

Amphibians

- ! **Yolk Distribution - moderately telolecithal**
- ! **Cleavage Type and Pattern**
 - ! Holoblastic – “equal” – radial (irregular after 32 cells)
- ! **Blastula – amphiblastula**
- ! **Gastrulation – invagination and epiboly**
- ! **Blastopore fate – deuterostome**
- ! **Larval development – Tadpole**
- ! **Developmental determination**
 - ! **Regulative (indeterminate)**

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Fate and Potency

- ! **Prospective Fate**
 - ! **Normal developmental end-product(s) of blastomere(s) in intact embryo**
- ! **Prospective Potency**
 - ! **All possible end product(s) of blastomere(s) in experimental conditions**
 - P e.g. blastomere removal, blastomere isolation, new tissue combinations
- ! **Regulative – Potency >> Fate**
- ! **Mosaic – Potency = Fate**

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Roux' Experiment

- ! **Wilhelm Roux 1888**
 - ! **At 2-cell stage (frog) killed 1 blastomere with hot needle**
 - ! **Developed into 1/2 of tailbud stage with lump of undeveloped yolky material**
 - ! **Seemed to be what we now call mosaic**
- ! **Roux vs Driesch controversy**
- ! **Hans Spemann 1905**
 - ! **Actually separated 2 blastomeres by ligation**
 - ! **Each developed into full tadpole**
 - ! **Frog is regulative !**

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Cleavage and Early Development (1)

- ! **Fertilization**
 - ! **at Metaphase II (1 polar body forms at ovulation)**
- ! **Rotation**
 - ! **Fertilization membrane lift-off and cortical pigment rearrangement**
- ! **Second Polar Body forms**
- ! **Grey Crescent forms**
- ! **First cleavage**
 - ! **vertical – bisects grey crescent – equal**
- ! **Second cleavage**
 - ! **vertical – perpendicular to first cleavage plane**

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Cleavage and Early Development (2)

- ! **Third cleavage**
 - ! **Horizontal – unequal – about 1/3 down from animal pole**
- ! **Further cleavages become irregular**
 - ! **Less yolky animal blastomeres divide faster**
 - ! **Yolky vegetal blastomeres divide slowly**
- ! **Blastula**
 - ! **Blastocoel only in upper 1/3 of embryo**
 - ! **Yolky cells occupy lower 2/3**
- ! **Gastrulation**
 - ! **Blastopore begins to form at location of former grey crescent – notochord and archenteron form**

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Post-gastrulation summary

- ! **Late Gastrula**
 - ! **Yolk plug**
 - P remaining visible yolky endoderm where ectoderm has not yet migrated
 - P blastopore groove surrounds
- ! **Neurulation**
 - ! **formation of neural plate, neural groove, neural tube**
- ! **Tail bud stage**
- ! **Early larva**

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FROG CLEAVAGE

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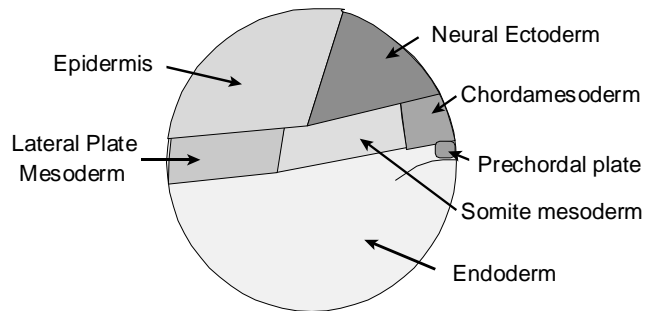
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Fate Map

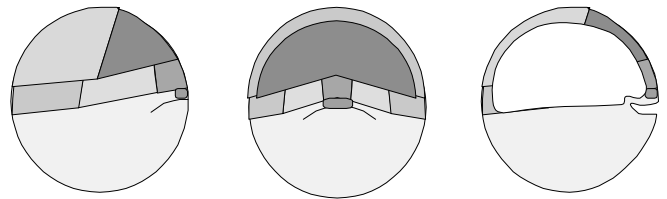
- ! **Vogt – 1929**
 - ! Apply vital dye (Nile Blue sulfate) to local area of blastomeres on surface
 - ! Follow development to some later stage
 - ! Sacrifice embryo and section
 - ! Look for stained cells
- ! **1960's**
 - ! Radiolabel DNA with 3H-thymidine
 - ! Transplant tissue to unlabelled embryo
- ! **1990's**
 - ! Inject fluorescent di-I (etc) into blastomere(s)

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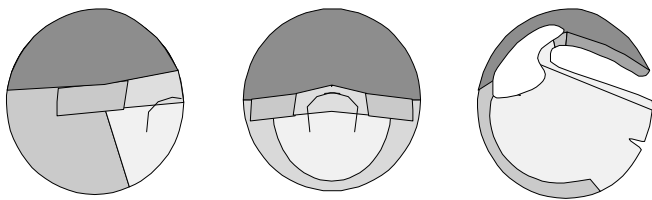
Amphibians



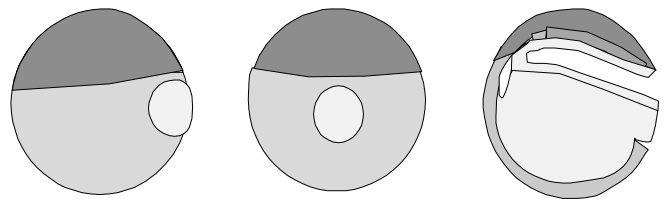
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