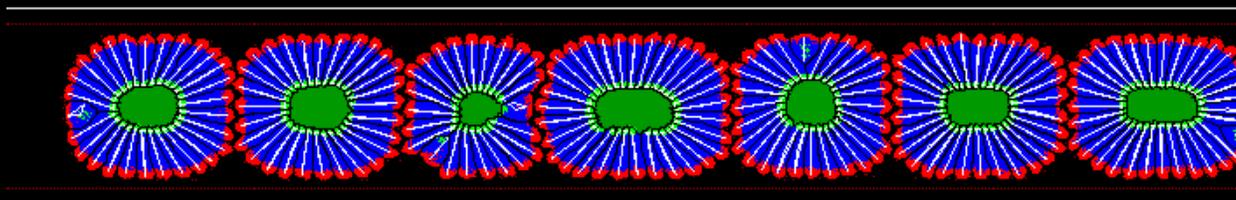


Modeling somite development

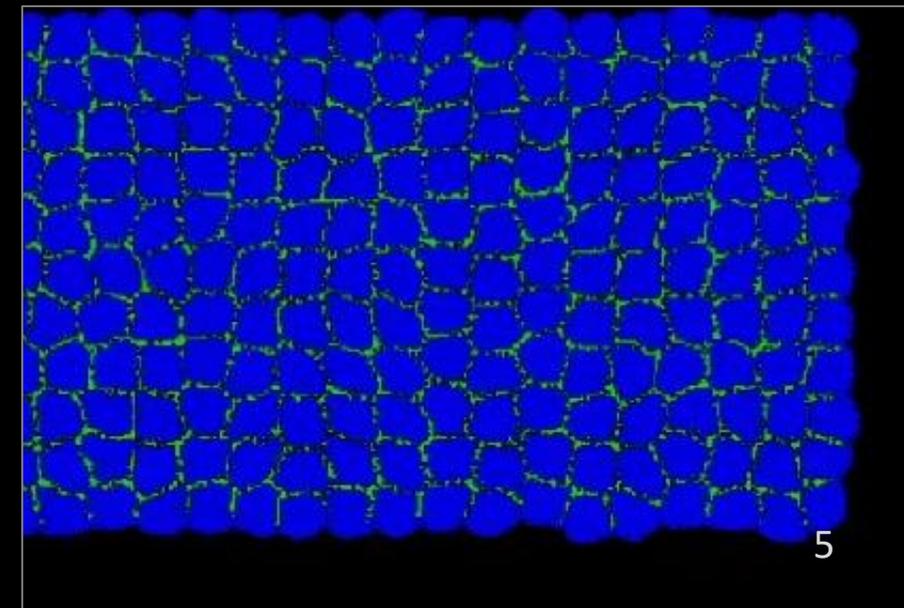
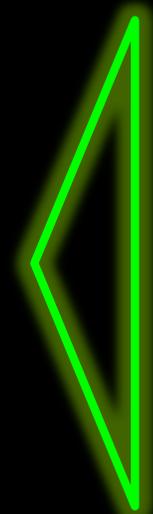


Differential cell adhesion

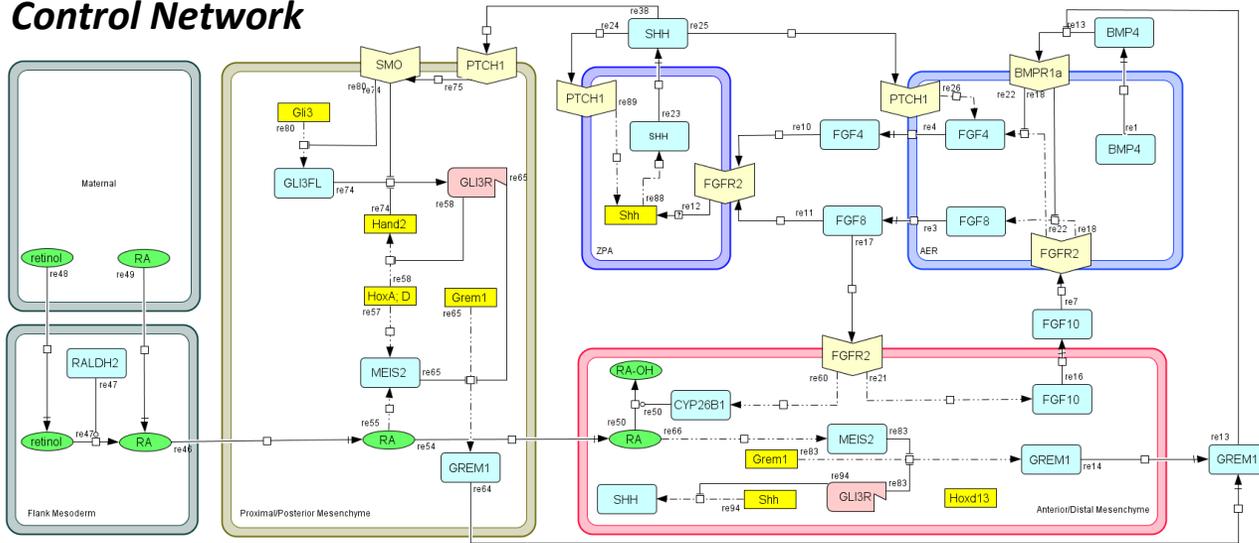
- clock genes do not oscillate
- somites form simultaneously



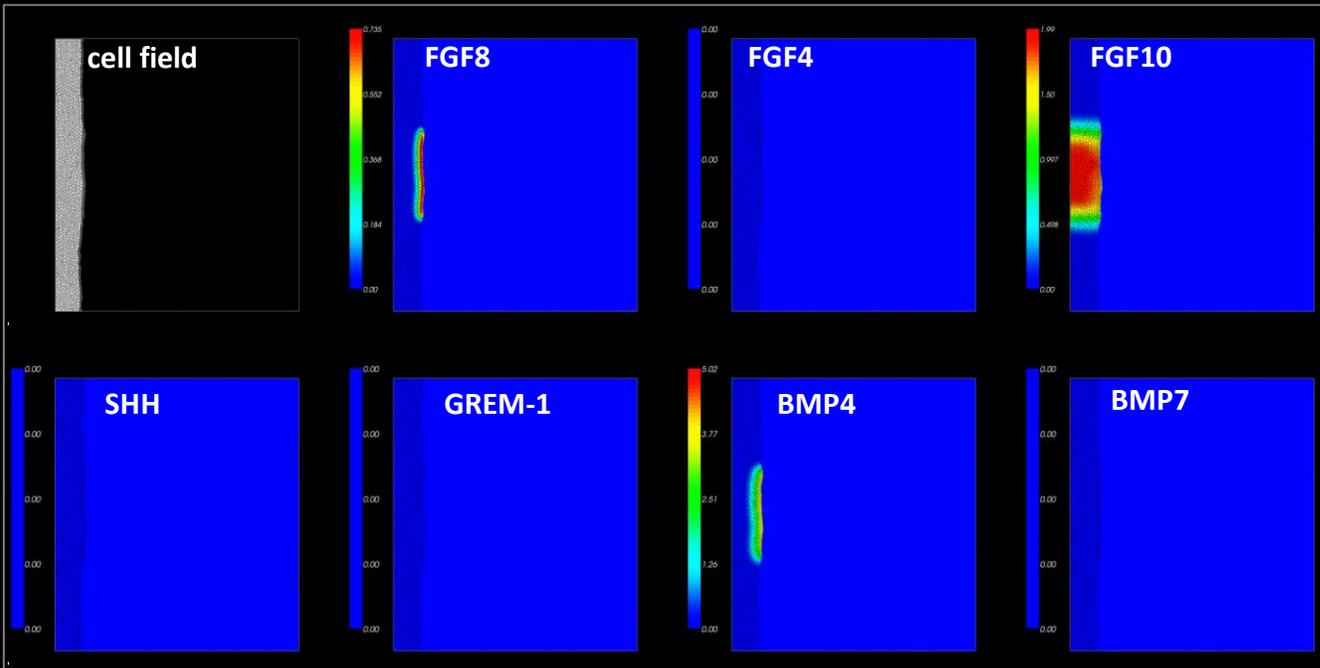
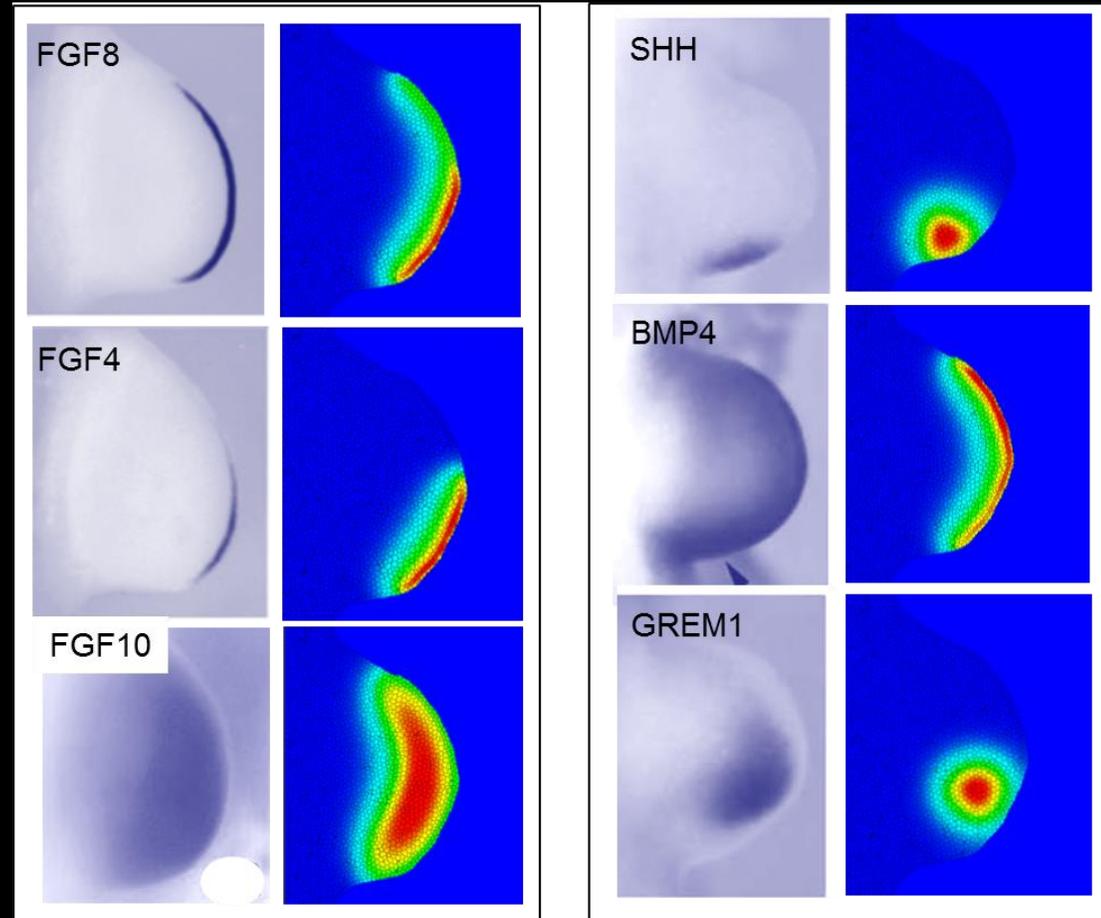
- *FGF8 wavefront restores sequentiality*
- *oscillatory clock improves regularity*



Control Network

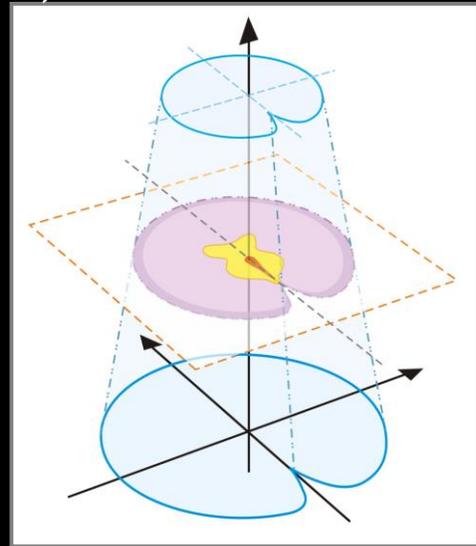
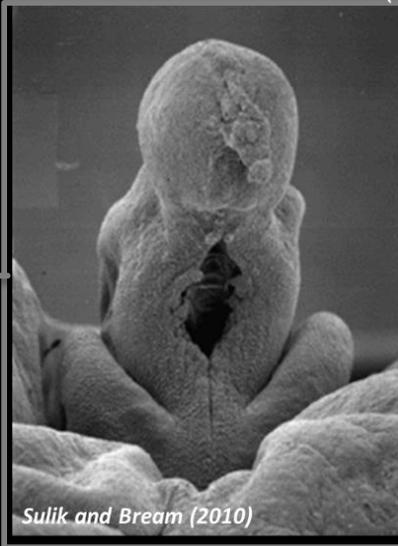


2. Limb-bud outgrowth

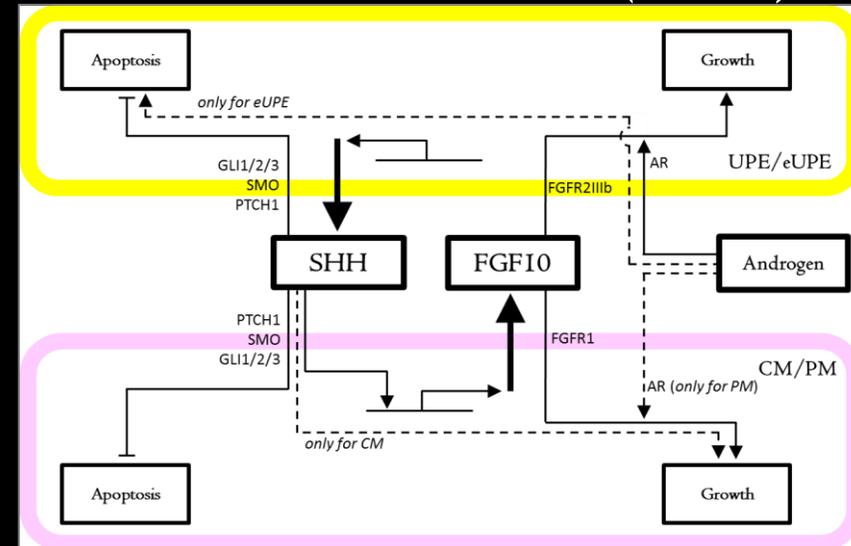


Sexual dimorphism: genital tubercle morphogenesis

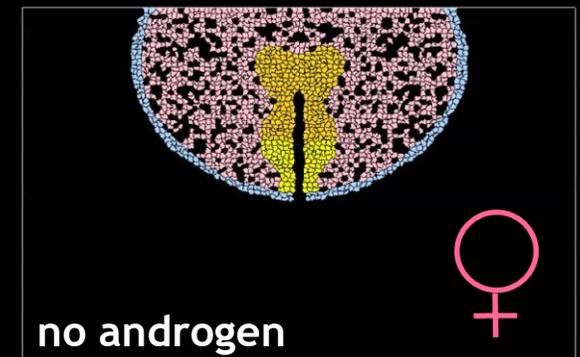
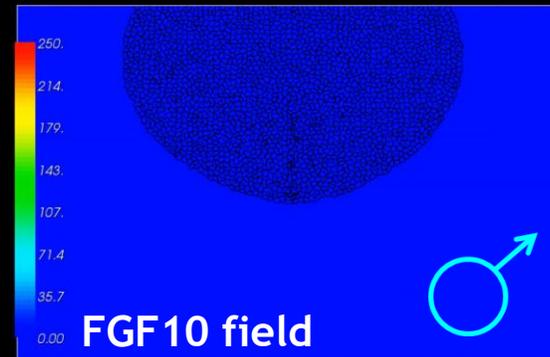
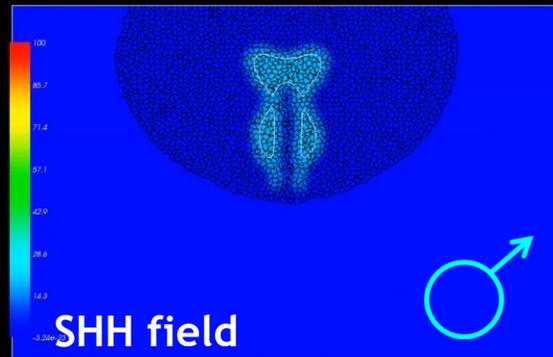
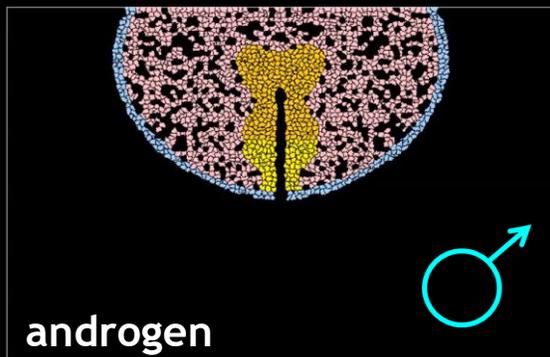
Genital tubercle (GT)



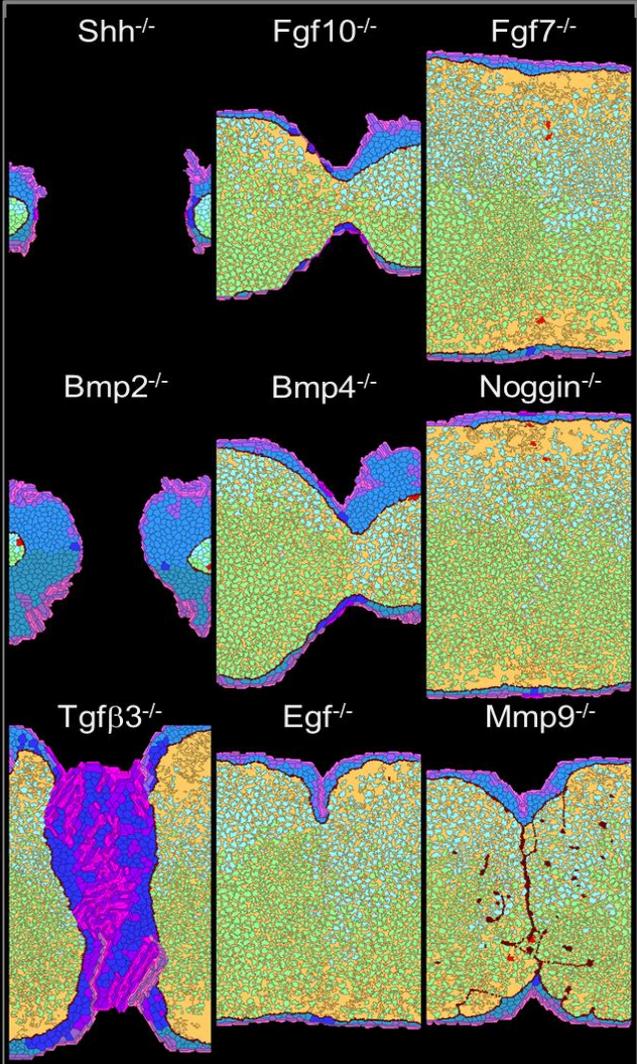
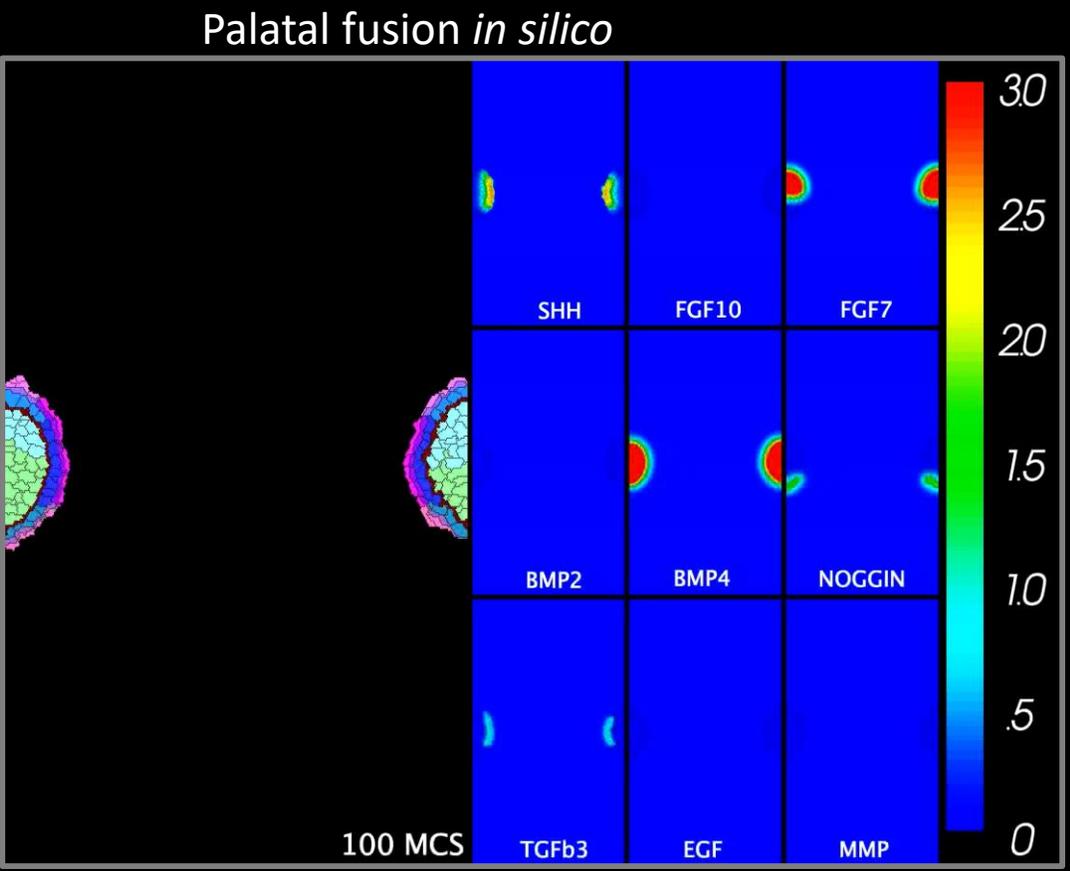
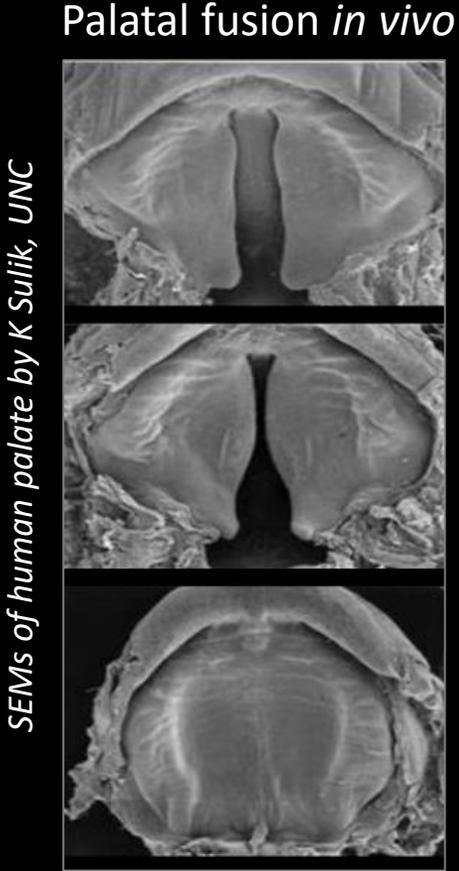
Control Network (mouse)



ABM simulation for sexual dimorphism (mouse GD13.5 - 17.5)



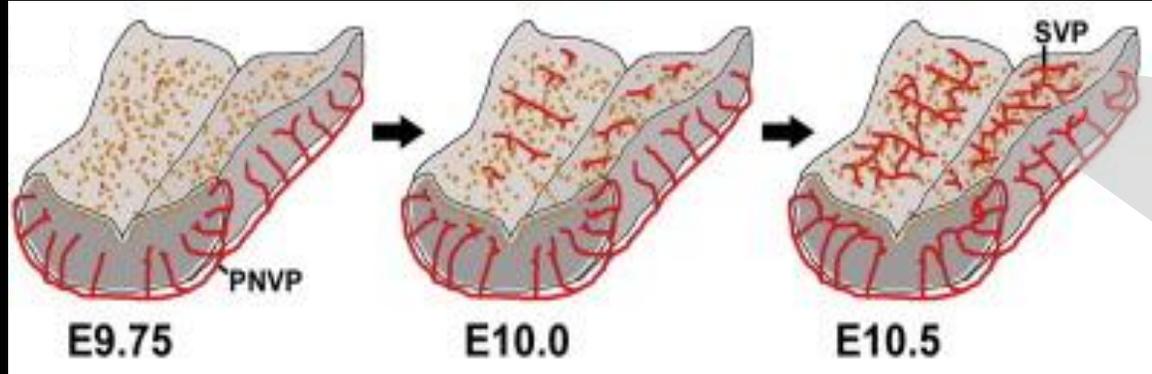
Palatal closure: medial edge epithelium (MEE) seam breakdown



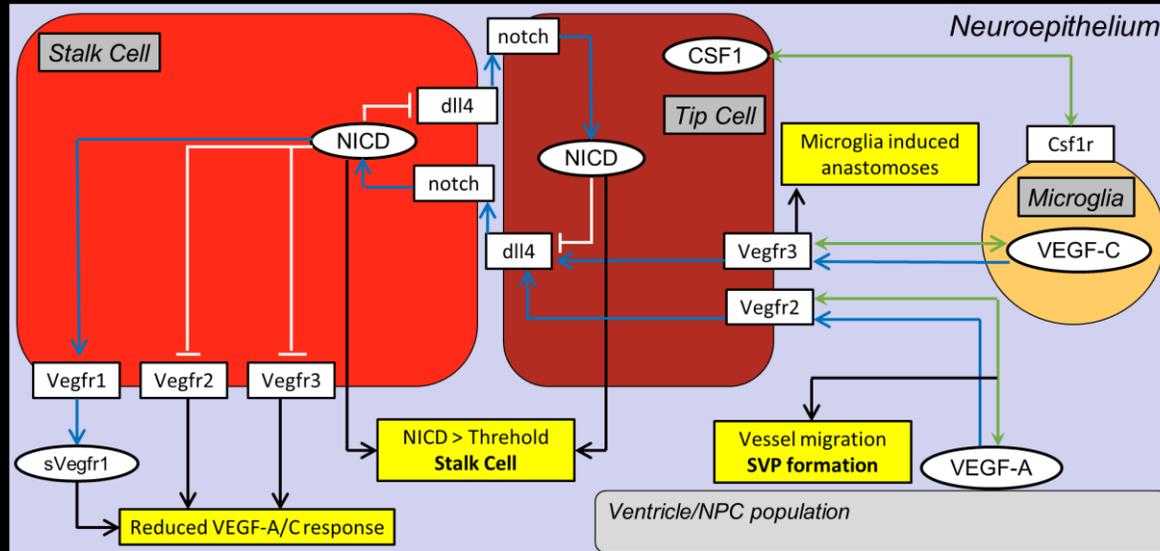
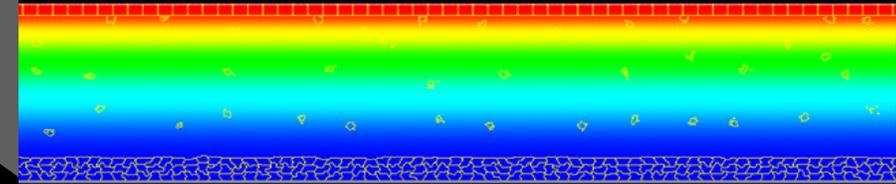
SOURCE: Hutson et al. (2017) Chem Res Toxicol

Brain angiogenesis

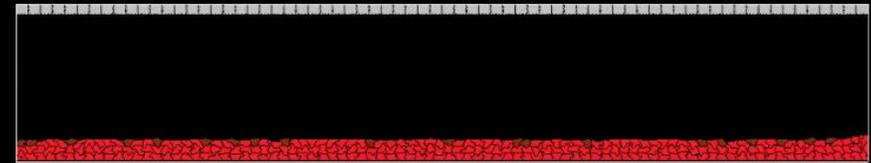
Tata et al. (2015) *Mechanism Devel*



VEGF-A gradient: NPCs in subventricular zone

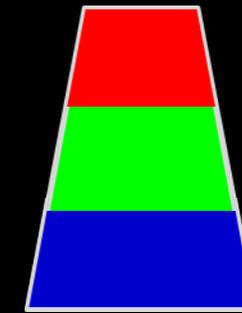
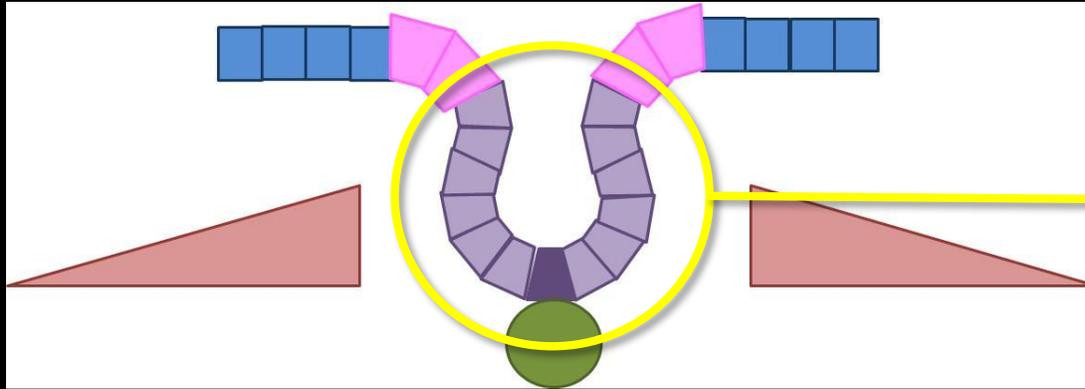


- endothelial tip cell
- endothelial stalk cell
- microglial cell



SOURCE: Zurlinden et al. (2018) - unpublished

Neural tube: *cellular mechanics that shape, fold, and fuse neural folds*



'apical' purse string
'middle' compartment
'basal' attached to BM

Cell Polarity

