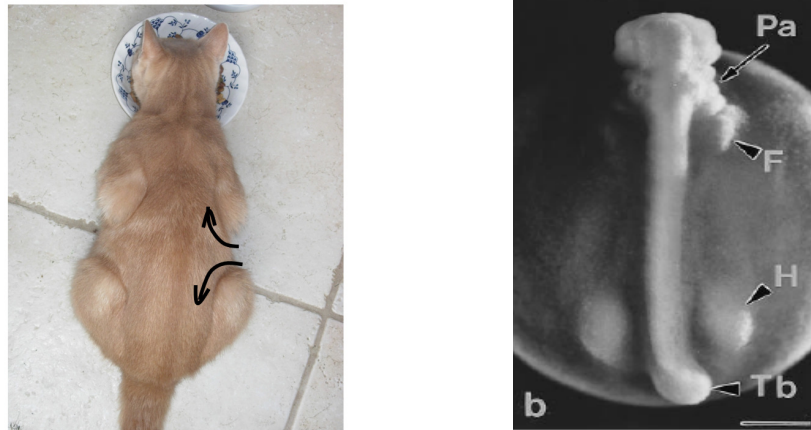
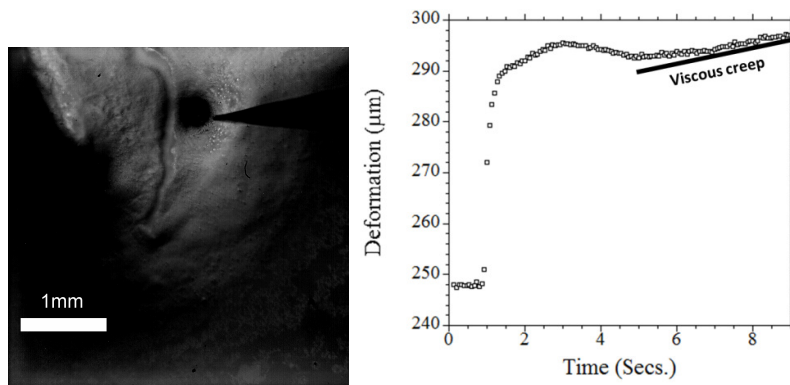


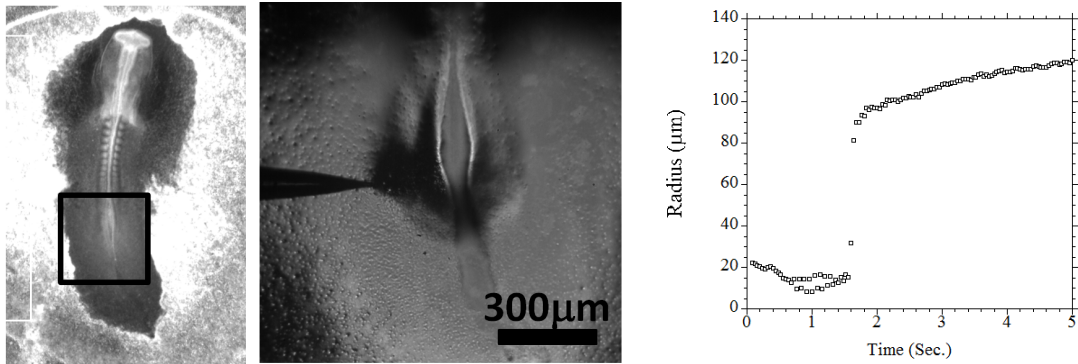
SUPPLEMENTARY FIGURES



Supplementary figure 1. Left.: When the dorsal side of a mammal such as a cat is observed, one has the intuition that the formation of the body may follow a bi-directional extension centered on a point located in between the forelimbs and hindlimbs. Right: A direct frog, at the limb bud stage, please note the tissue winding towards the scapula and the pelvis areas, with buds protruding with a partial mirror symmetry. (Courtesy, Prof. Richardson).



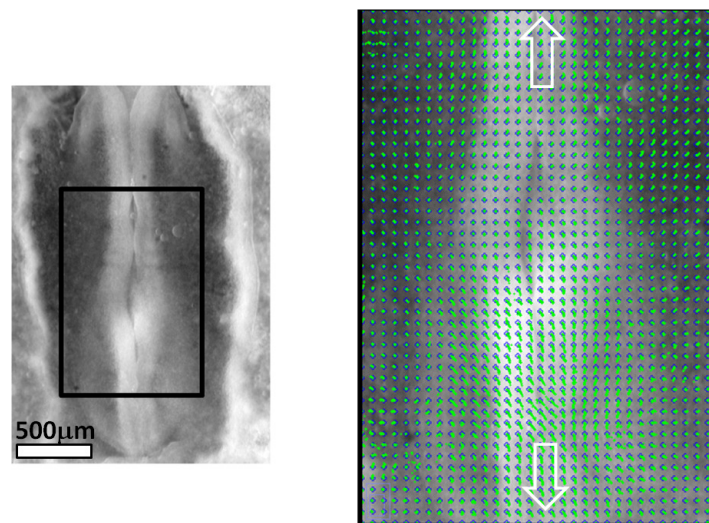
Supplementary Figure 2(A)



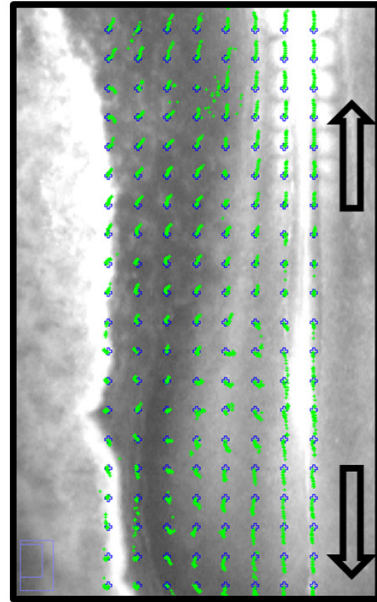
Supplementary Figure 2(B)

Supplementary Figure 2(A) Direct view of the embryo at the primitive streak stage. As classical, the primitive streak is slightly bent leftwards (broken symmetry). Right : the surface response to an air puff shows a viscous creep after a few seconds.

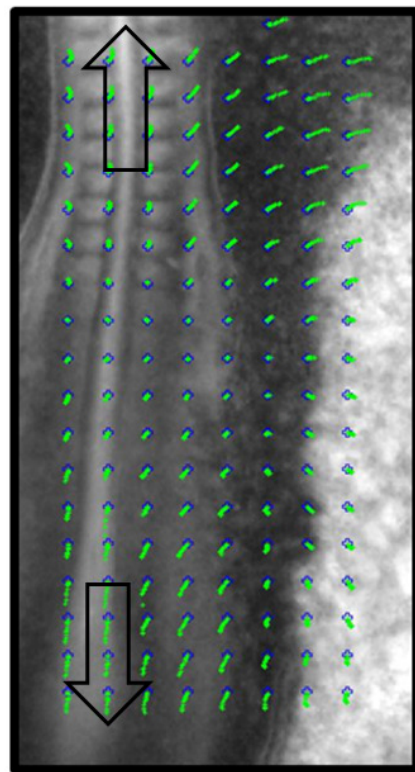
Supplementary Figure 2(B). Left and Middle, an embryo at the 9 somites pairs stage. Right : the lateral mesoderm response shows again a slow viscous creep after a rapid visco-elastic response. The total depth of the indentations is 20 micrometers.



Supplementary Figure 3 (Movie 4) Tracking of tissue flow in the chicken embryo during neurulation (HH 7-8), which occurs a few hours after the stage in Fig. 4 (Left, mag. 4X, full scale 2.7 mm). As the neural ectoderm folds, the entire lateral ectoderm is winding in an opposite fashion in the rostral and caudal halves of the embryo, with a neutral point located midway. The revolution has opposite chiralities in the rostral and caudal halves, in addition to the opposite chirality between the left and right halves.



Supplementary Fig 4(A)

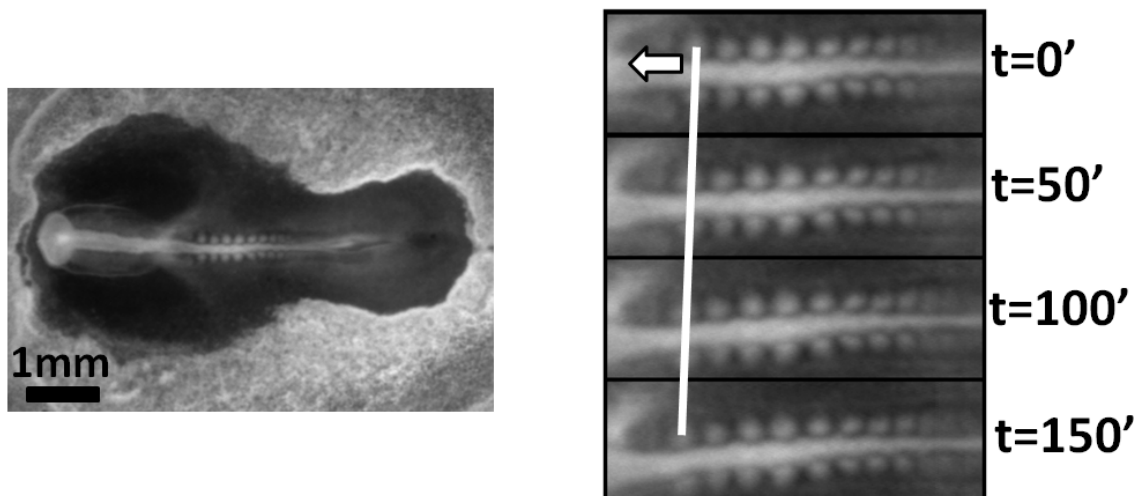


Supplementary Fig 4(B)

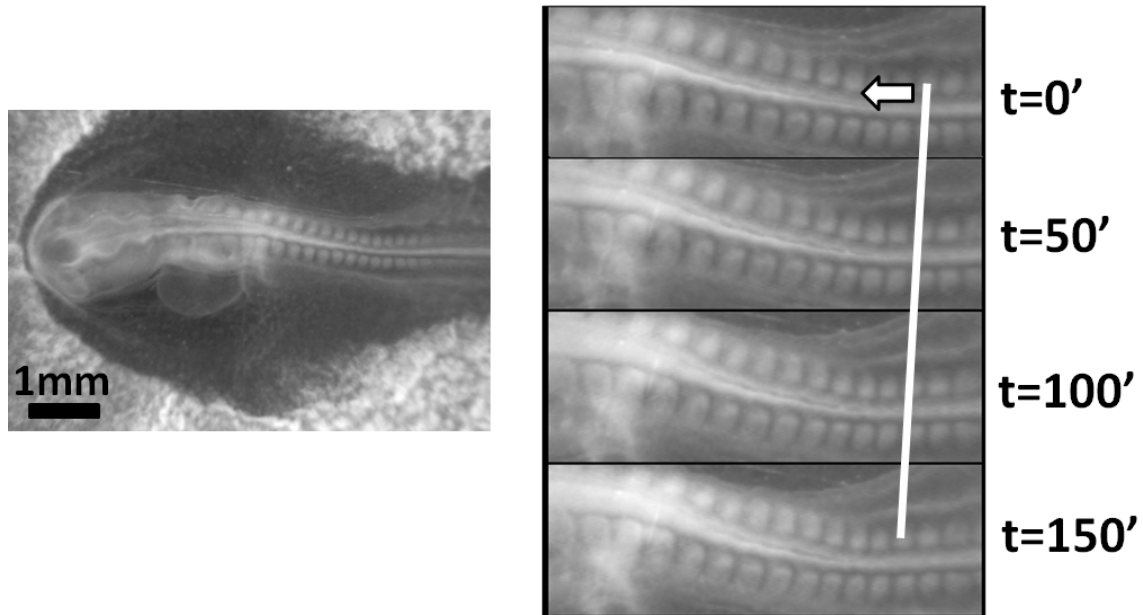
Supplementary Figure 4. Chicken embryo, HH 10-11.

Supplementary Figure 4 (A). At the 11 pairs of somites stage (stage 10-11), (Mag. 1.6X, Full scale 7.5mm), the vector field of the tissue flow is still very clearly oriented caudally and cranially, *outwards from the presumptive yolk stalk area* [8], with four windings at the areas of the limb fields. The shoulder fold is separated from the pelvic fold right at the point of the presumptive navel area, where there exists a stretched zone towards which the blood islands converge in a funnel fashion.

Supplementary Figure 4 (B). Chicken embryo, 13 somites (HH 11). The detailed analysis of the flow at the median axis shows very clearly a massive bidirectional stretch of tissue centered on the presumptive yolk-stalk area, with major areas of tissue rotation oriented tailbound and headbound.



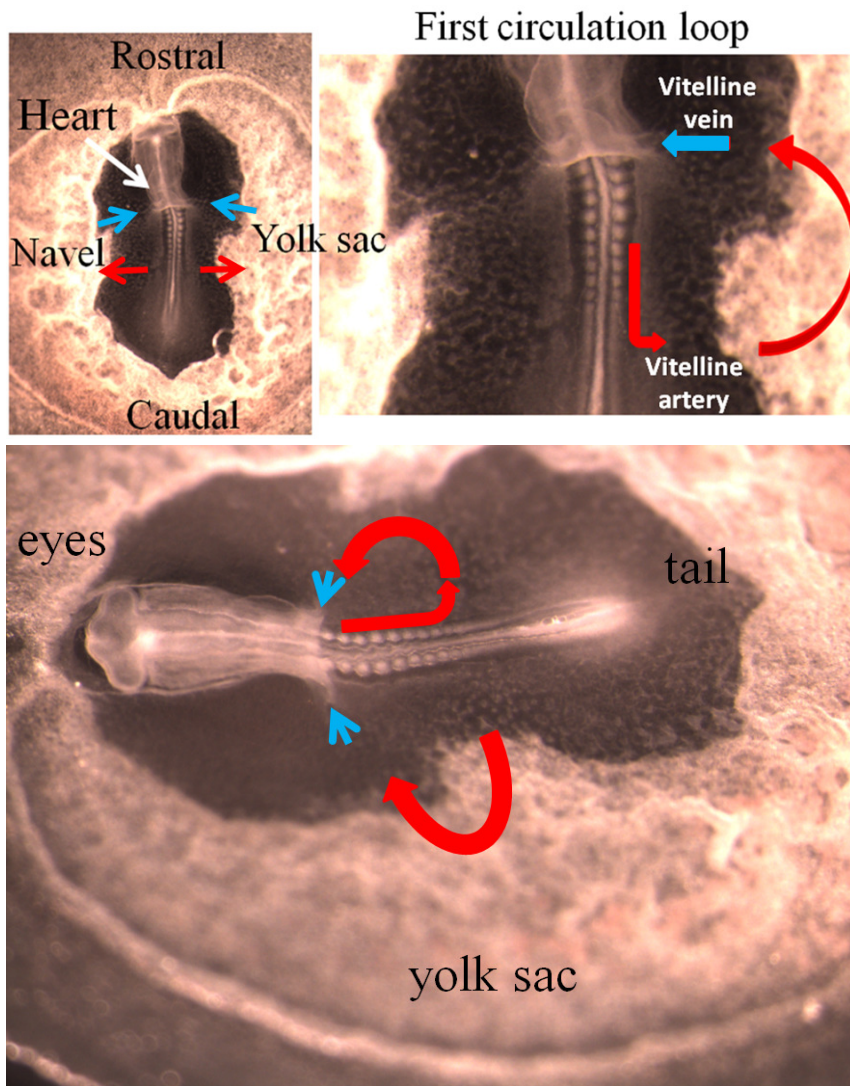
Supplementary Figure 5(Top)



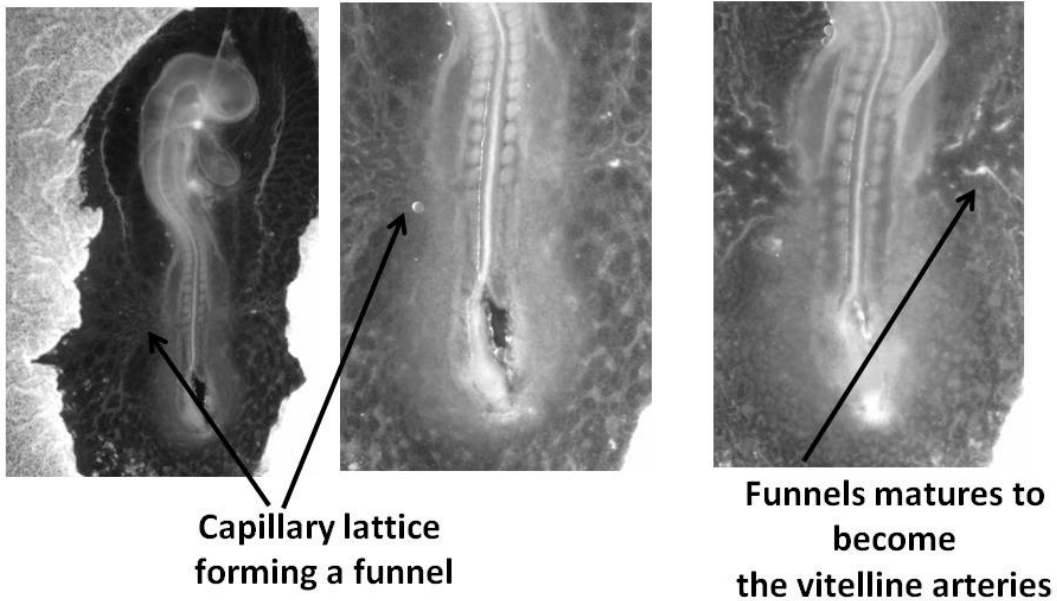
Supplementary Figure 5(Bottom)

Supplementary Figure 5 Top. Chicken embryo at the 8 somites pairs stage, showing the somite drift towards the anterior direction. Bottom. Chicken embryo at the 13 somite pair stage, showing the somite drift towards the anterior direction. Although somite generation occurs in the posterior direction, the global drift is anterior, therefore somites are continuously shifted more anteriorly.

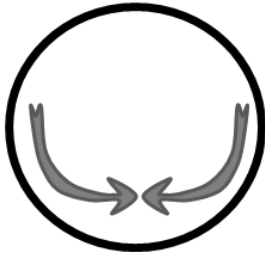
Ventral view



Supplementary Figure 6. Chicken embryo HH 10-11. Top : ventral view of an embryo. Bottom oblique view of the same embryo. The views show that the head has passed over the ectoderm plane. In the presumptive navel area, the mesoderm has a global “funnel shape” oriented towards the navel area. The heart is connected to vitelline vein primordia (blue arrows), which wrap some of the lateral mesoderm. All somites (11, here) have drifted above the presumptive navel area.



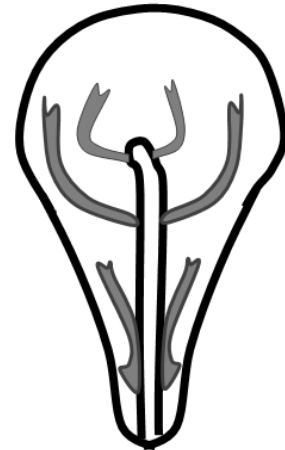
Supplementary Figure 7. Chicken embryo HH 13-14 (Mag. 2X, full scale 6 millimeters). The funnel formed by the capillary lattice towards the presumptive navel, located just below the forelimb territory, is well visible (arrows). During the 2 hours of maturation, the capillary lattice is transformed into the vitelline arteries. Therefore, there existed a pre-pattern for the vitelline arteries in the shape of the capillary lattice, which itself formed from the blood islands, whose positions followed the tissue flow.



**Blastula
flow towards
the
posterior pole**

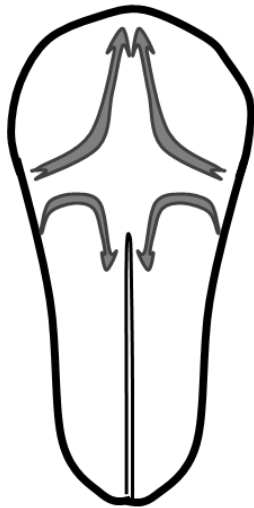


**Early gastrula
opening of
primitive
streak**

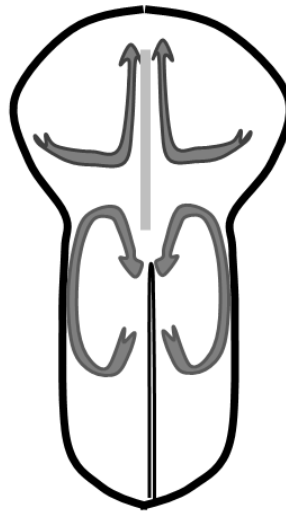


Involution

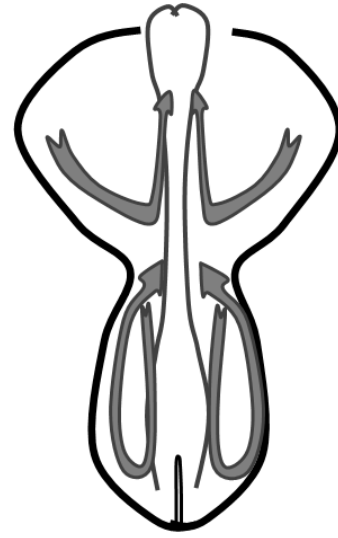
Supplementary Figure 8 (A)



**Start of apex
recession
The primitive streak
closes**



**Lateral plates
wind
Chord extends**



**Head passes
over gut pocket
Dorsal folds appear**

Supplementary Figure 8(B)

Supplementary Figure 8. This plate summarizes the movements of the ectoderm, which give the global shape of the embryo. The first movements are in-plane (Figure 8A, Left). The nucleation of the primitive streak (Fig. 8A, Middle) pours cells underneath (Fig. 8A Right). When enough cells have involuted, the primitive streak closes. It is only then that the body starts to form (Fig. 8B), by a strong traction oriented posteriorly, which generates first the chord, and then the dorsal folds which cover the chord. The dorsal folds pass over the gastrula plane.