

# HISTORY OF EMBRYOLOGY

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Aristotle (384-322 B.C.)

Galen (130-200 A.D.)

de Graaf (1672) and Hamm and Leeuwenhoek (1677)

encasement theories

ovists (Bonnet - 1745) versus spermists

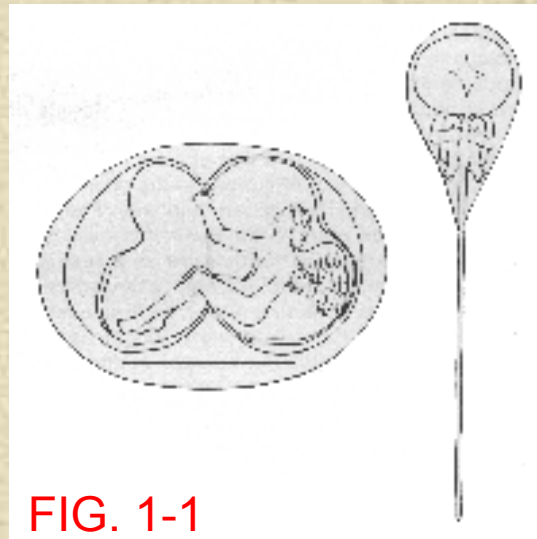
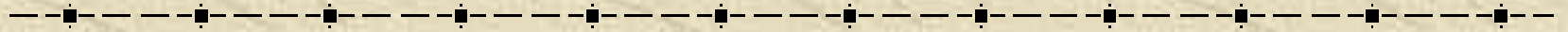


FIG. 1-1

# HISTORY OF EMBRYOLOGY



Spallanzani (1729-1799)

Wolff (1733-1794) = theory of epigenesis

von Baer (1828) = von Baer's law

Virchow

Schleiden and Schwann – Cell Theory

# HISTORY OF EMBRYOLOGY

August Weismann (1834-1914)

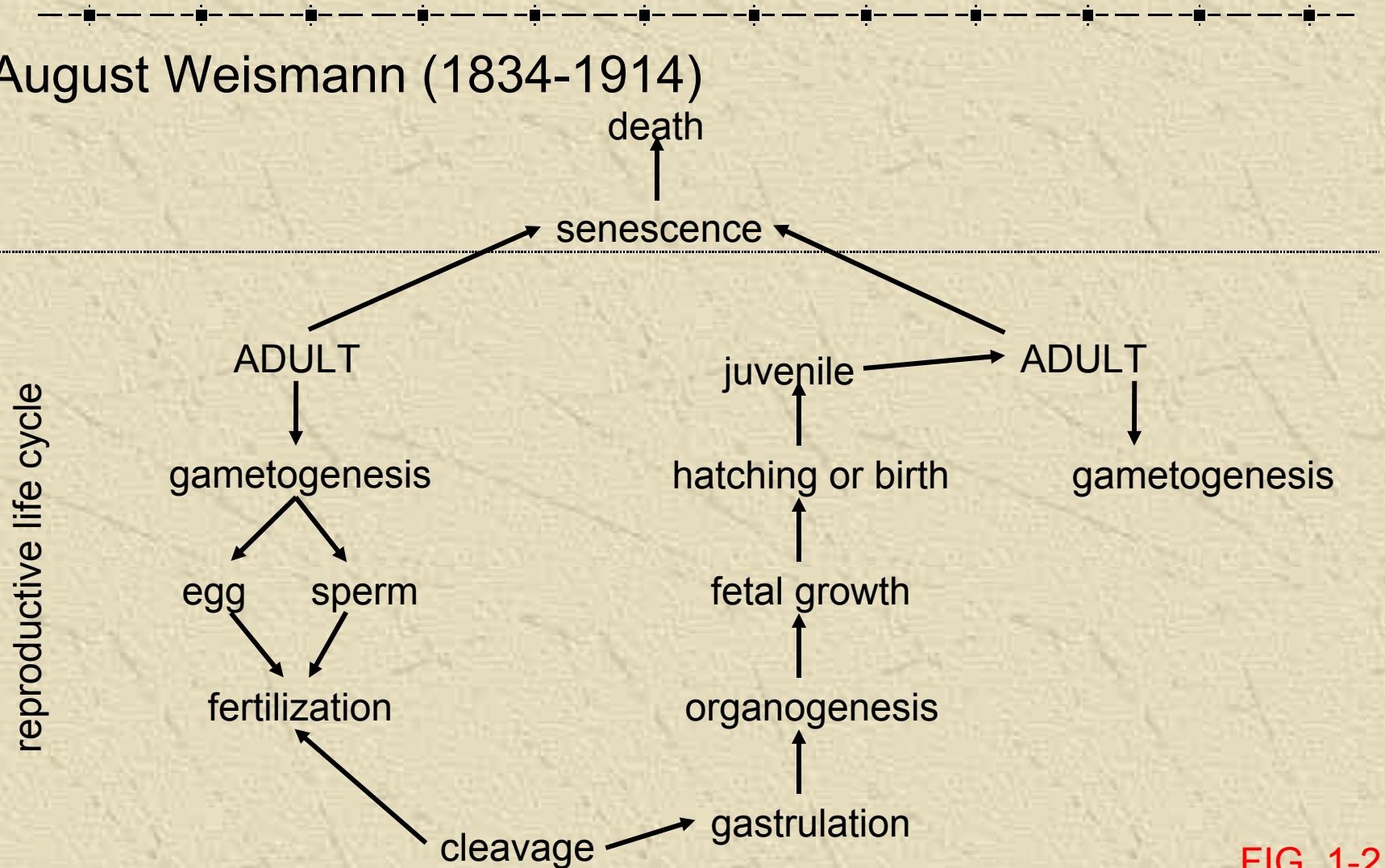


FIG. 1-2

# THE CELL AND ITS ENVIRONMENT

## Intracellular synthesis and its regulation

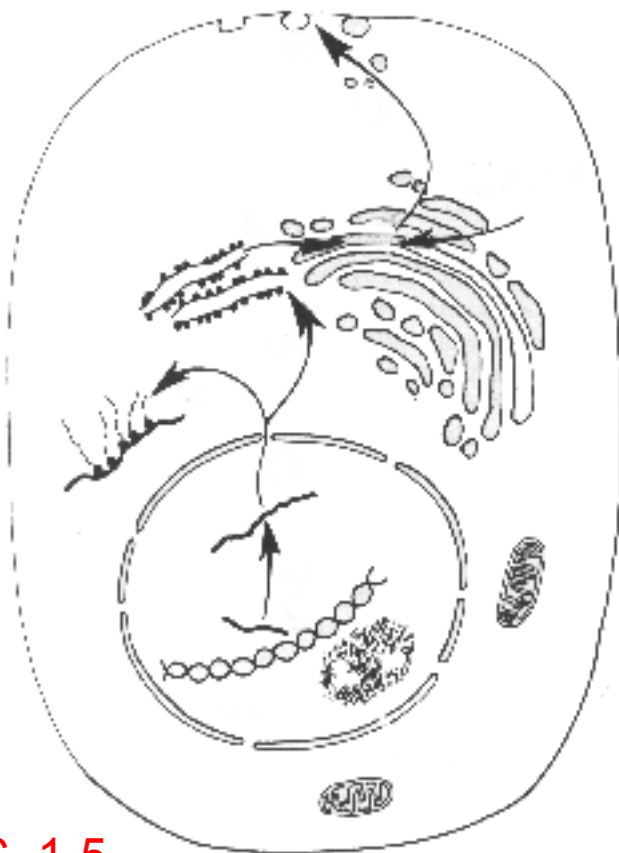


FIG. 1-5

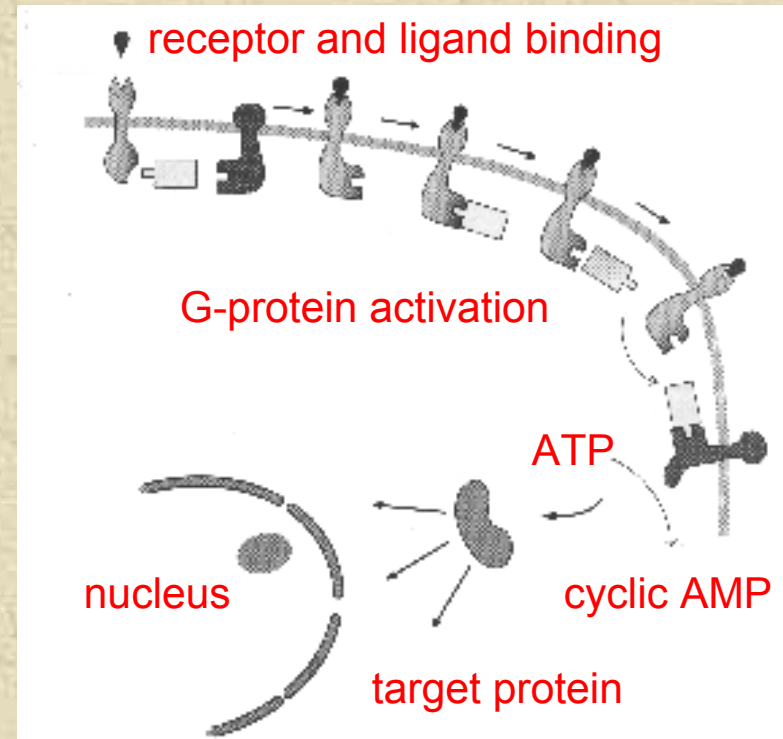


FIG. 1-6

# THE CELL AND ITS ENVIRONMENT

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## Cell surface

phospholipids

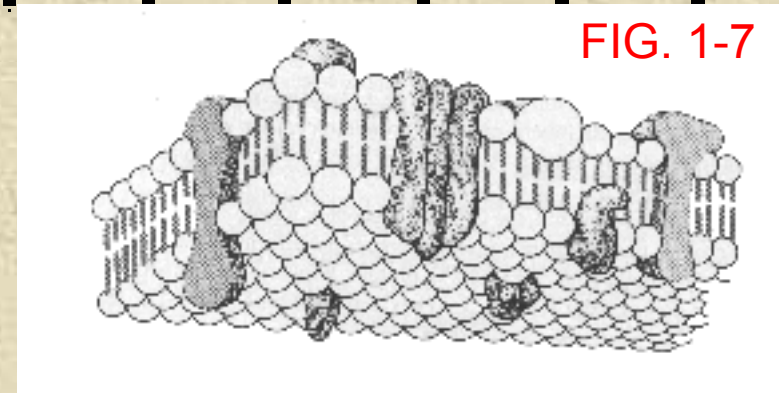
proteins

gap junctions

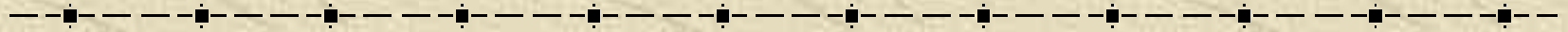
cell adhesion molecules (CAMs)

cadherins

sialic acid



# THE CELL AND ITS ENVIRONMENT



## Extracellular matrix

collagen

attachment glycoproteins

<u>Collagen</u>	<u>Glycoprotein</u>	<u>Distribution</u>
I	fibronectin	skin, bone, tendons, ligaments, teeth, cornea
II	chondronectin	cartilage
III	fibronectin	skin, vessels, skeletal muscles
IV	laminin	basal laminae
V	fibronectin	placenta, vessels, smooth muscle
X	chondronectin(?)	hypertrophying cartilage
?	osteonectin	bone

# THE CELL AND ITS ENVIRONMENT

## Extracellular matrix

influence of attachment glycoproteins in phenotypic expression of cells

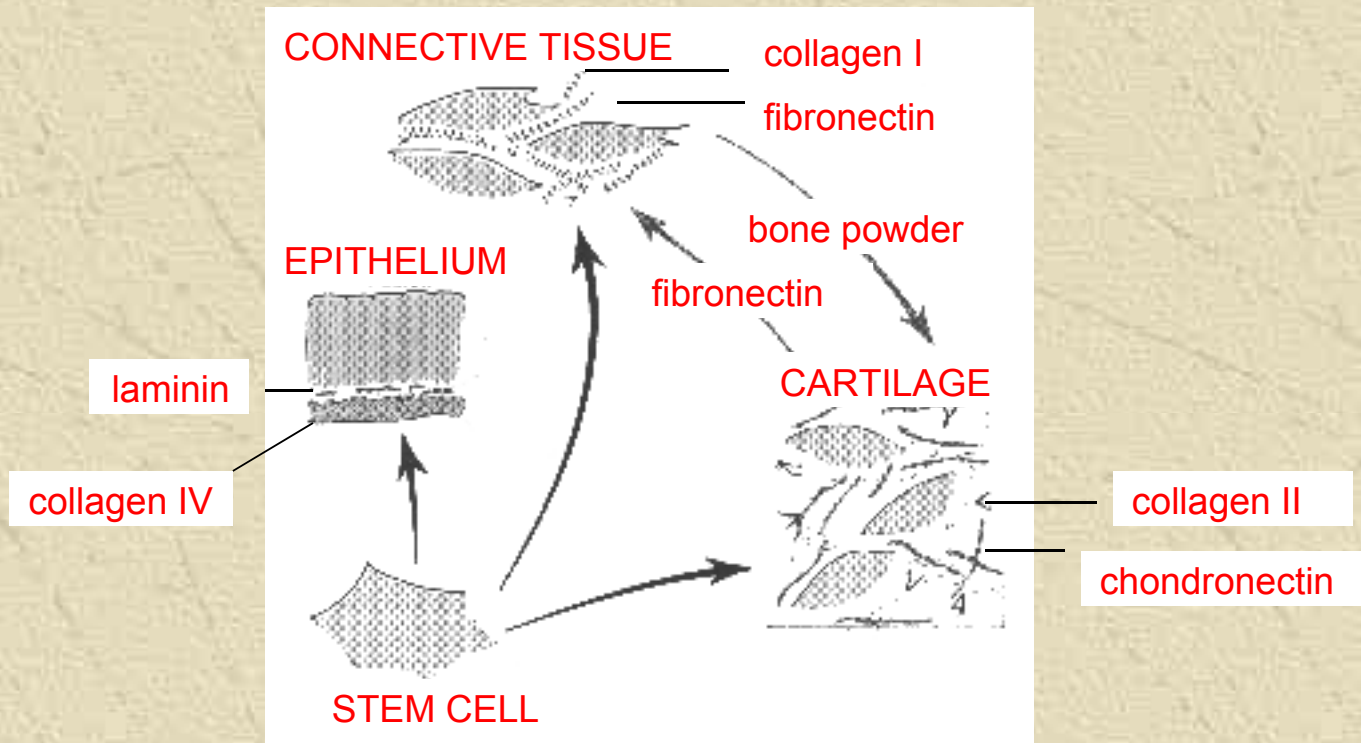


FIG. 1-12

# THE CELL AND ITS ENVIRONMENT

Extracellular matrix

glycosaminoglycans (GAGs, mucopolysaccharides)

hyaluronic acid

dermatan sulfate (chondroitin sulfate B)

chondroitin 4- or 6-sulfate (A or C)

keratan sulfate

heparan sulfate

proteoglycans

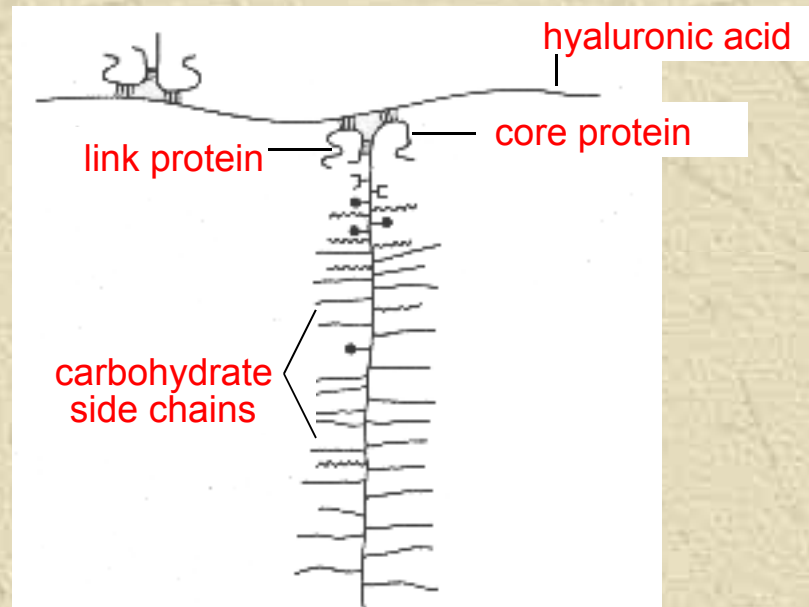


FIG. 1-11

# FUNDAMENTAL PROCESSES

Cell division and the cell cycle

Gene activation

heterochromatin = repressed DNA

activated DNA = derepressed

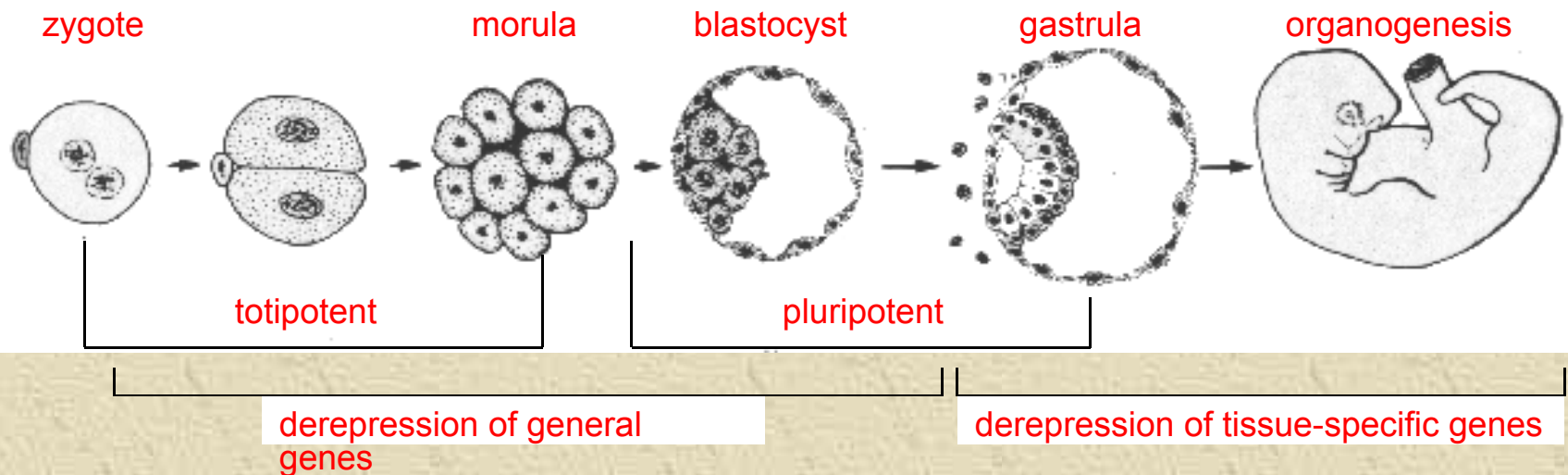


FIG. 1-16

# FUNDAMENTAL PROCESSES

## Restriction and determination

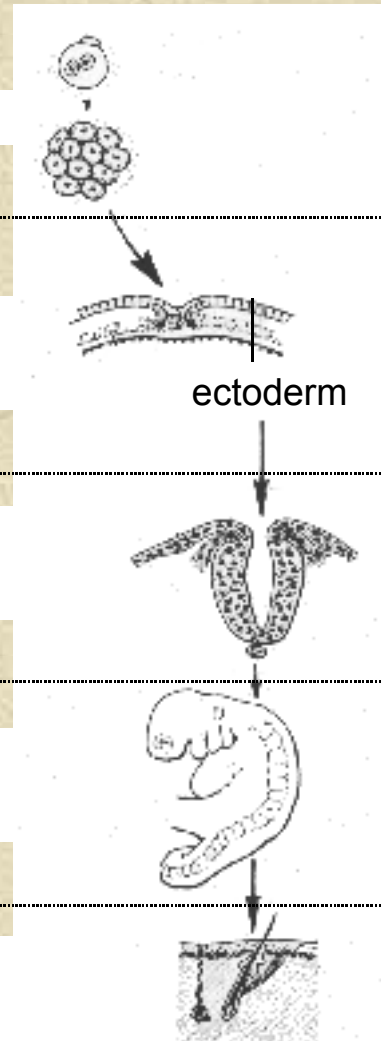
cells totipotent

cells pluripotent  
(ectoderm, mesoderm, endoderm established)

cells pluripotent, but less than before  
(ex: ectoderm=nervous, epidermis)

cells pluripotent, but even less than before  
(ex: ectoderm=brain, spinal cord, hair,  
cornea)

cells differentiated  
(ex: ectoderm=specialized features)



zygote

cleavage

gastrulation

ectoderm

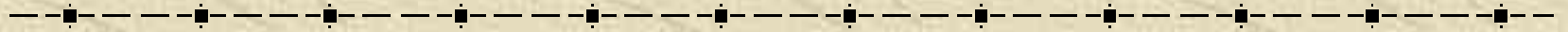
neurulation  
(primary induction)

secondary  
inductions

further  
inductions

FIG. 1-20

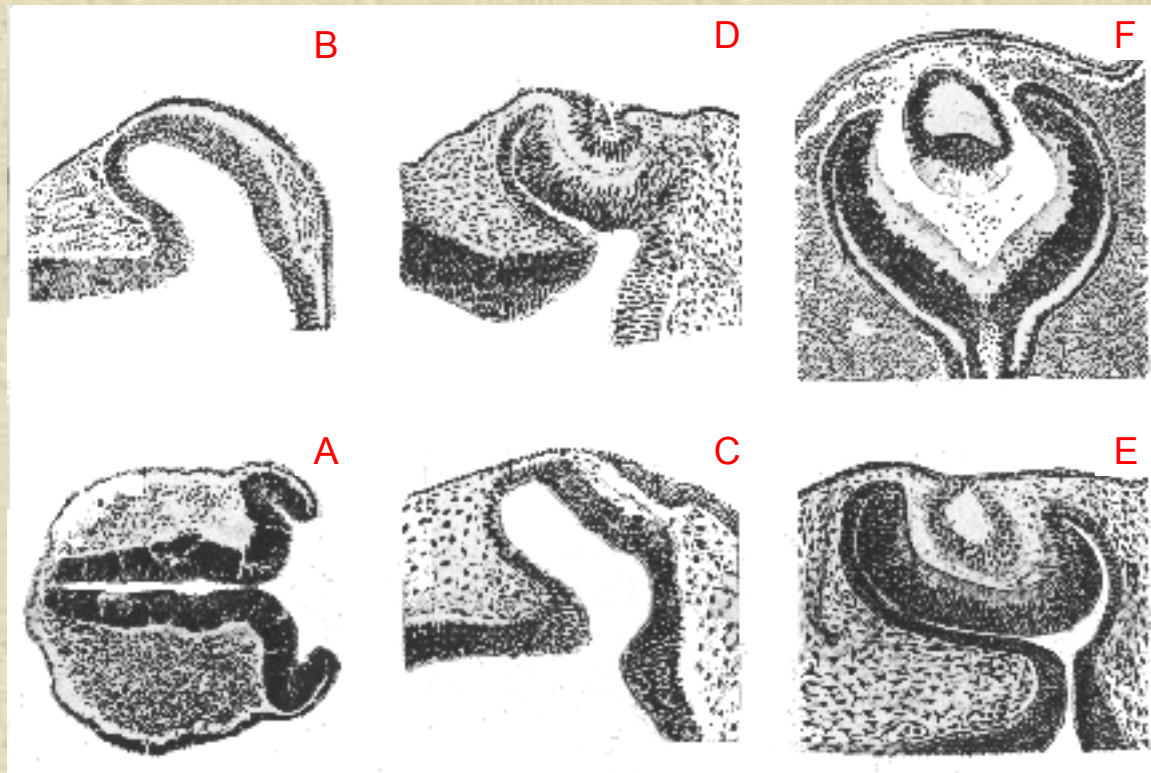
# FUNDAMENTAL PROCESSES



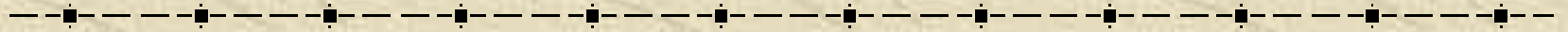
## Induction

inductor and the responding tissue

permissive versus instructive



# FUNDAMENTAL PROCESSES



Differentiation

biochemical vs. functional

What is terminal differentiation?

Morphogenesis (morphogenetic events)

pattern formation

positional information

realization of the pattern

cell proliferation

cell migration

aggregation

extracellular matrix secretion

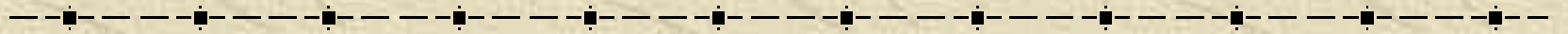
cell shape changes

localized cell death

FIG. 1-22



# FUNDAMENTAL PROCESSES



Intercellular communication

Cell movements

invagination



involution



convergent extension



epiboly



delamination



Table 5-1

# FUNDAMENTAL PROCESSES

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## Cell movements

ameboid motion



lateral  
intercalation



radial intercalation



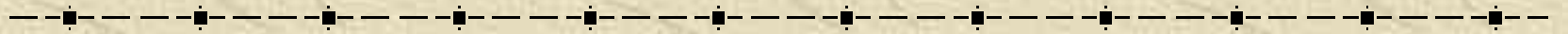
ingression



shape changes



# FUNDAMENTAL PROCESSES



Cell death (apoptosis)

The clonal mode of development

Regulation and regeneration

morphogenetic field

Growth

hypertrophic

hyperplastic

determinate

indeterminate

differential

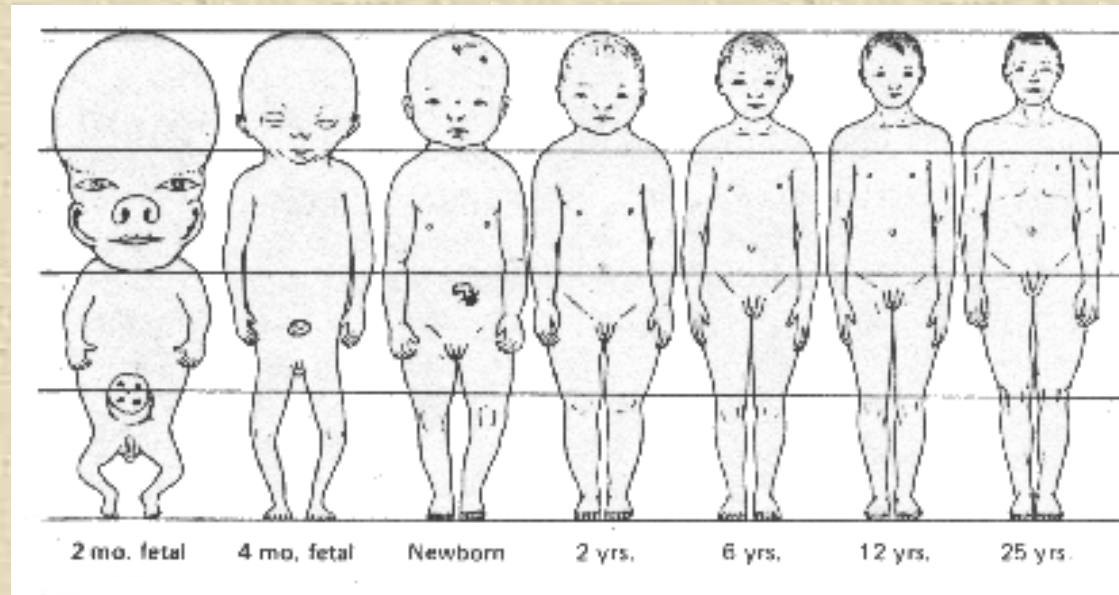
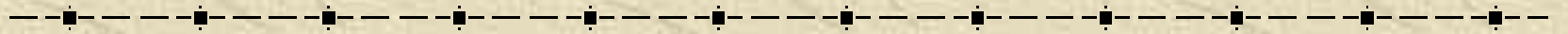


FIG. 1-26

# FUNDAMENTAL PROCESSES



Recapitulation (biogenetic law of Muller and Haeckel)

ontogeny recapitulates phylogeny

Heredity and environment

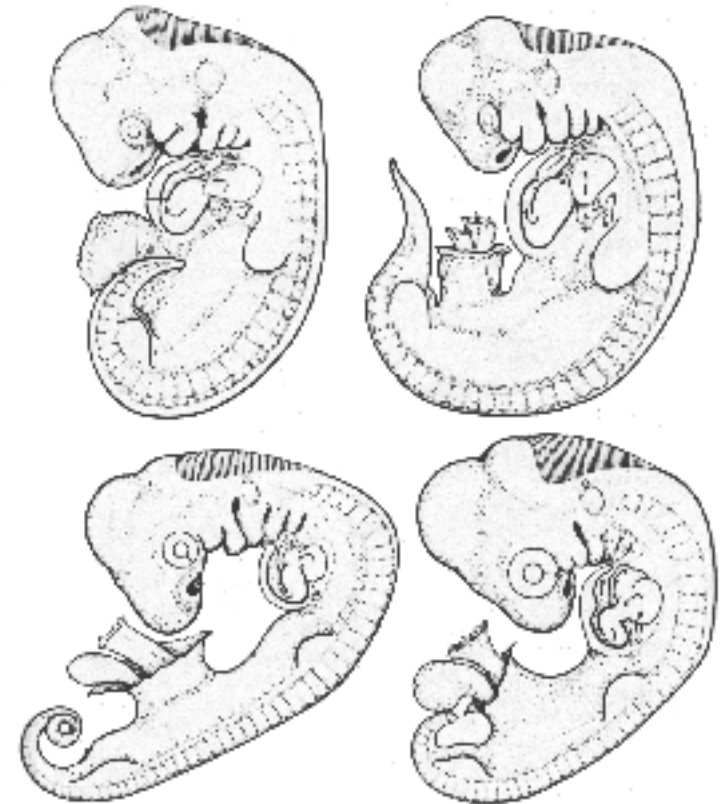


FIG. 1-27