CONCEPTUALIZING & IMPLEMENTING

Large-Scale Collection Digitization

Gracen Brilmyer
Field Museum of Natural History

THE FIELD MUSEUM'S COLLECTION

- 25 million specimens & objects
- Over ½ are insects
- 13,000 insect type specimens
- 8.5 million alcohol insect specimens

TACKLING A LARGE-SCALE COLLECTION

Robert E. Gregg's Fluid-Preserved Collection

Step 1 – Digitization of Type Specimens

- Mounting
- Imaging

Step 2 – Digitization of the rest of the collection

- Understanding each tier of a collection
- Label imaging
- Expanding digitization

Step 3 – Applying methods to other collections

ROBERT E. GREGG

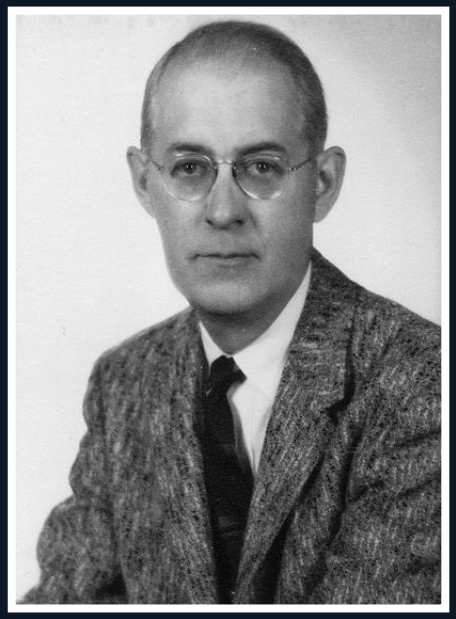
What we knew:

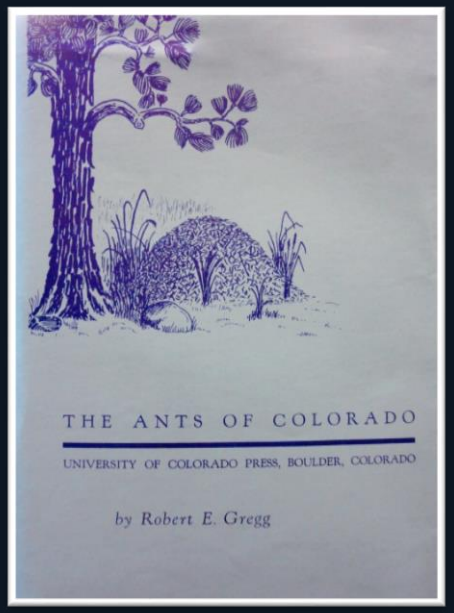
- Collected from 1920s-80s

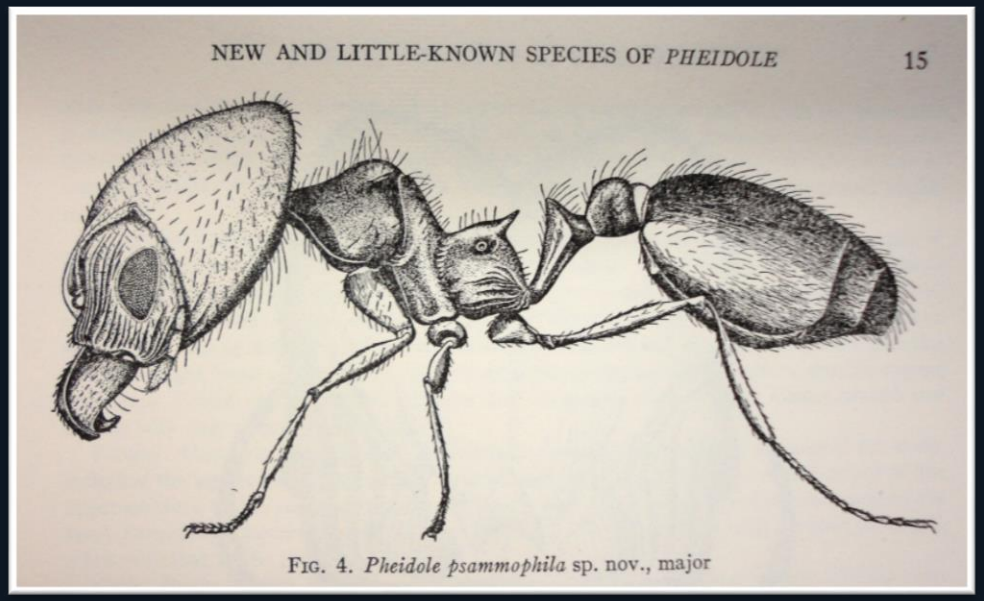
- ~ 1 million specimens

- Published predominately on Colorado and North American species

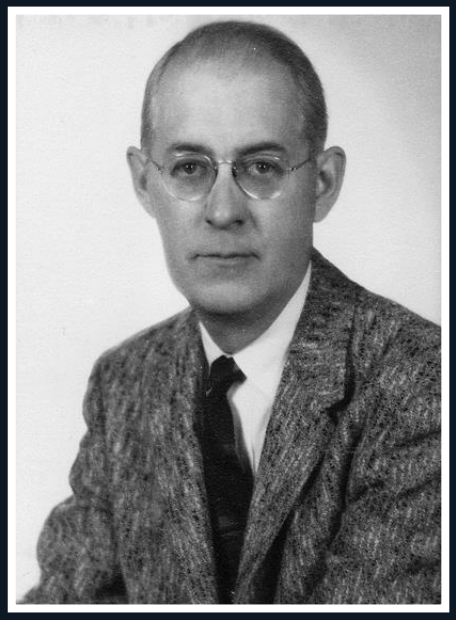
- Published predominately on the genus *Pheidole*







ROBERT E. GREGG



What we found out:

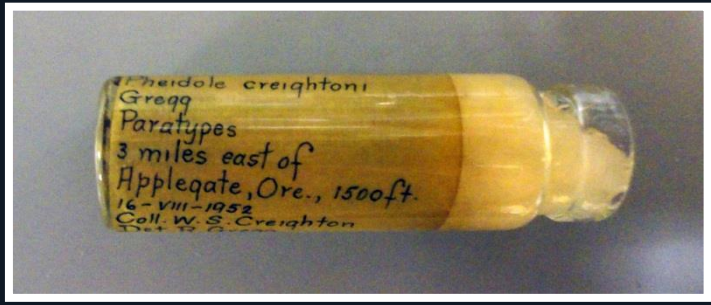
- Collected from 1920s-80s
- ~ 1 million specimens
- Collected worldwide
- Traded specimens worldwide
- Type collections
- Specimens from other type series
- Nest & myrmecophile collections

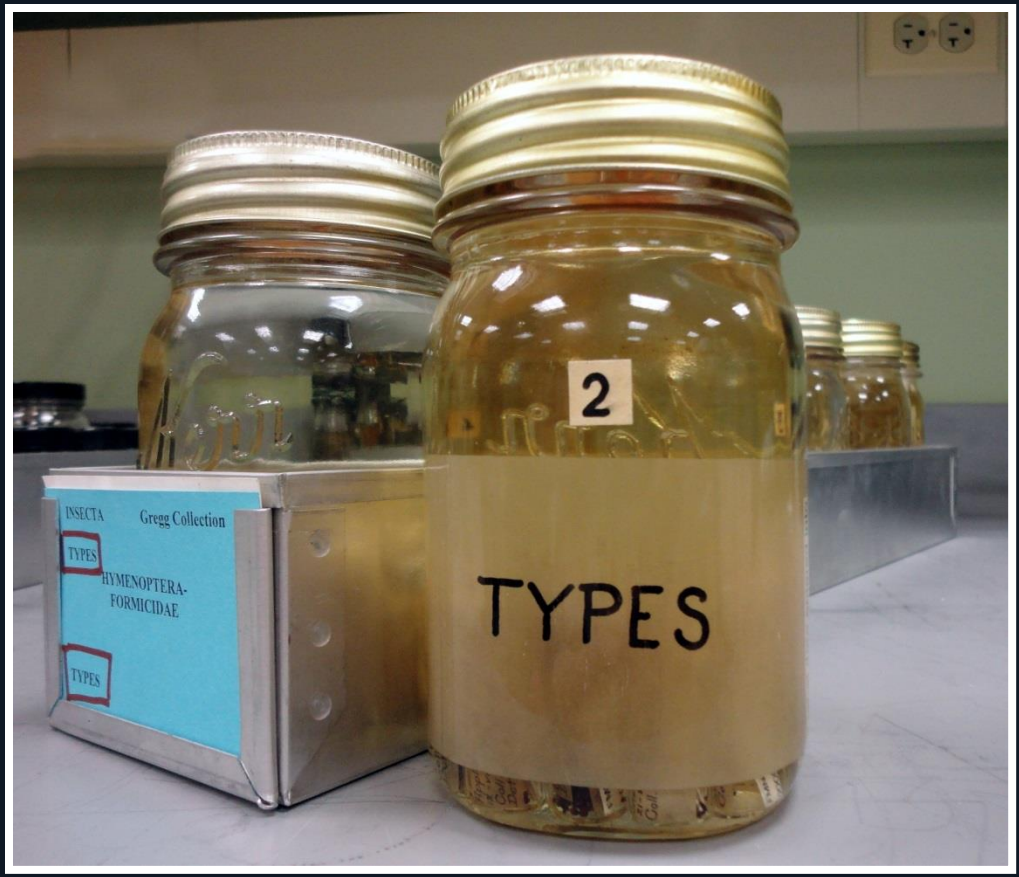
STEP 1 – TYPE SPECIMENS

Gregg described 23 species

~800 specimens in the type collection

Collection contained type specimens from Creighton & Wilson





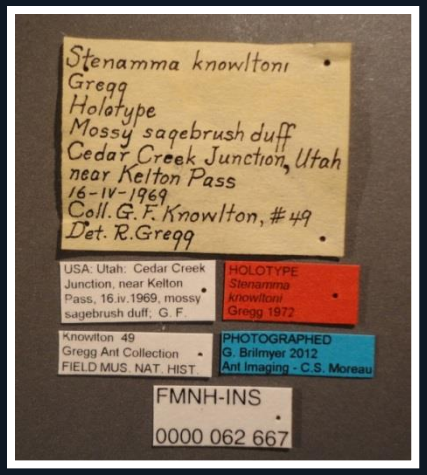
Photos: Gracen Brilmyer

STEP 1 – TYPE SPECIMENS

- Counted & databased all specimens

- Pulled & mounted

all holotypes & up to 3 individuals from each caste and location for paratypes



Photos: Gracen Brilmyer

STEP 1 – TYPE SPECIMENS

Ant Castes

Pheidole creightoni Gregg, 1955

Photos: Gracen Brilmyer

STEP 1 – TYPE SPECIMENS

Ant Castes

Pheidole creightoni Gregg, 1955

Photos: Gracen Brilmyer

STEP 1 – TYPE SPECIMENS

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Pheidole creightoni Gregg, 1955

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Pheidole creightoni Gregg, 1955

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STEP 1 – TYPE SPECIMENS

Ant Castes

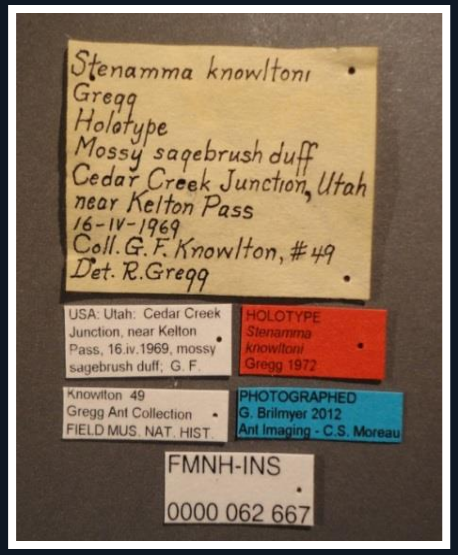
Pheidole creightoni Gregg, 1955

Photos: Gracen Brilmyer

STEP 1 – TYPE SPECIMENS

Imaged all holotypes & 1 of each caste from every locality of paratypes

- Dorsal
- Lateral
- Head
- Labels



Photos: Gracen Brilmyer

STEP 1 – TYPE SPECIMENS

Photo: Stephanie Ware

STEP 1 – TYPE SPECIMENS

Photos: Gracen Brilmyer

STEP 1 – TYPE SPECIMENS

Photos: Gracen Brilmyer

STEP 1 – TYPE SPECIMENS

Photos: Gracen Brilmyer

STEP 1 – TYPE SPECIMENS

Photos: Gracen Brilmyer

STEP 1 – TYPE SPECIMENS

- 127 specimens from 70 species imaged

- Uploaded to KE EMu (museumwide database) and are publically available

- Shared with AntWeb.org

- Incorporated into FMNH pinned collection

www.fieldmuseum.org search site map help

Department of Zoology
Arthropod Collections Database

Search: All Arthropods

New Search

Stenamma knowltoni Gregg, 1972

Current name	Stenamma smithi Cole, 1966				
Higher taxonomy	**Phylum** Arthropoda	**Class** Insecta	**Order** Hymenoptera	**Family** Formicidae	**Subfamily** Myrmicinae
Taxonomy	**Tribe** Stenammini			**Subtribe**	
Catalog #	FMNH-INS-62667				
Semaphoront(s)	adult female - worker				
Pinned Count	1				
Types Present	Yes				
Type Status	Holotype				
Region	Nearctic				
Other sample #	#49				
Geography	**Continent** North America	**Country** U.S.A.	**Island Group**	**Island**	
Country geography	**Province/State/Territory** Utah		**District/County/Shire**		
Precise location	Cedar Creek Junction, near Kelton Pass				
Collection Number	FMNH.Emu.CE.IRN_350003				
Site #	FMNH.Emu.Site.IRN_386603				
Habitat	mossy sagebrush duff				
Collector(s)	G. F. Knowlton				
Collected date(s)	16 Apr 1969 to 16 Apr 1969				
Multimedia					

New Search

Photo: Gracen Brilmyer

STEP 2....

Photos: Gracen Brilmyer

ANTS

VIALS

JARS

TRAYS

CABINETS

Photos: Gracen Brilmyer

ANTS

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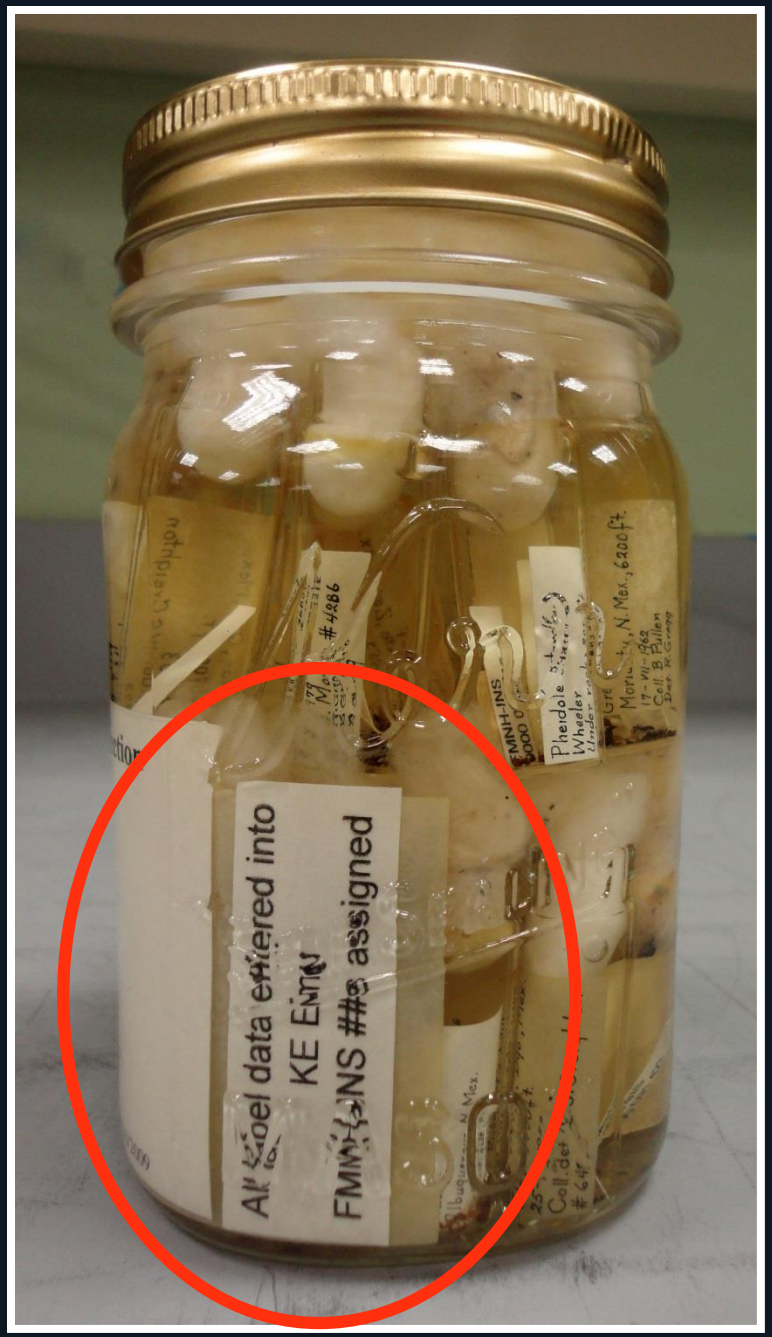
CABINETS

Jar has been databased label



Photos: Gracen Brilmyer

ANTS

VIALS

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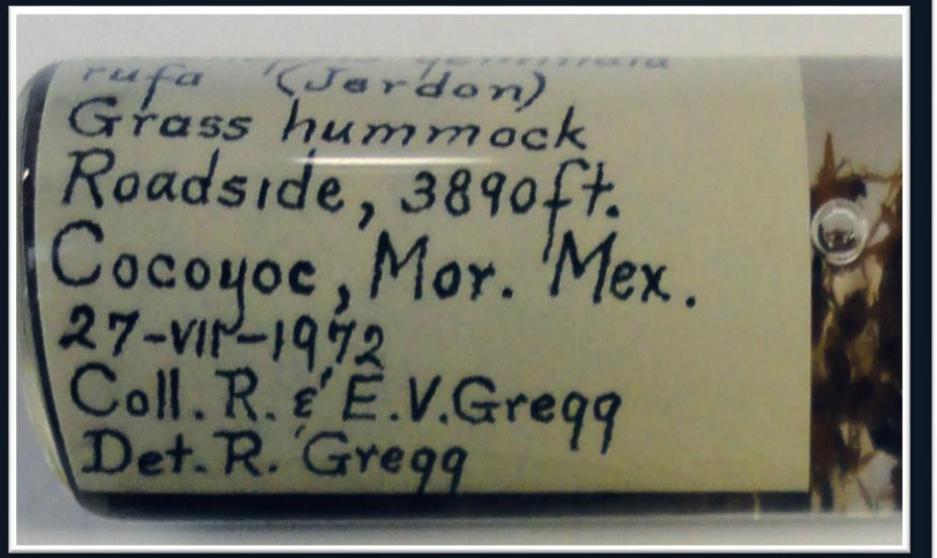
TRAYS

CABINETS

Assign each vial a unique identifying number (FMNHINS#)

Record all label data



Photos: Gracen Brilmyer

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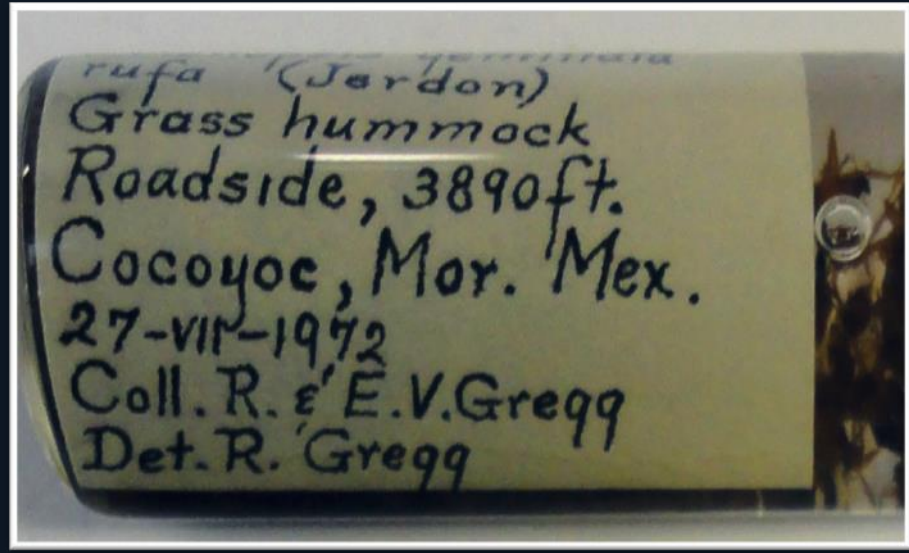


Photos: Gracen Brilmyer

ANTS

VIALS

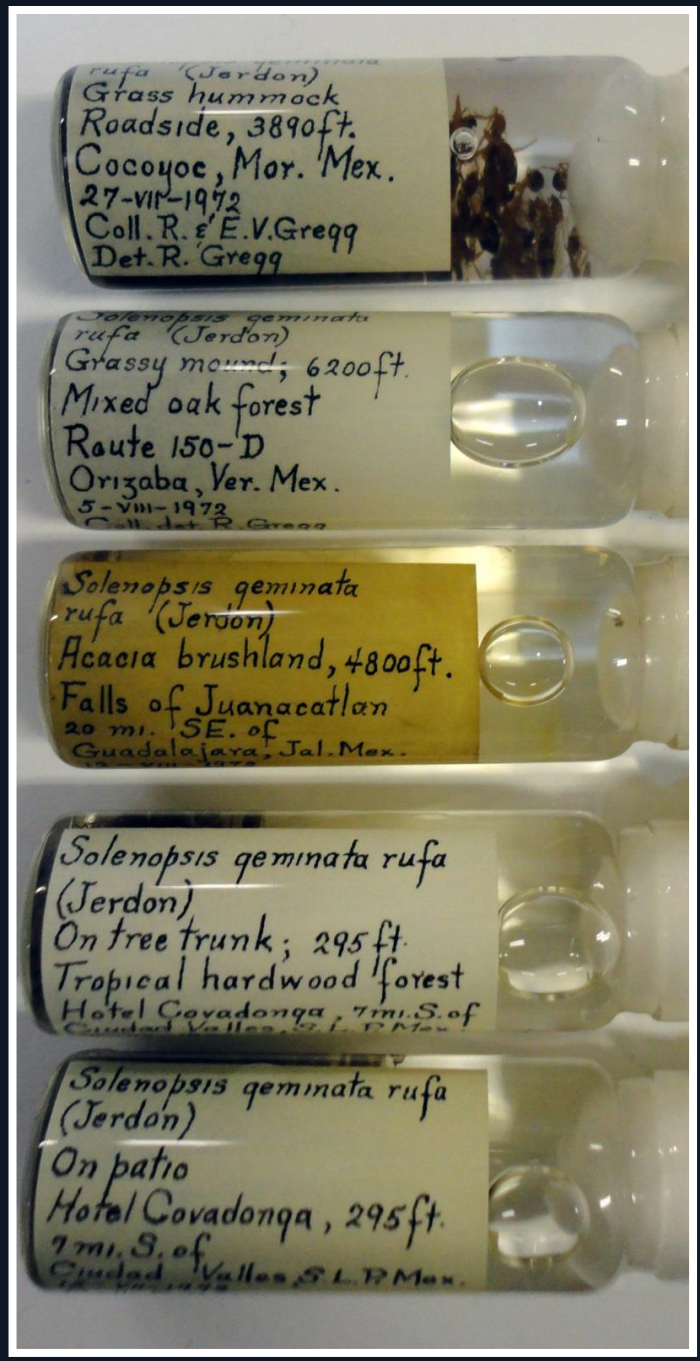
JARS

TRAYS

CABINETS

Spreadsheet

- KE EMu compatible
- Sorting capabilities
- Easily checkable
- Dropdown lists or precise way of writing each field



Photos: Gracen Brilmyer

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- Sorting capabilities
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Photos: Gracen Brilmyer

ANTS

VIALS

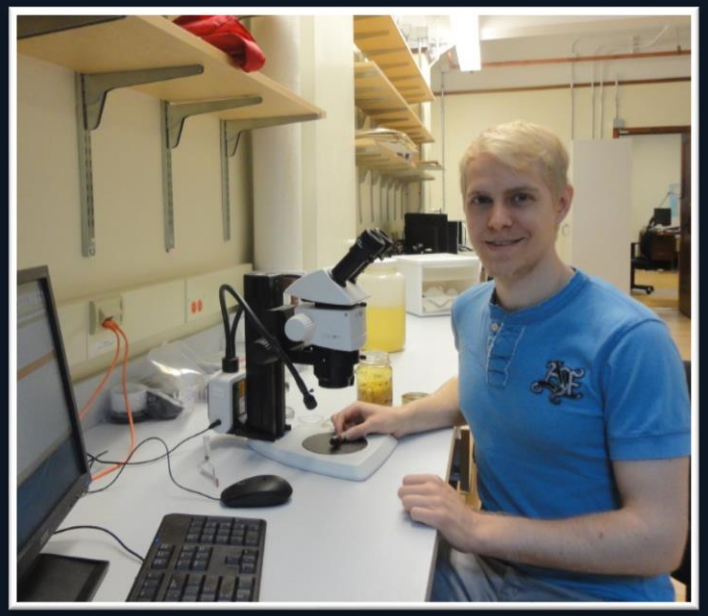
JARS

TRAYS

CABINETS

Interns learned about:

- Ant castes
- How to recognize an ant
- Basic taxonomy



Photos: Gracen Brilmyer

ANTS

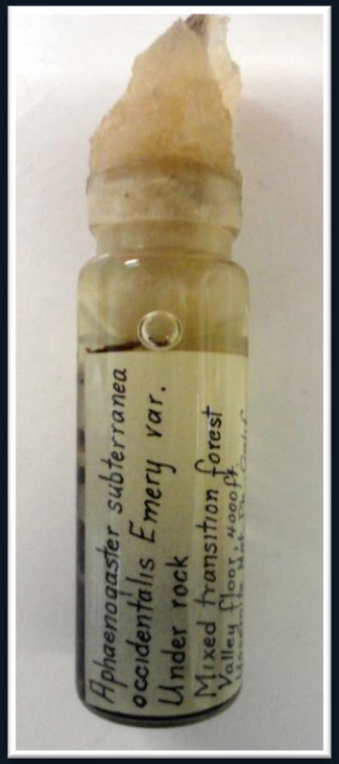
VIALS

JARS

TRAYS

CABINETS

A	D	E	F	G	H	I	J	K	L	Q	R
FMNH-INS#	Semaphoront 1	# Wet 1	Estimate	Semaphoront 2	# Wet	Estimate	Semaphoront 3	# Wet 3	Estimate 3	Taxon	Identified by
116684	adult female - worker	1								Myrmica scabrinodis	H. Holgersen
112639	adult female - worker	25	Yes							Formica opaciventris	R.E. Gregg
110832	adult female - worker	25	Yes							Formica fusca neoclara	R.E. Gregg
112662	adult female - worker	1								Formica oreas	R.E. Gregg
113623	adult female - worker	30	Yes	adult female - dealate queen	1					Iridomyrmex pruinosus	R.E. Gregg
107867	adult female - worker	3								Camponotus hyatti	M.R. Smith
99728	adult female - worker	4								Camponotus herculeanus	R. Gregg
99849	adult male	1		adult female - worker	2					Camponotus aethiops	H. Holgersen
106704	adult female - alate queen	1								Camponotus herculeanus	H. Holgersen
106757	adult female - alate queen	1		adult female - dealate queen	1		adult male	1		Camponotus herculeanus whymperi	R.E. Gregg
106886	adult female - worker	3								Aphaenogaster ashmeadi	M.R. Smith
106893	adult female - worker	3								Camponotus herculeanus	H. Holgersen
106897	adult male	1								Camponotus herculeanus	R.E. Gregg
107074	adult female - worker	40								Camponotus vicinus	R.E. Gregg
107078	adult female - worker	30	Yes	adult female - alate queen	2					Camponotus vicinus	R.E. Gregg
107084	adult female - worker	30	Yes	adult female - alate queen	2		adult female - d	1		Camponotus vicinus	R.E. Gregg
107219	adult female - worker	5								Camponotus sansabeanus	R.E. Gregg
107220	adult female - worker	4								Camponotus sansabeanus	R.E. Gregg
107229	adult male	1		adult female - worker	9					Camponotus sansabeanus	R.E. Gregg
107232	adult female - worker	1								Camponotus sansabeanus	R.E. Gregg
107233	adult female - worker	5								Camponotus sansabeanus	R.E. Gregg
107260	adult female - worker	1								Camponotus nearcticus	R.E. Gregg
107283	adult female - worker	50	Yes	pupa	20	Yes				Camponotus abdominalis floridanus	R.E. Gregg



Recorded specimen data:

- Estimate number of each caste in vial
- Taxon, as written

Photos: Gracen Brilmyer

LAB COMMUNICATION

- Six stations together

- Having monthly meetings to discuss issues

- Color coding spreadsheets

Photos: Gracen Brilmyer

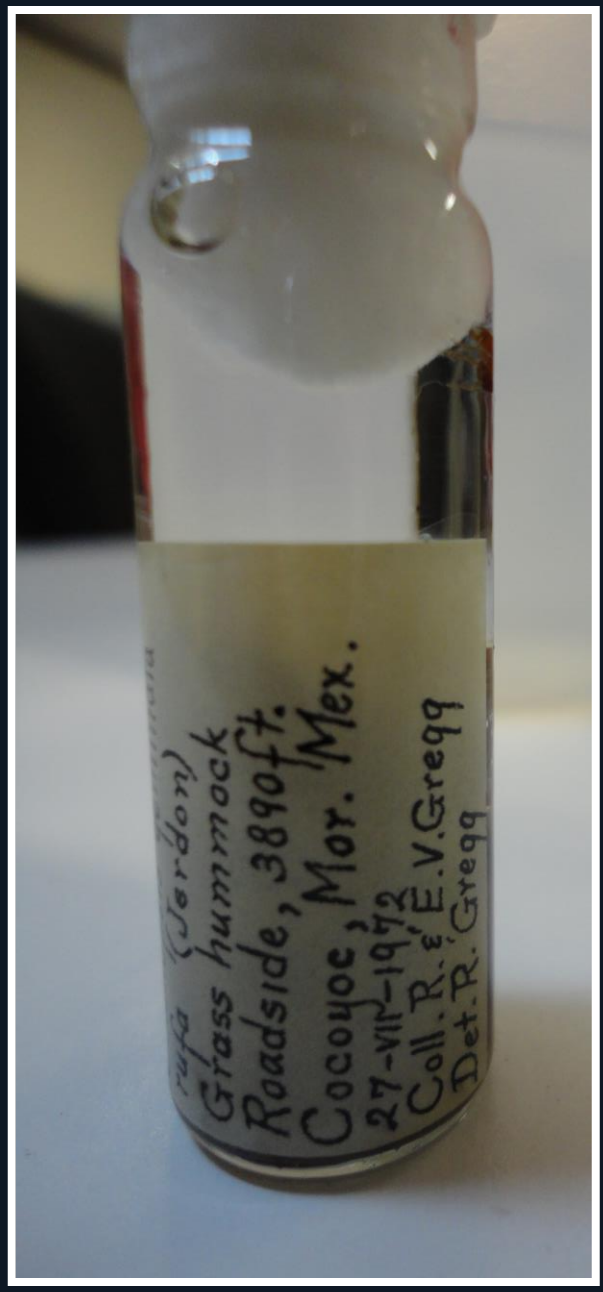
In 4 months, we databased 16,000 records containing approximately 350,000 specimens.

LABEL IMAGING

Initial Concept:

#1 Label Imaging + Specimen Handling → #2 Label Databasing

- Have imaging team to:
  - Image all labels
  - Record specimen counts & castes
- Have database team to:
  - Database directly from label image
- Easy way to check data discrepancies



Photos: Gracen Brilmyer

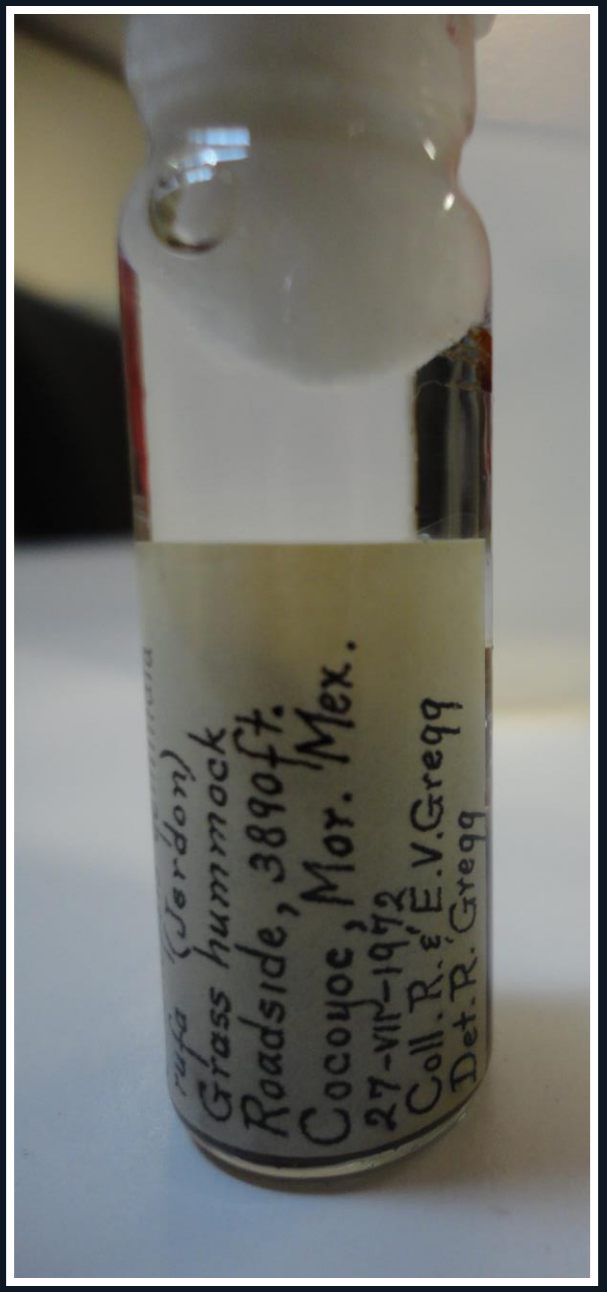
LABEL IMAGING

Implemented Concept:

#2 Label Imaging

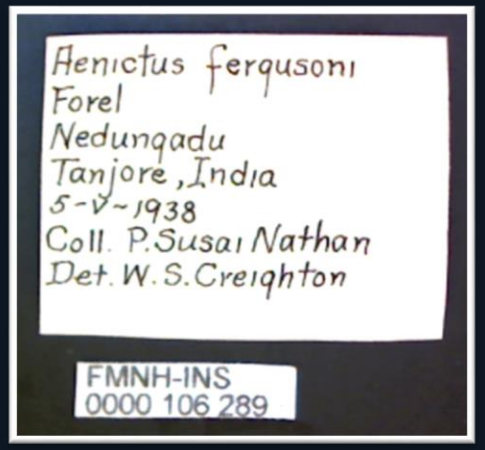
#1 Specimen Handling + Label Databasing

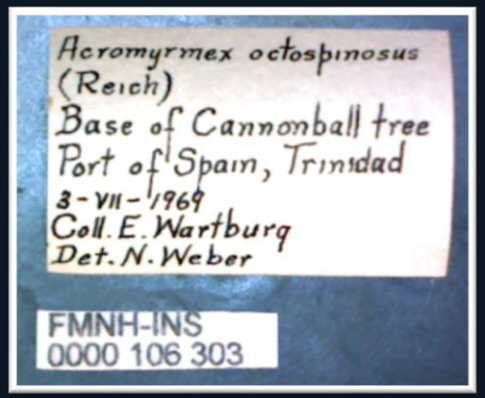
- Completed all label & specimen databasing
- Now image all labels with unique identifying number
- Link all images to KE EMu record
- Easy way to check data discrepancies

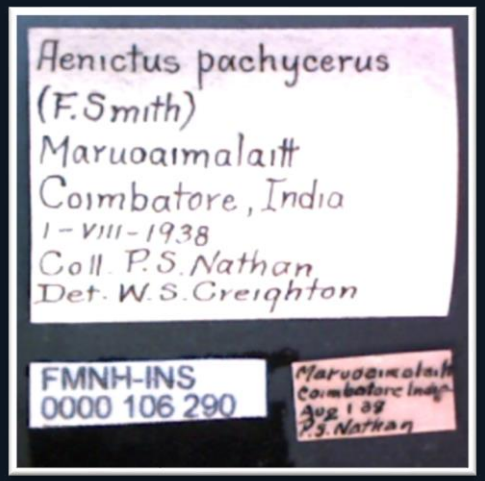


Photos: Gracen Brilmyer

LABEL IMAGING







Photos: Gracen Brilmyer & Ali Gutowski

LABEL IMAGING

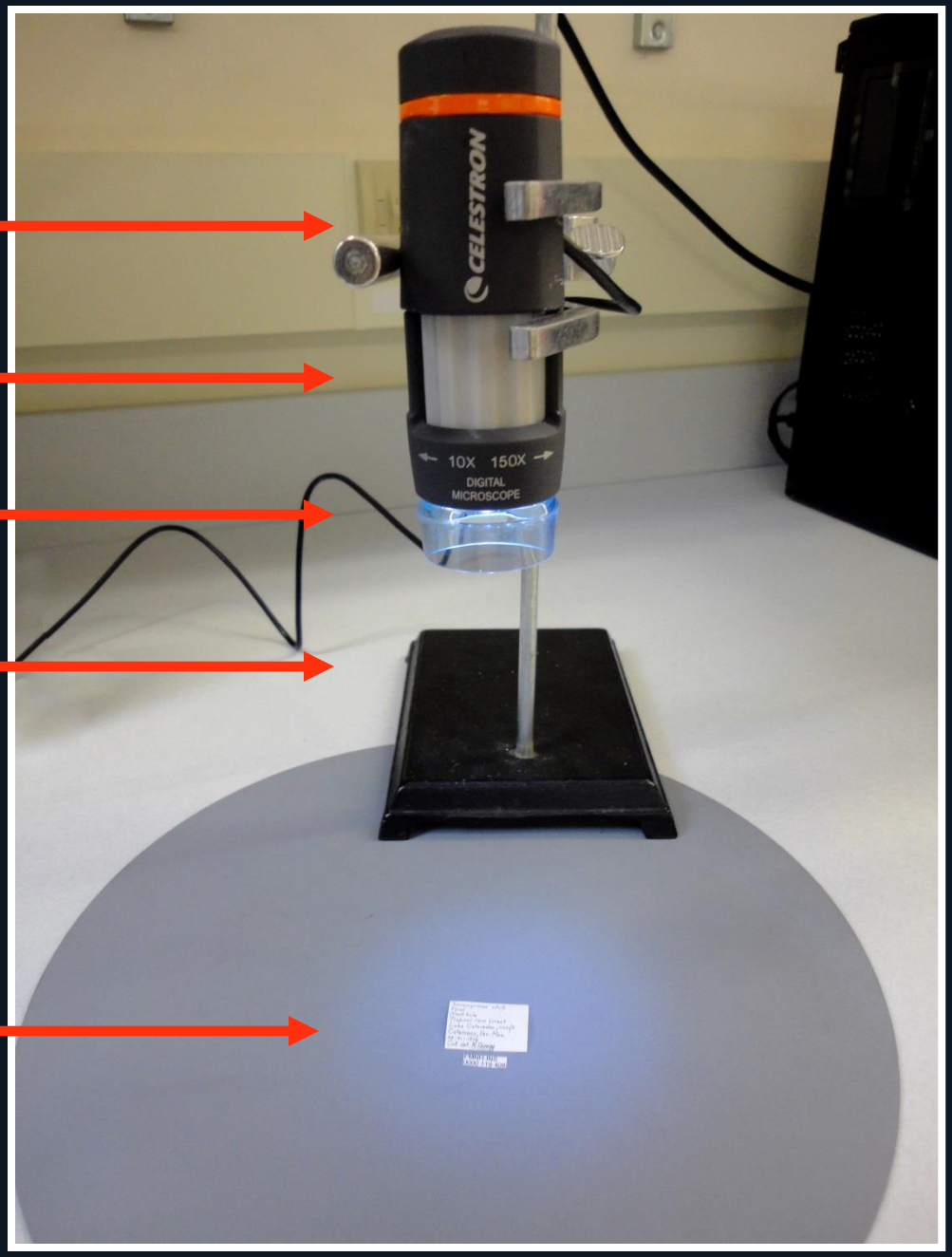
Camera

Zoom

Lighting

Stand

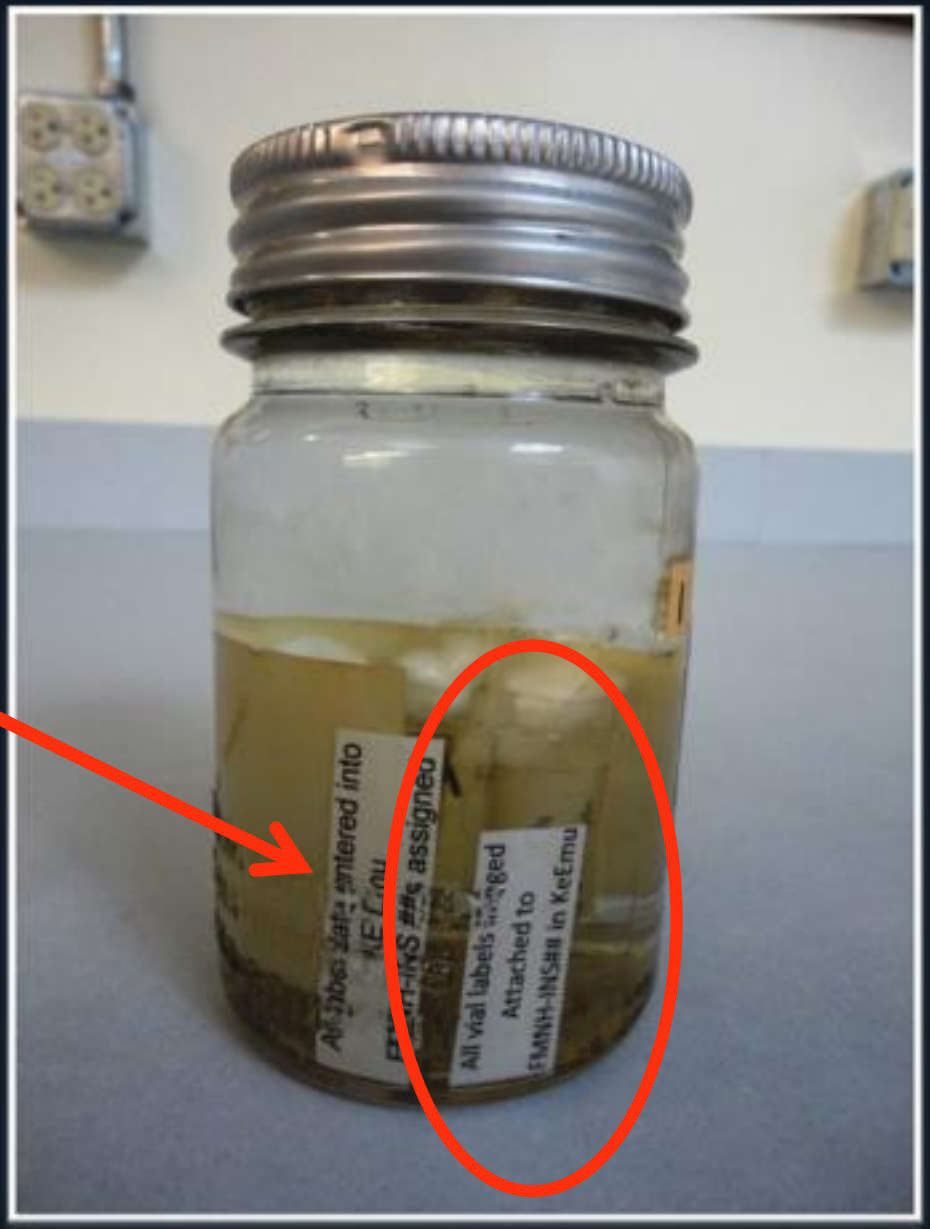
Labels



Photos: Gracen Brilmyer

LABEL IMAGING

‘All labels imaged’ label



Photos: Gracen Brilmyer

EXPANDING DIGITIZATION

- Geolocating
  - Acquiring Lat/Longs
  - ArcGIS

- Apply this protocol to:
  - Field Museum's ant alcohol collection
  - R.E. Gregg's unidentified material

- Teach interns how to identify ants

- Mount one specimen from each caste & location from R.E. Gregg collection

STEP 3 STARTING A DIGITIZATION PROJECT?

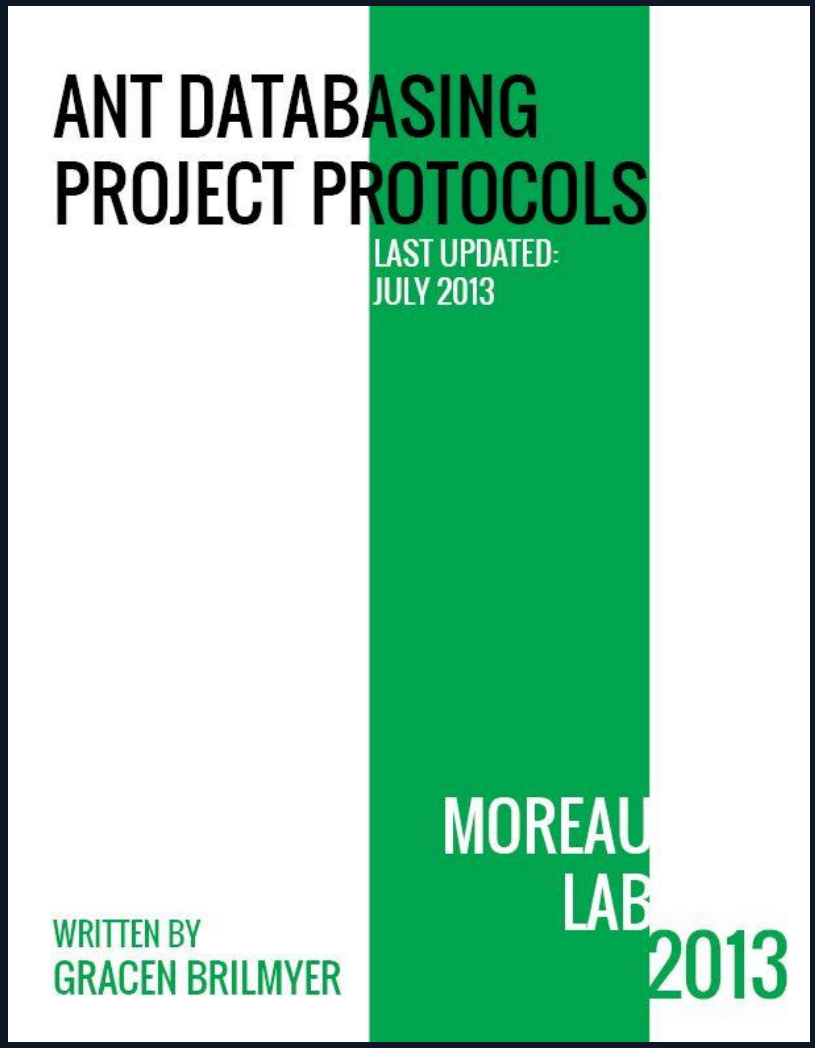
- Size of collection

- Time frame

- How many people can work at once
  Computers Paper
  Equipment Other supplies (alcohol, forceps)

- Where to save time

- Where to spend time



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LEICA APPLICATION SUITE V 4.2

IMAGING MANUAL

for high-resolution specimen image stacking

The Field Museum of Natural History — Moreau Lab (www.moreaulab.org)

Written by Gracen Brilmyer

Updated JANUARY 2013

1. EQUIPMENT (for exact equipment specs see Appendix H p. 18)

A Leica DFC450 Camera with Video Objective 0.63x

B Optics Carrier (Z6 or Z16)
- C Iris
- D Zoom

E Lens (Objectives: 0.5x, 1.0x, and 2.0x)

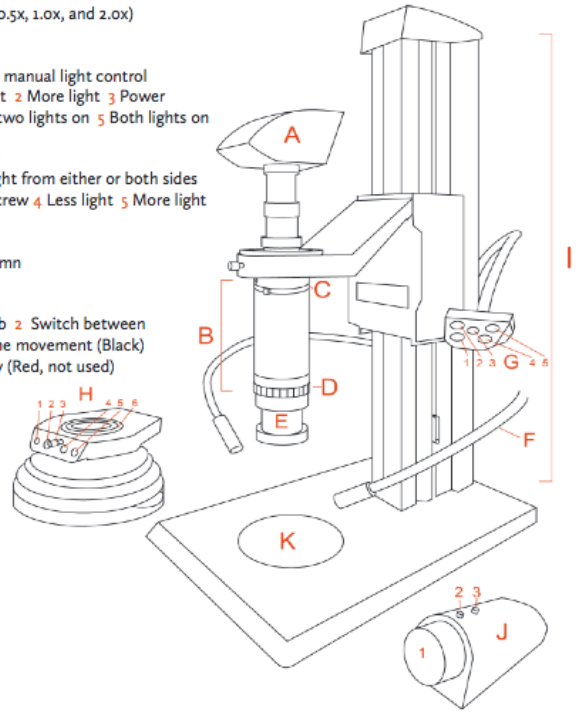
F Gooseneck Lights
- G Gooseneck manual light control
  - 1 Less light 2 More light 3 Power
  - 4 One of two lights on 5 Both lights on

H Dome Illuminator
- 1 Power 2 Light from either or both sides
- 3 Changing screw 4 Less light 5 More light
- 6 Inner rings

I Lift/Focusing Column

J Lift control
- 1 Motion knob 2 Switch between coarse and fine movement (Black)
- 3 Lift memory (Red, not used)

K Stage



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THANK YOU

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Steph Morgan
Greg Putzel
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Chelsea Wang
Alexandra Westrich
Max Winston
Brian Wray

iDigBio
Integrated Digitized Biocollections

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