

A viscous multi-tissue model for vertebrate embryo growth

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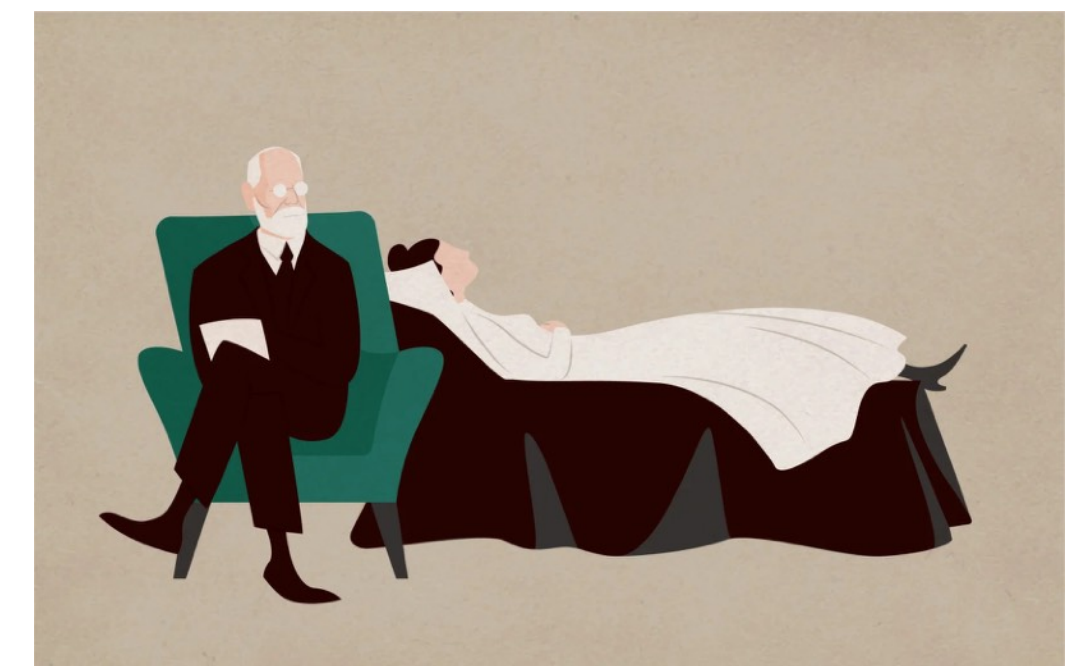
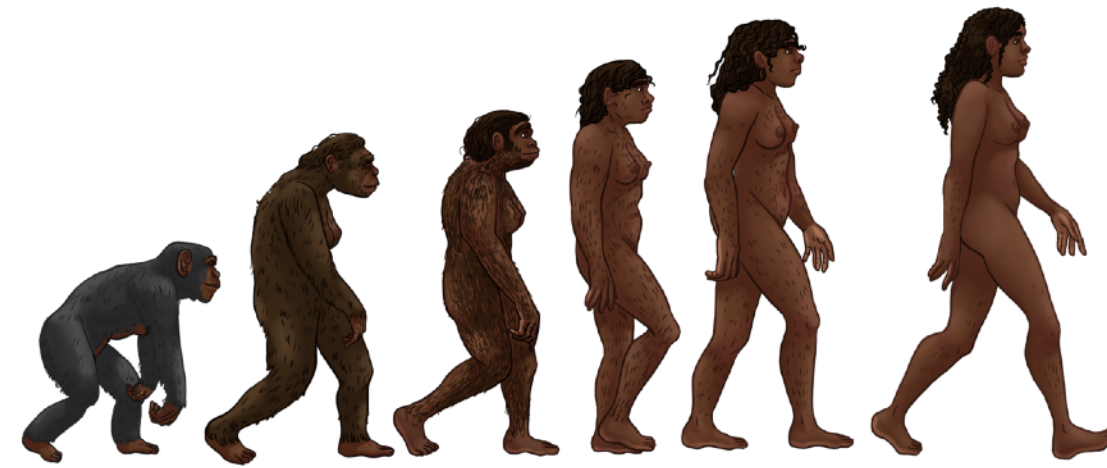


**Biological context:
embryo elongation**

Why study the (bird) embryo ?

Why study the embryo ?

- fundamental question (our origin)
- medical applications (pathological development)



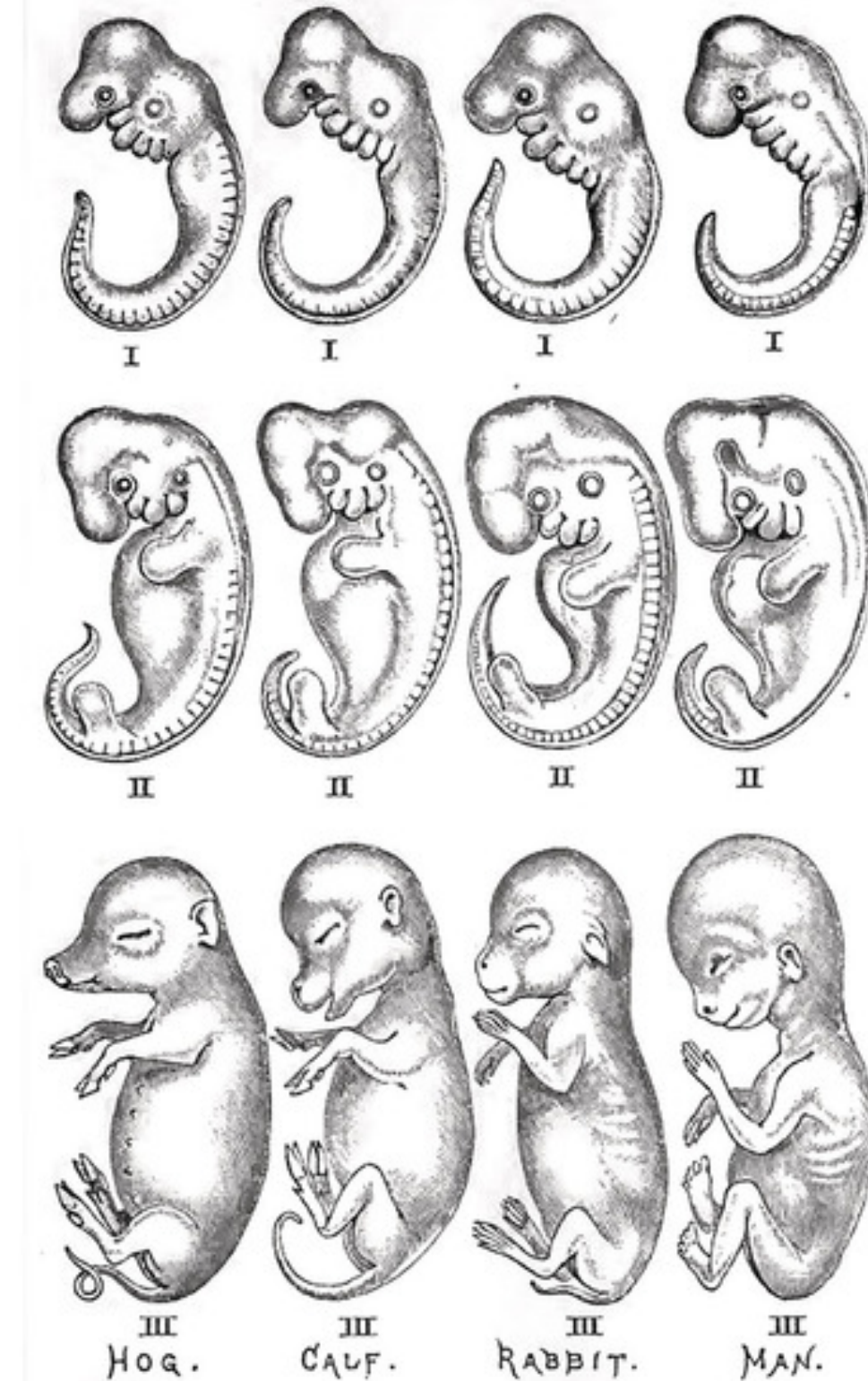
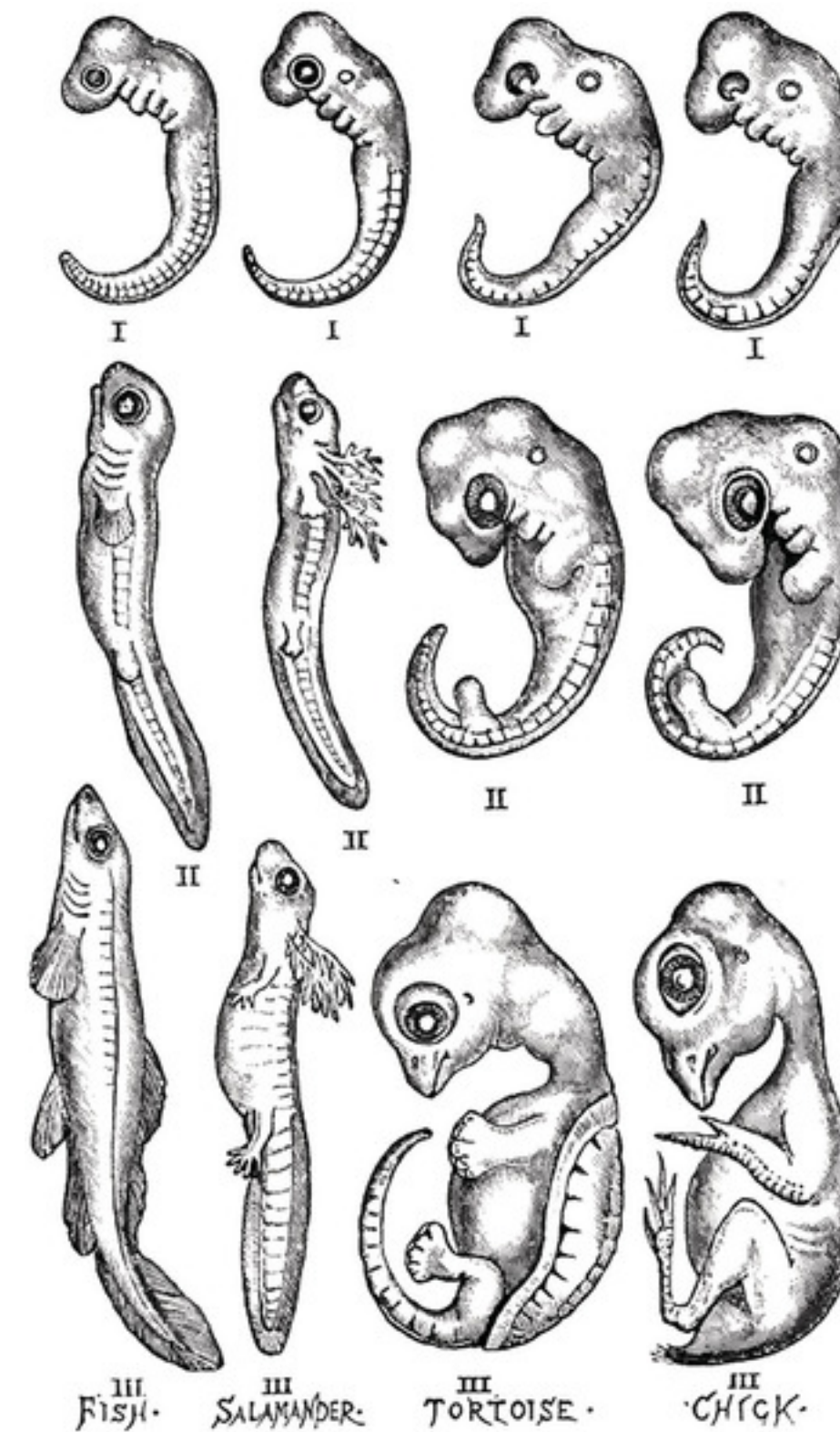
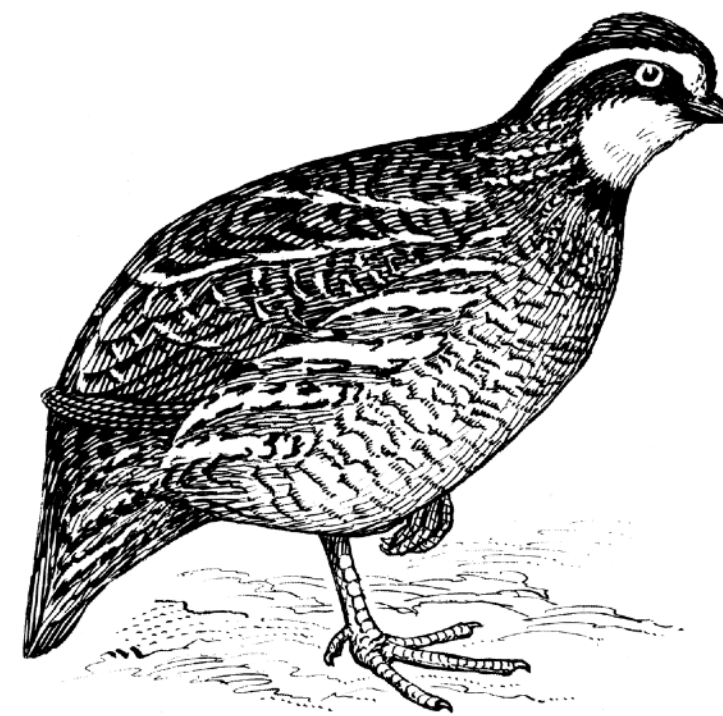
Why study the (bird) embryo ?

Why study the embryo ?

- fundamental question (our origin)
- medical applications (pathological development)

Our biological model: the quail

- model for early stages
- logistics
- ethics

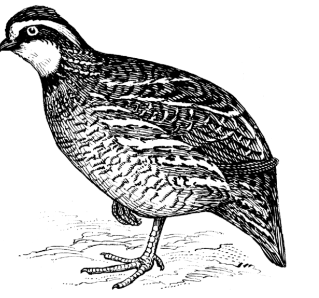


Stages of embryonic development across species

Taken from *Understanding Development - Revisiting the embryo* (Minelli 2021)

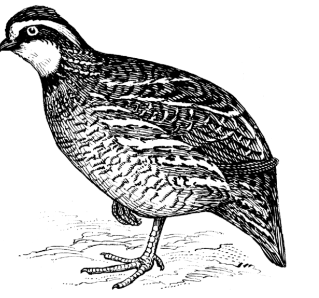
Anterior (head)

Posterior (tail)



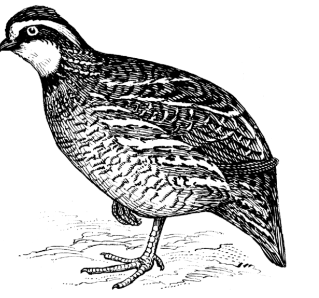
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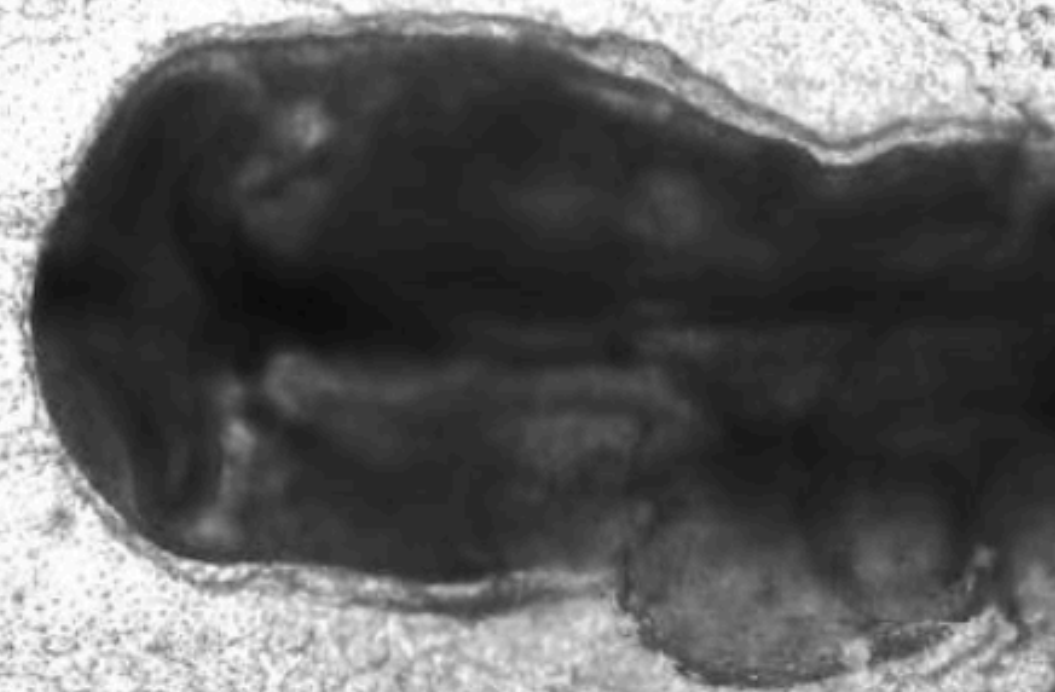
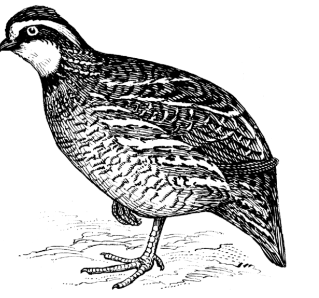
Anterior (head)

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Anterior (head)

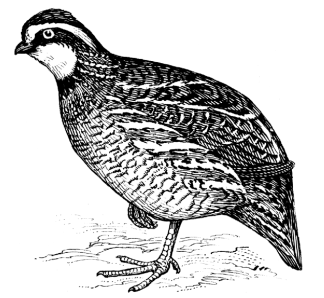
Posterior (tail)



FUTURE ORGANS:

Anterior (head)

Posterior (tail)



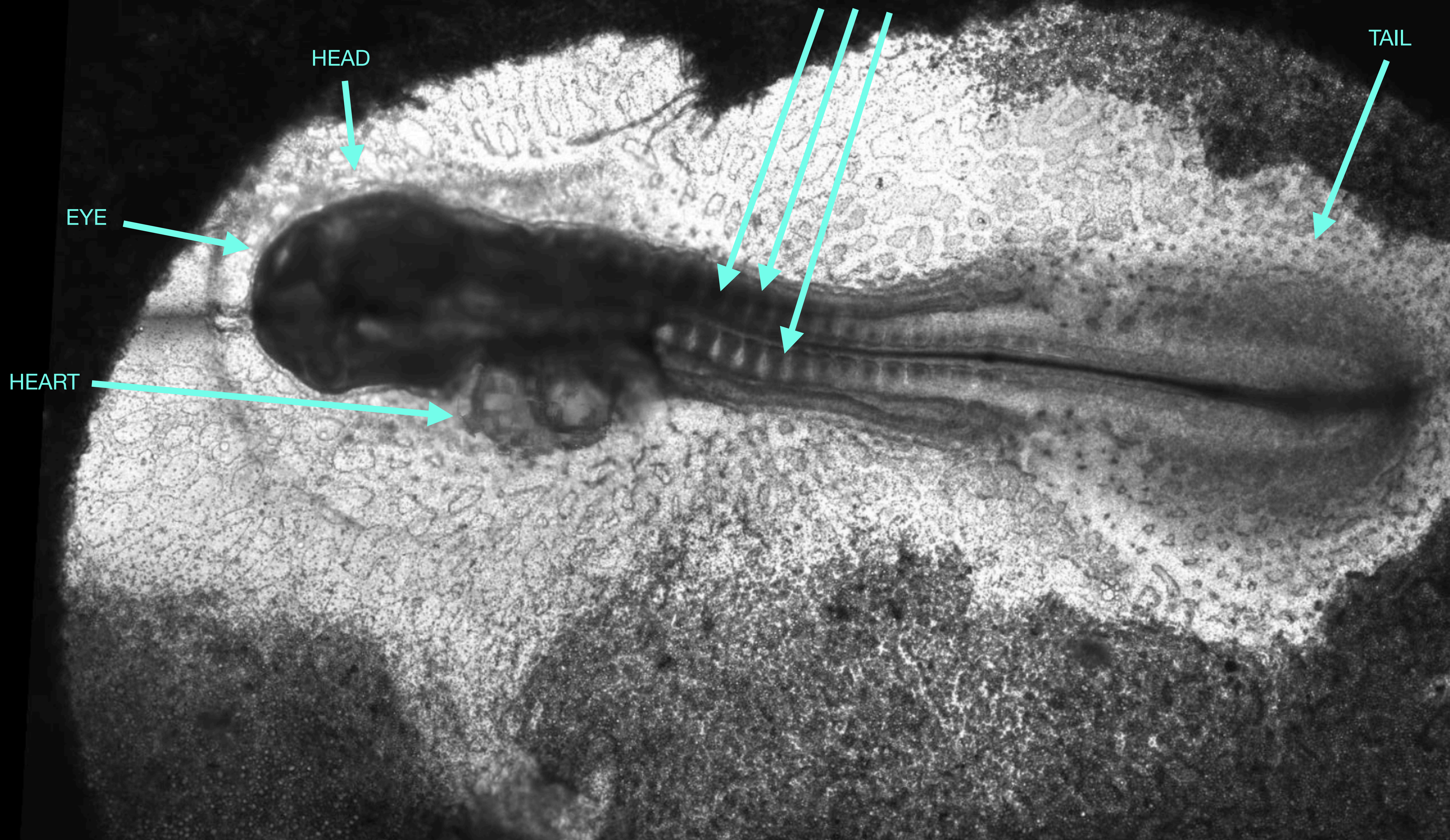
HEAD

EYE

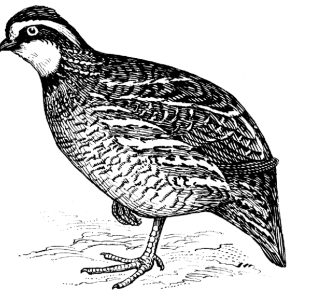
HEART

VERTEBRAES

TAIL

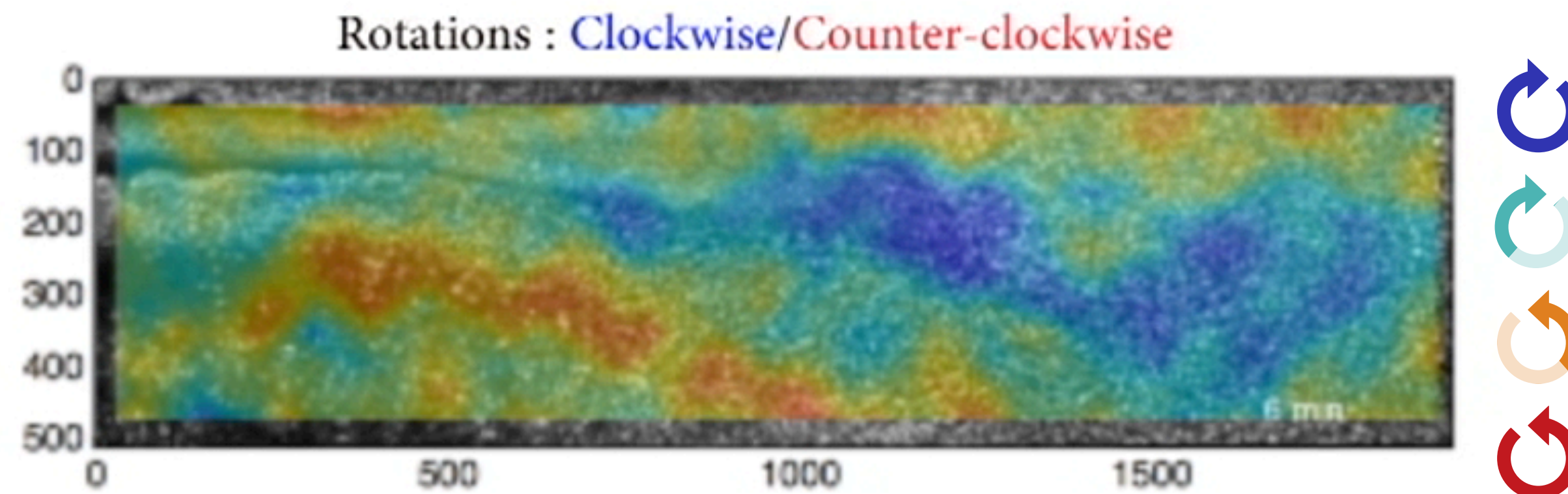
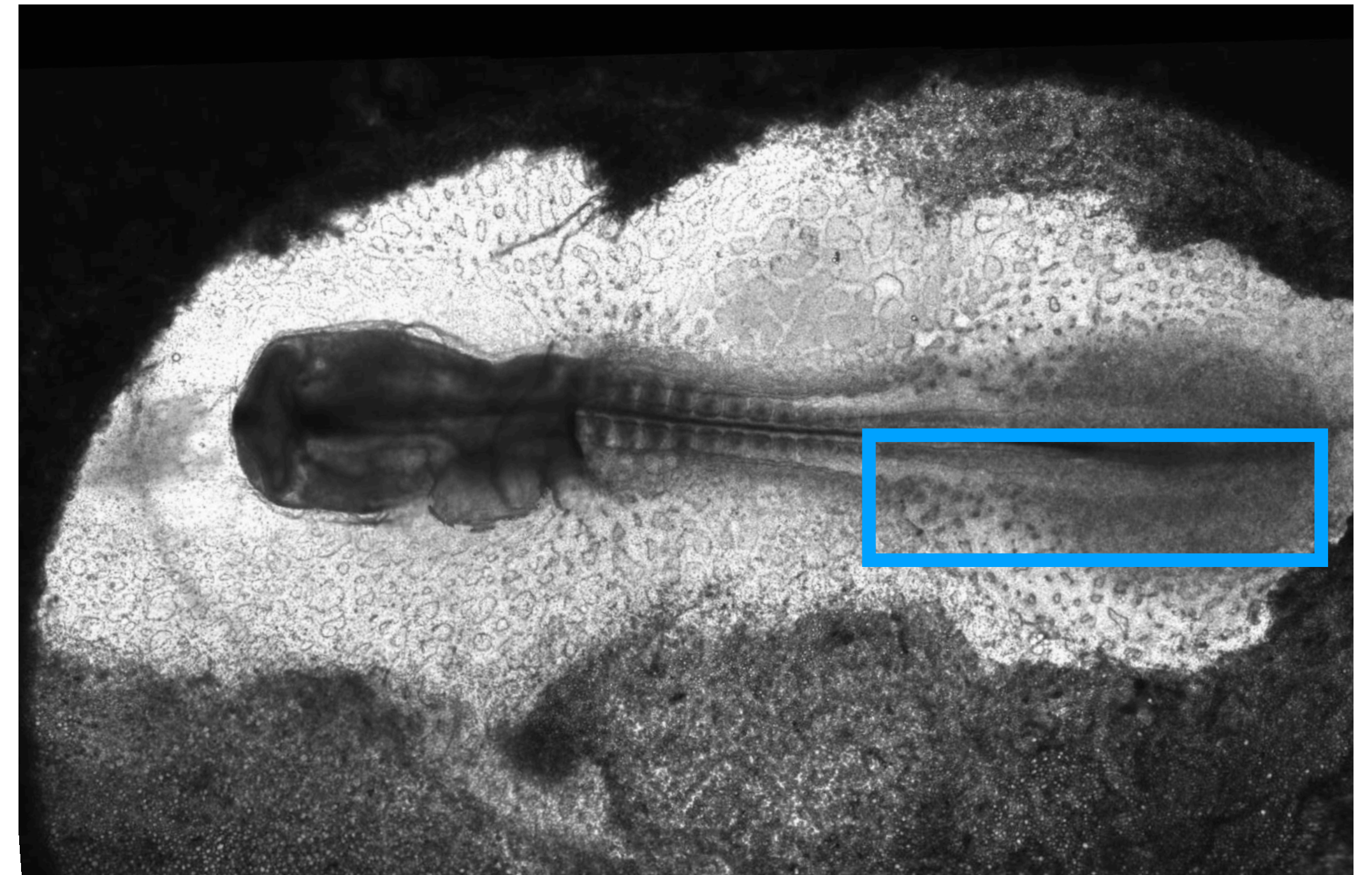


Live image of the embryo



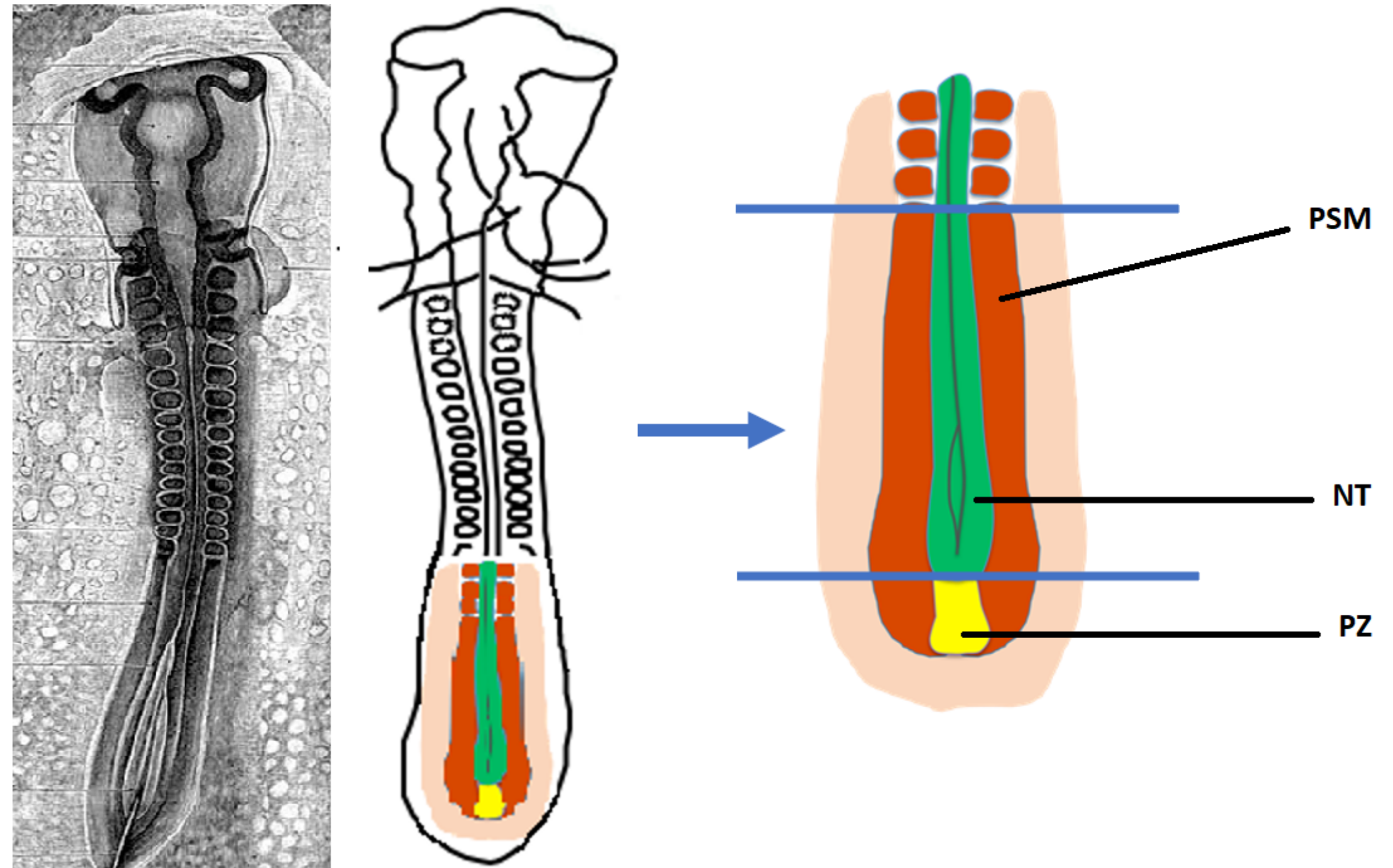
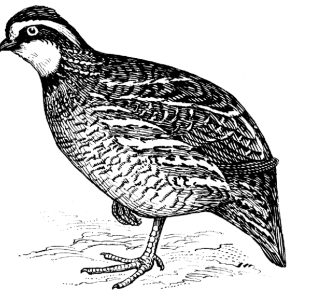
During the elongation of the Vertebrate embryo, the embryonic tissues co-develop in contact with each other, and cells obey a very complex choreography to form the future organs.

Live images show movements of contraction/expansion and rotational movements in the tissue



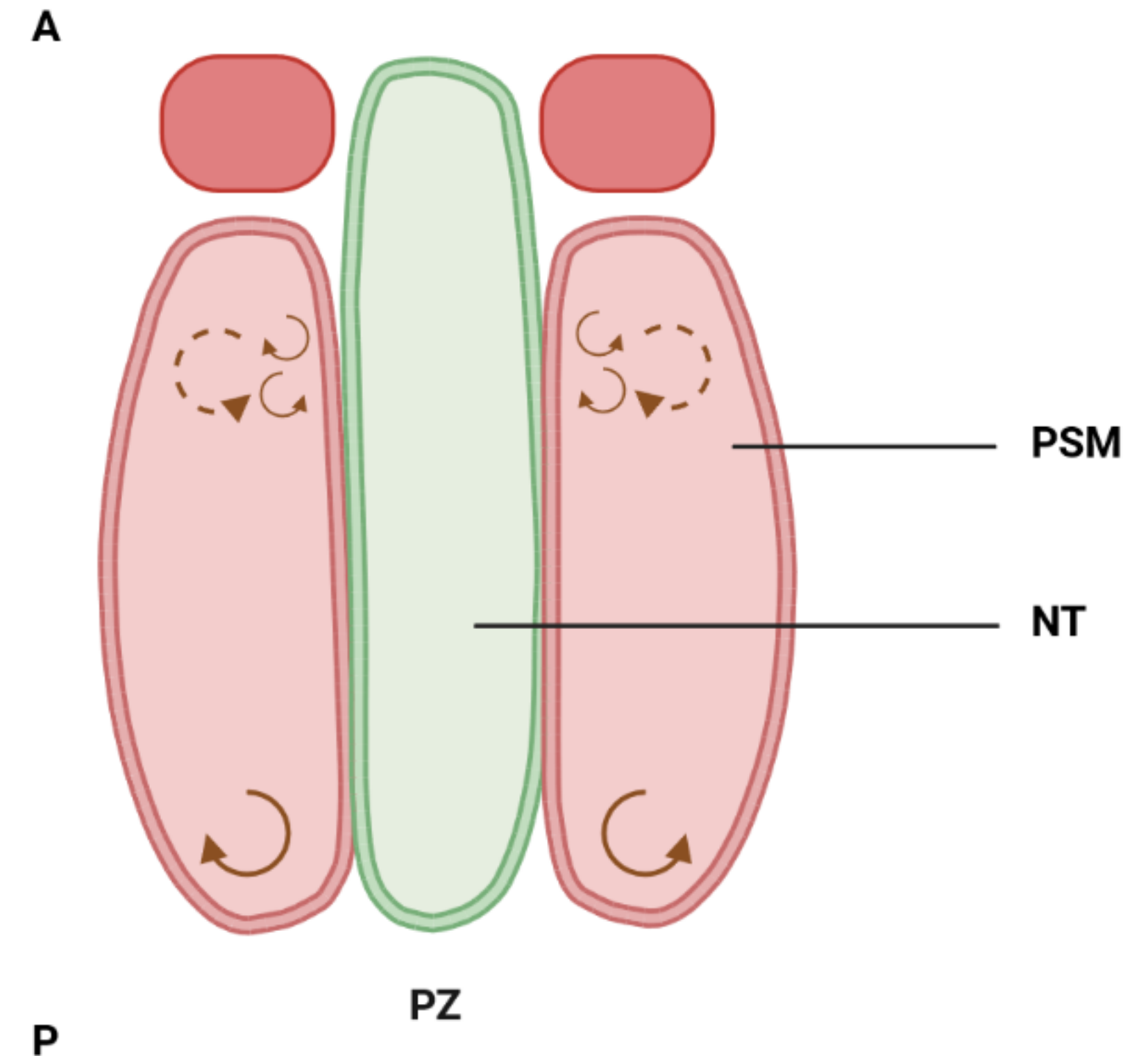
Rotational movements in the posterior zone of the embryo

Scheme of the embryo



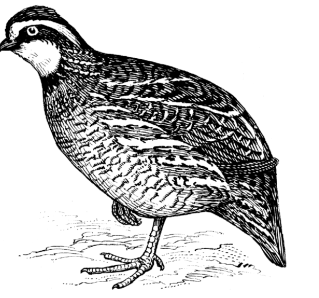
Quail embryo (1.5 day of development)

NT: neural tube (future nervous system)
PSM: mesoderm (future muscles+bones)
PZ: progenitor zone



Cell rotations inside the PSM

Main features of the embryo



! Main features :

- Turbulence/**rotational movements**
- Tissue-specific elongation speed and growth
- Mutually dependent tissues elongation

? Questions :

- Impact of each cell/tissue mechanism on the dynamics (growth, mechanical properties) ?
- Nature of inter-tissue interactions (pressure, friction) ?
- Origin and role of the turbulences ?