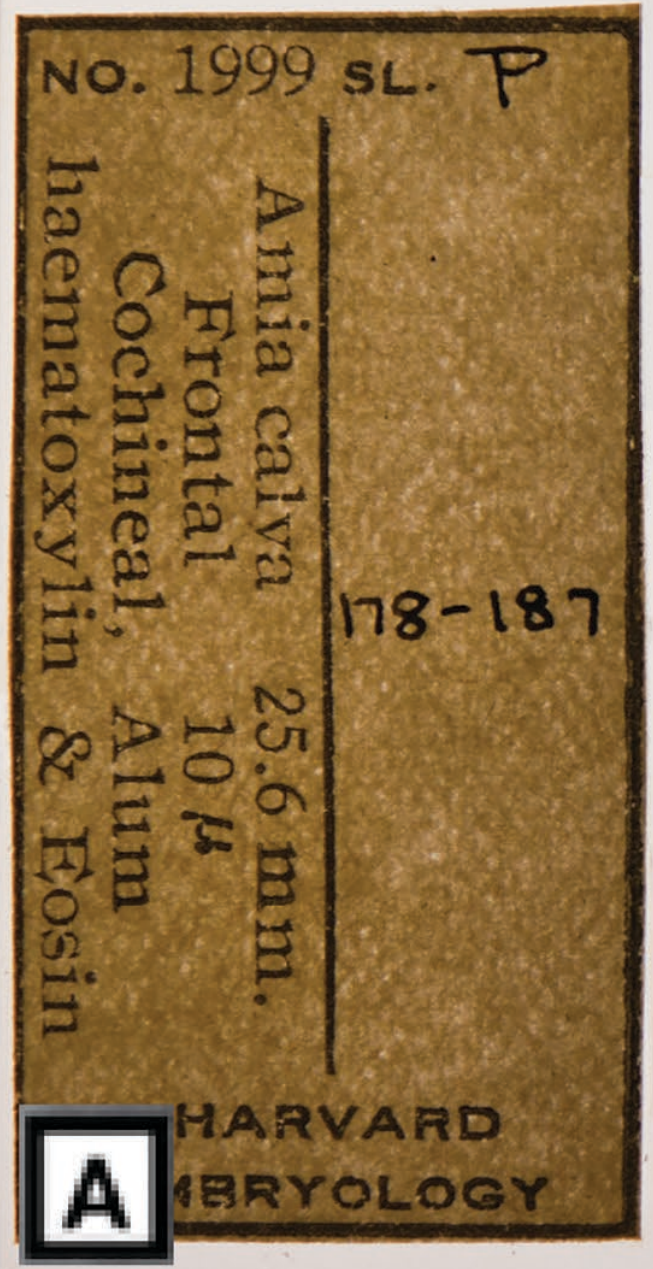
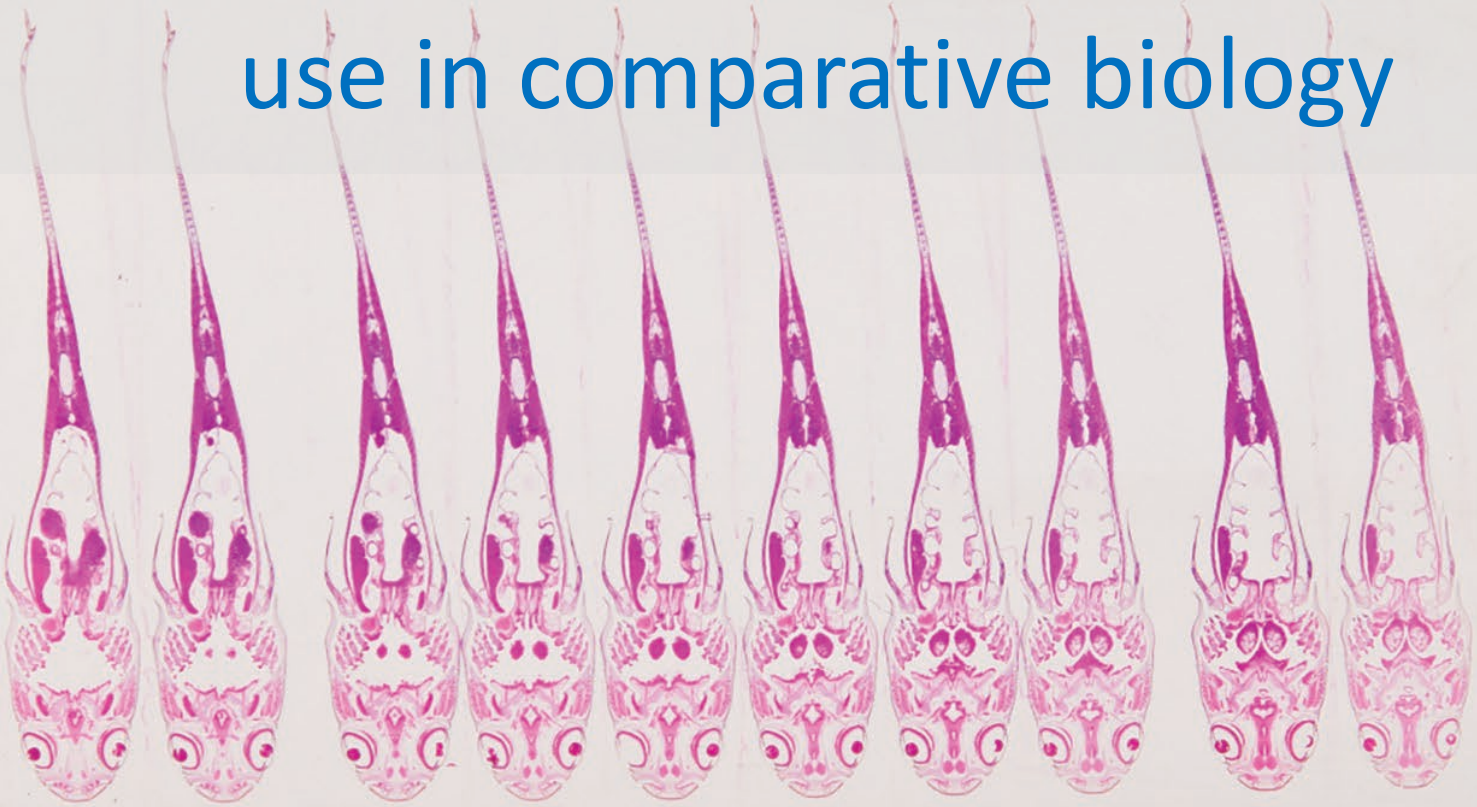


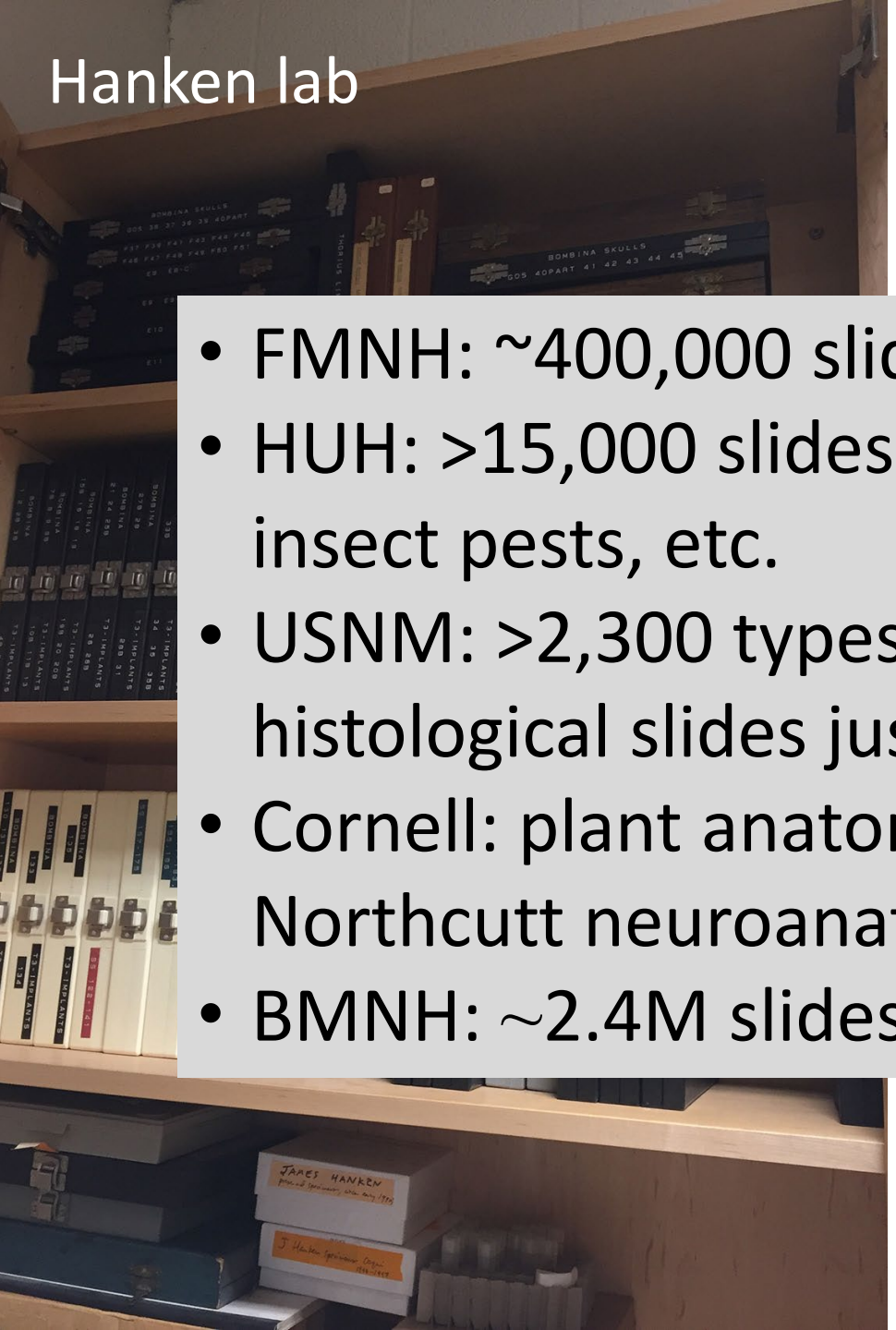
Unlocking the vault: mass digitization and imaging of historical slide collections for use in comparative biology

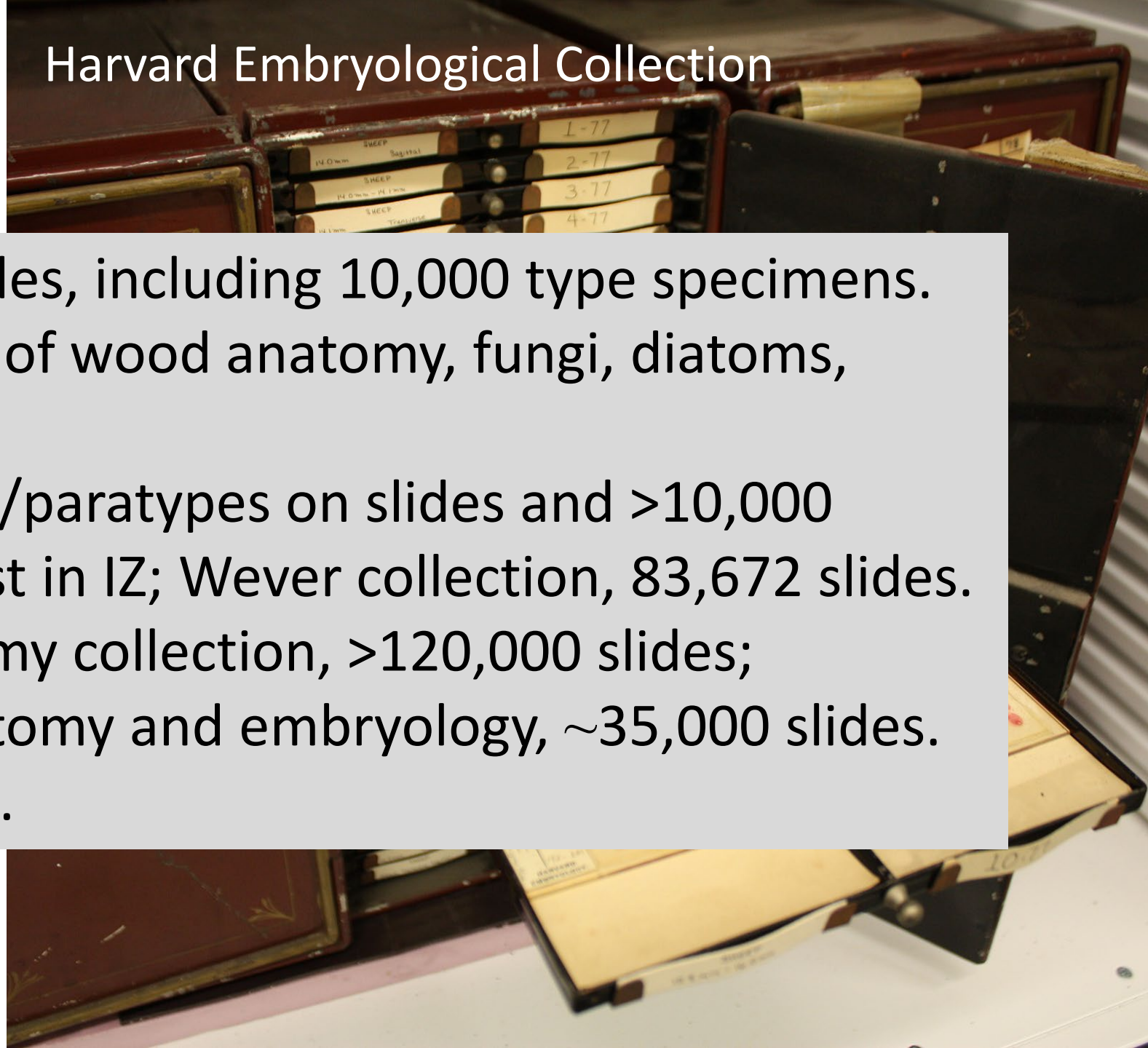


5 mm

James Hanken[1], Stephen Turney[2] & Linda Ford[1]

[1]Museum of Comparative Zoology [2]Center for Brain Science
Harvard University

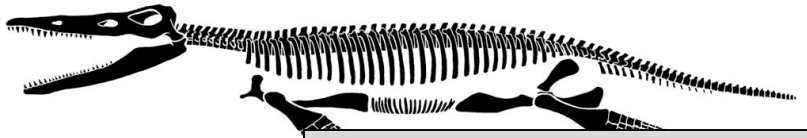




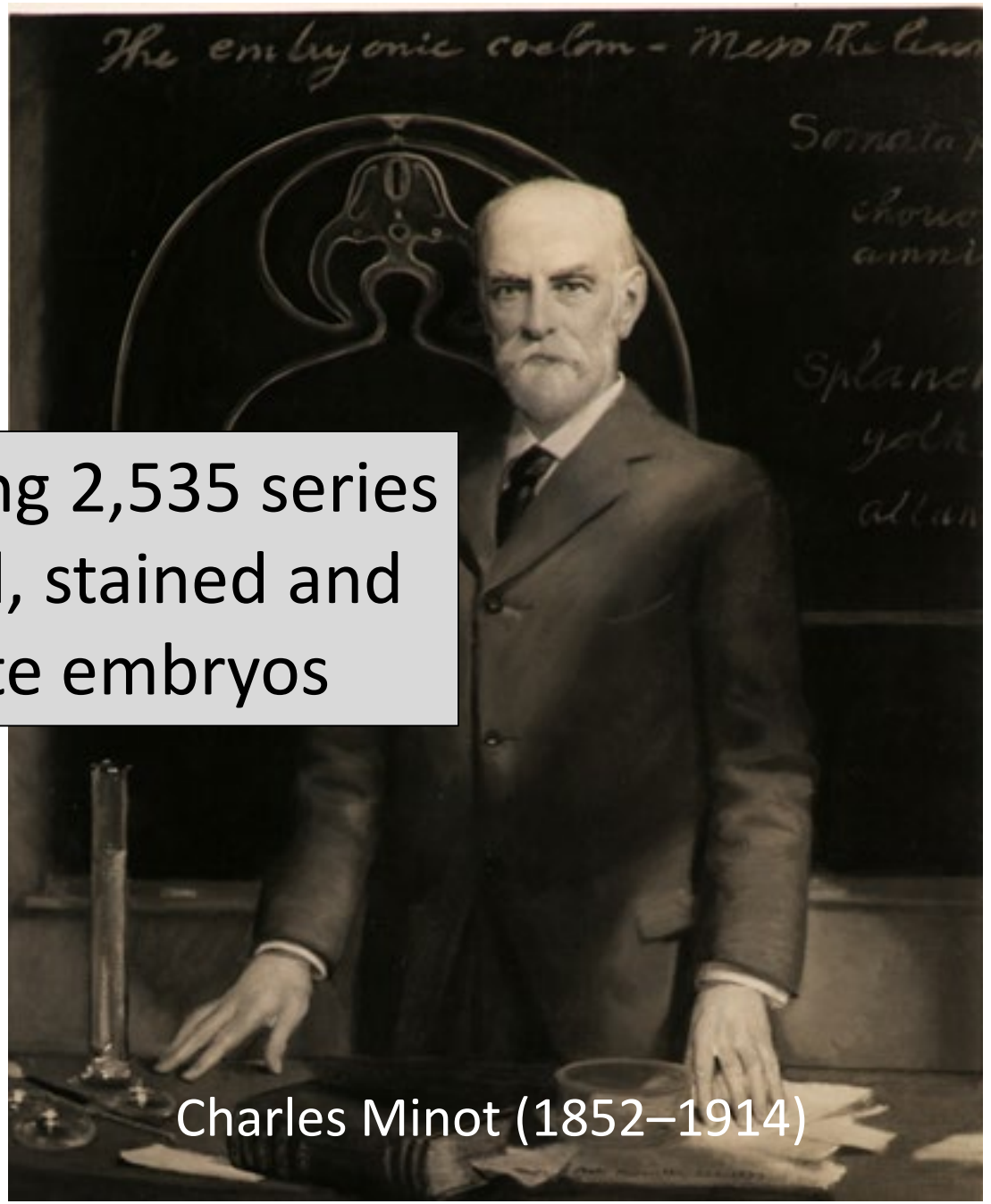
- FMNH: ~400,000 slides, including 10,000 type specimens.
- HUH: >15,000 slides of wood anatomy, fungi, diatoms, insect pests, etc.
- USNM: >2,300 types/paratypes on slides and >10,000 histological slides just in IZ; Wever collection, 83,672 slides.
- Cornell: plant anatomy collection, >120,000 slides; Northcutt neuroanatomy and embryology, ~35,000 slides.
- BMNH: ~2.4M slides.

BREVIORA

Museum of Comparative Zoology



32,000 slides comprising 2,535 series of paraffin-embedded, stained and sectioned vertebrate embryos



Charles Minot (1852–1914)

BIOLOGY LETTERS

rsbl.royalsocietypublishing.org

Research

BIOLOGICAL REVIEWS

Cambridge Philosophical Society

Biol. Rev. (2015), pp. 000–000.
doi: 10.1111/brv.12187

Fishing for jaws in early vertebrate evolution: a new hypothesis of mandibular confinement

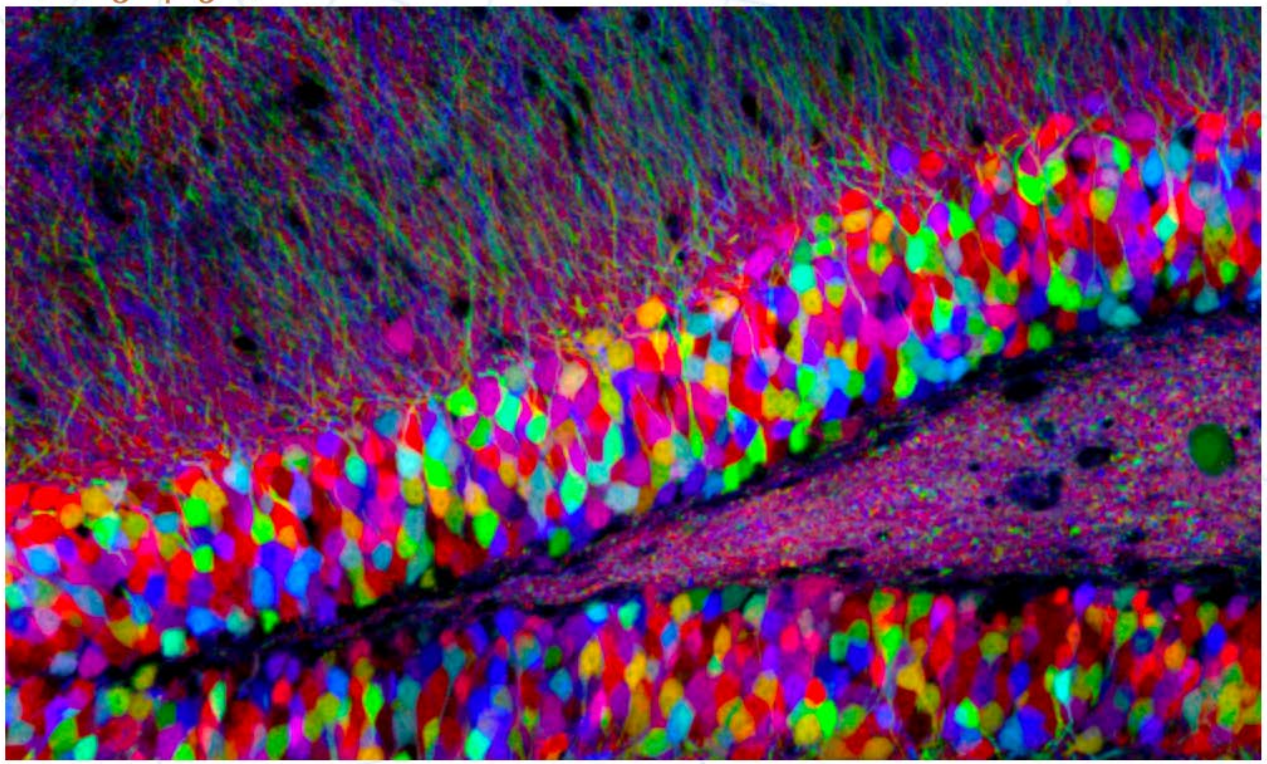
Tetsuto Miyashita*

Department of Biological Sciences, University of Alberta, Edmonton, Alberta T6G 2E9, Canada

CENTER FOR
BRAIN SCIENCE

COMMUNITY | SCIENCE | RESOURCES | ABOUT | CONTACT US

1 2 3 4 5 6



How the brain is wired

NEWS

Development of self-protective biases in response to social evaluative feedback.

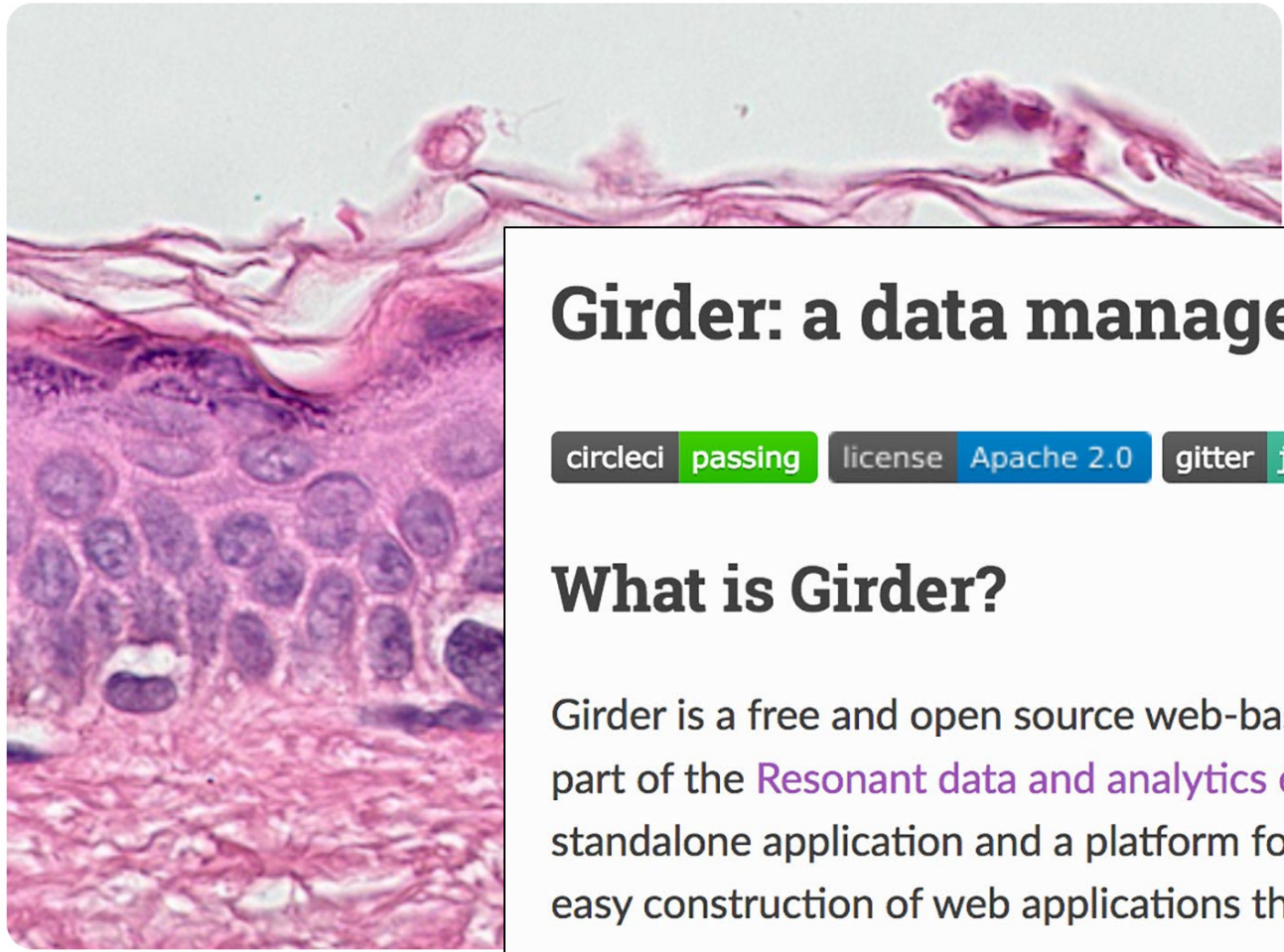
Rodman AM, Powers KE, Somerville LH

Stephen Turney

SlideAtlas | Home | Collections | Status | About | Log in

Welcome to SlideAtlas

Users: Sign in | Register | Guest



Girder: a data management platform

circleci passing | license Apache 2.0 | gitter join chat | discourse forum | coverage 90% | GitHub 161

What is Girder?

Girder is a free and open source web-based **data management platform** developed by Kitware as part of the Resonant data and analytics ecosystem. What does that mean? Girder is both a standalone application and a platform for building new web services. It's meant to enable quick and easy construction of web applications that have some or all of the following requirements:

Semi-Automated Slide-Scanning Workflow

Curate
- Clean and organize slide series into drawers of consolidated slide cabinet
- Index slides by drawer

Setup
- Transfer slides to slide holders
- Auto-acquire preview images
- Refine scan region and focus map

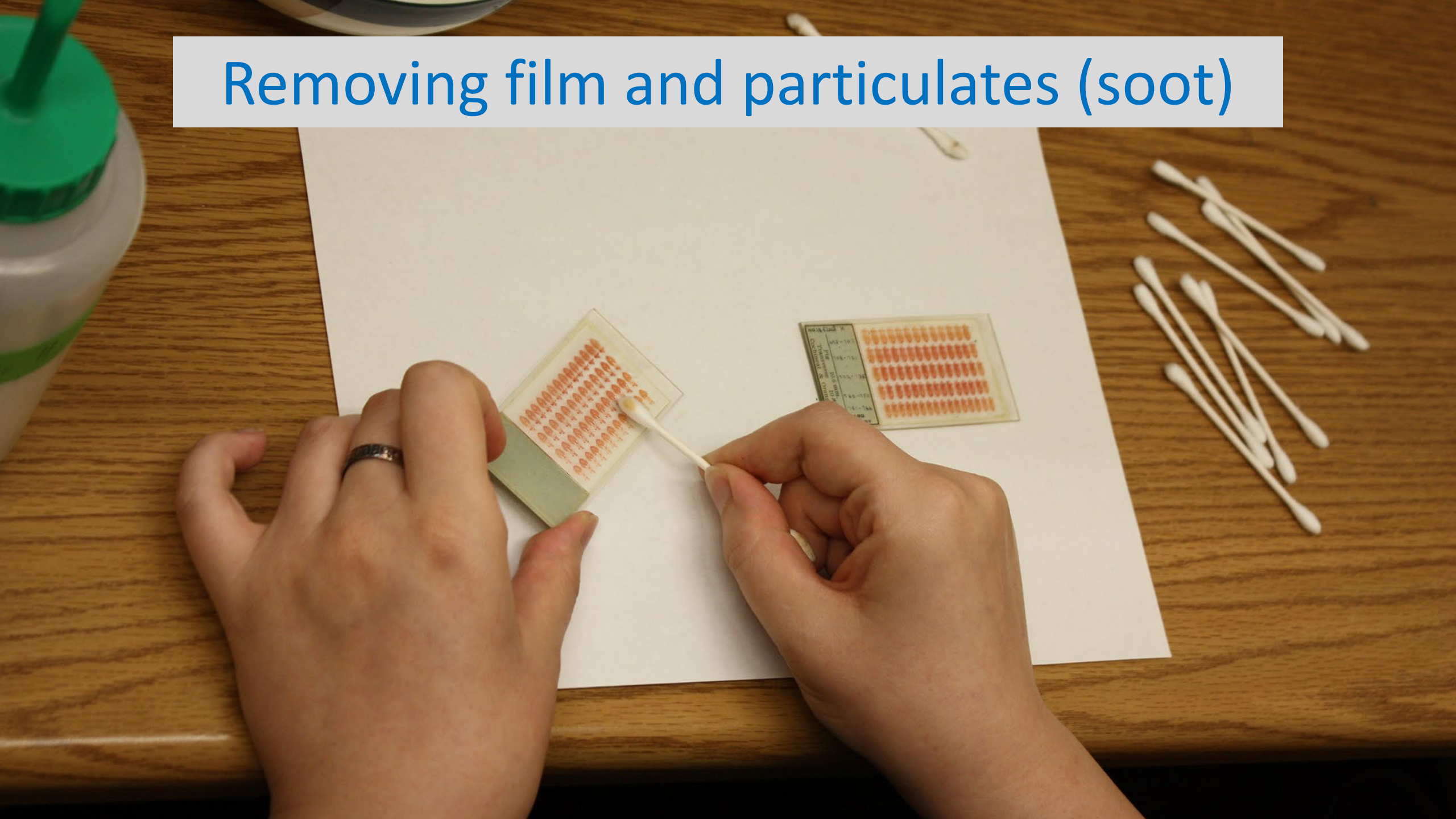
Scan
- Batch-process up to 10 slide holders

Ingest
- Web-upload scan files to Girder
- Transcribe slide labels

Export CSV
- Load image records into MCZbase

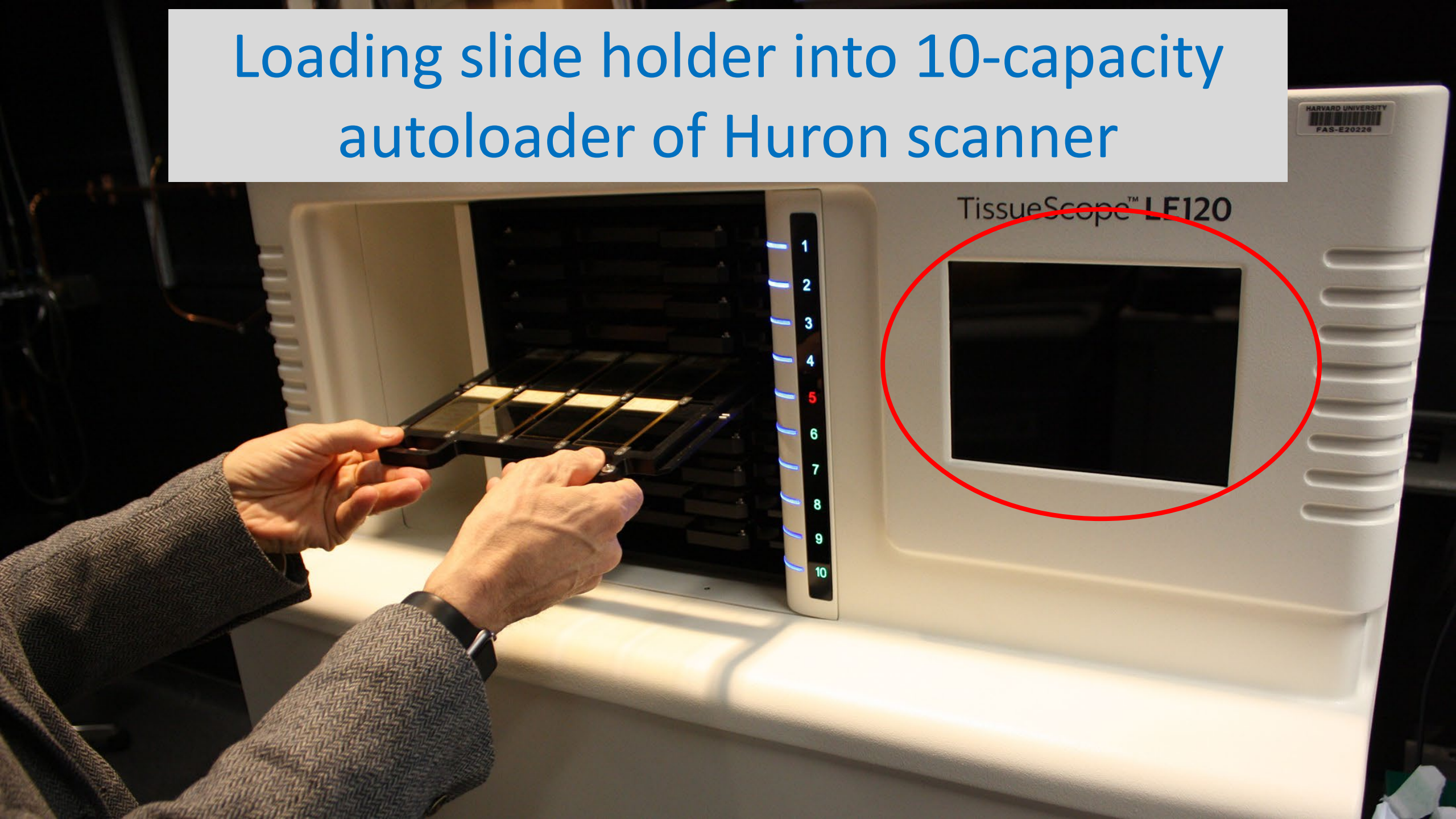
Consolidated cabinet

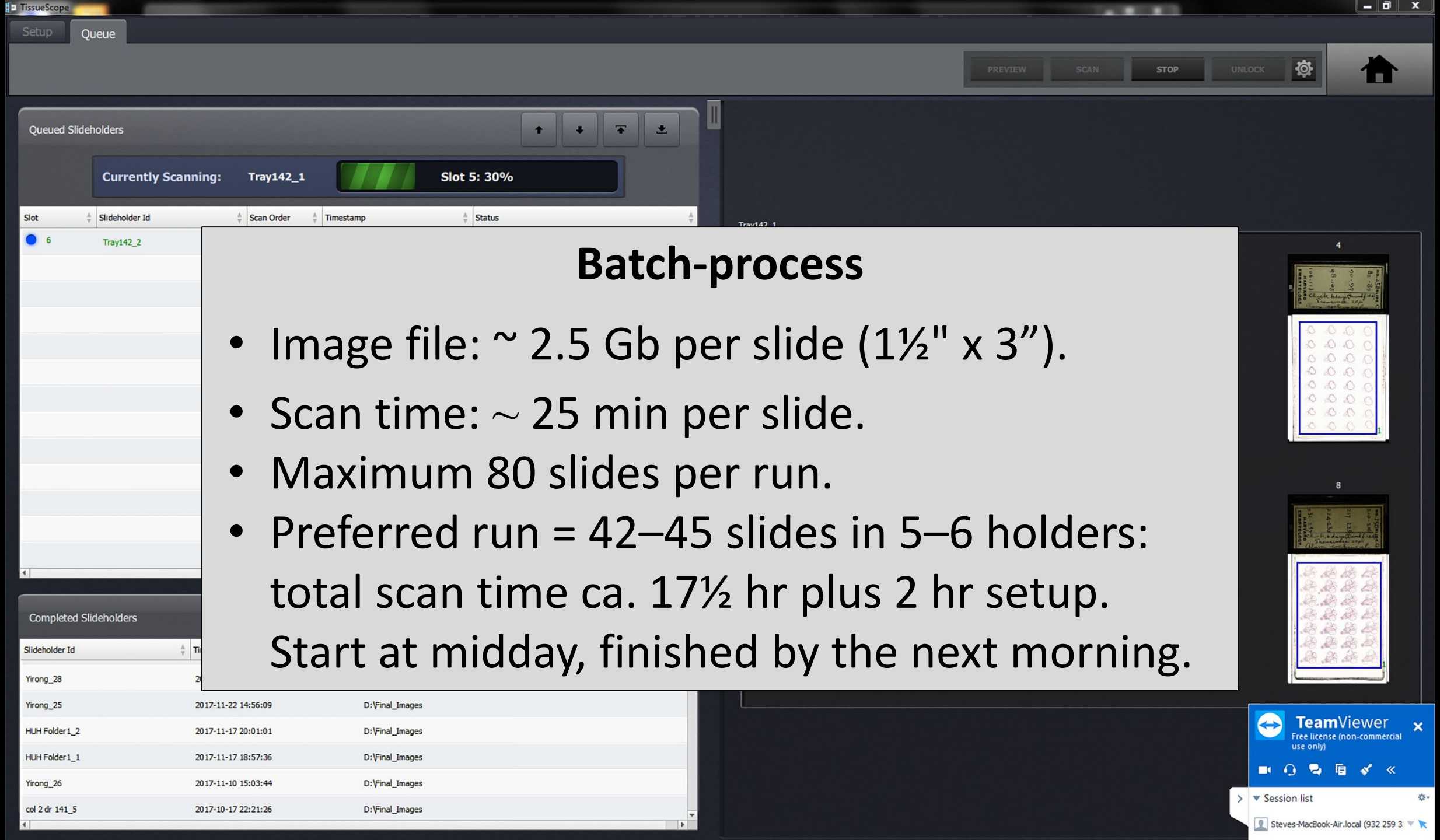
Removing film and particulates (soot)



Inserting slides into custom slide holder

Loading slide holder into 10-capacity autoloader of Huron scanner





Batch-process

- Image file: ~ 2.5 Gb per slide (1½" x 3”).
- Scan time: ~ 25 min per slide.
- Maximum 80 slides per run.
- Preferred run = 42–45 slides in 5–6 holders: total scan time ca. 17½ hr plus 2 hr setup. Start at midday, finished by the next morning.

MCZBASE:The Database of the Zoological Collections
Museum of Comparative Zoology - Harvard University

Search | Enter Data | Manage Data | Manage Arctos | Reports | My Stuff | Help

Special Collections 1995
Chaerephon plicatus
histological serial section (histological slide)
Report Bad Data | Return to results

Java
Asia: Indonesia: Central Java Province: Java
Prepared:1910-II (1910-02-01 - 1910-02-28)

Taxa | Accn | Pick New Coll Event | Locality | Agents | Relations | Parts | Part Locn. | Attributes | Other IDs | Media | Encumbrances | Catalog

Identifications

Chaerephon plicatus (Buchannan, 1800)
Animalia Chordata Mammalia Chiroptera Molossidae Chaerep
Identified by [no agent data]
Nature of ID: legacy
Remarks: Chaerophon plicatus ? (Free tail bat)

Locality and Collecting Event Details

Continent/Ocean:	Asia
Country:	Indonesia
State/Province:	Central Java Province
Island:	Java
Specific Locality:	Java
Verbatim Locality:	Java.
Collecting Method:	unknown
Collecting Source:	unknown
Collecting Date:	Prepared:1910-II (1910-02-01

Collectors

Owen F. Bryant

Identifiers

other number: 1625

previous number: HEC-1606

HEC 1606

- *Chaerephon plicatus,* wrinkle-lipped free-tailed bat
- Collected in Indonesia
- Slides prepared in February 1910

Last Edited By: Jon Woodward on 2017-05-11

Encumbrances: mask record by Brendan Haley on 10 Jul 2014. Expires NEVER.

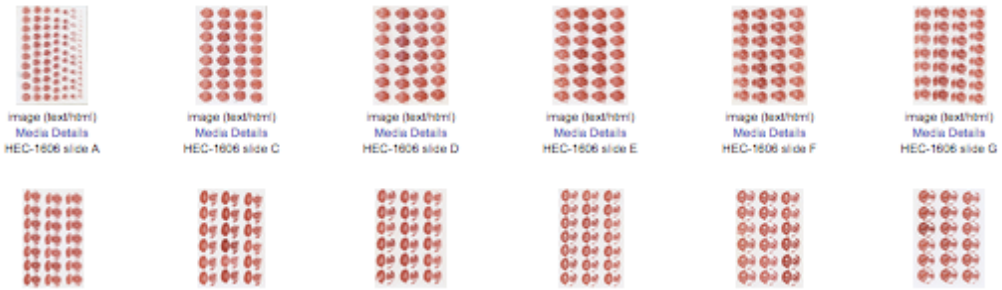
Accession

2000506

Usage

Loan History: Loans that include this cataloged item (1).

Media



Media

Edit

image (text/html)
Media Details
HEC-1606 slide A

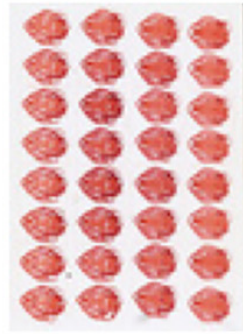


image (text/html)
Media Details
HEC-1606 slide C

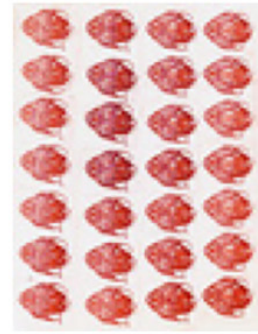


image (text/html)
Media Details
HEC-1606 slide D

image (text/html)
Media Details
HEC-1606 slide E

image (text/html)
Media Details
HEC-1606 slide F

image (text/html)
Media Details
HEC-1606 slide G

image (text/html)
Media Details
HEC-1606 slide H

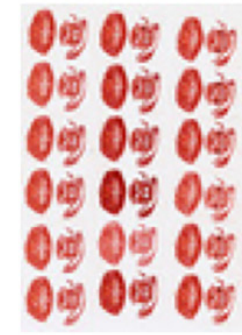


image (text/html)
Media Details
HEC-1606 slide J

Collections
Users
Groups

M

Actions

Info

865.0 MB (907040710 bytes)
Created on March 9, 2017 at 15:22:20
Updated on March 10, 2017 at 8:53:13

Image Viewer

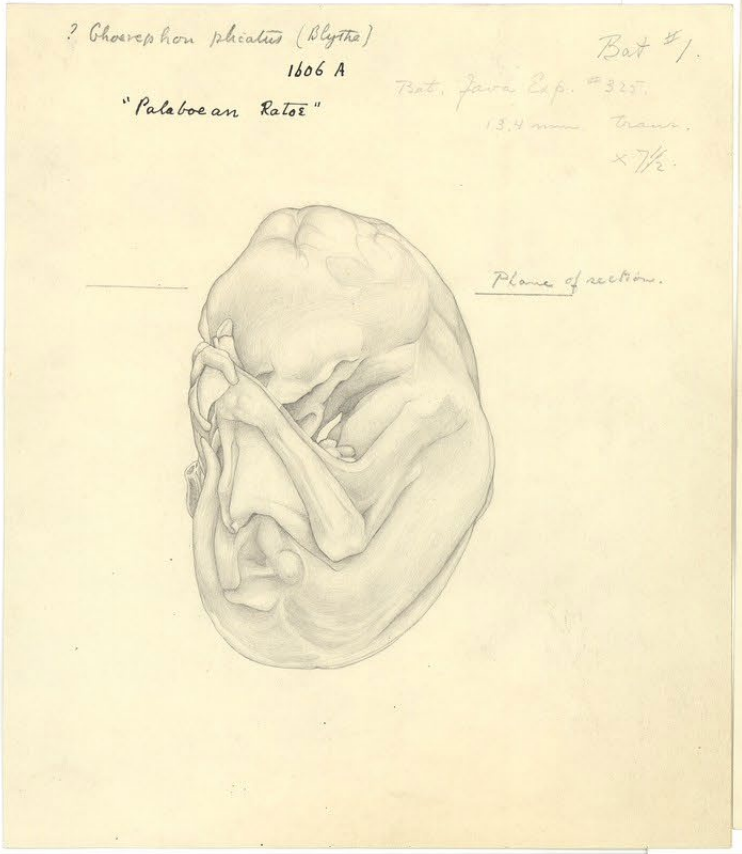
SlideAtlas

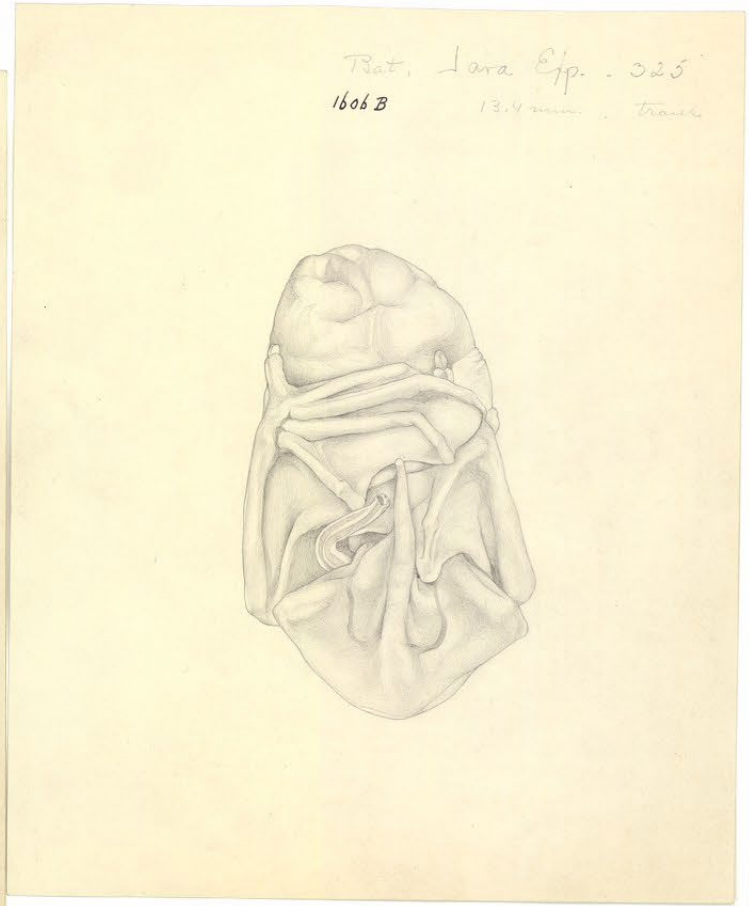
Metadata

Files & links

HEC1606_9_S04.tif 865.0 MB

© Kitware, Inc.





HARVARD EMBRYOLOGICAL COLLECTION

EMBRYO— Free tail bat (Choerophon plicatus?) **DATE,** II,1910 **NO.** 1606

LENGTH— 13.4 mm

AGE—

FIXATION— Formaline

SECTIONS— Transverse 10 μ.

STAIN— Alum cochineal and orange G.

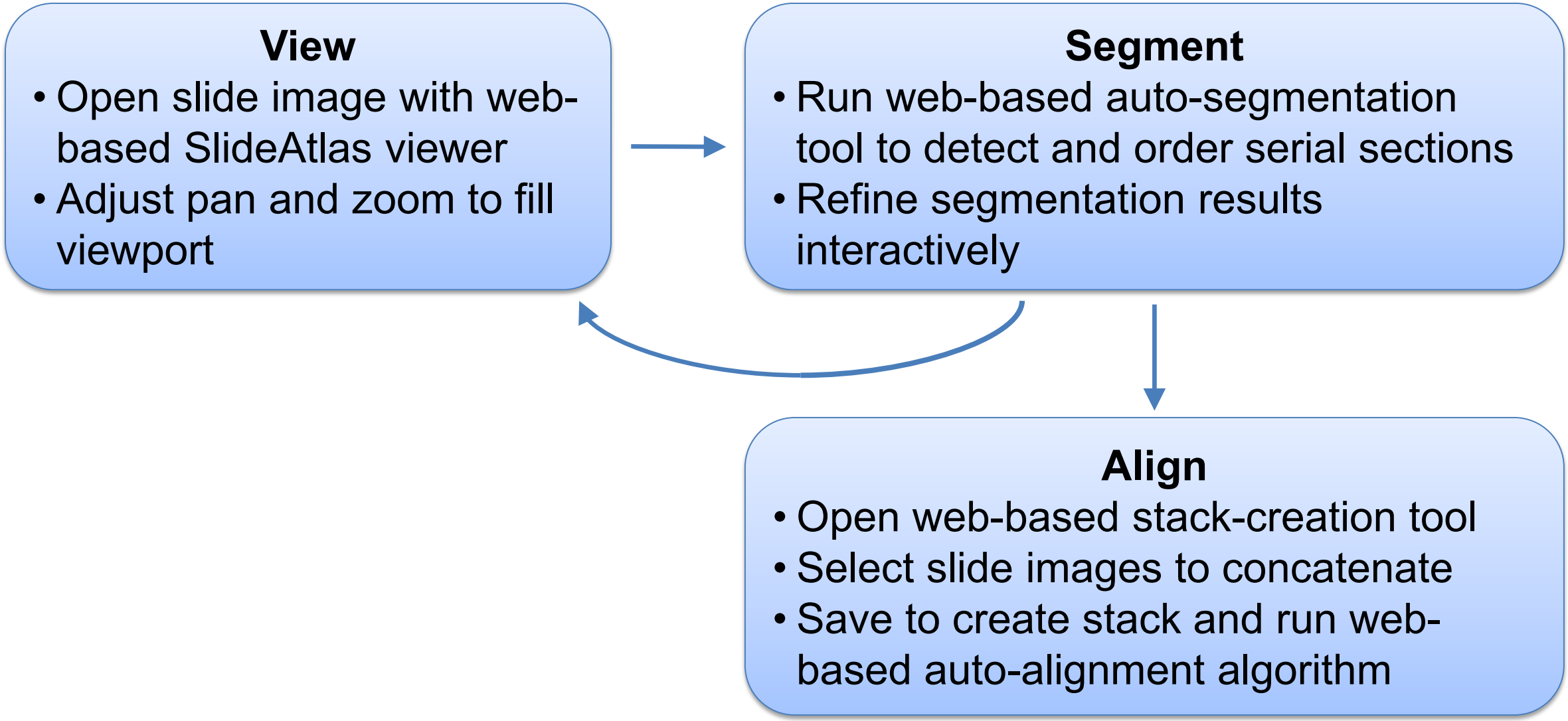
HISTORY—

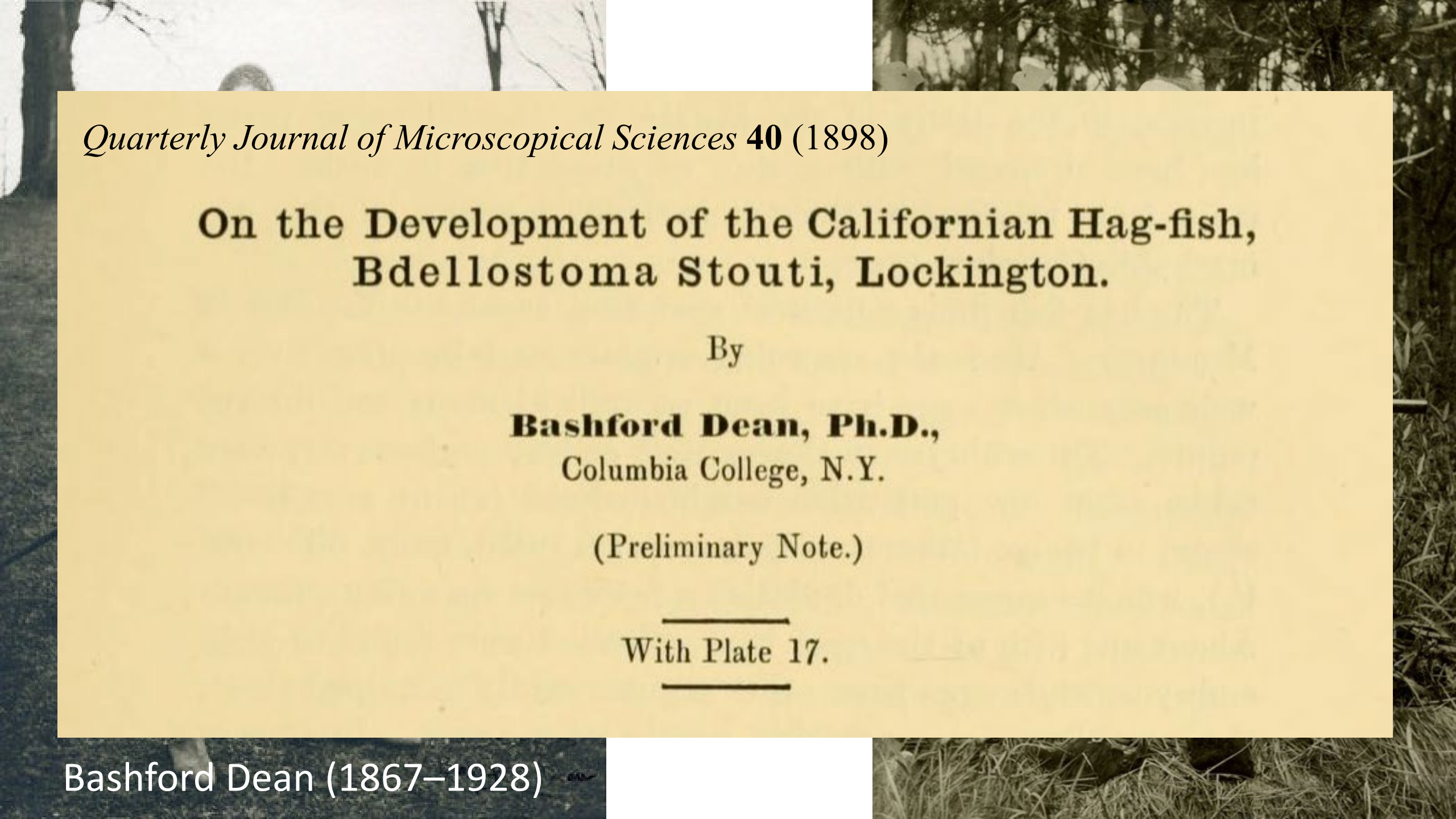
REMARKS— Drawings 1606 A, B.

Coll. Owen Bryant #325, Java.

PUBLICATIONS—

Automated Stack-Creation Workflow





Quarterly Journal of Microscopical Sciences **40** (1898)

On the Development of the Californian Hag-fish, Bdellostoma Stouti, Lockington.

By

Bashford Dean, Ph.D.,
Columbia College, N.Y.

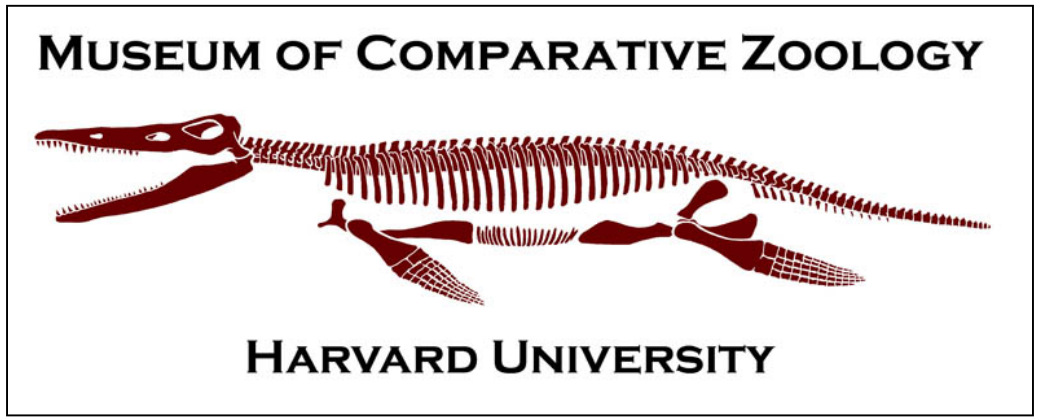
(Preliminary Note.)

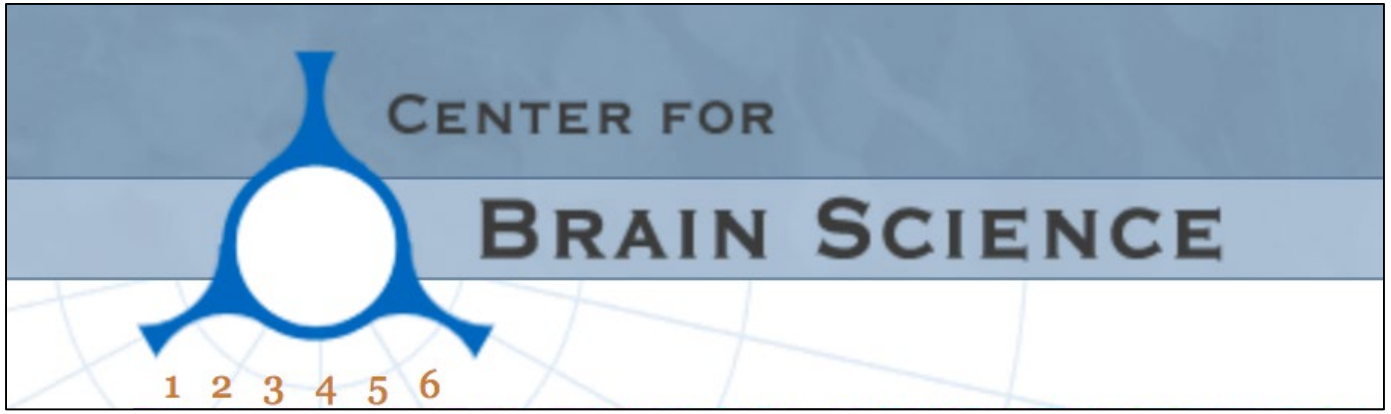
With Plate 17.

Bashford Dean (1867–1928)

Unlocking the Vault

- Available technologies offer a reliable and cost-effective means of rapidly converting historic and irreplaceable microscope slide collections to digital format for use in research and education.
- Bring us your slides!





CU-PAC

CORNELL UNIVERSITY

English Español

Links

Cornell University

L.H. Bailey Hortorium

Gandolfo Lab

L. H. Bailey Hortorium Herbarium

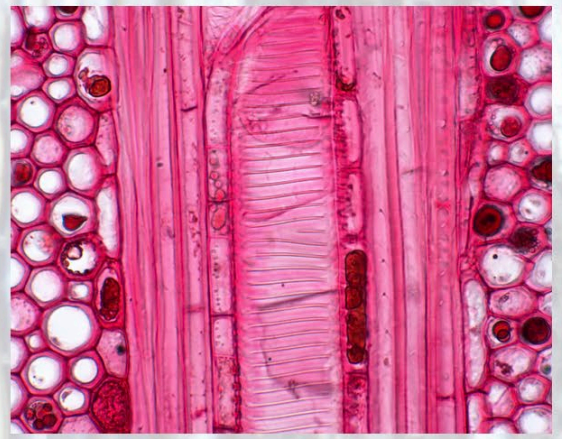
Plantsystematics.org

Contact Information

Dr. Maria A. Gandolfo
410 Mann Library Building
Dept. Plant Biology
Cornell University
Ithaca, NY, 14853
email:mag4@cornell.edu

Jennifer Svitko, M.S.
406 Mann Library Building
Dept. Plant Biology
Cornell University
Ithaca, NY, 14853
email:jls25@cornell.edu

Cornell University Plant Anatomy Collection



CUPAC(Cornell University Plant Anatomy Collection) is an historically important collection of anatomical slide preparations of a wide array of plant parts. These slides include materials prepared by renowned Cornell Plant Anatomists, both for teaching and publication. Included are slides from the collections of Arthur Eames, Mary Wilde, David W. Bierhorst, Hal Moore and Natalie Uhl; and from other famous plant anatomists such as K. Esau, Johri and Maheshwari.

Slides are being imaged by volunteers and undergraduate student workers, and simultaneously barcoded and databased. Post-processing involves automated resizing and labeling as well as magnification calibration that allows online measurement tools to be used as overlays on the images.

Search tools

IMAGE Keyword/Genus Search: quercus and wood Submit

Above, you may use "and" and "or" and mix genus names and keywords like this: "Quercus and wood" or perhaps "Zamia or Cycas"

GENUS Search: Submit

The genus search does not yet take "and-or" searches and must be an exact match for a genus

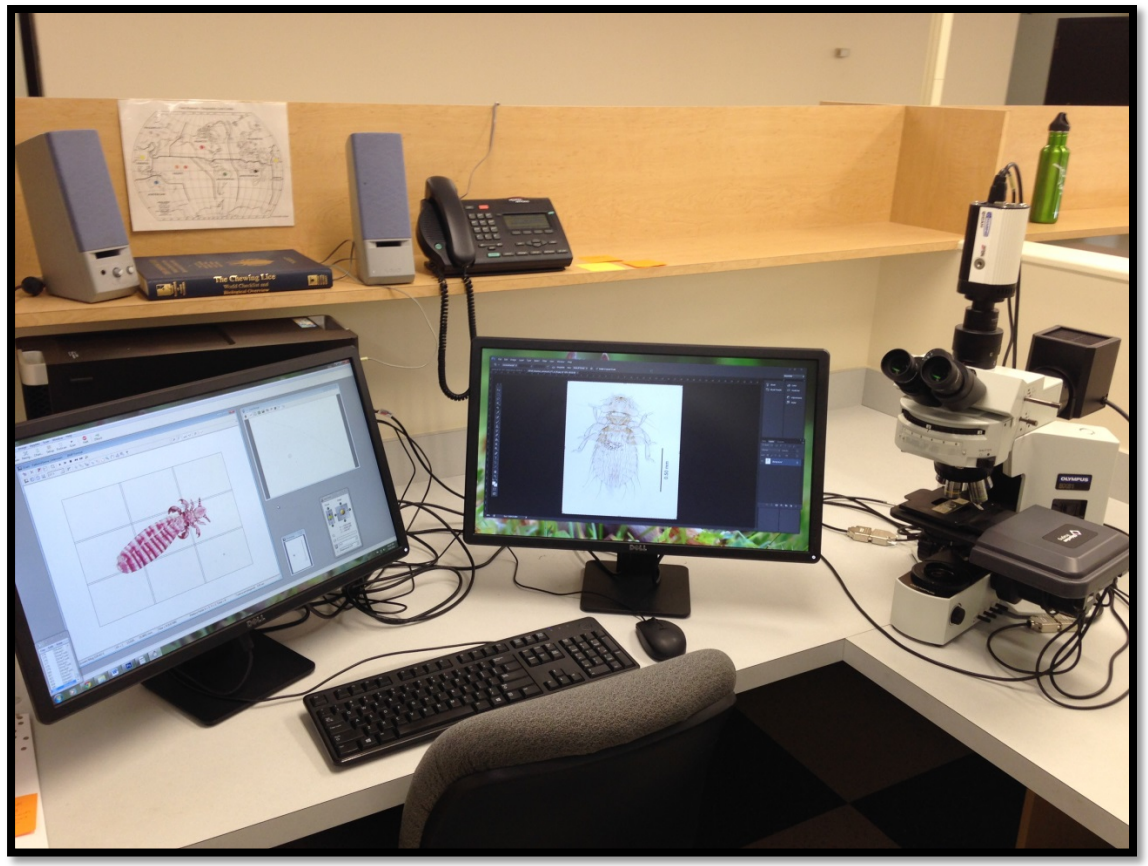
Index by taxon.

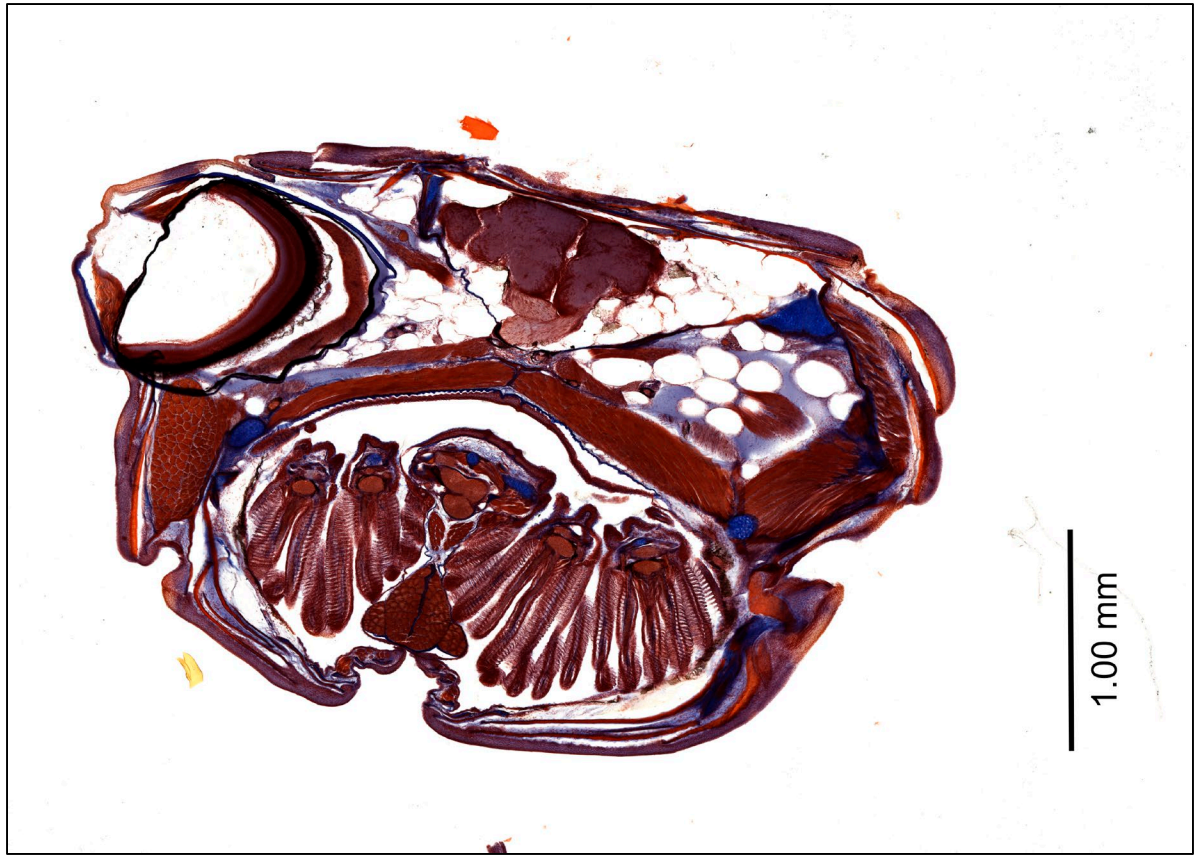
Index by image keyword list.

THIS PROJECT IS PARTIALLY SUPPORTED BY NSF AWARD CBR-7756 TO PIs GANDOLFO AND NIXON

Copyright 2012-2017

Field Museum: Grainger Digital Initiative





Yale PEABODY MUSEUM OF NATURAL HISTORY

Invertebrate Zoology
Virtual Microscopy

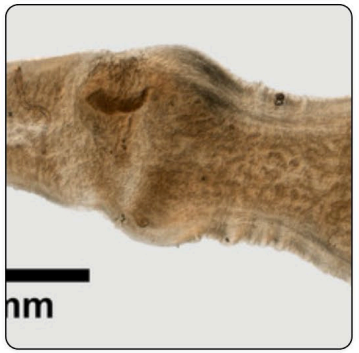
Search: Enter search term

Taxa [phylum, subphylum, superclass, class, subclass, superorder, order, infraorder, family, genus, species, scientific name], common name, caption, author, identifier, or location.

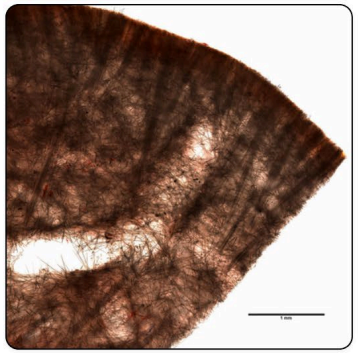
Themes: Select one...

Select one of many preset "thematic searches" to explore similar concepts and specimens.

Browse:



Pelagonemertes brinkmanni
Proboscis armature.
IZ.096351



Craniella cranium
section
IZ.076995

Cerebratulus signatus
Thin section
IZ.075359

Ampithoe rubricata
Maxilla 2
IZ.007784.CR

Biodiversity Data Journal 7: e32342
doi: 10.3897/BDJ.7.e32342

Methods

A Novel Automated Mass Digitisation Workflow for Natural History Microscope Slides

E Louise Allan‡, Laurence Livermore‡, Benjamin W Price‡, Olha Shchedrina‡, Vincent S Smith‡

‡ Natural History Museum, London, United Kingdom

Figure 2. doi

For the previous slide digitisation pilot batches of up to 100 slides were placed in a template and imaged using the SatScan™.

"Here we describe a novel process of semi-automated mass digitisation using both temporary and permanent barcode labels applied before and during slide imaging. By using a series of barcodes encoding information associated with each slide … we can run a series of automated processes, including file renaming, image processing and bulk import into the NHM's collection management system…"