

# **HOW DO YOU SOLVE A PROBLEM LIKE MULTIMEDIA?**

Sharon Grant, Kate Webbink, and Marc Lambruschi

# The Columbian Museum of Chicago

When the World's Columbian Exposition closed in the autumn of 1893, and its 25 million visitors had gone home, all that remained on the fairgrounds was the Palace of Fine Arts. A year later, the Columbian Museum of Chicago opened. The *Chicago Times* reported "It was, all like a memory of the fair."

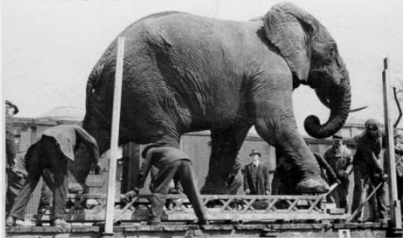
(<http://www.encyclopedia.chicagohistory.org/pages/450.html>)



W.B. CONROY CO. CHI.

# The Field Columbian Museum.

© The Field Museum, CSG4632



## 8,000 ATTEND OPENING OF NEW FIELD MUSEUM

### Exhibit Is Ready for Public Today.

Over a road as bumpy as the "rocky road to Dublin" private motors and taxicabs traveled all yesterday afternoon across Grant park taking thousands of invited visitors to the new Field Museum of Natural History at the foot of Roosevelt road.

There also were many who trudged across a narrow wooden walk, braving the biting wind and drizzly rain, for a first visit to the beautiful building and its exhibits, which were transferred from the old building in Jackson park during the last year. The new structure is the greatest natural history museum in the west, and one of the finest examples of Ionic architecture in this country.

#### No Formality to Opening.

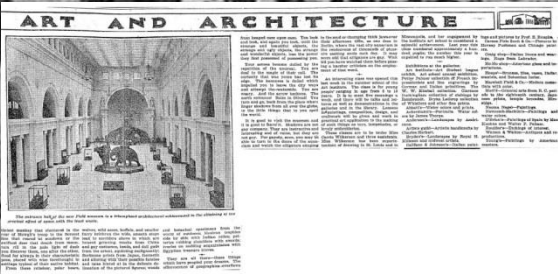
The opening was marked by no formality or celebration. The doors were simply opened at 2 o'clock and the first of the 8,000 guests entered. Speeches and music would have been superfluous.



## New Field Museum Makes Beauty Work Overtime as Praise

By Eleanor Jewett.

THE new Field museum is a remarkably beautiful building. This remark may sound trite—particularly to those who at the time of its opening read the panegyrics which greeted its stately dimensions—but trite as it may sound, there is no truer expression to be found which adequately describes this modern Greek temple. The purity of its lines is beautiful; the spaciousness of its halls is beautiful; the old world monastic quiet of its corridors is beautiful; the interminable progression of galleries, occupied by rare specimens of plant and animal life, is beautiful—in fact, to cut short a paragraph which insists upon harping on a single word, the Field museum is, throughout, beautiful.



The museum's collections quickly outgrew the space in the old Palace, and in first decades of the twentieth century plans for a new museum building began to take shape. The result, a massive white marble building rising from the mud. The Field Columbian Museum opened to 8,000 visitors in May 1921.

(<http://www.encyclopedia.chicagohistory.org/pages/450.html>)

# Chicago Natural History Museum.

The Depression, The Great War, the attack on Pearl Harbour and another name, none of these change The Museum's goals "Accumulation and dissemination of knowledge, and the preservation and exhibition of objects illustrating art, archaeology, science and history."



© The Field Museum, GN85106

TWDG 2014: Sharon Gant, Kate Webbing, Marc Lambrosini, Mike Yoshida - The Field Museum of Natural History, Chicago, IL

# The Field Museum of Natural History.

Into the 21<sup>st</sup> century, a new focus on scientific research increases The Field Museum of Natural History's collections to 24 million and 186,000 square feet of storage space is created 2 floors beneath the ground.



© The Field Museum, GN91340\_09d

# **WHAT'S ALL THIS FUSS ABOUT DIGITIZATION?**

# The Impossible Dream?

ZooKeys 209: 133–146 (2012)  
doi:10.28911/zookeys/209/3/178  
www.zookeys.org

RESEARCH ARTICLE



## No specimen left behind: industrial scale digitization of natural history collections

Vladimir Blagoderov<sup>1</sup>, Ian J. Kitching<sup>1</sup>, Laurence Livermore<sup>1</sup>, Thomas J. Simonsen<sup>1</sup>, Vincent S. Smith<sup>1</sup>

<sup>1</sup> Department of Life Sciences, Natural History Museum, Cromwell Road, London, SW7 5BD, UK  
Corresponding author: Vladimir Blagoderov (v.blagoderov@nhm.ac.uk)

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Citation: Blagoderov V, Kitching IJ, Livermore L, Simonsen TJ, Smith VS (2012) No specimen left behind: industrial scale digitization of natural history collections. In: Blagoderov V, Smith VS (Eds) No specimen left behind: mass digitization of natural history collections. ZooKeys 209: 133–146. doi: 10.28911/zookeys/209/3/178

**Abstract**  
Traditional approaches for digitizing natural history collections, such as specimen selection, metadata capture, are both labour- and time-intensive steps, such as specimen selection. Digitization of larger collections should be automated and crowd-sourced, with minimal input identifier. A new workflow for the mass-digitize these principles, and using SetScan™ tray scanning.

**Keywords**  
Digitization, imaging, specimen metadata, natural history collections

### Introduction

Natural history collections are of immense scientific importance and herbaria and their assets of information on biodiversity, ecosystem of stakeholders, from governments and NGOs examples of the uses to which biodiversity have been put in research on evolution a management, public health and safety, and

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## So You Think You Can Digitize



a blog about natural history museum digitization projects, data sharing, and informatics

Biodiversity Informatics, 7, 2016, pp. 93 – 112

### NATURAL HISTORY SPECIMEN DIGITIZATION: CHALLENGES AND CONCERNS

ANA WILLIAMS FORBES<sup>1</sup>, JAMES A. MACKLIN<sup>1</sup>, LINDA S. FURSE<sup>2</sup>  
<sup>1</sup> Harvard University Herbaria, 22 Divinity Avenue, Cambridge, MA 02138  
<sup>2</sup> Harvard University Museum of Comparative Zoology, Cambridge, MA 02138  
Correspondence: email: jmacl@oeb.harvard.edu

### Re:Sourcing Primary Materials: Notes from A Workshop

Posted on April 1, 2016 by A00398

Last week, we both attended a workshop on Primary Source Material digitization organized by iDigBio, where we had some great, truly interdisciplinary conversations with folks like Rusty Russell over at the [Field Book Project](#), Ben Brumfield at [From The Page](#), Terry Catanagan at [Ezri](#) and many others. We're both eager to stay involved with this

This blog by...

All posts by...

Recent

**AMERICAN MUSEUM OF NATURAL HISTORY**  
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Digital Special Collections of the American Museum of Natural History's Research Library provides access to our rich collections of digitized archival photographic images, art and memorabilia images and Rare Book Collection illustrations. Use the tabs above to view Collections and Exhibits, or choose Browse to see all the images digitized to date. Enter terms in the box above to search across all our images or choose the Advanced Search option.

**Featured Collection | Lantern Slides**  
This collection of black and white and hand-colored lantern slides was originally used to illustrate public lectures given at the Museum.

**Featured Images From The Collections**

**iDigBio**  
About iDigBio | Research | Technical Information | Education

Technical info Working Groups Workshops Digitization Proposals Bibliography Wiki Forums

**GBIF TRAINING MANUAL 1: DIGITIZATION OF NATURAL HISTORY COLLECTIONS DATA**

Title: GBIF TRAINING MANUAL 1: DIGITIZATION OF NATURAL HISTORY COLLECTIONS DATA  
Publication: Manuscript  
Type: 2008  
Publication: 2008  
Keywords: Digitization, Imaging, LabelCapture, Workflow  
URL: [http://www.informatics.org/system/files/research/GBIF\\_T111.pdf](http://www.informatics.org/system/files/research/GBIF_T111.pdf)

**Description:**  
The Global Biodiversity Information Facility (GBIF) is a worldwide network that makes primary scientific biodiversity data (documented species occurrence data) from many sources openly available via the internet. It does this by building an information infrastructure that interconnects hundreds of databases, and by promoting the digitization and sharing of data that are not currently available via the internet, such as those associated with specimens in natural history museums. This promotion of digitization is approached as a number of ways. Seed money awards to stimulate digitization projects, the development (with partners) of community-accepted standards for data and metadata, as well as software tools that enable interoperability and interoperability, workshops for training in digitization and data-sharing, and guides such as this training manual and its components. GBIF's hope is to help collectors and database personnel around the world share best practices in the tasks and operations required in building a web-based, global 'natural history collections and herbarium' that can be accessed any time any where by any one via the internet.

**INITIATING A COLLECTION DIGITIZATION PROJECT**

**Christopher K. Frazier<sup>1</sup>, John Wall<sup>2</sup> and Sharon Grant<sup>3</sup>**

**Abstract:**  
This document is designed to give the reader the confidence to get started and to make the right decisions when planning a natural history collection digitization project. The authors have years of experience working with collections and they have distilled this expertise into this paper so you can more efficiently ask the right questions and make the appropriate plans prior to consulting any resources to the task.

**GBIF**  
[www.gbif.org](http://www.gbif.org)

<sup>1</sup> Dept of Biology, University of New Mexico, Albuquerque, NM 87131, United States of America  
<sup>2</sup> Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, United Kingdom  
<sup>3</sup> Illinois Natural History Survey, 111 Greenwood Dr., Urbana, IL 61801, United States

Had you noticed that there is an effort underway to digitize collections?



To capture specimen data fast enough to digitise entire collections while maintaining data quality.

To store and retrieve the assets created.

To share the information held in these collections.

How do you do this?

Can we do this?

Should we do this?

**CAN WE REALIZE THE IMPOSSIBLE DREAM?**

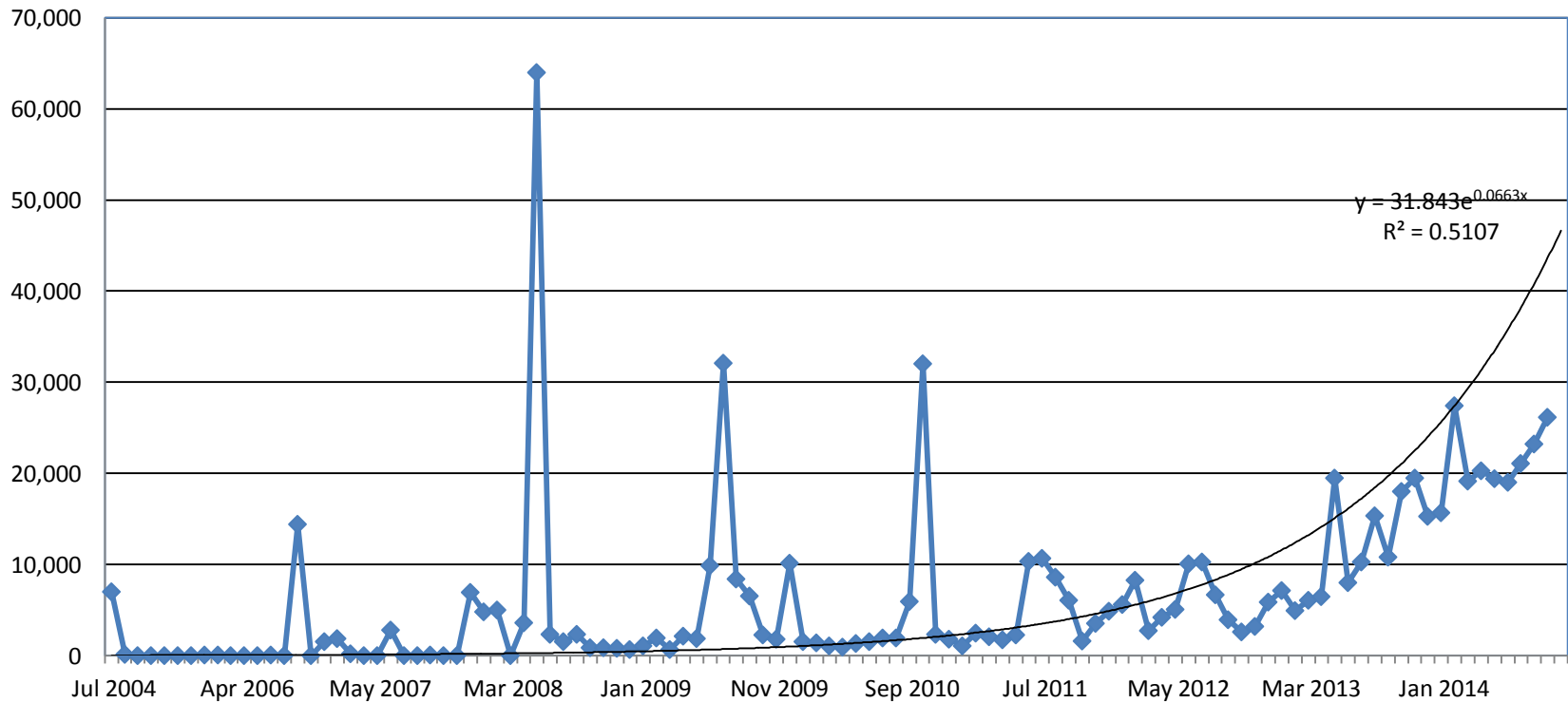
TWDG 2014: Sharon Grant, Kate Webbink, Marc Lambruschi, Mike Yoshida – The Field Museum of Natural History. Chicago. IL



# INTERMISSION

# Imaging Frenzy

What to do when when ...  
the bunnies are multiplying and eating all the grass?



# Storage Crisis

And we asked for more space and the answer was NO.



# Plus our... re-indexing hell

## Reindex - Starting Sun Jun 15 01:00:01 2014

### Batch - Starting Fri May 16 22:00:01 2014

eaccessionlots... Records updated : 0  
ebibliography... Records updated : 0  
ecatalogue... Records updated : 10478  
ecollectionevents... Records updated : 5950  
econdition... Records updated : 0  
econervation... Records updated : 228  
edocuments... Records updated : 0  
eevents... Records updated : 2  
eexports... Records updated : 0  
efieldhelp... Records updated : 0  
efmnhrepatriation... Records updated : 20  
efmnhtransactions... Records updated : 36  
egazetteer... Records updated : 0  
egroups... Records updated : 5  
einsurance... Records updated : 0  
einternal... Records updated : 136  
eloans... Records updated : 0  
elocations... Records updated : 0  
eluts... Records updated : 60  
emovements... Records updated : 0  
emultimed... Records updated : 3882  
enhmstratigraphy... Records updated : 0  
eparties... Records updated : 28  
eregistry... Records updated : 118  
erights... Records updated : 0  
eschedule... Records updated : 0  
esites... Records updated : 13  
estatistics... Records updated : 0  
etaxonomy... Records updated : 95  
etemplate... Records updated : 0  
ethesaurus... Records updated : 0  
etransactions... Records updated : 0  
evaluations... Records updated : 0  
ewebgroups... Records updated : 0  
ewebusers... Records updated : 0

eregistry... # of records updated = 12885  
eaccessionlots... # of records updated = 4402  
ebibliography... # of records updated = 33081  
ecatalogue... Increased size to 2883905 records # of records updated = 2873905  
ecollectionevents... Increased size to 1400746 records # of records updated = 1390746  
econdition... # of records updated = 7935  
econervation... # of records updated = 38424  
edocuments... # of records updated = 19748  
eevents... Increased size to 2477 records # of records updated = 2252  
eexports... Increased size to 50 records # of records updated = 5  
efieldhelp... # of records updated = 5905  
efmnhrepatriation... # of records updated = 4805  
efmnhtransactions... # of records updated = 7624  
egroups... # of records updated = 5  
einsurance... Increased size to 50 records # of records updated = 2  
einternal... Increased size to 1222 records # of records updated = 10622  
eloans... # of records updated = 0  
elocations... # of records updated = 76723  
eluts... Increased size to 15104 records # of records updated = 15004  
emovements... Increased size to 50 records # of records updated = 0  
emultimed... Increased size to 638947 records # of records updated = 628947  
enarratives... Increased size to 250 records # of records updated = 189  
enhmstratigraphy... # of records updated = 2587  
eparties... Increased size to 190197 records # of records updated = 180197  
erights... Increased size to 50 records # of records updated = 11  
eschedule... Increased size to 50 records # of records updated = 2  
esites... Increased size to 452063 records # of records updated = 442063  
estatistics... Skipped compact... # of records updated = 78612  
etaxonomy... Increased size to 549590 records # of records updated = 539590  
etemplate... Increased size to 50 records # of records updated = 5  
ethesaurus... Increased size to 907026 records # of records updated = 897026  
etransactions... Increased size to 50 records # of records updated = 0  
evaluations... # of records updated = 1361  
ewebgroups... Increased size to 100 records # of records updated = 84  
ewebusers... Increased size to 100 records # of records updated = 82  
Starting background loads..

## Reindex audit - Starting Sun Jun 15 01:00:01 2014

Starting system maintenance at Sat Sep 28 22:02:02 CDT 2013  
Starting compact maintenance at Sat Sep 28 22:02:02 CDT 2013  
Audit...

Checking for index updates...  
Closing database...  
Skipped compact...  
Reconfiguring database...  
Increased size to 1118073 records  
Reindexing...

**Error: reindex failed to start!**

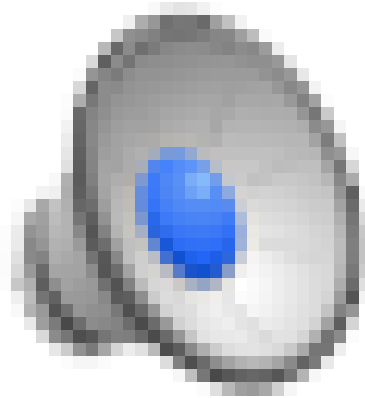
Opening database...  
Starting background loads...  
Finished compact maintenance at Sat Sep 28 22:00:48 CDT 2013  
Finished system maintenance at Sat Sep 28 22:01:11 CDT 2013

## Finished Sun Jun 15 14:26:59 2014

## Finished Sun Jun 15 14:26:59 2014

## Finished Sat May 17 00:28:04 2014

# Run away from the multimedia.



The role of multimedia in this clip is played by a fuzzy white bunny.  
It wasn't quite the wild, wild west...

# INTERMISSION

# HOW DO YOU SOLVE A PROBLEM LIKE MULTIMEDIA



# Is a Puzzlement





# FILE FORMATS

# File Formats - Layers



Volumize with

**LAYERS**

Layers allow flexible editing.

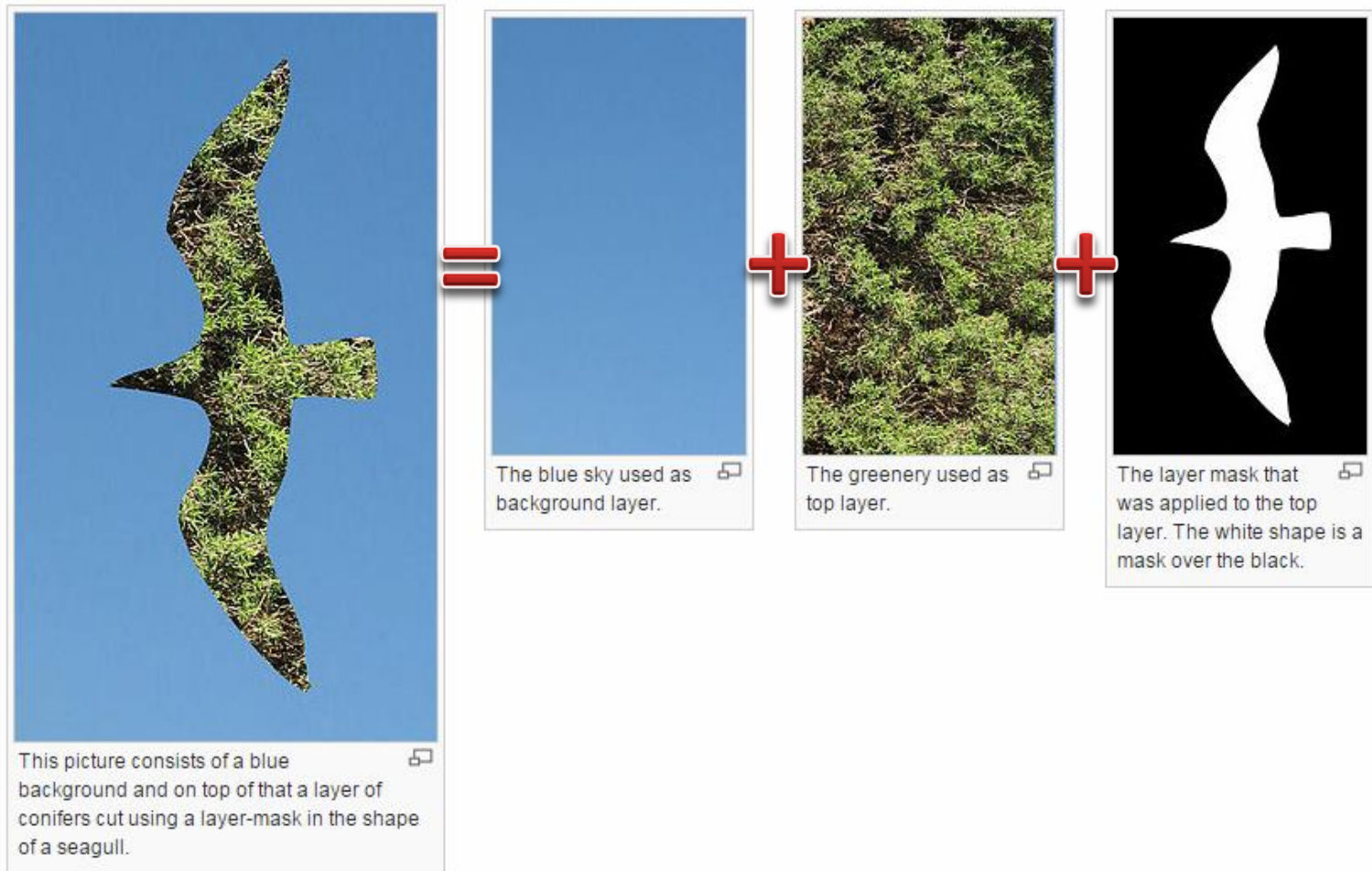
Merging of images.

Addition of reference details and scale bars.

Watermarking and security.

# File Formats – Layers

Each new layer added to an image increases the size of the file.



# File Formats - Color Depth



## The Benefits of **BITS**

More bits = More colours

More Colours = More Information

More Information = More Data

More Data = More File Space

# 16-bit vs 8-bit

---

## 8-bit

- Approximately 16 million tone variations

## 16-bit

- Approximately 281 **trillion** tone variations

*Adelotopus  
parumpunctatus*



• 8 Bit Color

5.0 mm



• 16 Bit Color

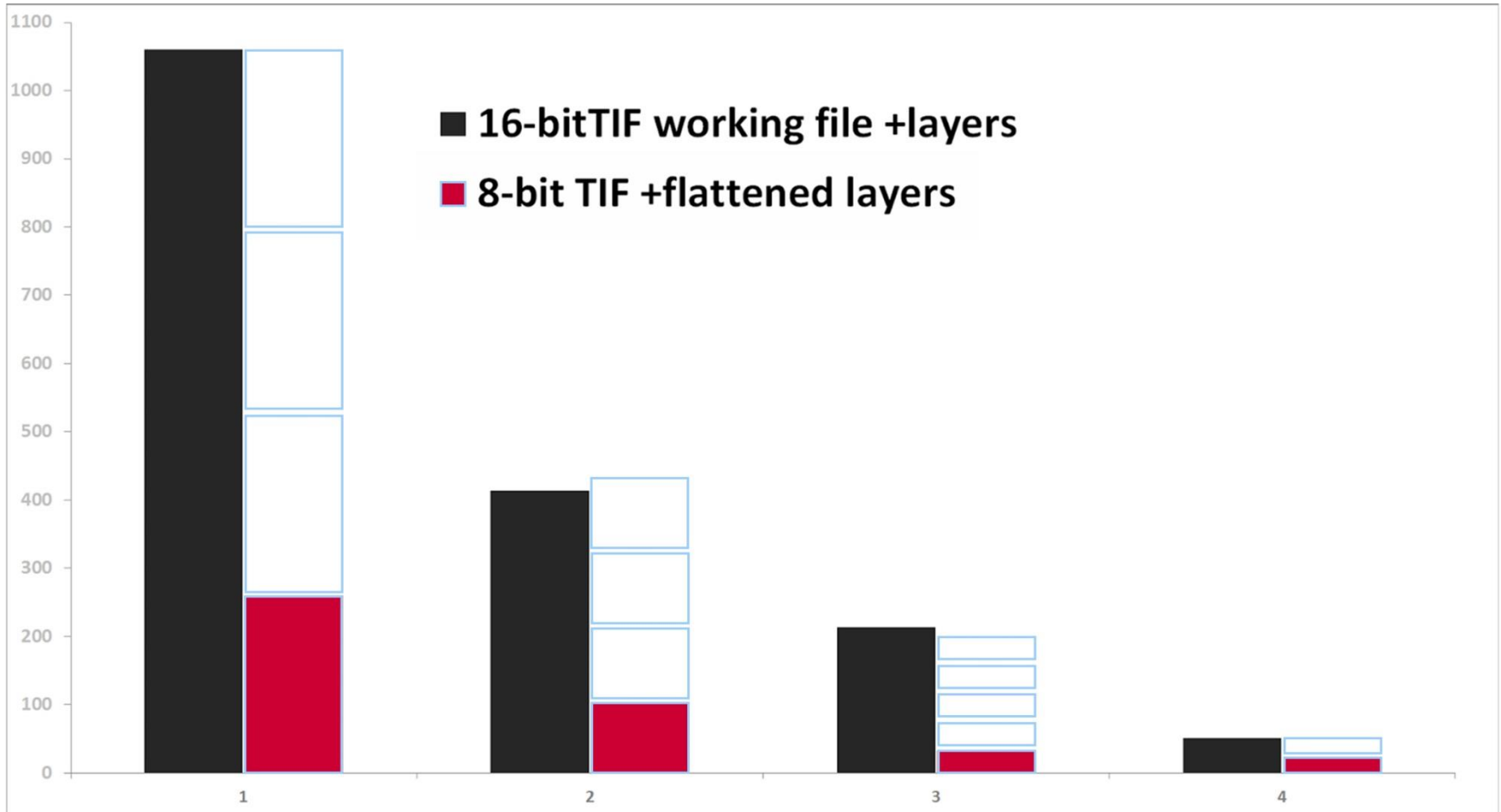
5.0 mm

# Archiving S&E Imagery

	8-bit	16-bit	
	Color (bit-depth)		
- Layers	x MB	4x MB	x 2
+ Layers	2x MB	8x MB	

# File Formats – Colour Depth

8-bit approx. 16 **million** tone variations; 16-bit approx. 281 **trillion** tone variations





# File Formats – TIFFs Vs DNGs

We archive TIFFS but they are **HUGE** is there anything else we could do?



**myhome.ie**  
Thousands of homes @ one address

MyHome.ie > Residential > Estate Agents

**DNG Kelly Duncan**



Waterlane,  
Offaly,  
Phone: 057 9  
Fax: 057 9  
License: 0

# File Formats – TIFFs Vs DNGs

## Four Things About

# DNGs

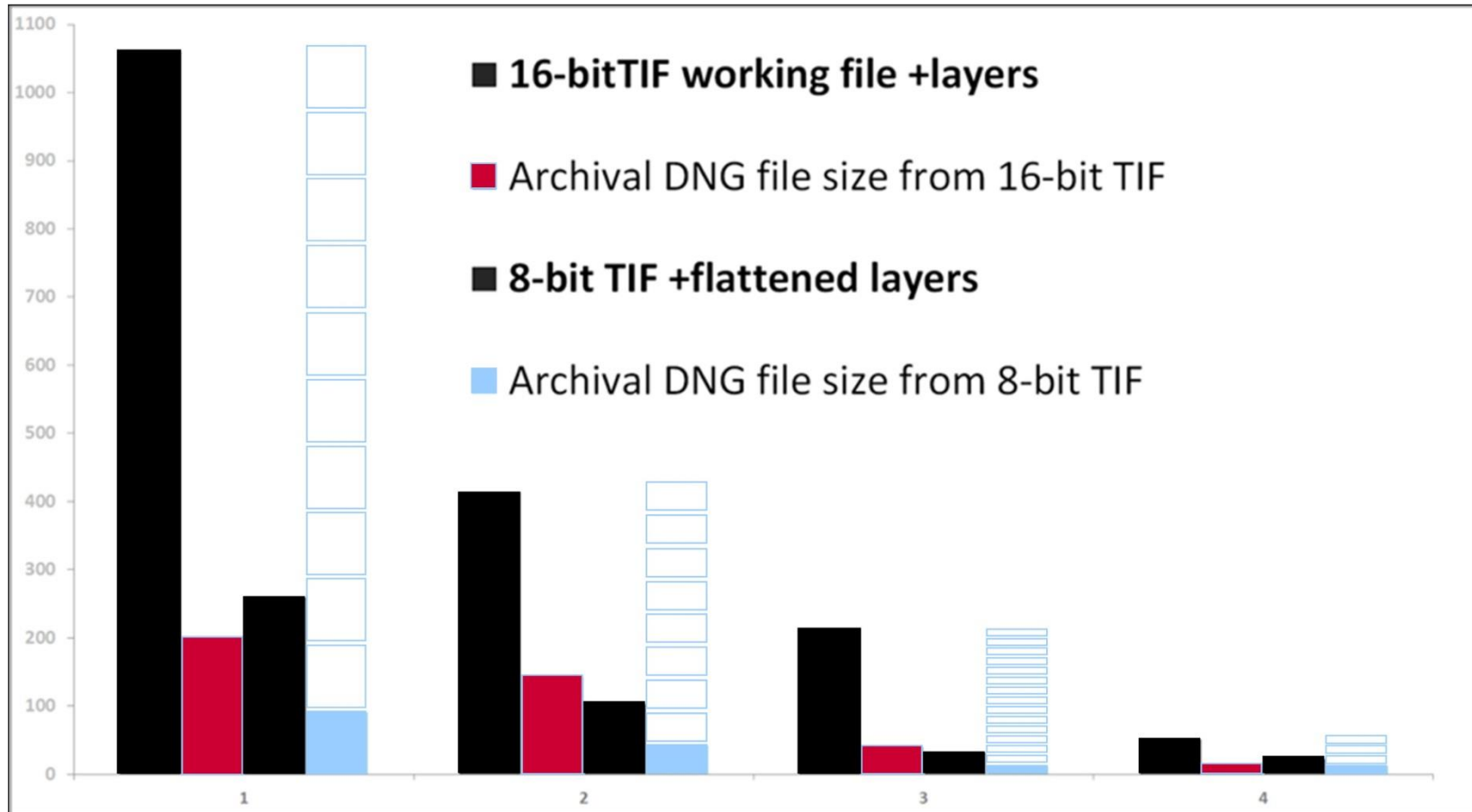
Firstly the acronym. DNG = Digital Negative (A two word TLA).

Secondly DNG is “open source” and was created by Adobe as a way to standardize RAW file formats.

Thirdly DNGs are small(er) than the TIFF that was used to create them.

Fourthly DNGs retain all the information in the TIFF AND the image is identical.

# File Formats – The upshot



# File Formats – Standards

## Establishing

# STANDARDS

TIFF working files; DNG archive files

DPI - 300dpi

ICC Color Profiles – AdobeRGB (& sRGB for Web)

Dimensions – < 10,000 x 10,000

Compression – None

8-bit (Approx. 16 million tone variations)

Layers – None

# Storage - remember to include Backups



Ingredients:

**3** copies of any important file  
(a primary and two backups)

on **2** different media types  
(such as hard drive and  
optical media), to protect  
against different types of  
hazards.

**1** copy offsite (or at least  
offline).

# Storage - Costs

<b>Solution</b>	<b>Cost per TB for 3-2-1</b>	<b>Total</b>
SAN + ExoGrid backup solution	\$7,500	\$2,490,000
External Hard-drives	\$300	\$99,600
Secret Online Sauce (shhh...)	\$3,000	\$996,000
Amazon Cloud Services	To hard to calculate!	Who knows?

Currently storing approx. 82 TB

150 TB is committed for digitization projects over 12-18 months (thanks NSF).

100 TB identified as under desks.

# Storage - Considerations

## Reimagining Storage

# THE 5Vs

**Velocity** – Speed of upload and download

**Volume** – Scalability and efficiency

**Value** – Affordability and costs

**Visibility** – Availability to users

**Vigilance** – Security and backup

# Storage - Considerations

<b>Solution</b>	<b>Velocity</b>	<b>Volume</b>	<b>Value</b>	<b>Visibility</b>	<b>Vigilance</b>
SAN + ExoGrid backup solution	High	M/H*	Low*	High	High
External Hard-drives	Low	High	High	Low	Low
Secret Online Sauce (shhh...)	M/L**	High	Medium	High**	High
Amazon Cloud Services	M/L**	High	Low???	High**	High

Warning: Back of a cigarette packet assessments!



# THE SERVER

# The Server - Upgrading

## *TOBY (\$18,568.41)*

*Live server specifications - Purchased 2009*

**Base Unit:** DELL PowerEdge R710 with Chassis for Up to Eight 2.5-Inch Hard Drives

**Processor:** PowerEdge R710

**Memory:** 12GB Memory (6x2GB), 1333MHz Dual Ranked UDIMMs for 2 Processors, 50GB Solid State Drive SATA Mainstream 2.5in HotPlug Hard Drive, RAID 5 for H700 or PERC 6/i Controllers, SSD Hard Drives

**Hard Drive:** 50GB Solid State Drive SATA Mainstream 2.5in HotPlug Hard Drive. [Hard Drive Controller: PERC 6/i SAS RAID Controller 2x4 Connectors, Internal, PCIe256MB Cache, x8 Chassis]



## *ROSS (\$48,513.01)*

*Live server specifications - Purchased 2014*

**Base Unit:** Cisco C240

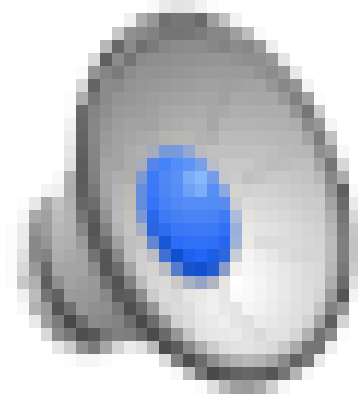
**Processor:** Dual Intel Xeon 3.5 GHz E5-2643

**Memory:** 512GB of DDR3-1866-MHZ LR DIMM/PC3 RAM

**Hard Drive:** Dual 300GB 10K RPM SAS drives for OS and a single 785GB MLC FusionIO drive



# The Server - Upgrading



This is ~~Rob's old server~~ ~~Rob's old server~~

# The Server – The Results

## Batch inc eaudit – Start Fri Oct 3 23:00:01 CDT 2014

eaccessionlots... Records updated : 0  
ebibliography... Records updated : 0  
ecatalogue... Records updated : 2213  
ecollectionevents... Records updated : 3  
econdition... Records updated : 12  
econservation... Records updated : 12  
edocuments... Records updated : 0  
eevents... Records updated : 1  
eexports... Records updated : 0  
efieldhelp... Records updated : 2  
efmnhrepatriation... Records updated : 16  
efmnhtransactions... Records updated : 16  
egazetteer... Records updated : 0  
egroups... Records updated : 9  
einsurance... Records updated : 0  
einternal... Records updated : 704  
eloans... Records updated : 1  
elocations... Records updated : 0  
eluts... Records updated : 75  
emovements... Records updated : 0  
emultimedia... Records updated : 1421  
enarratives... Records updated : 0  
enarratives... Records updated : 0  
enarratives... Records updated : 0  
enarratives... Records updated : 10  
eregistry... Records updated : 132  
erights... Records updated : 0  
eschedule... Records updated : 0  
esites... Records updated : 6  
estatistics... Records updated : 0  
etaxonomy... Records updated : 1  
etemplate... Records updated : 0  
ethesaurus... Records updated : 0  
etransactions... Records updated : 0  
evaluations... Records updated : 0  
ewebgroups... Records updated : 0  
ewebusers... Records updated : 0

## Reindex – Start Sat Aug 2 22:00:01 CDT 2014

eregistry... Number of records updated = 13321  
eaccessionlots... Number of records updated = 4405  
ebibliography... Number of records updated = 33116  
ecatalogue... Increased size to 2913319 records Number of records updated = 2903319  
ecollectionevents... Increased size to 1404107 records Number of records updated = 1394107  
econdition... Increased size to 279641 records Number of records updated = 269641  
econservation... Increased size to 44400 records Number of records updated = 40364  
edocuments... Number of records updated = 197  
eevents... Number of records updated = 25  
eexports... Increased size to 50 records Number of records updated = 50  
efieldhelp... Number of records updated = 50  
efmnhrepatriation... Number of records updated = 11111  
efmnhtransactions... Number of records updated = 48531  
egazetteer... Number of records updated = 624  
egroups... Number of records updated = 4985  
einsurance... Increased size to 100 records Number of records updated = 2  
einternal... Increased size to 1007828 records Number of records updated = 1057828  
eloans... Number of records updated = 3188  
elocations... Number of records updated = 76747  
eluts... Increased size to 1007826 records Number of records updated = 1513246  
emovements... Increased size to 50 records Number of records updated = 0  
emultimedia... Increased size to 676005 records Number of records updated = 666005  
enarratives... Increased size to 500 records Number of records updated = 259  
enhmstratigraphy... Number of records updated = 2594  
eparties... Number of records updated = 180453  
erights... Increased size to 50 records Number of records updated = 11  
eschedule... Increased size to 50 records Number of records updated = 3  
etes... Increased size to 100 records Number of records updated = 44  
etemplates... Number of records updated = 78  
ethesaurus... Increased size to 907026 records Number of records updated = 897026  
etransactions... Increased size to 50 records Number of records updated = 0  
evaluations... Number of records updated = 1361  
ewebgroups... Increased size to 100 records Number of records updated = 84  
ewebusers... Increased size to 100 records Number of records updated = 82

## Reindex audit – Start Sun Oct 5 22:00:01 CDT 2014

eaudit... Increased size to 4005230 records Number of records updated = 48095230

## Finished Mon Oct 6 06:51:40 CDT 2014

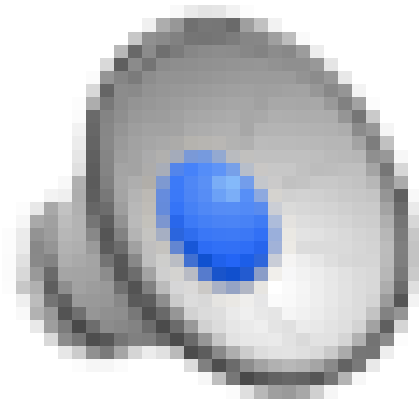
## Finished Sat Oct 4 06:15:37 CDT 2014

## Finished Sun Aug 3 01:42:06 CDT 2014

**13 hours per week**

**EMU**

# EMu-Magic



In the above clip please substitute EMu for the word OZ  
The broom stick plays the role of digitized specimen data with problems.  
The role of the faithful collection manager is played by Dorothy  
How exactly do you get help some multimedia help around here?

Know thy system.

Empower your

**DATABASE**

Match your server to your system.

Change your workflow NOT your database.

Change your database NOT your workflow.

Connect to other peoples data and systems.

# EMU Tools

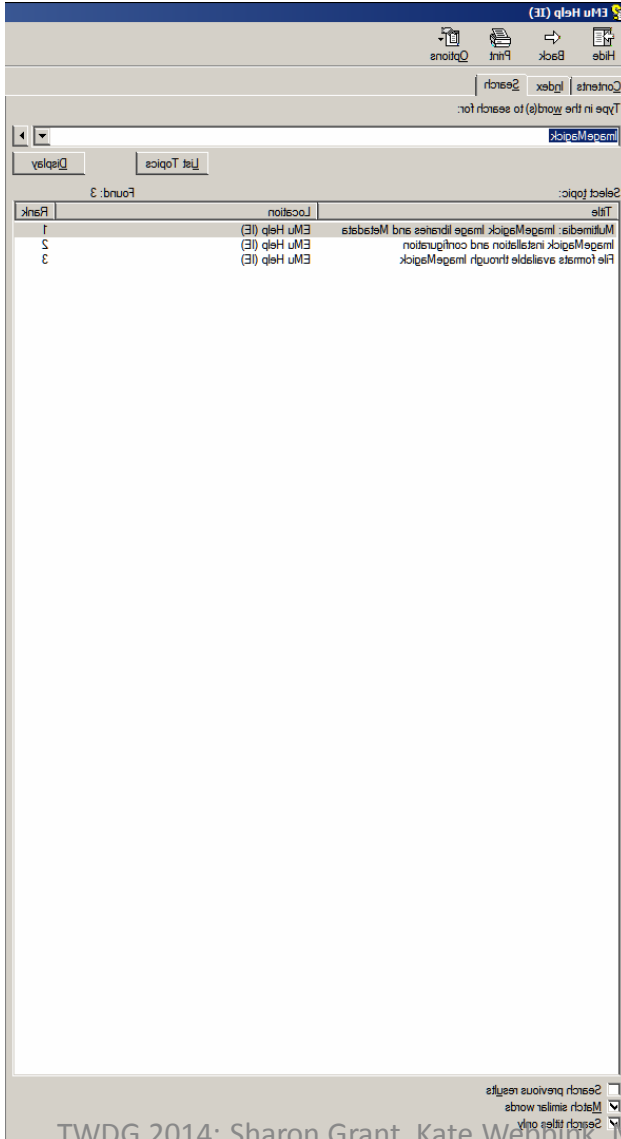
## Converting THINGS

ImageMagick® is a software suite to create, edit, compose, or convert bitmap images. It can read and write images in a variety of [formats](#) (over 100) including [DPX](#), [EXR](#), GIF, JPEG, JPEG-2000, PDF, PNG, Postscript, SVG, and TIFF. Use ImageMagick to resize, flip, mirror, rotate, distort, shear and transform images, adjust image colors, apply various special effects, or draw text, lines, polygons, ellipses and Bézier curves. - <http://www.imagemagick.org/>

dcrow- (pronounced "dee-see-raw"), has become a standard tool within and without the Open Source world. It's small (about 9000 lines), portable (standard C libraries only), free (both "gratis" and "libre"), and when used skillfully, produces better quality output than the tools provided by the camera vendor. - <http://www.cybercom.net/~dcoffin/dcrow/>



# EMu – ImageMagick



EMu Museum Management System

EMu administration > Custom installation and configuration

**Multimedia: ImageMagick**

The image, audio and video are supported by an open source solution with ImageMagick.

This section provides details about ImageMagick installation and configuration.

- ImageMagick installation and configuration
- Image formats available through ImageMagick

Access to metadata (EXIF) is available to use this support using Registry entries.

This section also describes:

**In this section**

- ImageMagick installation and configuration
- File formats available through ImageMagick
- Metadata

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EMu Museum Management System

EMu administration > Customising and configuring EMu > Multimedia: ImageMagick > Image libraries and Metadata > File formats available through ImageMagick

**File formats available through ImageMagick**

ImageMagick provides support for a large number of image formats. The actual list of file types supported depends on the version of ImageMagick installed. When EMU needs to display a list of supported image formats (either for adding an image or for a derivative) it asks ImageMagick for a list of file formats that have coders. EMU then consults the Windows registry to determine each entry in the list has a MIME type of image, discarding entries that do not. Thus if an installed application handles a format, EMU will add it to the list of available Image Files. Finally, the image format must have an encoder (used to write the file) and a decoder (used to read the format).

The list of image formats supported is:

File Extension	Coder	Read/Write/Multi-page	Format
A	RAW	rw+	Raw alpha samples
AVS	AVS	rw+	AVS X image
B	RAW	rw+	Raw blue samples
BIE	JBIG	rw-	Joint Bi-level Image experts Group interchange format (1.5)
BMP	BMP	rw-	Microsoft Windows bitmap image
C	RAW	rw+	Raw cyan samples
CIN	CIN	rw+	Cineon Image File
CMYK	CMYK	rw+	Raw cyan, magenta, yellow, and black samples
CMYKA	CMYK	rw+	Raw cyan, magenta, yellow, black, and opacity samples
CUR	CUR	rw-	Microsoft icon
CUT	CUT	r--	DR Halo
DCM	DCM	r--	Digital Imaging and Communications in Medicine image
DCX	PCX	rw+	7Soft IBM PC multi-plane Paintbrush

where:

- ImageMagick Configuration to be modified.
- Image Readable (IM\_READABLE)
- Image File

By default EMU installs per colour channel, that

- 48 bits per pixel
- 64 bits per pixel

Most images produced by devices are now capable of catering for these images.

# EMu - ImageMagick

Using EMu to empower your

# ASSETS

EMu uses ImageMagick libraries to handle multimedia.

ImageMagick is NOTHING to do the KE Software!

ImageMagick sometimes uses other programs called delegates to handle files.

dcraw is the delegate that handles DNGs.

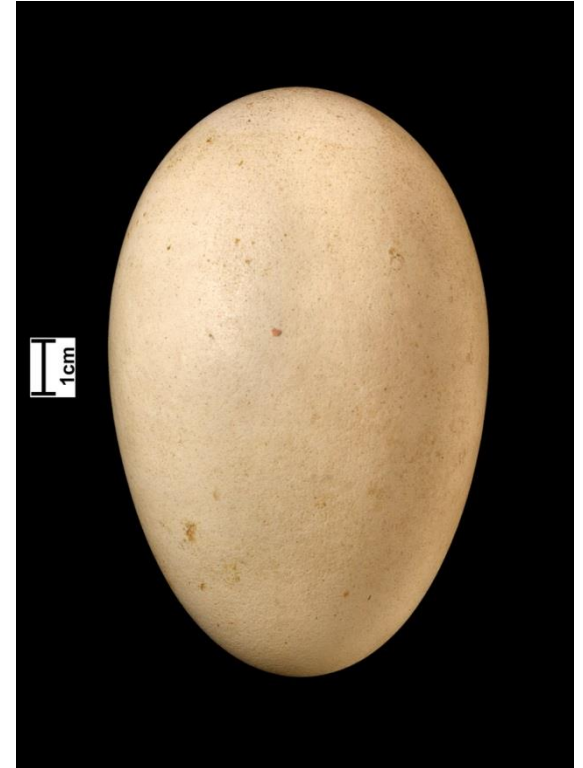
# EMu - ImageMagick



TIFF->DNG



TIFF->JPG (photoshop)



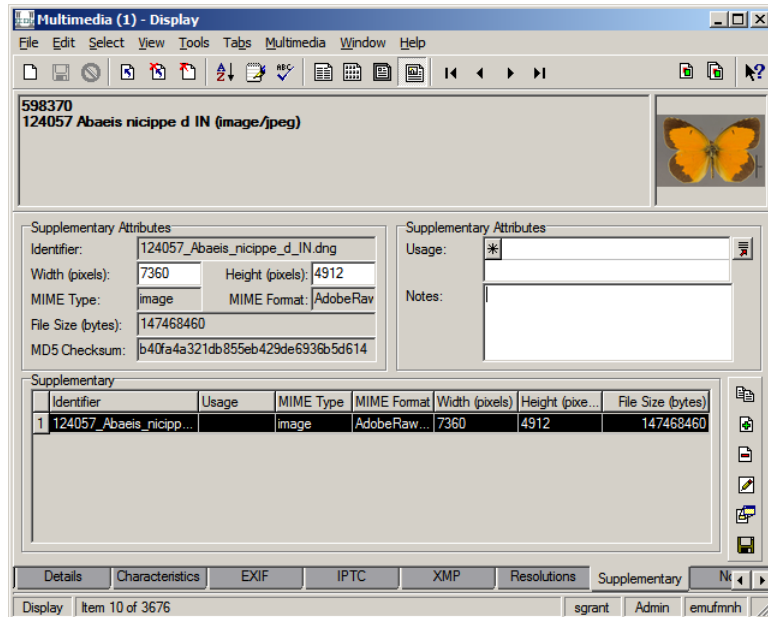
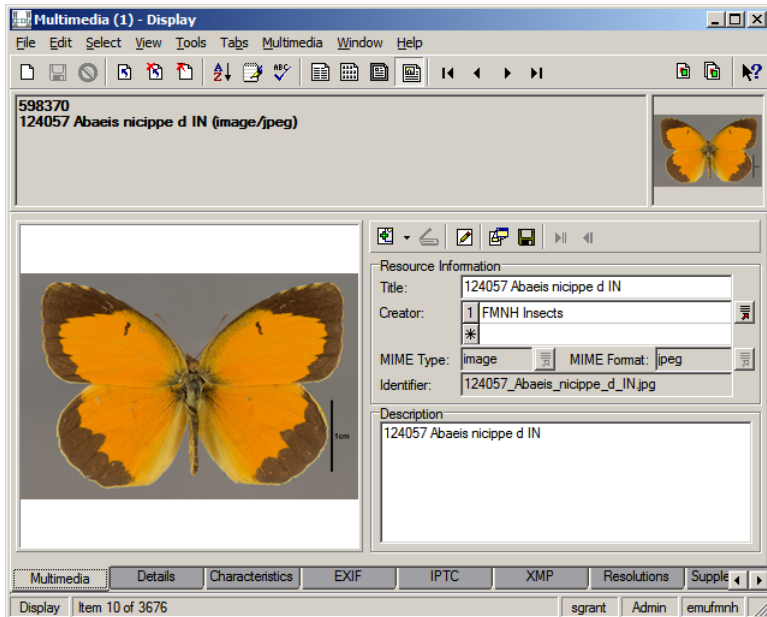
DNG->JPG (EMu)

# EMu - ImageMagick

7MB (Nikon raw --> DNG)	yes	10s
25MB (Canon raw --> DNG)	yes	20s
70MB (Mamiya raw --> DNG)	yes	40s
18MB raw --> DNG	yes	20s
25MB TIF --> DNG	yes	10s

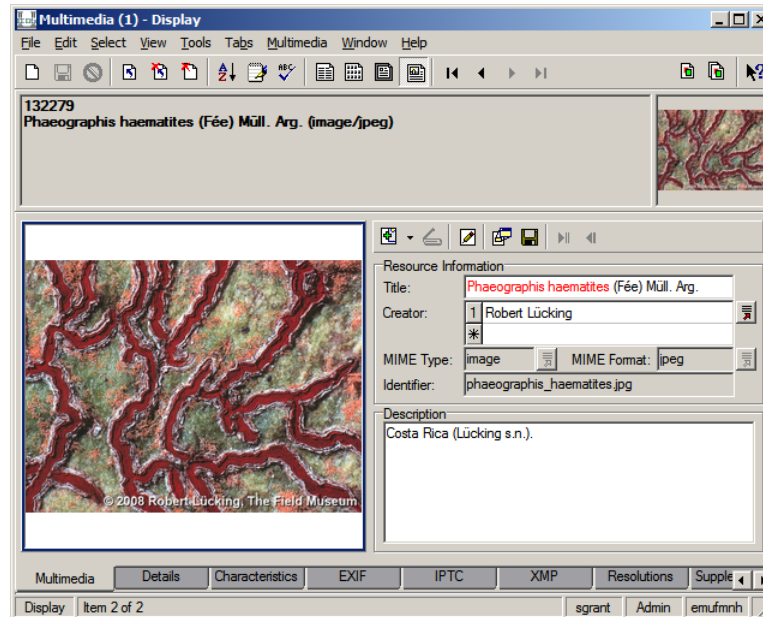
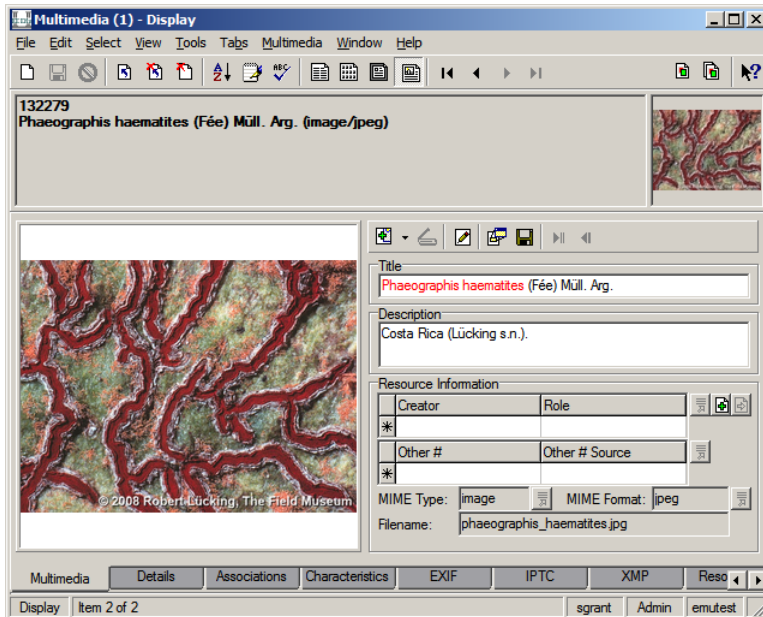
3000 25MB DNGs takes 8.5 hours!

# EMu - Work flow



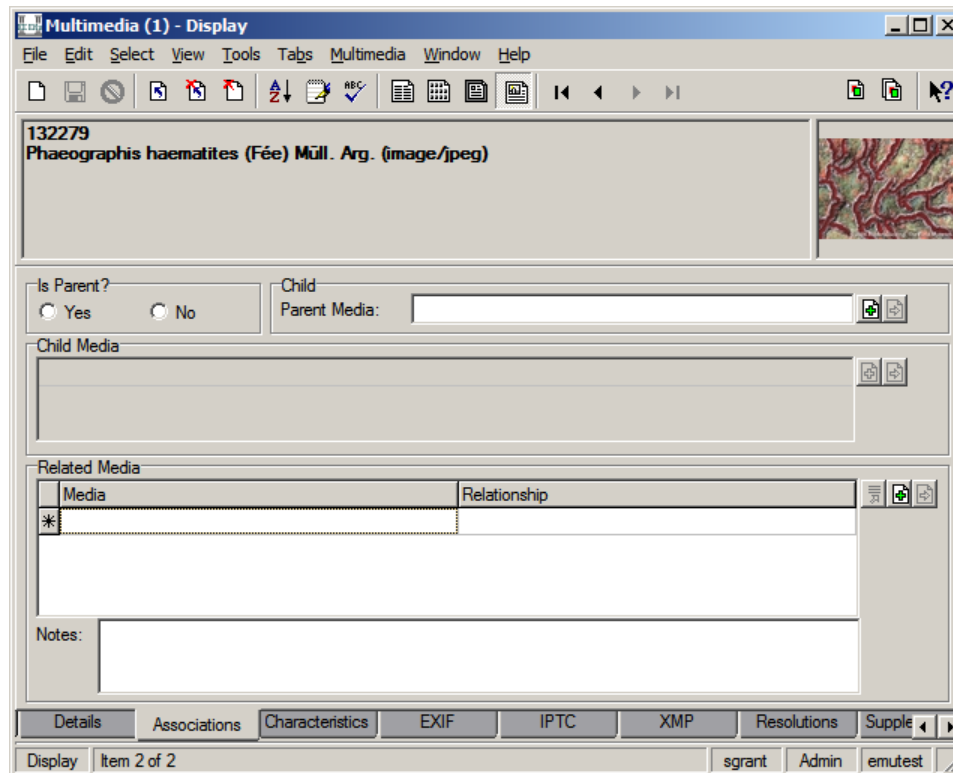
The Supplementary Tab

# EMu - Client Changes



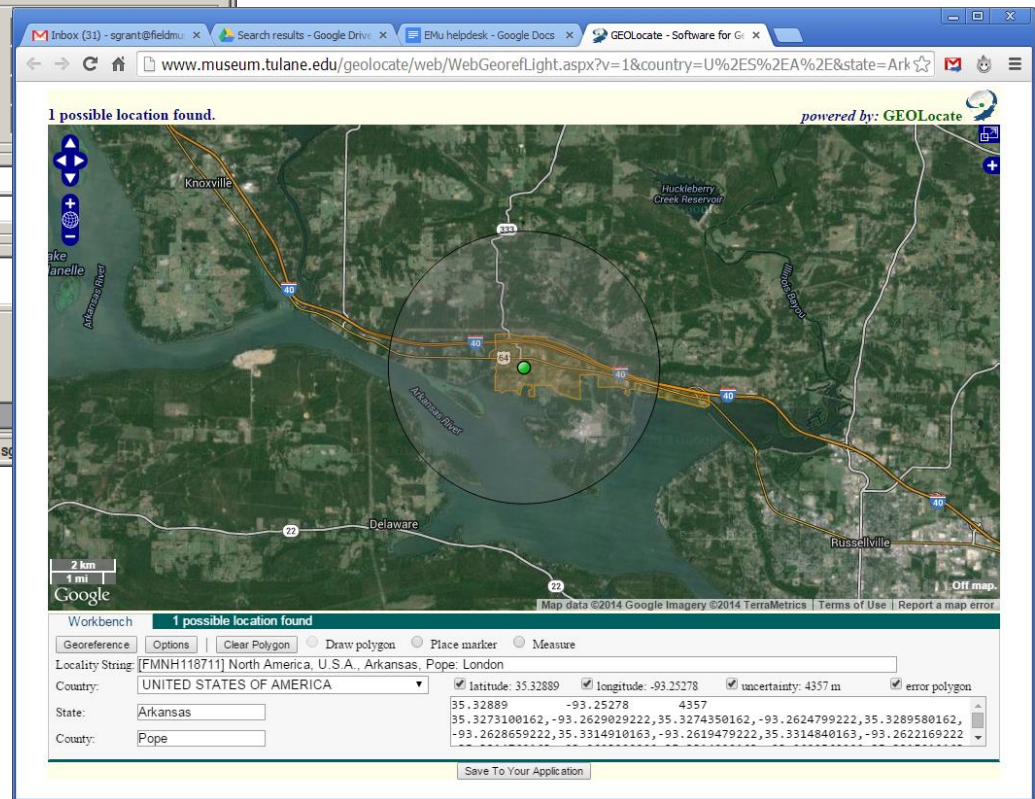
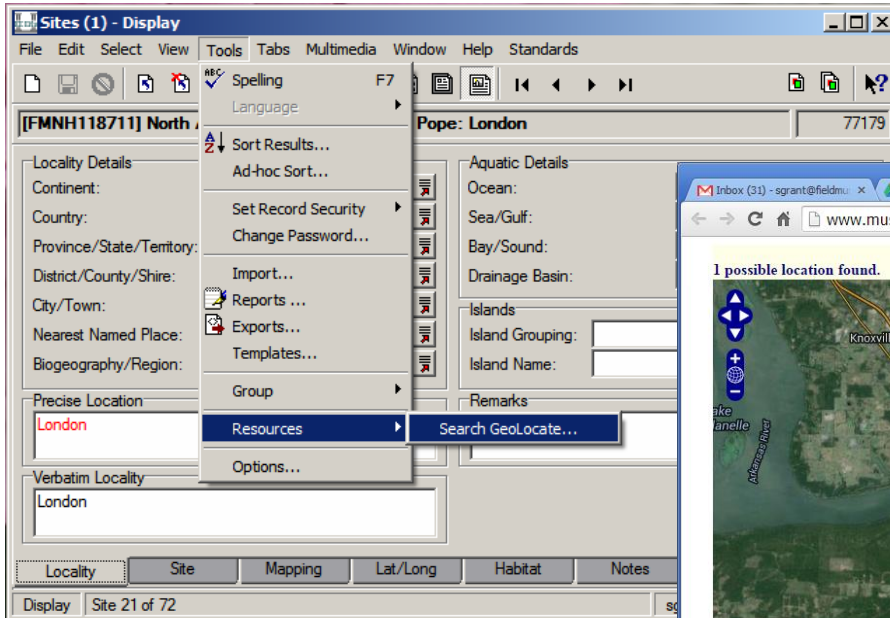
The Multimedia Tab

# EMu - Client Changes



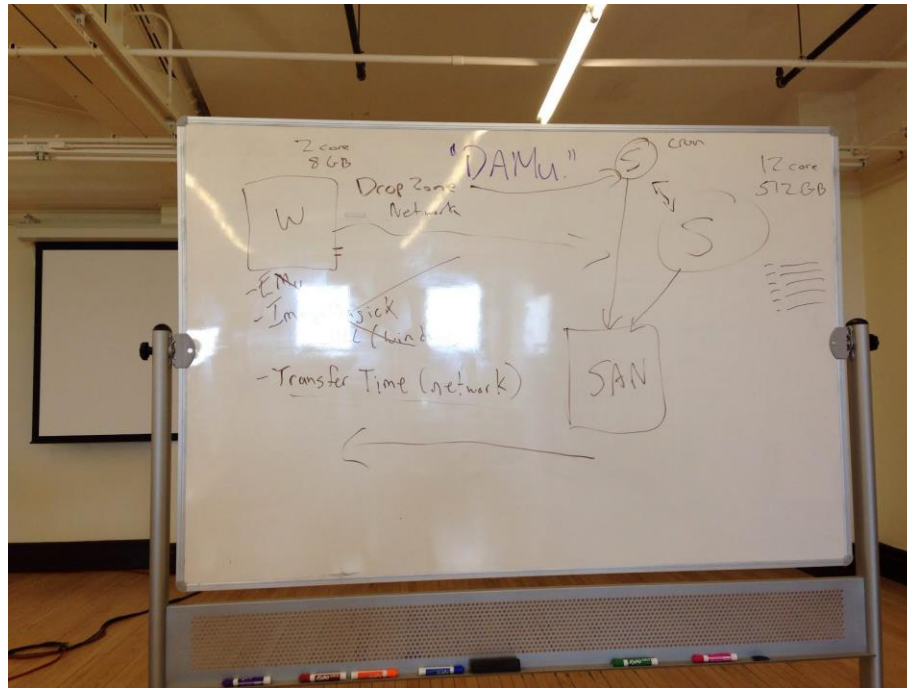
The Associations Tab

# Know thy system - Emu Connections





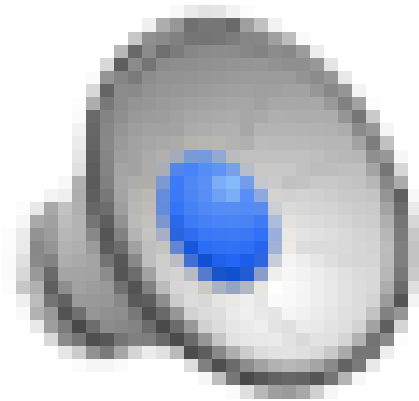
# The whiteboard challenge



Everything is easier on a whiteboard!

# FINALE

# Thank-you



The roles of curators, collection managers, and volunteers working together to digitize specimens are played by Can-can dancers.

Thanks to Janeen Jones, Marc Lambruschi, Kate Webbink, Mike Yoshida, Rob Zschernitz and all the FMNH EMu digitizers.

# Things to Read.

## DIGITISING COLLECTIONS

- <http://berkeleysciencereview.com/read/fall-2011/digitizing-the-drawers/>
- <http://zookeys.pensoft.net/articles.php?id=2916>
- <http://soyouthinkyoucandigitize.wordpress.com/>
- <https://www.facebook.com/pages/Insects-Plants-and-Parasites-Digitizing-Natural-History-Collections/330373400373054>
- <https://www.idigbio.org/content/gbif-training-manual-1-digitization-natural-history-collections-data>
- <http://images.library.amnh.org/digital/>
- <http://mw2013.museumsandtheweb.com/paper/building-cybercabinets-guidelines-for-online-access-to-digital-natural-history-collections/>
- <https://journals.ku.edu/index.php/jbi/article/view/3992>
- <http://www.gbif.org/resources/2775>

## FILE FORMATS

- [http://www.phonearena.com/news/Raw-DNG-vs-JPEG-on-a-smartphone-comparison-images\\_id58538](http://www.phonearena.com/news/Raw-DNG-vs-JPEG-on-a-smartphone-comparison-images_id58538)
- <http://www.rocktheshotforum.com/2012/09/14/three-things-to-know-about-dng/>
- <http://www.mosaicarchive.com/2013/05/01/the-raw-truth-about-dng/>
- <http://photo.stackexchange.com/questions/10208/how-many-colors-and-shades-can-the-human-eye-distinguish-in-a-single-scene>
- <http://helpx.adobe.com/photoshop/using/layer-basics.html>
- [http://en.wikipedia.org/wiki/Layers\\_\(digital\\_image\\_editing\)](http://en.wikipedia.org/wiki/Layers_(digital_image_editing))
- [http://www.phonearena.com/news/Raw-DNG-vs-JPEG-on-a-smartphone-comparison-images\\_id58538](http://www.phonearena.com/news/Raw-DNG-vs-JPEG-on-a-smartphone-comparison-images_id58538)
- <http://www.rocktheshotforum.com/2012/09/14/three-things-to-know-about-dng/>
- <http://www.barrypearson.co.uk/articles/dng/respectability.htm>
- <http://blogs.loc.gov/digitalpreservation/2014/10/the-library-of-congress-wants-you-and-your-file-format-ideas/>