

Whole Drawer Scanning

1. Attempt

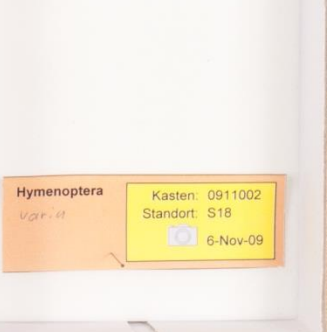
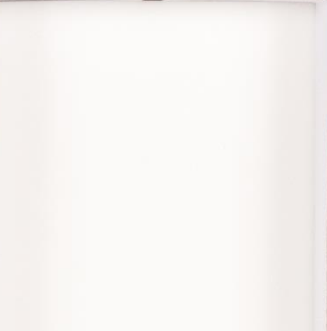
Taking images with a single Shot

Advantage

- Fast
- Small file size (12 MP, 6 Mb as jpg)
- Direct dissemination through the Internet

Disadvantage

- Low resolution -> relatively low information content



Hymenoptera
var. 4
Kasten: 0911002
Standort: S18
6-Nov-09

Whole Drawer Scanning

1. Attempt (1 Shot)



Whole Drawer Scanning

2. Attempt (GigaPan)

Photographic imaging of whole drawers using the GigaPan System



Whole Drawer Scanning

2. Attempt (GigaPan)

Photographic imaging of whole drawers using the GigaPan System

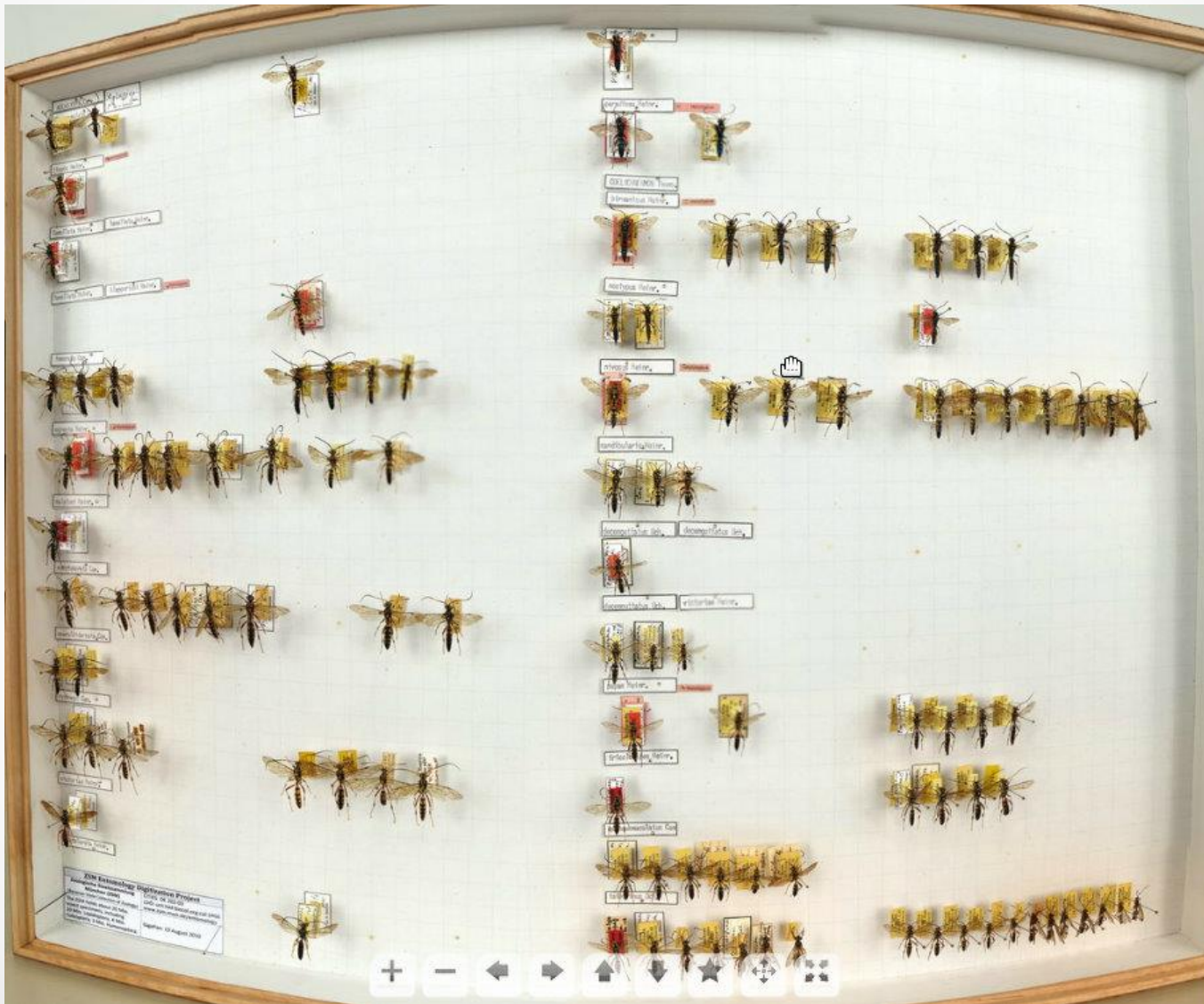
Advantage

- Higher Resolution and higher information content
- Relatively low costs (\$1000-1500 for the whole setup)

Disadvantage

- Large files (250 MP, 300 Mb tiff, 20 Mb jpg)
- No direct display on website possible
- Time requirements: several images per drawer:
 - Assembling of individual images (Stitching)
 - Creation of multi-resolution images

Whole Drawer Scanning



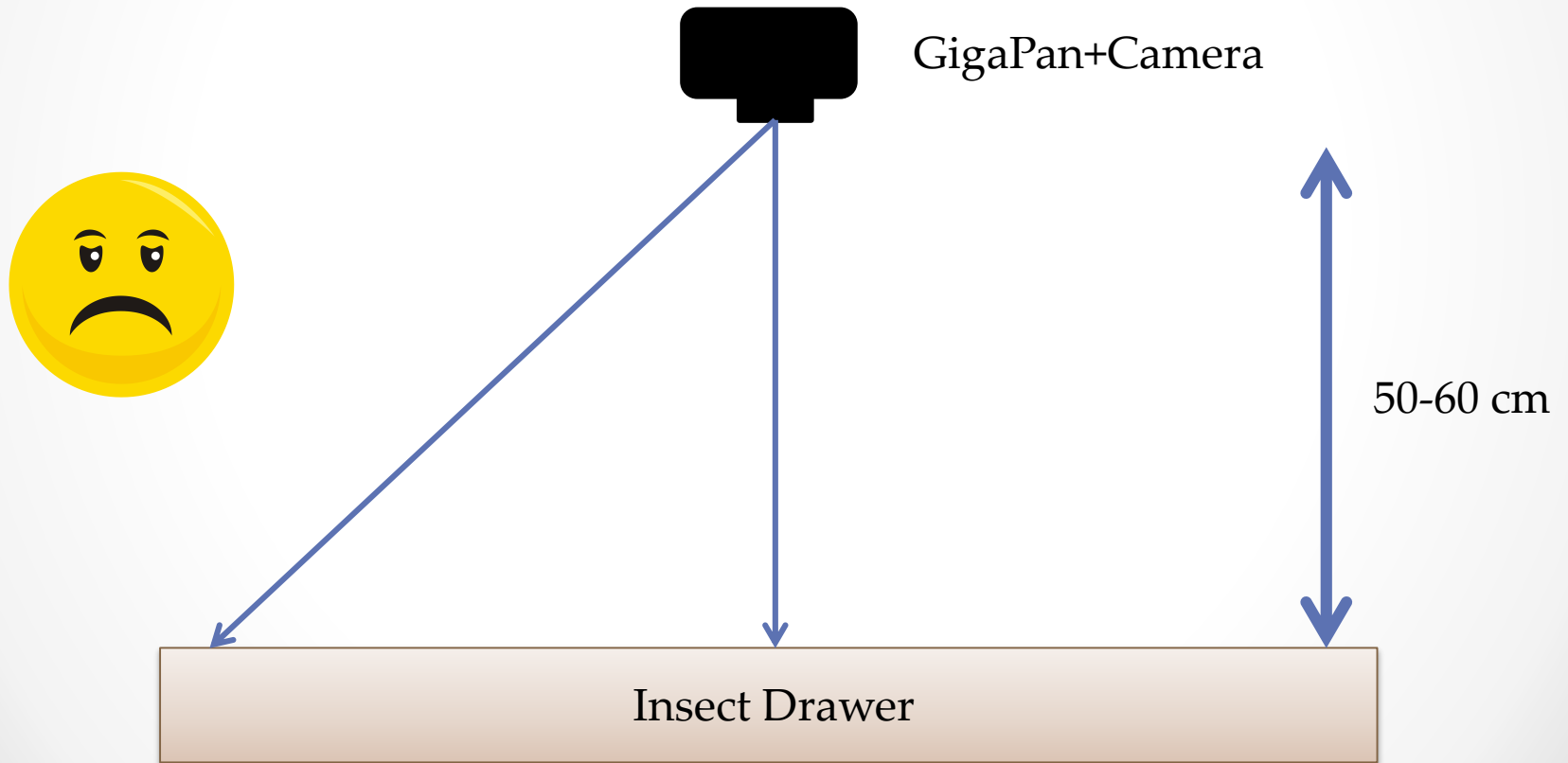
Drawer Scanning

2. Attempt (GigaPan)

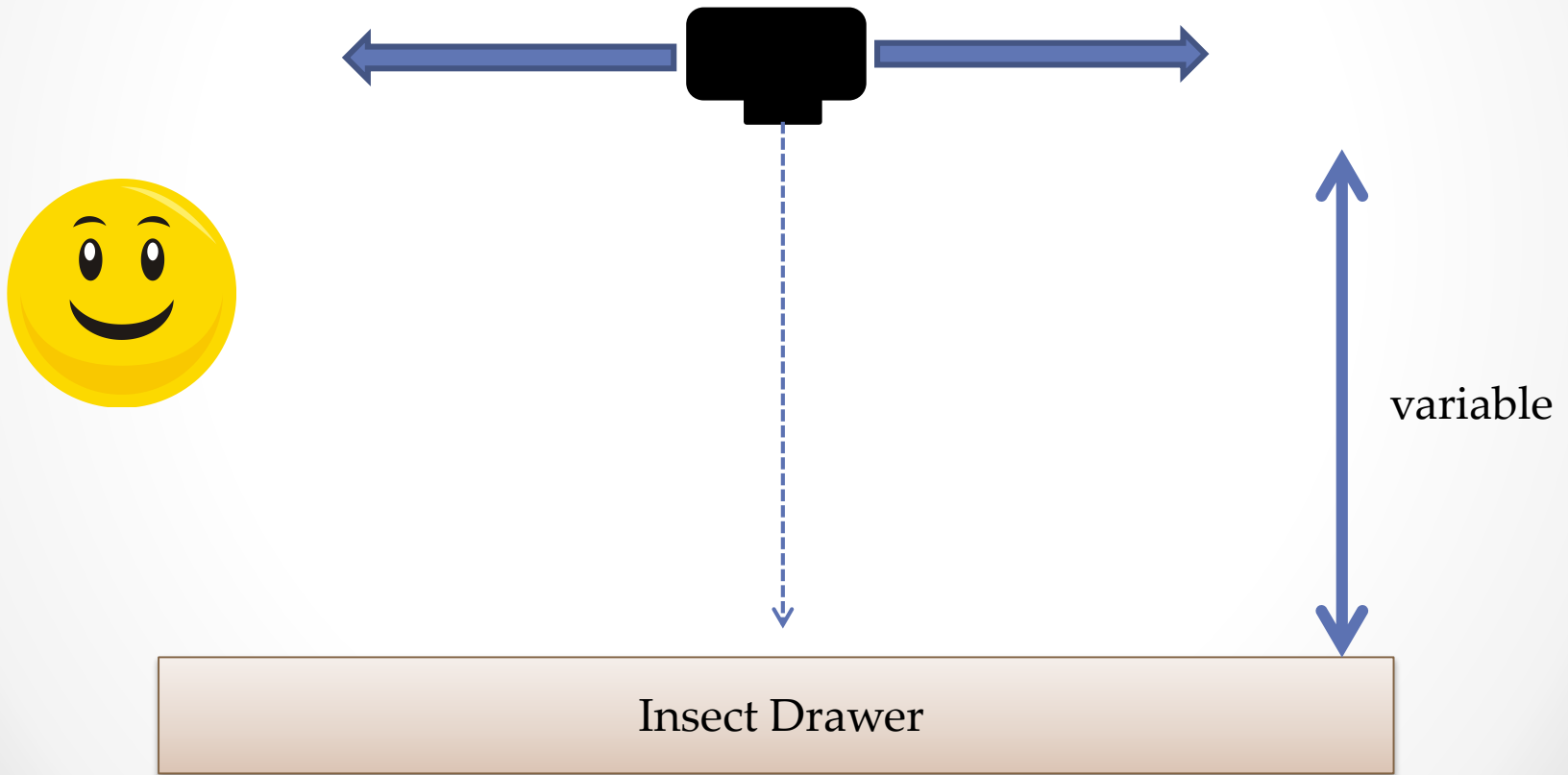
Disadvantages

- Relatively slow (10-15 minutes per drawer)
- Pin-cushion distortion
- Problems with the autofocus system (each image requires focussing)
- Minimal distance 50-60 cm

Drawer Scanning (GigaPan)

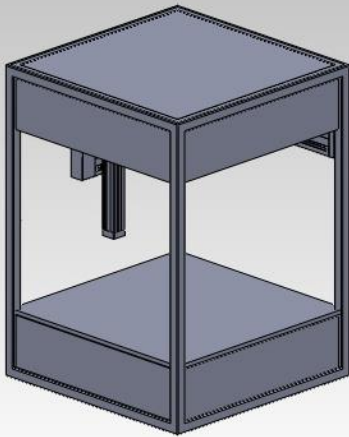


Drawer Scanning



Whole Drawer Scanning

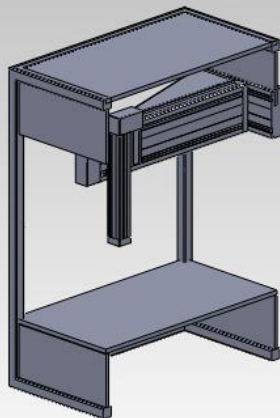
3. Attempt (DScan)



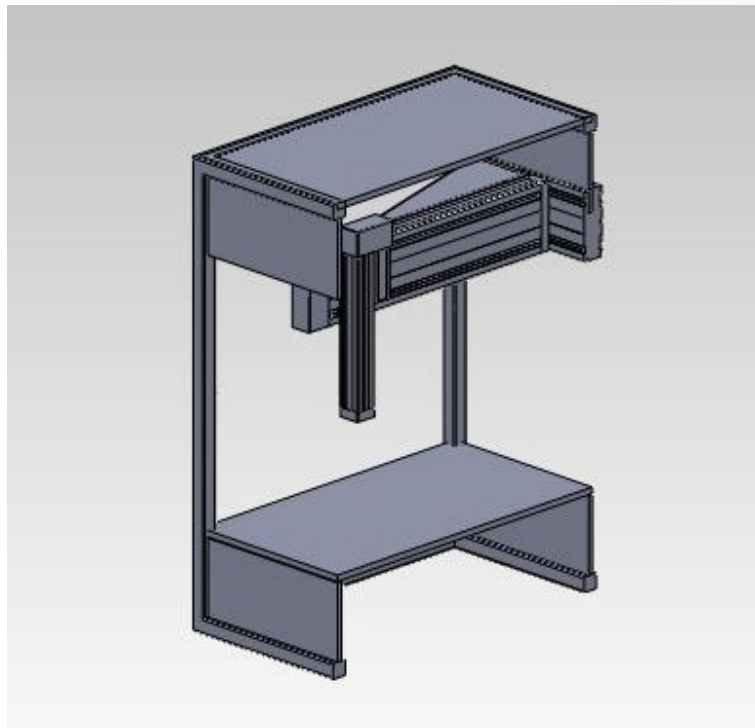
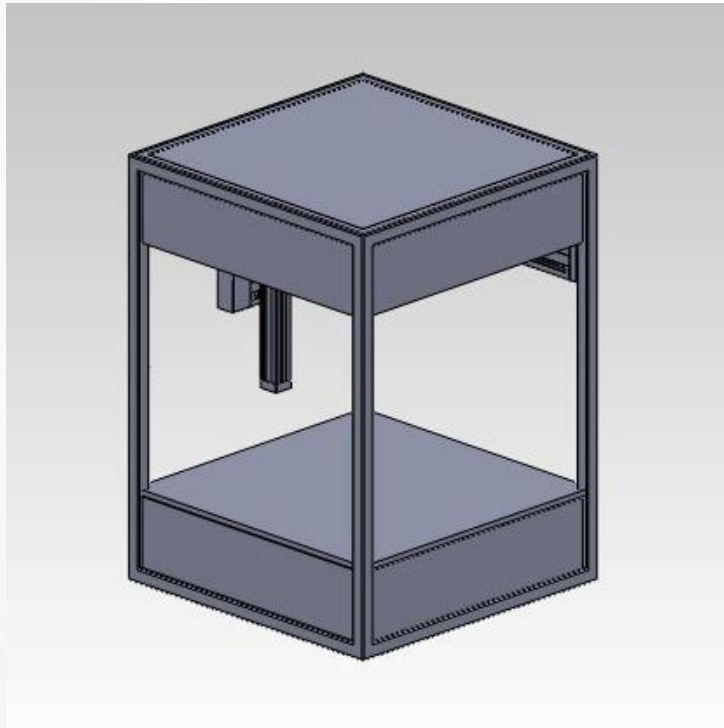
Photographic imaging of whole drawers using a dedicated drawer scanner (DScan)

Advantages

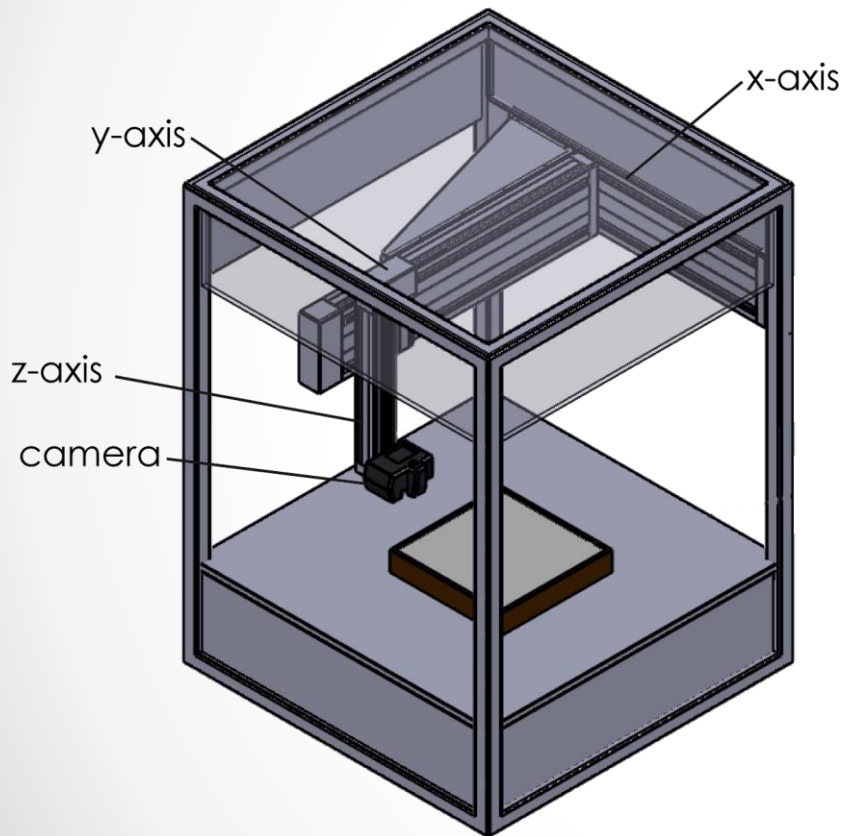
- Faster than GigaPan
- (Almost) no distortion
- No autofocus needed: (constant distance between object and camera means constant focus setting)
- Variable distance to drawer



CNC machine for whole drawer Scanning



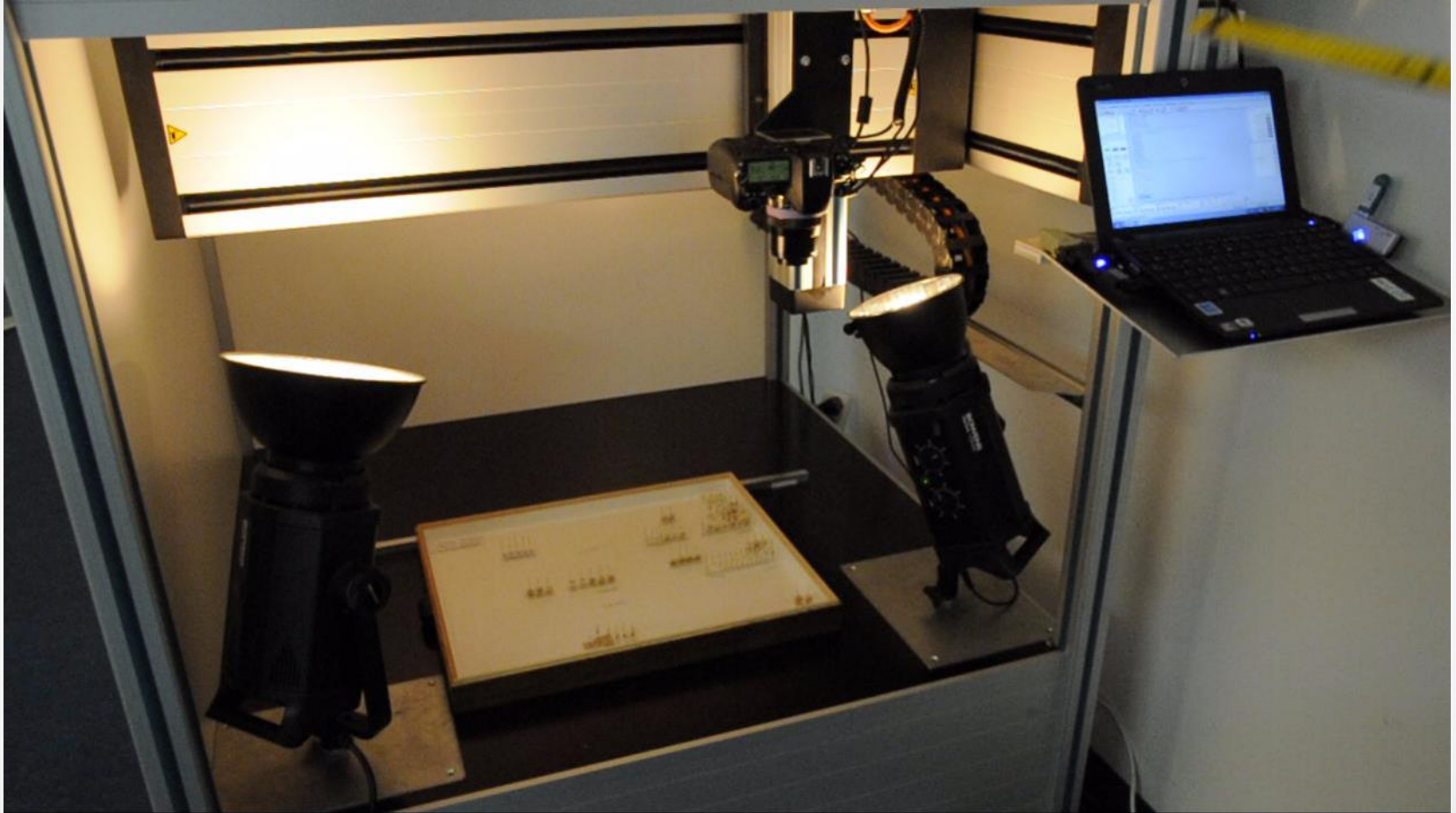
Dscan



Technical specifications

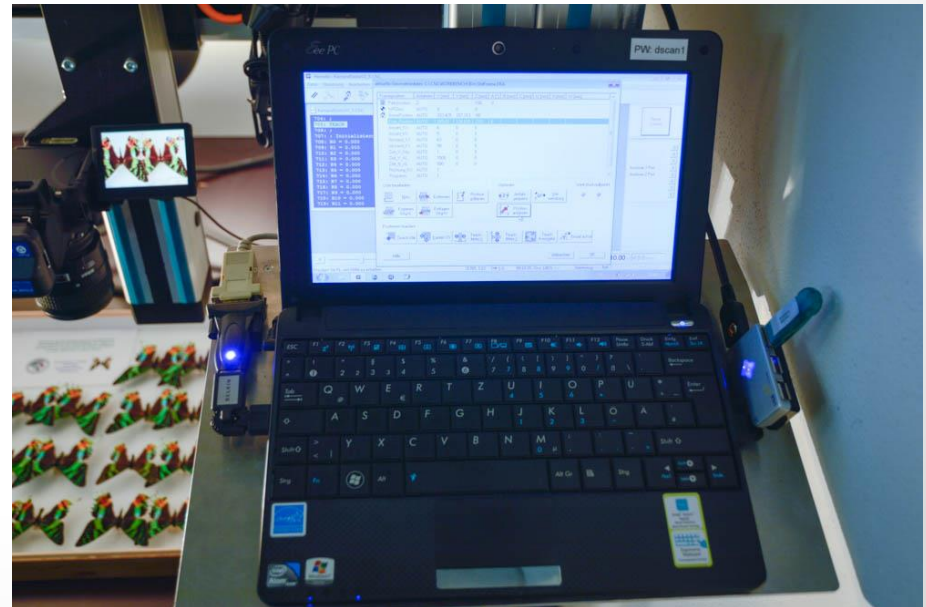
- Industrial standard aluminium frame
- 3 linear units with servo drives as used by CNC positioning machines
- Size (W x L x H): 1080 x 1080 x 1500 mm
- Weight: ca. 200 kg
- Scanning area X,Y,Z (mm): 600, 600, 200
- Scanning speed: 100 mm/s
- Minimal step distance: 0,02 mm
- Operated by PC-controlled console (netbook) with ProNC software
- Light source: two flash heads with external power pack (not shown)
- Flash and shutter managed by controlling unit (not shown)

DScan



<http://youtu.be/zyT7l-CZego>

DScan



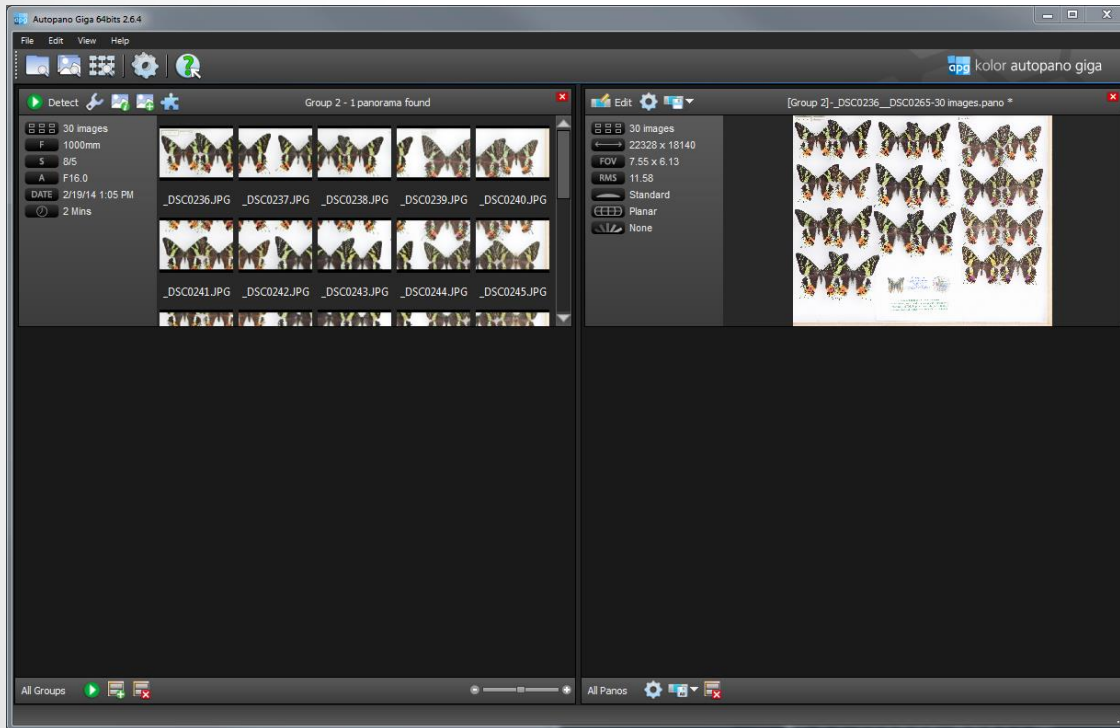
DScan

Processing times and image size (current setup):

- **Camera:** Nikon D5300 (24 MPix) with 60mm Micro-Nikkor AF D f/2.8
- **Number of images:** 30
- **Scanning time:** 2.5 mins
- **Image size:**
 - ~ 400 megapixel
 - 1.3 Gb as tiff image (flat, 8-bit)
 - 60 Mb as jpg image (,high' quality setting in Photoshop)

DScan

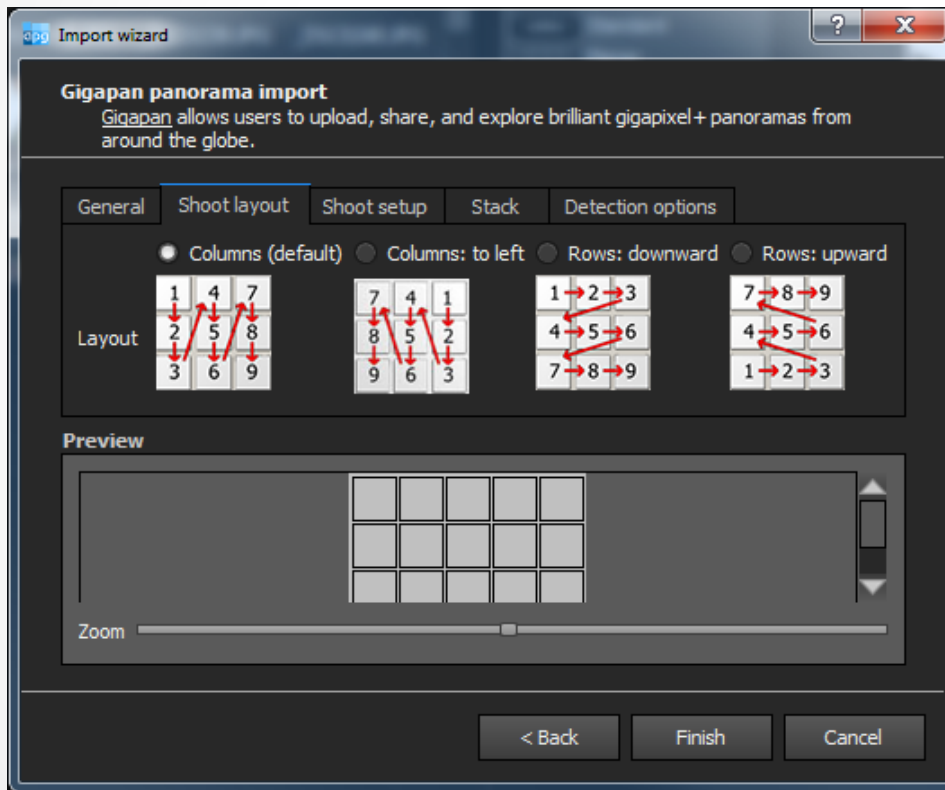
Image Stitching



- Kolor Autopano Giga
- Time need for stitching and saving as a tiff-image: 30 images á 24 Mpix: 2.5 min
- Accepts images with fixed shooting layout

DScan

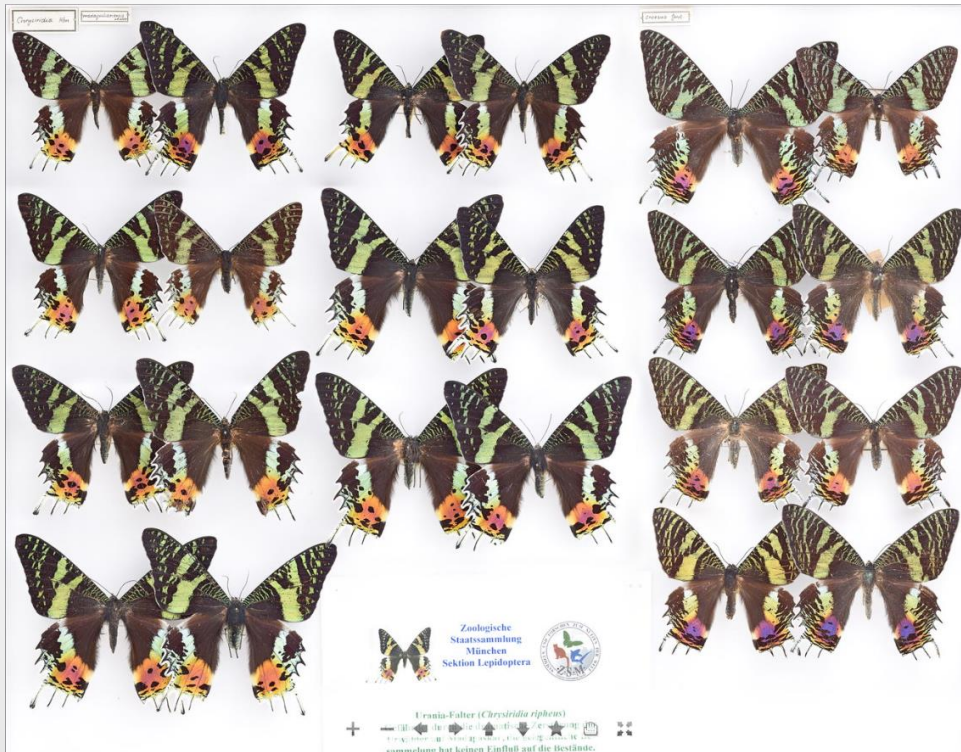
Image Stitching



- Kolor Autopano Giga
- Time need for stitching and saving as a tiff-image: 30 images á 24 Mpix: 2.5 min
- Accepts images with fixed shooting layout

DScan

Multi-resolution images



Krpano tools (krpano.com/tools/)

- Command line tool
- Time need for creating multi-resolution image from a 400 Mpix source image: 1.5 min, 1,700 tiles
- Flash and HTML5
- Highly customizable (dynamic xml scripting)

<http://media.zsm-entomology.de/dd/lep/ZSM-LD-000010-1402.html>

DScan

Multi-resolution images



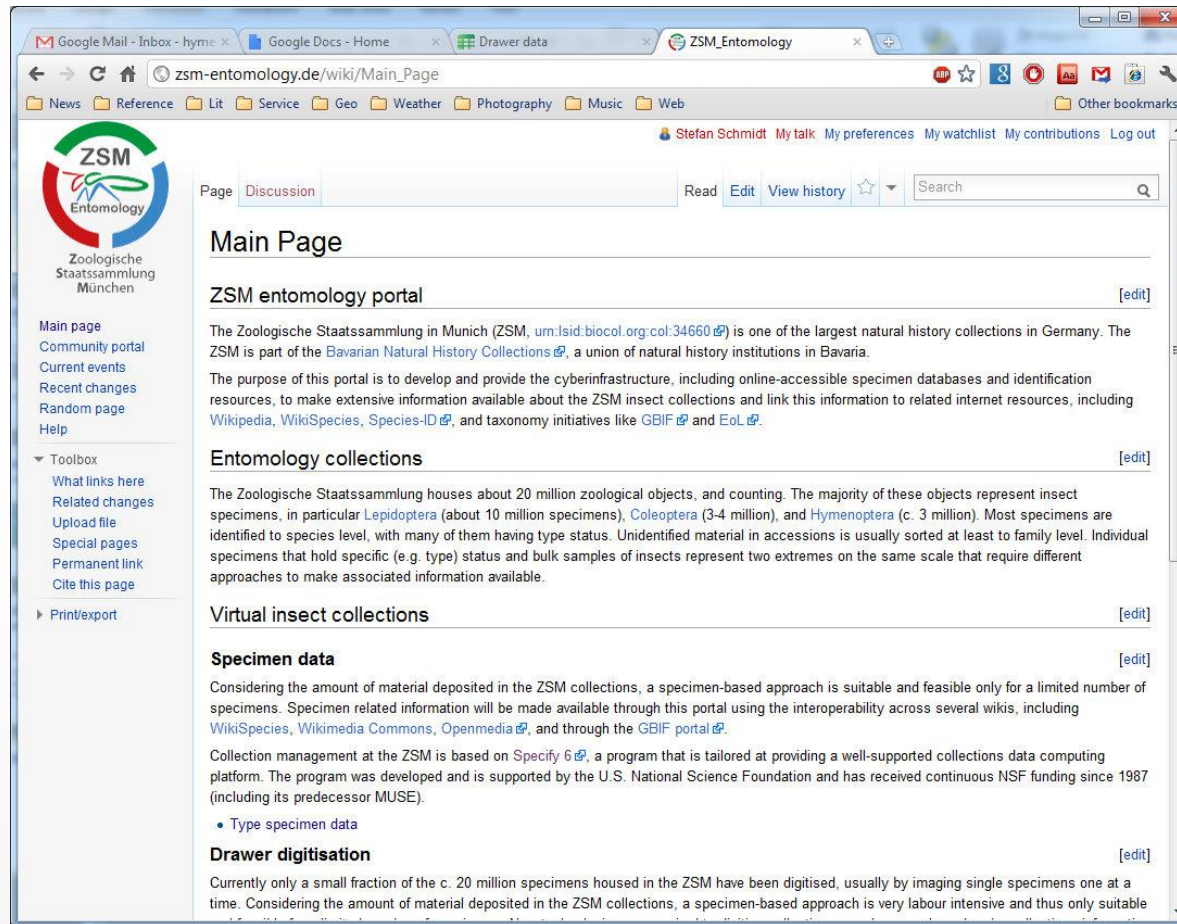
Krpano tools (krpano.com/tools/)

- Command line tool
- Time need for creating multi-resolution image from a 400 Mpix source image: 1.5 min, 1,700 tiles
- Flash and HTML5
- Highly customizable (dynamic xml scripting)
- e.g., for adding annotations

<http://media.zsm-entomology.de/dd/lep/ZSM-LD-000010-1402.html>

Drawer Scanning

public display of drawer images through
Wiki portal zsm-entomology.de



The screenshot shows a web browser window displaying the ZSM Entomology Wiki portal. The browser's address bar shows the URL `zsm-entomology.de/wiki/Main_Page`. The page features a sidebar on the left with the ZSM logo and navigation links such as "Main page", "Community portal", and "Toolbox". The main content area includes sections for "ZSM entomology portal", "Entomology collections", "Virtual insect collections", "Specimen data", and "Drawer digitisation". Each section contains descriptive text and links to external resources.

ZSM Entomology
Zoologische Staatssammlung München

ZSM entomology portal [edit]

The Zoologische Staatssammlung in Munich (ZSM, um.lsid:biocol.org:col:34660) is one of the largest natural history collections in Germany. The ZSM is part of the [Bavarian Natural History Collections](#), a union of natural history institutions in Bavaria.

The purpose of this portal is to develop and provide the cyberinfrastructure, including online-accessible specimen databases and identification resources, to make extensive information available about the ZSM insect collections and link this information to related internet resources, including [Wikipedia](#), [WikiSpecies](#), [Species-ID](#), and taxonomy initiatives like [GBIF](#) and [EoL](#).

Entomology collections [edit]

The Zoologische Staatssammlung houses about 20 million zoological objects, and counting. The majority of these objects represent insect specimens, in particular [Lepidoptera](#) (about 10 million specimens), [Coleoptera](#) (3-4 million), and [Hymenoptera](#) (c. 3 million). Most specimens are identified to species level, with many of them having type status. Unidentified material in accessions is usually sorted at least to family level. Individual specimens that hold specific (e.g. type) status and bulk samples of insects represent two extremes on the same scale that require different approaches to make associated information available.

Virtual insect collections [edit]

Specimen data [edit]

Considering the amount of material deposited in the ZSM collections, a specimen-based approach is suitable and feasible only for a limited number of specimens. Specimen related information will be made available through this portal using the interoperability across several wikis, including [WikiSpecies](#), [Wikimedia Commons](#), [Openmedia](#), and through the [GBIF portal](#).

Collection management at the ZSM is based on [Specify 6](#), a program that is tailored at providing a well-supported collections data computing platform. The program was developed and is supported by the U.S. National Science Foundation and has received continuous NSF funding since 1987 (including its predecessor MUSE).

- Type specimen data

Drawer digitisation [edit]

Currently only a small fraction of the c. 20 million specimens housed in the ZSM have been digitised, usually by imaging single specimens one at a time. Considering the amount of material deposited in the ZSM collections, a specimen-based approach is very labour intensive and thus only suitable

Whole Drawer Scanning

Future development

- Annotation of drawer contents
- Counting the number of specimens in a drawer
- Focus stacking to increase depth of field
- Meta data capture through OCR

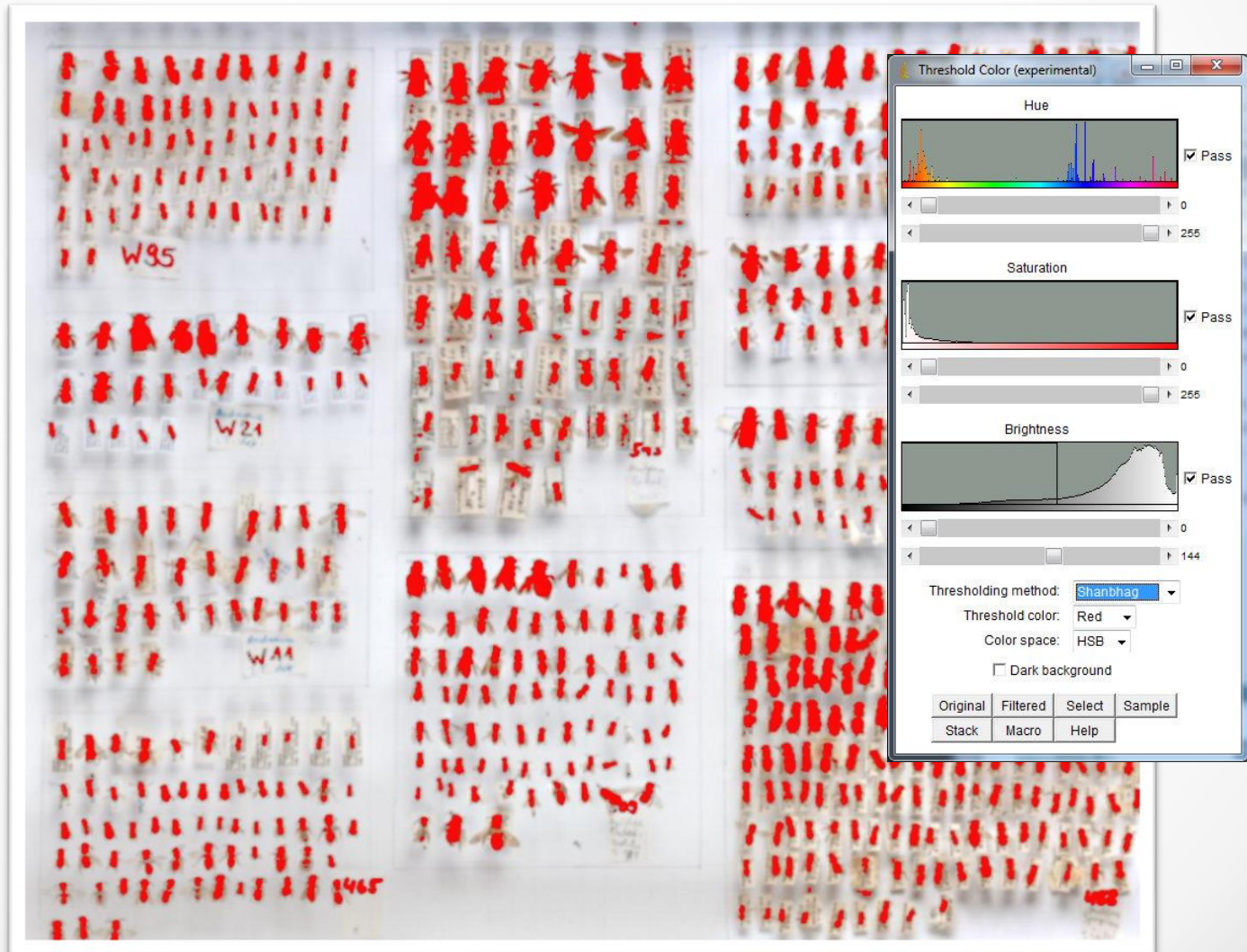
Whole Drawer Scanning

Counting specimens with ImageJ



Whole Drawer Scanning

Counting specimens with ImageJ



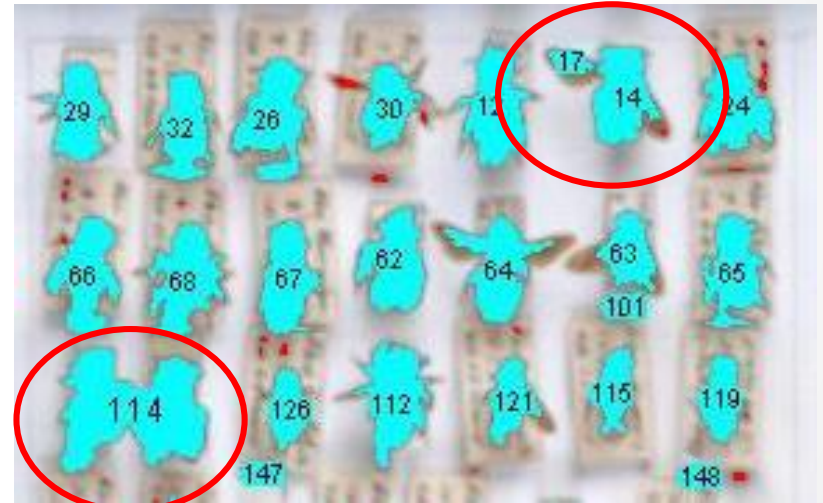
Whole Drawer Scanning

Counting specimens with ImageJ



Whole Drawer Scanning

Counting errors



Whole Drawer Scanning

Examples



Formicidae indet. (unidentified ants)

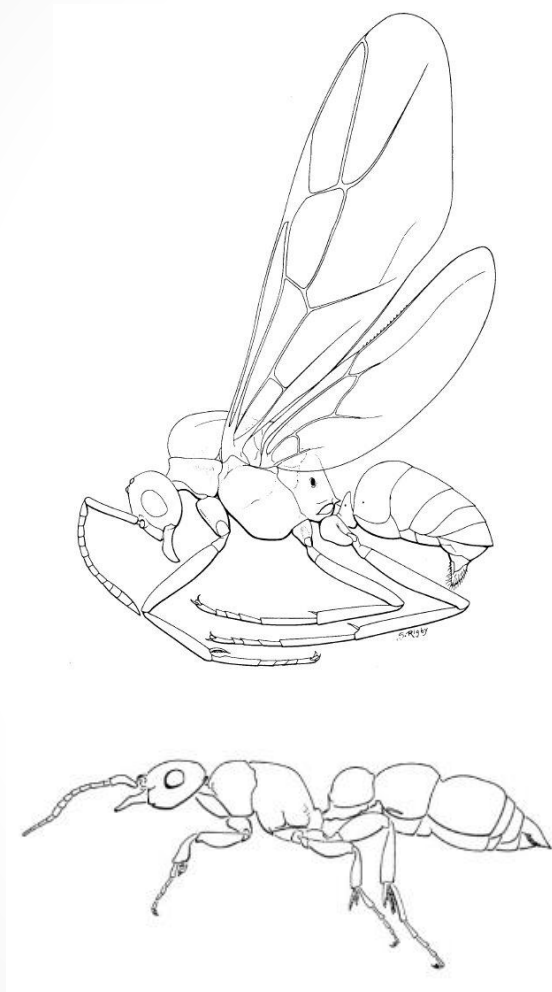
Whole Drawer Scanning

Examples

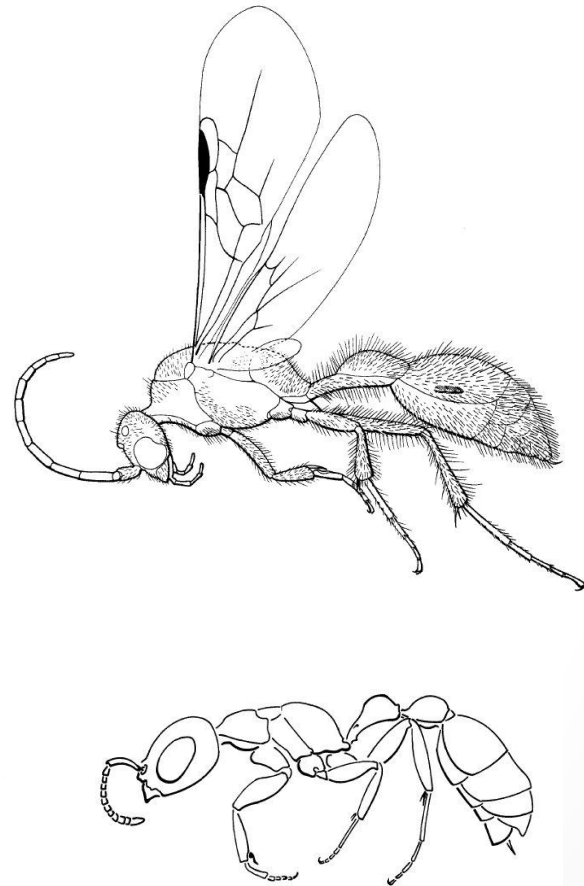


Formicidae indet. (unidentified ants)

Formicidae

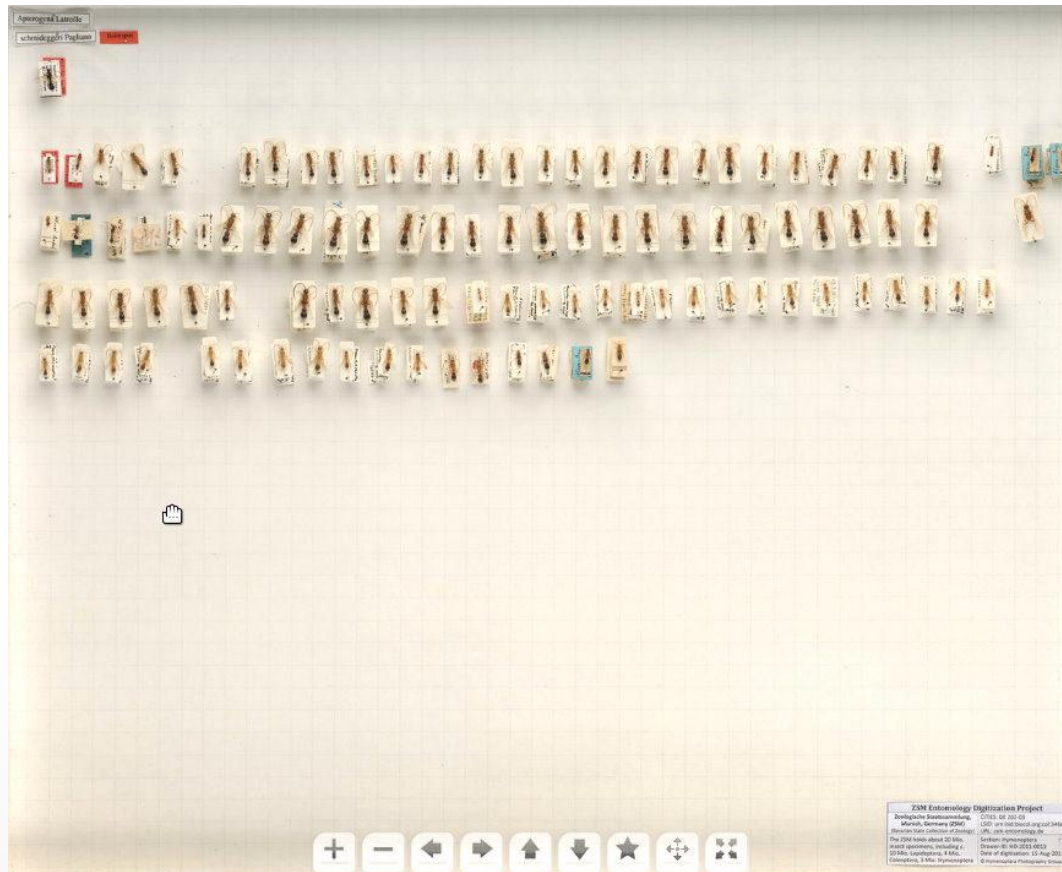


Bradynobaenidae



Whole Drawer Scanning

Examples



Bradynobaenidae in main collection