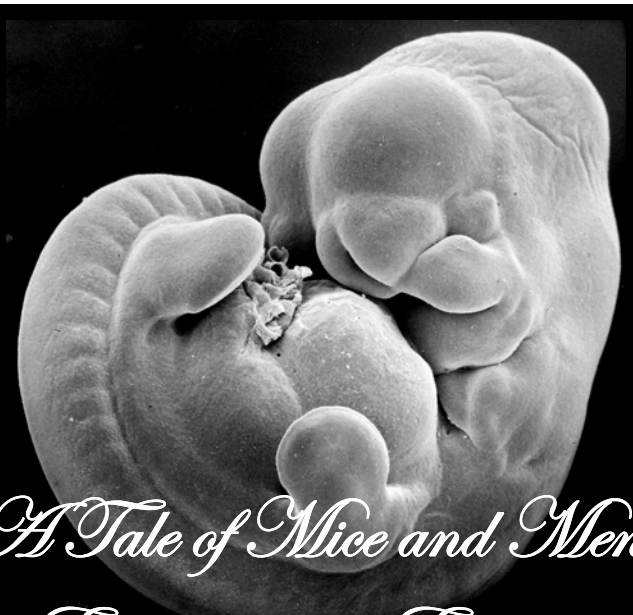


A Tale of Mice and Men, Embryos and Ethanol

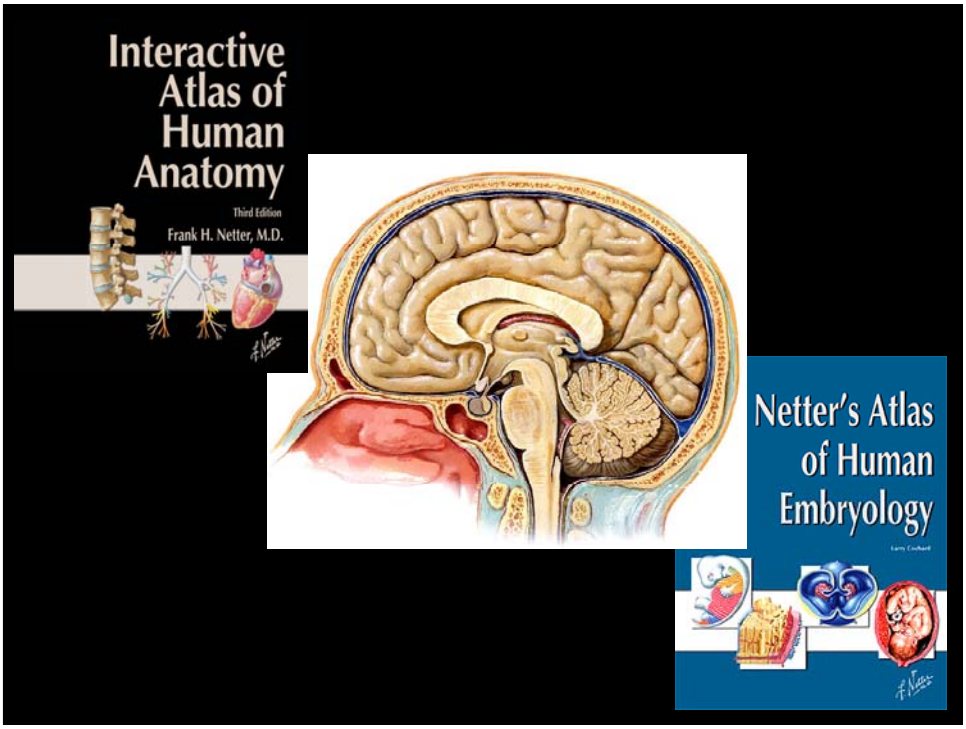
Disclosure

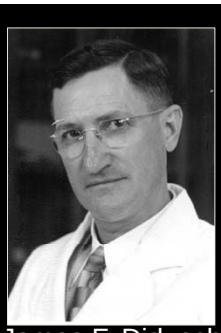
The authors of this research have no financial or other interests which pose a conflict of interest.

This research was funded by NIH/NIAAA

Josef Warkany, M.D. 1902-1992

Frank Netter, M.D. 1906-1991





James F. Didusch
1890-1955

CONTRIBUTIONS TO EMBRYOLOGY, NO. 112

A WELL-PRESERVED HUMAN EMBRYO OF 10 SOMITES

By George W. Corner

Professor of Anatomy, University of Rochester

With seven plates and nine text-figures

[Reprinted from Vol. XX of Contributions to Embryology, Carnegie Inst. Wash. Pub. No. 284, pages 81 to 101. Published January 1929.]

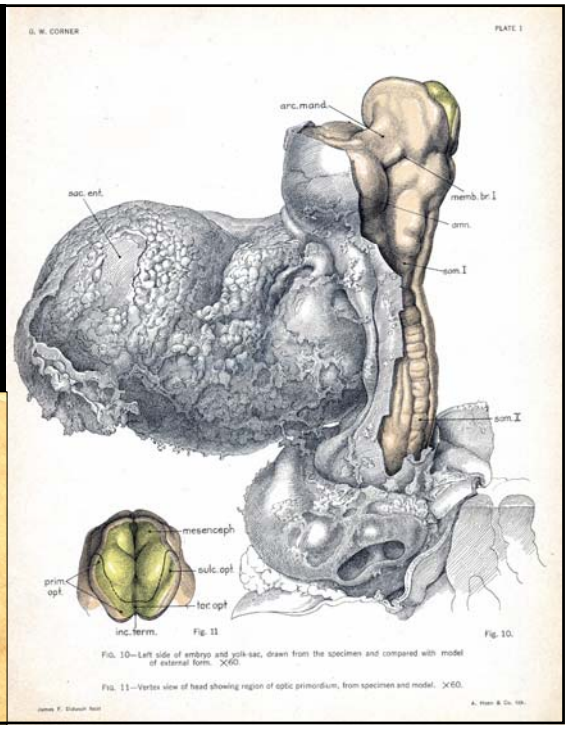


FIG. 10.—Left side of embryo and yolk-sac, drawn from the specimen and compared with model of external form. ×60.

FIG. 11.—Vertex view of head showing region of optic primordium, from specimen and model. ×60.

CONTRIBUTIONS TO EMBRYOLOGY, NO. 186

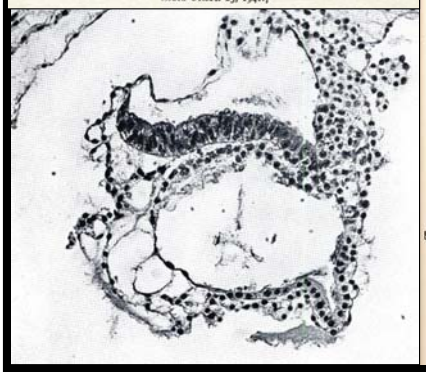
THE TORPIN OVUM, A PRESOMITE HUMAN EMBRYO

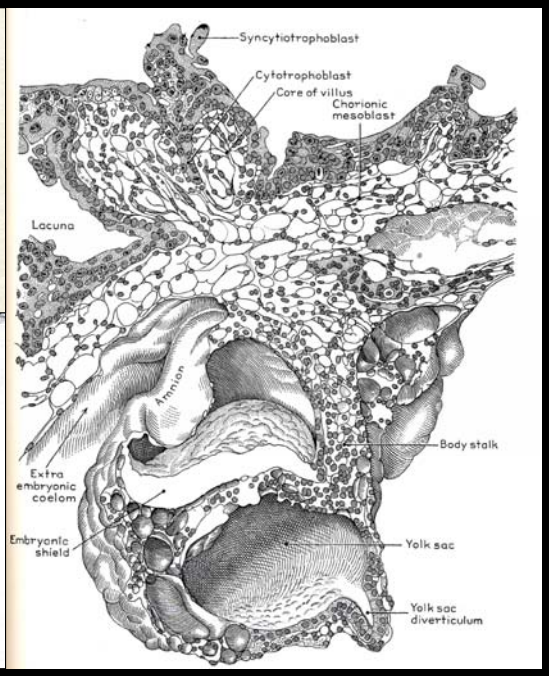
JOSEPH KRAFKA, JR.

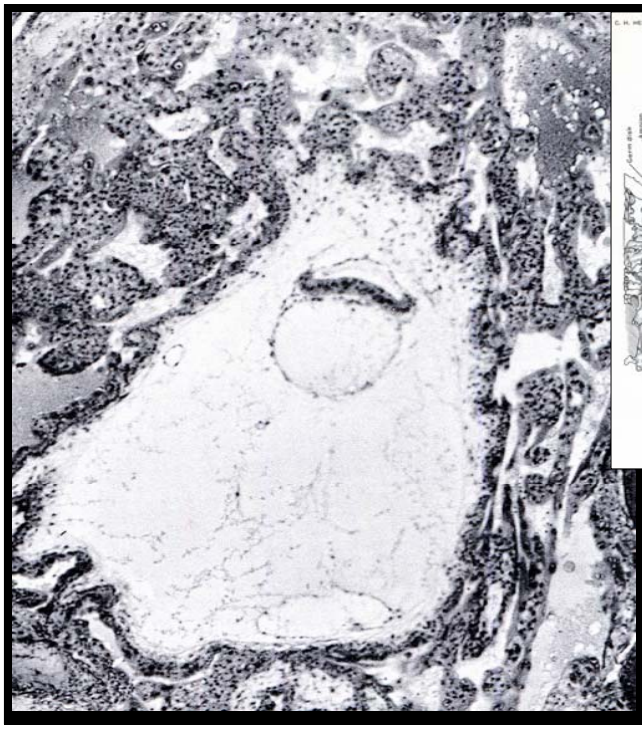
Department of Microscopic Anatomy,
University of Georgia

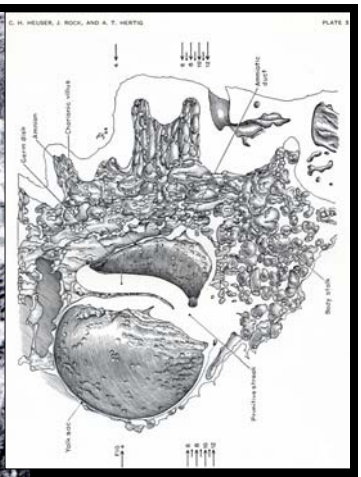
With four plates and three text figures

[Reprinted from Carnegie Institution of Washington Publication 525, pages 167 to 193.
Issued October 23, 1941.]

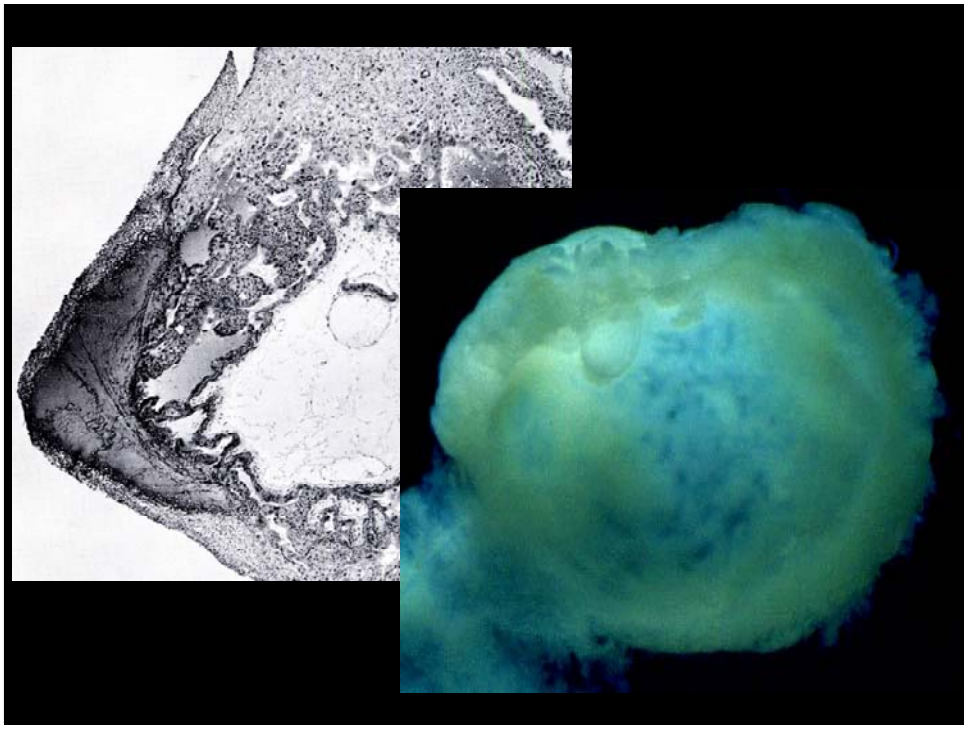


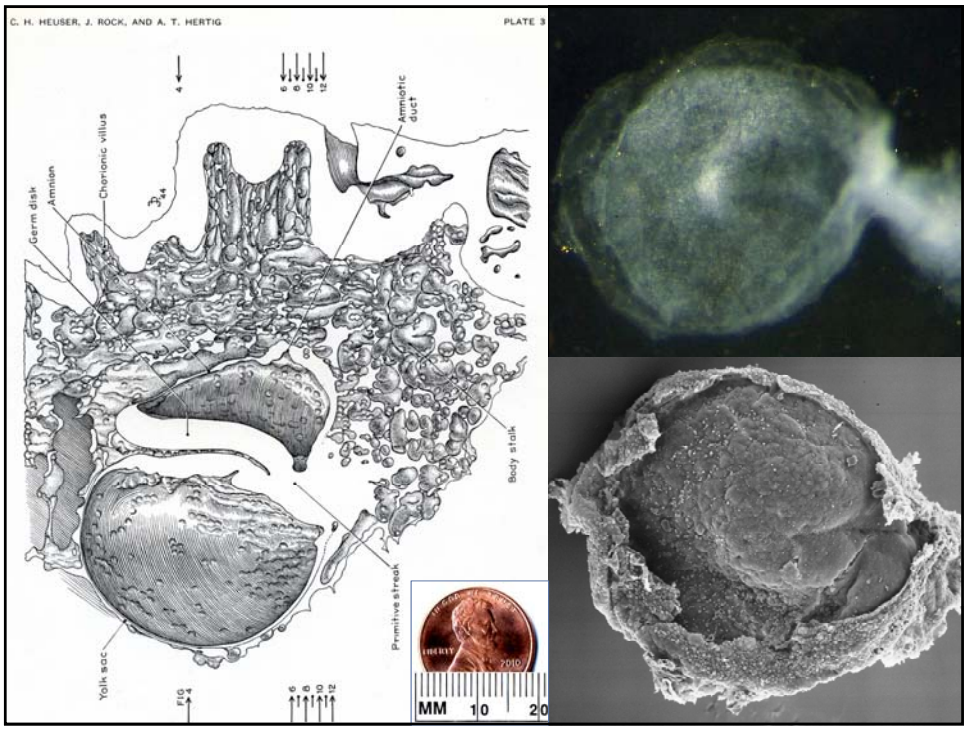


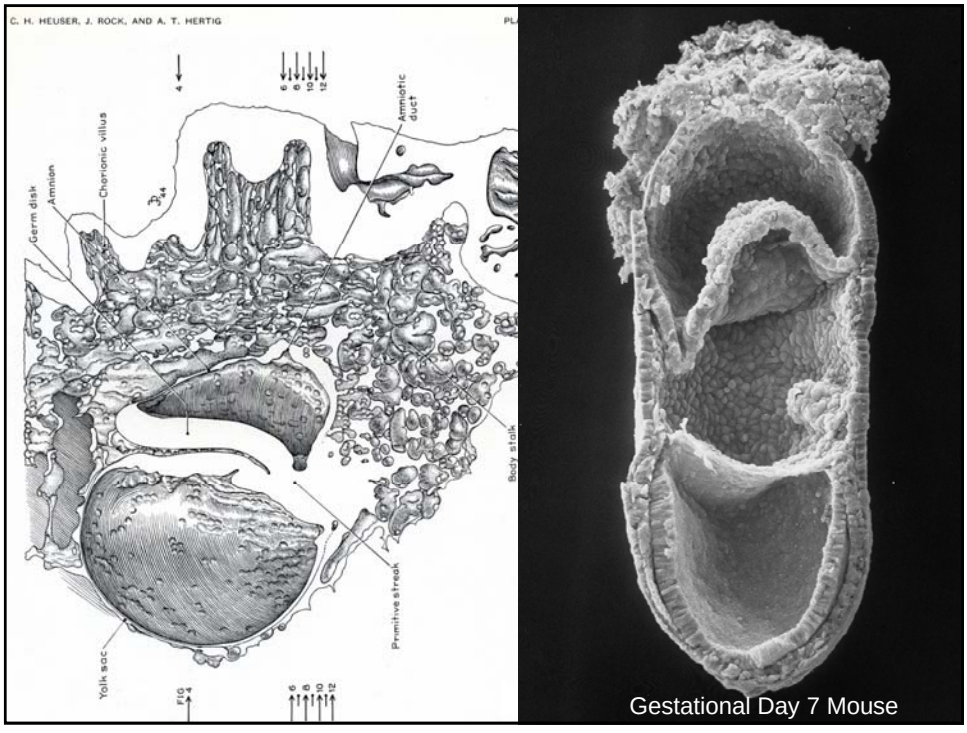


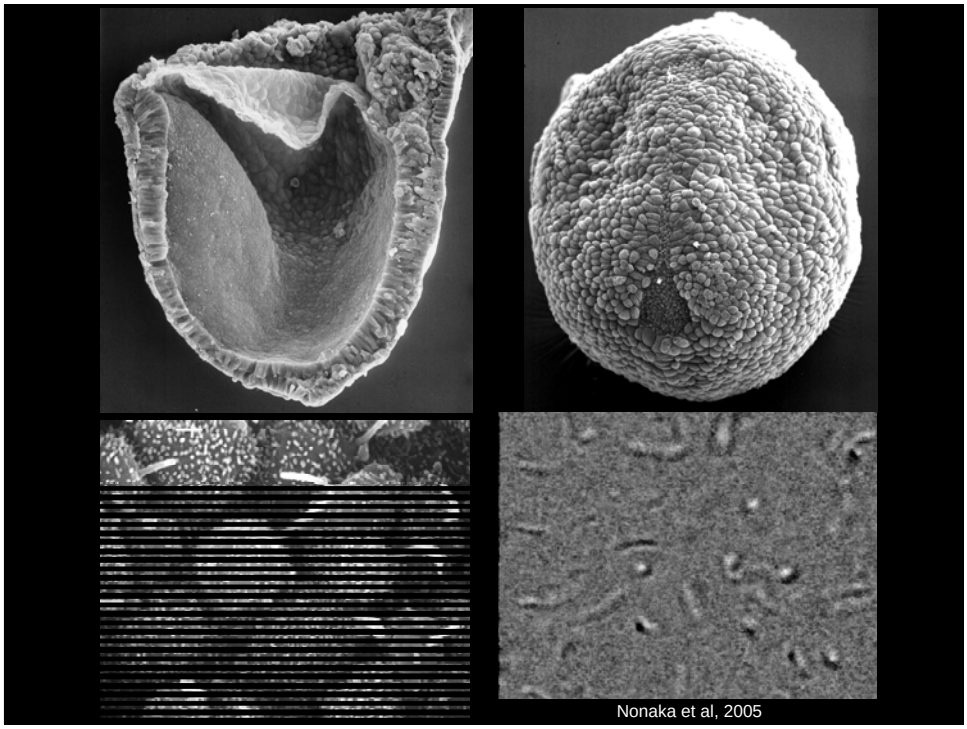


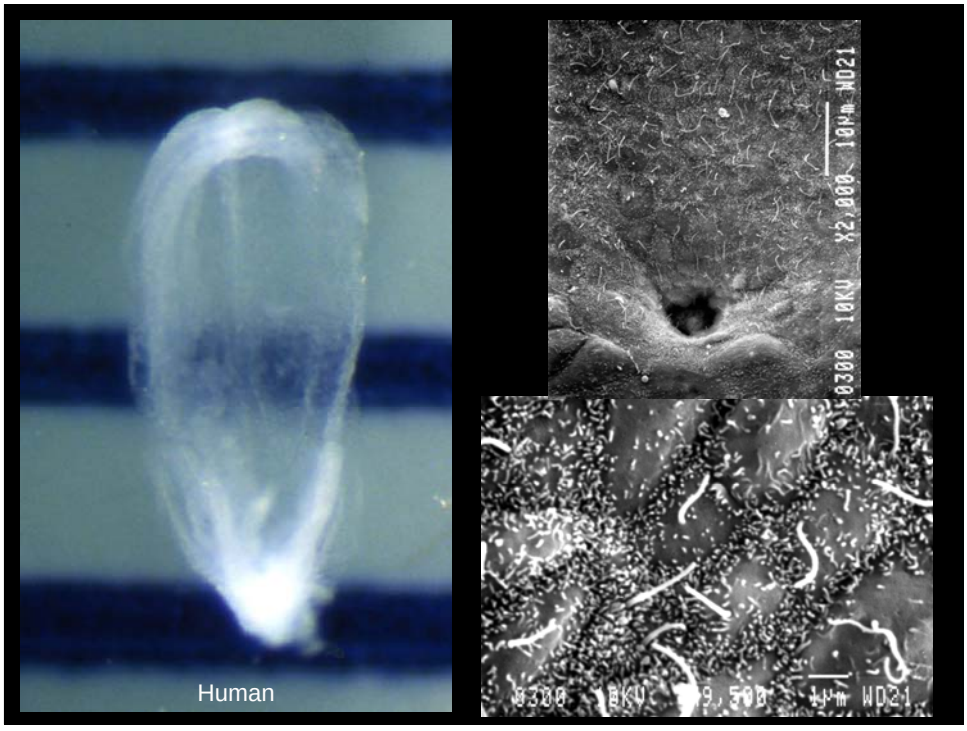
From
Heuser, Rock and Hertig
Contributions to
Embryology,1945

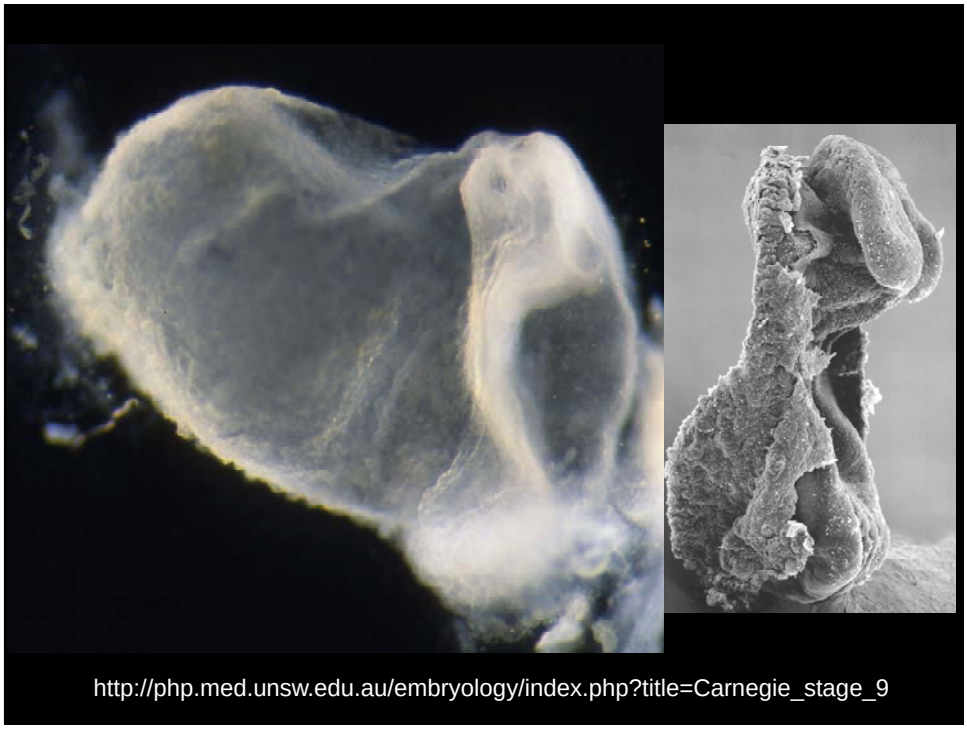



C. H. HEUSER, J. ROCK, AND A. T. HERTIG
PLATE 3
Germ disk
Amnion
Chorionic villus
Amniotic duct
Body stalk
Primitive streak
Yolk sac
FIG 4
MM 10 20

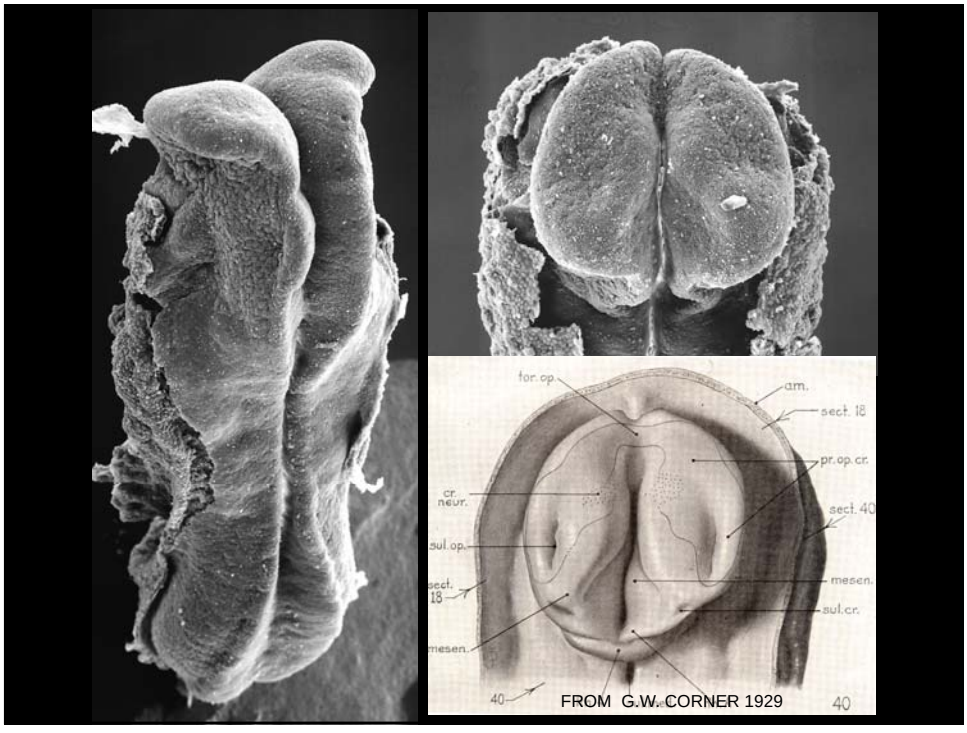

C. H. HEUSER, J. ROCK, AND A. T. HERTIG
Germ disk
Amnion
Chorionic villus
Amniotic duct
Body stalk
Primitive streak
Yolk sac
FIG 4
Gestational Day 7 Mouse


Nonaka et al, 2005


Human
0300 10KV X2,000 10μm WD21
0300 8KV 9,500 μm WD21

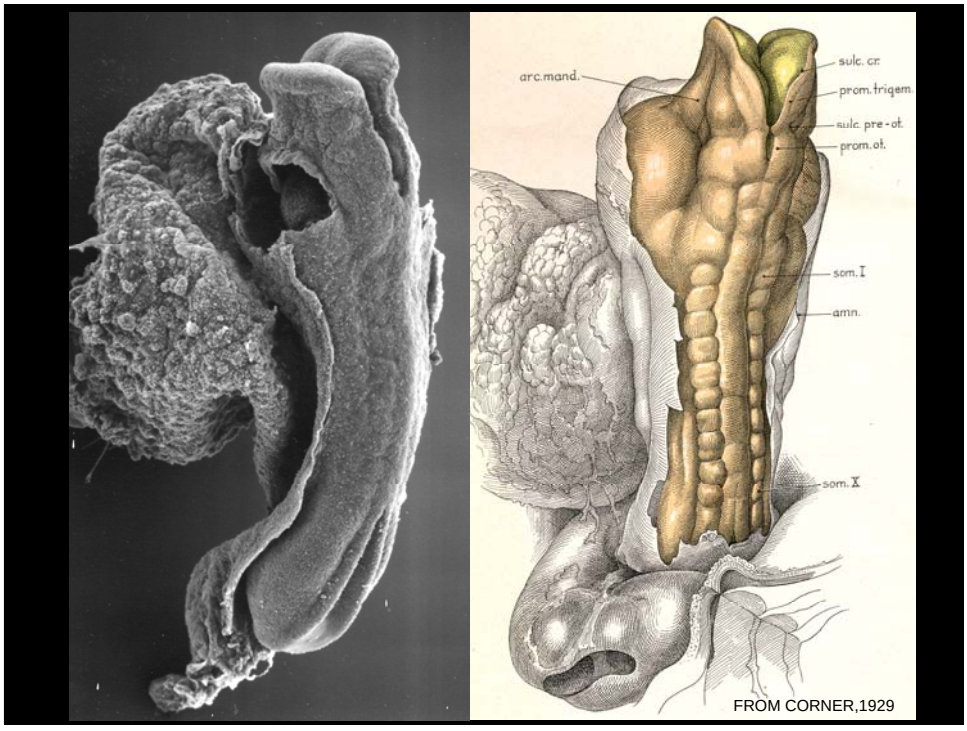


http://php.med.unsw.edu.au/embryology/index.php?title=Carnegie_stage_9

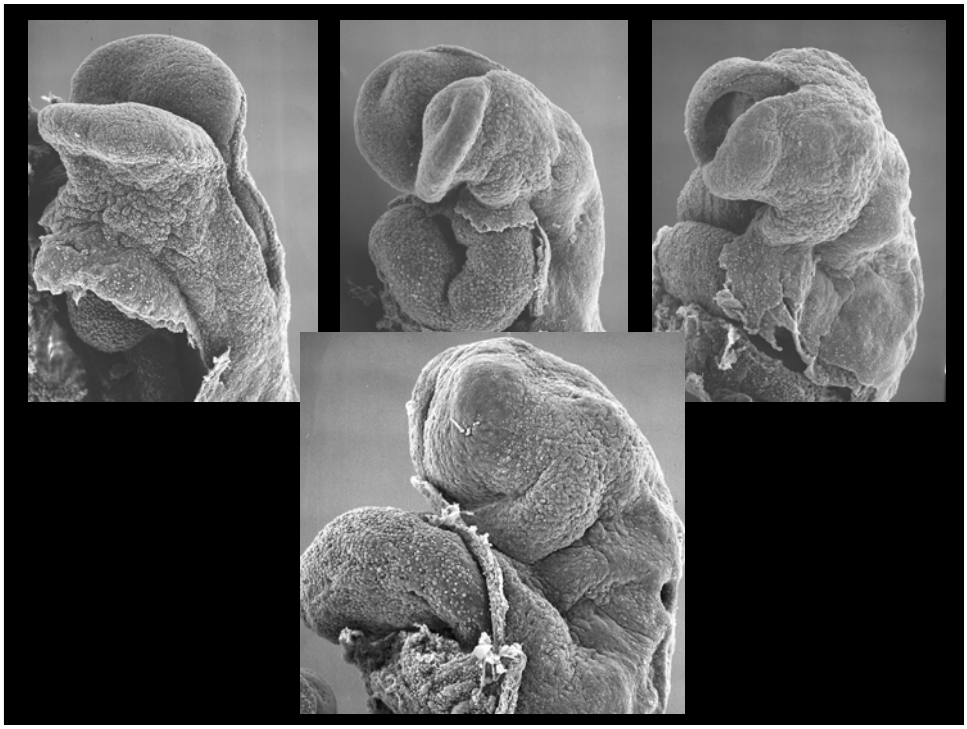


FROM G.W. CORNER 1929

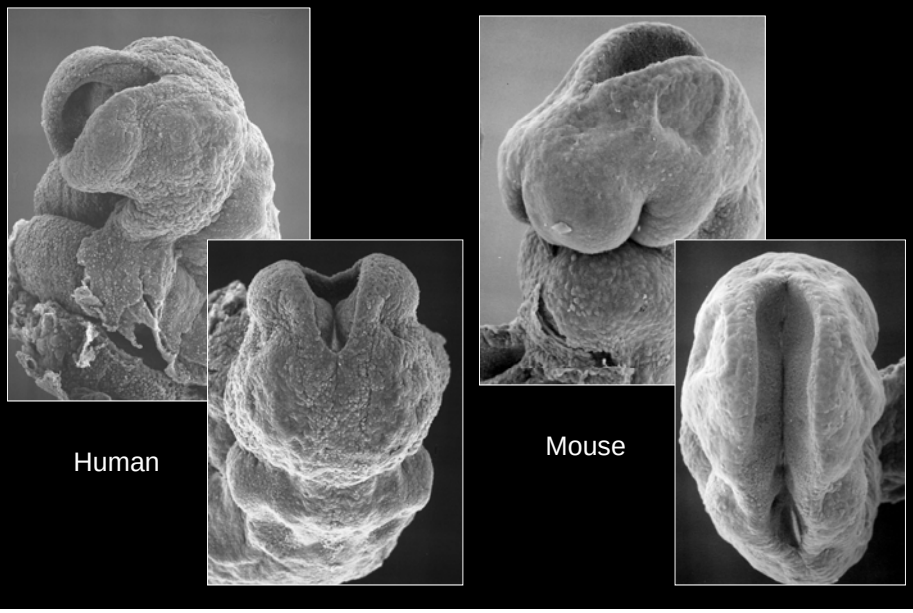
22 days post-fertilization

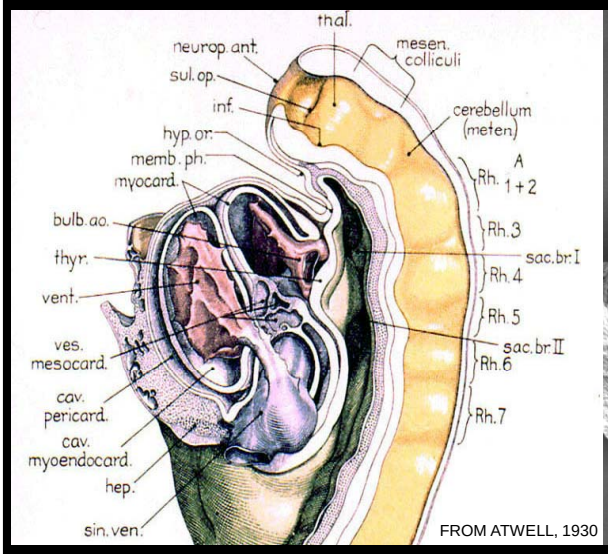


FROM CORNER,1929



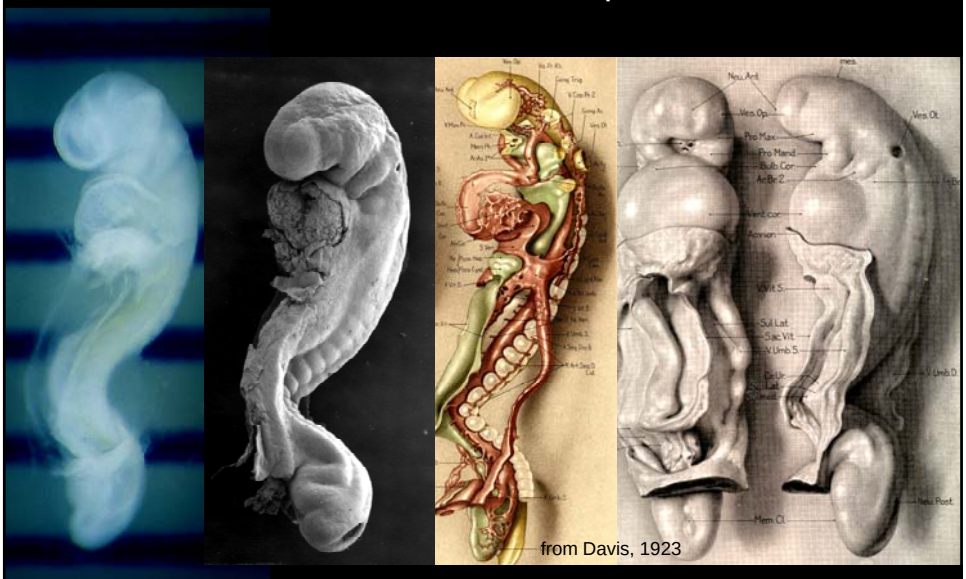
Human and mouse anterior neural tube closure patterns differ





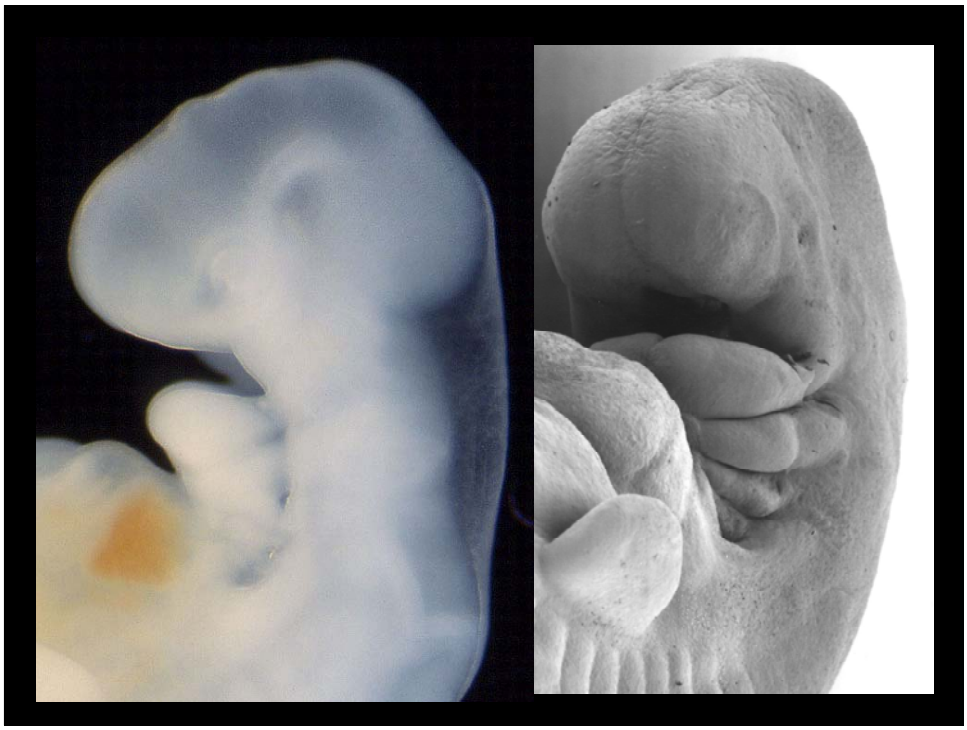
FROM ATWELL, 1930

26 days post fertilization
20 - 21 somite pairs

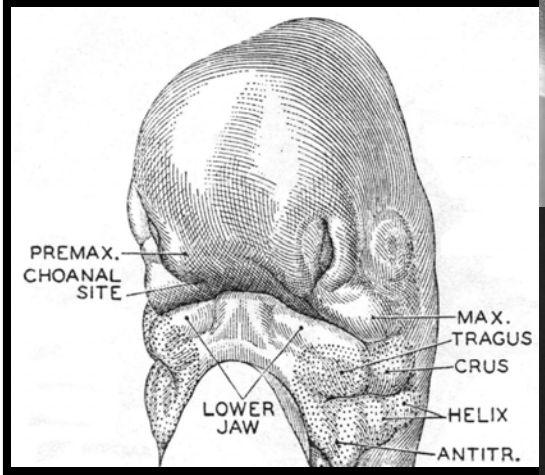


from Davis, 1923


26 days post-fertilization
21 somite pairs

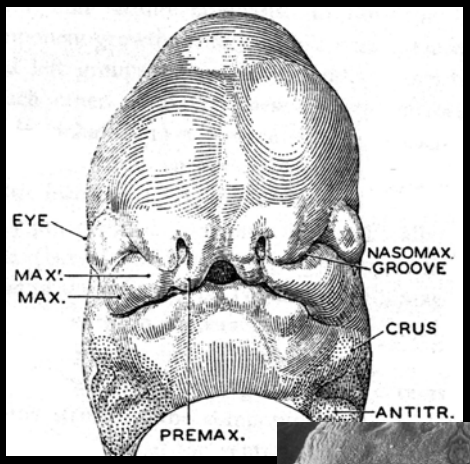


37 - 41 days post-fertilization

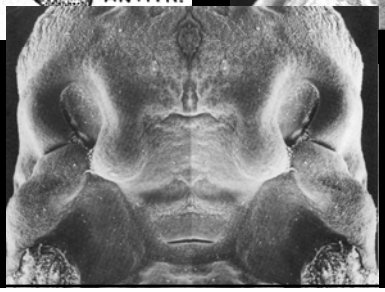


from Streeter, 1948

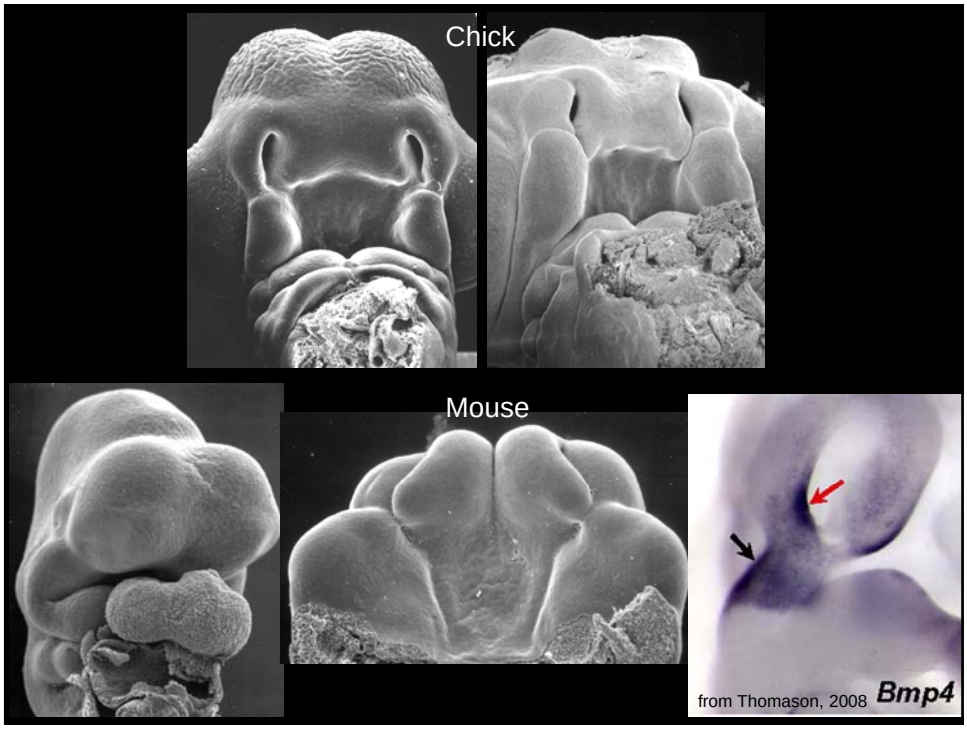
from Hinrichsen, 1985

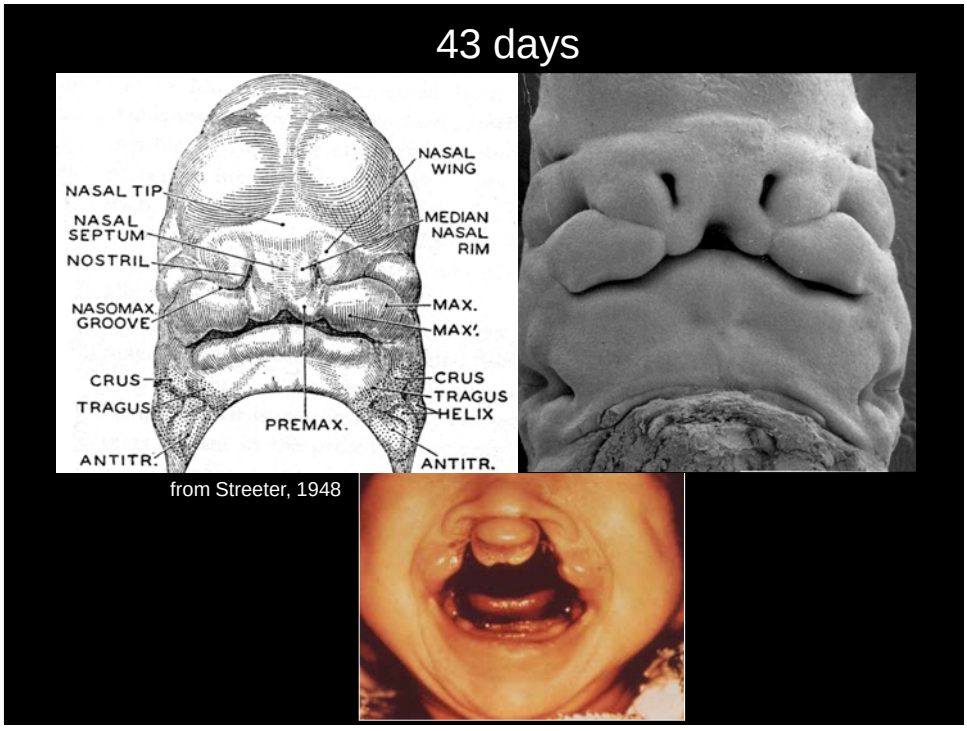


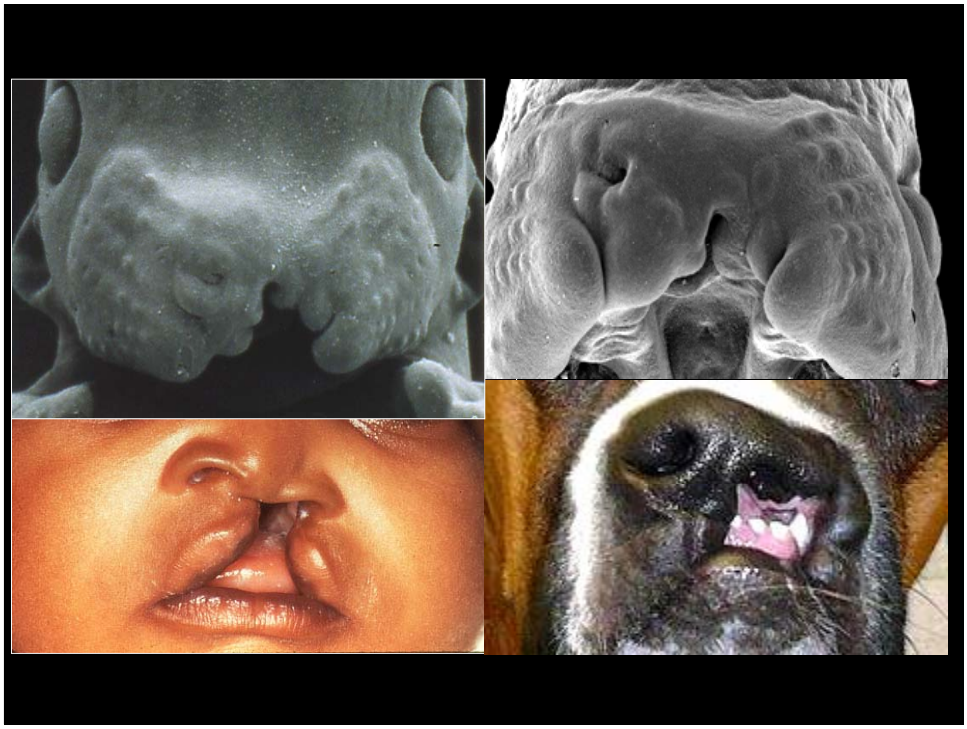
from Streeter, 1948

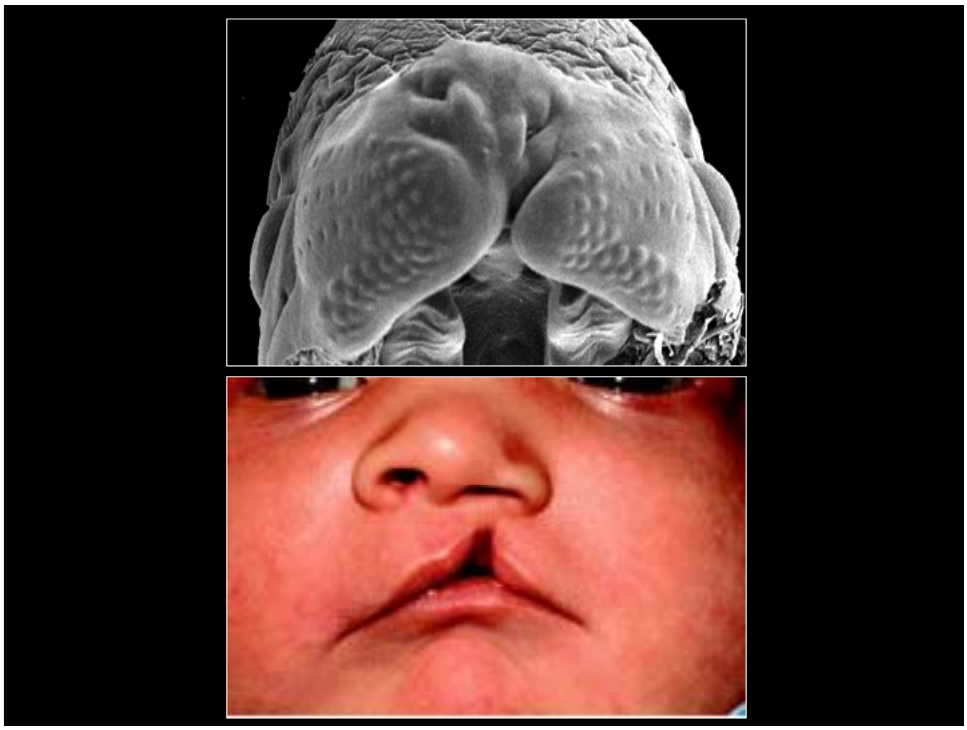


from Hinrichsen, 1985


Chick
Mouse
from Thomason, 2008
Bmp4

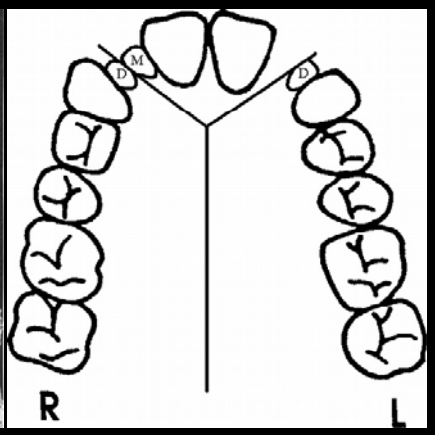

43 days
NASAL TIP
NASAL SEPTUM
NOSTRIL
NASOMAX. GROOVE
CRUS
TRAGUS
ANTITR.
NASAL WING
MEDIAN NASAL RIM
MAX.
MAX.
CRUS
TRAGUS
HELIX
PREMAX.
ANTITR.
from Streeter, 1948





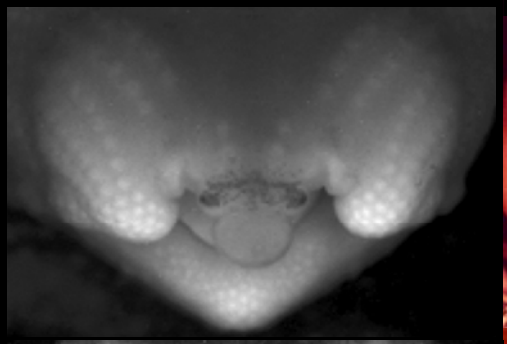
It appears that medial nasal prominence and Max' tissues both contribute to the portion of the alveolar ridge in which the upper incisors form, with the lateral part of each lateral incisor being derived from Max'

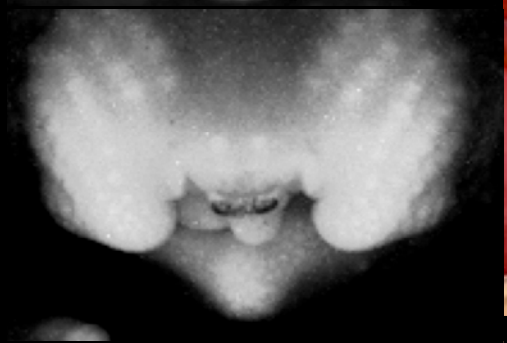
from Hinrichsen, 1985

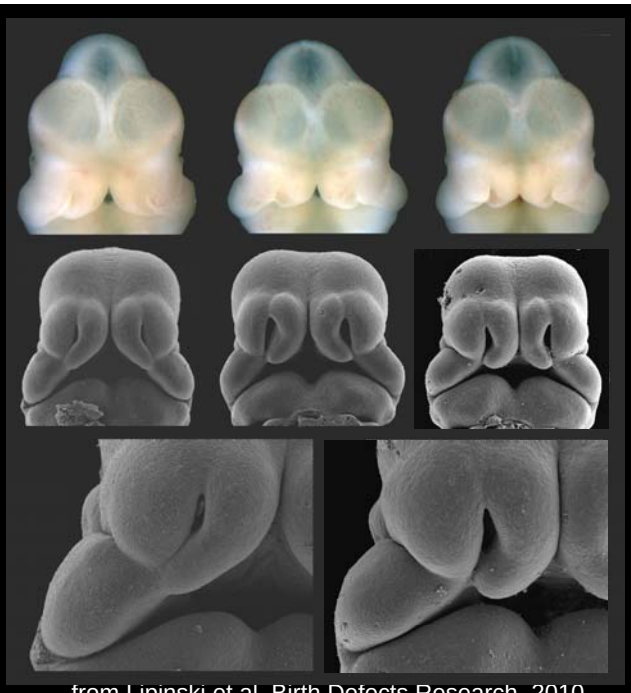


from Halpern and Noble, 2010

In human cleft lip, when a lateral incisor is present, it is most commonly located distal to the cleft. This suggests that deficiency in the medial nasal prominence-derived tissue is the developmental basis for many "typical" clefts of the lip.

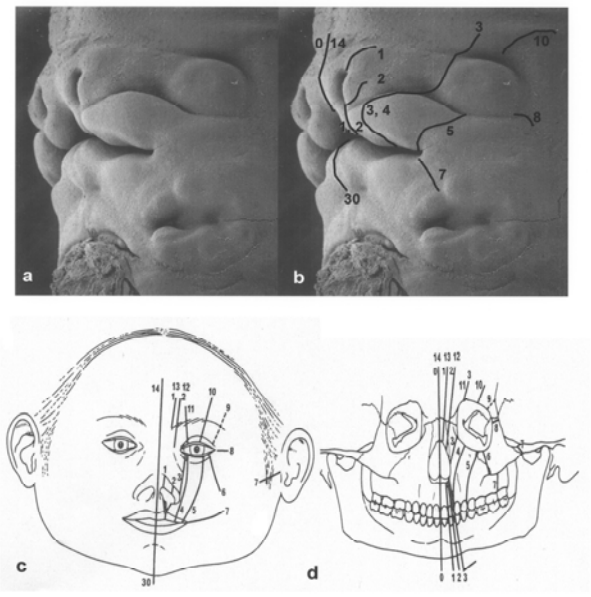


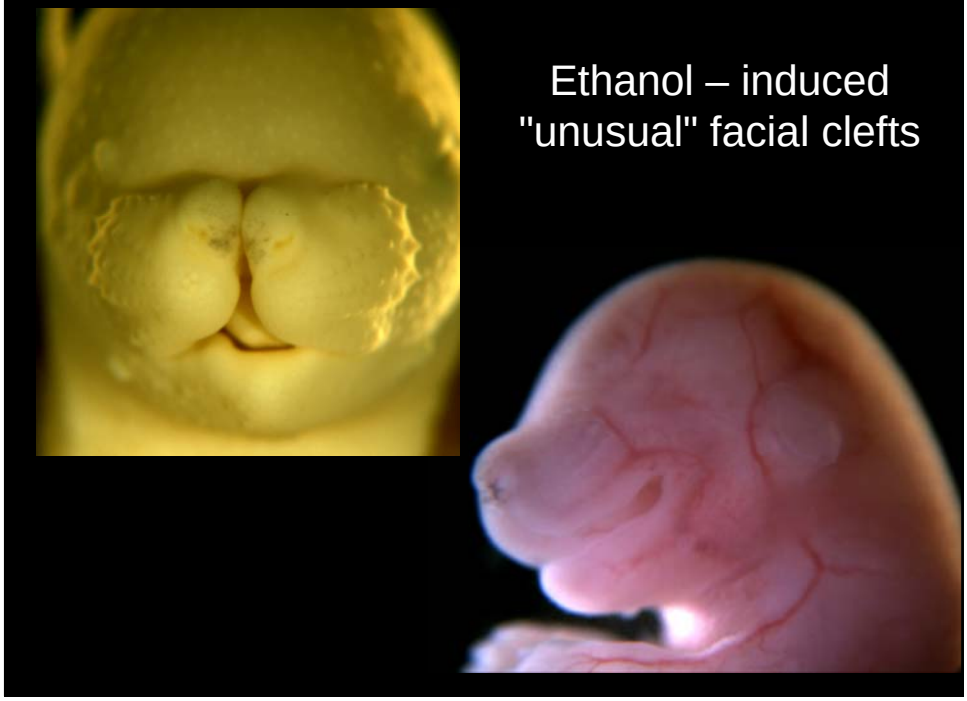


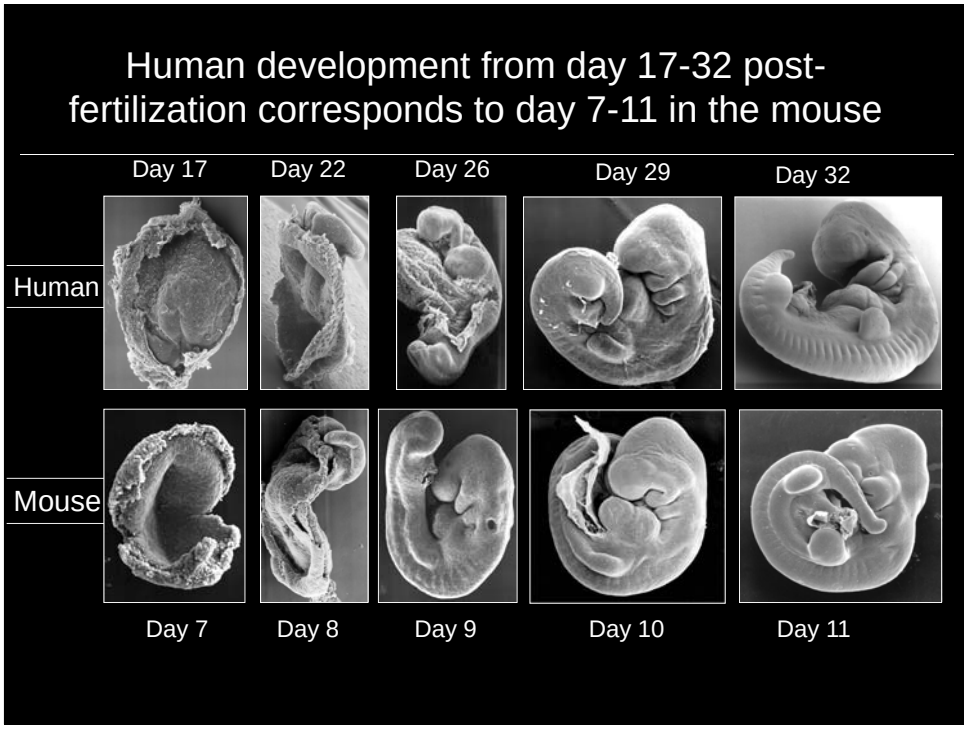


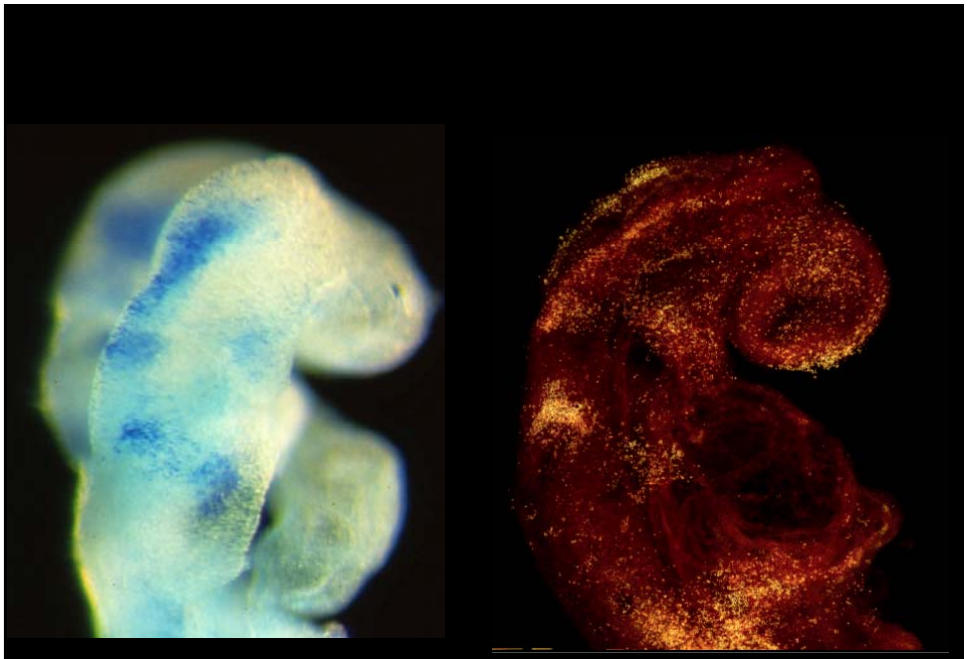
from Lipinski et al, Birth Defects Research, 2010

Facial clefts occur at growth center junctions

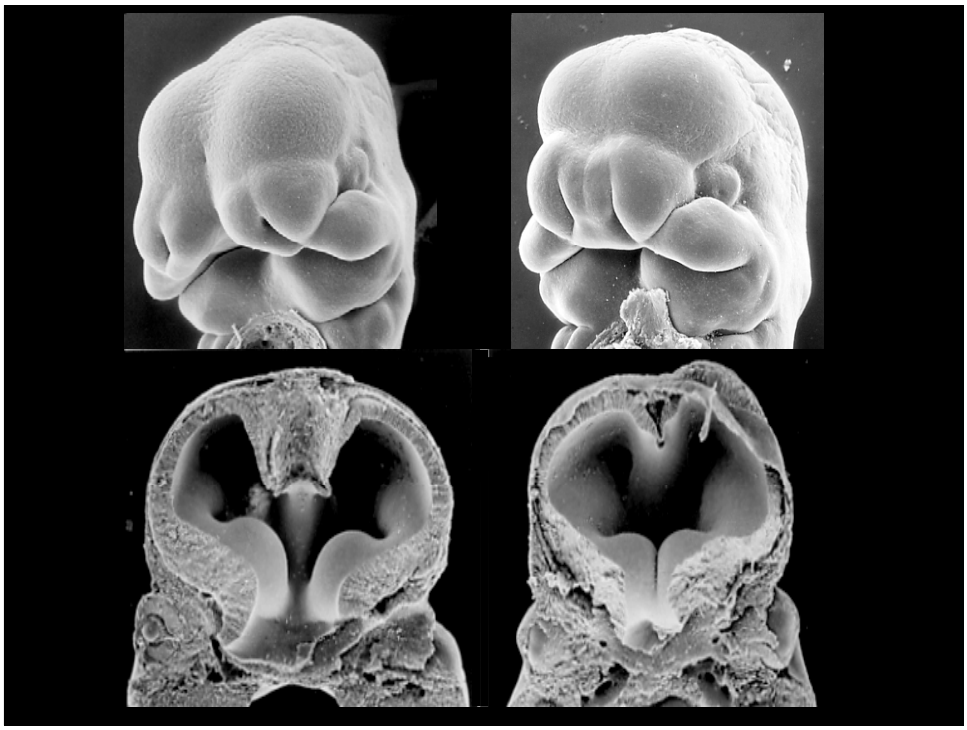



Ethanol – induced
"unusual" facial clefts

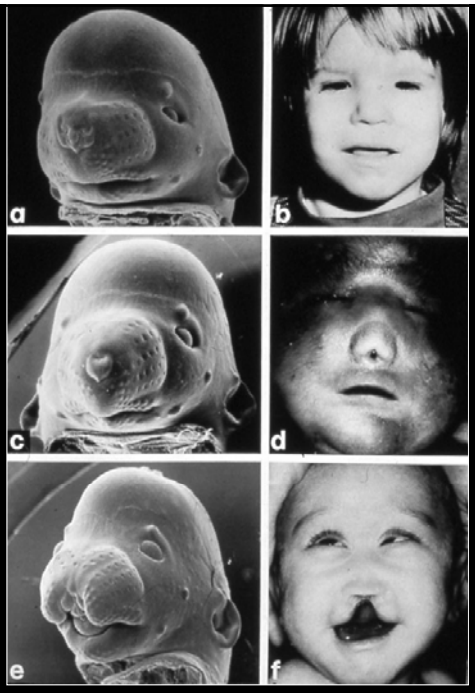

Human development from day 17-32 post-fertilization corresponds to day 7-11 in the mouse
Day 17
Day 22
Day 26
Day 29
Day 32
Human
Mouse
Day 7
Day 8
Day 9
Day 10
Day 11



from W.C. Dunty et al, 2001



Gestational Day 7 alcohol-induced facial abnormalities range from mild to severe, with the latter falling within the holoprosencephaly spectrum



from K.K. Sulik, 2005

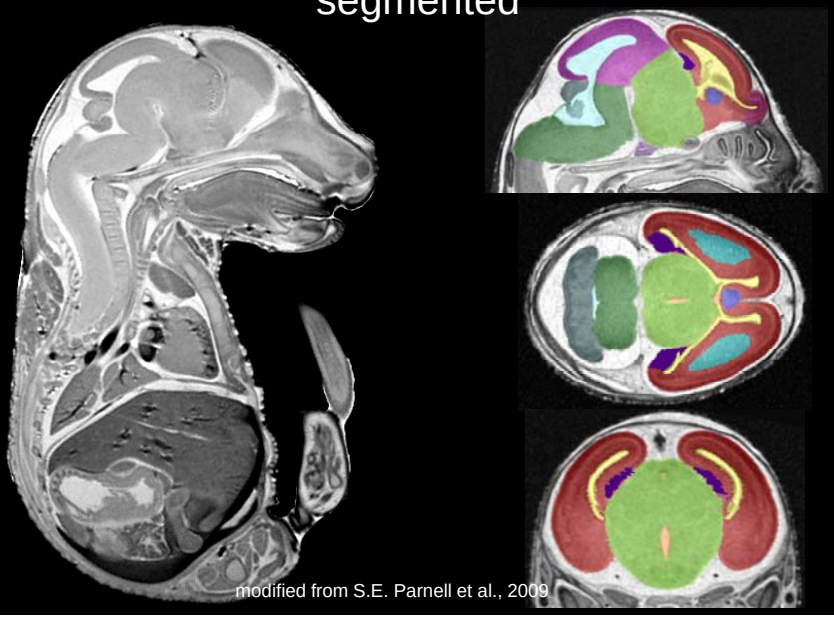
High Resolution Magnetic Resonance Imaging

Gestational Day 17
Mouse Fetus
17 mm crown rump length

=

Week 13 Human Fetus
92 mm crown rump length

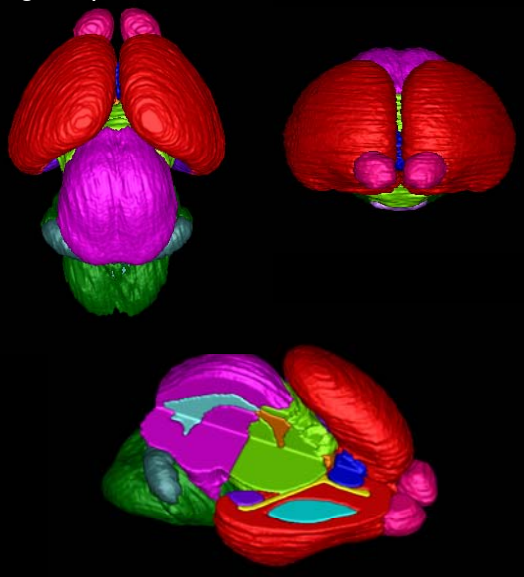
MRI scans of fetal mouse brains are manually segmented



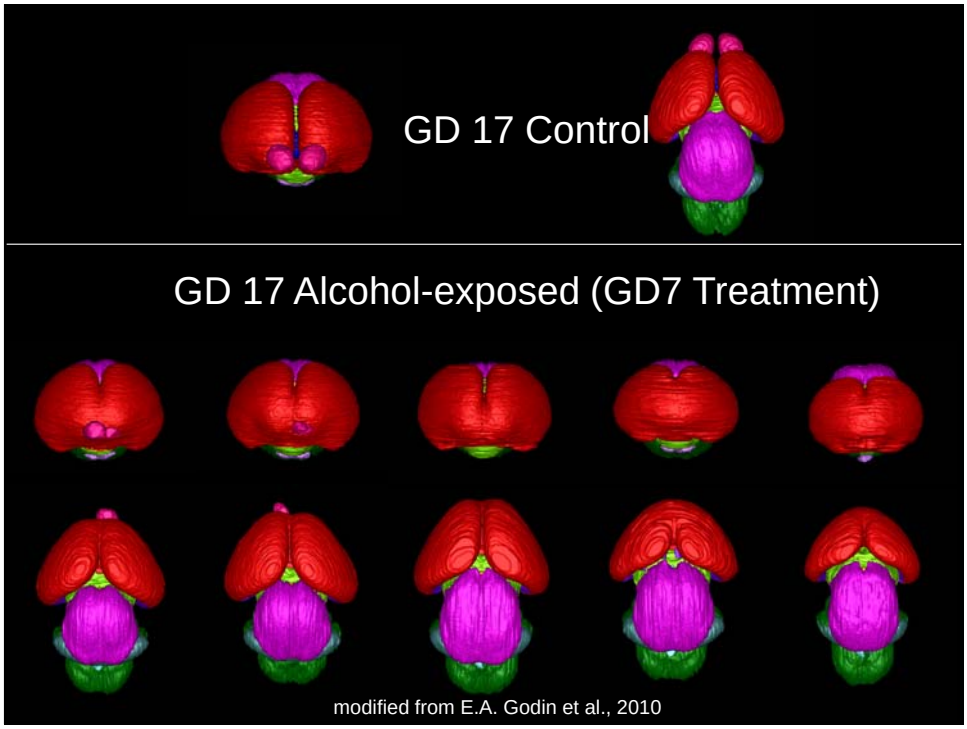
modified from S.E. Parnell et al., 2009

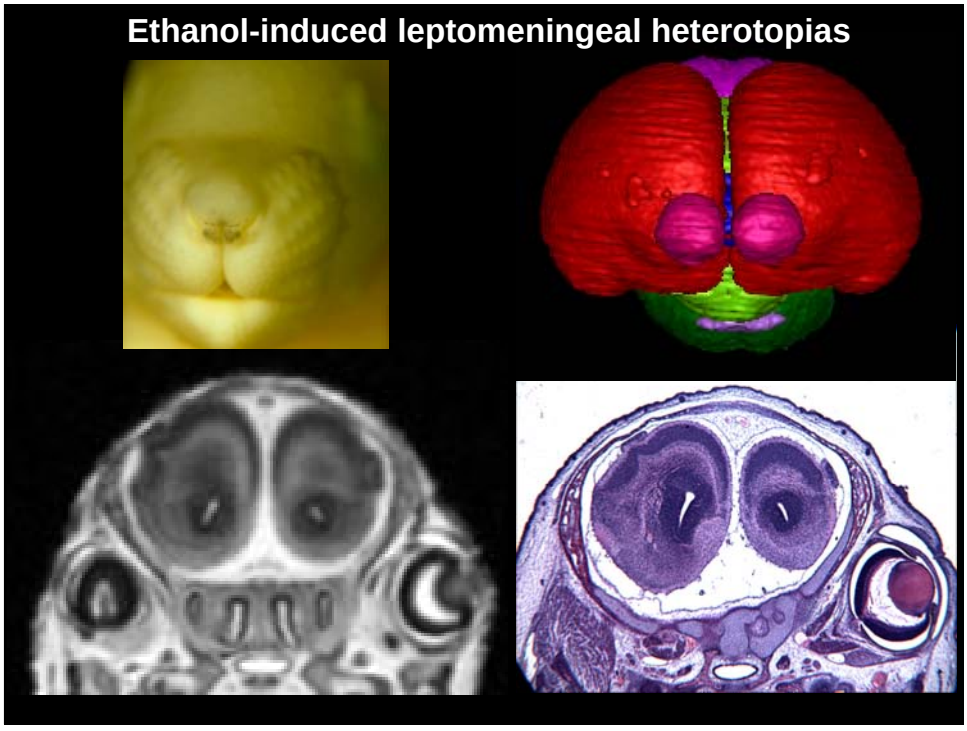
3-D reconstructions made from MRI scans provide information regarding shape and volume.

- CEREBRAL CORTEX
- LATERAL VENTRICLES
- CAUDATE NUCLEUS
- OLFACTORY BULBS
- HIPPOCAMPUS
- SEPTAL NUCLEI
- THALAMUS
- THIRD VENTRICLE
- MIDBRAIN
- 4th VENT AND CA
- PONS AND MEDULLA
- CEREBELLUM
- PITUITARY

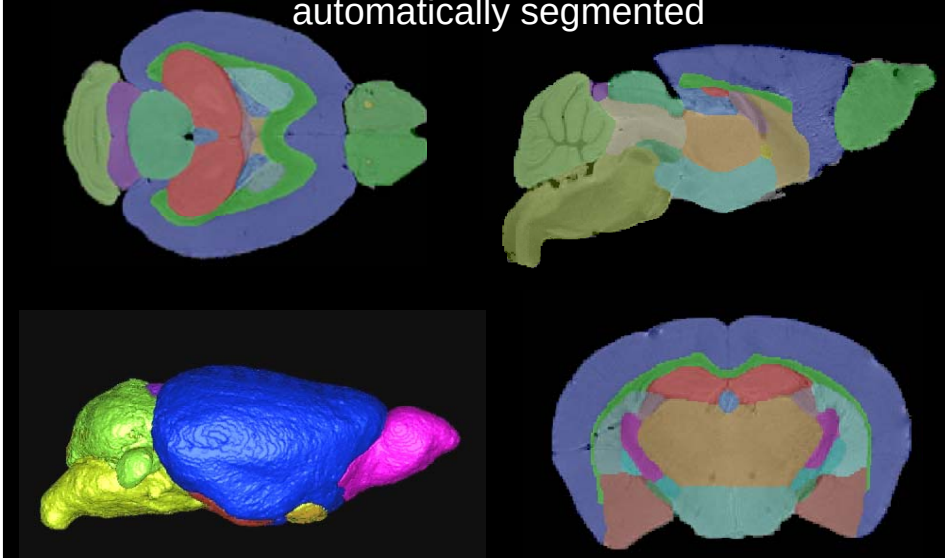


modified from E.A. Godin et al., 2010

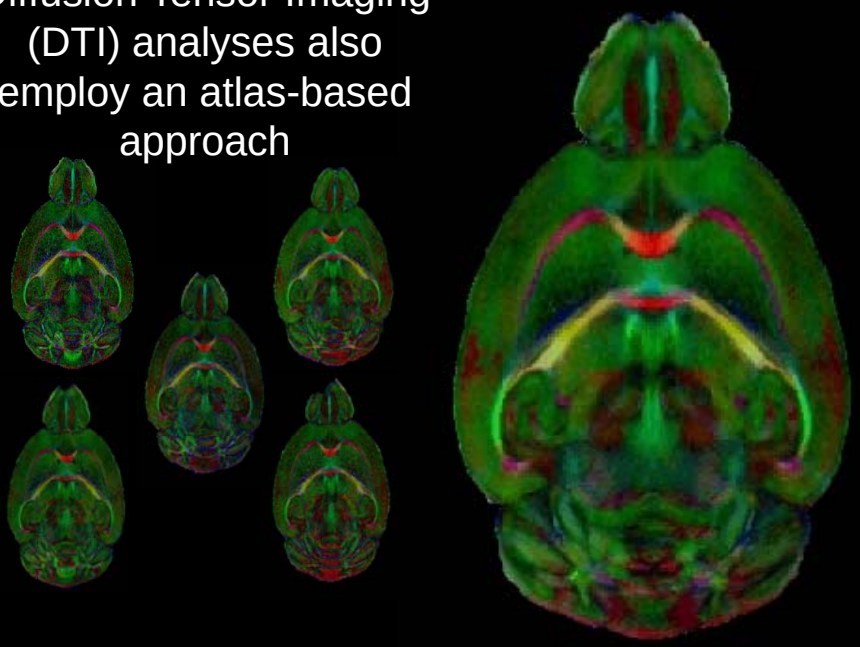

GD 17 Control
GD 17 Alcohol-exposed (GD7 Treatment)
modified from E.A. Godin et al., 2010

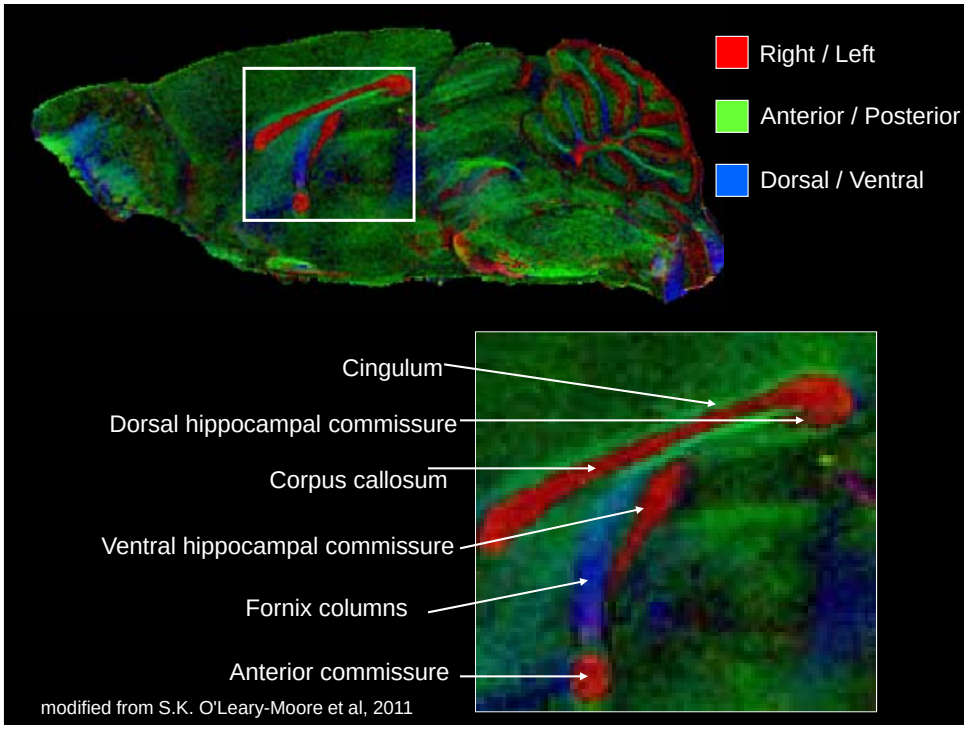

Ethanol-induced leptomeningeal heterotopias

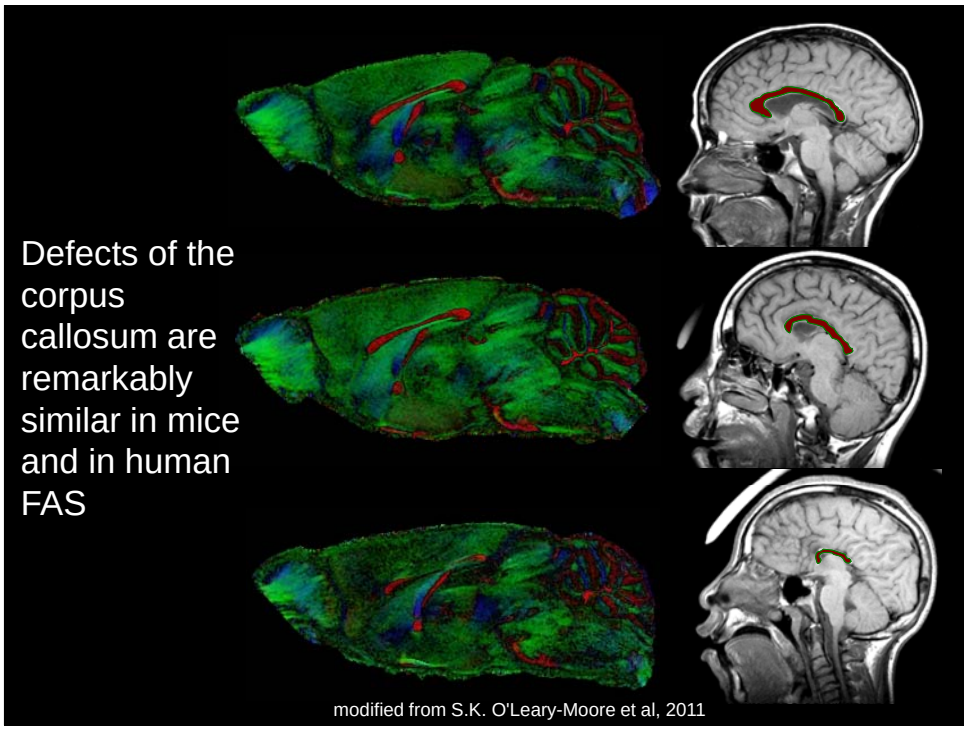
MRIs of adolescent and adult mouse brains are automatically segmented



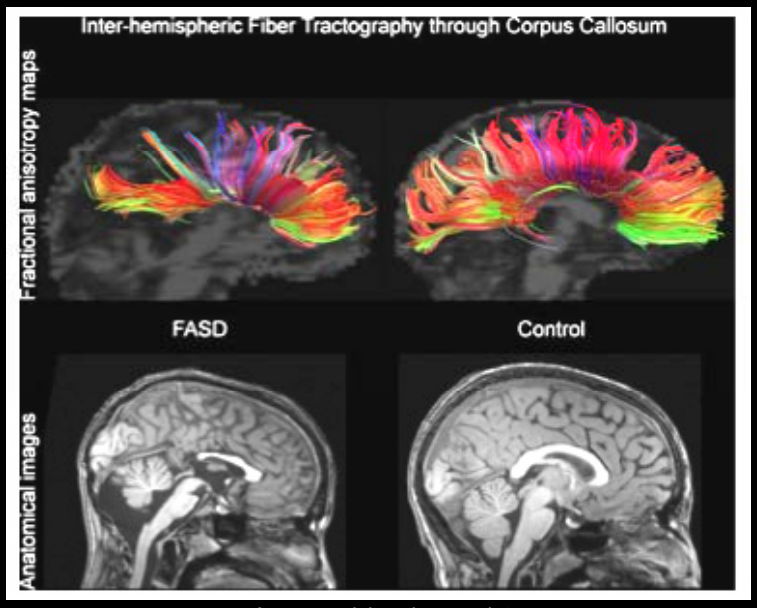
Diffusion Tensor Imaging (DTI) analyses also employ an atlas-based approach




Right / Left
Anterior / Posterior
Dorsal / Ventral
Cingulum
Dorsal hippocampal commissure
Corpus callosum
Ventral hippocampal commissure
Fornix columns
Anterior commissure
modified from S.K. O'Leary-Moore et al, 2011

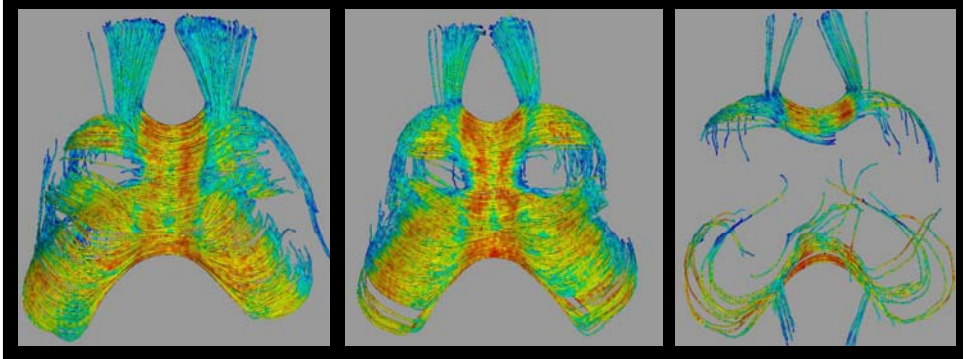

Defects of the corpus callosum are remarkably similar in mice and in human FAS
modified from S.K. O'Leary-Moore et al, 2011

Fiber Tractography illustrates Corpus Callosum abnormalities in individuals with FASD



from Wozniak and Muetzel, 2011

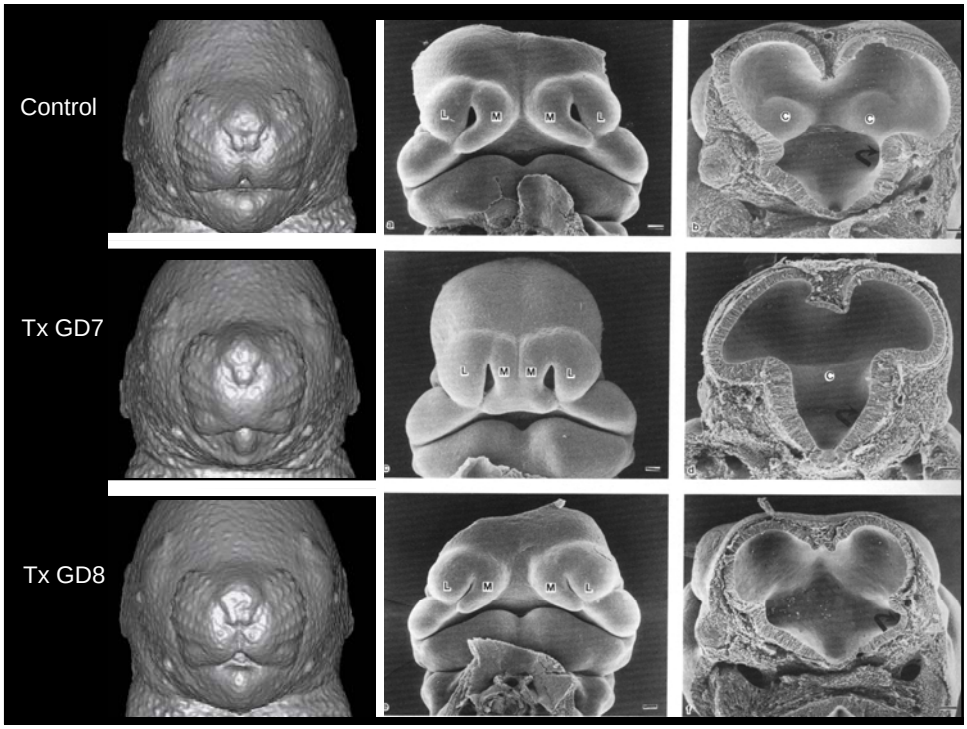
Fiber tract reconstruction of the corpus callosum in postnatal day 45 mice

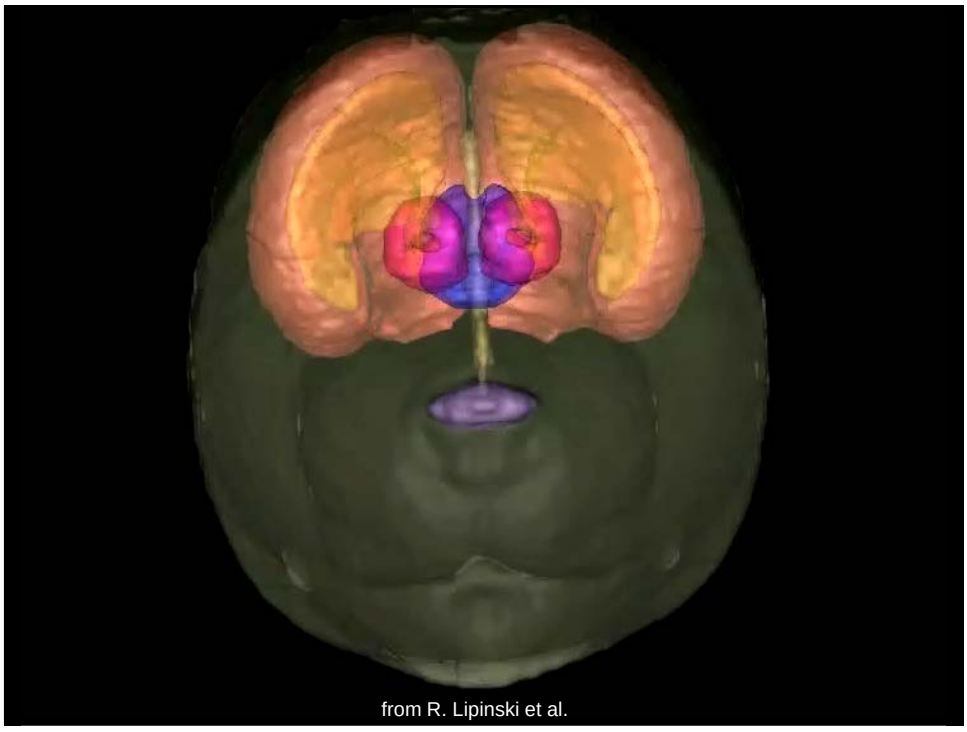


Control

Prenatal ethanol exposure

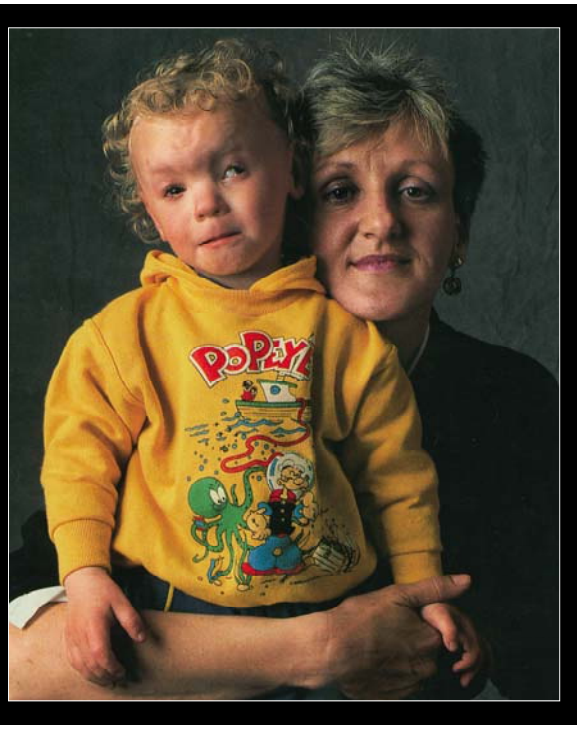
from O'Leary-Moore et al.





from R. Lipinski et al.

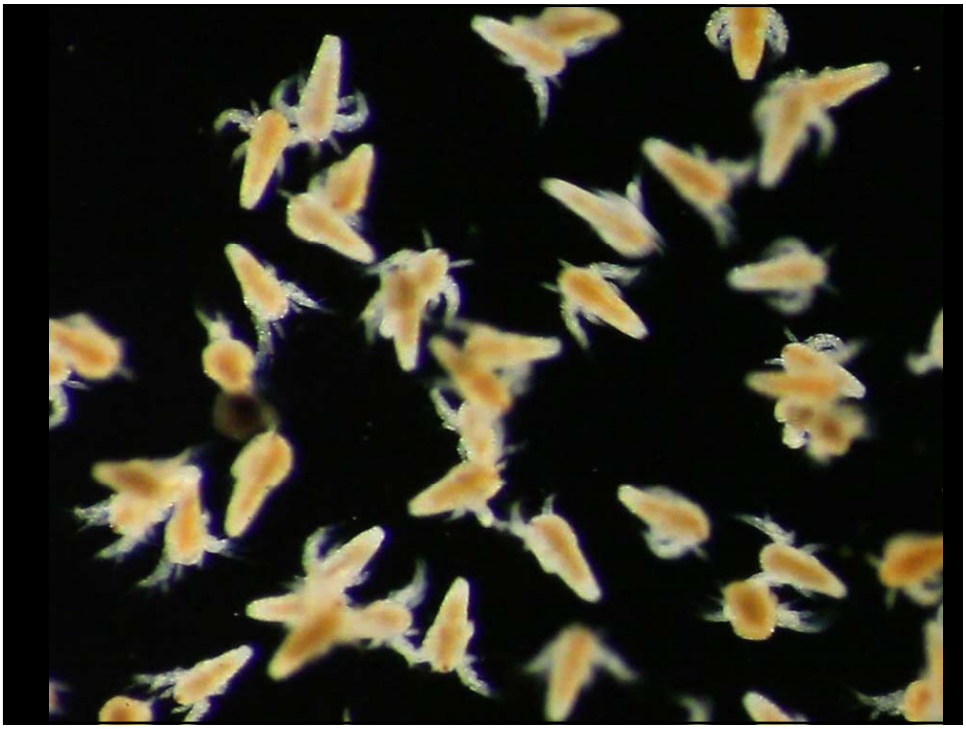
Maternal alcohol abuse can cause permanent CNS damage at virtually any prenatal stage including those stages that occur prior to the time that most pregnancies are recognized

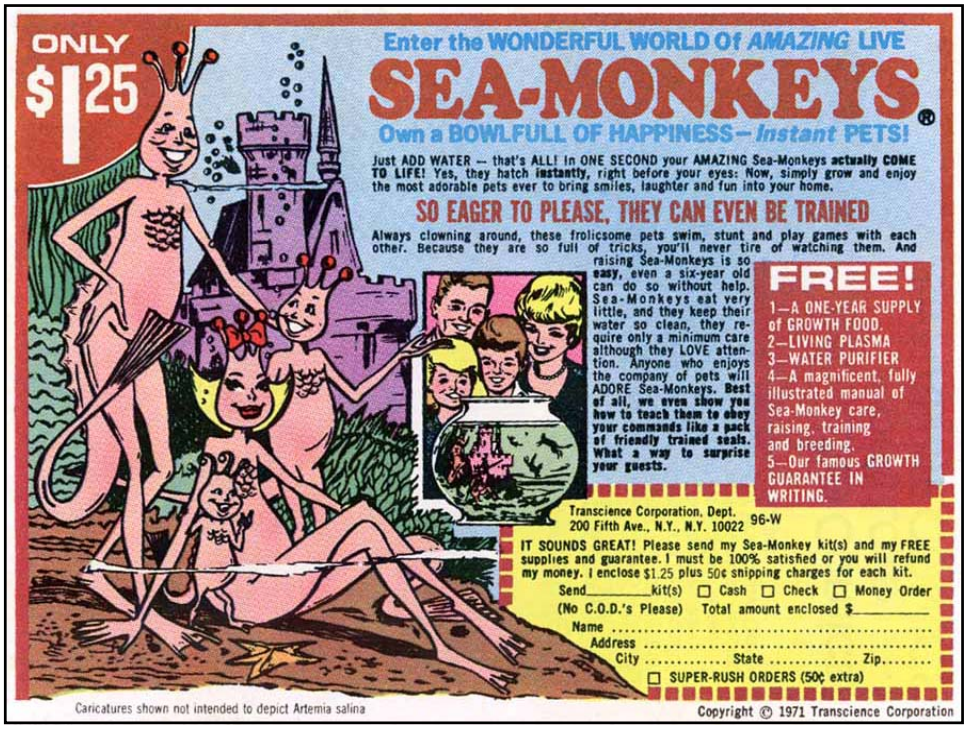


Prevention-directed curricula

Better Safe Than Sorry: Preventing a Tragedy

http://pubs.niaaa.nih.gov/publications/Science/curriculum.html

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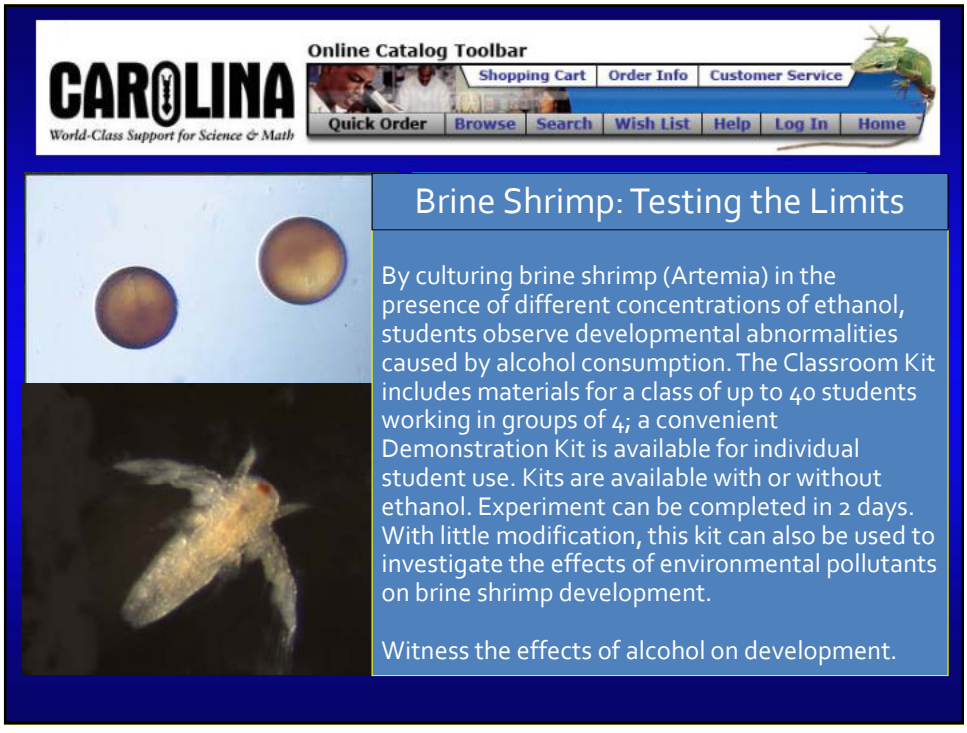
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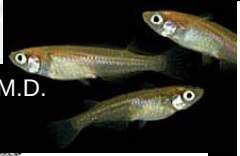
Charles R Stockard, M.D.
1879-1939

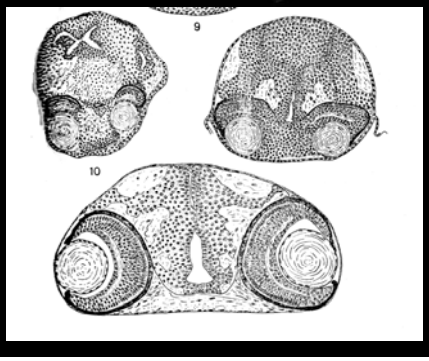
Am. J. Anatomy 1910
Vol 10 pp 369-392

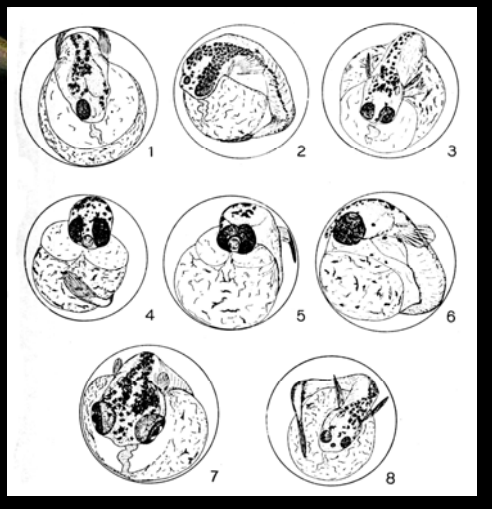
THE INFLUENCE OF ALCOHOL AND OTHER ANÆSTHETICS ON EMBRYONIC DEVELOPMENT

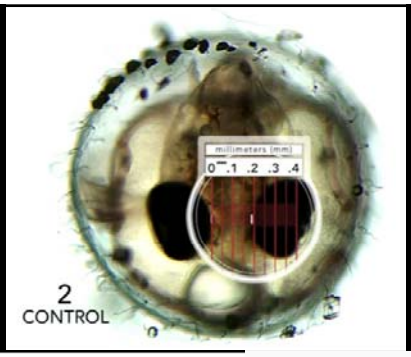
CHARLES R. STOCKARD

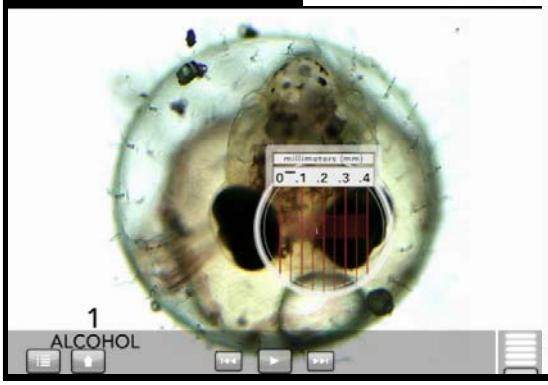
Anatomical Laboratory, Cornell University Medical School, New York City

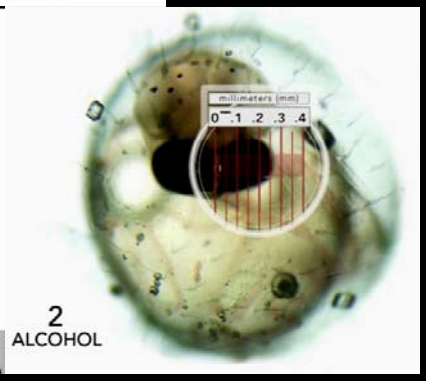


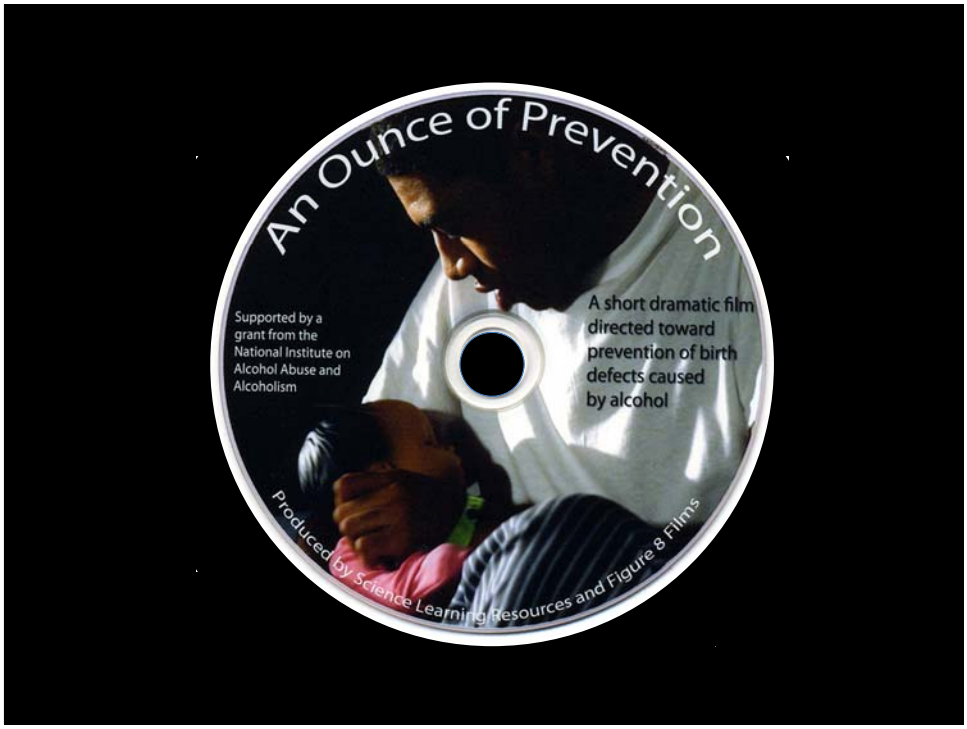











An Ounce of Prevention
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