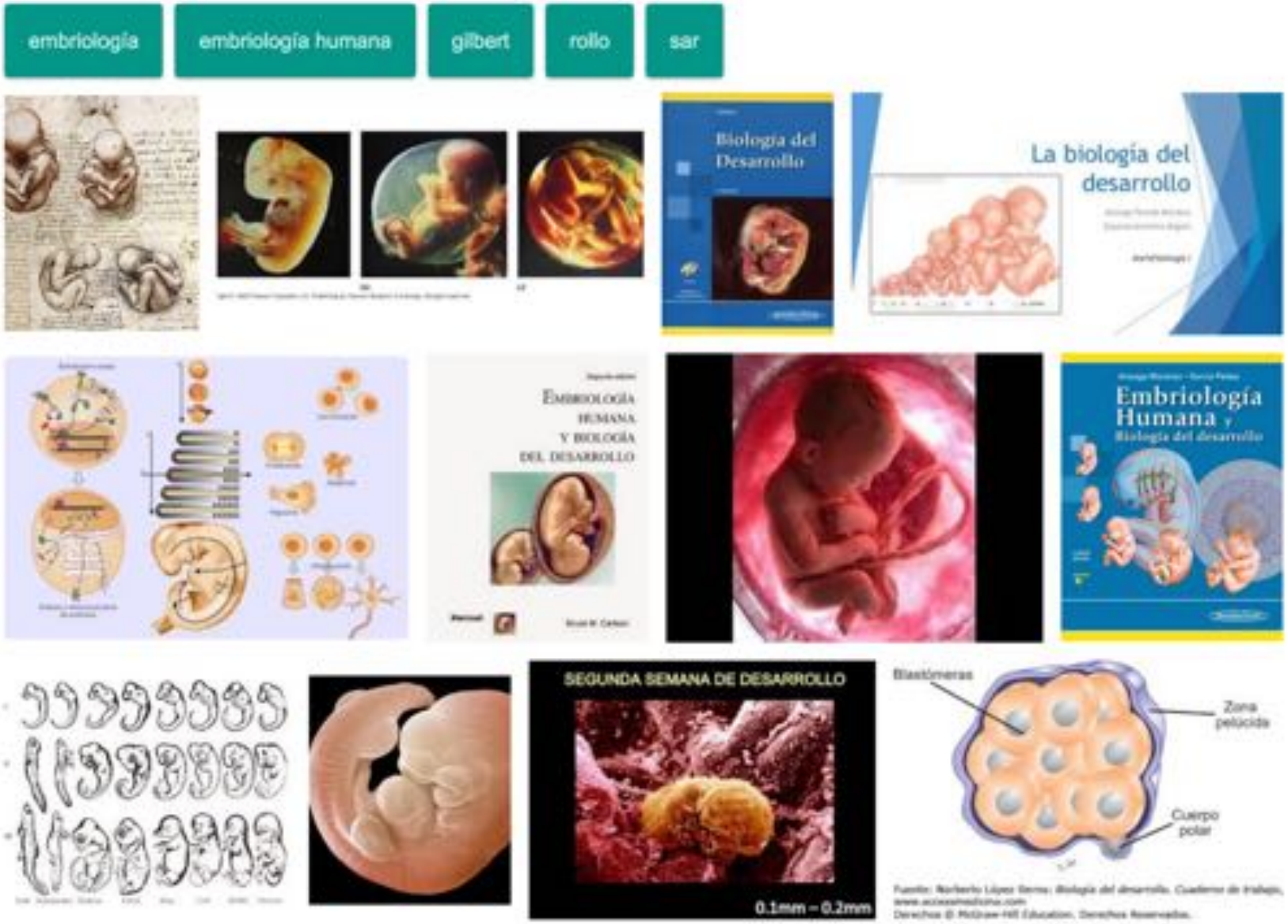
O qué e a biologia do desenvolvimento???

busqueda de imagenes en google (26-2-18): ‘biología del desarrollo’



O qué e a biologia do desenvolvimento???

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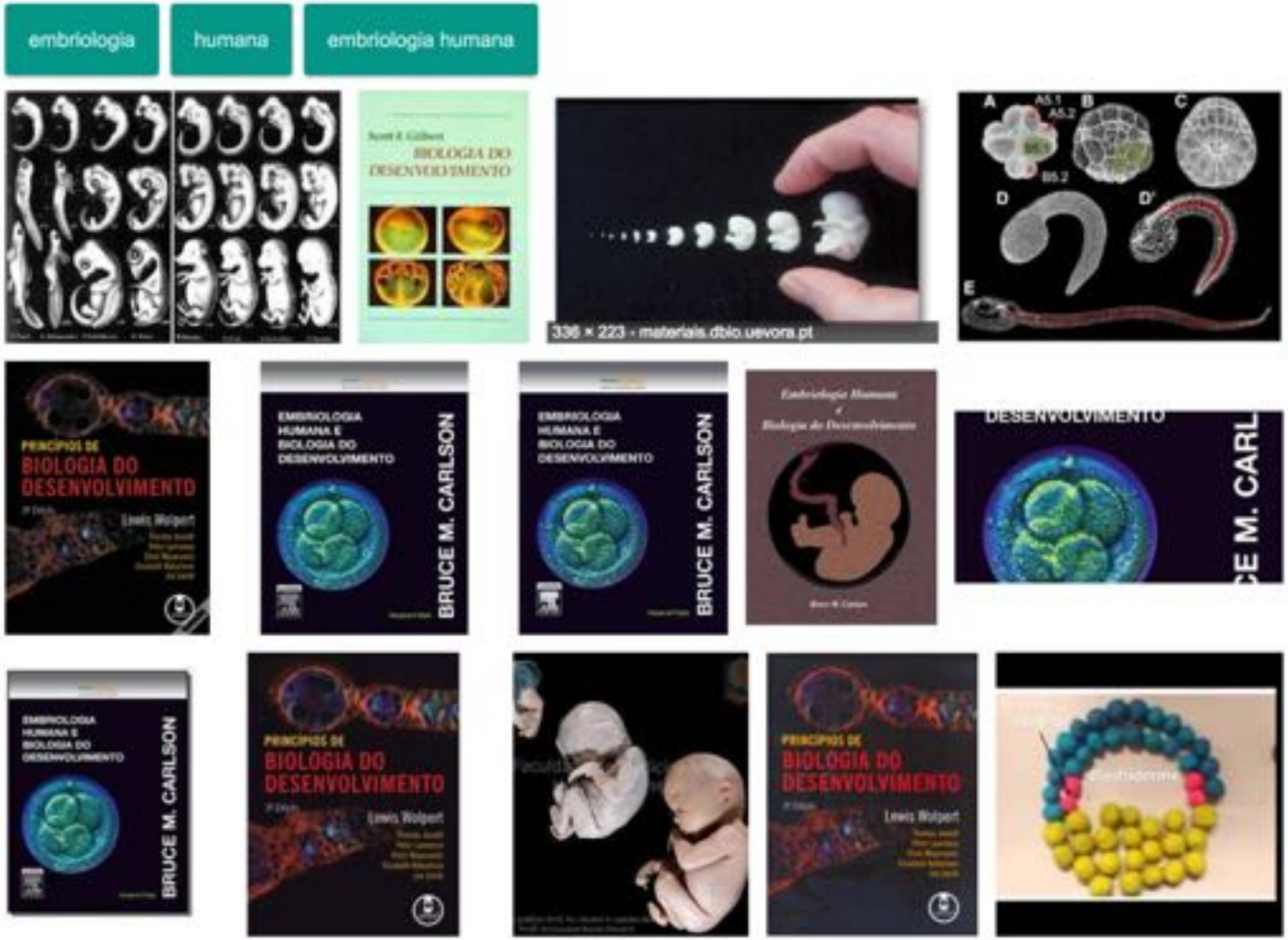
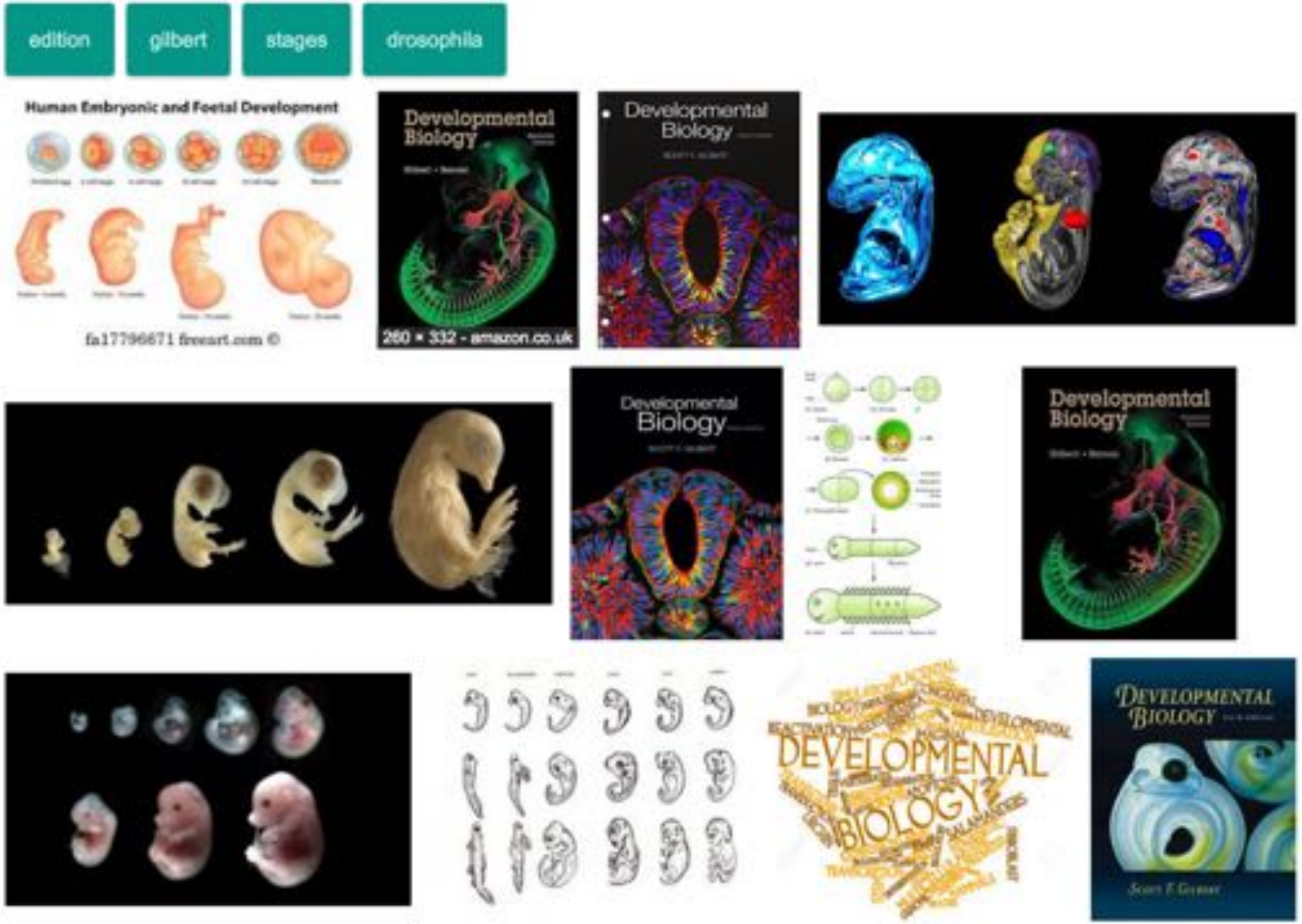


O qué e a biologia do desenvolvimento???

busqueda de imagenes en google (26-2-18): ‘developmental biology’



Historia do pensamento da Biologia de desenvolvimento

V AC Hipócrates define ao desenvolvimento como interações entre calor, humedade e solidificacão.

IV AC

Aristóteles propõe duas formas de desenvolver ó orgánico:

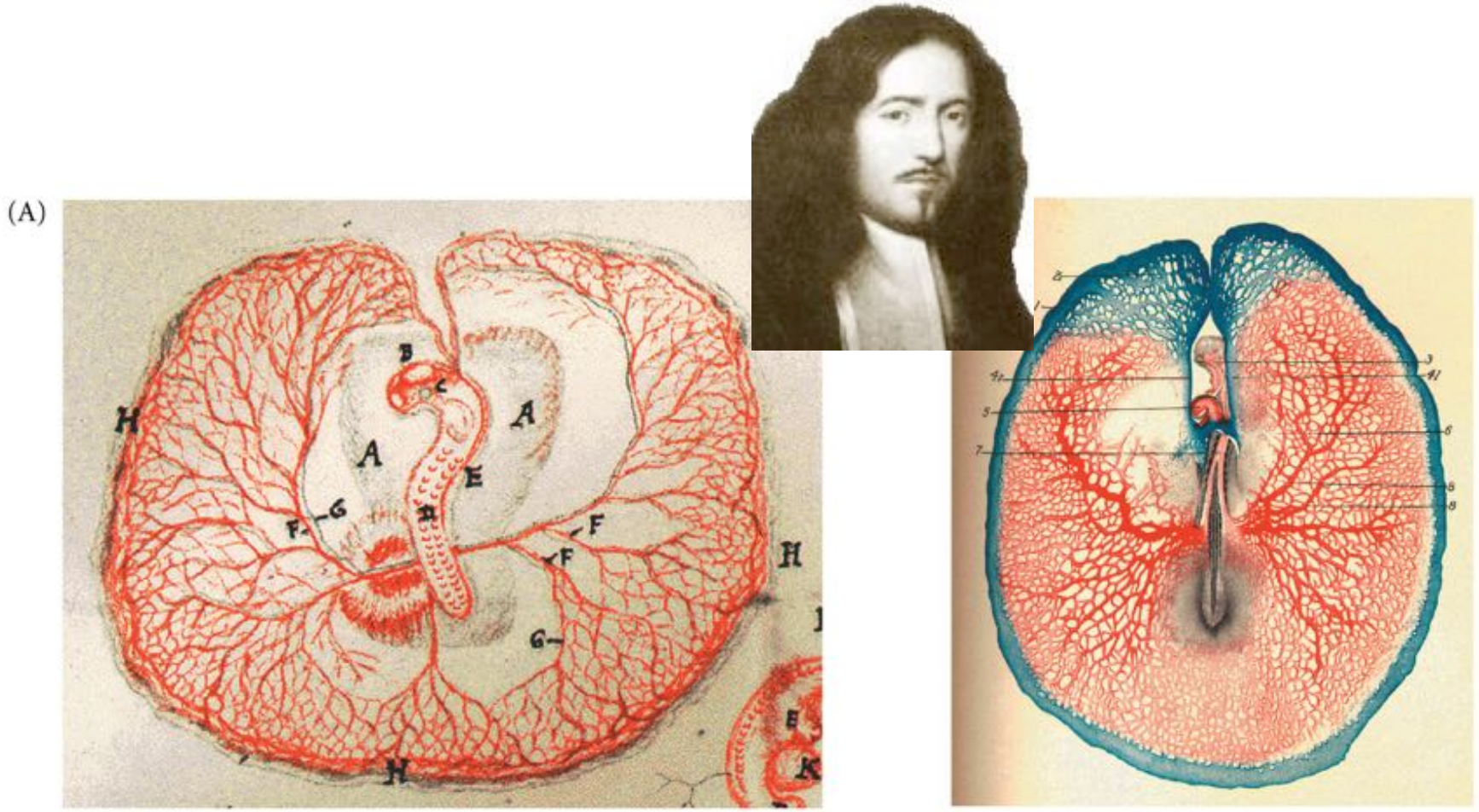
a) preformacão

b) epigénese (em formacão ou nova formacão), usó como metáfora el tecer uma rede

XVII DC William Harvey propõe como regra geral para os animais, o desenvolvimento a partir de um ovo (1651)

XVII DC O excelente microscopista Marcelo Malpighi observa e descreve com muito detalhe o desenvolvimento da galinha (1672). É influenciado pelo periodo histórico e descreve/afirma que os estagios iniciais do desenvolvimento da galinha não podem ser observados porque são muito pequenos.

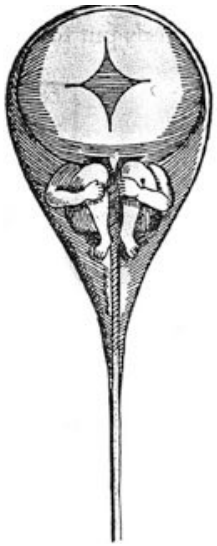
O pensamiento da creação divina do cristianismo em occidente estableciou o pensamento geralizado da preformação para explicar o desenvolvimento



DEVELOPMENTAL BIOLOGY, Eighth Edition, Figure 1.2 (Part 1) © 2006 Sinauer Associates, Inc.

DEVELOPMENTAL BIOLOGY, Eighth Edition, Figure 1.2 (Part

XVIII DC Começa novamente o debate da preformação e a epigénese com observações detalhadas do embrião da galinha. N. Hartsoeker escreve ter reconhecido o homúnculo/animalculo no espermatozoide de humanos (1694).



K. Friedrich Wolff amostra que os tessidos embrionários desenvolvem-se de precursores distintos aos observados no adulto favorecindo pela primera vez a visão da epigénese (1767)

C. Pander

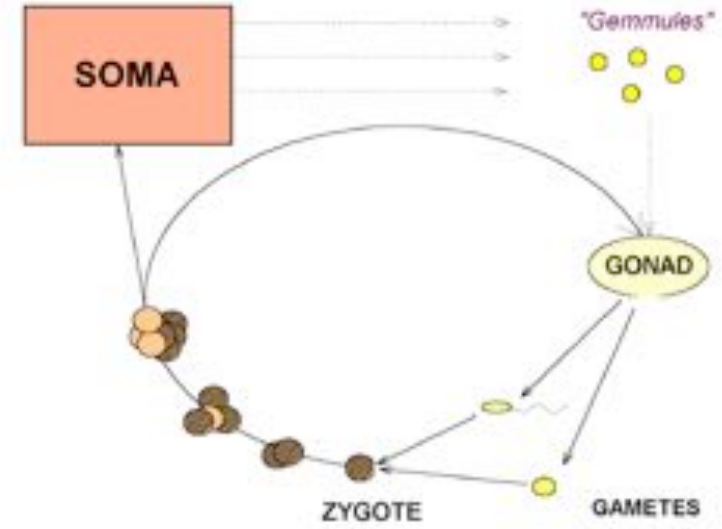
1817 **Christian Pander** define as camadas germinais e a inducção no embrião da galinha (e ideia é expandida a todos os vertebrados por **Karl Ernst von Baer** quem define a blástula e a notocorda, e descubre o ovo nos humanos)

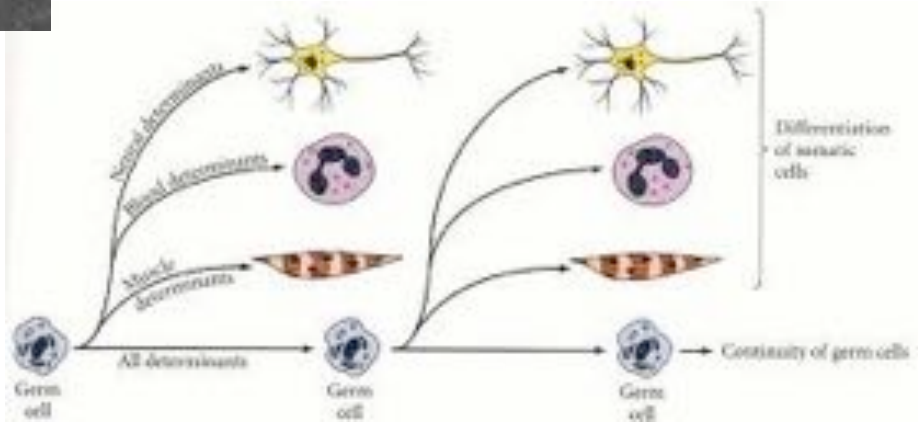
1820-80 Síntese da teoría celular (com a contribução do botánico Matthias Schleiden e o fisiólogo Theodor Schwann)

Schleiden

Schwann

XIX-XX August Weismann diferencia as células do corpo (soma) das células germinais (esperma e ovo); se descubre que os gametos tem a mitade do contenido cromosómico (haploide) e que ele duplica-se com a fertilização (diploide); describem-se os procesos de mitosis e meiosis; e desenvolvem-se os trabalhos da herencia e a genética do Gregor Mendel





Seculo XX-XXI
Principios contemporaneos da biologia do desenvolvimento:

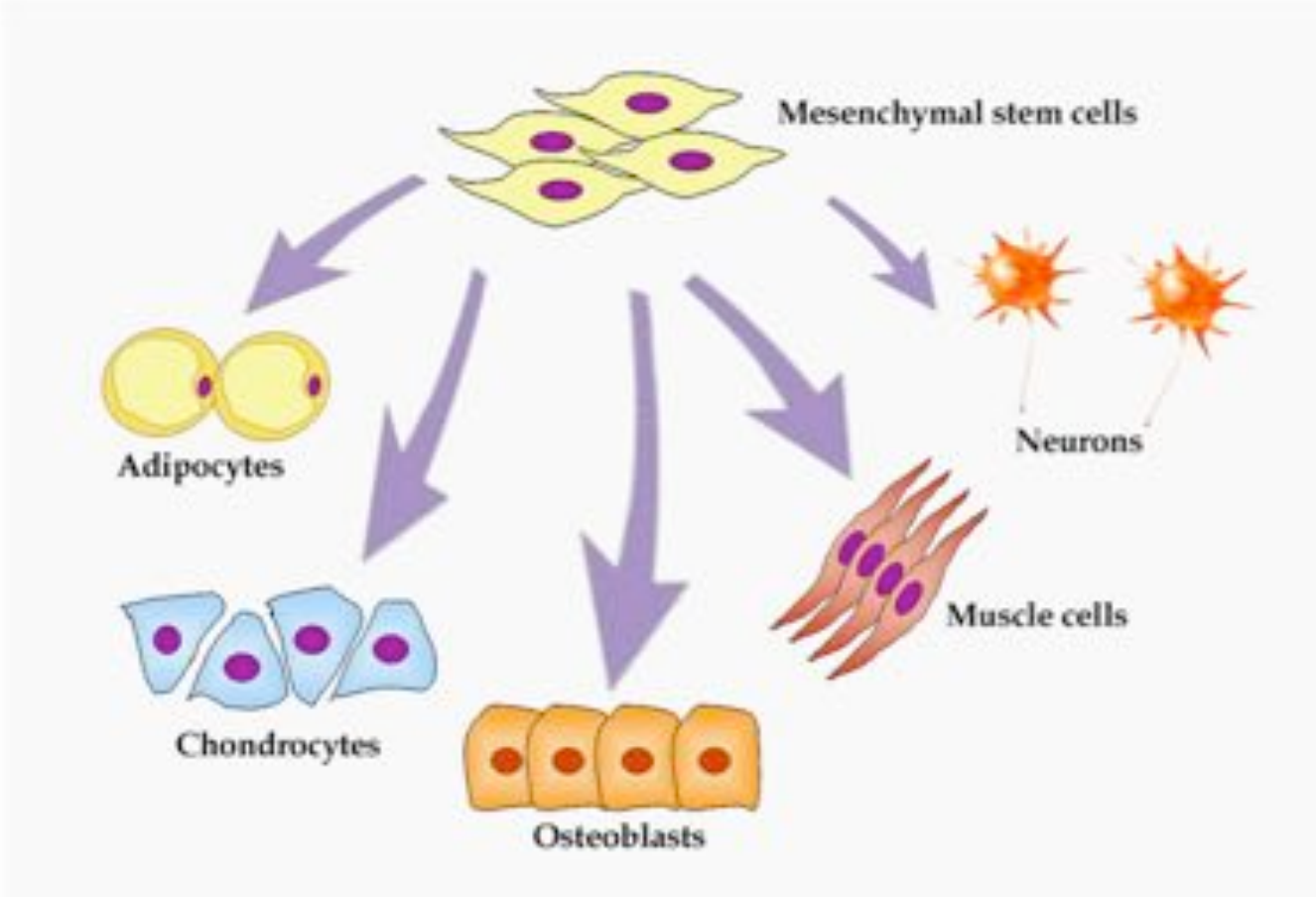
a) O desenvolvimento de linhagens celulares é progressivo e restritivo (e.g. mudanças intracelulares)

b) A expressão dos genes e regulada diferencialmente por células e tecidos: INDUÇAO

c) Os genes codificam informação importante que dirige comportamentos temporais e espaciais das células: MORFOGENESE

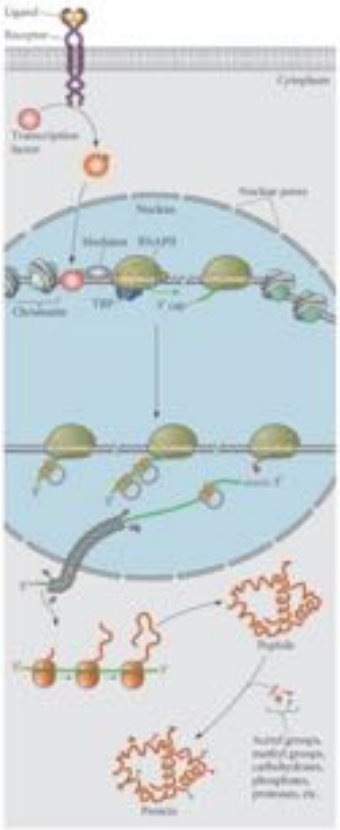
d) Comunicação intercelular (e.g. processos de indução e morfogenese)

Cellular specification: external and intrinsic factors

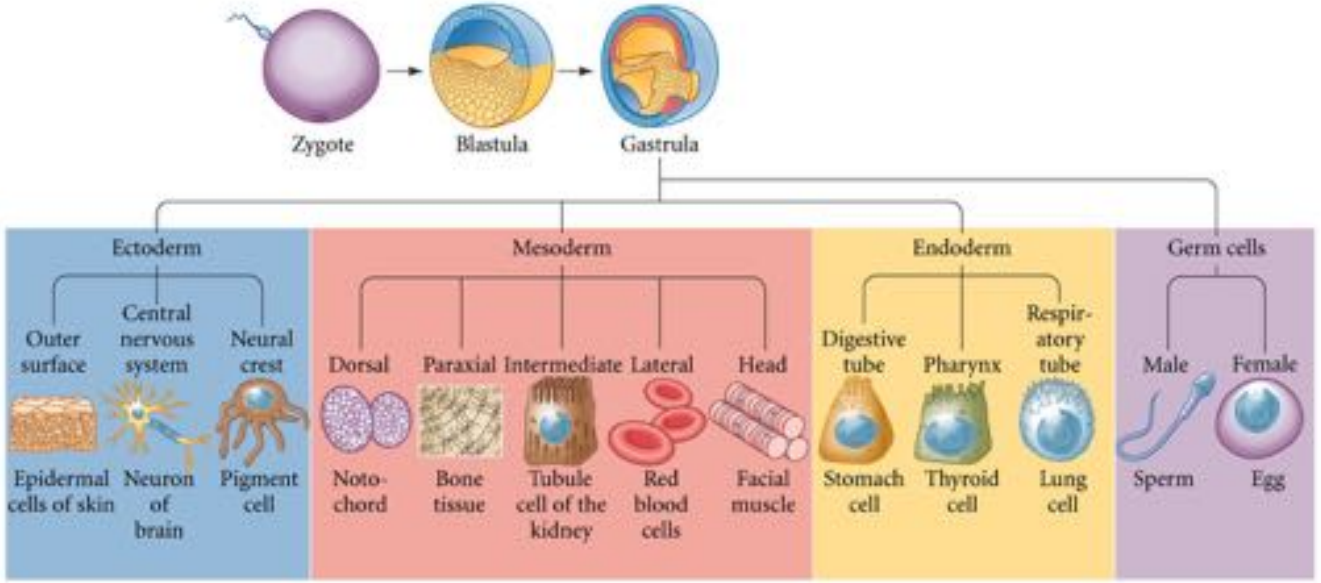


General principles of development:

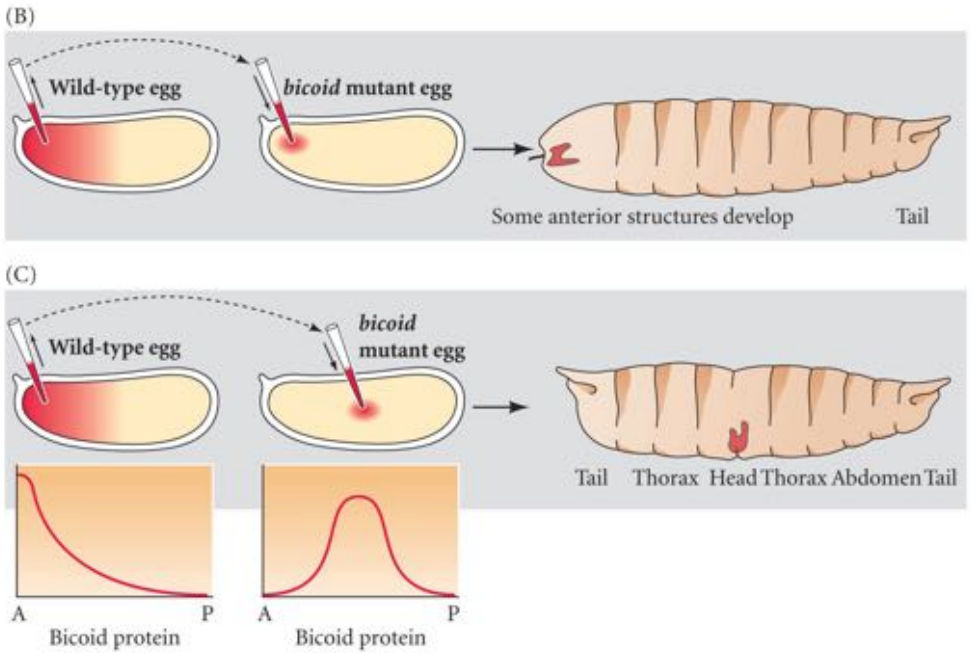
Gene regulation



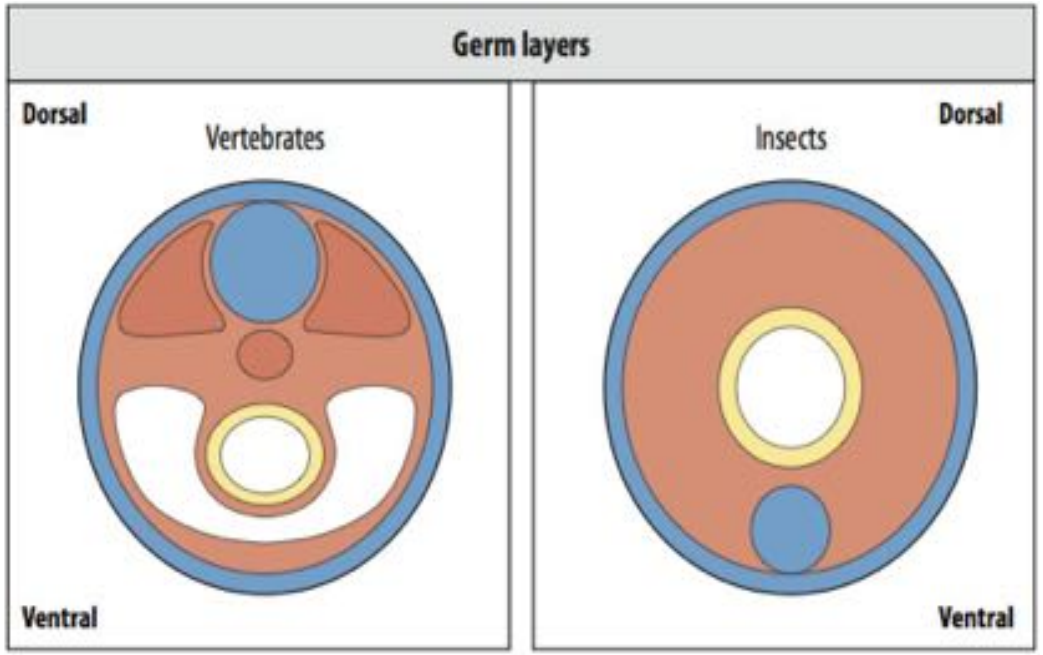
Specification & differentiation



Morphogens and gradients

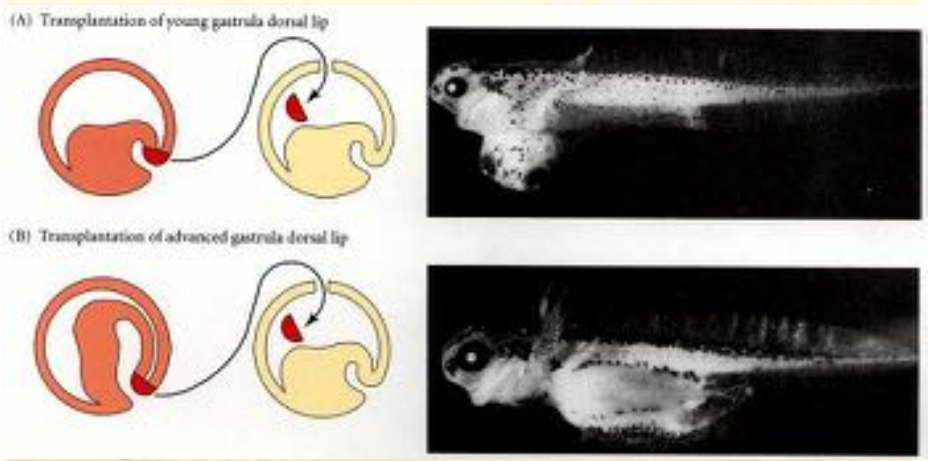


Camadas germinativas



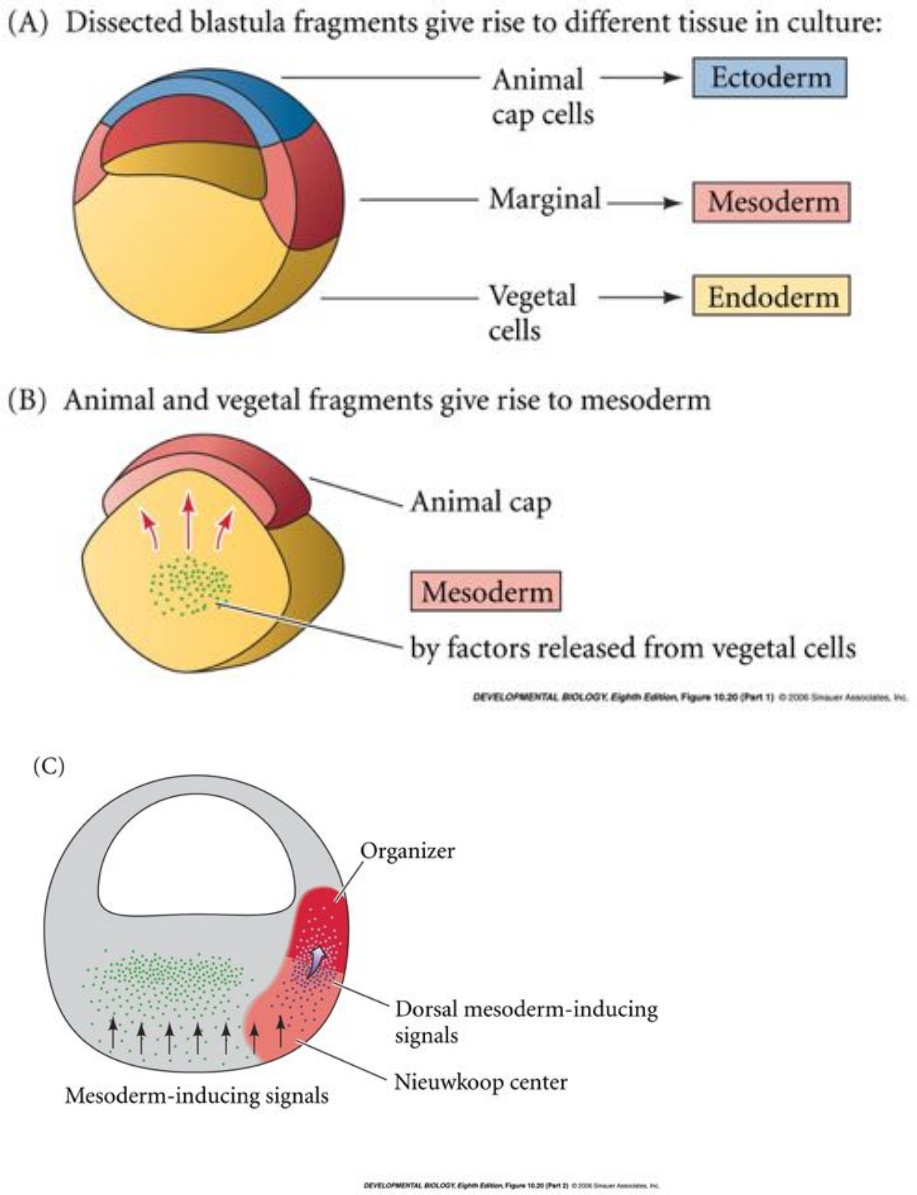
Germ layers	Organs	
Endoderm	gut, liver, lungs	gut
Mesoderm	skeleton, muscle, kidney, heart, blood	muscle, heart, blood
Ectoderm	skin, nervous system	cuticle, nervous system

INDUCTION (1924)



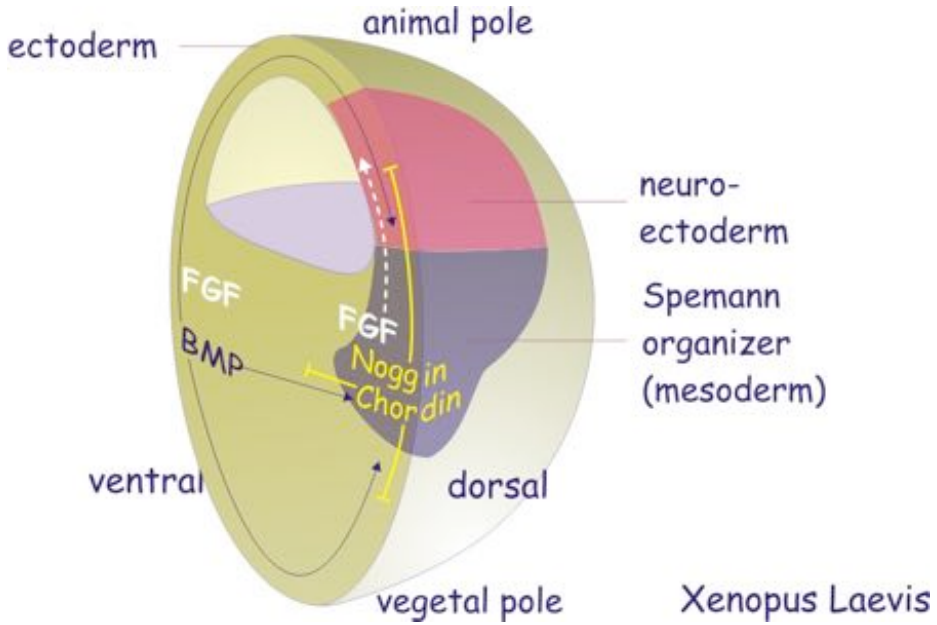
- Spemann & Mangold: embryonic induction
- Hilde Mangold: Hans Spemann's doctoral student in Freiburg
- Spemann wins Nobel in 1935

Mesoderm induction (1969)



- Nieuwkoop find that endoderm signals the ectoderm to specify mesoderm in the axolotl.
- J.M.W. Slack finds FGF signaling is responsible for induction in *X. laevis*
- D. Kimmelman & M. Kirschner find that FGF is present in early embryos. They and J.C. Smith find that TGF-b signaling is also important for mesoderm induction.

Neural induction (1989)



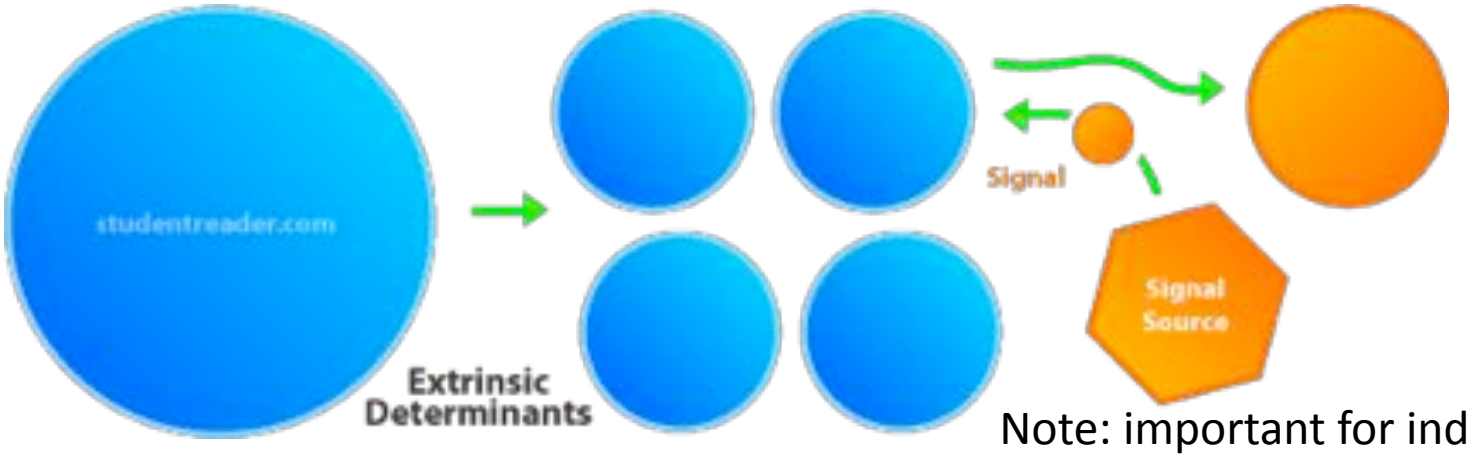
- Grunz & Tacke find that ectodermal cells form neural tissue when kept dissociated for long (without signaling of other molecules); i.e. ectoderm default is neural tissue

Neural plate floor and sonic hedgehog *shh* (1991)

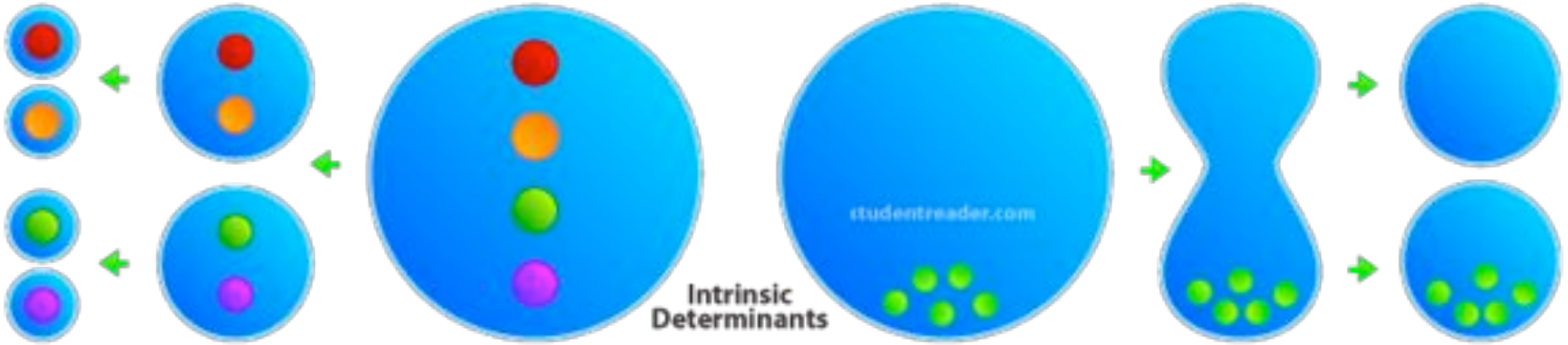
Defecto en Shh

Figura 3. Foto del recién nacido. Se observa ojo único central, con probóscide, confirmando la etmocefalia.

Determinants during early embryogenesis

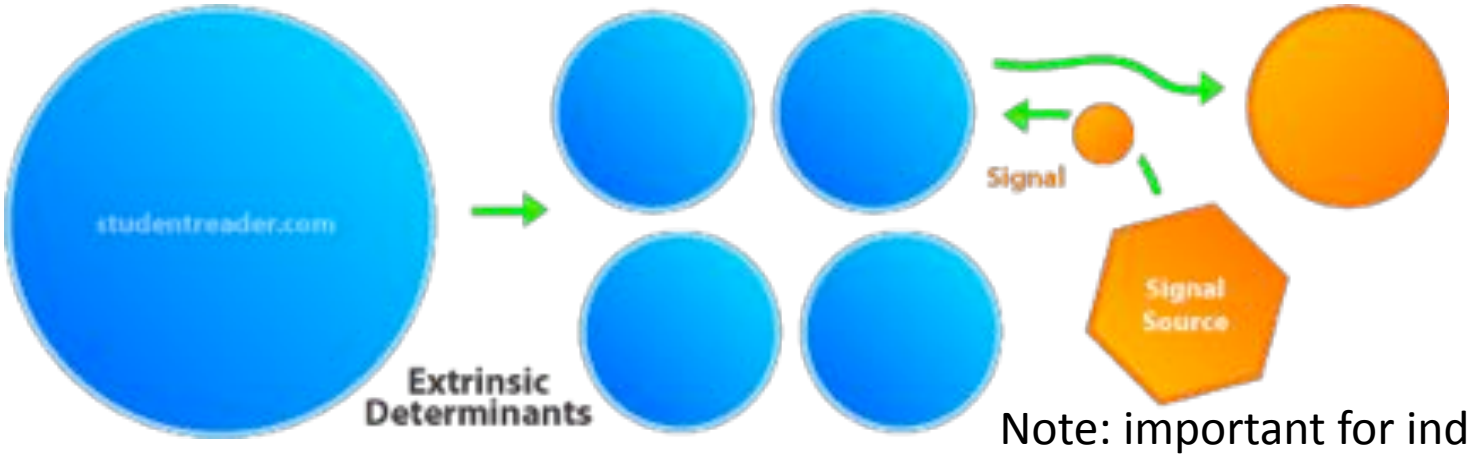


Note: important for induction, regulative development, conditional specification



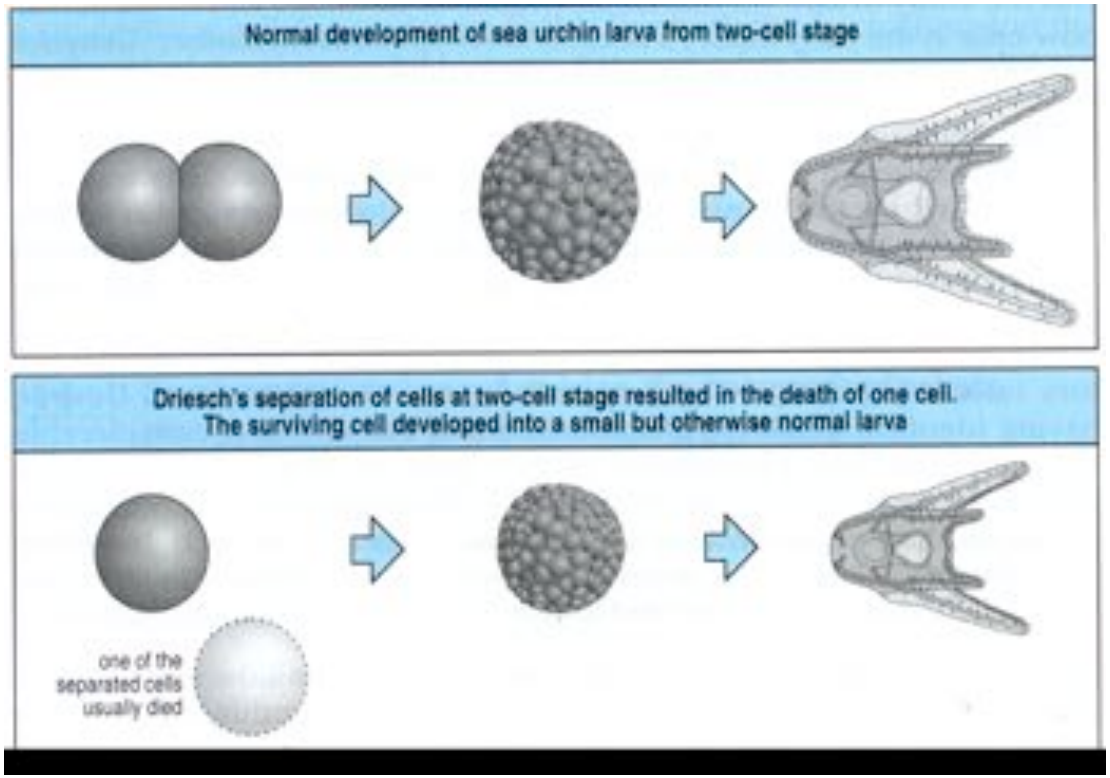
Note: important for preformation, autonomous development, determinative development

Determinants during early embryogenesis for **conditional specification**

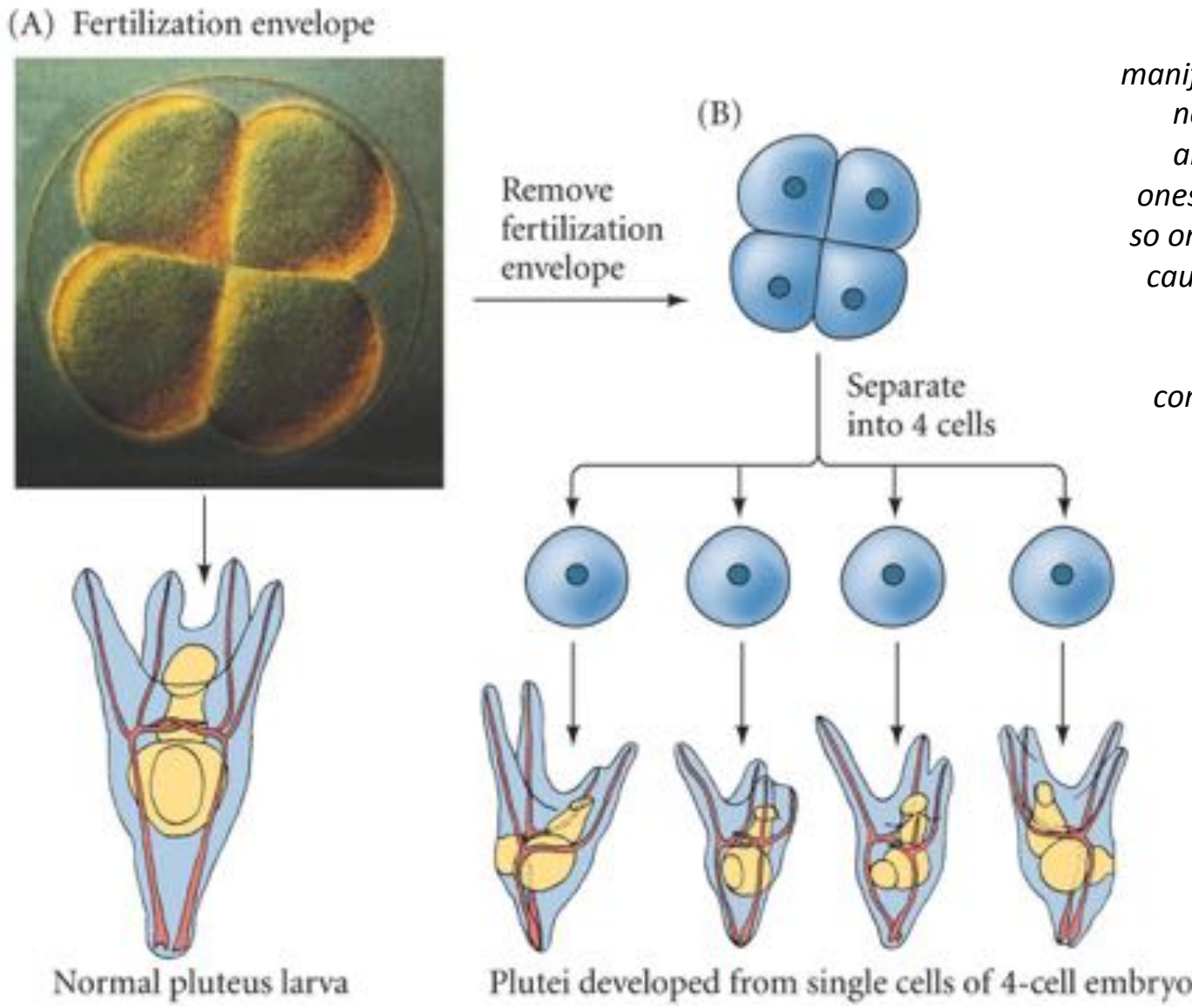


Note: important for induction, regulative development, conditional specification

Conditional specification: Regulative development in urchins

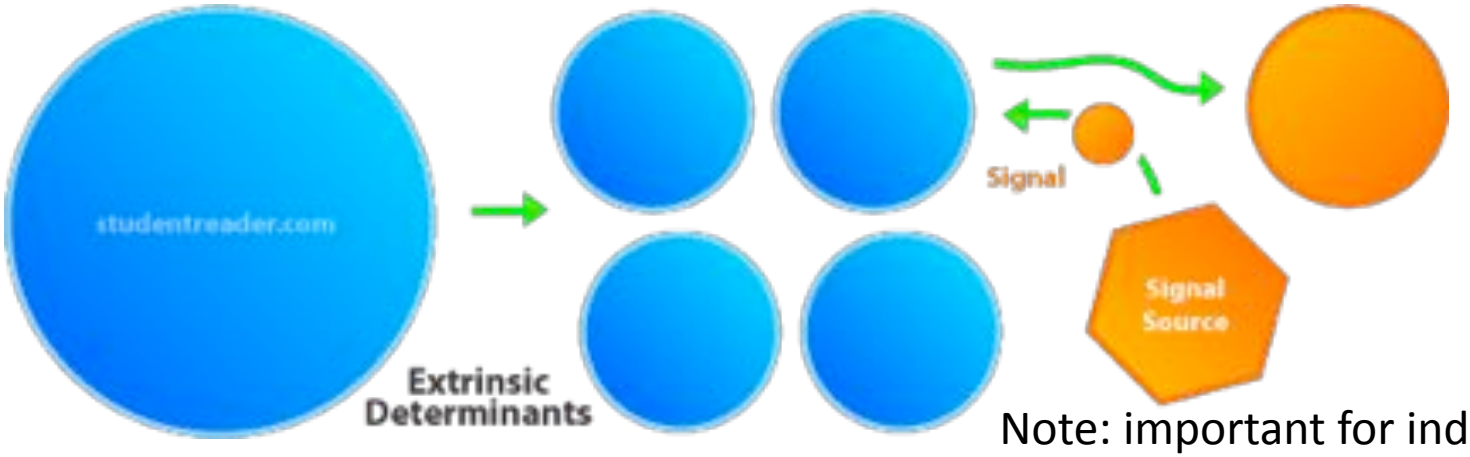


Conditional specification: regulative development in the urchin



"Development starts with a few ordered manifoldnesses; but the manifoldnesses create, by interactions, new manifoldnesses, and these are able, by acting back on the original ones, to provoke new differences, and so on. With each new response, a new cause is immediately provided, and a new specific reactivity for further specific responses. We derive a complex structure from a simple one given in the egg."

Determinants during early embryogenesis



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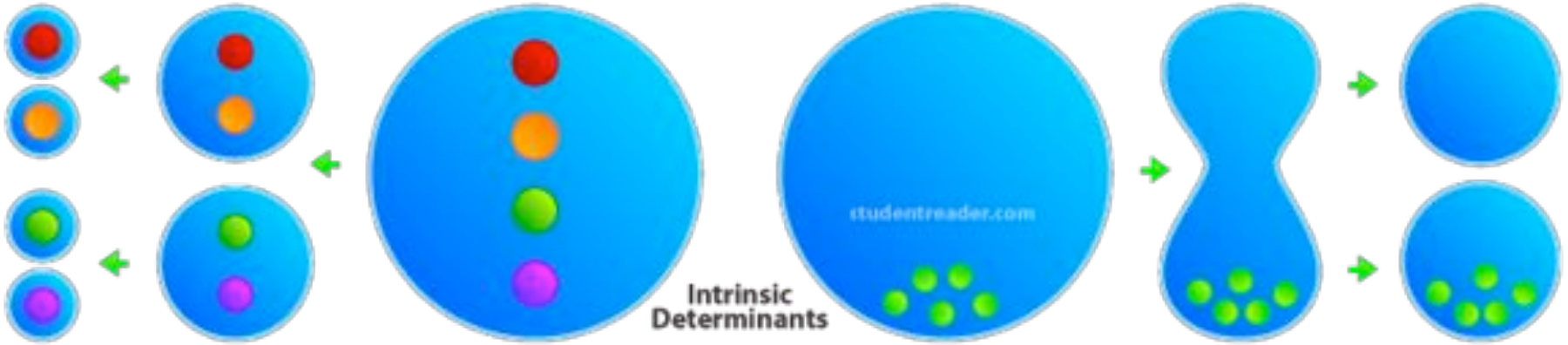
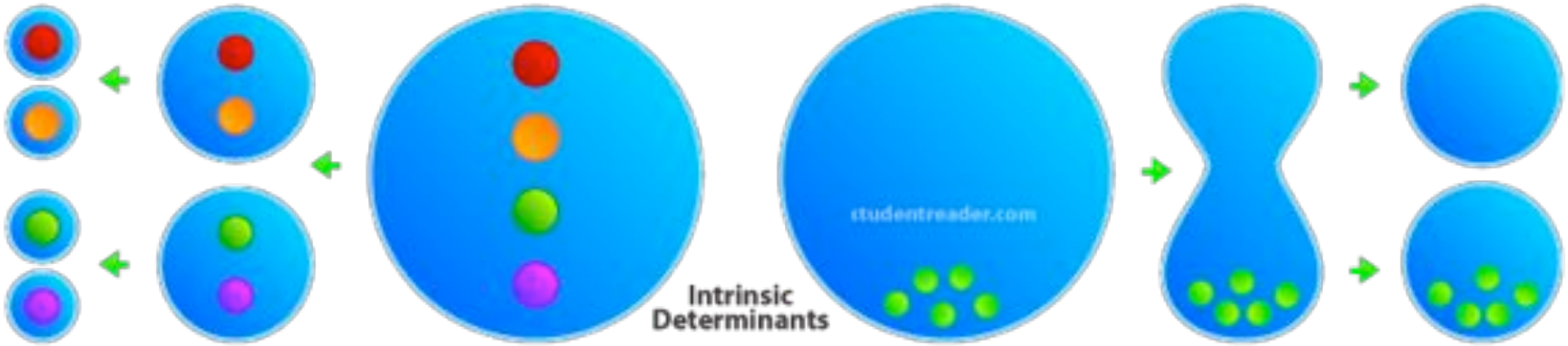


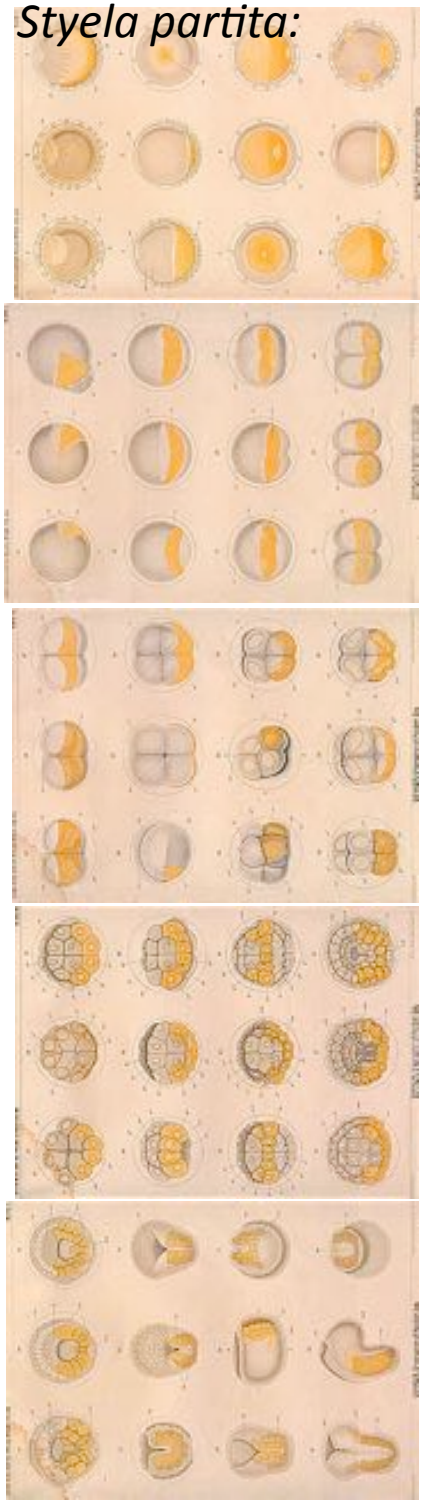
Note: important for preformation, autonomous development, determinative development

Determinants during early embryogenesis for **autonomous specification**

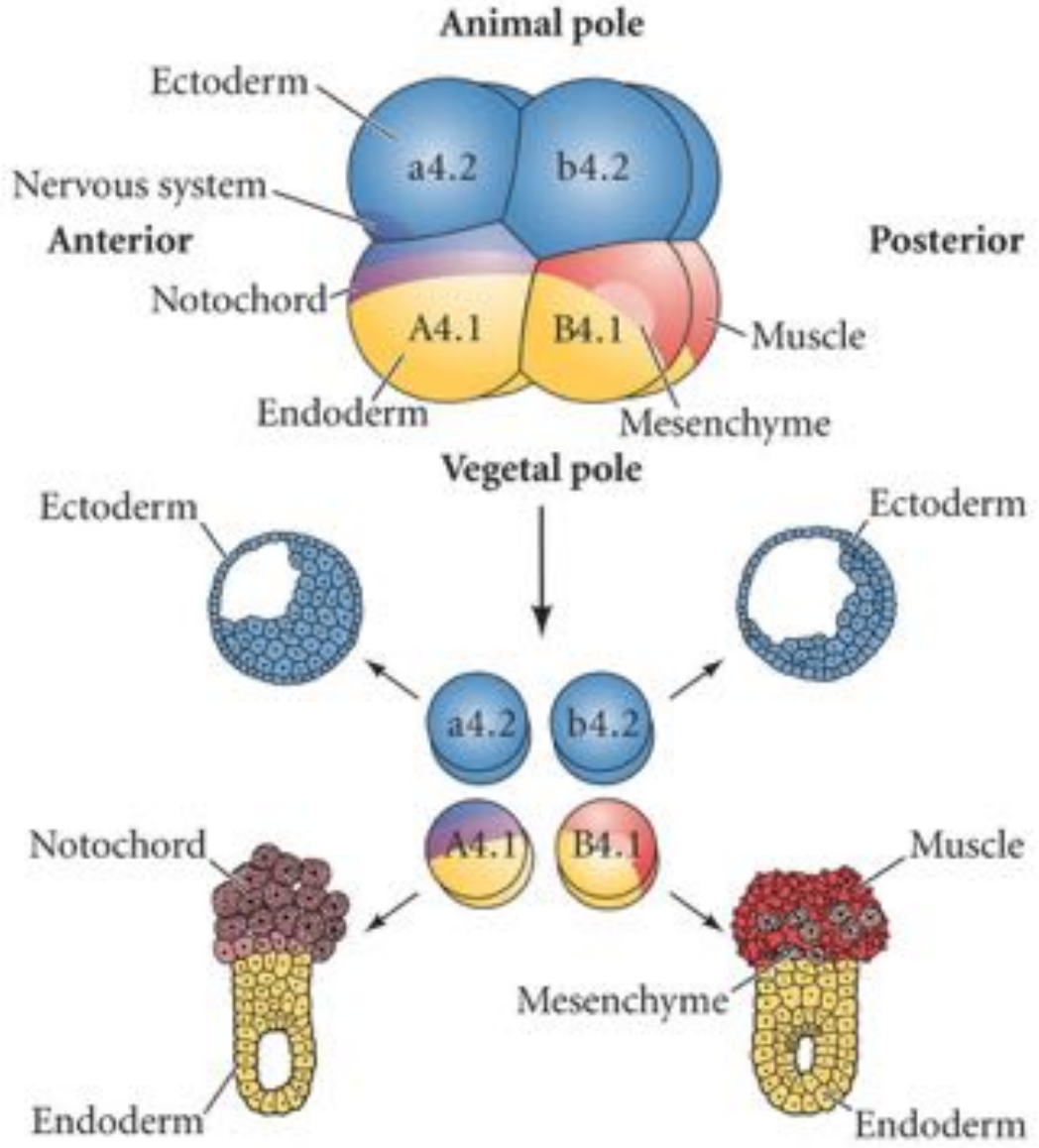


Note: important for preformation, autonomous development, determinative development

Styela partita:



Autonomous specification in ascidians



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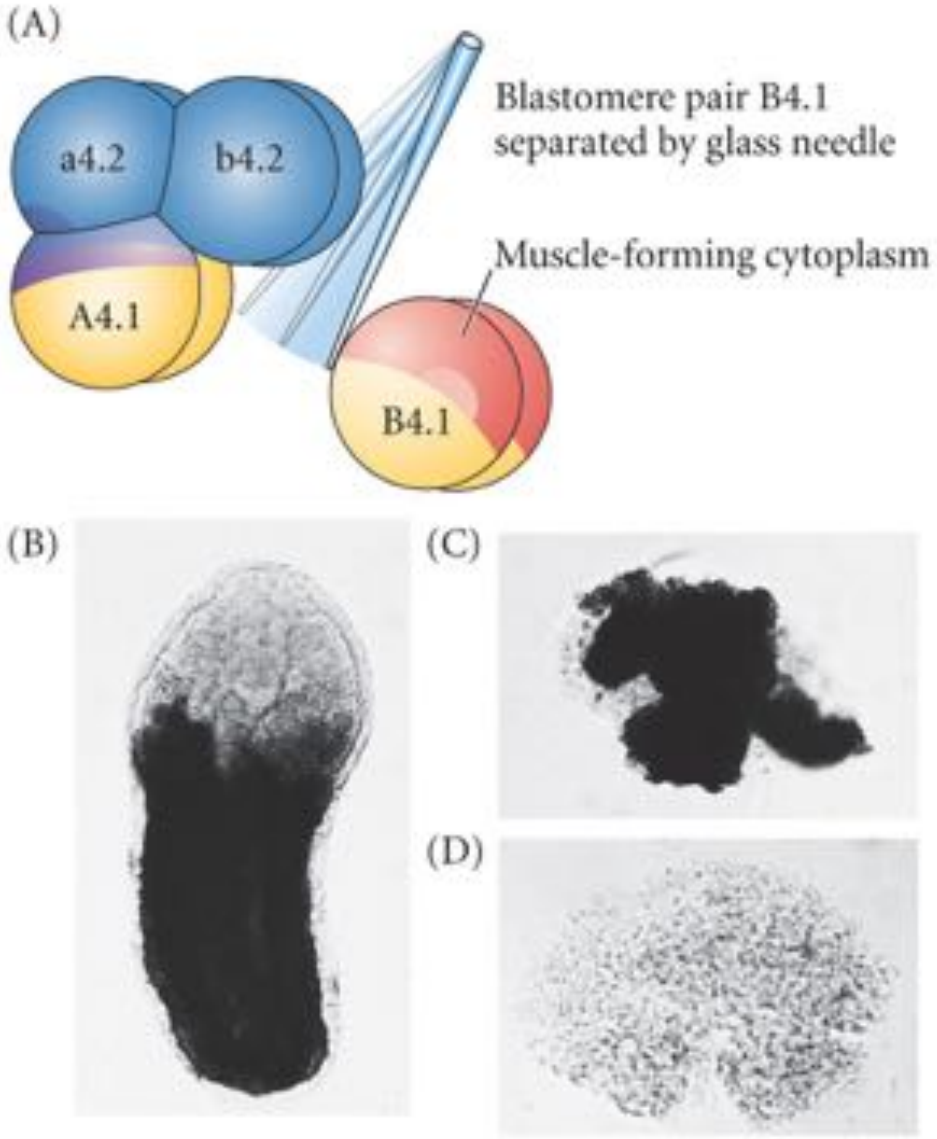
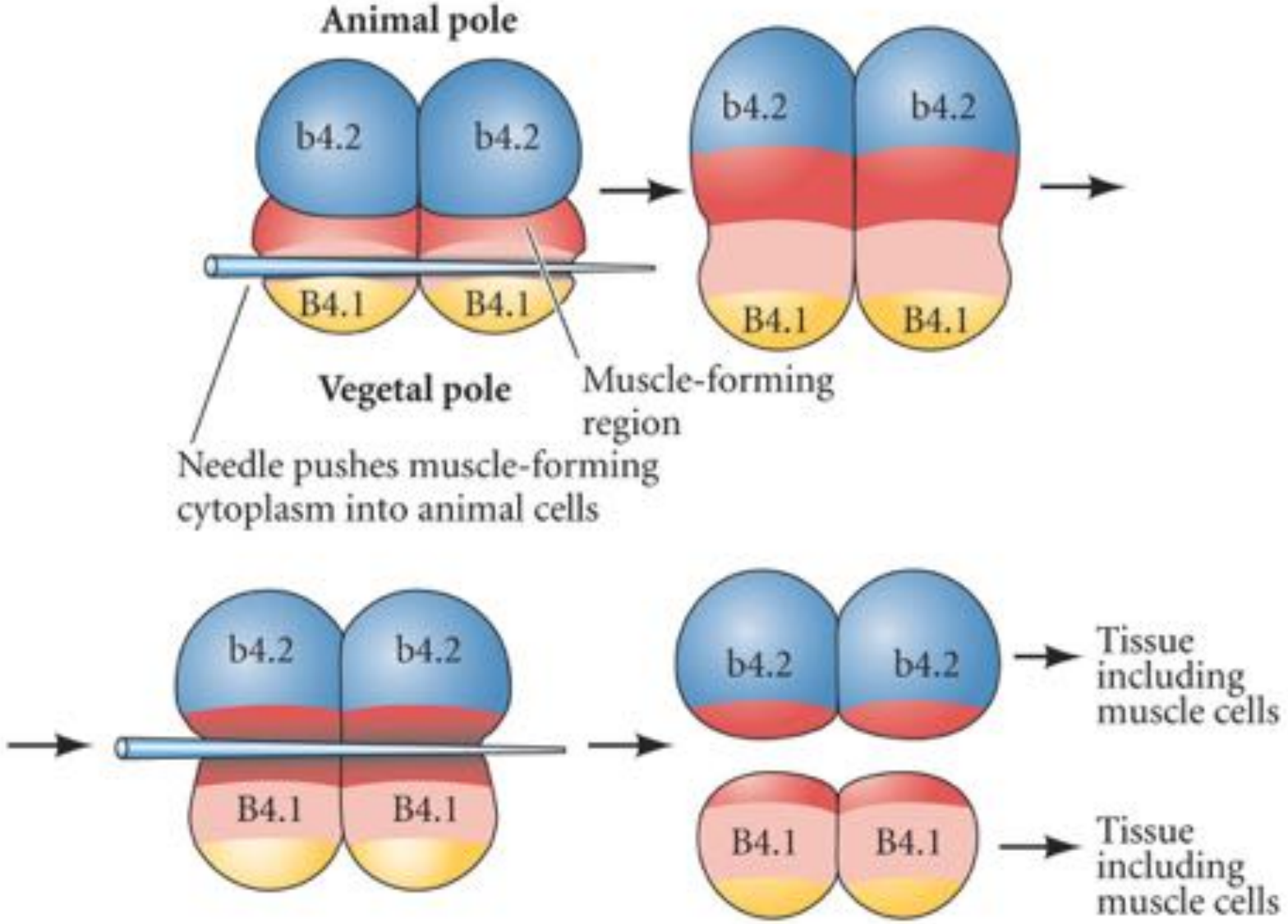
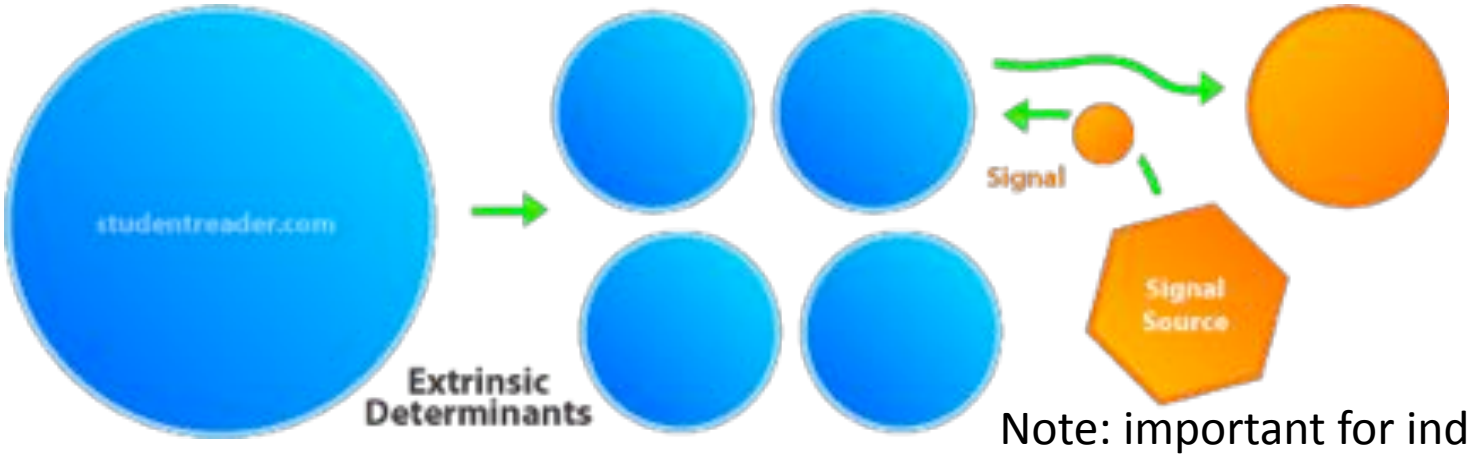
Muscle development in ascidians



Yellow crescent in the cytoplasm determines the destiny of muscle cells



Determinants during early embryogenesis for **morphogenesis**



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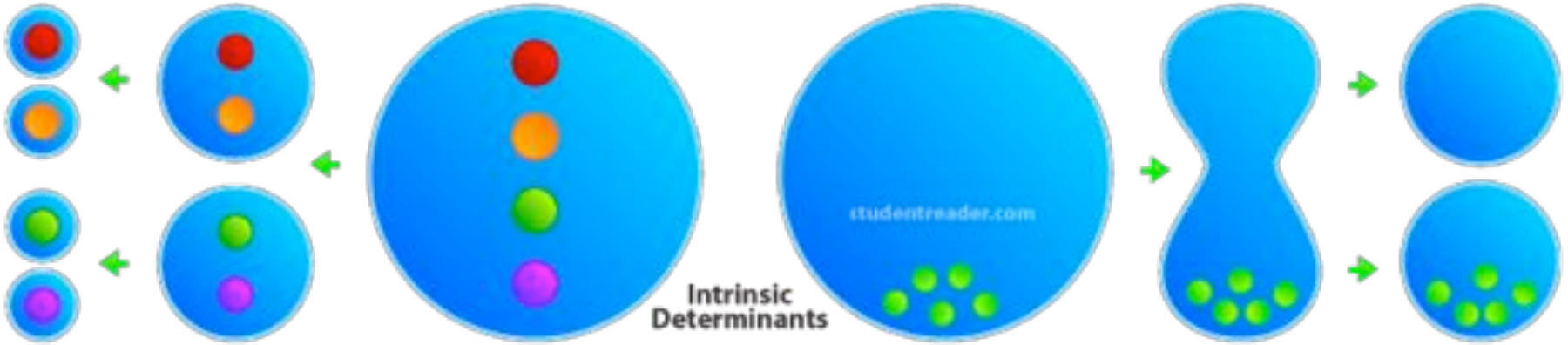
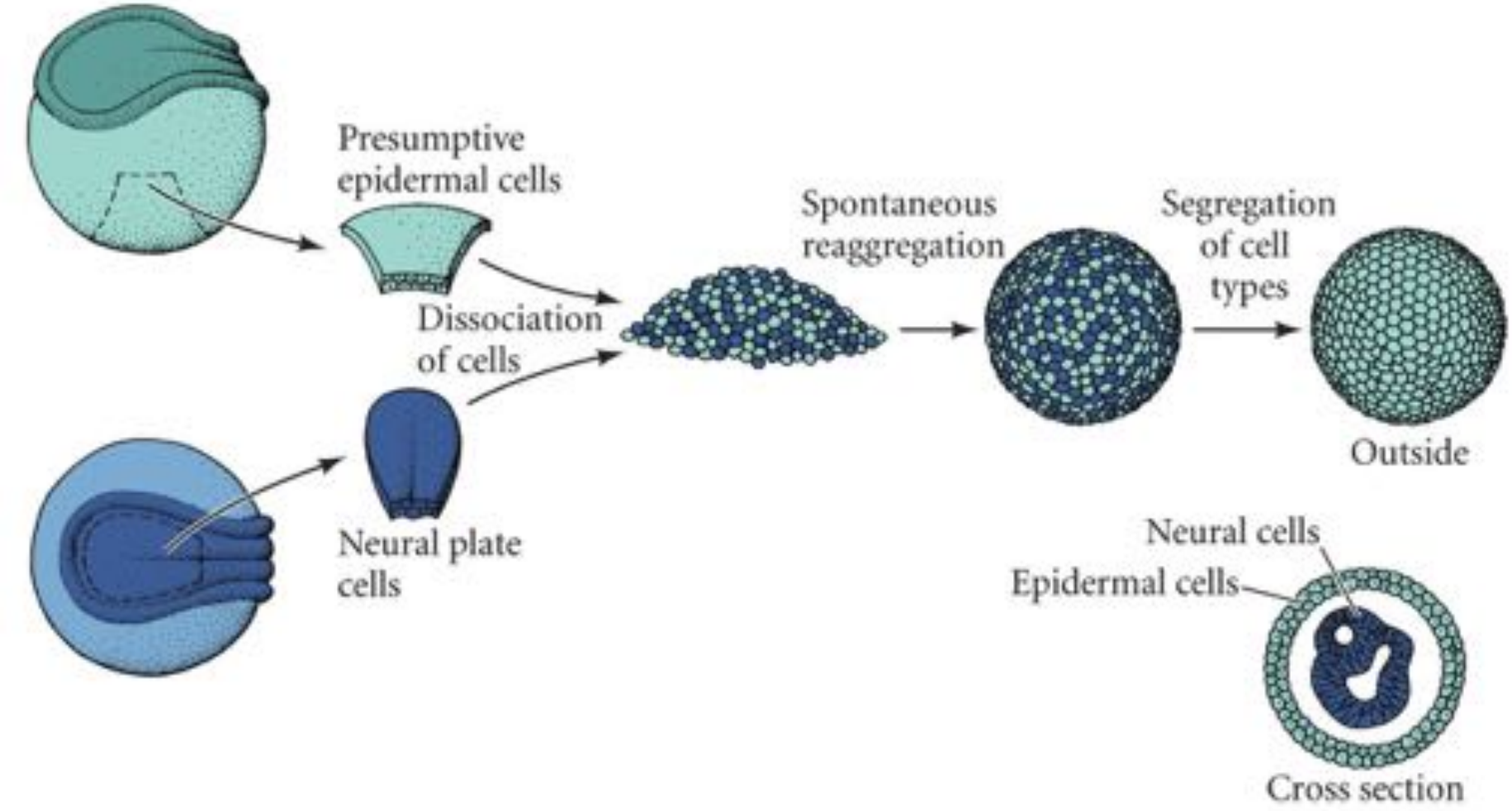


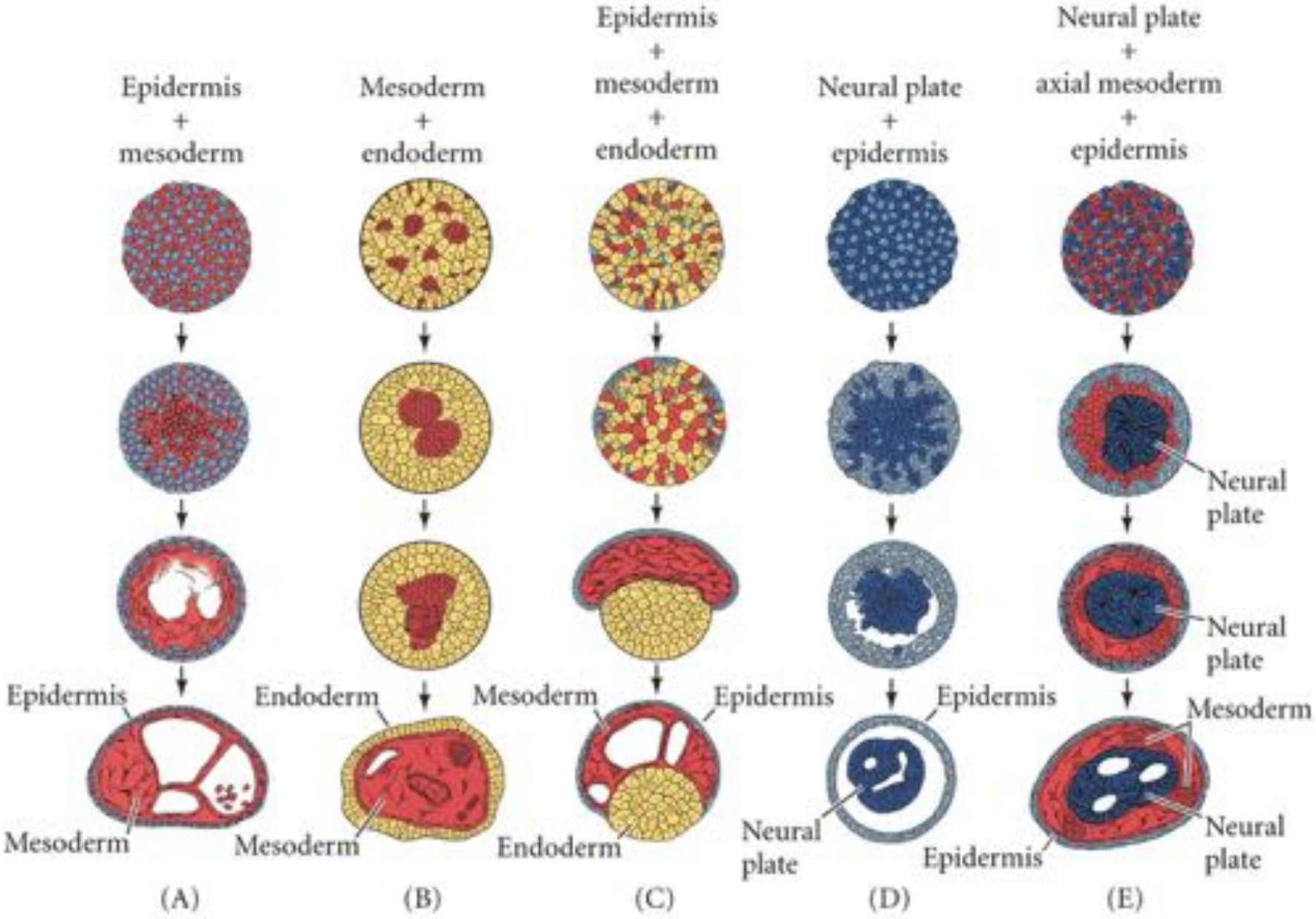
Note: important for preformation, autonomous development, determinative development

MORPHOGENESIS
and the formation of tissues

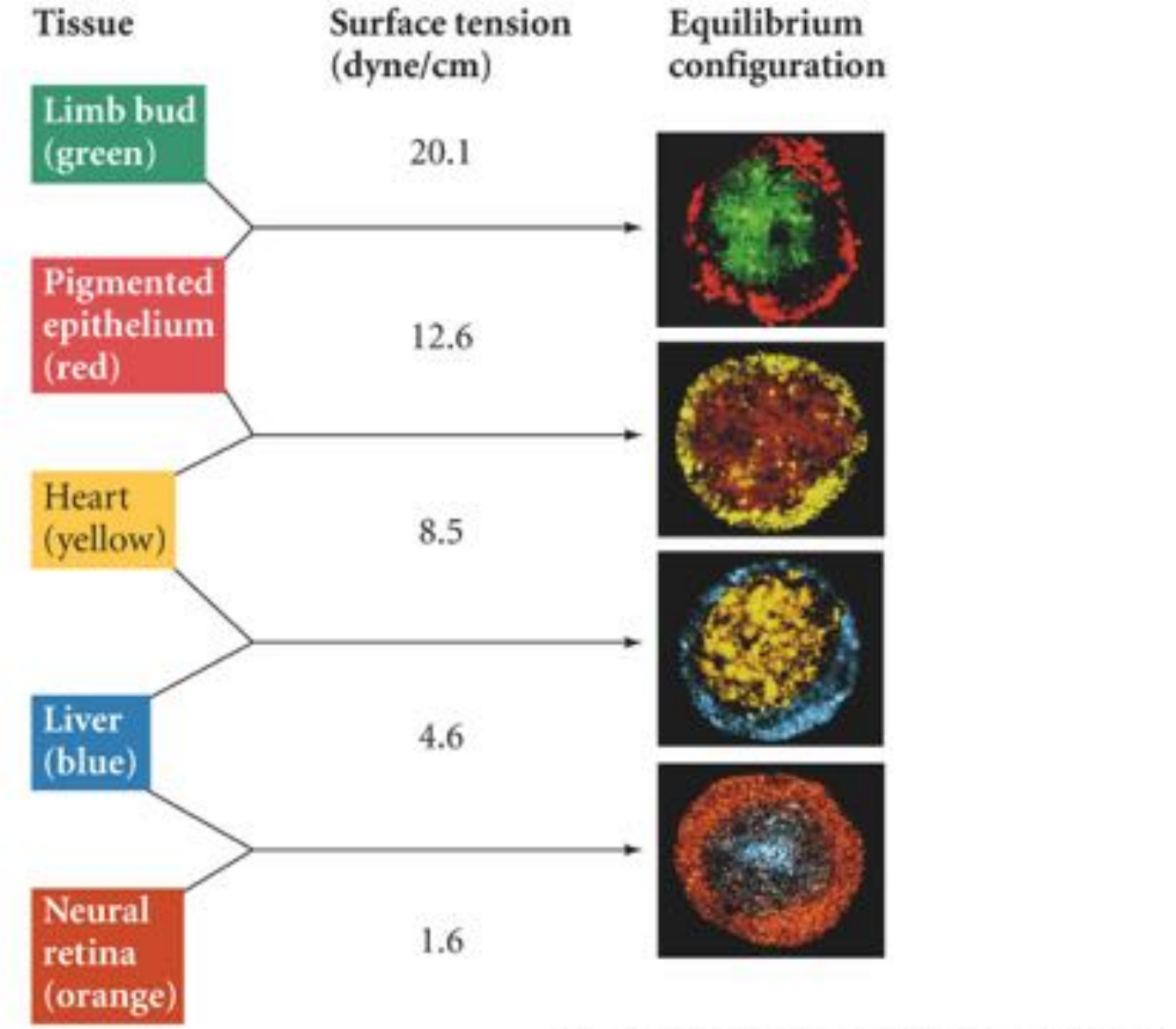
Cell aggregation of the amphibian neurula:



Spatial relationships in amphibian cell aggregates



Hierarchies in the cellular order in relation to the different superficial tensions.



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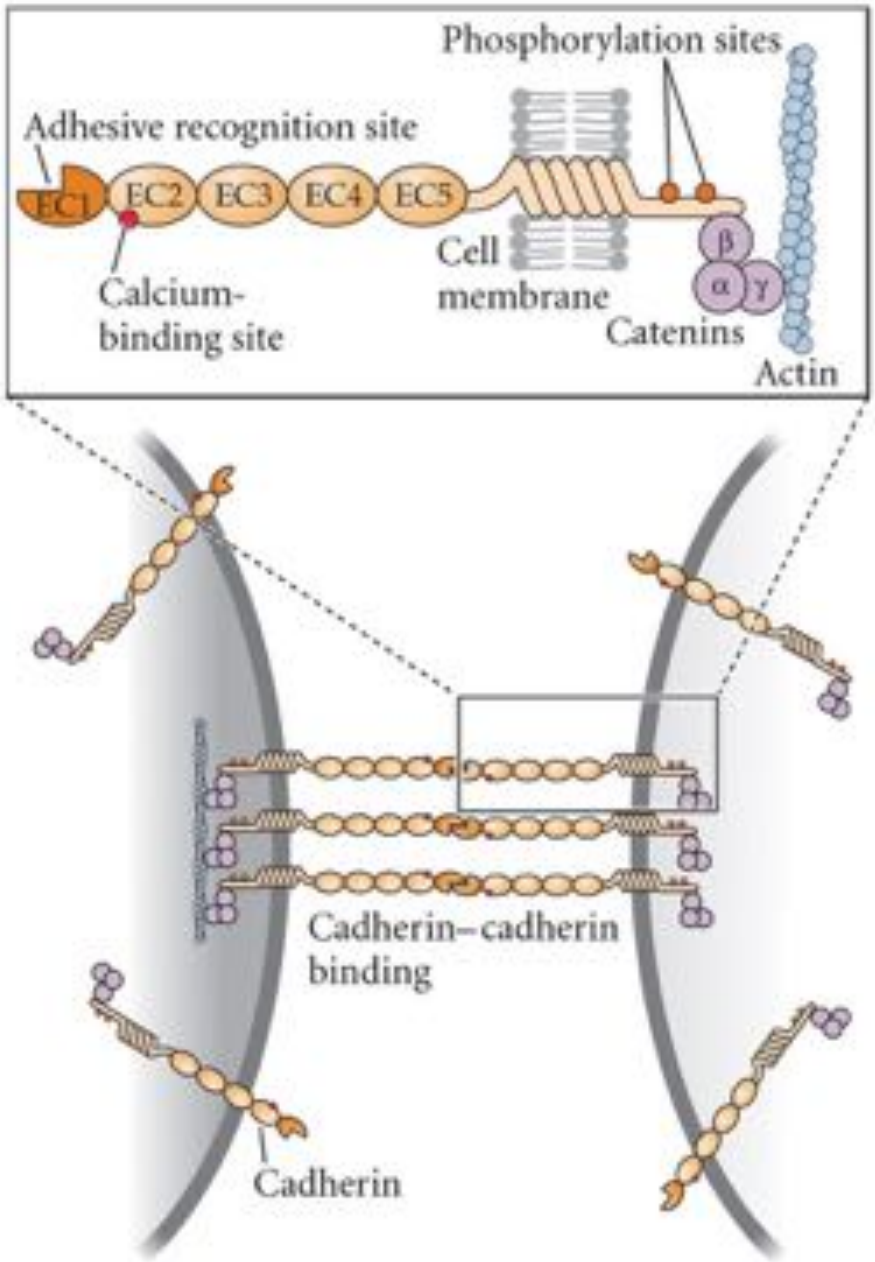
Cellular adhesion is mediated by cadherins



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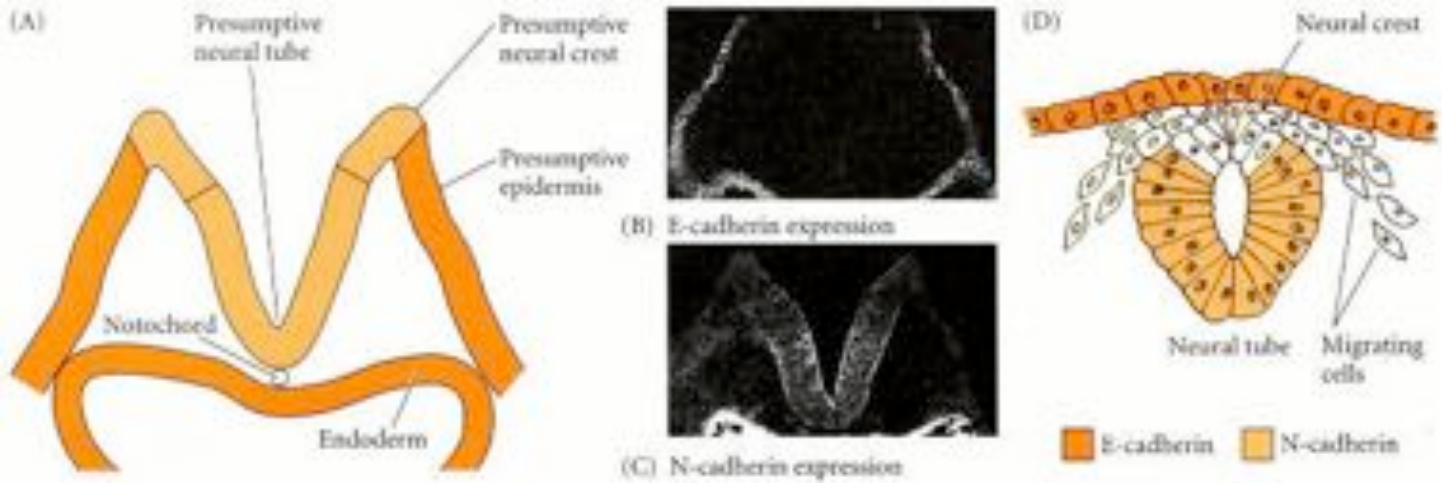
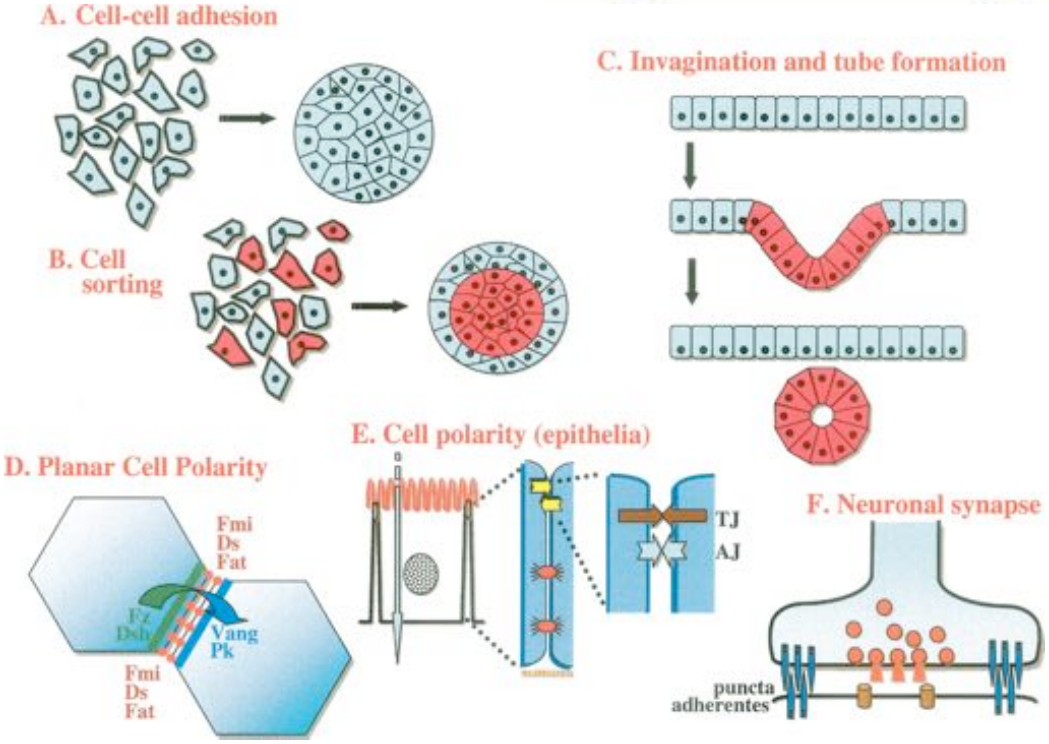
Morphogenetic movements mediated by different cadherins





Halbleib & Nelson 2006

ATIVIDADE:
XX-XI Ideias Contemporâneas do desenvolvimento

Instruções:

1) Formar grupos de 2-3 alunos com interesses similares da biologia

2) Como pensa que a biologia do desenvolvimento pode ajudar no entendimento do seu tema de interesse?

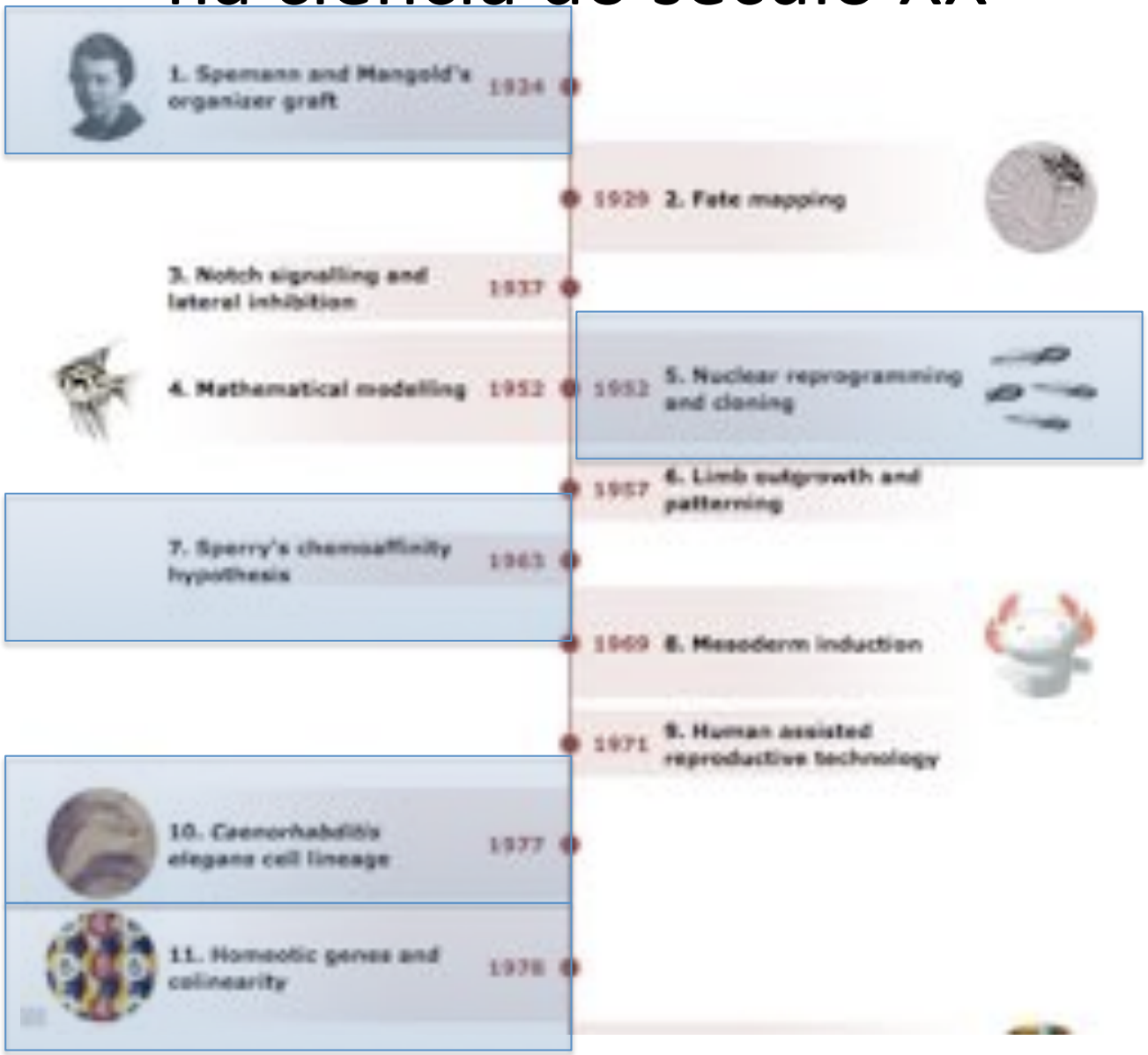
3) Pensa num trabalho científico (descubrimento ou artigo em particular) relacionado à biologia do desenvolvimento que pode contribuir no entendimento ou progresso na sua disciplina de interesse.

4) Pensa numa grande pergunta (i.e. mistério ou enigma) que ainda não foi resolvida na sua área de interesse, e pensa como a biologia do desenvolvimento pode contribuir na resolução dela.

ATIVIDADE:

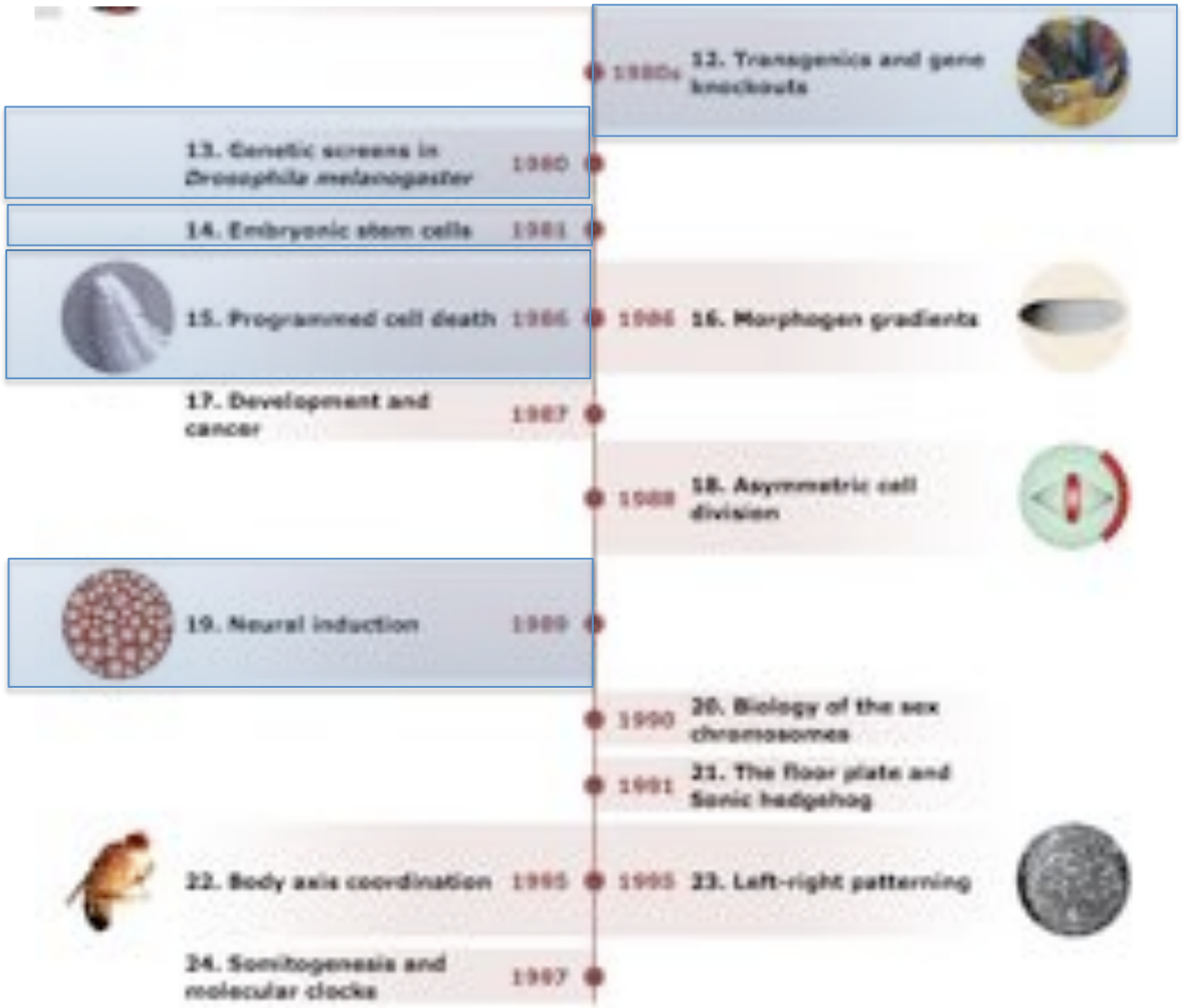
XX-XI Ideias Contemporâneas do desenvolvimento

Impacto da biologia do desenvolvimento na ciência do século XX



http://www.nature.com/milestones/development/milestones/index.html

Impacto da biologia do desenvolvimento na ciência do século XX



http://www.nature.com/milestones/development/milestones/index.html

1997-2016 Nobels of Medicine granted in development related fields

- 2001 Tim Hunt & Paul M. Nurse
  - for their discoveries of key regulators of the cell cycle
- 2002 Sydney Brenner, H.Robert Horvitz, and John E. Sulston
  - for their discoveries concerning 'genetic regulation of organ development and programmed cell death
- 2006 Andrew Z. Fire & Craig C. Mello
  - for their discovery of RNA interference – gene silencing by double-stranded RNA
- 2007 Mario R. Capecchi, Martin J. Evans, and Oliver Smithies
  - for their discoveries of principles for introducing specific gene modifications in mice by the use of embryonic stem cells
- 2010 Robert G. Edwards
  - for the development of in vitro fertilization
- 2012 John Gurdon & Shinya Yamanaka
  - for their discovery that mature cells can be reprogrammed to become pluripotent
- 2014 John O'Keefe, May-Britt Moser, and Edvard I. Moser
  - for their discoveries of cells that constitute a positioning system in the brain

TAREFA

Estudo dirigido sobre a leitura *"Milestones in Development" da Nature 2005*

Formação grupos de leitura: 26 de fevereiro 2018

Atividade Prática: 5 de março 2018.

1. Formar duplas entre alunos com interesses científicos similares. O Professor irá atribuir 3-4 "Milestones" para cada dupla ler (até a próxima aula) de acordo aos interesses.
2. Acesse o link: http://www.nature.com/milestones/development/milestones/index.html
3. Leia os 3-4 "Milestones" e leia-os com cuidado. Pesquise informação adicional que facilite a comprensão do texto.
4. Responda as perguntas abaixo para cada "Milestone"
5. Durante a seguinte aula (5 de março) cada dupla irá a preparar uma cruzadinha com 10 palavras, para logo outra dupla responder. Depois da atividade as duplas com maior número de acertos (maior numero de pontos) receberá um Bônus e apresentará os "Milestone" para a turma toda usando giz e o quadro.