



The Digital Embryology Consortium (DEC)

Never Stand Still

Dr Mark Hill

The objective of this international partnership is to:
digitise, preserve, and make available for researchers
the major embryology histological collections.

Dr Mark Hill

Head of Embryology

Anatomy, School of Medical Sciences
Room 221, level 2, Wallace Wurth West
UNSW AUSTRALIA

UNSW SYDNEY NSW 2052 AUSTRALIA

T: +61 (2) 9385 2477

E: m.hill@unsw.edu.au

W: medicalsciences.med.unsw.edu.au

Seminar - 3 December 2015

National Museum of Health and Medicine

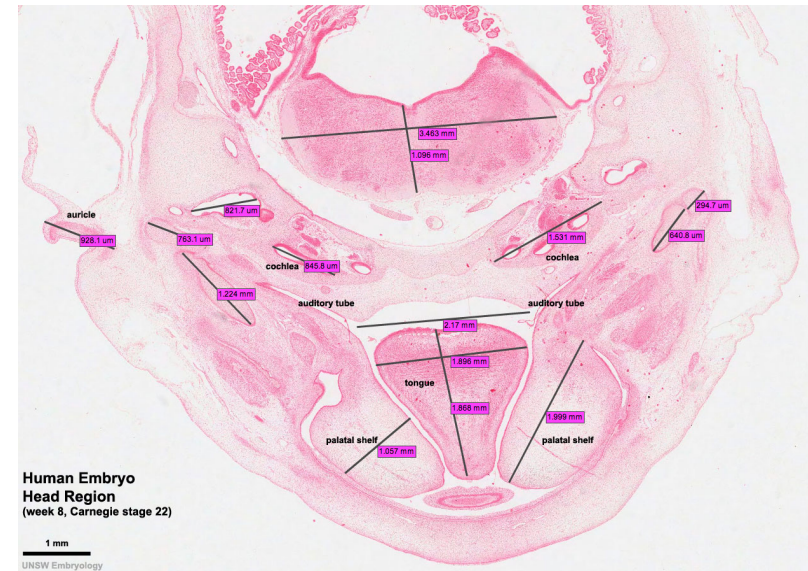
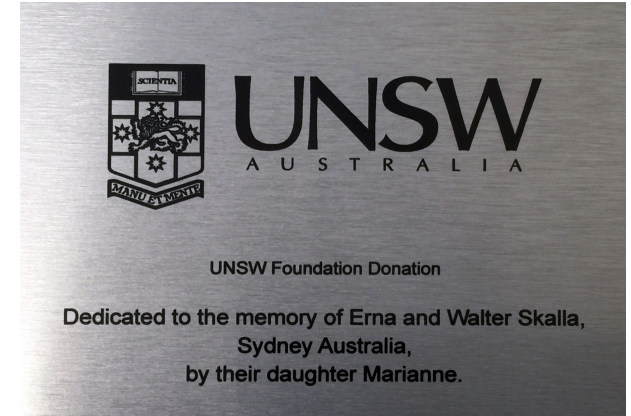
<http://human-embryology.org>



Dr Mark Hill

Digital Embryology Consortium

- **2013** visited major embryology collections
- **2014** planned with partners the digitization project
 - Researched scanner options
- **2015** purchased Zeiss Axioscan.Z1
 - Special thanks **Marianne Skalla** and the UNSW Foundation



Embryo (Stage 22) from the UNSW collection

Official Opening of DEC Göttingen University

- April 2015 – 3 major collections and Zeiss represented.



Prof Christoph Viebahn



Prof. Beate Brand-Saberi

Official Opening of DEC Kyoto University

- Kyoto Symposium (28 Nov 2015)
- Collection scanning will start in 2016



Congenital Anomaly Research Center
Kyoto University
Graduate School of Medicine
40th Anniversary
Commemoration Symposium

京都大学医学研究科
先天異常標本解析センター
開設40周年記念シンポジウム



Dr Mark Hill
Head of Embryology
Anatomy, School of Medical Sciences
Room 221, level 2, Wallace Wurth West

UNSW AUSTRALIA
UNSW SYDNEY NSW 2052 AUSTRALIA
T: +61 (2) 9385 2477
E: m.hill@unsw.edu.au
W: medicallibrary.med.unsw.edu.au



**Developing the Digital Kyoto
Collection in Education and
Research**

Never Stand Still

Dr Mark Hill



1. Education – Kyoto Collection eBook
2. Research – Digital Embryology Consortium

Consortium Partners and Collaborators

Digital Embryology Consortium



museum für
naturkunde
berlin



UNSW
Australia

Kyoto
University

University of
Göttingen

Ruhr-
University
Bochum

Museum für
Naturkunde
Berlin

Complutense
University of
Madrid

School of
Medical
Sciences,
Medicine

Graduate
School of
Medicine

Anatomy and
Embryology,
Medicine

Hinrichsen
Human
Embryology
Collection

Embryological
Collection

Department of
Anatomy and
Embryology,
Medicine

Dr. Mark Hill

Prof. Shigehito
Yamada

Prof. Christoph
Viebahn

Prof. Beate
Brand-Saberi

Dr. Peter Giere

Prof. José F.
Rodríguez-
Vázquez

<http://human-embryology.org>

Consortium Partners and Potential Collaborators

Digital Embryology Consortium



University of British Columbia

Perry-Arey-Milligan
Collection

Prof. Virginia Diewert



National Museum of Health
and Medicine*

Human Developmental Anatomy
Center

Ms Elizabeth Lockett

* Research collaborators



Universitat Autònoma de
Barcelona**

Barcelona Embryos

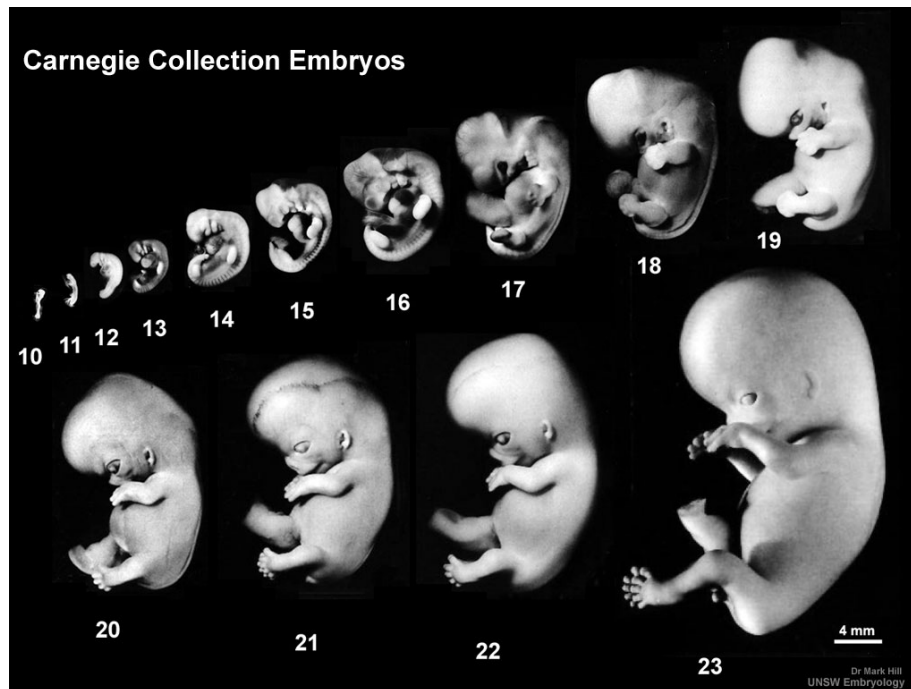
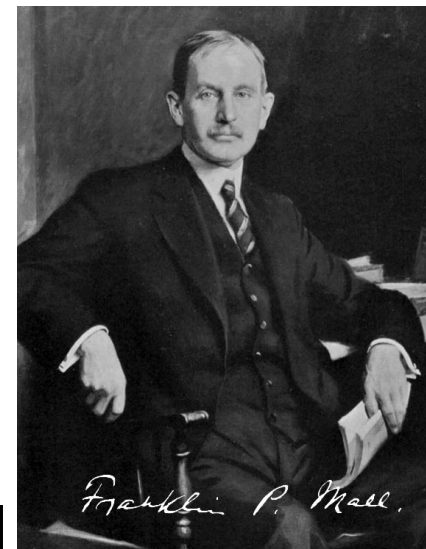
Dr Mirapeix

** In progress

<http://human-embryology.org>

USA - NMHM Developmental Collections

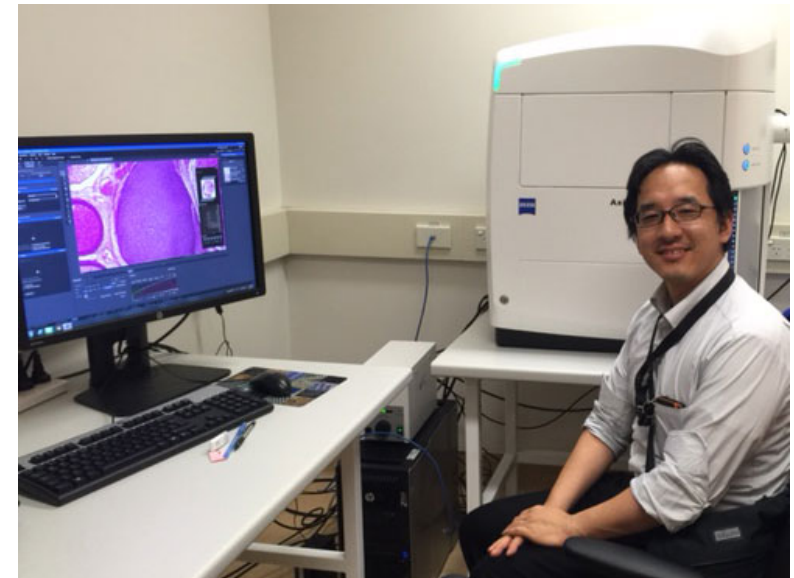
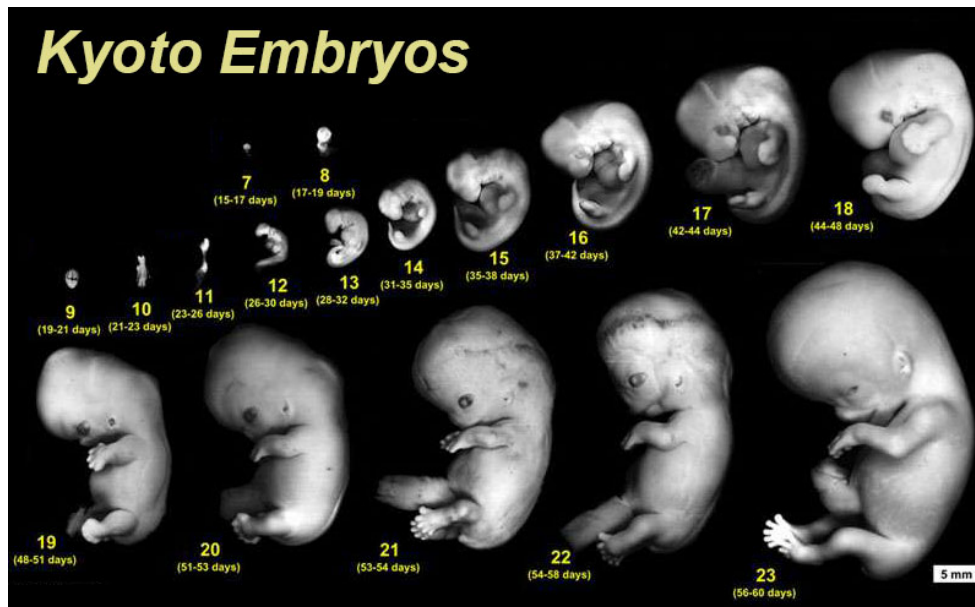
- **Carnegie Collection of Embryology**
 - Normal development in the first eight weeks.
- **George Sedgewick Minot Embryological Collection**
 - Harvard School of Medicine collected by Charles S. Minot.
- **Hooker-Humphrey Collection**
 - University of Chicago then University of Alabama neural development.
- **Cornell Human and Comparative Embryology Collection**
 - Cornell School of Veterinary Medicine includes human, rat, mouse and guinea pig.



Elizabeth Lockett

Kyoto – Embryology Collection

- 44,000 embryos 1962 to 1974
- Normal and abnormal
- Histology and whole embryos
- Researchers are actively using the collection

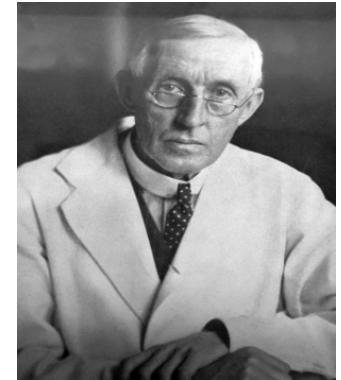


Prof Shigehito Yamada

Sydney March 2015 – testing the Axioskan digital scanner.

Berlin – Embryological Collections

- Hubrecht, Hill, Dohrn, Bolk and Kückenthal collections
- Histology and whole embryos
- Human and many other species
- Study leave 2013-14

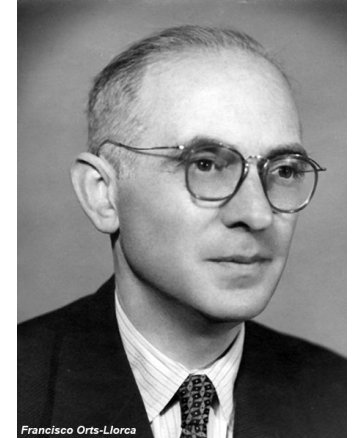


Dr Peter Giere



Madrid – Embryology Collection

- Histology collection
- Covering embryonic and fetal
- 100+ specimens



Francisco Orts-Llorca

Francisco Orts-Llorca
(1905-1993)



Human Embryo 15 mm
Madrid Collection



Prof José Rodríguez-Vázquez

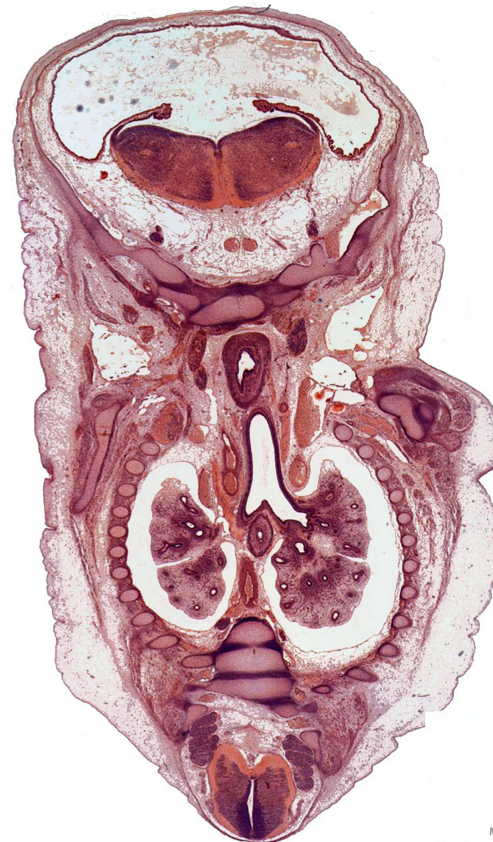
Ruhr-Universität Bochum

Hinrichsen Collection

- **Klaus Volquardt Hinrichsen (1927-1997)**
 - Department of Anatomy and Molecular Embryology
 - Collected between 1969 and 1994
 - Histological sections of 100+ specimens from 4 to 20 weeks
 - Plastic sections of 20 specimens
 - Additional 70 unsectioned fetuses



ME 54 Carnegie stage 21
22.5 mm, 8 weeks, female, frontal,
(Stain - Haematoxylin Eosin)



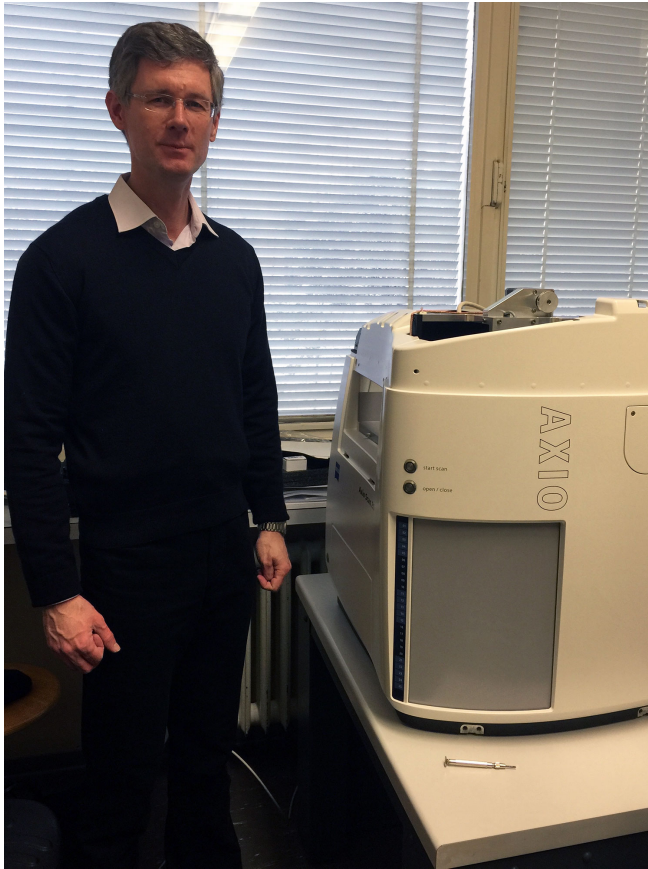
Göttingen - Blechschmidt Collection

- **Erich Blechschmidt (1904–92)**
 - Director of Göttingen University's Anatomical Institute from 1942 until 1973.
 - 200,000 serial sections of embryos and 64 models.
 - Some of the collection were assigned Carnegie Nos. 10315 -10434 in 1972.



Prof. Christoph Viebahn

Zeiss Axio Scan.Z1 - Slide Digitization



Dr. Thorsten Heupel (Zeiss Product Manager)

- Handle a range of slide sizes
- Does not directly handle the slide
- Generates high resolution digital image
- Automatically
 - Selects regions of interest
 - Adjusts focus
 - Handles 50 to 100 slides
- Can be transported to each collection in its own transport case

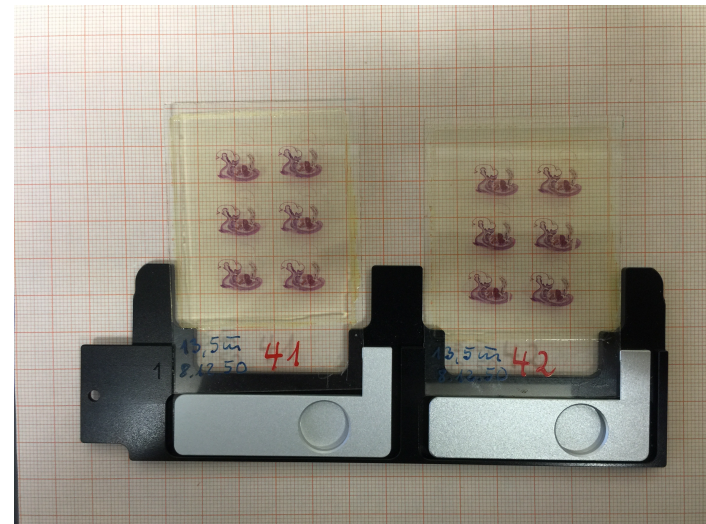


Zeiss Axio Scan.Z1

Zeiss Axio Scan.Z1 – Transport

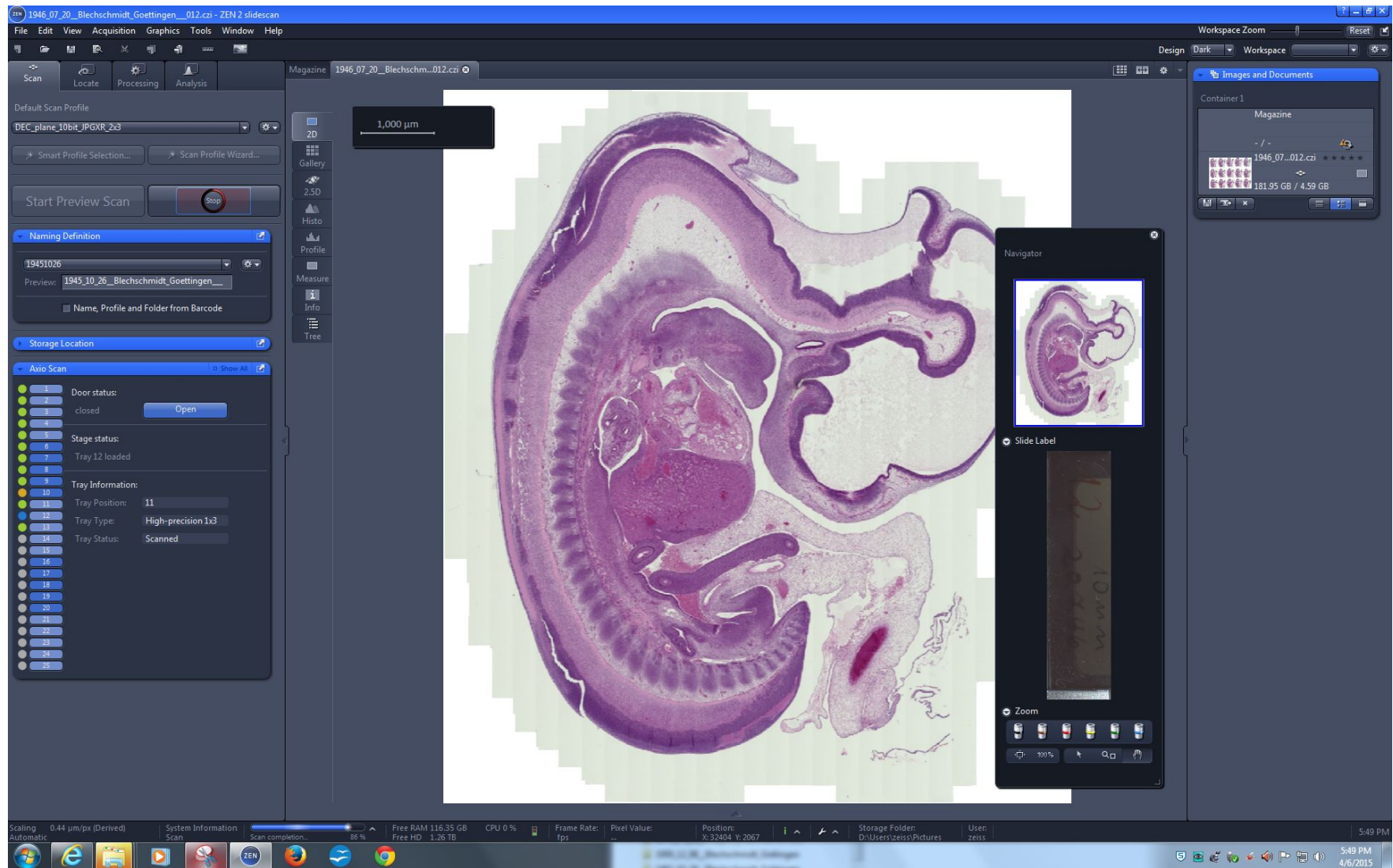


Box includes also all the accessories!



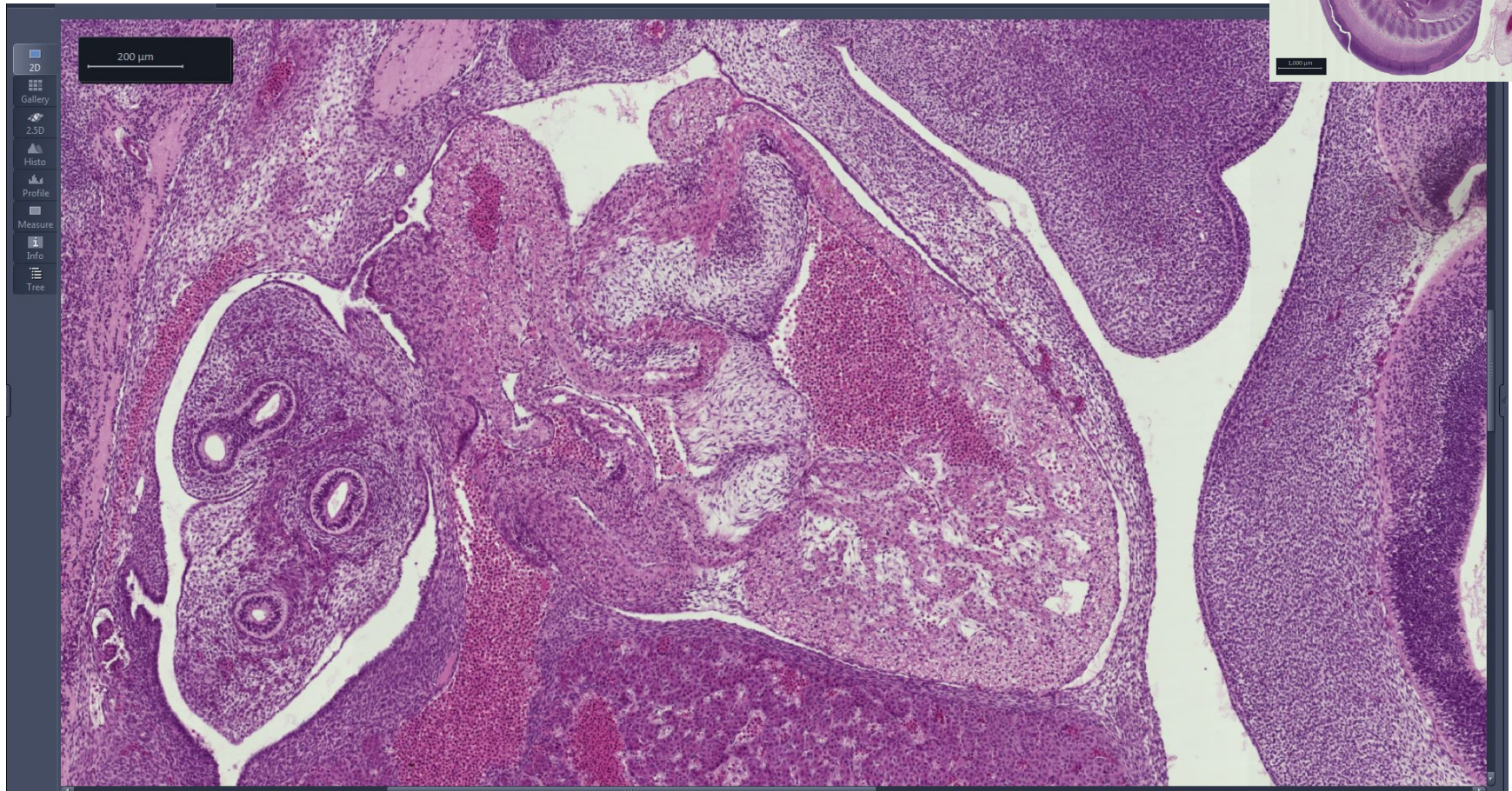
Specialised slide holders for oversize slides

Bleichschmidt Embryo Scanning - 2015

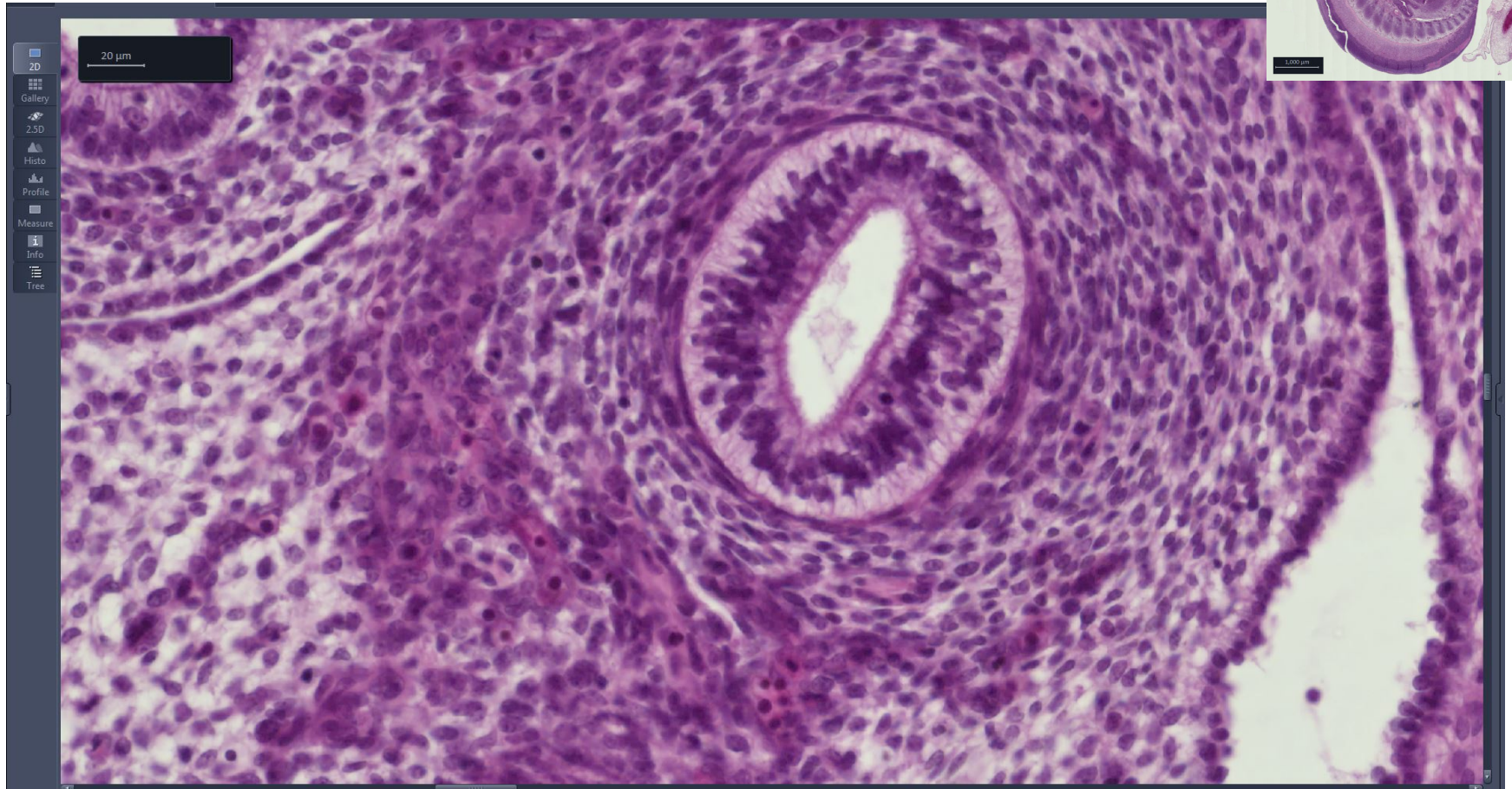
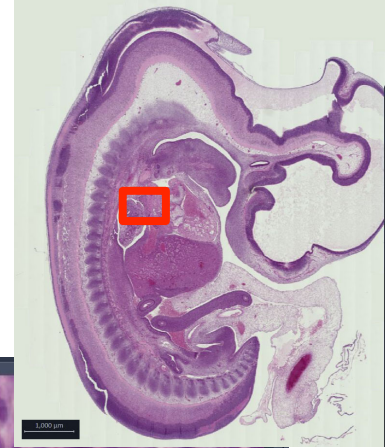


Scanned embryo viewed in Zen software

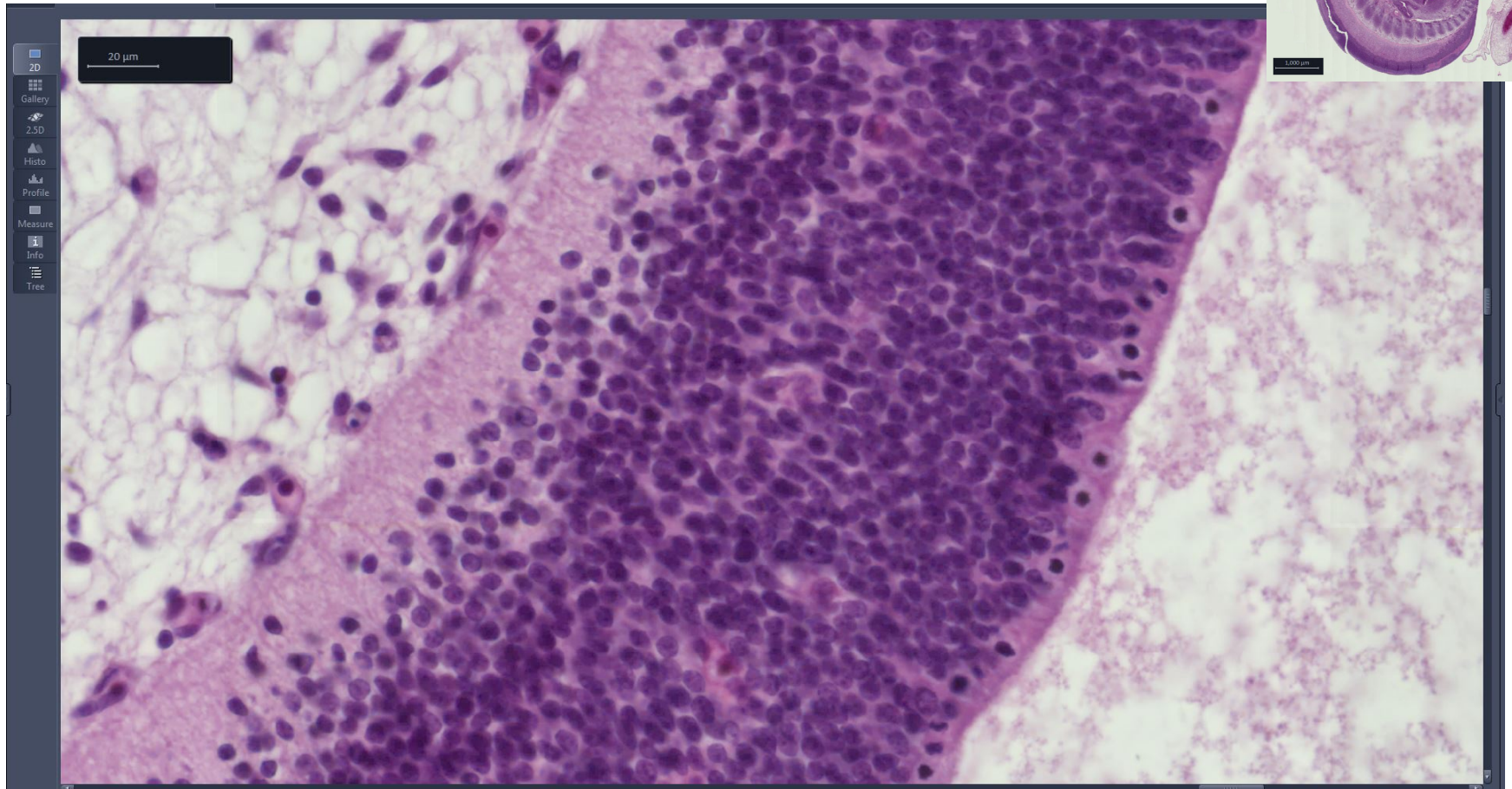
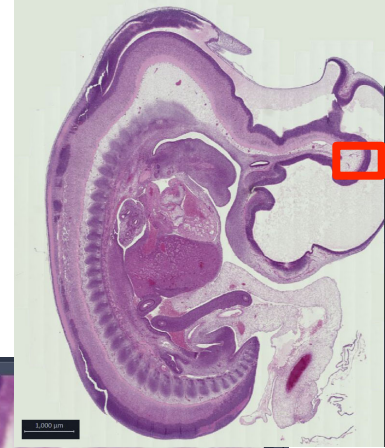
Lung and Heart



Bronchiole and Developing Lung



Developing CNS – ventricular mitosis

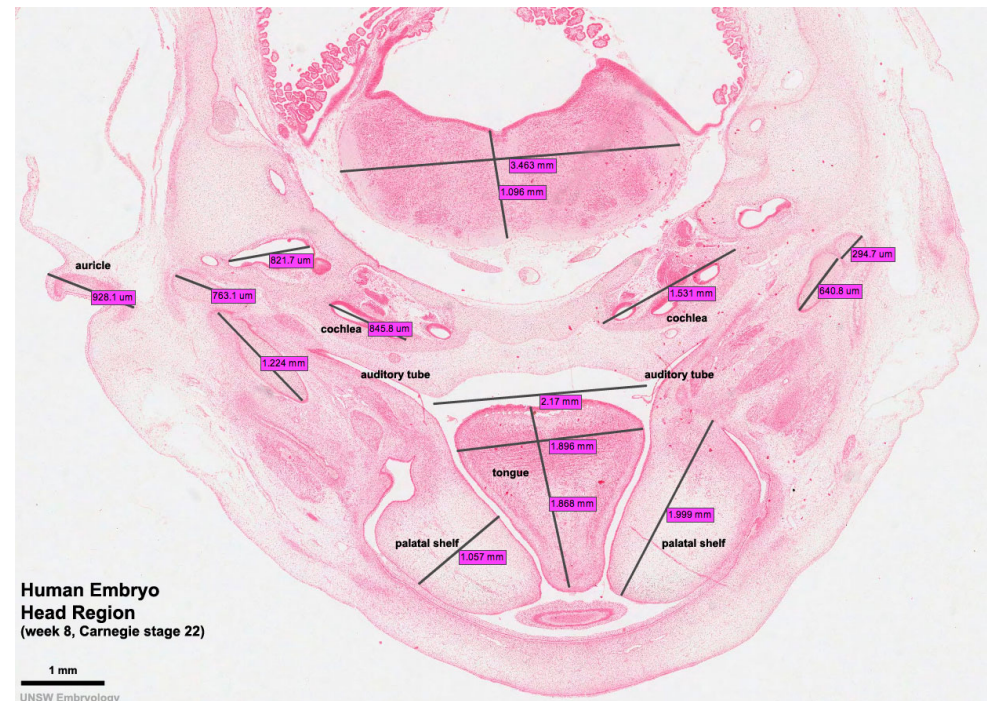


Online Image Database



- Open Microscope Environment
 - OMERO image database
 - Tiff format images compatible with Zeiss
 - Scanner metadata included
- Separate programs available
 - Image upload
 - Image analysis
 - <http://www.openmicroscopy.org>
- Test Database Server
 - <http://149.171.80.223:4080>
- **Server Demonstration**

“OME develops open-source software and data format standards for the storage and manipulation of biological microscopy data. It is a joint project between universities, research establishments, industry and the software development community.”



Stage 22 Embryo from the UNSW collection