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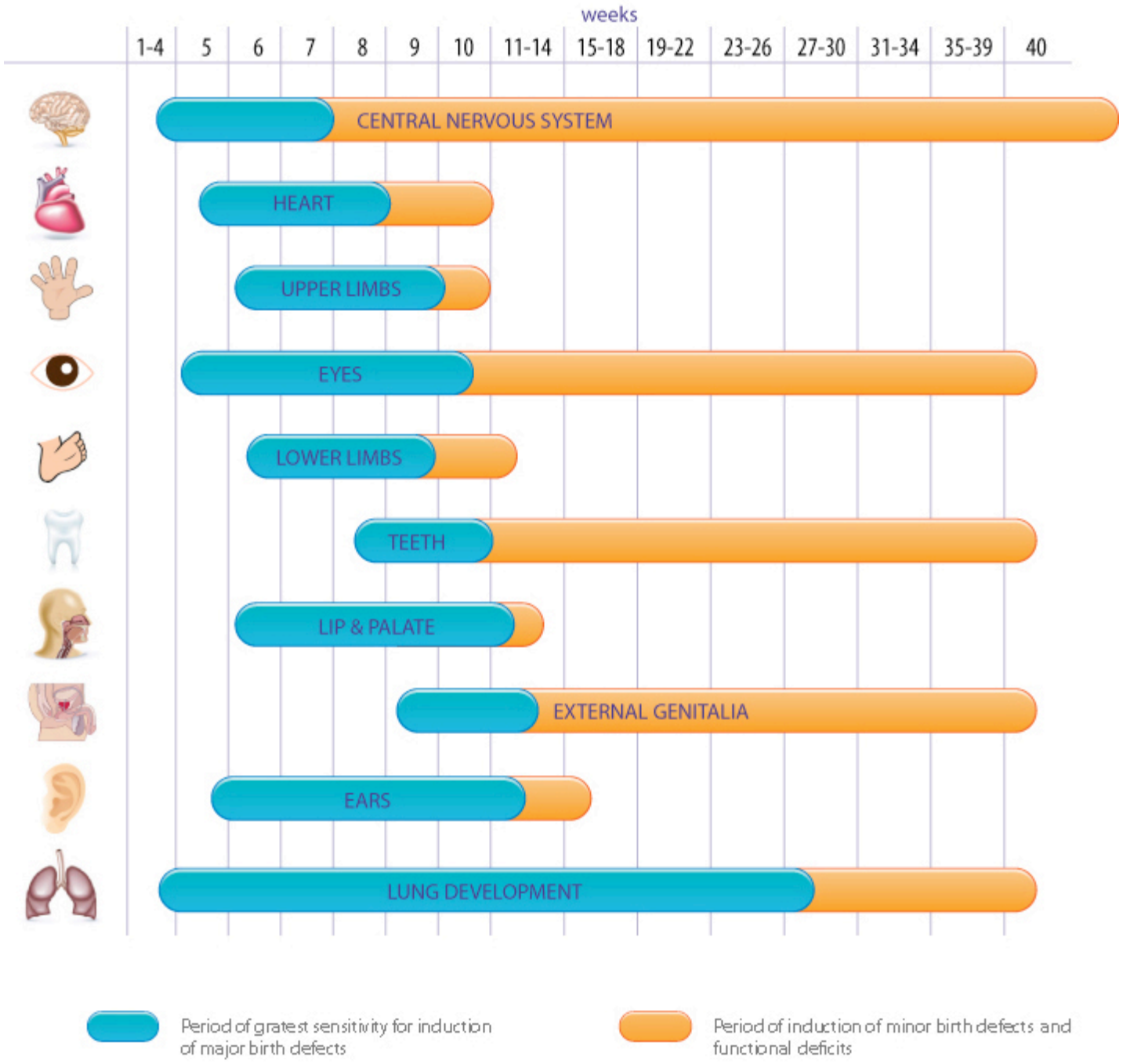

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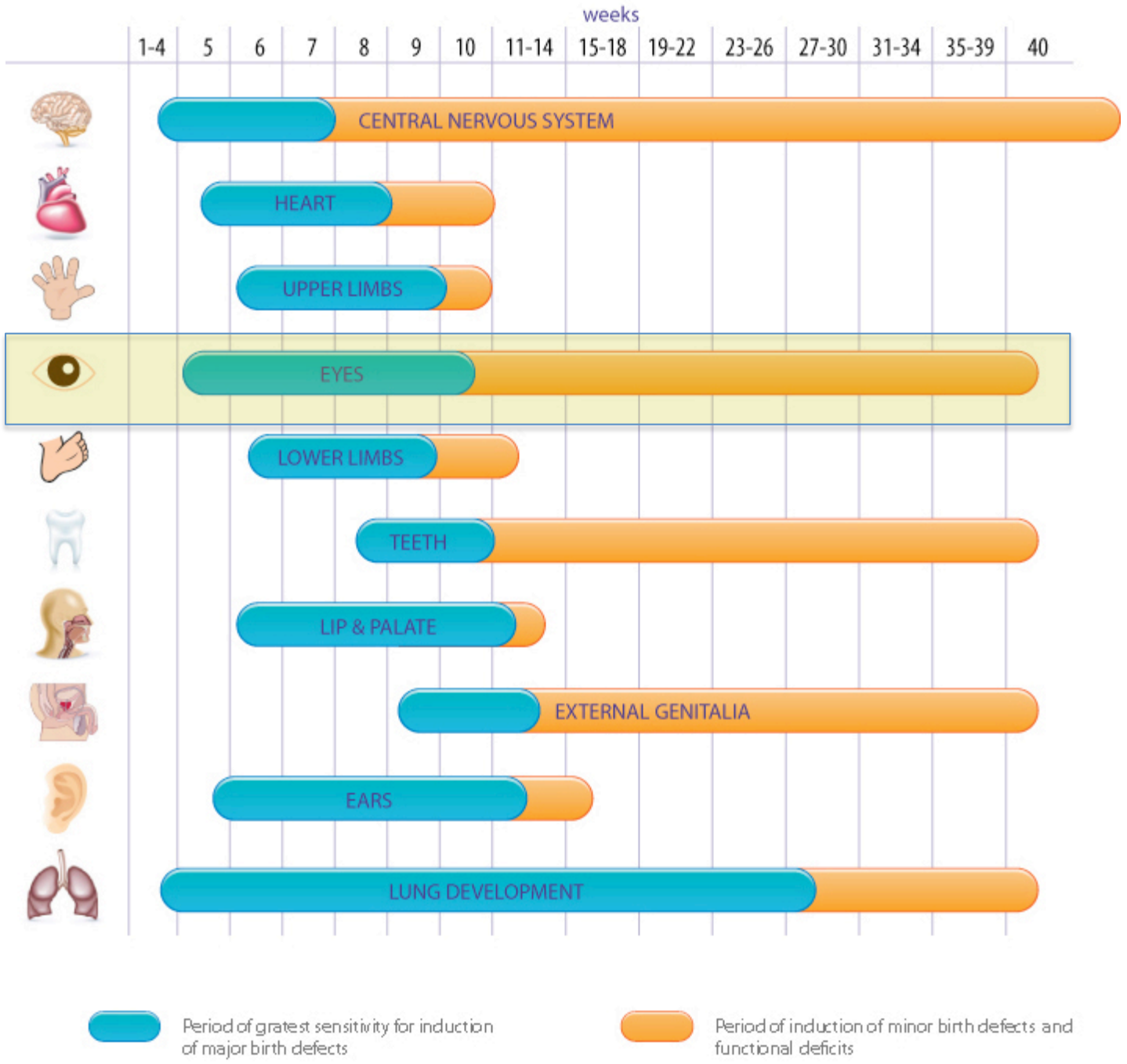
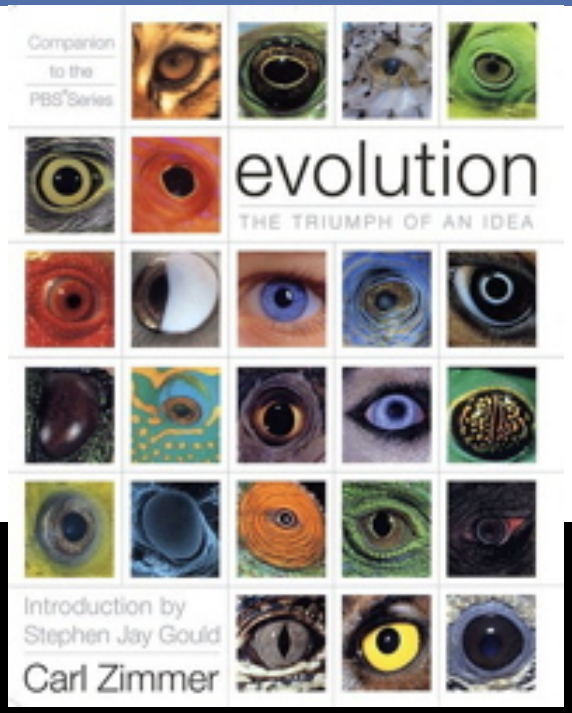
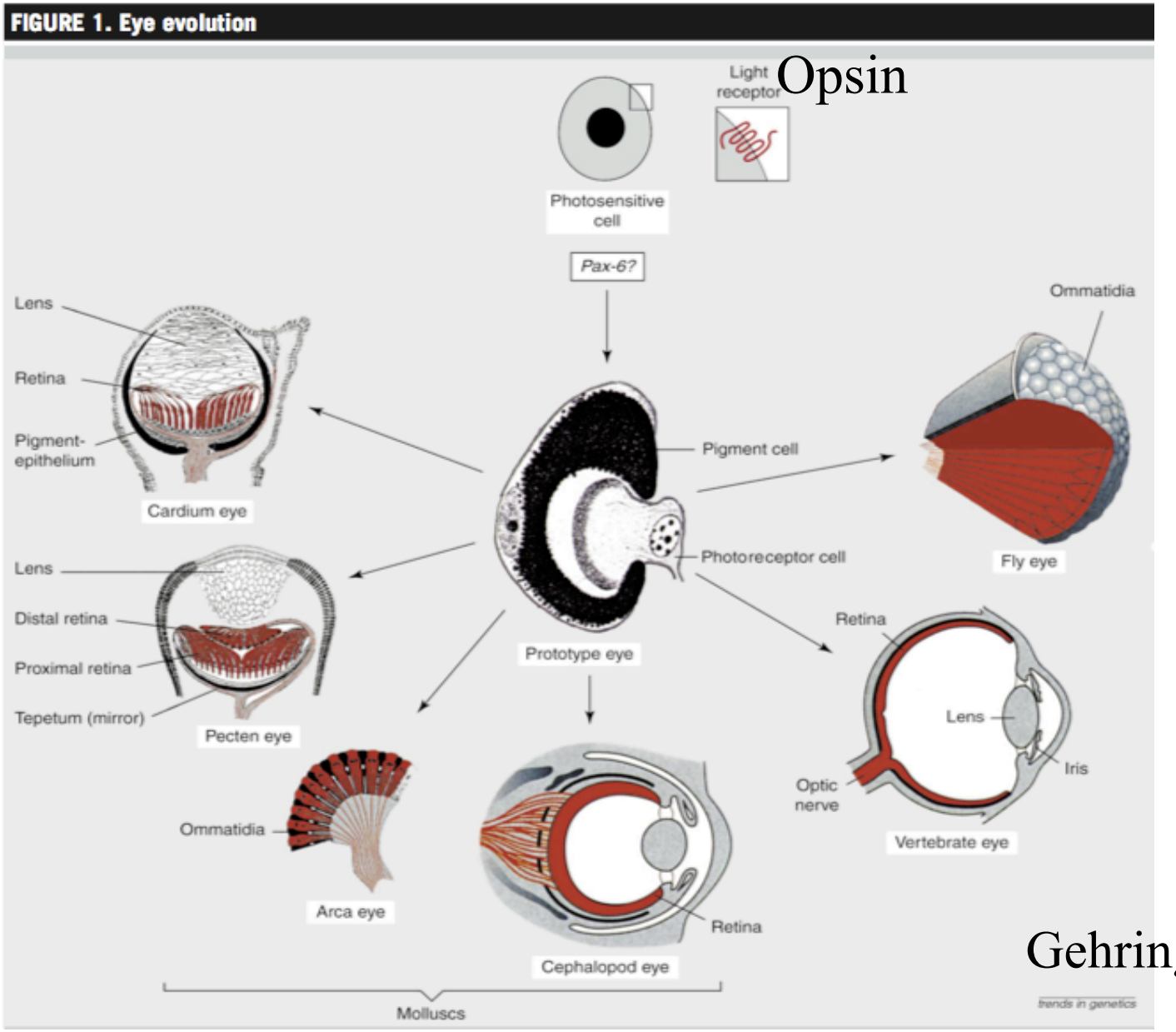




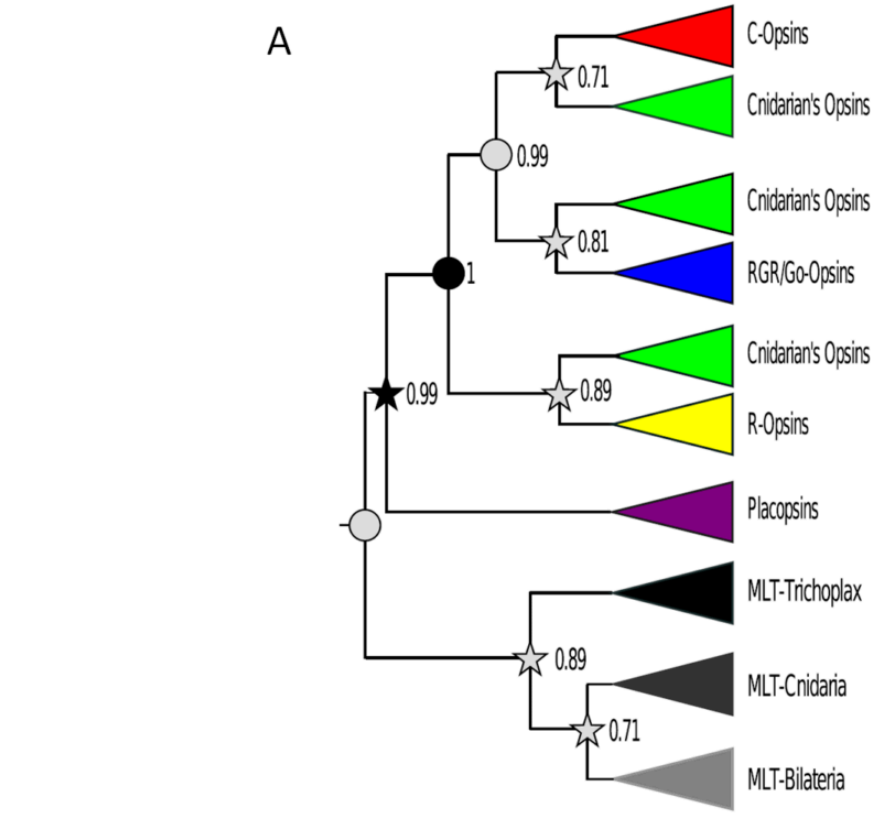
Tipos de OlhOs

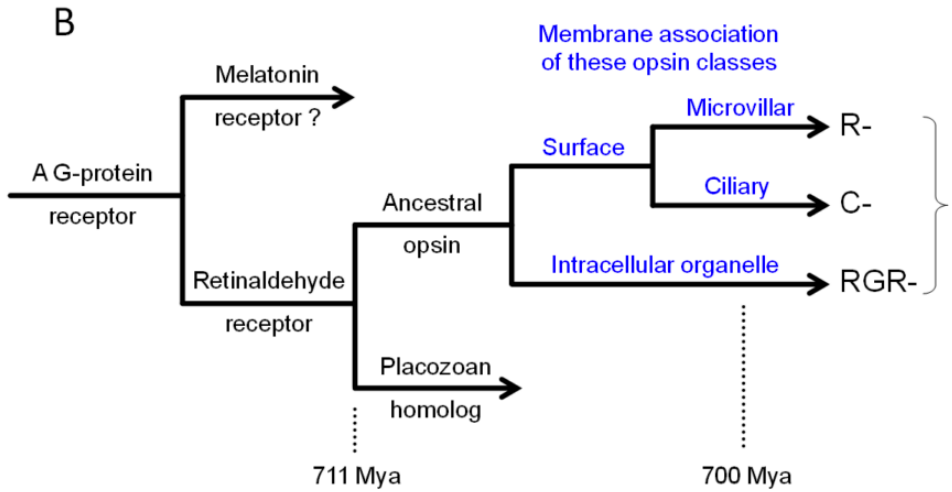
OlhOs, estruturas homólogas?

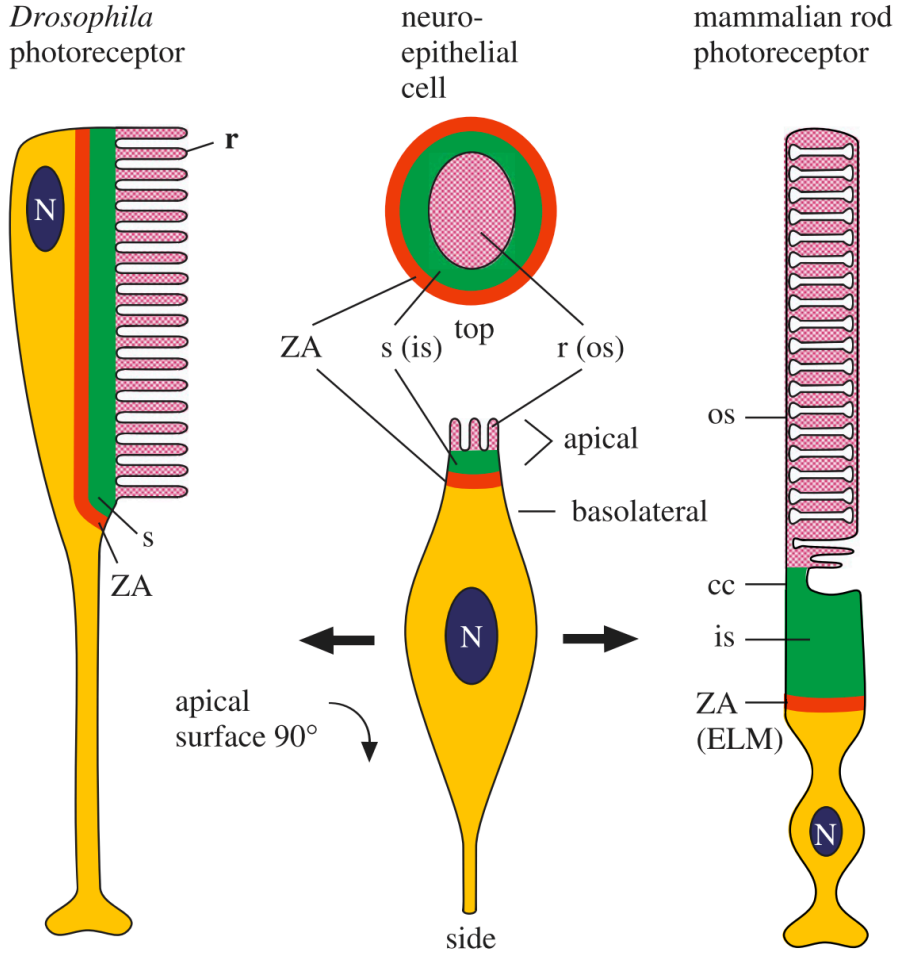


Gehring 1999

Evolução das opsinas e células fotoreceptoras:



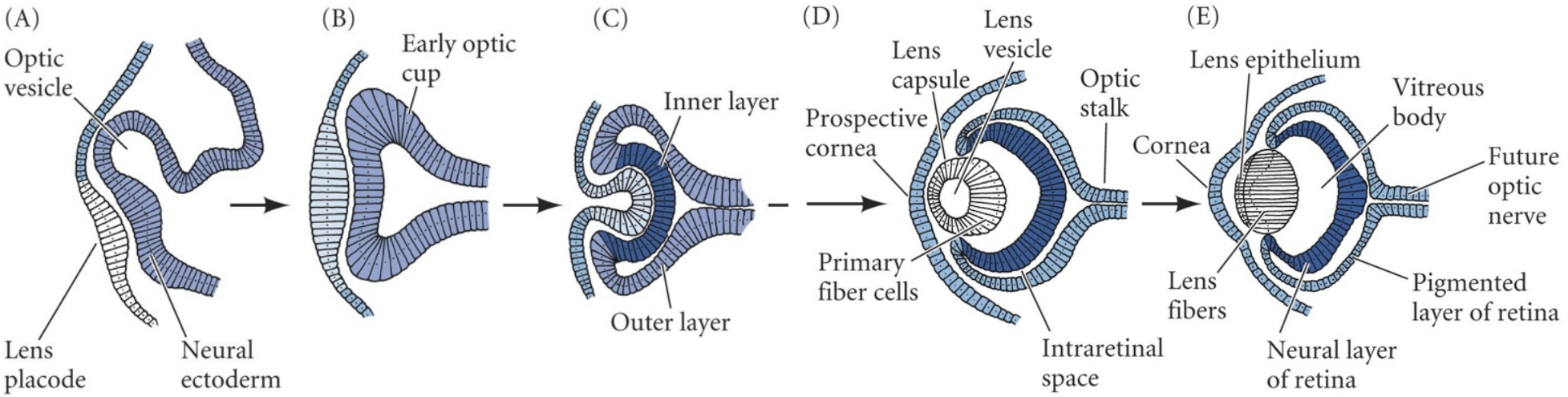




Lamb, 2013

CASO DE ESTUDIO: PAX6 E OLHOS

Desenvolvimento do olho no camondongo



DEVELOPMENTAL BIOLOGY, Seventh Edition, Figure 6.5 (Part 2) Sinauer Associates, Inc.
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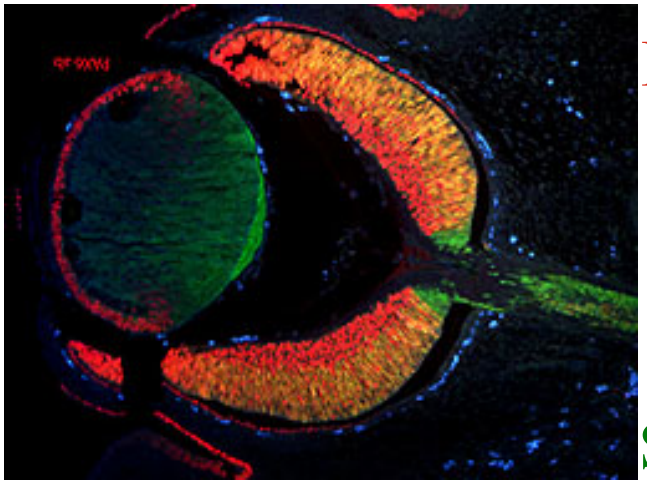
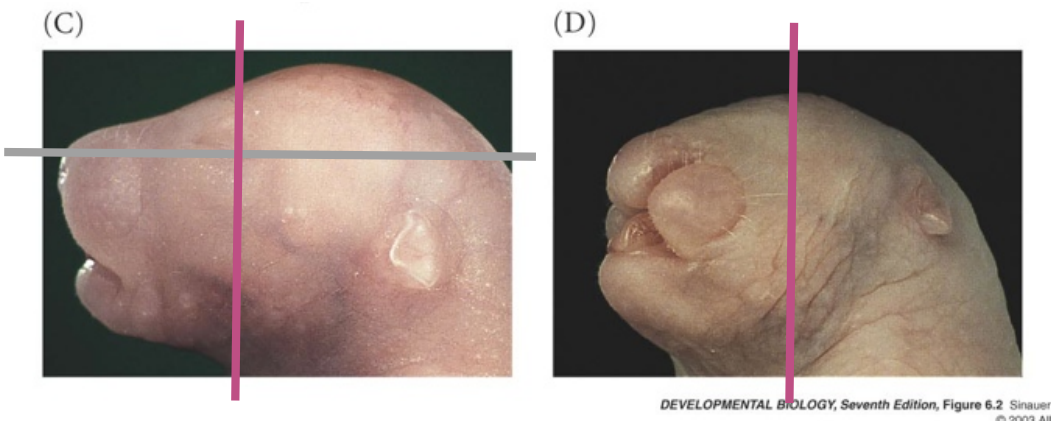


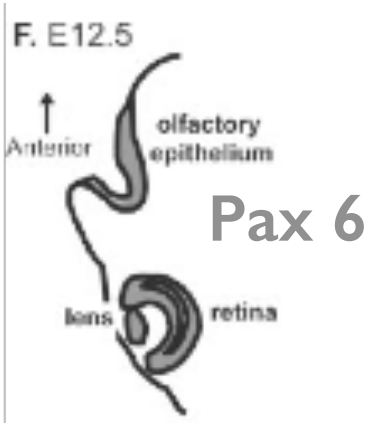
Pax6

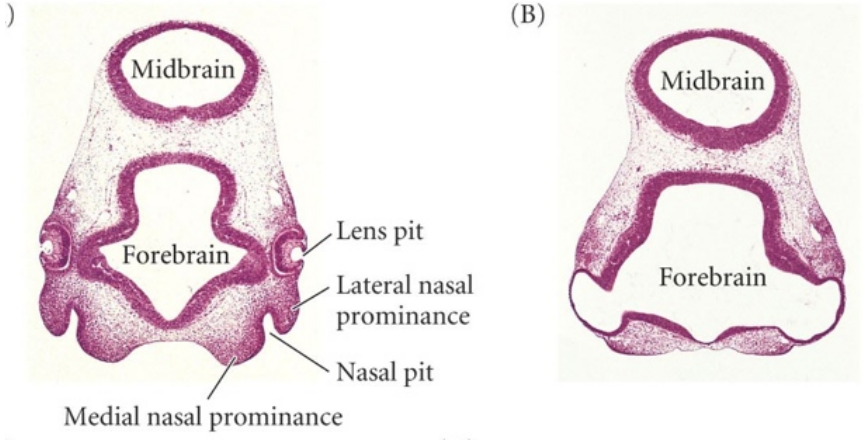
Sox2

Van Heyningen, MRC

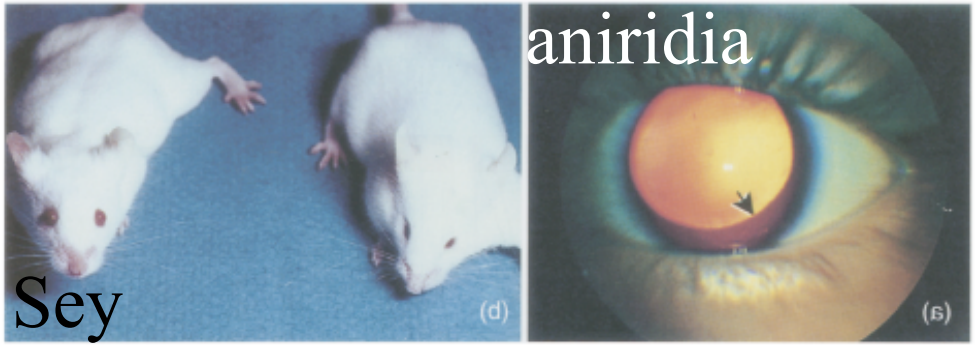
Y por que Pax 6?





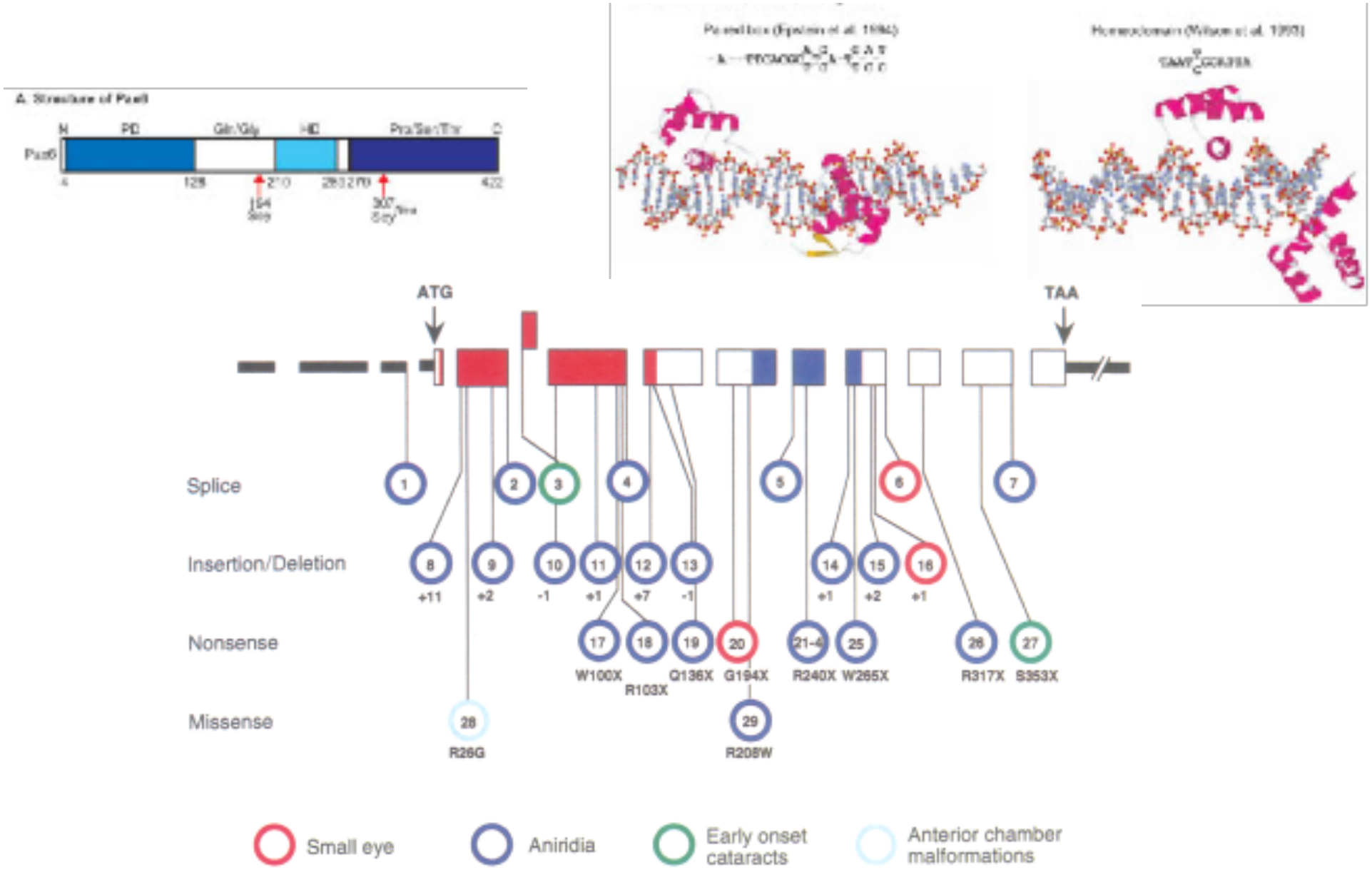


Simpson & Price, 2002



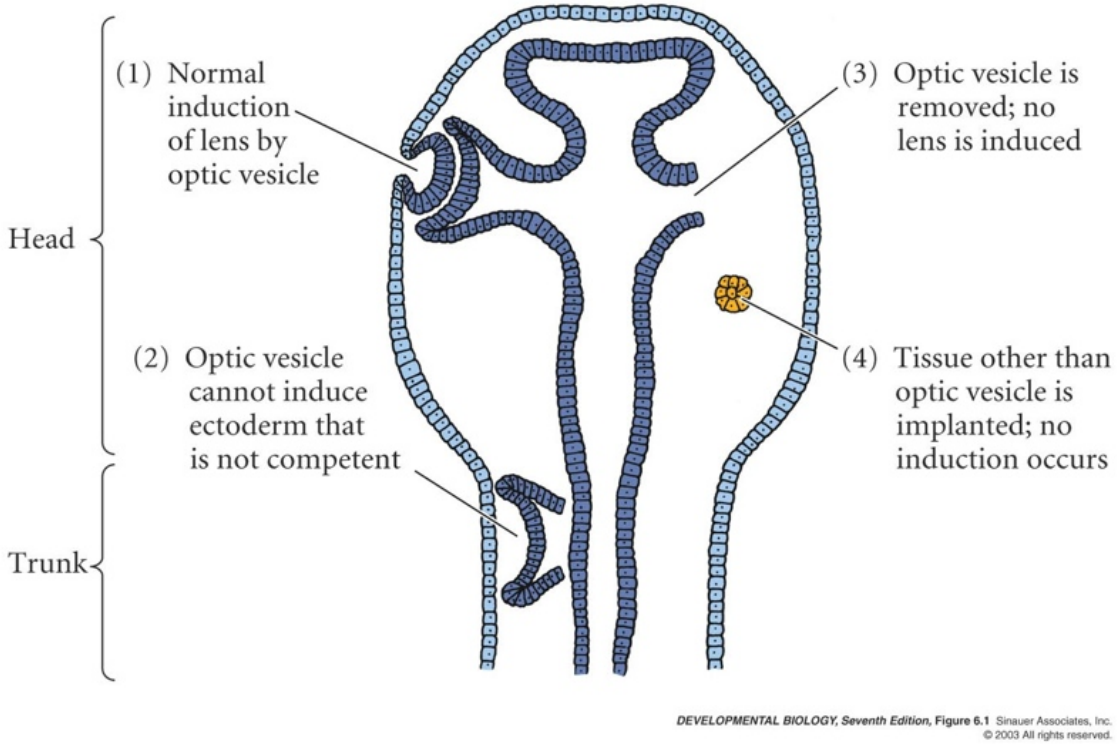
Hanson1995

Malformacões nos olhos por mutacões em *pax 6*



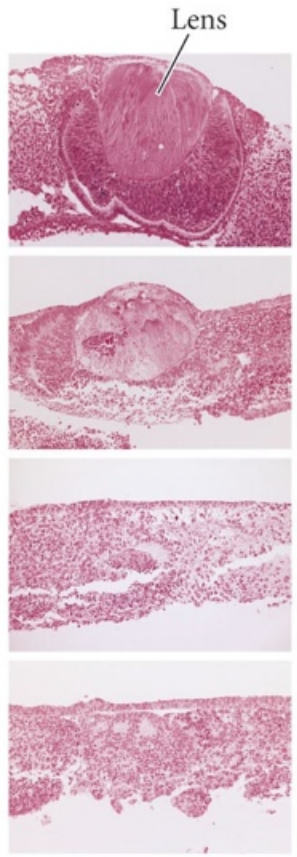
Hanson1995

Indução do lente: experimentos de transplante



DEVELOPMENTAL BIOLOGY, Seventh Edition, Figure 6.1 Sinauer Associates, Inc. © 2003 All rights reserved.

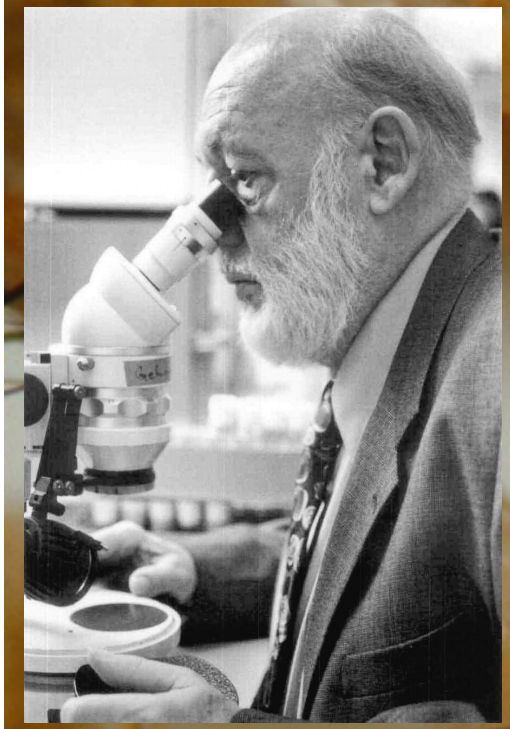
Optic vesicles	Surface ectoderm	Lens induction
Wild-type	Wild-type	Yes
Pax6⁻/*Pax6*⁻	Wild-type	Yes
Wild-type	*Pax6*⁻/*Pax6*⁻	No
Pax6⁻/*Pax6*⁻	*Pax6*⁻/*Pax6*⁻	No



DEVELOPMENTAL BIOLOGY, Seventh Edition, Figure 6.3 Sinauer A © 2003 All ri

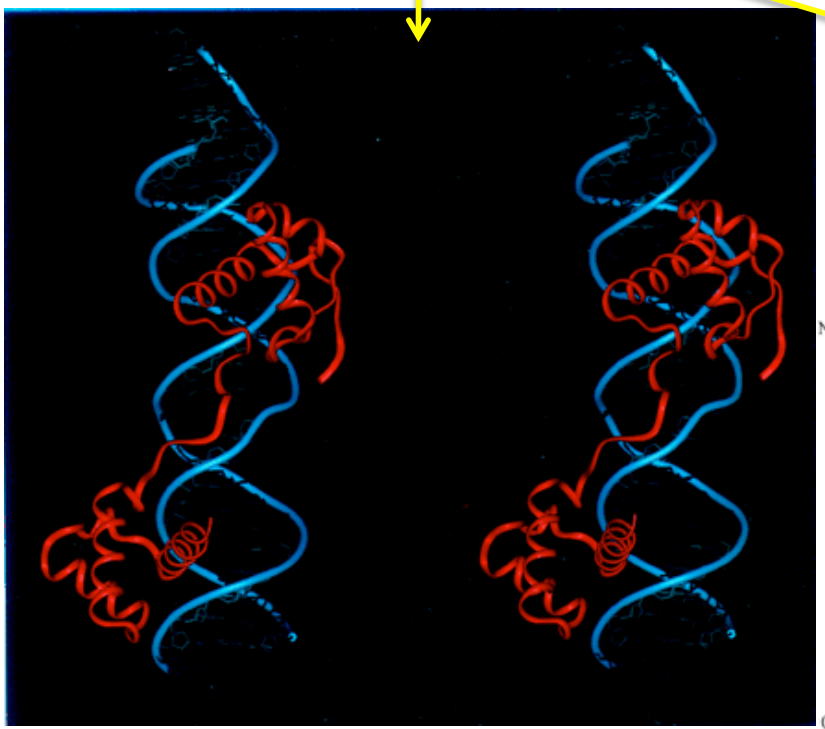
La formación del lente a partir del **ectodermo** requiere la acción de Pax 6

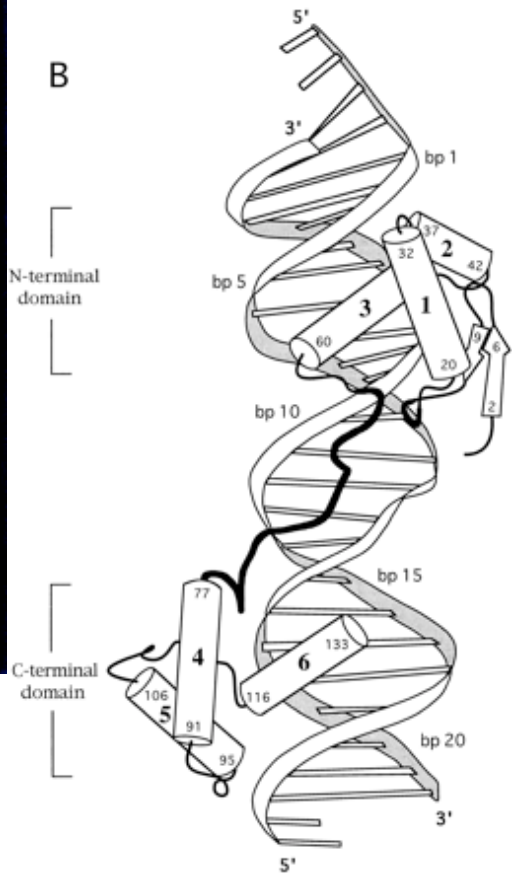
Walter Gehring
Pax 6 en *Drosophila melanogaster*

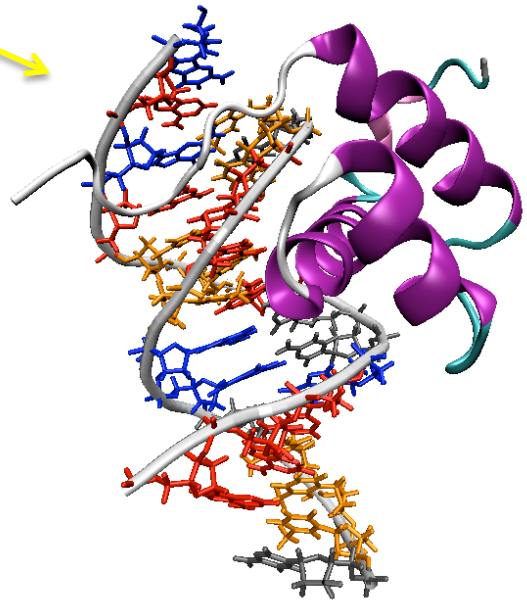


Kowalevsky Award 2003
Kyoto Award 2000

eyeless/pax6 en la mosca





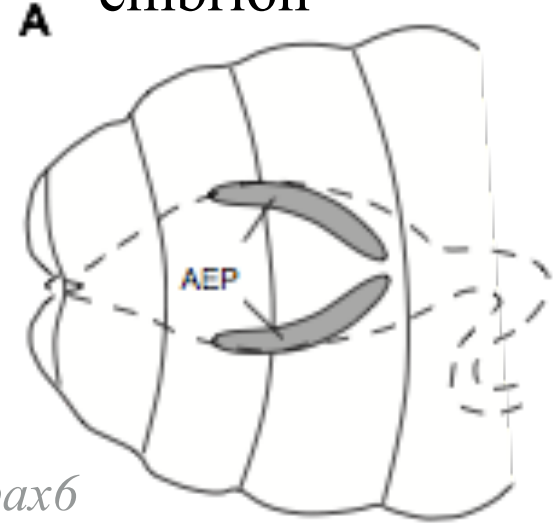


(Xu, et al. 1999)

eyeless/pax6 en la mosca

Expresión de *pax6* en primordio de antena y ojo

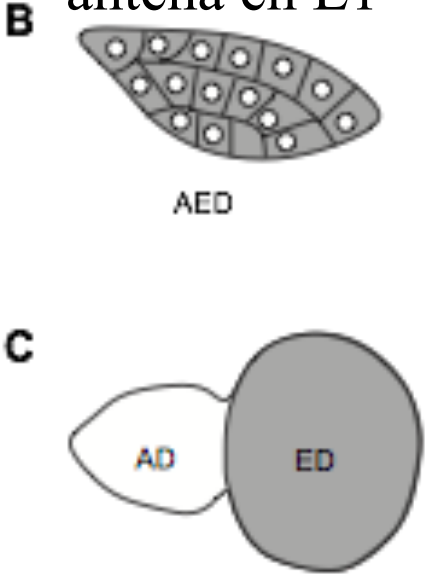
primordio de antena-ojo en embrión



pax6 mARN

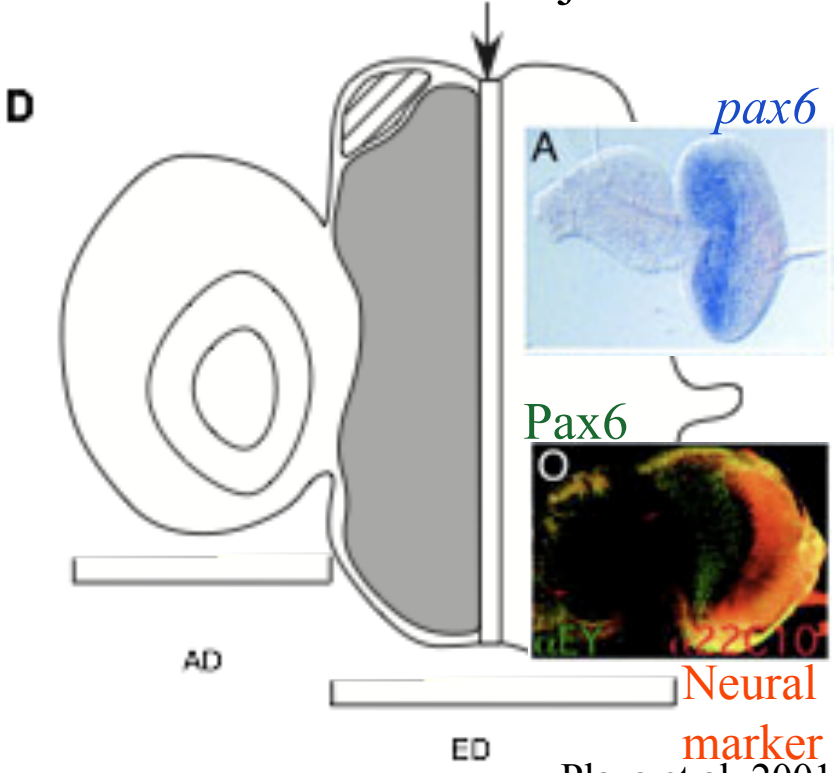
Callaerts et al. 2006

disco de antena-ojo antena en L1



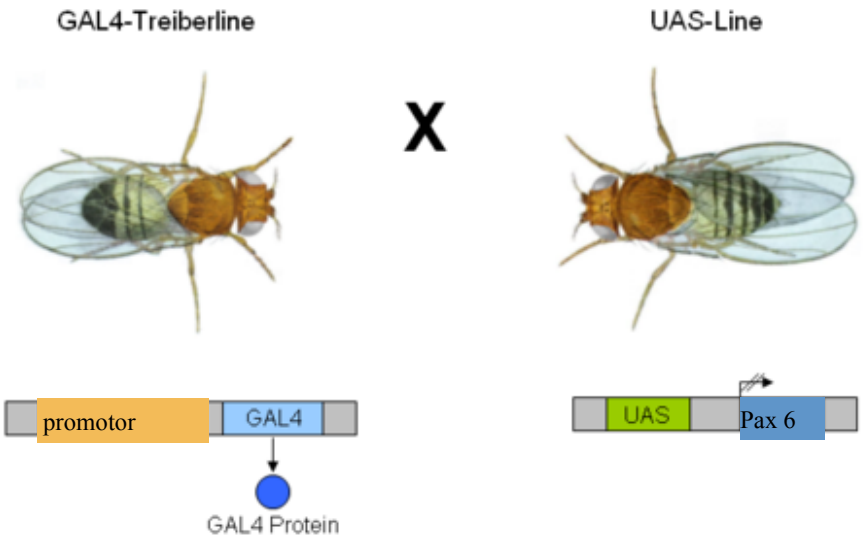
disco de antena y disco de ojo L2

disco de antena y disco de ojo L3



Plaza et al. 2001

Sistema de GAL4/UAS en *Drosophila melanogaster*

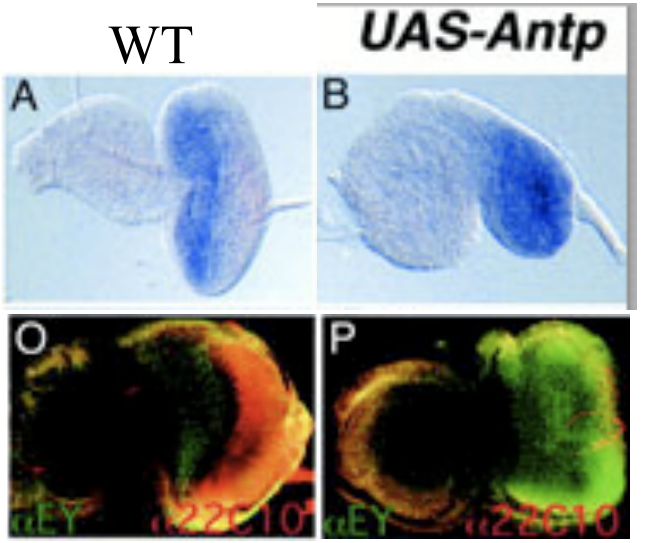


disco de antena y disco de ojo L3

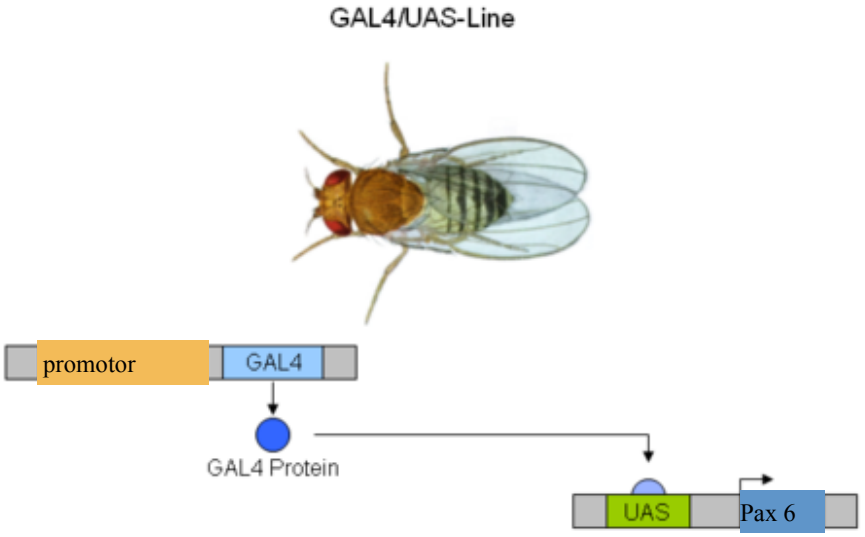
pax6

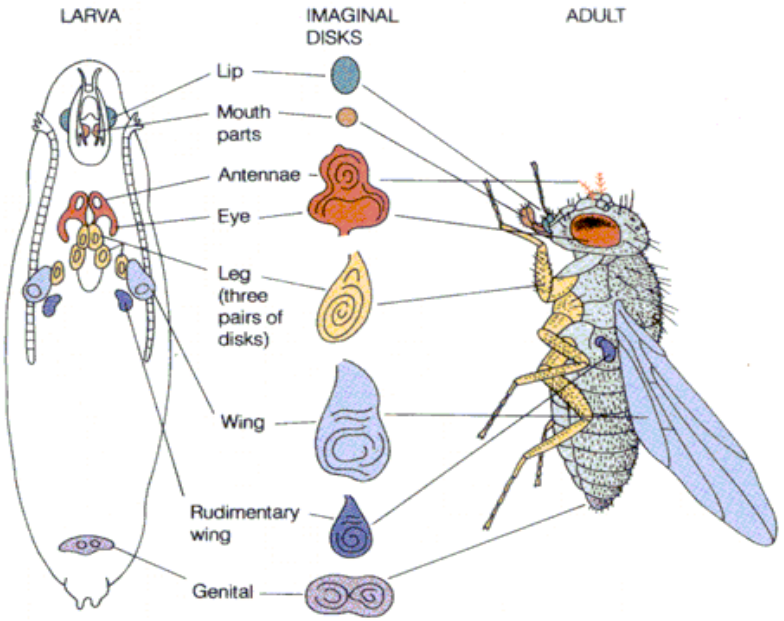
Pax6

Neural marker



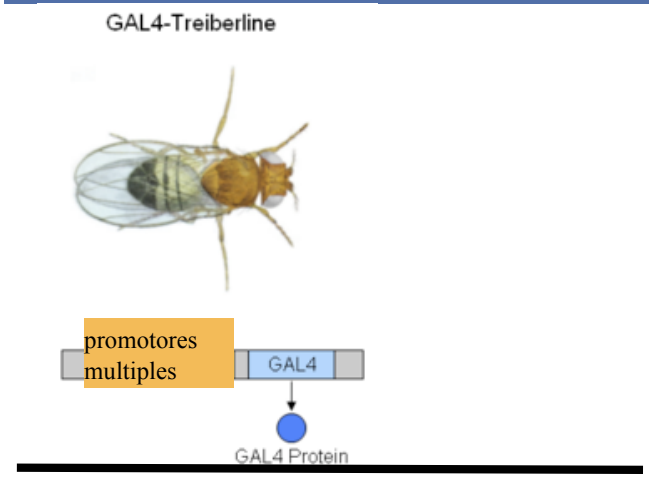
Plaza et al. 2001

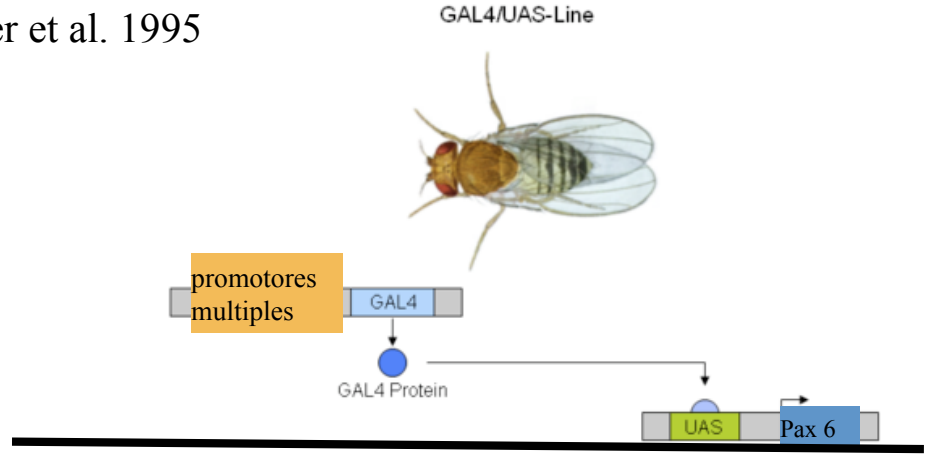




MASTER gen: *pax6*

Halder et al. 1995





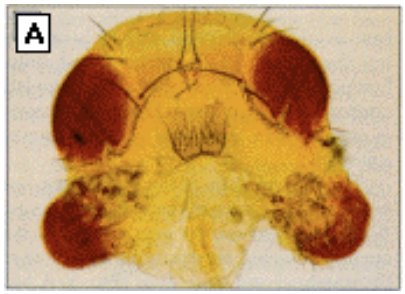
LacZ

disco de antena y disco de ojo L3

disco de ala L3

disco de pata L3

cabeza



antena

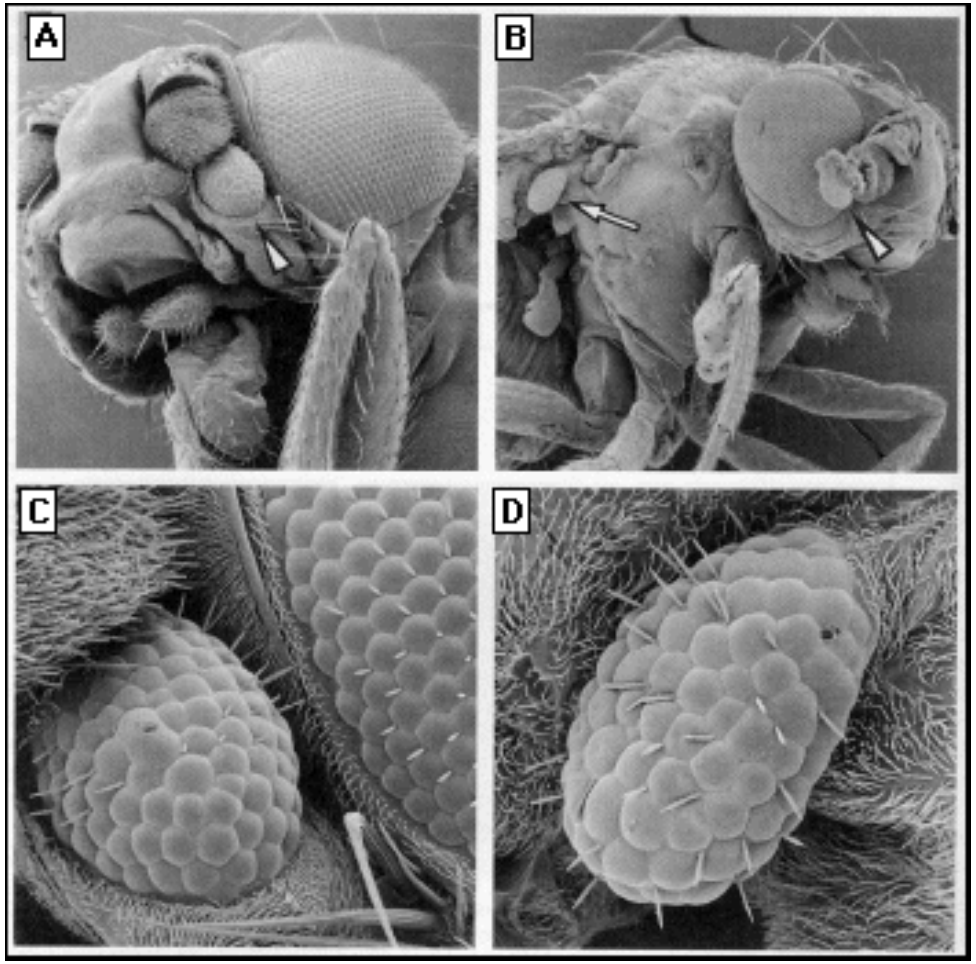
ala

patas

pata

Halder et al. 1995

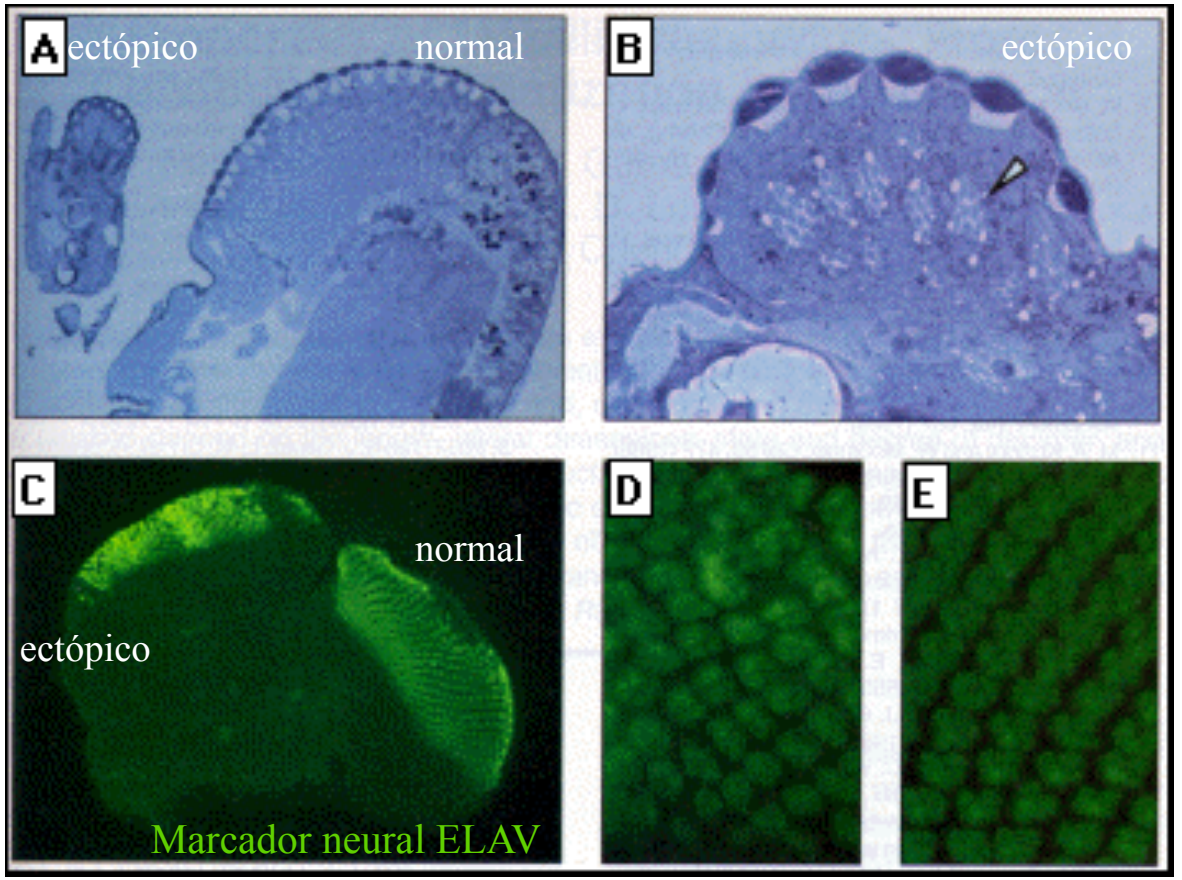
Microscopía electronica de ojos ectópicos



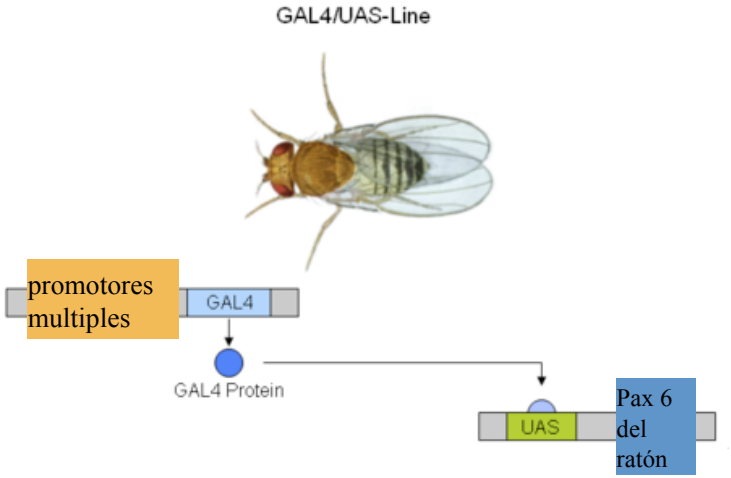
Histología y fotoreceptores en ojos ectópicos

Ojos adultos

Disco de antena
y ojo en L3

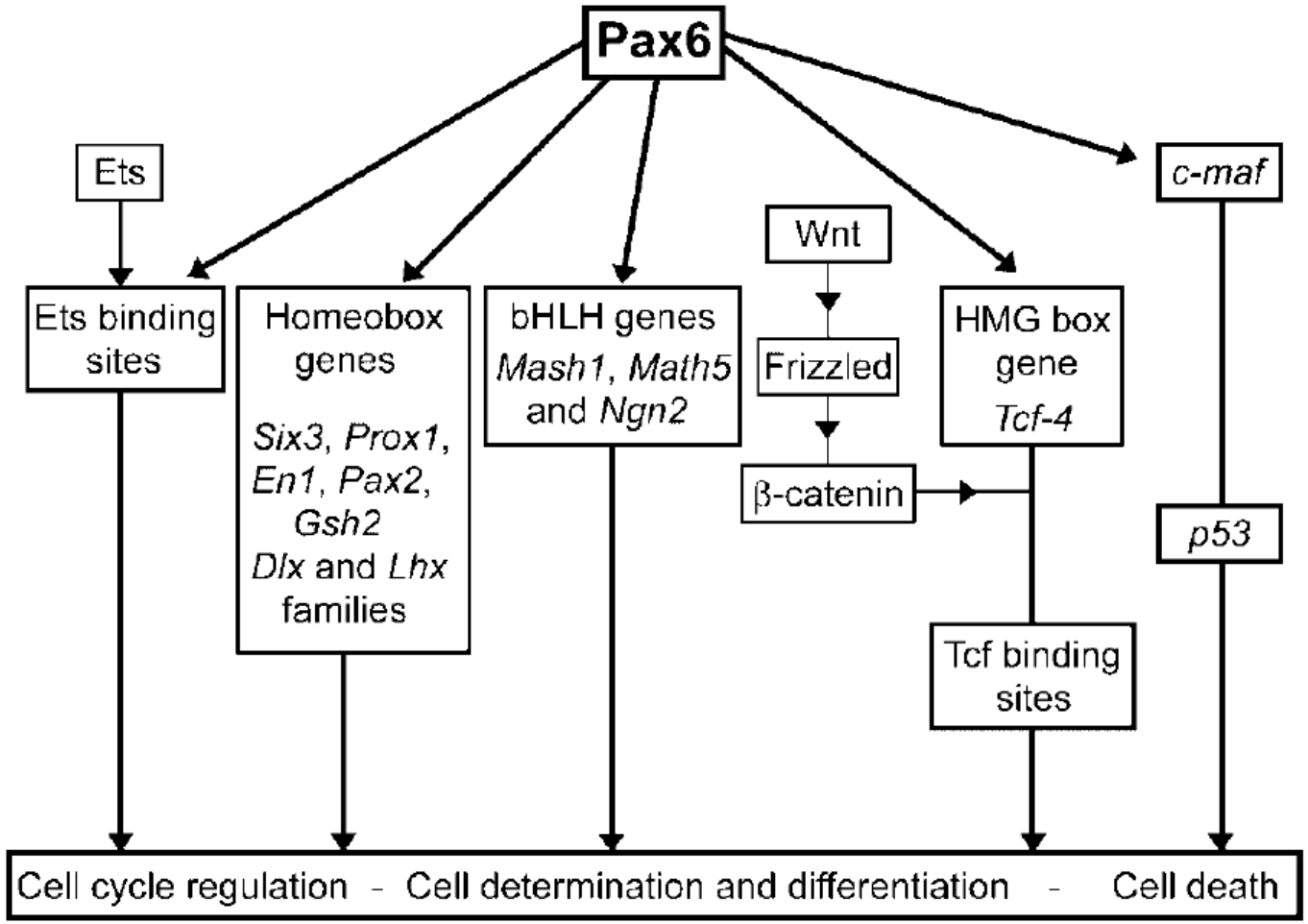


Pax6 del ratón también causa ojos ectópicos



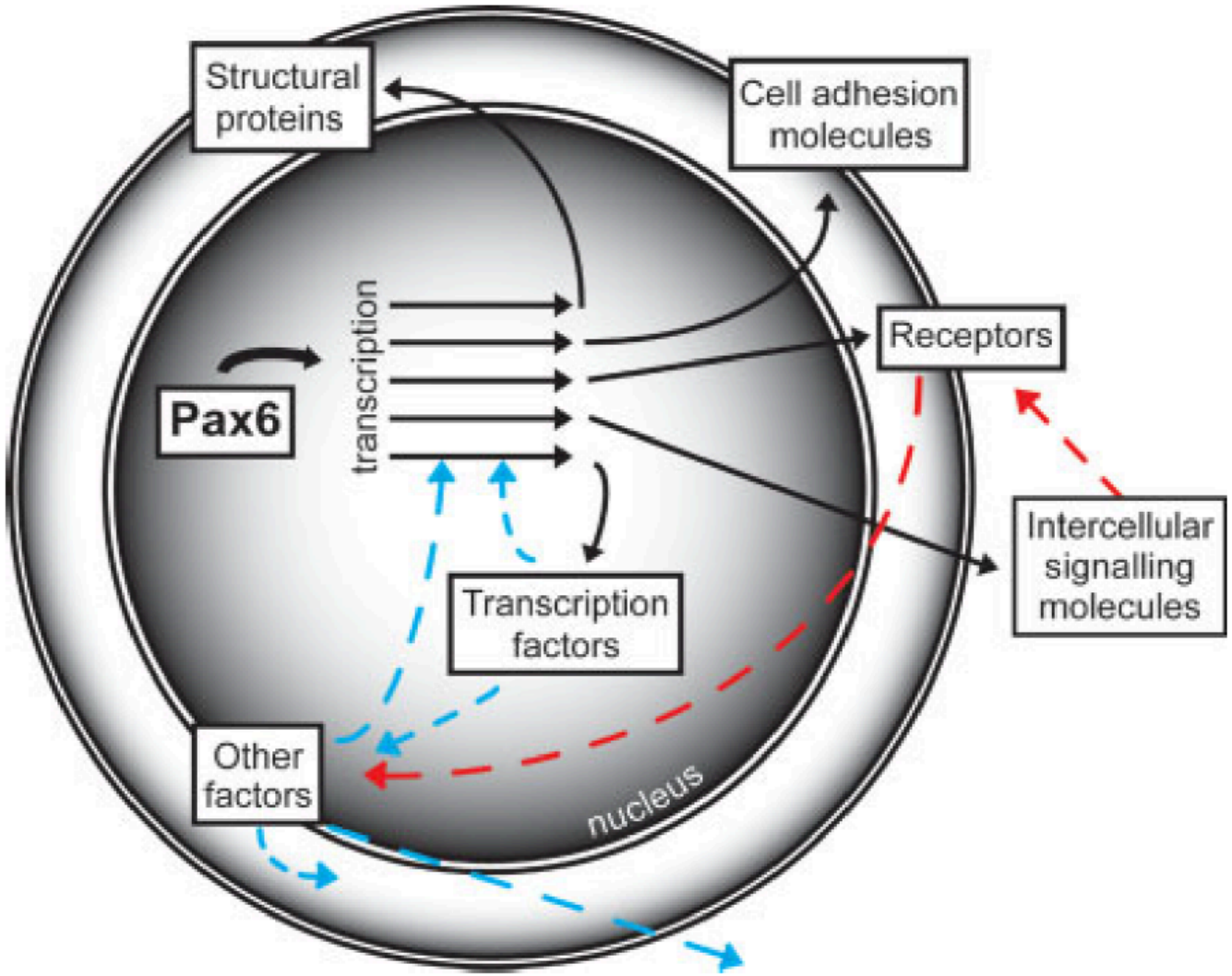
Efectos pleiotrópicos de Pax6

(MASTER ya no es tan MASTER, sino SUBMASTER)



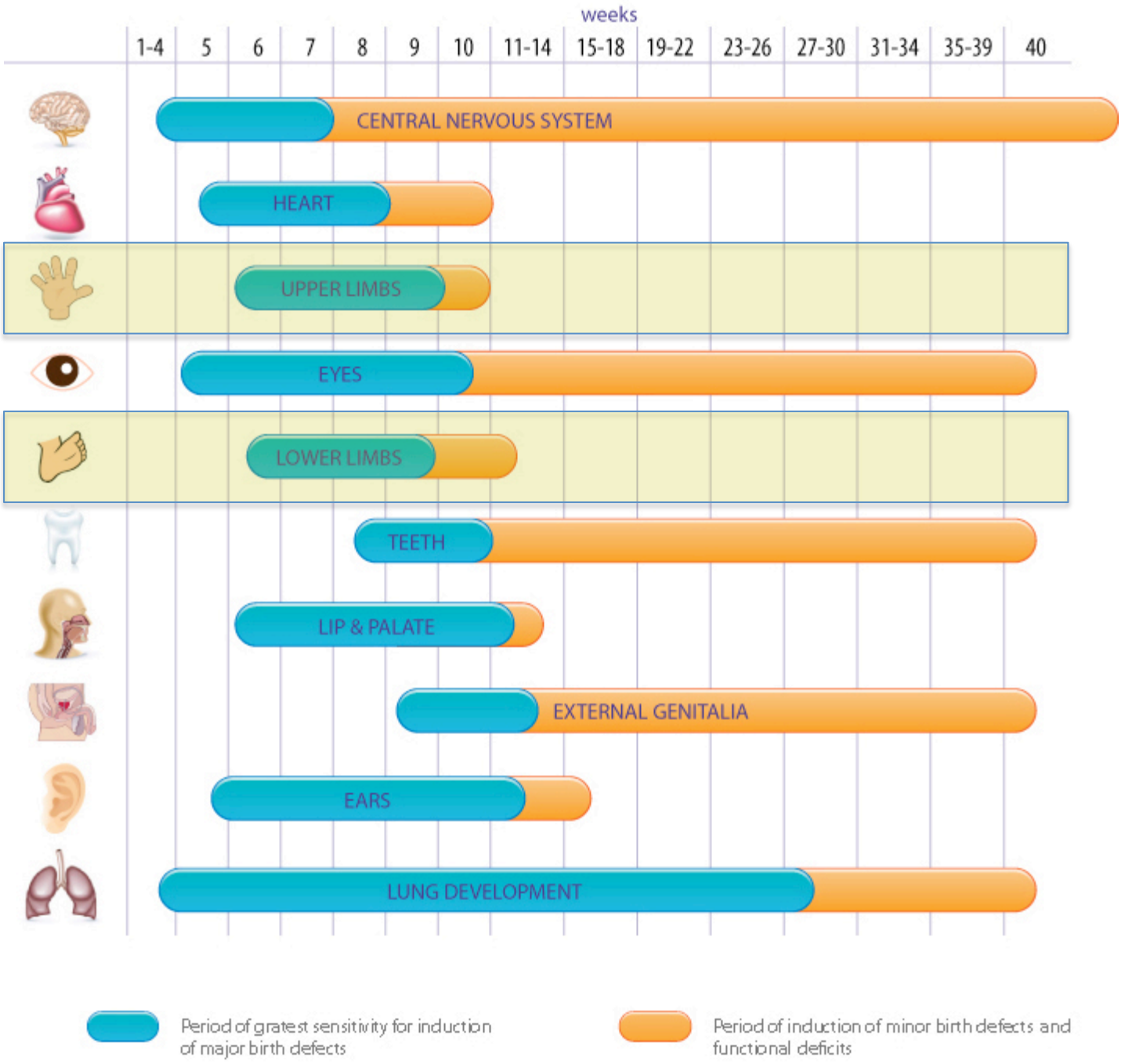
Simpson & Price, 2002

Efectos pleiotrópicos de Pax6



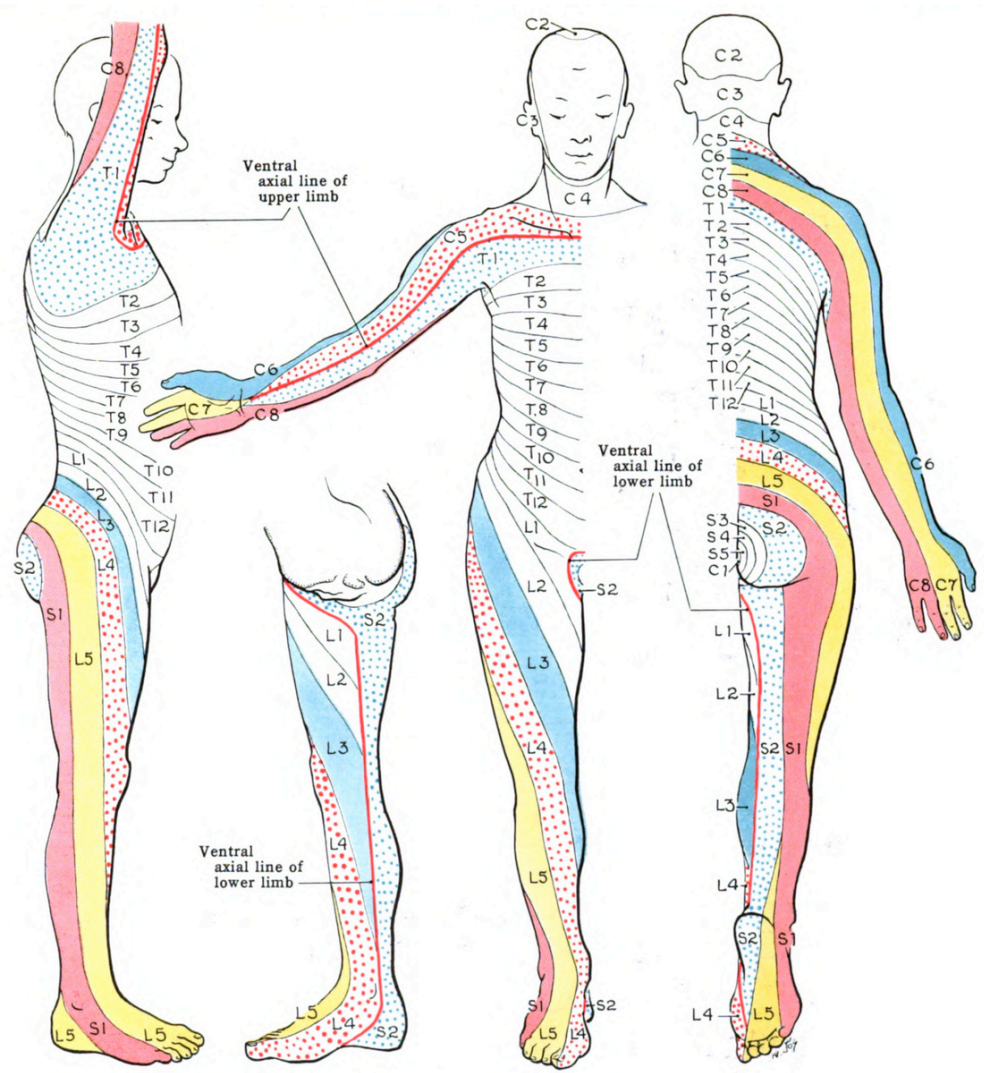
Simpson & Price, 2002

ORGANOGENESE:



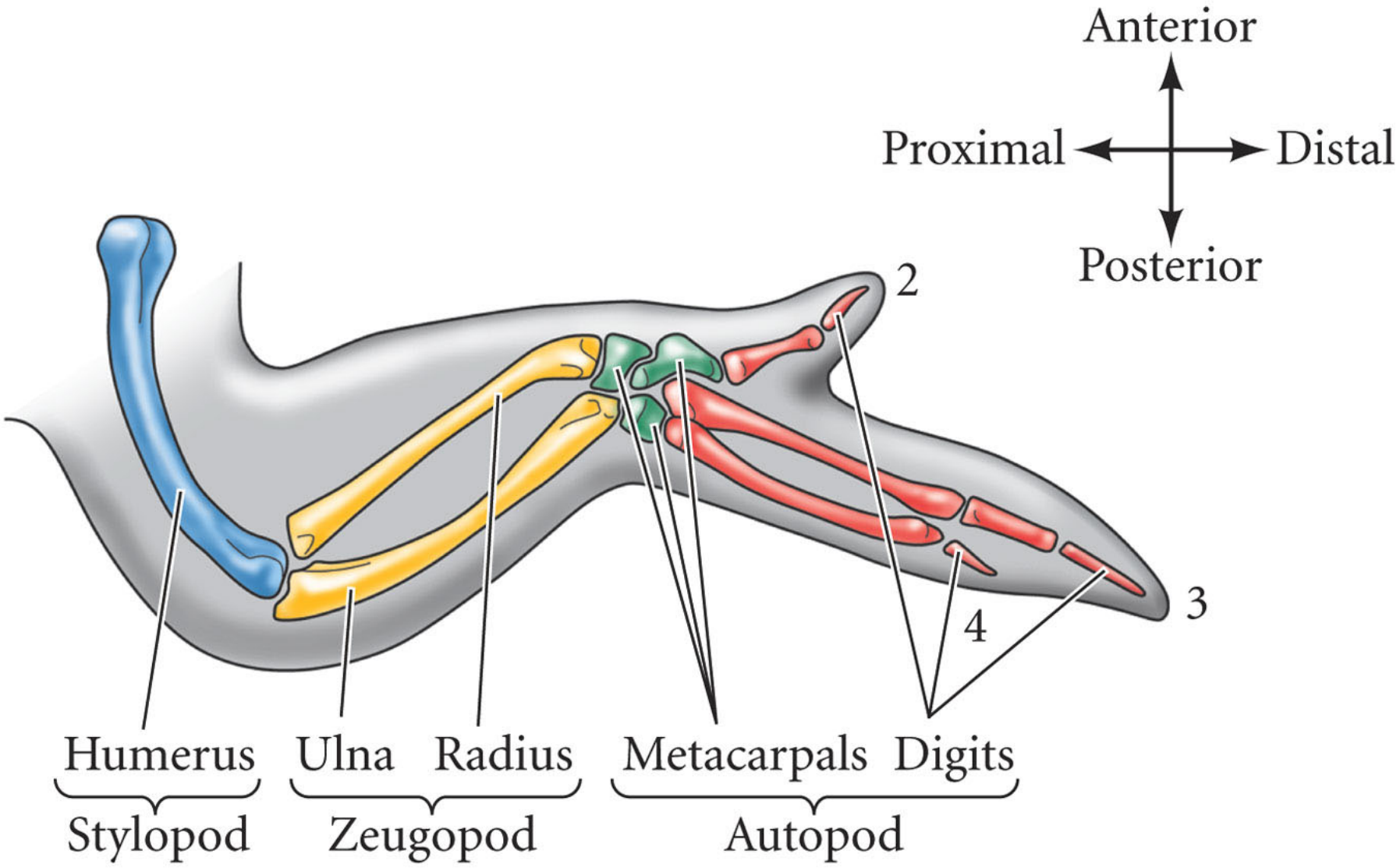
Dermatomas:

DEVELOPMENTAL BIOLOGY, Eighth Edition, Chapter 16, Opener © 2006 Sinauer Associates



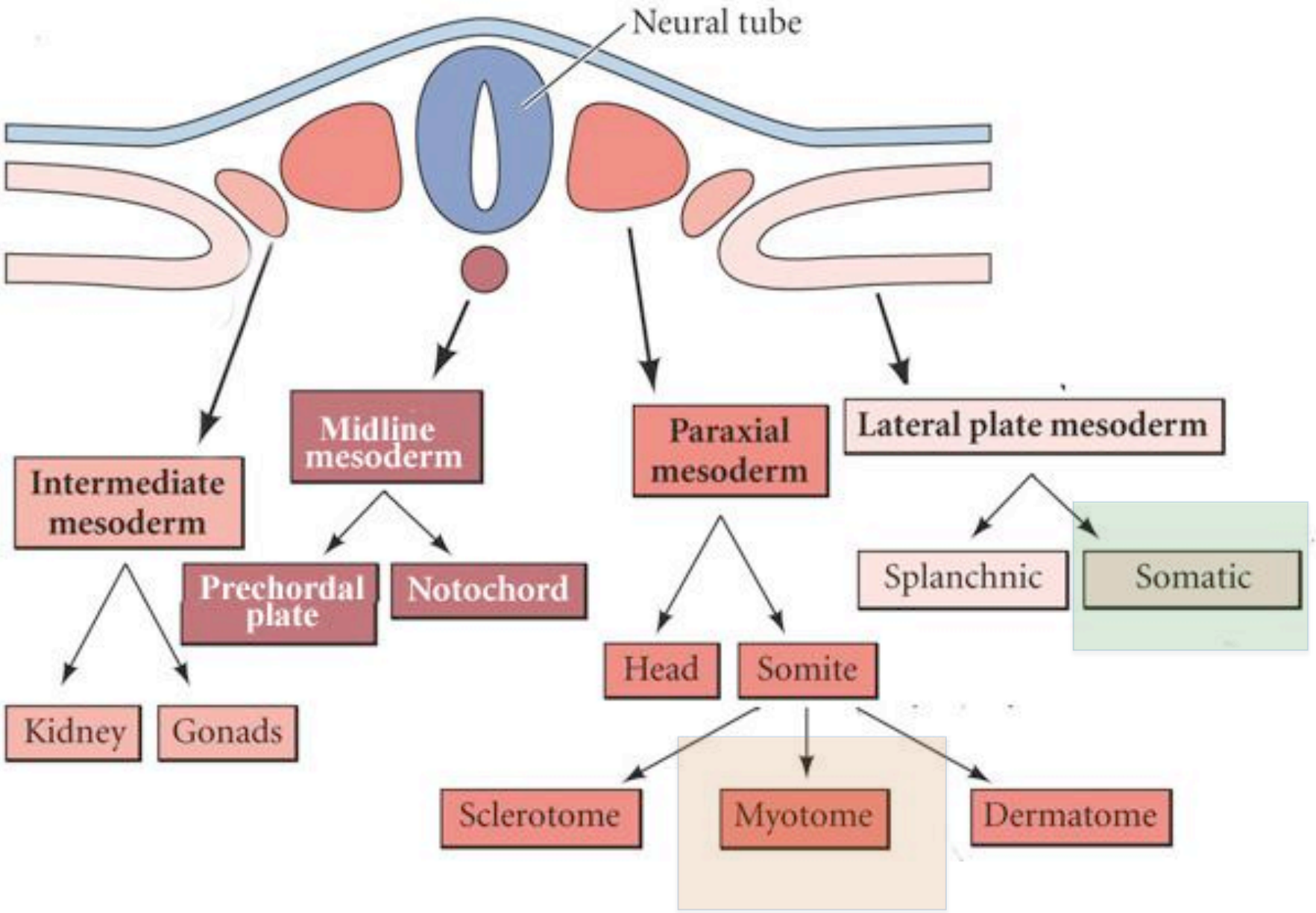
http://www.youtube.com/watch?v=VpbdqGJ9LWk

Skeletal pattern of the chick wing (limb axes)

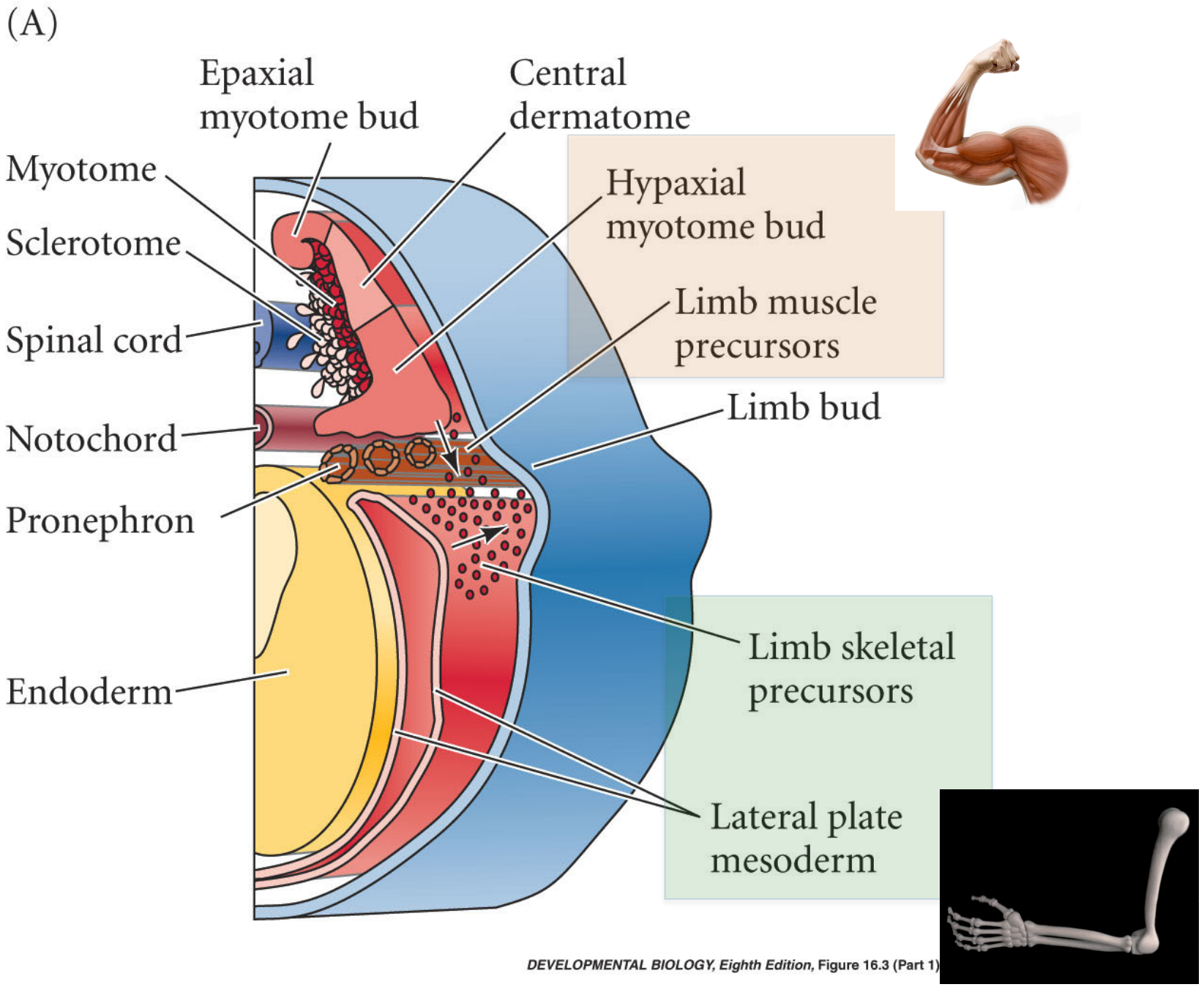


DEVELOPMENTAL BIOLOGY, Eighth Edition, **Figure 16.1** © 2006 Sinauer Associates, Inc.

Mesoderm derivatives and limb bud precursors



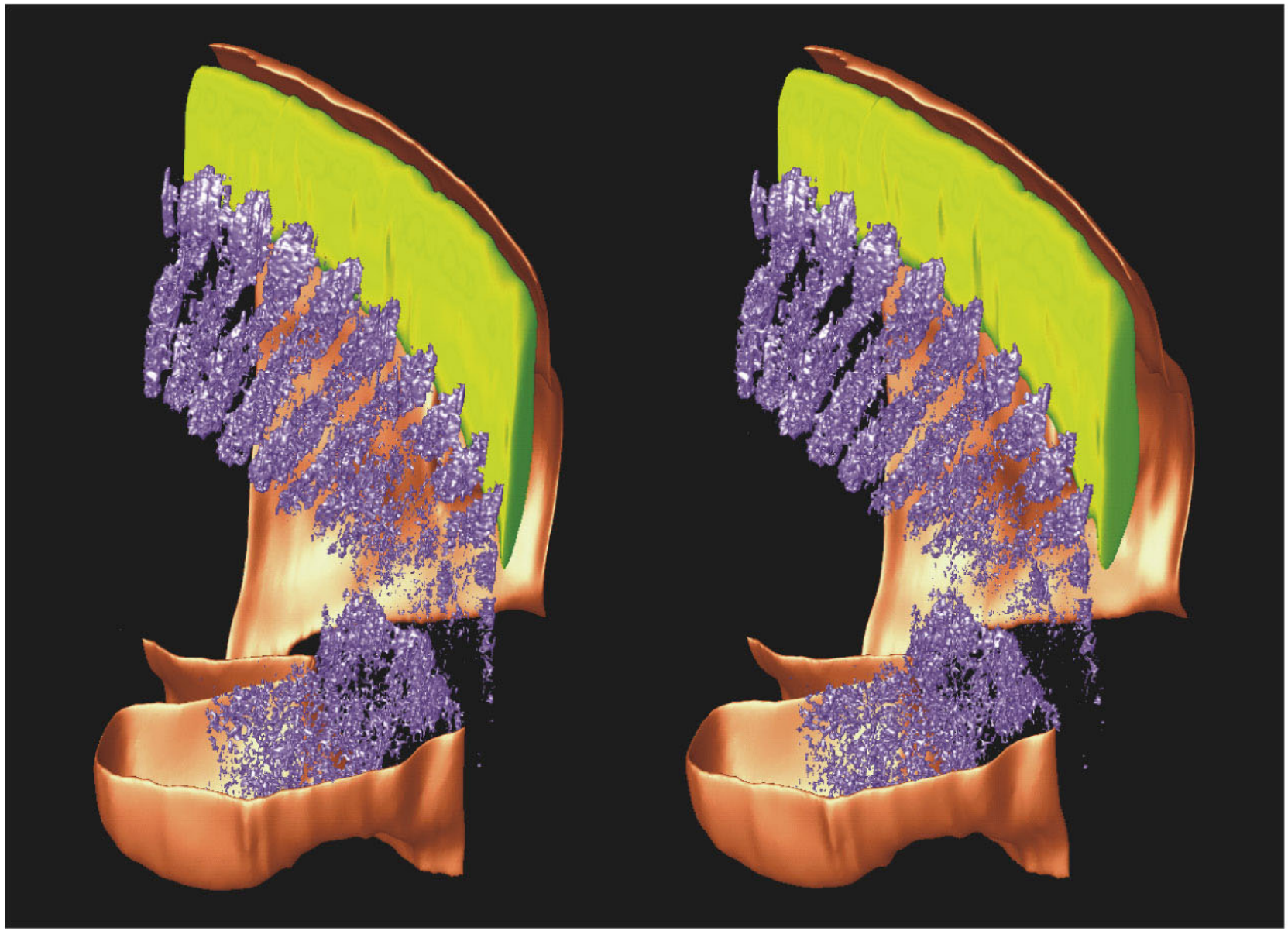
Proliferation of mesenchymal cells from the somatic region of the lateral plate mesoderm causes the limb bud in the amphibian embryo to bulge outward



DEVELOPMENTAL BIOLOGY, Eighth Edition, Figure 16.3 (Part 1)

Proliferation of mesenchymal cells from the somatic region of the lateral plate mesoderm causes the limb bud in the amphibian embryo to bulge outward

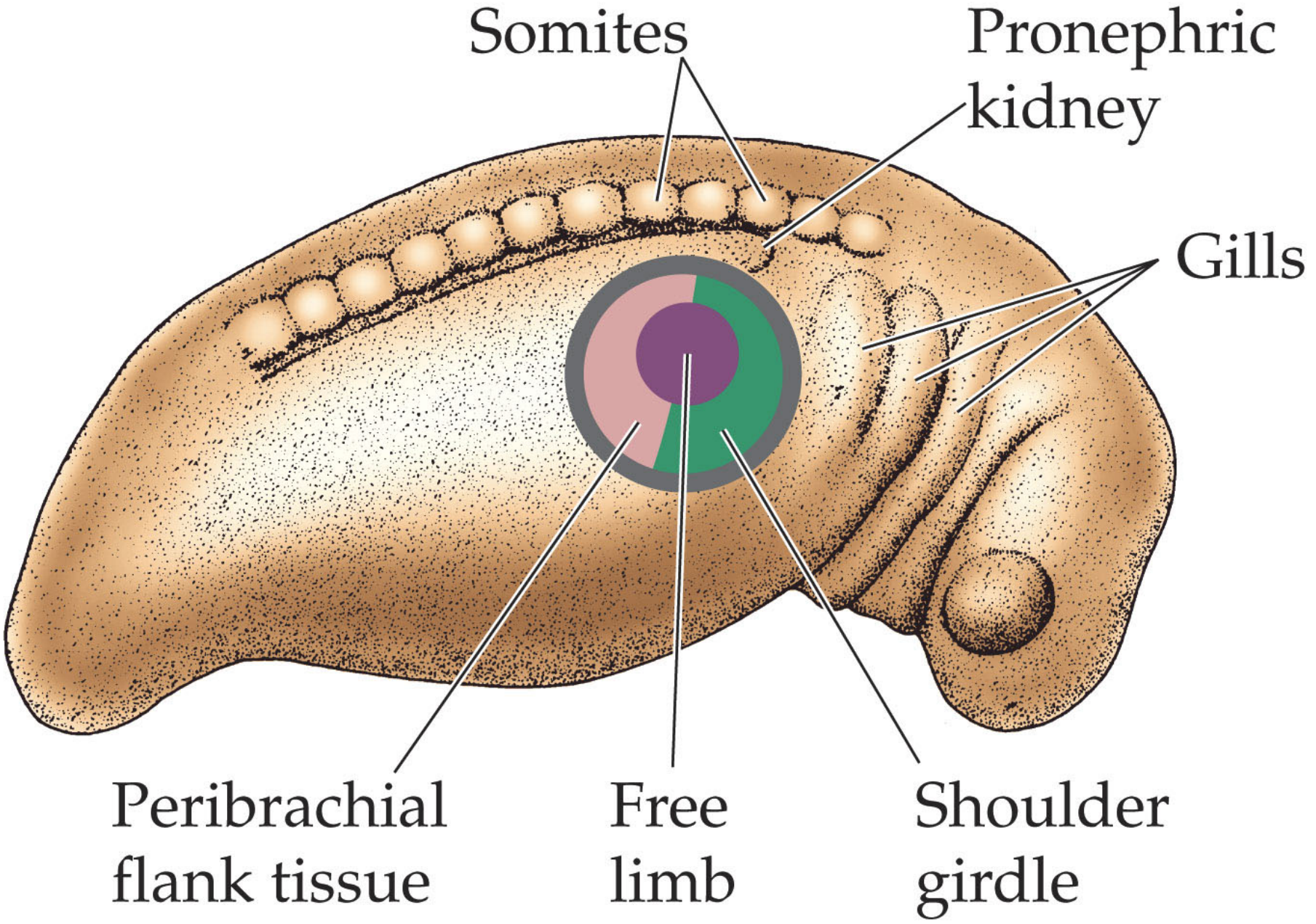
(B)



myf5 (developing muscle) cells in purple

***DEVELOPMENTAL BIOLOGY, Eighth Edition,* Figure 16.3 (Part 2)** © 2006 Sinauer Associates, Inc.

Prospective forelimb field of the salamander *Ambystoma maculatum*

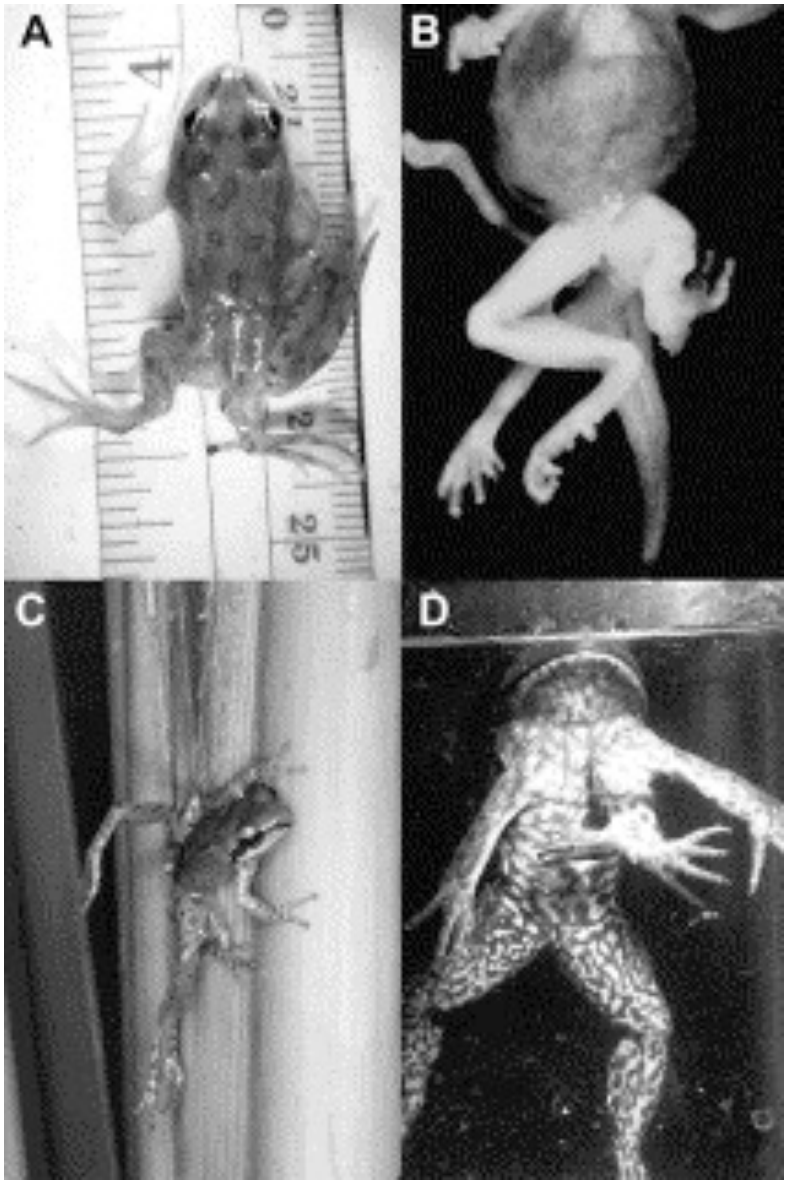


DEVELOPMENTAL BIOLOGY, Eighth Edition, **Figure 16.2** © 2006 Sinauer Associates, Inc.

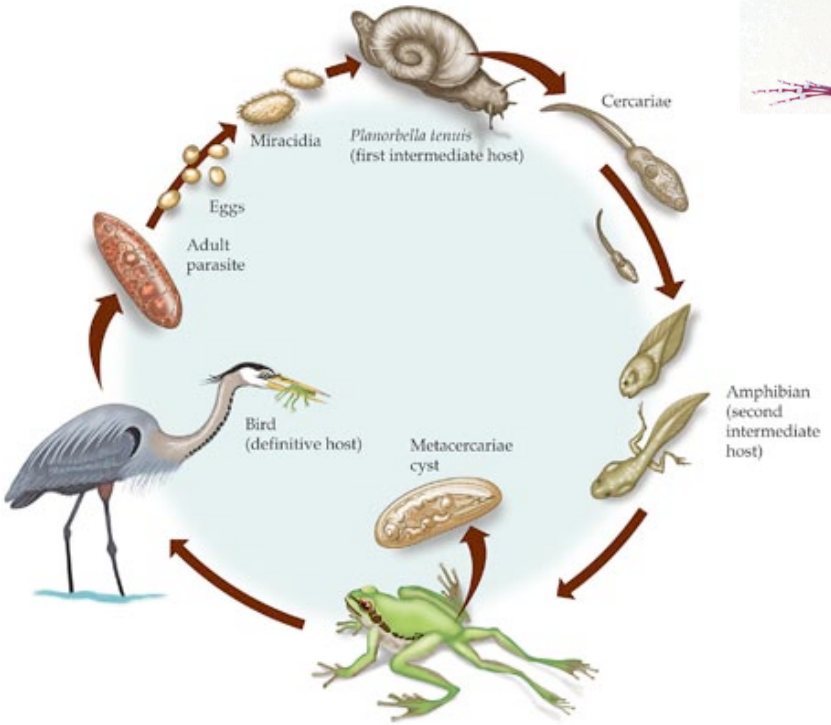
A multilimbed *Hyla regilla* and other frogs are the result of ???

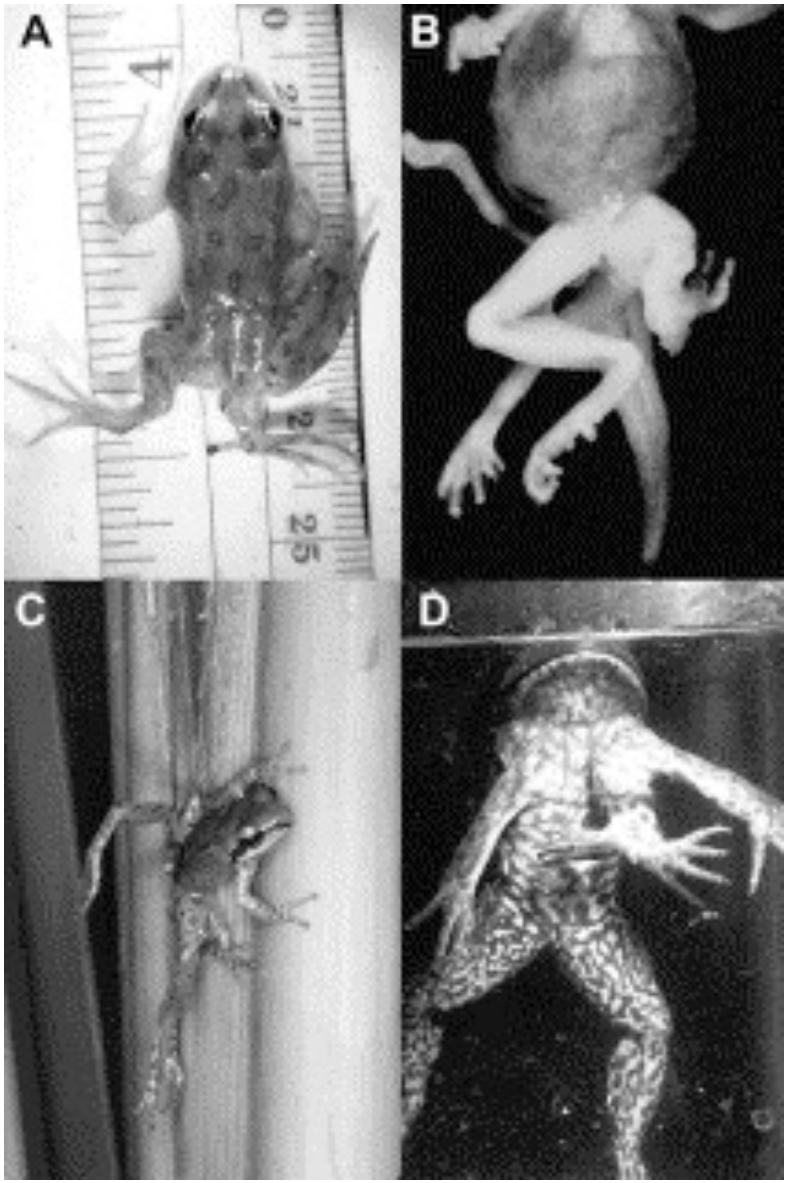
DEVELOPMENTAL BIOLOGY, Eighth Edition, Figure 16.4 © 2006 Sinauer Associates, Inc.

?



A multilimbed *Hyla regilla* is the result of infestation of the tadpole-stage developing limb buds by trematode cysts





John Saunders

Highlight work by John Saunders (Vade Mecum 3)

Dr. Saunders' Physiology Lab at Marquette in the early 1950'a. Dr. Saunders is in the middle with the pipe.

Dr. John saunders at Marquette University in the 1960's.