

We are walking and standing with parts of our bodies which could have been used for thinking had they developed in another part of the embryo.

Hans Spemann, 1943

Reading from
Chapter 3 - types of cell specification
Chapter 6 - cell-cell signaling (molecules, pathways)
Chapter 10 - amphibian axis formation

2nd Hourly Exam - Friday, October 30

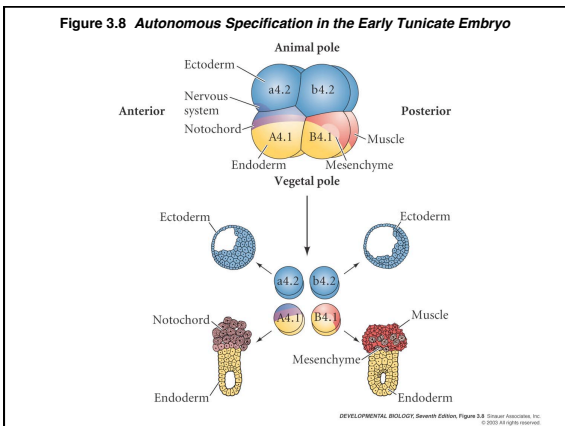
Skip 'Autonomous & conditional cell specification...'
lecture currently listed for Oct. 19 for now

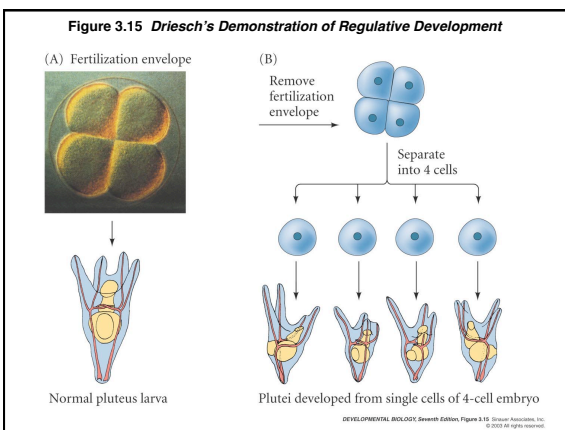
TABLE 3.3 Modes of cell type specification and their characteristics

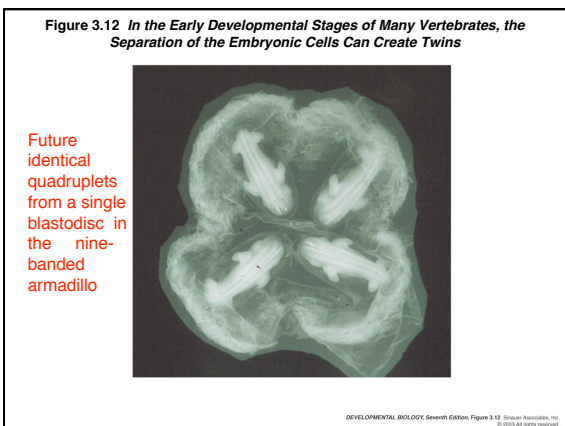
I. Autonomous specification Characteristic of most invertebrates. Specification by differential acquisition of certain cytoplasmic molecules present in the egg. Invariant cleavages produce the same lineages in each embryo of the species. Blastomere fates are generally invariant. Cell type specification precedes any large-scale embryonic cell migration. Produces "mosaic" development: cells cannot change fate if a blastomere is lost.	Autonomous
II. Conditional specification Characteristic of all vertebrates and few invertebrates. Specification by interactions between cells. Relative positions are important. Variable cleavages produce no invariant fate assignments to cells. Massive cell rearrangements and migrations precede or accompany specification. Capacity for "regulative" development: allows cells to acquire different functions.	Conditional
III. Syncytial specification Characteristic of most insect classes. Specification of body regions by interactions between cytoplasmic regions prior to cellularization of the blastoderm. Variable cleavage produces no rigid cell fates for particular nuclei. After cellularization, conditional specification is most often seen.	Syncytial

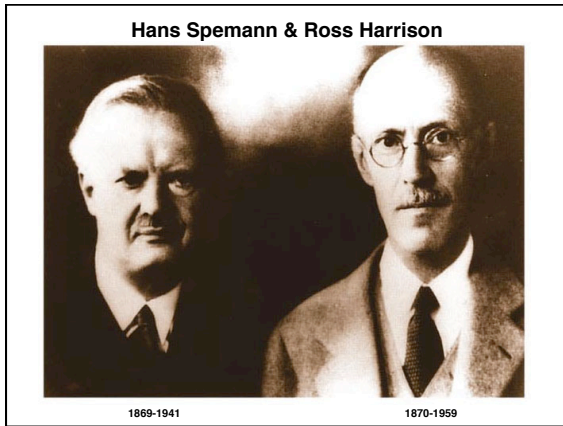
Source: After Davidson 1991.

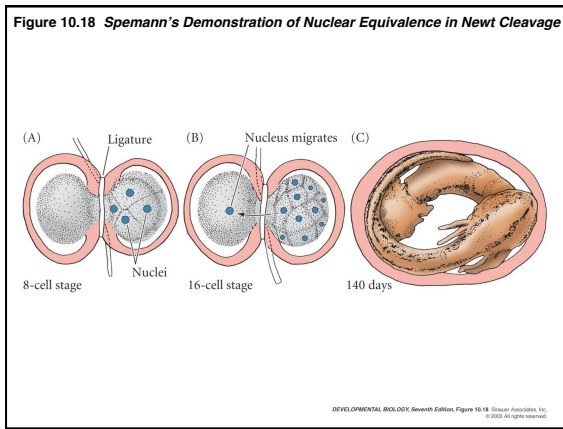
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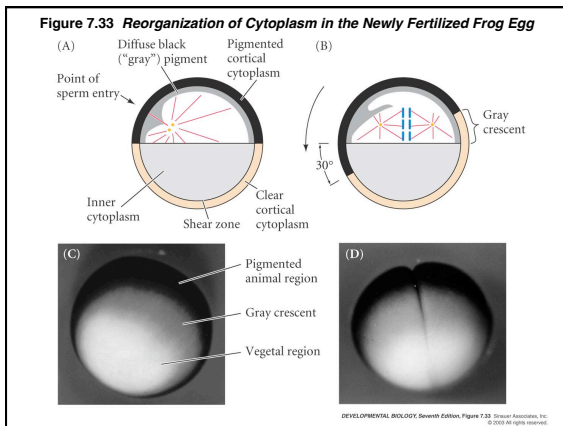


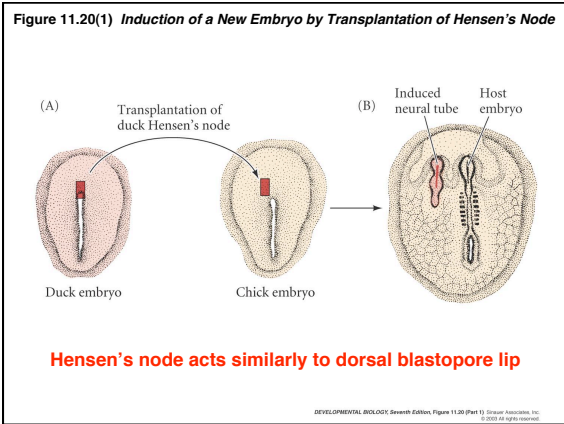












The field of "Chemical Embryology" was premature and therefore a dismal failure

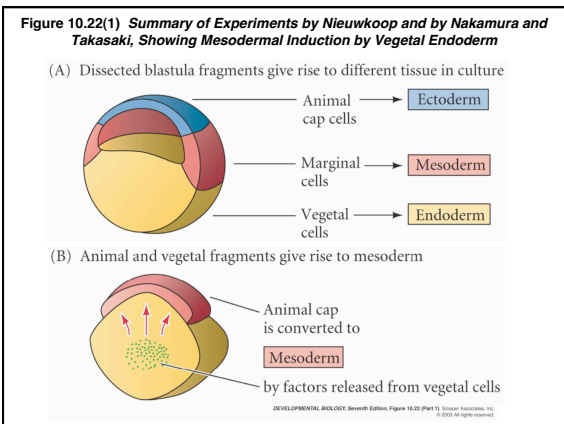
Discovery of the "Organizer" set in motion a search for the substances that caused "primary induction." (Ross Harrison - "...the new Yukon to which eager miners were now rushing to dig for gold around the blastopore")

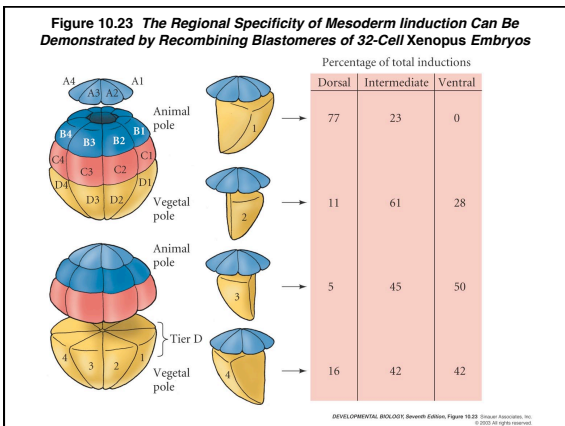
Researchers found that many tissues and substances, natural and artificial, could cause **ectoderm** to form **nervous system** ("primary induction").

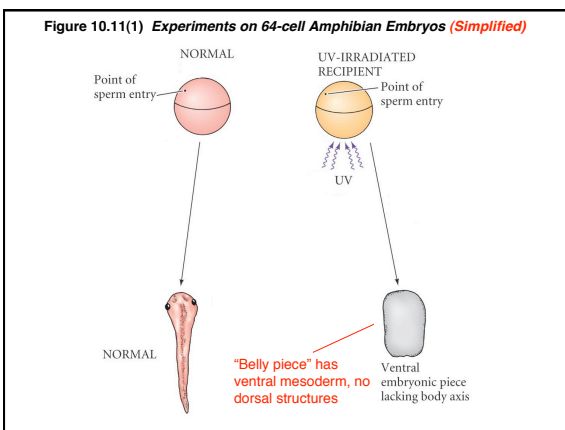
Some 'inducers' of neural ectoderm:

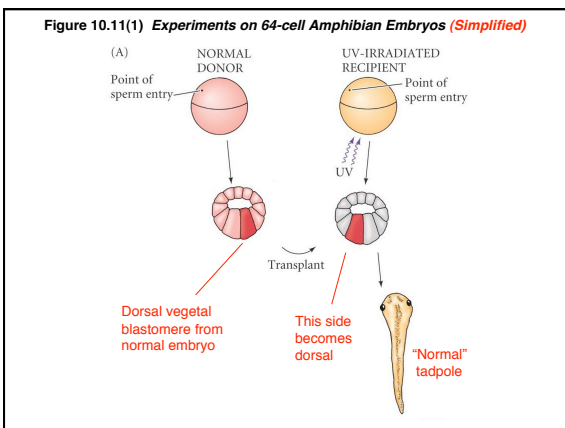
fixed dorsal lip	fireplace ash	boiled guinea pig liver
methylene blue dye	ground glass	turpentine

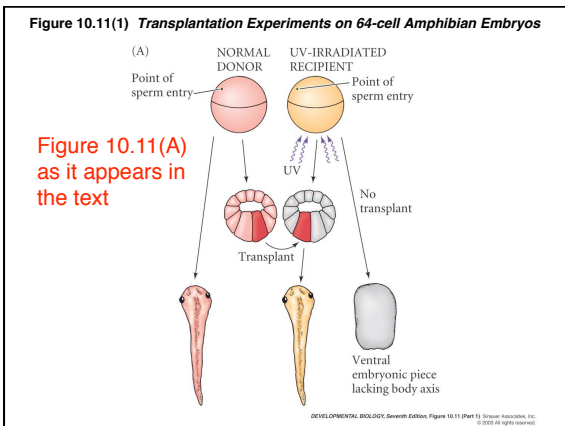
The discovery of organizer molecules could only come with the advent of powerful molecular biological and protein biochemistry techniques of the last 15-20 years.

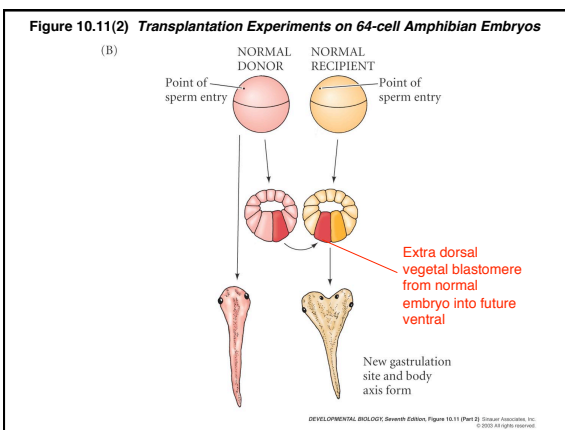


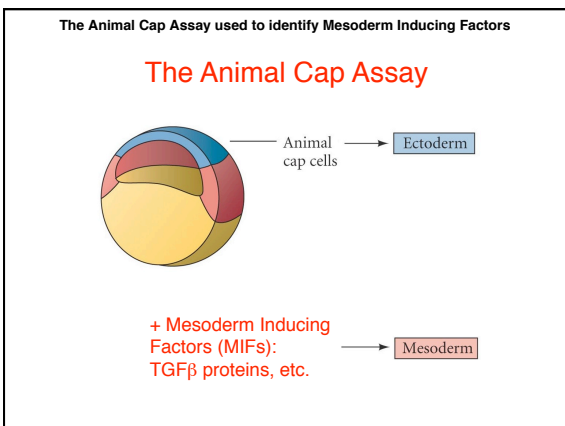


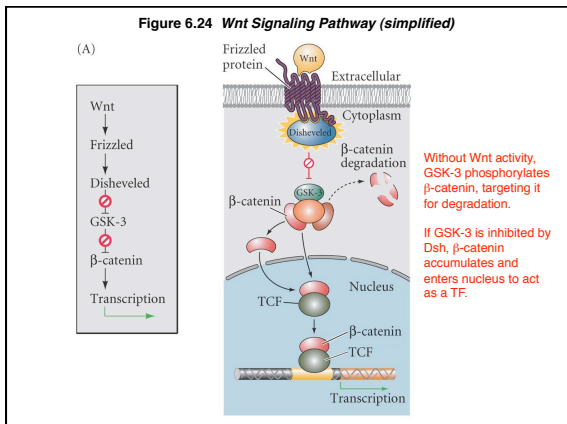


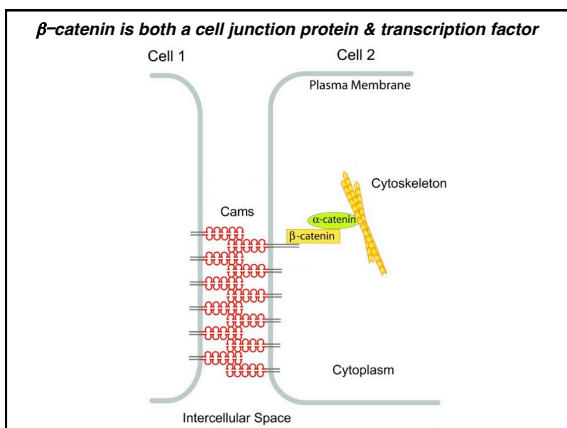












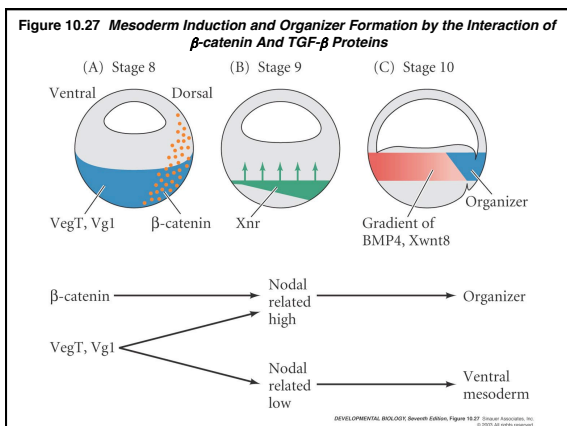
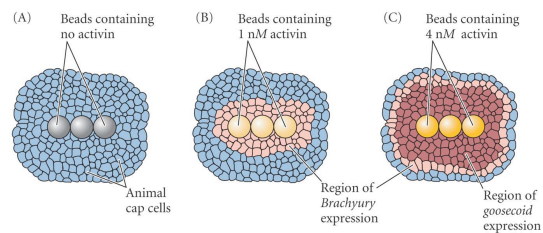
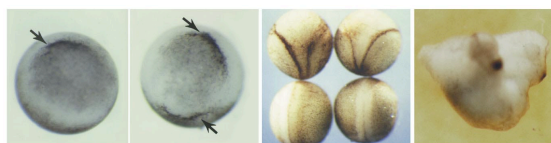


Figure 3.20(1) A Gradient of Activin Causes Different Gene Expression in *Xenopus* Animal Cap Cells



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Figure 10.28 Ability of *goosecoid* mRNA to Induce a New Axis



(A) control

(B) *goosecoid* mRNA injected into ventral blastomere

(C) Top: embryos with 2° axis
Bottom: control embryos

(D) "Twinned" embryo that got ventral *goosecoid* mRNA injection

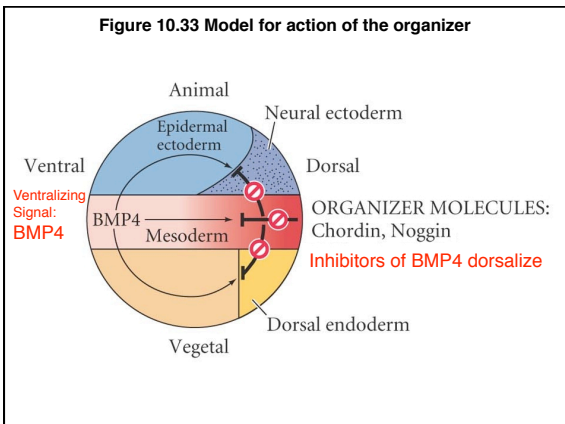
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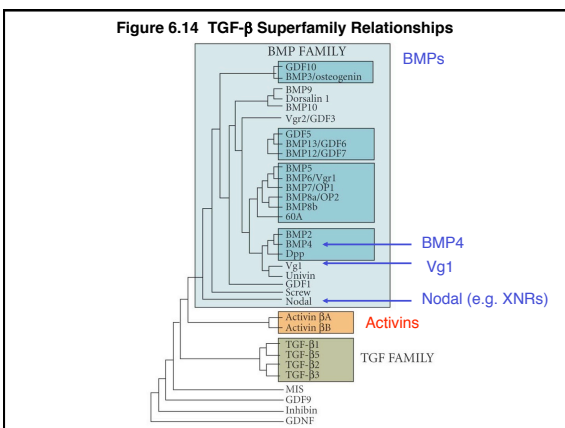
Fig. 10.29 Neural Structures induced in Presumptive Ectoderm by Newt Dorsal Lip Tissue, Separated From the Ectoderm by a Nucleopore Filter

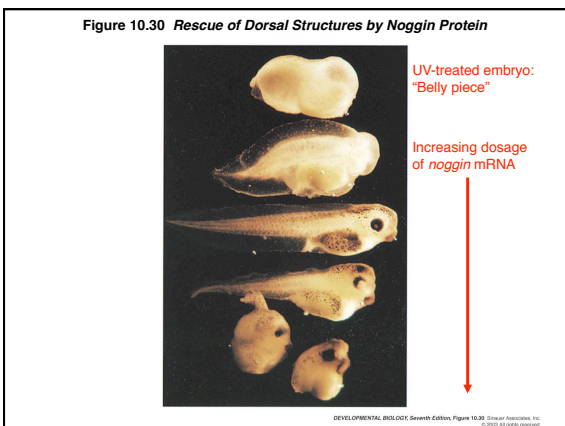


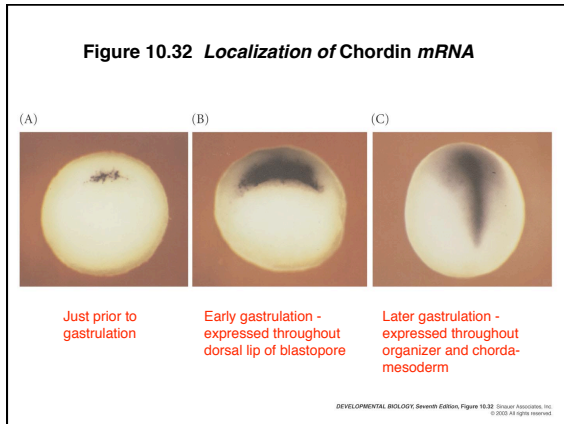
Dorsal lip secretes molecules that promote nervous system

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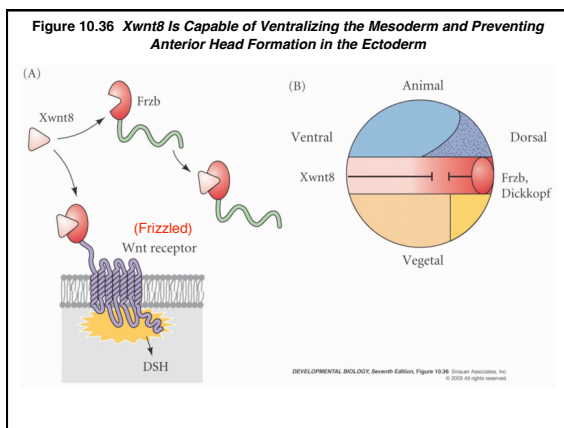


TABLE 10.2 Proteins expressed solely or almost exclusively in the organizer (partial list)

Nuclear proteins	Secreted proteins
Xlim1	Chordin
Xnot	Dickkopf
Ous2	ADMP
XFD1	Frzb
XANT1	Noggin
Goosecoid	Follistatin
TFE3β	Sonic hedgehog
	Cerberus
	Nodal-related proteins
	- (several) -

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