



**SPNHC 2015**  
**30TH ANNIVERSARY**  
SOCIETY FOR THE PRESERVATION  
OF NATURAL HISTORY COLLECTIONS

The Society for the Preservation of Natural History Collections

**30TH ANNUAL MEETING &  
GALA CELEBRATION**

*Making Natural History Collections Accessible through  
New and Innovative Approaches and Partnerships*



**MAY 17-23, 2015**  
**THE FLORIDA MUSEUM OF NATURAL HISTORY**  
**GAINESVILLE, FLORIDA, USA**

# Precious little survived the Impact of 2058

But once a great city thrived here.  
And a museum. Shattered columns,  
fractured statues and fragmentary  
artifacts tell us so. Not much to go on.

But what's this?

"We've discovered another!" we  
cheer. Eagerly we unseal it, confident  
that marvelous treasures await.  
Securely nestled inside. Butterflies.  
Brilliantly beautiful. Fearfully fragile.  
And wholly intact. Imagine!

We know little of the culture that  
produced this safe-guarding wonder.  
But we know the maker's name:  
**Delta Designs.** If only everyone had  
used these ...



The Standard for Collection Storage



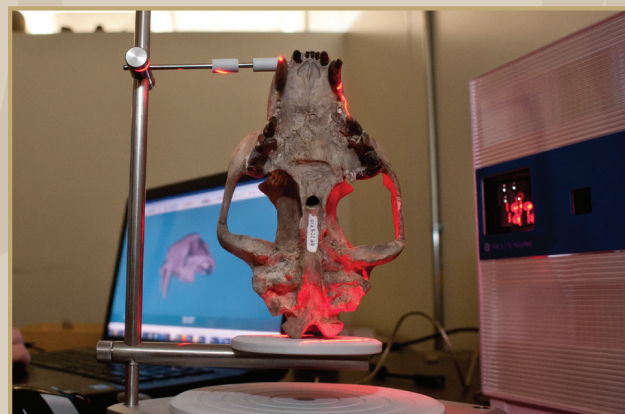


**SPNHC 2015**  
**30TH ANNIVERSARY**  
SOCIETY FOR THE PRESERVATION  
OF NATURAL HISTORY COLLECTIONS

# The Florida Museum of Natural History welcomes you to

the 30th Meeting of the Society for the  
Preservation of Natural History Collections.

The Florida Museum is home to many  
collections-based projects including iDigBio,  
the central coordinating unit for the U.S.  
National Science Foundation's Advancing  
Digitization of Biodiversity Collections Program.



3215 Hull Road ▪ 352-846-2000 ▪ [www.flmnh.ufl.edu](http://www.flmnh.ufl.edu)  
Mon.-Sat. 10 a.m.-5 p.m. ▪ Sun. 1-5 p.m.



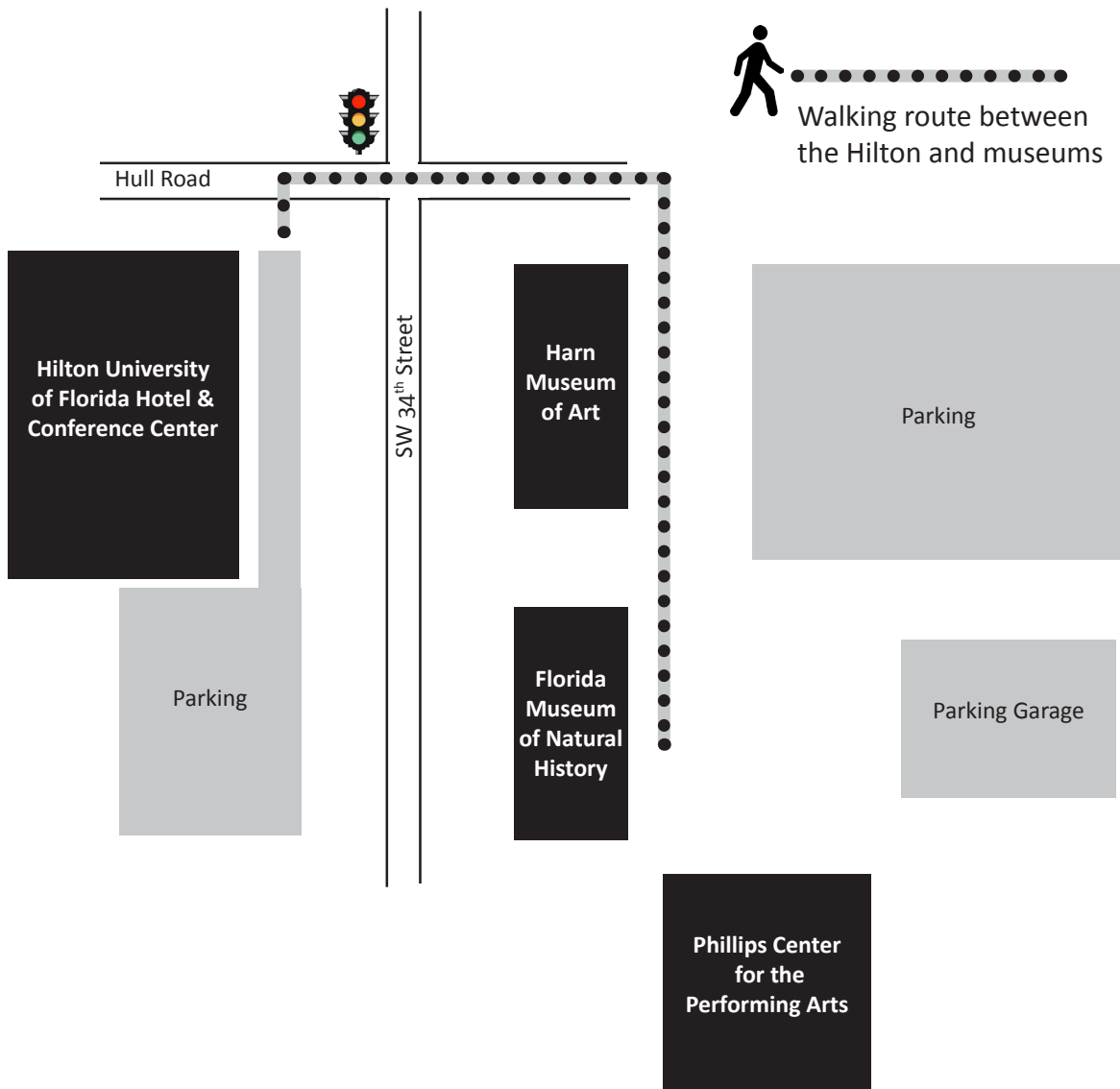
# WALK TO THE MUSEUMS

Both the Florida Museum of Natural History and the Harn Museum of Art are a 5-10 minute walk from the Hilton Conference Center.

Parking is available at both museums, but is very limited between the hours of 9:00 AM and 5:00 PM (due to University of Florida parking restrictions). Only a small amount of metered and “pay to park” spaces are available during the day. After 5:00 PM parking is plentiful.

Florida Museum of Natural History  
University of Florida Cultural Plaza  
3215 Hull Road, Gainesville, Florida 32611

Harn Museum of Art  
University of Florida Cultural Plaza  
3259 Hull Road, Gainesville, Florida 32611



*Additional maps of Gainesville and the University of Florida campus can be obtained from the conference registration desk.*





# iDigBio

Integrated Digitized Biocollections

## iDigBio – The HUB for Collections Digitization

iDigBio is the central coordinating unit for the U.S. National Science Foundation's Advancing Digitization of Biodiversity Collections Program, a national effort to make biodiversity information in U.S. collections accessible through the Internet to researchers, educators, citizen scientists and policy makers within the context established by the strategic and implementation plans for the Network Integrated Biocollections Alliance.

iDigBio serves as the administrative home for the national digitization effort, fosters partnerships and innovations, facilitates digitization practices and workflows, establishes integration and interconnectivity among the data generated by collection digitization projects, and promotes use of biological/paleontological collections data by the scientific community and stakeholders. These include government agencies, educational institutions, non-governmental organizations and other national and international entities to benefit science and society through enhanced research, educational and outreach activities.

Digitizing the past and present  
for the future.



Contact: [info@idigbio.org](mailto:info@idigbio.org) | Request a poster: [idigbio.org/content/idigbio-poster-available](https://idigbio.org/content/idigbio-poster-available)  
Subscribe to the newsletter: [idigbio.org/content/subscribe](https://idigbio.org/content/subscribe) | Visit [idigbio.org](https://idigbio.org) for additional resources.

iDigBio is funded by a grant from the National Science Foundation's Advancing Digitization of Biodiversity Collections Program (Cooperative Agreement EF-1115210).



# SPNHC

ADVANCING COLLECTIONS CARE

The Society for the Preservation of Natural History Collections (SPNHC) is an international society whose mission is to improve the preservation, conservation and management of natural history collections to ensure their continuing value to society. SPNHC takes a leading role in promoting collections care issues to the academic community, governments, and the general public. SPNHC Members-- curators, collections managers, conservators, preparators and database administrators from more than 20 countries-- are dedicated to training and mentoring the next generation of collections professionals. The Society holds annual meetings and sponsors symposia and workshops to foster the exchange of ideas and information related to the preservation, conservation and management of natural history collections. To learn more about SPNHC or to become a SPNHC member, please visit <http://www.spnhc.org/>.

### *Executive Council*

Andrew Bentley, *President*

Linda Ford, *President-Elect*

Christopher Norris, *Past President*

Ruth O'Leary, *Treasurer*

Ann Molineux, *Secretary*

Christine Johnson, *Managing Editor*

### *Members-at-Large*

Richard Sabin (2012-2015)

Gregory Watkins-Colwell (2012-2015)

Kelly Sendall (2013-2016)

Robert Huxley (2013-2016)

Julian Carter (2014-2017)

Barbara Thiers (2014-2017)

Mimsy XG



## The Number 1 in Collections Management Technology

690,000,000 Items 35 Countries 3000+ Customers 18 Offices



alm.axiell.com





**SPNHC 2015**  
**30TH ANNIVERSARY**  
 SOCIETY FOR THE PRESERVATION  
 OF NATURAL HISTORY COLLECTIONS

**THANK YOU TO OUR CONFERENCE SPONSORS**

DELTA DESIGNS LTD.



**MACROSCOPIC SOLUTIONS**  
*Inspiring Discovery*

[WWW.MACROSCOPICSOLUTIONS.COM](http://WWW.MACROSCOPICSOLUTIONS.COM)



**O.Berk**  
 OF NEW ENGLAND



UNIVERSITY OF  
 EASTERN FINLAND



**Radiocarbon Dating**  
*Consistent Accuracy  
 Delivered On-Time*  
 Beta Analytic Inc.



**patterson • pope**  
 SPACE MADE SIMPLE.





## SPNHC 2015 Travel Grant Recipients and Mentors

### Fitzgerald Travel Grant Recipients

Stephanie Allen  
Sam Noble Oklahoma Museum of Natural History  
*Conference Mentor: Lori Benson*

Cheyenne Gerdes  
Biology, Missouri State University  
*Conference Mentor: Kelly Sendall*

Gabrielle Maltaverne  
South Dakota State University  
*Conference Mentor: Sally Shelton*

Danielle Measday  
Museum Victoria  
*Conference Mentor: Jean-Marc Gagnon*

Lindsay Walker  
University of Colorado Museum of Natural History  
*Conference Mentor: Tiffany Adrian*

Barbara Welch  
Angelo State Natural History Collections  
Angelo State University  
*Conference Mentor: Jeff Stephenson*

### Christine Allen Travel Grant Recipient

Edward Chase Shelburne  
Jackson School of Geosciences  
Nonvertebrate Paleontology Lab  
University of Texas - Austin  
*Conference Mentor: Margaret Landis*

SPNHC and the 2015 Local Organizing Committee congratulate all of the 2015 SPNHC Travel Grant recipients and welcome them to this year's annual meeting. We also wish to express our sincere gratitude to all of those serving as conference mentors to this year's travel grant recipients.

Travel grant recipients and their mentors should be sure to arrive at the opening Icebreaker Reception, at the Florida Museum of Natural History's Exhibit and Education Building (Powell Hall), Tuesday evening, May 19, at 6:00 PM. This will be a special opportunity for travel grant recipients to meet members of the SPNHC Council, the Local Organizing Committee and SPNHC Committee Chairs.





#SPNHC2015, @SPNHC2015



SPNHC 2015 Annual Meeting

## Welcome from the SPNHC 2015 Local Organizing Committee

Welcome to Florida, the Sunshine State, and to Gainesville, home of the Florida Museum of Natural History at the University of Florida. The Florida Museum of Natural History is honored to be your host for this year's 30<sup>th</sup> SPNHC Annual Meeting and Gala Celebration. This year's conference theme, *Making Natural History Collections Accessible through New and Innovative Approaches and Partnerships*, links the collections at the heart of our institutions to the demands and uses these collections are addressing in the 21<sup>st</sup> century. This year's conference program highlights the novel and innovative ways that we are all using to make our collections more accessible in this new century of fast-paced technological advances, despite (or sometimes because of) the challenges of limited funds and resources. The conference opens with a stimulating plenary session, *Collections in the 21<sup>st</sup> Century*, sponsored by NSC Alliance, NIBA Research Coordination Network and iDigBio. It closes with a workshop that I am sure will be useful to many conference attendees, *Getting Started and Maintaining Herbarium Collections Data in a Symbiote Driven Web Portal*. In between, we have a dynamic program of general and themed sessions, symposia and posters, fun-filled social events and a few surprises planned for you, including the 30<sup>th</sup> Anniversary Gala Celebration banquet.

It takes a village to put together a successful conference. SPNHC 2015 would not be possible without the generous financial support of our sponsors and vendors, and grants from *Visit Gainesville* -the Alachua County Tourist Development Council and the University of Florida Office of the Vice President for Research. I extend a huge, heartfelt thank you to Doug Jones, FLMNH Director, Beverly Sensbach, FLMNH Associate Director, members of the Local Organizing Committee, the SPNHC Council and committee chairs, the staff of the UF Distance & Continuing Education Conference Department, and our volunteers (who come from the Museum, UF, and the Gainesville community) for all of their hard work and support. My sincere thanks and gratitude for service above and beyond the call of duty go to Laura Boekenoogen, our UF Conference Department conference planner.

Elise V. LeCompte  
Chair, SPNHC 2015 Local Organizing Committee

### SPNHC 2015 Local Organizing Committee Members

*Collections and Exhibit Tours* - Griffin Sheehy, Darcie MacMahon, Jaret Daniels

*Communications/Promotions Committee* - Andreina Hornez Peralta, Hollis Wooley, Paul Ramey, Kaitlin Gardiner

*Conference Committee* - Laura Boekenoogen, Elise LeCompte, Donna Ruhl

*Conference Web Design Committee* - Sarah Fazenbaker, Donna Ruhl

*Conference Social Media Committee* - Donna Ruhl, Stephanie Boothby, Elise LeCompte

*Events Committee* - Laura Boekenoogen, Elise LeCompte, Amber Tison

*Field Trips Committee* - Elise LeCompte, Mark Whitten, Richard Hulbert, Roger Portell

*Finance Committee* - Bev Sensbach, Elise LeCompte, Kara Schwartz, Brittany Snipes

*Photography* - Jeff Gage, Kristen Grace, Stephanie Boothby

*Plenary Session Committee* - Larry Page

*Program Committee* - Richard Hulbert, Laura Boekenoogen, Elise LeCompte

*Registration Committee* - Donna Ruhl, Laura Boekenoogen, Elise LeCompte

*Travel Grants Committee* - Donna Ruhl, Elise LeCompte, Rob Robins

Illuminance . Ultra-Violet  
Temperature . Humidity



# Understand Your Preservation Metrics



## 4 in 1 Data Loggers from TANDD

*Available as  
Wireless!*

TandD US, LLC.

E-Mail: [inquiries@tannd.com](mailto:inquiries@tannd.com) [www.tannd.com](http://www.tannd.com)

## INFORMATION IN IMAGES

OPTICAL AND DIGITAL IMAGING  
FOR  
NATURAL HISTORY COLLECTIONS

The Knowledge Centre  
Wyboston Lakes  
Bedfordshire  
UK  
MK44 3BY

Tel: +44 (0)7818 091031

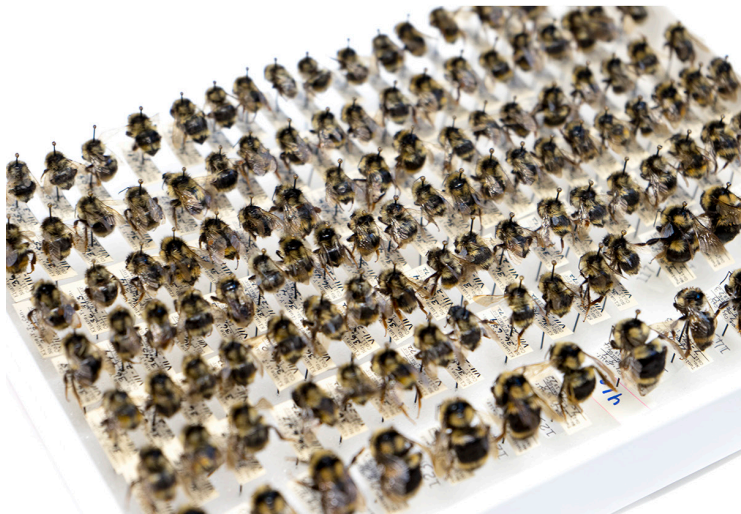
E-mail: [info@info-in-images.com](mailto:info@info-in-images.com)

[WWW.INFO-IN-IMAGES.COM](http://WWW.INFO-IN-IMAGES.COM)

P I X E L A C U I T Y



Imaging & Digitizing Expertise for All Collections



[www.PixelAcuity.com](http://www.PixelAcuity.com)







## Welcome from the Florida Museum of Natural History

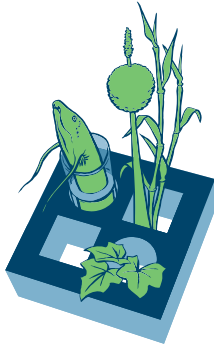
Welcome to Gainesville, Florida! We're glad you decided to attend this 30th annual meeting of the Society for the Preservation of Natural History Collections – SPNHC 2015. The University of Florida (UF) and its Florida Museum of Natural History (FLMNH) are pleased to serve as your hosts. As the only member of the American Association of Universities in Florida, UF is one of the largest, most comprehensive universities in the nation and the flagship of the State University System.

In 2017 the FLMNH will celebrate its 100th anniversary as the state's official museum of natural history. Over the past century the museum's collections grew rapidly so that today the FLMNH cares for more than 40 million specimens and artifacts. Its notable Lepidoptera collection is one of, if not the largest, in the world and is housed in our McGuire Center for Lepidoptera and Biodiversity. The McGuire Center is attached to our main education and exhibition facility, Powell Hall, located across the street from the UF Hilton Hotel & Conference Center. I hope you will take the opportunity to visit our permanent and temporary exhibitions and spend a few moments enjoying the magnificent living butterfly display in our Butterfly Rainforest.

Most of the museum's scientific collections and research facilities are concentrated in Dickinson Hall situated near the center of the UF campus, approximately two miles to the east. These include bioinformatics, conservation, molecular genetics, the herbarium, mammalogy, ornithology, ichthyology, herpetology, living and fossil invertebrates, paleobotany, vertebrate fossils, ethnography, environmental archaeology, Florida archaeology, island archaeology, historical archaeology and our cryogenic tissue collection. Scheduled tours of this facility will be offered as part of the conference agenda and I urge you to visit. The FLMNH is strongly committed to digitization of its collection holdings and sharing these important data with the scientific and user communities. To that end the museum currently serves as the national hub for NSF's Advancing Digitization of Biodiversity Collections initiative known as iDigBio (Integrated Digitized Bio-Collections). Many of you have participated in this initiative directly by attending symposia, workshops and webinars or via research projects through the distributed TCNs.

The conference organizers have prepared a dynamic program for SPNHC 2015 and I hope you find it beneficial to your professional development. But in addition to your formal conference activities, I hope you will take some time to enjoy your surroundings – search for alligators at Lake Alice or the nearby Paynes Prairie State Preserve, visit the Harn Museum of Art or Kanapaha Botanical Gardens, check out the dynamic music, art and restaurant scene downtown – and continue your conversations with colleagues while you explore Gainesville's abundant natural and cultural offerings.

Douglas S. Jones  
Director, Florida Museum of Natural History



# SPNHC 2016 31st Annual Meeting

## Berlin, Germany

### Green Museum - How to practice what we preach?

**Save the Date: June 20-25, 2016**

The *Museum für Naturkunde Berlin* and the *Botanischer Garten und Botanisches Museum Berlin* are glad to welcome you to the 2016 SPNHC conference, held from June 20 through 25, 2015, in Berlin, Germany. Under the heading “Green Museum – How to practice what we preach?” this 4th meeting of the society in Europe will focus on aspects of sustainability and green thinking in collections, museums and botanical gardens. In a world of climate change and ever decreasing biodiversity, sustainability should be the criterion that ideally determines all planning and decisions, ranging from field work to construction projects, from ethical aspects to cost-benefit analyses. In practice this often is compromised by constraints beyond the control of the institution, be it monetary, legal or other. The conference will offer a forum to discuss possible ways of reconciling the seemingly opposing requirements. We welcome your contributions to this or other topics and look forward to hosting you in 2016.

The location: Berlin has become highly popular with travelers over the past decade. With its amalgamation of history, culture and liveliness, this vibrant city is attractive for everyone. So please plan for a few extra days of exploring. The venue of the conference will be in the city center, at *Andel's Hotel Berlin*, which provides ample accommodation at special conditions for participants only a few stops from *Alexanderplatz*, the heart of former East Berlin.

Optional activities: Field trips will cover aspects of the history of Berlin and natural history within the region and beyond. The icebreaker will be held beneath the world's tallest dinosaur skeleton at the *Museum für Naturkunde Berlin* and the conference dinner will be in the grand green houses of the *Botanischer Garten und Botanisches Museum Berlin*.

Over the course of the coming months more information will be provided on the conference website [www.spnhc2016.berlin](http://www.spnhc2016.berlin). Please feel free to contact us at [spnhc2016@berlin.de](mailto:spnhc2016@berlin.de) on any SPNHC 2016 related matter.

We look forward to welcoming you at SPNHC 2016 in Berlin.



Museum für Naturkunde Berlin  
© C. Radke, MfN.



The Grand Green House of the Botanischer Garten und Botanisches Museum Berlin. © I. Haas, BGBM.

# GENERAL INFORMATION

## Dates and Location:

Sunday, May 17 - Saturday, May 23, 2015  
Hilton University of Florida Conference Center  
Gainesville, Florida, USA

## Host Hotel:

Hilton University of Florida Conference Center  
1714 SW 34th Street, Gainesville, Florida 32607  
1-352-371-3600

## Registration:

Conference registration includes admission to all sessions, conference materials, Continental Breakfast (Tues.-Thurs.), AM & PM coffee breaks, Ice Breaker and Vendor's Reception. The SPNHC Annual Business Luncheon is also included if registered for it prior to the start of the conference.

## Lunch

Lunch will be on your own. Lunch options include the following:  
- Hilton lunch buffet inside Albert's Restaurant  
- Local Food Trucks located in the Hilton parking lot  
- Off-site dining options at your discretion

## Registration/Information Hours:

### Hilton Conference Center Registration Desk

Sunday, May 17: 3:00 PM - 5:00 PM  
Monday, May 18: 7:30 AM - 5:00 PM  
Tuesday, May 19: 7:00 AM - 5:30 PM  
Wednesday, May 20: 7:30 AM - 5:30 PM  
Thursday, May 21: 7:30 AM - 5:30 PM  
Friday, May 22: 8:00 AM - 5:30 PM  
Saturday, May 23: 8:00 AM - 12:30 PM

## Oral Presentations

Talks are scheduled in 20 minutes time slots including any time for questions. This will be rigorously enforced to accommodate concurrent session needs and as a courtesy to presenters and attendees who may need to move between meeting rooms. All presentations must be loaded on the room's laptop prior to the start of your scheduled session. AV technicians will be available to assist. Thank you for your cooperation with this request.

## Posters

Presenters are expected to be by their posters for most of the morning or afternoon session for which they are scheduled. It is especially important to be there during the break periods (10:10-10:30 am) and (3:10-3:30 pm). Please check the program schedule to find your day and session.

## Poster Set-up and Breakdown:

Boards will be set up at the Hilton on Monday, May 18<sup>th</sup>. Please post on the board numbered according to the listing in the program.

*Wednesday Posters* - Please hang your poster by 8:30 AM on Wednesday. Remove poster by 5:30 PM.

*Thursday Posters* - Please hang your poster by 8:30 AM on Thursday. Remove poster by 5:30 PM.

## Social Media

Our Twitter hashtag is #SPNHC2015. Look for us on Facebook, SPNHC 2015 Annual Meeting.

## Exhibitor Set-up and Breakdown:

**Set-up:** Set-up will be available from 2:00 PM to 5:00 PM on Tuesday, May 19<sup>th</sup> in Century Ballroom A. Please set up your exhibit booth no later than 9:00 AM on Wednesday, May 20<sup>th</sup>.

**Breakdown:** Please break down your exhibit booth no later than 9:00am on Friday, May 22<sup>nd</sup>.

## Icebreaker: Tuesday, May 19<sup>th</sup> from 6:30 PM - 8:30 PM

The Ice Breaker will be held at the Florida Museum of Natural History. Hors d'oeuvres will be served. Each attendee has two drink tickets attached to their icebreaker ticket.

*\*First-time attendees, travel grant recipients and their mentors, SPNHC Council, Local Organizing Committee and SPNHC Committee Chairs are welcome to arrive at 6:00 PM\**

Complimentary bus transportation will run between the UF Hilton, Hume dorms and the Florida Museum beginning at 6:00 PM. Attire is casual and non-registered guests will be charged \$45 on-site.

## Vendors' Reception: Wednesday, May 20<sup>th</sup> from 6:30 PM - 8:30 PM

The Vendors' Reception will be held at the Harn Museum of Art. Hors d'oeuvres will be served. Each attendee has two drink tickets attached to their reception ticket.

Complimentary bus transportation will run between the UF Hilton, Hume dorms and the Harn Museum of Art beginning at 6:20 PM. Attire is casual and non-registered guests will be charged \$45 on-site.

## Banquet and SPNHC 30th Anniversary Celebration: Thursday, May 21<sup>st</sup> from 6:30 PM - 11:00 PM.

### Cocktail Hour & Cade Museum Demonstrations: 6:30 PM to 7:30 PM

### Dinner & Dancing: 7:30 PM - 11:00 PM

The Banquet will be held at the Touchdown Terrace at Ben Hill Griffin Stadium on campus. Each attendee has two drink tickets attached to their banquet ticket.

Complimentary bus transportation will run between the UF Hilton, Hume dorms and Touchdown Terrace beginning at 6:20 PM. Tickets to the banquet are \$75 per person. To purchase a ticket, please visit the conference registration desk.

## Programs and Exhibits of Note to Visit During Your Stay in Gainesville

On Sunday, May 17, visit the Florida Museum of Natural History's special event for International Museum Day, "Ask a Scientist", from 1:00-4:00 pm. This event - free and open to all - is located at the Museum's Exhibit and Education Building (Powell Hall) across the street from the Hilton Conference Center Hotel (see map, pg. 2). A T-Rex Named Sue will be open without charge to conference registrants during the Icebreaker Reception. A complimentary ticket for free entry to the Museum's Butterfly Rainforest (part of the McGuire Center for Lepidoptera located in Powell Hall) is included in your conference bag. This ticket is good for the duration of your stay in Gainesville. You may also wish to visit the Samuel P. Harn Museum of Art's current traveling exhibit, Monet and American Impressionism, which highlights twenty-five artists who launched a new way of painting in response to the influence of French Impressionism. The Harn is located across the street from the Hilton (see map, pg. 2).



# SCHEDULE AT A GLANCE

## SUNDAY, MAY 17, 2015

Florida Museum of Natural History Special Event for International Museum Day,  
"Ask a Scientist"  
1:00-4:00 pm

Florida Museum of Natural History-Exhibits and Education Building (Powell Hall)  
(Free and open to all. Transportation not provided, but Powell Hall is within walking distance of the Hilton Conference Center Hotel)

### Registration

3:00 PM - 5:00 PM

Hilton Conference Center Registration Desk

## MONDAY, MAY 18, 2015

### Registration

7:30 AM - 5:00 PM

Hilton Conference Center Registration Desk

### Fieldtrips

8:00 AM - 5:00 PM

Hilton Conference Center Registration Desk

*(Meet at the registration desk no later than 7:45 AM)*

*#2 Botany Habitats of North-Central Florida*

*#3 Natural and Cultural Environments of Cedar Key by Kayak*

*#4 The Fossil History of North-Central Florida*

## TUESDAY, MAY 19, 2015

### Registration

7:00 AM - 5:30 PM

Hilton Conference Center Registration Desk

### Continental Breakfast

7:00 AM - 8:00 AM

Hilton Conference Center, Pre-function

### Official Welcome

8:00 AM - 8:30 AM

Hilton Conference Center, Century Ballroom A

### Plenary Session

8:00 AM - 12:00 PM

Hilton Conference Center, Century Ballroom A

*Collections for the 21<sup>st</sup> Century*

The plenary session is sponsored by the NSC Alliance, NIBA Research Coordination Network, and iDigBio.

### Lunch

12:00 PM - 1:30 PM (on your own)

### SPNHC Committee Meetings

1:30 PM - 5:30 PM (open to all)

Hilton Conference Center

### Vendor Setup

2:00 PM - 5:00 PM

Hilton Conference Center, Century Ballroom A

### Icebreaker Reception

6:00 PM - 8:30 PM

Florida Museum of Natural History-Exhibits and Education Building (Powell Hall)

*\*6:00 PM - 6:30 PM First-time attendees, travel grant recipients and their mentors, SPNHC Council, Local Organizing Committee and SPNHC Committee Chairs\**

*\*6:30 PM - 8:30 PM All other attendees, including sponsors and vendors welcome\**

Complimentary bus transportation will run continuously between the Hilton, Florida Museum of Natural History and Hume dorm beginning at 6:00 PM.

## WEDNESDAY, MAY 20, 2015

### Registration

7:30 AM - 5:30 PM

Hilton Conference Center Registration Desk

### Continental Breakfast

7:30 AM - 8:30 AM

Hilton Conference Center, Pre-function

### General and Themed Session Papers and Posters

8:30 AM - 12:10 PM

Hilton Conference Center

Symposium: *Specimens Full Circle: Collection to Digitization to Data Use*

8:50 AM - 12:10 PM

Hilton Conference Center, Century Ballroom B

### Vendor's Exhibits

9:00 AM - 12:10 PM

Hilton Conference Center, Century Ballroom A

### Break

10:10 AM - 10:30 AM

Hilton Conference Center, Century Ballroom A

### Lunch

12:00 PM - 1:30 PM (on your own)

### Emerging Professionals Luncheon (invitation only)

12:10 PM - 1:30 PM

Florida Museum of Natural History  
Exhibits and Education Building (Powell Hall)  
McGuire Center Conference Room

### SERNEC-TCN SIG Lunch Meeting

12:10 PM - 1:30 PM

Hilton Conference Center, Dining Pavilion  
(lunch available at the Hilton hotel restaurant at cost)

### General and Themed Session Papers and Posters

1:30 PM - 5:30 PM

Hilton Conference Center

Symposium (cont.): *Specimens Full Circle: Collection to Digitization to Data Use*

1:30 PM - 5:30 PM

Hilton Conference Center, Century Ballroom B

### Vendor's Exhibits

1:30 PM - 5:30 PM

Hilton Conference Center, Century Ballroom A

### Break

3:10 PM - 3:30 PM

Hilton Conference Center, Century Ballroom A

### SPNHC Council Meeting

5:30 PM - 7:30 PM

Hilton Conference Center, Century Ballroom B

### Vendor's Reception

6:30 PM - 8:30 PM

The Samuel P. Harn Museum of Art

Complimentary bus transportation will run continuously between the Hilton, Harn Museum of Art and Hume dorm beginning at 6:20 PM.

## THURSDAY, MAY 21, 2015

### Registration

7:30 AM - 5:30 PM

Hilton Conference Center Registration Desk

## THURSDAY, MAY 21, 2015 (CONTINUED)

### **Continental Breakfast**

7:30 AM - 8:30 AM

Hilton Conference Center, Pre-function

### **General and Themed Session Papers and Posters**

8:30 AM - 12:10 PM

Hilton Conference Center

Symposium: *The Contribution of Small Natural History Collections in the 21st Century*

8:10 AM - 12:10 PM

Hilton Conference Center, Century Ballroom C

Symposium (cont.): *Specimens Full Circle: Collection to Digitization to Data Use*

8:50 AM - 12:10 PM

Hilton Conference Center, Century Ballroom B

### **Vendor's Exhibits**

9:00 AM - 12:10 PM

Hilton Conference Center, Century Ballroom A

### **Break**

10:10 AM - 10:30 AM

Hilton Conference Center, Century Ballroom A

### **Lunch**

12:00 PM - 1:30 PM (on your own)

### **General and Themed Session Papers and Posters**

1:30 PM - 5:30 PM

Hilton Conference Center

Symposium (cont.): *The Contribution of Small Natural History Collections in the 21st Century*

1:30 PM - 5:30 PM

Hilton Conference Center, Century Ballroom C

### **DemoCamp Demonstrations**

1:30 PM - 5:30 PM

Hilton Conference Center, Century Ballroom B

### **WeDigBio Special Interest Group Meeting**

1:30-3:10 pm

Hilton Conference Center, Hawthorne

### **Vendor's Exhibits**

1:30 PM - 5:30 PM

Hilton Conference Center, Century Ballroom A

### **Break**

3:10 PM - 3:30 PM

Hilton Conference Center, Century Ballroom A

### **Banquet and 30<sup>th</sup> Anniversary Gala Celebration**

6:30 PM - 11:00 PM

UF Touchdown Terrace

Cocktail Hour & Cade Museum Demonstrations: 6:30 PM to 7:30 PM

Dinner & Dancing: 7:30 PM to 11:00 PM

\* *Banquet tickets can be purchased prior to the event at the conference registration desk for \$75 \**

Complimentary bus transportation will run continuously between the Hilton, Touchdown Terrace and Hume dorm beginning at 6:20 PM.

## FRIDAY, MAY 22, 2015

### **Registration**

8:00 AM - 5:30 PM

Hilton Conference Center Registration Desk



## FRIDAY, MAY 22, 2015 (CONTINUED)

### **Florida Museum of Natural History Behind-the-Scenes Research Collections and Exhibit Tours**

Behind-the-Scenes Research Collections Tours

8:30 AM - 11:30 AM

Florida Museum of Natural History, Dickinson Hall

&

Florida Museum of Natural History, McGuire Center for Lepidoptera & Biodiversity, Powell Hall

Exhibit Tours

8:30 AM - 11:30 AM

Florida Museum of Natural History, Powell Hall

### **Vendor's Breakdown**

7:00 AM - 9:00 AM

Hilton Conference Center, Century Ballroom A

### **SPNHC Annual Business Meeting Luncheon**

12:00 PM - 2:30 PM

(open to all; included in registration; please bring your lunch ticket to the event)

Hilton Conference Center, Century Ballroom A

### **Special Interest Group Meetings**

"TCN Coffee Klatch" SIG, Sustainability SIG, Emerging Professionals SIG

2:45 PM - 4:30 PM

Hilton Conference Center, Century Ballroom B & C and Dogwood

### **Downtown Festivities**

5:30 pm-?? (Transportation provided until 11:00 pm)

Visit fine restaurants, attend a play or film at the Hippodrome Theatre,  
or dance the night away in a variety of clubs.

### **Natural History Trivia Quiz Night**

First Magnitude Brewing Company

Quiz starts at 6:30 pm.

Complimentary bus transportation will run continuously between the Hilton, Hume dorms, downtown Gainesville (Hampton Inn) and First Magnitude Brewing Company beginning at 5:30 PM. Last bus will leave First Magnitude Brewing Company at 9:00 pm. Last bus will leave downtown at 11:00 pm.

## SATURDAY, MAY 23, 2015

### **Workshop: SERNEC-TCN and Symbiota Software Group**

8:30 AM - 12:30 PM

(open to all; included in registration)

Hilton Conference Center, Century Ballroom B/C

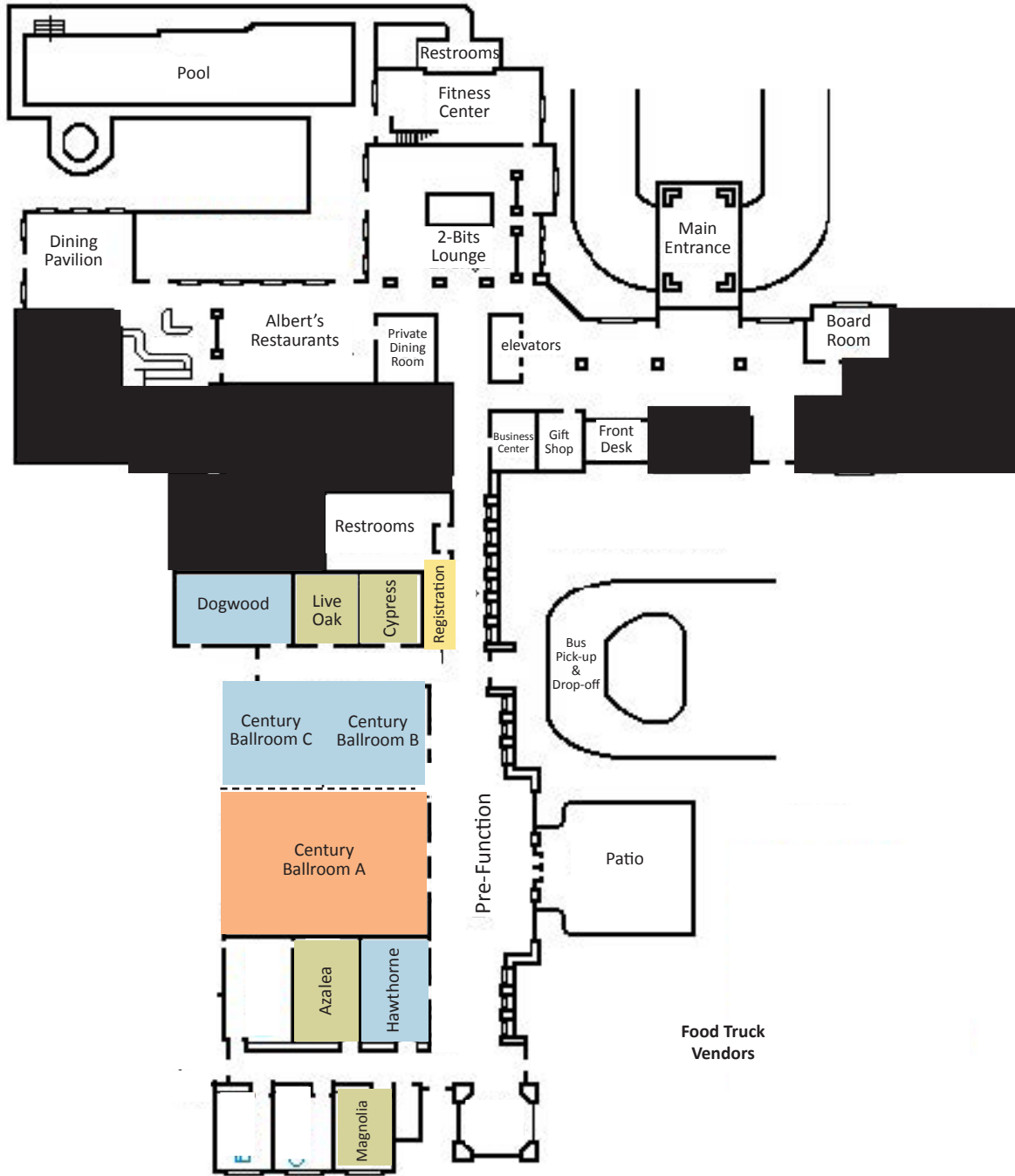
### **Global Plant Initiative Steering Committee Meeting**

8:30 am-5:00 pm

Hilton Conference Center, Magnolia

*Open to Global Plant Initiative members only*

## HILTON UNIVERSITY OF FLORIDA CONFERENCE CENTER



Program	Room
General Sessions and Vendor Area	Century Ballroom A
Break out sessions	Century Ballrooms B & C, Dogwood & Hawthorne

# PROGRAM

## TUESDAY MAY 19, 2015

7:00 AM - 8:00 AM Continental Breakfast - Prefunction

### OPENING SESSION CENTURY BALLROOM A

8:00 AM Introductory Remarks-Elise V. LeCompte, Chair, SPNHC 2015 Local Organizing Committee

8:05 AM Welcome-- Mr. Andrew Bentley, President, SPNHC Council

8:10 AM Welcome-- Dr. Douglas S. Jones, Director, FLMNH

8:15 AM Welcome- Dr. W. Kent Fuchs, President, University of Florida

### PLENARY SESSION - COLLECTIONS IN THE 21<sup>ST</sup> CENTURY CENTURY BALLROOM A

8:30 AM In Defense of Specimen Collecting, Natural History Collections, and Bioethics  
Larry **Page**

9:00 AM Evidence of Evolution: Darwin's Cabinet of Curiosities  
Susan **Middleton**

9:30 AM Endless Forms, Most Useful  
Erin **Tripp**

10:00 AM BREAK

10:30 AM WeDigBio—Public Participation in Digitization of Natural History Collections Hits its Stride  
Austin R. **Mast**

11:00 AM Time to Grow a Pair: Institutional Leadership, Taxonomy and Natural History  
Quentin **Wheeler**

11:30 AM Building a Networked National Community for Collections  
Robert **Gropp**

### SPNHC COMMITTEE MEETINGS

	Century Ballroom B	Century Ballroom C	Dogwood
1:30 PM	Web	Conservation	International Relations Sessional Committee
2:30 PM	Best Practices	Professional Development	Legislation & Regulations
3:30 PM	Long Range Planning	Documentation	Emerging Professionals Group
4:30 PM	Membership	Conference	Publications

#### SPNHC Icebreaker - Powell Hall / Florida Museum of Natural History

6:00 PM - 8:30 PM \* First time SPNHC attendees, travel grant recipients and their mentors, SPNHC Council, Local Organizing Committee and SPNHC Committee Chairs are welcome to arrive at 6:00 PM \*

Complimentary bus transportation will run continuously between the Hilton Conference Center, Florida Museum of Natural History and Hume dorm beginning at 6:00 PM.



**WEDNESDAY  
MAY 20, 2015**

7:30 AM - 8:30 AM Continental Breakfast - Prefunction

**SPECIMENS FULL CIRCLE SYMPOSIUM 1  
CENTURY BALLROOM B**

8:50 AM	Specimens Full Circle: Collection to Digitization to Data Use Dena M. Smith, Deborah <b>Paul</b> and Vladimir Blagoderov
9:10 AM	Using Museum Data for Large-Scale Questions: Modeling Florida Plant Diversity Charlotte C. <b>Germain-Aubrey</b> et al.
9:30 AM	Mining herbarium Databases to Discover Plant Species Associations in Central Arizona Daryl L. <b>Lafferty</b> and Leslie R. Landrum
9:50 AM	Accelerating Digitization of Biodiversity Research Specimens through Online Public Participation Elizabeth R. <b>Ellwood</b> et al.
10:10 AM	BREAK
10:30 AM	The Utility of Accessioned Collections for Conservation Management of Endangered Species Samantha M. <b>Wisely</b> , Paul M. Marinari and Oliver A. Ryder
10:50 AM	Providing the Computing Skills for the Next Generation of Biodiversity Scientists François <b>Michonneau</b> and Deborah Paul
11:10 AM	The New and Improved Armchair Botanist Richard K. <b>Rabeler</b>
11:30 AM	The Digital Roundabout: Data Flow from Field Project to Archive to New Project Ann <b>Molineux</b> and Liath E. Appleton
11:50 AM	Discussion

**GENERAL SESSION 1  
CENTURY BALLROOM C**

8:30 AM	Assessing the Database Practices of Natural History Collections Laura <b>Brenskelle</b>
8:50 AM	Digitization of Arthropod Diversity Data: Progress, Biases, and Research Readiness Nico M. <b>Franz</b> , Neil S. Cobb and Katja C. Seltmann
9:10 AM	The Vertnet Data Migrator: Cleaning Up the Community's Dirty Laundry Robert <b>Guralnick</b> et al.
9:30 AM	Collaborative Georeferencing and Data Repatriation: A Case Study from the Fishnet 2 Project Nelson E. <b>Rios</b> , Henry L. Bart and Mann Justin
9:50 AM	DNA Barcoding is Specimen Digitization David L. <b>Schindel</b> and Michael G. Trizna
10:10 AM	BREAK
10:30 AM	Skeletal Records Accompanying Images - Efficiency vs. Later Utility Richard K. <b>Rabeler</b>
10:50 AM	Not Your Average Herbarium Specimens - The Challenges of Digitizing the Macroalgae Sarah N. <b>Dutton</b> and Nicole Tarnowsky

**GENERAL SESSION 1  
CENTURY BALLROOM C  
(CONTINUED)**

11:10 AM	Georeferencing at NYBG - Applying a Central Database and Site-Based Approach to Streamline Geographic Data Acquisition through the Point-Radius Method Charles J. <b>Zimmerman</b> and Elizabeth A. Kiernan
11:30 AM	DOEI: Mass Digitisation of the Herbarium Collection BR at the Botanic Garden Meise (Belgium) Sofie <b>De Smedt</b> et al.
11:50 AM	Introducing SEQDB for Comprehensive Management of Specimen-Derived DNA Sequences James A. <b>Macklin</b> et al.

**GENERAL SESSION 2  
DOGWOOD**

9:10 AM	Introduction to the Lepidoptera Collections at the McGuire Center for Lepidoptera and Biodiversity at the Florida Museum of Natural History Andrew D. <b>Warren</b>
9:30 AM	The Relocation, Composition and Utilization of the Phillip V. Tobias Hominin Collections, University of the Witwatersrand, Johannesburg, South Africa Bernhard <b>Zipfel</b> , Cynthia Kemp and Sifelani, Jirah
9:50 AM	Fossil Exhibit Evolution and Survival of the Fittest Collections Management Plans: Managing the Collections De-Installation of the Smithsonian National Museum of Natural History Fossil Halls Amanda M. <b>Millhouse</b> and Kathy A. Hollis
10:10 AM	BREAK
10:30 AM	The Research and Outreach Potential of Small Collections: Engaging Students to Become Future Stewards Marcia A. <b>Revelez</b>
10:50 AM	The Botanic Garden Meise: In a Nut-Shell Piet <b>Stoffelen</b> et al.
11:10 AM	Experiences with Salvage and Restoration of Natural History Collections Damaged by Earthquakes and Subsequent Tsunami in East Japan, 2011 Masahiro <b>Ohara</b> et al.
11:30 AM	A Renaissance for the Oregon State Ichthyology Collection Brian L. <b>Sidlauskas</b> et al.
11:50 AM	Vertebrate Zoology at the Illinois State Museum Meredith J. <b>Mahoney</b>

**POSTER SESSION 1  
COLLECTIONS / CONSERVATION**

1	Role of Off-Site Museums for Restoration-Experiences with Salvage and Restoration of Natural History Collections Damaged by Earthquakes and Subsequent Tsunami in East Japan, 2011, Part II Daisuke <b>Sakuma</b> et al.
2	Collections Program Technicians: A SWAT Approach to Collections Management Erin K. <b>Bilyeu</b> and Amanda N. Lawrence
3	NMNH Paleobiology Registration: Past, Present and Future Jennifer L. <b>Strotman</b> , Mark S. Florence and Kathy Hollis
4	Re-Housing Fluid-Preserved Vertebrate Specimens at the Michigan State University Museum Laura M. <b>Abraczinskis</b> and Barbara L. Lundrigan

**POSTER SESSION 1  
COLLECTIONS / CONSERVATION  
(CONTINUED)**

5	Installing Mobile Compact Storage on an Existing Footprint Lynn A. <b>Jones</b> and Tim White
6	Shifting Collections: A Case Study on How to Coordinate, Implement and Complete Moving Over 160 Cases of Specimens Meghann S. <b>Toner</b>
7	From Attic to Ground Floor: Relocating the Yale Peabody Museum's Oceania Ethnographic Collection Roger H. <b>Colten</b> , Maureen D. White and Rebekah DeAngelo
8	Down to the Nitty Gritty: A Case Study of Collection Policies and Procedures in the Ethnology Department at the Sam Noble Oklahoma Museum of Natural History Stephanie L. <b>Allen</b>
9	An Extreme Case of Byne's Efflorescence: A Novel, Two-Pronged Approach to Consolidation Claire M. <b>Curran</b> and Bruno P. Pouliot
10	NHC3: A Novel Approach to Encourage Student Participation in Natural History Collections Preservation, Research, and Outreach Christopher S. <b>Thigpen</b> et al.
11	The Conservation Project for the Bound Herbaria of Michał Fedorowski Magdalena <b>Grenda</b>
12	Integrating Physical and Intellectual Curation into Digitization Workflows Eric <b>Schuettpelz</b> et al.
13	What are *Your* Data Curation Challenges? Please Tell Us! J.A. <b>Macklin</b> et al.
14	Scripting to Save Time and Sanity C. Julie <b>Hoskin</b> and Adam T. Mansur
15	Digitizing the National Insect Collection: Capturing a Species Level Inventory Laura <b>Tancredi</b> and Patricia Gentili-Poole
16	The End of the Beginning: A Look Back From Near The Finish-Line of an IMLS Funded Silurian Reef Digitization Project Patricia <b>Coorough Burke</b> et al.
17	The Global Plants Initiative: DAO Herbarium Gisèle F. <b>Mitrow</b> et al.
18	Assessment of Student Involvement in the University of Iowa Paleontology Repository's NSF-Supported Project "Critical Renovation and Revitalization of the University of Iowa Fossil Plant Collection." Alyson E. <b>Wilkins</b> et al.
19	Using the Data We've Digitized Jessica A. <b>Utrup</b> , Derek Briggs and Susan Butts

**Emerging Professionals Luncheon (invitation only)**

Florida Museum of Natural History, Exhibits and Education Building (Powell Hall), McGuire Center Conference Room

12:10 PM - 1:30 PM

This luncheon is by invitation only. Please meet in the Hilton Conference Center Hotel Lobby at 12:10 PM. From there you will be escorted to the McGuire Center Conference Room, located in the Florida Museum of Natural History Exhibits and Education Building (Powell Hall). This is a 5-10 minute walk from the hotel to Powell Hall, across a major street. Motorized transportation will not be provided. If you prefer to drive over, there is parking available in designated areas around Powell Hall. (The McGuire Conference Room is ADA accessible; if you will need assistance, please contact someone at the conference registration desk by Wednesday morning at 10:00 AM.)



**SERNEC-TCN SIG Lunch Meeting** - Hilton Conference Center, Dining Pavilion  
(lunch available at the Hilton hotel restaurant at cost)

**Digitization TCN: The Key to the Cabinets: Building and Sustaining a Research Database for a Global Biodiversity Hotspot**

12:10 PM - 1:30 PM

The southeastern USA is botanically rich, with areas of high global biodiversity in both the Appalachians and the coastal plain. Millions of plant specimens have been collected from this region over the past four centuries, and these specimens and the information they contain currently reside in museums, or herbaria, at universities across the area. Scientists study these specimens intently; however, it is difficult to retrieve information at broad geographic and taxonomic scales without pipelines to move the information electronically from the specimen to an accessible pool of data. SERNEC, or the SouthEast Regional Network of Expertise and Collections, is a large regional network of botanical experts and collections that has, through an NSF-sponsored research coordination network (RCN) project, developed critical skills in biodiversity informatics. The current project will allow the SERNEC group to make data available for over 3 million specimens using the latest photography and information capture tools and to engage citizen scientists and students to assist in transcribing and georeferencing this large dataset. The ultimate goal of this project is to develop an imaged and databased set of over 3 million specimens from over 100 herbaria in one of the most floristically diverse regions in North America and a global hotspot of plant diversity. By partnering with Symbiota, Notes from Nature, GEOLocate, Adler Planetarium, iPlant/TACC, and Specify, the project will develop ways to best integrate various efforts for data accessibility.

This luncheon is open to all interested conference attendees. Lunch will be available for purchase from Albert's Restaurant. Seating for the meeting will be in Albert's Restaurant Dining Pavilion (see the Hilton map on page 16).

**SPECIMENS FULL CIRCLE SYMPOSIUM 2**  
**CENTURY BALLROOM B**

1:30 PM	The Contribution of Small Collections: A Case Study from Fuireneae (Cyperaceae) Heather E. <b>Dame</b> et al.
1:50 PM	Biodiversity Information Serving Our Nation (BISON), The Integrated Taxonomic Information System (ITIS) and the Federal Ecosystem of Biodiversity Data Gerald F. <b>Guala</b>
2:10 PM	The Scrub-Lovin' Grasshoppers (Orthoptera: Acrididae: <i>Melanoplus</i> : The Puer Group) of the Southeastern U.S.: Integrating Specimen Data From Then and Now for Maximum Effect Derek A. <b>Woller</b> and Hojun Song, Hojun
2:30 PM	Something Old, Something New, Specimens Borrowed and Published Too: Integrating New Specimens and Old Collections into Research Evan P. <b>Anderson</b> and Dena M. Smith
2:50 PM	Collaborating with Federal Partners: A New Online National Park Service Locality Database through the University of California Museum of Paleontology Erica C. <b>Clites</b> et al.
3:10 PM	BREAK
3:30 PM	Taxonomic Concept Resolution for Voucher-Based Biodiversity Information Platforms Nico M. <b>Franz</b> et al.
3:50 PM	An Update on the Notes From Nature Project: Bringing a Proof of Concept into Full Production Robert <b>Guralnick</b> and Michael W. Denslow
4:10 PM	Specimen Label Digitization Using OCR/NLP Tools Integrated Within the Symbiota Processing Toolkit Edward E. <b>Gilbert</b> et al.
4:30 PM	The Processes, End Uses and Unexpected Bonuses of High Resolution Imaging of Entomology Collection Items Peter K. <b>Lillywhite</b>
4:50 PM	Mobilizing Fossils for Global Change Research Patricia A. <b>Holroyd</b> and Charles R. Marshall
5:10 PM	Discussion

**GENERAL SESSION 3**  
**CENTURY BALLROOM C**

1:30 PM	Cooperative Protection of Sensitive Species Data: A Partnership Between Natural Heritage Programs and the Collections Community in the Northeastern USA Aaron <b>Marcus</b> et al.
1:50 PM	Global Registry of Biodiversity Repositories (GRBIO): Status Report and Future Directions David E. <b>Schindel</b> and Adele E. Crane
2:10 PM	Scientific Collections: Engaging Across Disciplinary Boundaries to Combat Emerging Infectious Diseases Eileen <b>Graham</b> and David E. Schindel
2:30 PM	Numbers and Things: The Catalogs of the Malacology Collection at the Academy of Natural Sciences Paul <b>Callomon</b> and Gary Rosenberg
2:50 PM	Aquatic Invasives: Documenting the Fish, Mollusks, Algae and Plants Threatening North America's Great Lakes Jonathan W. <b>Toll</b> , Kenneth M. Cameron and Melissa Tulig
3:10 PM	BREAK
3:30 PM	Challenges and Opportunities for the Management of U.S. Federal Scientific Collections Christopher A. <b>Norris</b> et al.
3:50 PM	Challenges and Opportunities for the Management of U.S. Federal Scientific Collections Christopher A. <b>Norris</b> et al.
4:10 PM	Challenges and Opportunities for the Management of U.S. Federal Scientific Collections Christopher A. <b>Norris</b> et al.
4:30 PM	Challenges and Opportunities for the Management of U.S. Federal Scientific Collections Christopher A. <b>Norris</b> et al.
4:50 PM	Challenges and Opportunities for the Management of U.S. Federal Scientific Collections Christopher A. <b>Norris</b> et al.

**GENERAL SESSION 4**  
**DOGWOOD**

1:30 PM	Sharing Knowledge in Collections: Building a Wiki on Collection Management Peter <b>Giere</b> et al.
1:50 PM	Scaling the Heights: Results of Benchmarking Collections Access Equipment and Policies Walt <b>Crimm</b>
2:10 PM	Collections Space - The Final Frontier: Planning for the Future of Collections Storage Space Carol <b>Butler</b>
2:30 PM	Crunched for Space: Expansion at the New York Botanical Garden Herbarium Lance E. <b>Jones</b> and Nicole Tarnowsky
2:50 PM	Kurator: An Extensible, Open-Source Workflow Platform for Users and Makers of Data Curation Tools Bertram <b>Ludäscher</b> et al.
3:10 PM	BREAK
3:30 PM	Water, Water Everywhere and Where Exactly is it? Considerations for Describing Oceanic Collecting Localities When Coordinates Are Not Available Andrew D. <b>Williston</b>
3:50 PM	Practical Implementation of Best Practice Guidelines for Genetic Resources Associated with Natural History Collections Breda M. <b>Zimkus</b> and Linda S. Ford

**GENERAL SESSION 4  
DOGWOOD  
(CONTINUED)**

4:10 PM	SCAN: The Schistosomiasis Collection at the Natural History Museum Muriel E. <b>Rabone</b> et al.
4:30 PM	Going Back to the Source: Enriching Access Through Field Notes and Literature Carolyn <b>Sheffield</b> et al.
4:50 PM	Improved Storage of a Radioactive Geologic Collection - A Case Study Christian M. <b>Cicimurri</b> and Lynn B. Dobbs

**6:30 PM - 8:30 PM Vendor's Reception - Harn Museum of Art**  
Complimentary bus transportation will run continuously between the Hilton, Harn Museum of Art and Hume dorm beginning at 6:20 PM.

**THURSDAY  
MAY 21, 2015**

7:30 AM - 8:30 AM Continental Breakfast - Prefunction

**SPECIMENS FULL CIRCLE SYMPOSIUM 3  
CENTURY BALLROOM B**

8:50 AM	A Picture is Worth a Thousand Words: Imaging in Digitization Workflows Vladimir <b>Blagoderov</b> , Vladimir and Laurence Livermore
9:10 AM	INSECT: An Innovative Tool for Automatic Digitization of Natural History Collections Laurence <b>Livermore</b> et al.
9:30 AM	Putting Our Images to Work: Using Digitized Fossil Beetles to Study a Global Climate Transition Lindsay J. <b>Walker</b> , Dena M. Smith and Talia S. Karim
9:50 AM	Optimizing a Compression Fossil Digitization Workflow at the University of Colorado Talia S. <b>Karim</b> and Lindsay J. Walker
10:10 AM	BREAK
10:30 AM	Joining Up for Digitization - A Pilot Project Between KEW and The Natural History Museum Alan <b>Paton</b> et al.
10:50 AM	Inclusion of Botany-Naive Undergraduates in Digitization Workflows: It is Possible! Emily L. <b>Gillespie</b> , Joshua J. Hamrick and Kristen N. Hammond
11:10 AM	Digital Collections Programme: A Structured Approach to Mass Digitization Ben <b>Atkinson</b>
11:30 AM	Follow a Fossil Full Circle from Collection to Research to Outreach and Interpretation Through the Field Museum's Silurian Reef Digitization Project Paul S. <b>Mayer</b> et al.
11:50 AM	Discussion



**CONTRIBUTIONS OF SMALL NATURAL HISTORICAL COLLECTIONS SYMPOSIUM 1  
CENTURY BALLROOM C**

8:10 AM	Why Small Collections - What is Unique, Valuable and Important? Anna K. <b>Monfils</b> and Gil Nelson
8:30 AM	Human Diversity and the Opportunities to Engage Students in Small Collections Roland P. <b>Roberts</b>
8:50 AM	Aim-Up: Bringing Big Data to Educators at Small Institutions Kurt E. <b>Galbreath</b> and Joseph A. Cook
9:10 AM	Small Collections Working Together: <a href="http://collectionseducation.org">collectionseducation.org</a> Erica R. <b>Krimmel</b> et al.
9:30 AM	Citizen Science: A Symbiotic Future for Research and Education Using Biological Collections Emily K. <b>Meineke</b> and Steven D. Frank
9:50 AM	Collections Internships for College Students: Designing an Interdisciplinary Program Emily P. <b>Smith</b>
10:10 AM	BREAK
10:30 AM	Small Entomology Collections: How to Manage Christy L. <b>Bills</b> and Janaki Krishna
10:50 AM	Transforming Accessibility to the Rich, Site-Based, Multi-Taxon Collections of Field Stations; A Case Study from Archbold Biological Station Hilary M. <b>Swain</b> and Gil Nelson
11:10 AM	Managing Multiple Small Collections in an Interdisciplinary Museum Lena F. <b>Hernandez</b>
11:30 AM	Challenges and Obstacles to Digitizing Small Paleontology Collections Laura A. <b>Vietti</b>
11:50 AM	Research Opportunities Using Data from Small Collections Pamela S. <b>Soltis</b>

**GENERAL SESSION 5  
DOGWOOD**

8:30 AM	Experimenting with a Workflow to Speed Up the Digitization of a Large Collections of Pinned Entomological Specimens Patricia <b>Gentili-Poole</b> and Jessica Bird
8:50 AM	Bone Maceration and Bone Degreasing - A Necessary Tool for Preserving Natural History Collections Guenther <b>Weber</b>
9:10 AM	Cleaning Protocol for Mercuric Chloride Contaminated Herbarium Cases Melinda D. <b>Peters</b> , Douglas Fallon and Michael Hunt
9:30 AM	Smoking Under Scrutiny: Evaluating Methods for the Removal of Ammonium Chloride Residue from Fossils Edward C. <b>Shelburne</b> and Angella Thompson
9:50 AM	Overcoming the Inherent Problem of Detaching Hairs on Caribou Hides Fran E. <b>Ritchie</b>
10:10 AM	BREAK
10:30 AM	Integrated Pest Management for the Angelo State Natural History Collections: An Approach for Small Collections Barbara F. <b>Welch</b> , Robert C. Dowler and Marcia A. Revelez
10:50 AM	Algae in Herbaria, In History, and In Art Maura C. <b>Flannery</b>

**GENERAL SESSION 5  
DOGWOOD  
(CONTINUED)**

11:10 AM	Risk Under the Microscope: Risk Management for Museum Victoria's Scientific Slide Collection Danielle <b>Measday</b> , Alice Cannon and Robert Waller
11:30 AM	Stitching Data Together Margaret L. <b>Landis</b> and Richard A. Lupia
11:50 AM	Beyond "No Food or Drink Allowed in the Gallery:" Best Practices for Food in Cultural Institutions Fran E. <b>Ritchie</b> , Bethany Palumbo and Rebecca Newberry

**POSTER SESSION 3  
DIGITIZATION**

1	Integrating Across Collections: Parasite/Host Relationships in the Arctos Collections Database Mariel L. <b>Campbell</b> et al.
2	Global Registry of Biodiversity Repositories: Function and Application Adele E. <b>Crane</b> and David E. Schindel
3	Emergence of Three Voucher-Based Neotropical Biodiversity Portals Edward E. <b>Gilbert</b> , Nico M. Franz and Benjamin Brandt
4	Collections Help to Control Invasives at Borders Gisèle F. <b>Mitrow</b> et al.
5	Getting the Family Together: Digitizing the Icacinaceae Katy A. <b>Estes-Smargiassi</b> , Gregory W. Stull and Steven R. Manchester
6	ARPO - Augmented Reality for Public Outreach Melody A. <b>Basham</b> et al.
7	Digitizing Herbarium Collections in Partnership: A Collaboration Between the NC Museum of Natural Sciences and the NC State University Vascular Plant Herbarium Natalia <b>Zbonack</b> et al.
8	Looking for Treasures in a Mega-Diverse Country: Natural Collections in Ecuador Maria C. <b>Segovia-Salcedo</b> , Nestor A. Acosta-Buenano and Luis Carrasco
9	Toward Automated Identification of Chagas Disease Vectors Hannah <b>Owens</b> et al.
10	Restoring Natural History Collections of Native Amphibians and Reptiles in South Dakota Gabrielle A. <b>Maltaverne</b>
11	Restoring a Degraded Mammal Collection at a Small University Cheyenne <b>Gerdes</b> , Sean P. Maher, and Lynn W. Robbins
12	Public Engagement Through Volunteers in Collections Dawn <b>Roberts</b>
13	Investigating Calcium Growths in Museum Victoria's Fluid-Preserved Marine Invertebrate Collection Danielle <b>Measday</b> et al.
14	Cowboy Conservation: The Treatment of a Taxidermy Leatherback Turtle in Cordova, Alaska Fran E. <b>Ritchie</b>
15	Use of Black Carpet Beetles ( <i>Attagenus Unicolor</i> ) as an Alternative to Carrion Beetles ( <i>Dermestes Maculatus</i> ) for Cleaning Small Fragile Skeletons for Natural History Collections John J. <b>Ososky</b>
16	Organization, Expansion, and Digitization of the Larval Fish Collection at The Virginia Institute of Marine Science Sarah K. <b>Huber</b> et al.

**POSTER SESSION 3  
DIGITIZATION  
(CONTINUED)**

- 17 Rehydration of Desiccated Fish Specimens in The Arkansas State University Museum of Zoology Ichthyology Collection  
Mary **Rath** et al.
- 
- 18 Assessing Research Potential of Historic Archaeological Collections: A Case Study of Three Florida Assemblages  
Neill J. **Wallis**, Mark C. Donop and Kristen C. D. Hall

**DEMOCAMP DEMONSTRATIONS  
CENTURY BALLROOM B**

- 1:30 PM Lifemapper's Species Distribution Modeling Based on Idigbio Biocollections  
Aimee **Stewart** et al.
- 
- 1:50 PM Smithsonian Transcription Center - Discovering Smithsonian Collections through Volunteer Transcription  
Sylvia S. **Orli**, Patricia Gentili-Poole and Jessica Bird
- 
- 2:10 PM Global Registry of Biodiversity Repositories: Function and Application  
Adele E. **Crane** and David E. Schindel
- 
- 2:30 PM ARCTOS: A Collaborative Web-Based Collections Database and Management System  
Mariel L. **Campbell** et al.
- 
- 2:50 PM Rapid Collection Inventories  
Jason **Best** and Tiana Rehmann
- 
- 3:10 PM BREAK
- 
- 3:30 PM The New Virtual Silurian Reef: How Building a Website with the Museum's Database can Streamline Web Development  
Marc **Lambruschi** et al.
- 
- 3:50 PM Specify for the Web, A New Generation Specify for Biological Collections Digitization and Collaborative Databases  
James H. **Beach** and Ben Anhalt
- 
- 4:10 PM Taking Collection Data Places Where It Has Never Gone Before - Specify Insight for the iPad  
Rod **Spears** and James H. Beach
- 
- 4:30 PM A Scientific Workflow Tool for Targeted Data Quality Improvement of Natural Science Collection Data  
Paul J. **Morris** et al.
- 
- 4:50 PM YESWORKFLOW: How to Render a Data Curation Script as a Workflow in Under 10 Minutes  
Bertram **Ludäscher** et al.

**CONTRIBUTIONS OF SMALL NATURAL HISTORICAL COLLECTIONS SYMPOSIUM 2  
CENTURY BALLROOM C**

- 1:30 PM Strategies for Digitizing Small Vertebrate Collections  
Laura M. **Abraczinskas**
- 
- 1:50 PM The Fairbanks Museum: A Small, Rural, New England Natural History Museum's Challenge to Adapt  
Mary B. **Prondzinski**
- 
- 2:10 PM SCNET: Supporting Digitization in Small Natural History Collections  
Gil **Nelson** and Anna K. Monfils
- 
- 2:30 PM Getting Started: Digitizing Multiple Small Collections at UCSB  
Laurie **Hannah**
- 
- 2:50 PM Recruiting and Managing Volunteers in Small Collections  
Melissa B. **Islam**

**CONTRIBUTIONS OF SMALL NATURAL HISTORICAL COLLECTIONS SYMPOSIUM 2  
CENTURY BALLROOM C  
(CONTINUED)**

3:10 PM	BREAK
3:30 PM	Ten Years of the Society of Herbarium Curators: Past, Present and Future Andrea <b>Weeks</b>
3:50 PM	The Role of Human Infrastructure in Biodiversity Informatics: SERNEC as a Model for Community Development Zack E. <b>Murrell</b> , Michael W. Denslow and Joseph McKenna
4:10 PM	Large and Small Collections: Partners in a Time of Challenges and Opportunities Barbara K. <b>Thiers</b>
4:30 PM	A List of U.S.-Based Natural History Collections François <b>Michonneau</b> and Larry Page
4:50 PM	The Role of Small Natural History Collections in Contributing to Understanding Species' Distributions Travis D. <b>Marsico</b> et al.

**GENERAL SESSION 6  
DOGWOOD**

1:30 PM	Much More than a "Cabinet of Curiosities:" Communicating the Value of Collections Christopher A. <b>Norris</b>
1:50 PM	Teaching with Bones: Utilizing Bio-Archaeology Reference Collections for Interdisciplinary Instruction Emily P. <b>Smith</b>
2:10 PM	Science Communication of Fossil News in China Facheng <b>Ye</b>
2:30 PM	Unlocking Hidden Potential: Using Museum Specimens to Engage and Educate Children with Autism Randy A. <b>Singer</b>
2:50 PM	Integrating Citizen Science into High School Classrooms Using Notes from Nature Kari M. <b>Harris</b> and Jill L. Czerwonky
3:10 PM	BREAK
3:30 PM	Broadening Participation in the Biological Sciences Gil <b>Nelson</b> and Greg Riccardi
3:50 PM	Object Based Inquiry: Collections and Critical Thinking Colleen R. <b>Carter</b>
4:10 PM	Door-to-Door Natural History Richard A. <b>Busch</b>
4:30 PM	Community Collections: Partnership Programs at The Denver Museum of Nature & Science Eric <b>Godoy</b>

**WEDIGBIO SPECIAL INTEREST GROUP (SIG) SESSION  
HAWTHORNE**

1:30 PM	WeDigBio: Worldwide Engagement for the Digitization of Biocollections Paul G. <b>Kimberly</b> et al.
1:50 PM	WeDigBio: Worldwide Engagement for the Digitization of Biocollections Paul G. <b>Kimberly</b> et al.
2:10 PM	WeDigBio: Worldwide Engagement for the Digitization of Biocollections Paul G. <b>Kimberly</b> et al.



**WEDIGBIO SPECIAL INTEREST GROUP (SIG) SESSION  
HAWTHORNE  
(CONTINUED)**

2:30 PM	WeDigBio: Worldwide Engagement for the Digitization of Biocollections Paul G. <b>Kimberly</b> et al.
2:50 PM	WeDigBio: Worldwide Engagement for the Digitization of Biocollections Paul G. <b>Kimberly</b> et al.
3:10 PM	BREAK

**Banquet & 30th Anniversary Celebration - Touchdown Terrace/ Ben Hill Griffin Stadium**

Cocktail Hour & Cade Museum Demonstrations: 6:30 PM to 7:30 PM

6:30 PM - 11:00 PM Dinner & Dancing: 7:30 PM to 11:00 PM

*\* Banquet tickets can be purchased prior to the event at the conference registration desk for \$75 \**

Complimentary bus transportation will run continuously between the Hilton, Touchdown Terrace and Hume dorm beginning at 6:20 PM.

**FRIDAY  
MAY 22, 2015**

8:30 AM - 11:30 AM Florida Museum of Natural History - Behind-the-Scenes Research Collections and Exhibit Tours

Florida Museum of Natural History, Dickinson Hall  
&  
Florida Museum of Natural History, McGuire Center for Lepidoptera & Biodiversity, Powell Hall  
Exhibit Tours  
8:30 AM - 11:30 AM  
Florida Museum of Natural History, Powell Hall

The Florida Museum of Natural History is Florida's official state natural history museum. With over 40 million objects and specimens, it is one of the nation's largest and fastest-growing natural history museums. Although its primary geographic emphasis is on Florida, the Caribbean Basin and Latin America, the collections span the globe. Many of its collections rank among the top ten nationally and internationally. Its notable Lepidoptera collection is one of, if not the largest, in the world. Centered around Florida and the Southeast, the Museum's exhibits and educational programs focus on the rich and diverse nature of our natural and cultural world. Fascinating, stimulating permanent and temporary exhibits like the Butterfly Rainforest and a A T-Rex Named Sue draw people from around the globe. Since its beginning in 1891, the Florida Museum has evolved into a world-class institution committed to inspiring people to value the biological richness and cultural heritage of our diverse world and make a positive difference in its future.

*Complimentary bus transportation will run continuously between the Hilton, McGuire Hall/Powell Hall and Dickinson Hall beginning at 8:20 AM. The last bus pickup will be at McGuire/Powell Hall at 11:30 AM followed by the last pickup at Dickinson Hall at 11:40 AM.*

Behind-the-Scenes Research Collections Tours  
8:30 AM - 11:30 AM  
Florida Museum of Natural History, Dickinson Hall

The Museum's Research and Collections building, Dickinson Hall, houses the following collections and programs on three different floors—Archaeology, Florida Program for Shark Research, Genetic Resources Repository, Herbarium, Herpetology, Ichthyology, Invertebrate Zoology, Mammalogy, Molecular Systematics and Evolutionary Genetics Lab, Ornithology, Invertebrate Paleontology, Paleobotany and Palynology, Vertebrate Paleontology. This tour is set up like an open house, so that participants may wander at their own pace from range to range and meet with various collections staff throughout the entire building. If you wish to visit these collections, please exit the bus at Dickinson Hall. (Each floor of Dickinson Hall is ADA accessible; if you will need assistance, please contact someone at the conference registration desk before Friday morning.)

8:30 AM - 11:30 AM Florida Museum of Natural History - Behind-the-Scenes Research Collections and Exhibit Tours (Continued)

---

Behind-the-Scenes Research Collections Tours

8:30 AM - 11:30 AM

Florida Museum of Natural History, McGuire Center for Lepidoptera & Biodiversity, Powell Hall

The McGuire Center for Lepidoptera and Biodiversity is attached to the Museum's exhibit and education building, Powell Hall. If you wish to visit the McGuire Center, please exit the bus at Powell Hall. There will be guides outside the building to escort you to the proper location. There you will be met by museum staff who will lead you through the McGuire Center collections and research labs. (The McGuire Center is ADA accessible; if you will need assistance, please contact someone at the conference registration desk before Friday morning.)

Exhibit Tours

8:30 AM - 11:30 AM

Florida Museum of Natural History, Powell Hall

The Museum's exhibits are housed in Powell Hall. If you wish to visit the exhibits, please exit the bus at Powell Hall. There will be guides outside the building to escort you to the proper location. Once inside, you will be met by museum staff who will lead you through the exhibit halls. (Powell Hall is ADA accessible; if you will need assistance, please contact someone at the conference registration desk before Friday morning.)

12:00 PM - 2:30 PM **SPNHC Annual Business Meeting Luncheon** - Century Ballroom A  
(open to all; included in registration; please bring your lunch ticket to the event)

**Century Ballroom B**

**Century Ballroom C**

**Dogwood**

2:45 PM - 4:30 PM Emerging Professionals SIG

"TCN Coffee Klatch" SIG

Sustainability SIG

**Emerging Professionals SIG**

The Emerging Professionals SIG meeting includes 10-15 minute informal presentations (1:30-3:30), followed by a Question & Answer session with an amazing group of panelists (3:30 PM - 4:30 PM).

**"TCN Coffee Klatch" SIG**

Current TCN participants and a representative from NSF will be available to answer questions about the ADBC program for non-TCN SPNHC participants. It will be an informal mentoring/networking session for collections outside of the existing ADBC network. It will give participants the opportunity to ask questions about the proposal process, and learn more about being a part of a TCN from colleagues that have experience with the program.

**Sustainability SIG**

One of the main aims of museums is to preserve the collective cultural and scientific heritage for perpetuity. Sustainability is therefore, by definition, at the very heart of museums, but can mean very different things to different people. Collection care and documentation standards are important for the sustainability of collections. Good energy management and water-saving measures are important for environmental sustainability; at the same time, increasing resource-efficiency comes under the same heading as funding and the financial sustainability of the museum as an organization. The high level of expertise present in museums is leading to calls for this to be translated into more actively helping the transition towards a more sustainable society. And there is also the question of the "sustainability of sustainability" – at the moment, sustainability is high on the agenda, but would this remain the case if political and/or managerial frameworks changed? At this meeting, we seek to build momentum on the subject, with a view to have a much wider debate at the SPNHC 2016 in Berlin, Germany.

**Downtown Festivities** - (Transportation provided until 11:00 pm)

*Visit fine restaurants, attend a play or film at the Hippodrome Theatre, or dance the night away in a variety of clubs. Take advantage of Visit Gainesville's Historic Downtown Gainesville Dine-Around—a packet of special offers and discount coupons for various downtown restaurants (included in your conference bag). Several of these restaurants are planning special menus and treats related to natural history and this conference.*

**Natural History Trivia Quiz Night**

First Magnitude Brewing Company

Quiz starts at 6:30 pm.

5:30 PM - ???

Join us at the First Magnitude Brewery in downtown Gainesville as we continue a fun-filled tradition started last year at the SPNHC 2014 annual meeting in Cardiff-- the SPNHC Natural History Trivia Quiz. We promise a rip-roaring evening sampling local craft beers, yummy food, and natural-history themed brainteasers. "Valuable" prizes will be awarded to the first, second and third place trivia teams. For those that don't enjoy beer, non-alcoholic drinks will be available from the foodtruck.

Complimentary bus transportation will run continuously between the Hilton, Hume dorm, downtown Gainesville (Hampton Inn) and First Magnitude Brewing Company beginning at 5:30 PM. Last bus will leave First Magnitude Brewing Company at 9:00 pm. Last bus will leave downtown at 11:00 pm.

**SATURDAY  
MAY 23, 2015**

**Workshop-- SERNEC-TCN and Symbiota Software Group - Century Ballroom B/C**

Symbiota is a software package that is currently being used by many thematically, regionally, or taxonomically defined digitization efforts to publish, edit and maintain primary biodiversity data. "The Key to the Cabinets" is a Thematic Collection Network (SERNEC-TCN) funded through the NSF-ADBC program. The focus of the SERNEC-TCN is to build a biodiversity database of southeast U.S. plants and Symbiota is an important tool being leveraged for this effort. The SERNEC Symbiota portal (<http://serneportal.org>) is being used to mobilize and aid in digitizing 4.7 million specimens from 107 herbaria and new functionality is being developed to support this massive digitization effort, expanding this to all the southeast herbaria. This hands-on workshop is designed for data contributors and will focus on managing (processing and publishing) herbarium data within the SERNEC Symbiota portal. The focus will be on publishing and processing data in Symbiota, but will also be tailored to participants' interests. An emphasis will be placed on herbarium records and associated images; however, this workshop is open to all interested in getting started or wanting to learn more about managing data and images in Symbiota regardless of taxonomic or regional scope. The workshop will likely concentrate on account creation, account management, migrating data in and out of Specify, publishing data to iDigBio, managing taxonomies and linking duplicates from other collections. Georeferencing with the GEOLocate module will also be highlighted. A personal laptop is required to participate. Participants will be polled before the event to gauge interests and tailor the agenda accordingly.

8:30 AM - 12:30 PM

**Global Plant Initiative Steering Committee Meeting - Hilton Conference Center**

*Open to Global Plant Initiative members only*

8:30 AM - 5:00 PM

## General and Themed Session Papers, Posters and Workshops

*Email Addresses are provided for the presenter.*

Contributions Small Nat. Hist. Coll. Symp. 2 TH 05/21/2015 01:30 PM

### STRATEGIES FOR DIGITIZING SMALL VERTEBRATE COLLECTIONS

**Abraczinskas, Laura M.**, Michigan State University Museum, 409 West Circle Dr., East Lansing, MI 48824; [abraczi1@msu.edu](mailto:abraczi1@msu.edu)

The Michigan State University Museum houses over 111,000 vertebrate specimens. The specimens date from 1844 and are preserved as skins, skulls, skeletons, fluid-preserved materials, tanned hides, frozen tissues, DNA samples, nests, eggs, anatomical preparations, and taxidermy mounts. Like many collections-holding institutions, the Museum began digitizing collections in the early 1990s by key-entering text data into a computer database. At that time, the primary goals of digitization were to facilitate collections management and to effectively provide specimen information on an as-requested basis. Over time, the Museum employed multiple strategies for vertebrate collections digitization and related activities such as inventory, reconciliation, data enhancements, and standards conformance. These strategies included developing written protocols for digitization; selecting standard terminology for specimen preparation types; utilizing standard resources for taxonomical and geographical data; modifying database fields to conform to Darwin Core standards; employing best practices and resources for georeferencing and inventory; dividing complex projects into smaller discreet components; and utilizing multiple original data sources and documents to reconcile records and enhance specimen data. Original records and specimen data sources included catalog ledgers, cards, accession documents, field notes, specimen tags, egg slips, necropsy reports, correspondence documents, archival records, and dissertations. Multiple numbering systems and collections catalogs in use since the Museum's founding in 1857 were accommodated. Today, the Museum is part of the Global Registry of Biorepositories, has two institutional codes for vertebrate collections, and digitized records are published to the GBIF, iDigBio, VertNet, and FishNet2 online portals. Our digitized vertebrate specimen records are accessed every day.

Poster Session 1

W 05/20/2015 AM

### RE-HOUSING FLUID-PRESERVED VERTEBRATE SPECIMENS AT THE MICHIGAN STATE UNIVERSITY MUSEUM

**Abraczinskas, Laura M.**, Michigan State University Museum, 409 West Circle Dr., East Lansing, MI 48824; [abraczi1@msu.edu](mailto:abraczi1@msu.edu);  
**Lundrigan, Barbara L.**, Michigan State University Department of Zoology and Michigan State University Museum, 409 West Circle Dr., East Lansing, MI 48824

Established in 1857, the Michigan State University (MSU) Museum houses over 111,000 vertebrate specimens dating from 1844. Over the past 25 years, the MSU Museum has successfully completed 11 re-housing projects for both wet and dry vertebrate specimens. Between 1995 and 1997, wet specimens that were stored in glass jars (including all type specimens) were re-housed into new jars with new lids and ethanol. Between 2004 and 2006, the large-bodied specimens were re-housed into new tanks or barrel containers. In October 2014, the MSU Museum received funding from the Institute of Museum and Library Services to improve safety, environmental conditions, and accessibility of 27,577

fluid-preserved specimens that had been stored on substandard shelving in the Museum's fluid specimen room. Prior to the project, the center aisle of the room, which provided access to 26% of specimens, was only 40.64 cm (16 inches) wide. This made accessing specimens difficult and awkward, and placed specimen jars at risk of damage from physical forces. Carts and the area safety ladder would not fit in the narrow aisle. At the direction of campus fire and safety officials, jars of specimens are being re-housed into 14 new flammable liquid cabinets within the room and the space is being reconfigured to accommodate standard-width aisles. Project activities include transfer of jars to new cabinets, production of shelf and cabinet labels for the re-housed specimens, and updating storage locations in the Specify database. MSU undergraduate students have undergone training and are assisting with all project activities.

Poster Session 1

W 05/20/2015 AM

### DOWN TO THE NITTY GRITTY: A CASE STUDY OF COLLECTION POLICIES AND PROCEDURES IN THE ETHNOLOGY DEPARTMENT AT THE SAM NOBLE OKLAHOMA MUSEUM OF NATURAL HISTORY

**Allen, Stephanie L.**, Sam Noble Oklahoma Museum of Natural History, University of Oklahoma, 2401 Chautauqua Ave, Norman, OK 73072; [stephanie.allen@ou.edu](mailto:stephanie.allen@ou.edu)

While most museum professionals understand the basic differences between a Collection Management Policy (CMP) and collection-related procedures, many find it difficult when faced with the prospect of creating, updating, and implementing these different documents. Through looking at a case-study of the creation of a procedural manual for the Ethnology Department at the Sam Noble Oklahoma Museum of Natural History (SNOMNH) at the University of Oklahoma and at the updating of SNOMNH's CMP, the following items will be examined: the differences between policies and procedures, the varying processes of creating and/or updating these very different documents, the sometimes difficult implementation of the stated policies and procedures, and the ultimate necessity of both these types of collection-based documents.

Spec. Full Circle Symp. 2

W 05/20/2015 02:30 PM

### SOMETHING OLD, SOMETHING NEW, SPECIMENS BORROWED AND PUBLISHED TOO: INTEGRATING NEW SPECIMENS AND OLD COLLECTIONS INTO RESEARCH

**Anderson, Evan P.**, Department of Geological Sciences, University of Colorado Boulder, 399 UCB, Boulder, CO 80309-0399; [Evan.P.Anderson@Color-ado.edu](mailto:Evan.P.Anderson@Color-ado.edu); **Smith, Dena M.**, CU Museum of Natural History, University of Colorado, 265 UCB, Boulder, CO 80309

A museum collection that is used by students and researchers is a collection that is maintained and kept up to date. Yet, often the best way for students and researchers to be engaged and enthusiastic with their research is to work with specimens that they themselves have collected. Unfortunately, this approach can lead to a great cumulative influx of specimens over the years and neglect of perfectly good and usable specimens already in collection. A happy medium is to incorporate both newly collected



and already curated specimens into new research projects.

We examined multiple fossil collections from the University of Colorado Museum of Natural History in order to study the effects of different preservational pathways on the resultant quality of insect fossils. Initial assessment data were collected using Green River Formation fossils already in collection. Working with these specimens provided an opportunity to become familiar with fossil preservation within lake environments and directed the goals of new specimen collection from the field. Additionally, working to update the taxonomic identification of existing collections as part of an NSF funded digitization project enhanced the data associated with specimens and led to greater speed and accuracy when identifying and curating new specimens. All specimen data was further improved by the opportunity to return to the Green River Formation and collect information focused on the sedimentological and stratigraphic context of fossil specimens. Integrating research and curatorial activities allows for both the updating and strengthening of a museum's collection.

Spec. Full Circle Symp. 3

TH 05/21/2015 11:10 AM

### **DIGITAL COLLECTIONS PROGRAMME: A STRUCTURED APPROACH TO MASS DIGITIZATION**

**Atkinson, Ben**, The Natural History Museum, Cromwell Road, London, UK; b.atkinson@nhm.ac.uk

Undertaking mass digitization within large collections institutions requires more than imaging and data basing. It often spans far wider than the physical process itself including but not limited to: agreeing and documenting standards for data and image capture; the preparation of specimens and organization of the collection; and the modification of collection management systems. Each challenge requires significant organizational and cultural change that must be addressed in a cohesive, structured way.

In 2014, the Natural History Museum (NHM) London launched its Digital Collections Programme (DCP) with the aim of digitizing a quarter (20 million) of its collection within five years. The Museum holds a total of over 80 million objects varying in size, scale and discipline, so establishing a coordinated approach to its digital agenda has been paramount.

This talk will outline how DCP has used formal project and program management methodology to both lay the foundations for mass digitization and prepare for transformation change within its people, processes and systems. We will explore the techniques used to aid project planning, track complex dependencies and prioritize collections at an institutional level. Finally we will show how a benefits-led approach to mass digitization can maximize the products of digitization by defining clear curatorial and research use-cases.

Poster Session 3

TH 05/21/2015 AM

### **ARPO—AUGMENTED REALITY FOR PUBLIC OUTREACH**

**Basham, Melody A.**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501; melody.basham@asu.edu; **Mast, Austin R.**, Department of Biological Science, Florida State University, Tallahassee, FL 32306-4295; **Franz, Noco M.**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501; **Holmes, Kody**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501

ARPO (Augmented Reality for Public Outreach) is an iDigBio Working Group involving 15 Thematic Collections Networks

(TCNs), in partnership with Arizona State University's informatics and outreach team. We are developing a collection-based learning app that will connect audiences with collections in an innovative way using augmented reality (AR) technologies. The app will feature select specimens from each contributing network and will benefit the education and outreach goals of the National Science Foundation's Advancing Digitization of Biodiversity Collections (ADBC) program and iDigBio. In particular, the app will communicate the importance of specimens as they are used in research while promoting understanding of our biodiversity. The advent of Reality Computing confers new opportunities to explore the potential of 3D/AR technologies in teaching and in connecting the public with natural history specimens in ways that were not previously possible just five years ago.

Link to ARPO Working Group wiki:

[https://www.idigbio.org/wiki/index.php/IDigBio\\_Working\\_Groups#Augmented\\_Reality\\_Public\\_Outreach\\_Working\\_Group\\_.28ARPO.29](https://www.idigbio.org/wiki/index.php/IDigBio_Working_Groups#Augmented_Reality_Public_Outreach_Working_Group_.28ARPO.29)

DemoCamp Session

TH 05/21/2015 03:50 PM

### **SPECIFY FOR THE WEB, A NEW GENERATION SPECIFY FOR BIOLOGICAL COLLECTION DIGITIZATION AND COLLABORATIVE DATABASES**

**Beach, James H.**, Specify Software Project, University of Kansas, 1345 Jayhawk Boulevard, Lawrence, KS 66045; beach@ku.edu; **Anhalt, Ben**, Specify Software Project, University of Kansas, 1345 Jayhawk Boulevard, Lawrence, KS 66045

In January 2015, the Specify Software Project released Specify 7, a new generation of Specify for the web. This wholly-new Specify platform combines the flexible interface design components and robust institutional data management foundation of Specify 6 with the efficiency and promise of web-based data access, web-services integration, and cloud computing. The Specify 7 web app uses the same interface layout language as Specify 6—any customizations made in one product are mirrored in the other. And the Specify 6 “thick” and Specify 7 “thin” clients use the same data model which means they can be run simultaneously with a Specify database. By providing an easy migration path to the web, Specify 7 helps transition existing Specify 6 collections to cloud computing. Specify 7 is also a great starting platform for collections which prefer zero workstation software installation and universal web browser access. Specify 7's server/browser architecture opens doors for collections computing support for collaborative projects and for remote hosting of institutional or project specimen databases. We will demonstrate the latest capabilities of Specify 7 and discuss our project roadmap for supporting Specify in the cloud.

DemoCamp Session

TH 05/21/2015 02:50 PM

### **RAPID COLLECTION INVENTORIES**

**Best, Jason**, Botanical Research Institute of Texas, 1700 University Drive, Fort Worth, TX 76107; jbest@brit.org ; **Rehman, Tiana**, Botanical Research Institute of Texas, 1700 University Drive, Fort Worth, TX 76107

An accurate accounting of a biological collection's holdings can be used to prioritize digitization, expose specimens for scientific research, determine curatorial needs, and prioritize field work and acquisitions by identifying gaps in the collection. Unfortunately, many biocollection institutions have only an estimate of the

number and taxonomic and geographic scope of the items in a collection. The Botanical Research Institute of Texas (BRIT) reports an overall estimate based on previous estimates of acquired large collections as well as carefully maintained yearly records of incoming exchange and gift specimens. In order to generate an accurate accounting of its holdings, the number of specimens of each species in the collection was recorded, along with the geographic region of collection. The first step to accomplish this goal was to develop a web-based application called the BRIT Rapid Inventory of Specimen Collections (BRISC). BRISC is open source software that allows herbarium staff and volunteers to use tablets or laptops to count and record the contents of herbarium cabinets. BRIT began the inventory on 17 February 2015 with the combined efforts of staff and volunteers. Maintaining the established rate of inventory suggests BRIT's estimated 1.01 million specimens will be completed after investing 210 person-days. In addition to obtaining an accurate account of BRIT's collections, this project will also produce open source software that can be used by other herbaria and biocollections for their own inventories.

Contributions Small Nat. Hist. Coll. Symp. 1 TH 05/21/2015 10:30 AM

### **SMALL ENTOMOLOGY COLLECTIONS: HOW TO MANAGE**

**Bills, Christy L.**, Natural History Museum of Utah, 301 Wakara Way, Salt Lake City, UT 84108; **Krishna, Janaki**, Natural History Museum of Utah, 301 Wakara Way, Salt Lake City, UT 84108; jkrishna@umnh.utah.edu

Being an entomology collection manager of a small collection can mean working in isolation, away from other professionals and the benefits of the exchange of ideas and experience that collaboration can bring. Also, managers of small collections can feel intimidated by the scope of larger collections and not feel as important or as welcome to the national conversation. However, "small" entomology collections can hold thousands, or even, hundreds of thousands of individual specimens, of unique regional, taxonomic or historic importance. It is vital for those specimens to be included in any metadata efforts and for those specimens to be properly cared for. The managers of small collections often need additional resources to successfully answer curation questions, advocate for their collections, understand funding opportunities, seek partnerships, weigh database options, discover outreach possibilities and navigate the treacherous world of professional acronyms. Fortunately, there are many resources available, many options for connection and places for ongoing conversations where managers of small entomology collections can get answers.

Poster Session 1 W 05/20/2015 AM

### **COLLECTIONS PROGRAM TECHNICIANS: A SWAT APPROACH TO COLLECTIONS MANAGEMENT**

**Bilyeu, Erin K.**, National Museum of Natural History, Smithsonian Institution, 10th & Constitution Ave, Washington, D.C. 20560; bilyeue@si.edu; **Lawrence, Amanda N.**, National Museum of Natural History, Smithsonian Institution, 10th & Constitution Ave, Washington, D.C. 20560

The Collections Program Technicians (CPT) at the National Museum of Natural History (NMNH), Smithsonian Institution, provides an innovative approach to digitizing the NMNH collections. Currently, NMNH collections staff spend a majority of their time processing loans and assisting researchers, leaving little time for digitization. In 2012, the NMNH Collections Program hired a team of six museum professionals who could facilitate interdepartmental collection

management initiatives through specific projects focusing on cataloging, digitizing and updating complete collections and associated data. In three years, the CPTs have created 155,000 new descriptive records, 85,000 digital surrogates, enhanced/edited over 825,000 digital records, digitized 65,000 registration transactions, and participated in several rapid capture pilot projects. They have also rehoused collections, mitigated pest infestations, participated in collections statistical captures, and assisted with museum-wide collections initiatives. By focusing on the routine tasks of collections management, the CPTs have been able to enhance accessibility in all seven scientific departments far more effectively than any one department could have done on its own.

Spec. Full Circle Symp. 3

TH 05/21/2015 08:50 AM

### **A PICTURE IS WORTH A THOUSAND WORDS: IMAGING IN DIGITIZATION WORKFLOWS**

**Blagoderov, Vladimir**, Natural History Museum, Cromwell Road, London SW7 5BD, UK; vblago@gmail.com; **Livermore, Laurence**, Natural History Museum, Cromwell Road, London SW7 5BD, UK

Images of specimens are considered as the most important part of digitization and by far is the most interesting step in workflow. However huge variety of specimens in natural history collections and limited resources call for optimization of imaging. Therefore imaging techniques must depend on research question and expected curatorial benefits for each particular digitization project. Based on experience of Digital Collection Programme run in NHM I demonstrate value of differential approach.

General Session 1

W 05/20/2015 08:30 AM

### **ASSESSING THE DATABASE PRACTICES OF NATURAL HISTORY COLLECTIONS**

**Brenskelle, Laura**, The University of Texas at Austin, Jackson School of Geosciences, 1 University Station C1140 Austin, TX 78712; lbrensk@utexas.edu

National and global digitization initiatives for biodiversity collections have created a necessity for natural history collections to be databased, and for data to be subsequently shared through various online portals, such as local museum websites, iDigBio, and GBIF. Because of this, collections managers have gone from managing databases intended for internal use to maintaining databases that are now the origin of internationally accessible research data sets. This study surveys 16 managers of natural history collections owned by academic institutions, and describes the database practices observed across diverse natural history disciplines. Information about database practices was gathered via interviews, observations, and questionnaires during on-site visits to assorted biological collections. Creating a better understanding of how collections managers utilize databases will improve database training for museum professionals, inform database developers on how their software is being used in the real world, and enhance researchers' awareness on how data gets to various portals and the implications this may have for the reliability of analyses. Ultimately, the insights provided by this study will help improve the usability of collections management databases, and thereby, increase the accuracy of data sets produced by the digitization of biodiversity collections and the subsequent research done using these data.

**DOOR-TO DOOR NATURAL HISTORY**

**Busch, Richard A.**, Education Collections, Denver Museum of Nature & Science, 2001 Colorado Blvd, Denver, CO 80205; rbusch@dmns.org

The Education Collections at the Denver Museum of Nature & Science has been sending specimens off site to schools in the Rocky Mountain Region for nearly 25 years. Beyond our normal outreach programs, which also prominently feature the DMNS Education Collections, the School Loan Program works directly with teachers and their curriculum to get authentic, natural history objects into the school classroom.

In an age where digital media makes up most of our lives, museums remain the Repository of the Real. Working on an individual basis with school teachers of all educational pedagogies—from Montessori to public schools systems—on their terms with their curriculum and standards requirements, the DMNS Education Collections send real dinosaur bones, real minerals, real archaeological material and real animals directly to their classroom or library.

This talk focuses on the processes that we have implemented to make this a successful program—not only for the DMNS Education Collections, but also for the teachers that that are accessing the collections—as well as some of the risks we assume with a program such as this (and just how real those risks are). This presentation will also cover some of the additional learning curves we have faced—beyond our normal collections management and preservation knowledge and into the realm of state standards, classroom management, and standardized testing.

**COLLECTIONS SPACE—THE FINAL FRONTIER: PLANNING FOR THE FUTURE OF COLLECTIONS STORAGE SPACE**

**Butler, Carol**, National Museum of Natural History, Smithsonian Institution, 10th & Constitution Avenue, NW, Washington, DC; ButlerCR@si.edu

Collections stewardship is not a single process, but a series of interwoven and interdependent components. The condition of facilities housing collections, the quality of storage and preservation, and the ability to document collections directly affect an institution's ability to make collections available to scholars and the public worldwide. To address their collections storage challenges, the Smithsonian Institution undertook a multi-year highly collaborative and interdisciplinary planning initiative, conducted by collections and facilities management staff with the assistance of an architecture and planning firm, to transform the future of collections storage space. This session will provide an overview of the planning process, illustrate the methodologies utilized, and highlight the resulting outcomes which will ultimately strengthen collections stewardship—ensuring the long-term preservation and accessibility of Smithsonian collections.

**NUMBERS AND THINGS: THE CATALOGS OF THE MALACOLOGY COLLECTION AT THE ACADEMY OF NATURAL SCIENCES**

**Callomon, Paul**; Department of Malacology, Academy of Natural Sciences of Drexel University, 1900 Parkway, Philadelphia PA 19103; prc44@drexel.edu; **Rosenberg, Gary**, Department of Malacology,

Academy of Natural Sciences of Drexel University, 1900 Parkway, Philadelphia PA 19103

Established with the founding of the institution in 1812, the Malacology collection at the Academy of Natural Sciences in Philadelphia (ANSP) is the third largest in the world and one of the oldest. Although it had been organized systematically since at least the 1840s, compilation of label data in ledgers, with assignment of catalog numbers, did not begin until the 1890s. Newly accessioned material has been databased as part of the cataloguing process since 1976, and between 1999 and 2001 the old ledgers were digitized. A full electronic inventory of the collection was commenced in 2011, and is scheduled for completion this year.

Analysis of the integrated database reveals patterns and problems that developed during more than a century of cataloging, and suggests ways to solve them. Catalogue numbers were not always assigned in chronological order; dates of presentation, cataloguing and collection were at times conflated; and various errors resulted in thousands of duplicate catalogue numbers.

**ARCTOS: A COLLABORATIVE WEB-BASED COLLECTIONS DATABASE AND MANAGEMENT SYSTEM**

**Campbell, Mariel L.**, Museum of Southwestern Biology, MSC03 2020, University of New Mexico, Albuquerque, NM 87131; campmlc@unm.edu; **Cicero, Carla**, Museum of Vertebrate Zoology, 3101 Valley Life Sciences Bldg., University of California, Berkeley, CA 94720-3160; **Cook, Joseph A.**, Museum of Southwestern Biology, MSC03 2020, University of New Mexico, Albuquerque, NM 87131; **Jarrell, Gordon**, Museum of Southwestern Biology, MSC03 2020, University of New Mexico, Albuquerque, NM 87131; **Jordan, Chris**, Texas Advanced Computing Center, Research Office Complex 1.101, J.J. Pickle Research Campus, Building 196, 10100 Burnet Road (R8700), Austin, Texas 78758-4497; **Koo, Michelle S.**, Museum of Vertebrate Zoology, 3101 Valley Life Sciences Bldg., University of California, Berkeley, CA 94720-3160; **McDonald, Dusty L.**, University of Alaska Museum, 907 Yukon Drive, Fairbanks, AK 99709; **Olson, Link**, University of Alaska Museum, 907 Yukon Drive, Fairbanks, AK 99709; **Spencer, Carol L.**, Museum of Vertebrate Zoology, 3101 Valley Life Sciences Bldg., University of California, Berkeley, CA 94720-3160.

Arctos (<http://arctos.database.museum>) is a web-based collections database and management system that currently serves data on over 2,300,000 records from 91 collections at 22 institutions. The integrative, collaborative, cost-efficient, and cross-disciplinary features of Arctos make it unique and well-suited for biological, earth science, and cultural collections of all sizes and types. Arctos integrates online access to diverse data types including specimen records, observations, tissues, stomach contents, parasites, and digitized media such as field notes, photographs, videos, audio recordings, and morphometric imaging. Key features include collection-management and object tracking applications, tools for data visualization and mapping (GEOlocate, BerkeleyMapper), and partnerships with external web resources (GenBank, Texas Advanced Computing Center) to reciprocally link specimens with associated data and media. In addition, users can easily track accessions, loans, permits, and publications tied to specific projects and specimen vouchers. Arctos offers data storage capacity to archive digitized field notes and images which can be tagged with reciprocal links to specimen records, enabling discovery of hidden data and providing a robust means for validating georeferenced localities. New developments



include linkage of parasites and hosts across collections and institutions, as well as implementation of an event-based approach for specimens with multiple lifetime collecting events (mark/recapture, biopsies, cultural objects). Arctos code is open, and users form a strong community that contributes to data standards, application enhancements, and improved data quality through sharing of authorities for taxonomy, geography, people names, part types, and other data. We will demonstrate key features of Arctos and discuss new developments.

Poster Session 3

TH 05/21/2015 AM

### **INTEGRATING ACROSS COLLECTIONS: PARASITE/HOST RELATIONSHIPS IN THE ARCTOS COLLECTIONS DATABASE**

**Campbell, Mariel L.**, Museum of Southwestern Biology, MSC03 2020, University of New Mexico, Albuquerque, NM 87131; campmlc@unm.edu; **Jarrell, Gordon**, Museum of Southwestern Biology, MSC03 2020, University of New Mexico, Albuquerque, NM 87131; **Jordan, Chris**, Texas Advanced Computing Center, Research Office Complex 1.101, J.J. Pickle Research Campus, Building 196, 10100 Burnet Road (R8700), Austin, Texas 78758-4497; **McDonald, Dusty L.**, University of Alaska Museum, 907 Yukon Drive, Fairbanks, AK 99709; **Cook, Joseph A.**, Museum of Southwestern Biology, MSC03 2020, University of New Mexico, Albuquerque, NM 87131; **Hoberg, Eric P.**, USDA, 10300 Baltimore Ave, Bldg. 1180 BARC-East, Beltsville, MD, 20705-2350.

A difficult challenge faced by museums is the linkage of shared specimen records across collections. These specimens may represent different taxa with symbiotic associations, such as hosts, parasites, parasitoids, and mutualists, which were collected together but archived separately in taxonomically-based collections. At the Museum of Southwestern Biology, we have addressed this issue with the acquisition of 50,000 lots of parasites from a lifetime of research by Robert and Virginia Rausch on the helminth parasites of mammals, birds, and other vertebrates of the arctic and subarctic. The Rausch collection is exceptional for the number of preserved mammalian and avian host voucher specimens in other collections, as well as for a 40+ year, 5,000 page field ledger with specimen data on both parasites and hosts. We have integrated this collection into the Arctos collections database (<http://arc-tos.database.museum>), a collection-management tool and a public portal for specimen information. We have modified existing linkages to external databases such as GenBank to build into Arctos the capacity to form reciprocal linkages between parasite records and host vouchers across multiple collections. We have made high-resolution digital scans of the Rausch field ledger, which are archived and linked with Arctos through collaboration with the Texas Advanced Computing Center. References to host and parasite specimen vouchers in the scanned media are being tagged and linked to specimen records in multiple collections. This database allows for online queries exploring parasite-host biodiversity through time that will be of increasing importance in a world experiencing accelerating and dynamic change.

General Session 6

TH 05/21/2015 03:50 PM

### **OBJECT BASED INQUIRY: COLLECTIONS AND CRITICAL THINKING**

**Carter, Colleen R.**, Education Collections, Denver Museum of Nature & Science, 2001 Colorado Blvd, Denver, CO 80205; colleen.carter@dmns.org

Museums have the ability to use collections outside of exhibition and research to educate students and teachers. We are not always looking for students to memorize facts and spout them back on an exam; we also look for students to question how they see the world and understand how all those pieces connect and interact on a variety of levels. We seek to create critical observers. The act of physically holding an object engages multiple senses and it creates a more memorable experience for children and adults. When collections are used beyond "show & tell" the impact is longer lasting. When educators are trained to use museum collections in Object Based Inquiry they have a profound tool to help students develop the skills necessary to navigate and succeed as scientists, professionals and responsible citizens. Using observation, existing knowledge and critical thinking skills students gain the ability to look more closely at the world around them and question it. The beauty of this method is it can be used with students of every age and background—even adults. Young children will make different (and sometimes deeper) observations than educators. The same set of objects will spark different conversations and lines of inquiry with each group they are presented to. Museum collections can not only participate, but contribute to creating a generation of critical observers and thinkers by pairing museum objects with Object Based Inquiry.

General Session 4

W 05/20/2015 04:50 PM

### **IMPROVED STORAGE OF A RADIOACTIVE GEOLOGIC COLLECTION—A CASE STUDY**

**Cicimurri, Christian M.**, McKissick Museum, University of South Carolina, 816 Bull Street, Columbia, SC 29208; cicimurr@mailbox.sc.edu; **Dobbs, Lynn B.**, Department of Radiation Safety, University of South Carolina, 306 Benson School, Columbia, SC 29208

As part of an IMLS Museums for America grant awarded in 2011, collections staff at McKissick Museum, University of South Carolina, surveyed the natural history collection for NORM (Naturally Occurring Radioactive Material). Nearly 600 samples were sealed in plastic zipper bags, labeled, and moved to a dedicated radioactive storage cabinet in a low occupancy area. Accumulating the NORM, coupled with unrelated building upgrades resulted in elevated radon concentration immediately outside the cabinet. With the assistance of the university's Radiation Safety Department, the team cataloged and temporarily rehoused the NORM collection until suitable storage was devised. During this process measurements of radioactive output were also documented.

A second grant was awarded in 2013 to move the radioactive collection into upgraded storage cabinets and to devise a storage system that limited both radiation exposure and radon concentration to within recommended levels according to the principles of ALARA (As Low As Reasonably Achievable). Acceptable exposure levels outside the cabinet were achieved through the cabinet's construction; however, reducing radon levels required the installation of an exhaust system. A continuous radon monitor was used during several different venting scenarios to determine an adequate protocol. The radioactive geology collection is now permanently housed in three cabinets, each outfitted with an on-demand exhaust system to vent radon and introduce clean air into the cabinet. Exposure and radon levels outside the cabinets remains below federal action levels and the concentration of radon gas inside the cabinets is reduced by 94% on average before opening.



### **COLLABORATING WITH FEDERAL PARTNERS: A NEW ONLINE NATIONAL PARK SERVICE LOCALITY DATABASE THROUGH THE UNIVERSITY OF CALIFORNIA MUSEUM OF PALEONTOLOGY**

**Clites, Erica C.**, University of California Museum of Paleontology 1101 Valley Life Sciences Bldg Berkeley CA 94720; eclites@berkeley.edu; **Marshall, Charles R.**, University of California Museum of Paleontology 1101 Valley Life Sciences Bldg Berkeley CA 94720; **Goodwin, Mark B.**, University of California Museum of Paleontology 1101 Valley Life Sciences Bldg Berkeley CA 94720; **Santucci, Vincent L.**, National Park Service, Geologic Resources Division, 1201 Eye Street NW, Washington DC 20005

The University of California Museum of Paleontology (UCMP) and the National Park Service Pacific West Region recently launched a collaborative project to make locality information available for natural resource management. This involved building a portal in the UCMP Locality Database (<http://ucmpdb.berkeley.edu/loc.html>) to allow National Park Service staff to view detailed locality records. These records are maintained by the UCMP, but not served on the public website in accord with federal law. The portal provides a browse list by state and park, and the ability to text search all fields in the locality record. Localities are added to the portal by comparing park boundary maps in Google maps with georeferenced localities and by text searches for popular park destinations.

The UCMP and UC Berkeley have a long history of partnering with federal land management agencies. UCMP's museum scientists manage fossils from at least 46 national park service areas, comprising at least 14,000 specimens from almost 900 localities. The criteria for inclusion in the portal are very broad—any locality within (or near) the administrative boundaries of NPS areas are listed, even if the specimens were collected prior to federal ownership. Locality information helps land managers determine the significance of their paleontological resources, relocate historic localities and assess the potential for future discoveries. Sharing this data has resulted in updated and corrected database records, contributed to other projects including an inventory report for Golden Gate National Recreation Area, and the launch of a long-term field monitoring program at Point Reyes National Seashore.

Poster Session 1

W 05/20/2015 AM

### **FROM ATTIC TO GROUND FLOOR: RELOCATING THE YALE PEABODY MUSEUM'S OCEANIA ETHNOGRAPHIC COLLECTION**

**Colten, Roger H.**, Anthropology Division Yale Peabody Museum of Natural History 170 Whitney Ave New Haven, CT 06511, **White, Maureen D.**, Anthropology Division Yale Peabody Museum of Natural History 170 Whitney Ave New Haven, CT 06511; maureen.daros@yale.edu; **DeAngelo, Rebekah**, Anthropology Division Yale Peabody Museum of Natural History 170 Whitney Ave New Haven, CT 06511

With funding from the Institute of Museum and Library Services (IMLS) and Yale University, the Peabody Museum rehoused a portion of its Oceania ethnographic collections. We relocated over 8,500 New Guinea, Philippine, Polynesian and other Pacific objects from an inaccessible and overcrowded Peabody building collection room to a newly renovated space at Yale's West Campus with improved environmental conditions and modern museum equipment for "browsable" storage. The collections were housed in the original 1926 Peabody building in a room only accessible from a stairwell or through the rear of an adjacent exhibition space.

Because of a combination of its remoteness, poor accessibility and lack of environmental controls, the space is unacceptable for long-term storage and preservation of museum collections. At Yale's West Campus, six miles from Central Campus, space in the Collections Study Center for Peabody's Anthropology collections was renovated to accommodate the Oceanic collections in a stable museum environment in custom Delta Designs cabinets and shelving on Spacesaver mobile carriages in a reorganized and accessible arrangement. The move of collections from Central Campus to West Campus also allowed for the opportunity to fully inventory the collections, clean and conserve any material in need of restoration and to digitally photograph the objects. All of the images are integrated into our collections management data base and accessible on the museum's web site and the Yale University Cross Collection Discovery web site. This project will serve as a model for future collections storage upgrades in the Peabody Museum Anthropology Division.

Poster Session 2

W 05/20/2015 PM

### **THE END OF THE BEGINNING: A LOOK BACK FROM NEAR THE FINISH-LINE OF AN IMLS FUNDED SILURIAN REEF DIGITIZATION PROJECT**

**Coorough Burke, Patricia**, Geology Department, Milwaukee Public Museum, 800 W. Wells Street, Milwaukee WI 53233; **Caywood, Alyssa**, Geology Department, Milwaukee Public Museum, 800 W. Wells Street, Milwaukee WI 53233; **Mortensen, Jenna**, Geology Department, Milwaukee Public Museum, 800 W. Wells Street, Milwaukee WI 53233; **Mayer, Paul S.**, The Field Museum, 1400 South Lake Shore Drive, Chicago, IL 60605; pmayer@fieldmuseum.org

The Milwaukee Public Museum (MPM) and The Field Museum of Natural History (FMNH) are nearing the end of a three-year IMLS funded project to digitize our Midwest Silurian collections and create a shared online database. The project has been a cooperative effort to digitize fossils collected over the past 125 years from upper Midwest quarry outcrops and sites lost to urban development. The joint project involved three distinct components: FMNH workflow, MPM workflow and inter-museum workflow. The dual nature of the project required information exchange between museums, and each collection required a tailored workflow.

The FMNH collection is organized systematically by age and includes multiple labels for each specimen. The workflow for the FMNH digitization included photographing the specimen and the labels as well as inputting specimen information into KE Emu Collection Management System. The work is being completed by summer interns (2 of 3 summers completed) with 9,078 catalog entries to date.

The MPM collection, organized by locality and age, included only a locality number for multiple specimens. The workflow for MPM's digitization included assigning and attaching individual specimen numbers, photographing specimens and inputting specimen data into KE. The MPM work has been completed by two assistants working part-time with 5987 catalog entries to date.

The inter-museum work included both Information Technology and Geology departments. Initially, we established a process to share FMNH generated internal record numbers for taxonomy, chronostratigraphy and lithostratigraphy to simplify the ultimate goal of a shared online collections database.

### GLOBAL REGISTRY OF BIODIVERSITY REPOSITORIES: FUNCTION AND APPLICATION

**Crane, Adele E.**, Scientific Collections International, Smithsonian Institution, 10th and Constitution Ave NW, Washington, DC 20560; cranea@si.edu; **Schindel, David E.**, Scientific Collections International, Smithsonian Institution, 10th and Constitution Ave NW, Washington, DC 20560

GRBio ([www.grbio.org](http://www.grbio.org)) is an online registry for biorepositories around the world. This database contains records for institutions, institutional and personal collections, and staff members. Information available for the more than 7,000 institutional records includes staff, preservation and content type, and governance type. GRBio requires basic contact and location information and checks for global uniqueness through institution codes and the collection codes within each institution. Institutions, collections, and staff members are searchable by name, institution or collection code, and location.

GRBio is run by the Consortium for the Barcode of Life (CBOL) and Scientific Collections International (SciColl), which update the website and address user needs. The record content of GRBio was originally a merger of data from Index Herbariorum, CBOL, and the Biodiversity Collections Index. GRBio is a community curated clearinghouse and is therefore dependent upon curators, collection managers, researchers, and other staff members to provide high-level information on these institutions. Once records are created or updated, these changes go into a moderator queue and become public after review, usually within five days. GRBio acts as an up-to-date resource which increases awareness and accessibility of collections.

### SCALING THE HEIGHTS: RESULTS OF BENCHMARKING COLLECTIONS ACCESS EQUIPMENT AND POLICIES

**Crimm, Walt**, Walt Crimm Associates, Inc., 6868 Scotforth Road, Philadelphia, PA 19119; wcrimm@waltrimm.com

Over the past decade, collections have been stored at greater heights above the floor—either because there is no other space, or new space by design is higher to make the building area smaller. This is not a trend heading anywhere but up. Either way, access is more difficult and safety for staff, volunteers and collections are an increasing concern. Based on responses to 7 listserv postings, understand what your peers (and people in other museum types) are doing from a policy and equipment perspective to access their collections. Learn about mechanized and non-mechanized solutions, the advantages and challenges of each from access, safety and training perspectives. It is hoped that this information can be shared on the SPNHC website and be updated as new ideas and solutions are developed.

### AN EXTREME CASE OF BYNE'S EFFLORESCENCE: A NOVEL, TWO-PRONGED APPROACH TO CONSOLIDATION

**Curran, Claire M.**, Department of Art Conservation, University of Delaware, 303 Old College, Newark, DE 19716; ccurran@udel.edu; **Pouliot, Bruno P.**, Winterthur Museum, Garden & Library, 5105 Kennett Pike, Wilmington, DE 19735

Greek Beach V, by artist Ilse Getz, was gifted to the Winterthur/University of Delaware Program in Art Conservation as a student treatment project. The piece is composed of found materials: a plywood support, woven rattan caning, cuttlefish bones, an animal phalange, and a whole egg. The sculpture, displayed in a Plexiglas case, was in poor condition; the cuttlefish bone had developed extensive Byne's efflorescence and was actively delaminating, while only a third of the egg remained intact and attached to the wicker substrate. Examination with the Plexiglas cover removed showed the presence of mold and corrosion of metal wire components, indicating sustained high relative humidity. It became apparent that this along with the plywood support and limited ventilation within the case had accelerated degradation and the development of Byne's efflorescence on the shell components. The extremely unstable condition of the cuttlefish bones meant that they could not take the slightest touch. As such, consolidation of the cuttlefish bone, the focus of this poster, was an essential component of this treatment.

Typical application of a consolidant with a brush was not appropriate as it caused the fragile surface to disintegrate further, requiring the development of a two-pronged approach. Consolidation was carried out by fixing the outer layers in place via mist consolidation, thereby allowing, as a second step, a more complete and in-depth consolidation of the interior layers with micro-pipette consolidation. This combination of consolidation methods provided minimal aesthetic change to the outer surface, yet an adequate consolidation of the cuttlefish bones.

### THE CONTRIBUTION OF SMALL COLLECTIONS: A CASE STUDY FROM FUIRENEAE (CYPERACEAE)

**Dame, Heather E.**, Central Michigan University, Mt. Pleasant, MI 48858; Dame1h@cmich.edu; **Monfils, Anna K.**, Central Michigan University, Mt. Pleasant, MI 48858; **Heumann, Benjamin W.**, Central Michigan University, Mt. Pleasant, MI 48858; **Carter, J. Richard**, Valdosta State University, Valdosta, GA 31698; **Bartek, Jessica M.**, Valdosta State University, Valdosta, GA 31698

The global biodiversity information facility (GBIF) provides free, open access to a digital repository of biodiversity data, including digitized occurrence records from natural history collections. As national digitization initiatives continue, increasing numbers of natural history collections are contributing data to GBIF with the database becoming a progressively more accurate representation of biodiversity. We wanted to investigate the relative utility of small regional collections and associated data to our current understanding of species distributions. Species distribution modeling was performed on a test group composed of herbaria records and taxa from the North American Fuireneae (Cyperaceae). Herbaria were divided into two size classes: large (>100,000) and small (<100,000). Geolocated digitized data were partitioned into three groups: GBIF large collection data, GBIF large and small collection data, and pooled data from GBIF and two small collections not yet delivering data to GBIF (VSC and CMC). Small collections were selected based on collections size, curator expertise, and availability of digitized and geo-referenced specimens. Environmental layers were selected from biologically relevant climate and soil based variables. Species distributions models were created in MaxEnt and resultant models were assessed by 1) spatially comparing predicted geographical niche outputs for all three data sets and 2) statistically testing the effectiveness of niche models in predicting small herbaria collections-based occurrence records. Results indicate small

collections hold significant records that can inform our current understanding of species distributions. This study reinforces the importance of digitized small collections data to building an accurate and comprehensive understanding of biodiversity.

General Session 1

W 05/20/2015 11:30 AM

### **DOE!: MASS DIGITISATION OF THE HERBARIUM COLLECTION BR AT THE BOTANIC GARDEN MEISE (BELGIUM)**

**De Smedt, Sofie**, Botanic Garden Meise, Nieuwelaan 38, B1860 Meise, Belgium; [sofie.desmedt@br.fgov.be](mailto:sofie.desmedt@br.fgov.be); **Stoffelen, Piet**, Botanic Garden Meise, Nieuwelaan 38, B1860 Meise, Belgium; **Bogaerts, Ann**, Botanic Garden Meise, Nieuwelaan 38, B1860 Meise, Belgium; **Engledow, Henry**, Botanic Garden Meise, Nieuwelaan 38, B1860 Meise, Belgium; **Groom, Quentin**, Botanic Garden Meise, Nieuwelaan 38, B1860 Meise, Belgium; **Sosef, Marc**, Botanic Garden Meise, Nieuwelaan 38, B1860 Meise, Belgium; **Van Wambeke, Paul**, Botanic Garden Meise, Nieuwelaan 38, B1860 Meise, Belgium; **Dessein, Steven**, Botanic Garden Meise, Nieuwelaan 38, B1860 Meise, Belgium

The herbarium BR of the Botanic Garden Meise, up to 2014 known as the National Botanic Garden of Belgium, houses ca. 4 million specimens. This collection is primarily divided into three main collections: a general herbarium with a.o. the famous Martius collection, a Belgian herbarium with ca. 200,000 specimens, and an African collection of ca. 1 million specimens. The latter is focused on central Africa (Congo D.R., Rwanda and Burundi) due to colonial history of Belgium. More than 85% of all collections ever made in central Africa are housed in the herbarium BR. In late 2014, the Botanic Garden Meise received a grant from the Flemish Government to optimize its current scanning infrastructure and to outsource the digitization of the entire Belgian herbarium and the ca. 500,000 specimens of the central African collection within the next three years. We named this project DOE! (acronym of 'digitale ontsluiting erfgoedcollecties' which in Dutch means 'digital access of our cultural heritage collection'). How we are handling and organizing such a huge project is explained in this presentation.

General Session 1

W 05/20/2015 10:50 AM

### **NOT YOUR AVERAGE HERBARIUM SPECIMENS—THE CHALLENGES OF DIGITIZING THE MACROALGAE**

**Dutton, Sarah N.**, Herbarium, The New York Botanical Garden, 2900 Southern Boulevard, Bronx, NY, 10458; [sdutton@nybg.org](mailto:sdutton@nybg.org); **Tarnowsky, Nicole**, Herbarium, The New York Botanical Garden, 2900 Southern Boulevard, Bronx, NY, 10458

As a member of the Macroalgal Herbarium Consortium (MHC) Thematic Collections Network (TCN) sponsored by the National Science Foundation, the New York Botanical Garden is currently digitizing its collection of more than 100,000 algae specimens. Making these specimens accessible to the scientific community and the greater public will facilitate research and could be useful as an educational resource. Herbarium specimen data has been used in a wide variety of studies including climate change, taxonomy, and biodiversity. Macroalgae in particular are fundamental to marine, estuarine and freshwater ecosystems, and can give us insights into studying these aquatic environments.

Since the start of the Macroalgae Digitization Project in 2013, we have curated and barcoded over 100,000 algae specimens and have imaged about 30,000. As the project has progressed, we have faced many challenges arising from the physical conditions of our specimens. In addition to the typical herbarium sheet, the

collection also includes specimens in boxes, bottles, and bound in exsiccatae. Roughly 90% of our specimens were mounted 50 years ago or more, often on non-archival paper, and therefore many were in poor condition. In addition, there are specimens that are mounted in ways that render them difficult to barcode and image rapidly. This presentation will discuss several of the obstacles we have faced in the efficiency of the digitization workflow, the choices that we have made in response to these challenges, and the results of these decisions so far.

Spec. Full Circle Symp. 1

W 05/20/2015 09:50 AM

### **ACCELERATING DIGITIZATION OF BIODIVERSITY RESEARCH SPECIMENS THROUGH ONLINE PUBLIC PARTICIPATION**

**Ellwood, Elizabeth R.**, Department of Biological Science, Florida State University, Tallahassee, FL 32306; [eellwood@bio.fsu.edu](mailto:eellwood@bio.fsu.edu); **Dunckel, Betty A.**, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611; **Flemons, Paul**, Collection Informatics, Australian Museum, Sydney NSW 2010, Australia; **Guralnick, Robert**, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611; **Nelson, Gil**, Department of Biological Science and Institute for Digital Information, Florida State University, Tallahassee, FL 32306; **Paul, Deborah**, Institute for Digital Information, Florida State University, Tallahassee, FL 32306-2100; **Riccardi, Greg**, Institute for Digital Information, Florida State University, Tallahassee, FL 32306-2100; **Rios, Nelson**, Tulane University Biodiversity Research Institute, Belle Chasse, LA, 70037; **Seltmann, Katja C.**, American Museum of Natural History, Department of Invertebrate Zoology, New York, NY 10024; **Mast, Austin R.**, Department of Biological Science, Florida State University, Tallahassee, FL 32306

Biodiversity research specimens provide a historical baseline of diversity and distributions against which to compare new samples and project changes to diversity and distribution into the future. However, just ca. 10 percent of the estimated 1 billion specimens in U.S. collections have been digitized (e.g., databased, imaged, and/or georeferenced) with the data made available online. A goal of the biodiversity research community is to digitize most of the remaining specimens within a decade. Meeting this ambitious goal requires increased collaboration, technological innovation, and broader engagement in digitization beyond the walls of biodiversity research collections. Engaging the public in digitization, rather than simply hiring more digitizers, promises to both serve the digitizing institutions and further public understanding of biodiversity science.

We identify 24 digitization tasks that the public could participate in online and examples from three broad areas that will accelerate research progress: label and ledger transcribing/cataloging from digital images, georeferencing from collection locality descriptions, and specimen tagging/categorizing from images. We illustrate each activity, identify and compare useful tools, present relevant best practices and standards, and identify gaps in our knowledge and areas for improvement. We will also highlight the citizen science projects of iDigBio, NSF's National Resource for Advancing the Digitization of Biodiversity Collections. The field of public participation in digitization of biodiversity research specimens is clearly in a growth phase with many emerging opportunities for scientists, educators, and the public.



**GETTING THE FAMILY TOGETHER: DIGITIZING THE ICACINACEAE**

**Estes-Smargiassi, Kathryn A.**, Florida Museum of Natural History, University of Florida, 1659 Museum RD, Gainesville, FL 32611-7800; kestessma@ufl.edu; **Stull, Gregory W.**, Florida Museum of Natural History, University of Florida, 1659 Museum RD, Gainesville, FL 32611-7800; **Manchester, Steven R.**, Florida Museum of Natural History, University of Florida, 1659 Museum RD, Gainesville, FL 32611-7800

The Icacinaceae are a pantropical flowering plant family comprising 23 genera and ca. 150 species of trees, shrubs, and woody climbers. The family is unique among modern tropical angiosperm groups in having an extensive fossil record, primarily from the Paleogene of Europe, North America, and South America. Although pollen and leaf fossils have been documented, the fossil record of the family consists largely of taxonomically informative fruit remains. In the paleobotany collection at the Florida Museum of Natural History, there are approximately 119 Icacinaceae specimens, primarily from North American Paleocene–Eocene floras, such as the Clarno Nut Beds flora of Oregon, the Blue Rim flora of Wyoming, and the Mississippi Embayment region. There are also extensive collections of both modern and fossil examples at other institutions in the United States and in museums abroad. We plan to digitize fossil and modern specimens of the family, making photos and accompanying taxonomic, stratigraphic, and geographic information more accessible to researchers everywhere, and connecting collections across the globe. We will begin with the collection at the Florida Museum of Natural History, and move on to the Icacinaceae collections from other museums as we are able. The newly digitized collections will be made available through the Florida Museum of Natural History website.

General Session 5

TH 05/21/2015 10:50 AM

**ALGAE IN HERBARIA, IN HISTORY, AND IN ART**

**Flannery, Maura C.**, Center for Teaching and Learning, St. John's University, Bent 268, 8000 Utopia Parkway, Jamaica, NY 11439; flannerm@gmail.com

The Macroalgal Digitization Project is making a great deal of information about algae accessible to a wider audience. In this presentation, I look at algae in the broad context of how these collections relate to botanical history and to art. My aim is to explore these avenues as ways to interest more people in this botanically—and culturally—significant online resource. The 19th-century interest in seaweed collections that spawned so many albums is one obvious link, but there are many others. William Henry Harvey, whose exsiccatae are found in many herbaria, did all his own illustrations and even some lithographs for his publications. Also from the same period are Anna Atkins's cyanotypes of seaweeds. Later Ernst Haeckel and other artists created images of algae from diatoms to large seaweed that inspired Art Nouveau designs. This work continues to have a strong aesthetic appeal and can lure people into the world of underwater plants. It was such beauty that originally struck the 19th-century artist, Mary Philadelphia Merrifield, who then went on to publish original research on algae as well as to create watercolor drawings of them. In terms of 21st-century algal science and art, at a microscopic level, there is the work of Martyn Kelly, an ecologist specializing in diatoms, who uses watercolor paintings to bring this world to life for nonscientists. And as a commentary on seaweed collection, there is the Henry Perrine herbarium created by artist Mark Dion.

**DIGITIZATION OF ARTHROPOD DIVERSITY DATA: PROGRESS, BIASES, AND RESEARCH READINESS**

**Franz, Nico M.**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501; nico.franz@asu.edu; **Cobb, Neil S.**, Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ 86011; **Seltmann, Katja C.**, American Museum of Natural History, Central Park West at 79th Street New York, NY 10024-5192

How ready are digitized arthropod specimen-level data to support multi-scale inferences of global change patterns and other ecological and evolutionary research inquiries? To address this question, we examined > 5.6 million records of North American arthropods, made available through multiple Thematic Collections Networks (TCNs) including Tri-Trophic (<http://tcn.amnh.org/>) and SCAN (<http://scan1.ac-is.ufl.edu/>). In particular, we assessed the number of species for which we could reliably predict how global change might affect their future distribution and abundance. We further examined data/occurrence patterns over time and space as well as relative efforts of digitization for higher-level insect taxa and ecological assemblages. Several informative patterns emerged from the available records that merit consideration in the planning of future digitization priorities. (The current rate of digitization would need to increase ten-fold in order to digitize all the current specimens by the year 2050. Only 11% of the analyzed species have sufficient occurrence data to potentially model responses to climate change. However, less than one percent of these species have been the actual focus of ecological niche modeling. Occurrence records are clustered near institutions with strong entomological interests. The Apoidea, Heteroptera, and Papilionoidea have been the focus of digitization to a much greater extent than other insect groups. In terms of ecological assemblages, pollinators and herbivores are much better represented than predators and parasitoids. These patterns provide interesting insights for developing strategies to expand the research impacts gained from the estimated 250 million specimens found in North American research collections.

Spec. Full Circle Symp. 2

W 05/20/2015 03:30 PM

**TAXONOMIC CONCEPT RESOLUTION FOR VOUCHER-BASED BIODIVERSITY INFORMATION PLATFORMS**

**Franz, Nico M.**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501; nico.franz@asu.edu; **Gilbert, Edward E.**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501; **Weakley, Alan S.**, Department of Biology, University of North Carolina, Chapel Hill, NC 27599-3280, **Ludäscher, Bertram**, University of Illinois at Urbana-Champaign, 501 E Daniel ST, Champaign, IL 61820

We are developing a solution to logically represent and reason over instances of congruence and incongruence between taxonomic concepts. This approach is relevant to use cases and biodiversity data environments (such as Thematic Collections Networks) where specimen-level information identified to taxonomic names is utilized, however the underlying meanings that names are intended to represent are not adequately exposed and computable by name identity and/or nomenclatural relationship alone. Our logic-based toolkit "Euler/X" (reference: doi:10.1371/journal.pone.0118247; code: <https://github.com/EulerProject>) can read in two taxonomies and sets of Region Connection Calculus (RCC-5) input articulations - congruence, inclusion, exclusion, etc. - provided by a human user. Jointly these

constraints are logically reconciled, leading to merge taxonomies and visualizations that resolve the provenance (relationships) of meanings across the input taxonomies at more granular levels than names and nomenclatural relationships would permit. We illustrate the application of this approach and toolkit to several use cases including insect phylogenies, primate classifications, and plant taxonomies. We furthermore outline concrete steps needed to build concept resolution functionality into voucher-based biodiversity platforms, with particular reference to the Symbiota Software Project that sustains several active TCNs, including the Southeast Regional Network of Expertise and Collections (SERNEC). The transition from name- to concept-based resolution can be gradual, starting with the development of platforms and practices that facilitate the identification of vouchers to particular, explicitly referenced taxonomic concepts.

Contributions Small Nat. Hist. Coll. Symp. 1 TH 05/21/2015 08:50 AM

### **AIM-UP: BRINGING BIG DATA TO EDUCATORS AT SMALL INSTITUTIONS**

**Galbreath, Kurt E.**, Department of Biology, Northern Michigan University, 1401 Presque Isle Ave, Marquette, MI 49855; kurt.galbreath@gmail.com; **Cook, Joseph A.**, Department of Biology and Museum of Southwestern Biology, University of New Mexico, Albuquerque, NM 87131-1051

Museum specimens and the data that accompany them represent an extraordinary resource for teaching core biological concepts to undergraduates. However, this resource has traditionally been accessible only to students fortunate enough to attend institutions with natural history collections. Even when available for teaching, collections are often used for relatively narrow purposes (e.g., to illustrate taxonomic characters in organismal courses). Thus, integration of specimen-based learning into biology curricula has not yet become widespread, despite strong pedagogical reasons for bringing collections into the classroom. Recent efforts to massively digitize specimens and associated data and to increase their online accessibility are breaking barriers that once inhibited instructors from using these rich educational resources. Students and citizen scientists can now access vast troves of specimen data from any internet-connected computer and use them to explore a variety of biological phenomena. The NSF-funded Research Coordination Network, Advancing Integration of Museums into Undergraduate Programs (AIM-UP!), is taking advantage of this burgeoning resource by developing new classroom applications for specimen data. Network participants are tapping into museum databases to provide place-based exercises that go beyond traditional classroom uses of specimens. Educational modules are being constructed to facilitate active, student-driven exploration of natural history data to learn about diverse topics, including geographic patterns of phenotypic variation, biotic responses to climate change, and dynamics of co-evolving systems. These efforts provide models that educators can adapt to their specific needs as they further develop relevant student learning experiences, while also highlighting the significant contributions of collections to various biological disciplines.

General Session 5 TH 05/21/2015 8:30 AM

### **EXPERIMENTING WITH A WORKFLOW TO SPEED UP THE DIGITIZATION OF A LARGE COLLECTION OF PINNED ENTOMOLOGICAL SPECIMENS**

**Gentili-Poole, Patricia**, Department of Entomology, Smithsonian Institution, Washington, DC; **Bird, Jessica**, Department of

Entomology, Smithsonian Institution, Washington, DC; birdj@si.edu

With an estimated 34 million specimens, the entomological collection at the National Museum of Natural History, Smithsonian Institution, is the largest in the Western hemisphere. An estimated 20+ million records will be needed to represent the scientific value of this collection, of which 18 million records are for the pinned specimens alone. Retrospective cataloguing at this level of volume is an enormous and labor intensive undertaking considering the time it takes to remove the labels from the pin to read them. Applying the 'traditional' method of processing one specimen and capturing one record at a time the rate of digitization is approximately 100 records per day per person.

We experimented with a workflow to speed up the process by splitting the process in phases with staff assigned to each step: processing specimens, capturing digital images, generating skeleton records, and capturing the label information into a searchable format. The rate of digitization was increased to 184 specimens per person per day. Some wrinkles, however, still need to be ironed out.

Poster Session 4

TH 05/21/2015 PM

### **RESTORING A DEGRADED MAMMAL COLLECTION AT A SMALL UNIVERSITY**

**Gerdes, Cheyenne L.**, Biology, Missouri State University, 901 S National Ave, Springfield, MO 65897; Gerdeso13@live.missouristate.edu; **Maher, Sean P.**, Biology, Missouri State University, 901 S National Ave, Springfield, MO 65897; **Robbins, Lynn W.**, Biology, Missouri State University, 901 S National Ave, Springfield, MO 65897

At small colleges and universities, natural history collections may lack official curators. In these situations, specimens may be abandoned for years, and during this time collections can be seriously damaged. At Missouri State University, the mammal collection consists of an estimated 1000+ specimens which have not been actively curated in decades. In our collection, almost none of the specimens are properly labeled to species, and many specimens are extremely damaged or missing data. This situation provides a familiar challenge to those working at small colleges and universities: protecting the degrading specimens, organizing the collection, and preventing further data loss while working with very little funding. With the creation of the Missouri State University branch of the Natural History Collection Curation Club (NHC3), major recovery efforts are now beginning. Digitization of the collection has begun and many specimens have been correctly identified, labeled, and recovered from poor storage conditions. Our branch of NHC3 has also been active in curating our ornithology teaching collection, and the club has hosted a bird specimen preparation demonstration to teach students proper technique. Our goals for the future include the complete digitization of the mammal collection, establishment of a strong curation community on campus, and the use of our specimens in biological research.

Spec. Full Circle Symp. 1

W 05/20/2015 09:10 AM

### **USING MUSEUM DATA FOR LARGE-SCALE QUESTIONS: MODELING FLORIDA PLANT DIVERSITY**

**Germain-Aubrey, Charlotte C.**, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611-7800; cgermain@ufl.edu; **Allen, Julia M.**, University of Illinois - Illinois Natural History



Survey - Urbana-Champaign, IL; **Guralnick, Robert P.**, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611-7800; **Neubig, Kurt M.**, Southern Illinois University - Department of Plant Sciences - Carbondale, IL; **Ponciano, Jose Miguel**, Department of Biology, University of Florida, Gainesville, FL; **Lamy, Thomas**, University of Montreal - Quebec Center for Biodiversity Science - Montreal, Canada; **Majure, Lucas C.**, Desert Botanical Gardens - Phoenix, AZ; **Soltis, Douglas E.**, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611-7800; **Soltis, Pamela S.**, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611-7800

The effort to digitize all biological collections in the USA is quickly leading to an online dataset of over one billion specimens, available for addressing questions at unprecedented scales. Florida hosts several biodiversity hotspots and is home to over 4,100 species of plants. Using herbarium collections, we took advantage of the historical data linked with the specimens and constructed a pipeline that extracts environmental variables at the time of the collection for each of 1,550 species. We used the collections to reconstruct niche models and project the effect of climate change on the Florida vegetation landscape. Moreover, we reconstructed the regional phylogeny for those species for which we built models, investigating similar questions through the lens of the evolutionary history of the region. This study emphasizes the importance of museum collections for research. We will discuss several steps and assumptions made in order to use as much of the data as possible. Through our experience, we will recommend concrete actions that collectors, collection managers, and researchers can take to facilitate the use of museum specimens by the maximum number of scientists and non-scientists.

General Session 4

W 05/20/2015 01:30 PM

#### SHARING KNOWLEDGE IN COLLECTIONS: BUILDING A WIKI ON COLLECTION MANAGEMENT

**Giere, Peter**, Museum für Naturkunde Berlin, Leibniz Institute for Evolution and Biodiversity Science, Invalidenstraße 43, 10115 Berlin, Germany; peter.giere@mfn-berlin.de; **Quaiser, Christiane**, Museum für Naturkunde Berlin, Leibniz Institute for Evolution and Biodiversity Science, Invalidenstraße 43, 10115 Berlin, Germany; **Aßel, Edda**, Museum für Naturkunde Berlin, Leibniz Institute for Evolution and Biodiversity Science, Invalidenstraße 43, 10115 Berlin, Germany; **Patzschke, Eva**, Museum für Naturkunde Berlin, Leibniz Institute for Evolution and Biodiversity Science, Invalidenstraße 43, 10115 Berlin, Germany

Collection management typically includes a multitude of tasks and duties that are based on the individual knowledge and skills of the staff dealing with it. Due to the varied nature of objects within the collections, this knowledge can be equally diverse. In many instances, this knowledge is available among the staff dealing with a collection, but it usually is not accessible from the outside and it may even be difficult to access it within an institution. To make this intrinsic knowledge available to others, a project based at the Museum für Naturkunde Berlin has devised a wiki on collection management that collates available knowledge, procedures and standards in an online knowledge base. After an initial planning phase, the wiki now is being filled with intrinsic and published data to become a tool that facilitates collection management on many levels. At the same time, staff members are encouraged to actively participate in the production of entries or in the quality control of the wiki. This is especially important prior to opening the wiki to external use, which is planned at a

later stage. Ultimately, it is conceivable that this approach will link up to similar approaches on the international level.

Workshop

S 05/23/2015 08:30 AM

#### GETTING STARTED AND MAINTAINING HERBARIUM COLLECTIONS DATA IN A SYMBIOTA DRIVEN WEB PORTAL

**Gilbert, Edward E.**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501; **Brown, Herrick**, SC Dept. of Natural Resources, Heritage Trust Program, PO Box 167, Columbia, SC 29202; **Denslow, Michael W.**, SERNEC, Department of Biology, Appalachian State University, Box 32027, Boone, NC 28608; michael.denslow@gmail.com; **Murrell, Zack**, Department of Biology, Appalachian State University, ASU Box 32027, Boone, NC 2860; **Franz, Nico M.**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501

Symbiota is a software package that is currently being used by many thematically, regionally, or taxonomically defined digitization efforts to publish, edit and maintain primary biodiversity data. "The Key to the Cabinets" is a Thematic Collection Network (SERNEC-TCN) funded through the NSF-ADBC program. The focus of the SERNEC-TCN is to build a biodiversity database of southeast U.S. plants and Symbiota is an important tool being leveraged for this effort. The SERNEC Symbiota portal (<http://sernecportal.org>) is being used to mobilize and aid in digitizing 4.7 million specimens from 107 herbaria and new functionality is being developed to support this massive digitization effort, expanding this to all the southeast herbaria. This hands-on workshop is designed for data contributors and will focus on managing (processing and publishing) herbarium data within the SERNEC Symbiota portal. The focus will be on publishing and processing data in Symbiota, but will also be tailored to participants' interests. An emphasis will be placed on herbarium records and associated images; however, this workshop is open to all interested in getting started or wanting to learn more about managing data and images in Symbiota regardless of taxonomic or regional scope. The workshop will likely concentrate on account creation, account management, migrating data in and out of Specify, publishing data to iDigBio, managing taxonomies and linking duplicates from other collections. Georeferencing with the GEOLocate module will also be highlighted. A personal laptop is required to participate. Participants will be polled before the event to gauge interests and tailor the agenda accordingly.

Spec. Full Circle Symp. 2

W 05/20/2015 04:10 PM

#### SPECIMEN LABEL DIGITIZATION USING OCR/NLP TOOLS INTEGRATED WITHIN THE SYMBIOTA PROCESSING TOOLKIT

**Gilbert, Edward E.**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501; egbot@asu.edu; **Lafferty, Daryl**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501; **Anglin, Robert**, Center for Limnology, University of Wisconsin, 155 Birge Hall, Madison, WI 53706; **Gottschalk, Stephen**, New York Botanical Garden, 2900 Southern Boulevard, Bronx, NY 10458; **Franz, Nico M.**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501; **Gries, Corinna**, Center for Limnology, University of Wisconsin, 155 Birge Hall, Madison, WI 53706; **Landrum, Leslie R.**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501; **Thiers, Barbara**, New York Botanical Garden, 2900 Southern Boulevard, Bronx, NY 10458

Symbiota (<http://symbiota.org>) is an open-source software

designed to promote and facilitate collaboration among those working to document biodiversity. In addition to providing open access to integrated research data along with the ability for the public to explore regional biodiversity, Symbiota offers a specimen-based Content Management System that aids researchers in efficiently compiling and managing specimen data within an integrated network. Several Optical Character Recognition (OCR) and Natural Language Processing (NLP) techniques (e.g. Tesseract, SALIX, LBCC parser, etc.) have been incorporated into the software, with an emphasis on accelerating data entry while improving data quality. In preparation for digitization, automated image ingestion scripts create skeletal records in the database followed by an automated OCR process that extracts and links label text from the images. Several OCR text processors have been integrated into Symbiota's online data entry form, giving transcribers the ability to parse OCR text into Darwin Core fields. OCR parsers are also available for controlled batch processing of the raw label output. Moreover, wordclouds and direct filtering techniques can be applied to the OCR text to batch populated targeted fields or define theme based digitization projects. Finally, OCR output can be used to link specimens based on specimen duplicates, duplicate collection events, or themed label formats. Rather than parsing the OCR output, the duplicate clustering technique uses the OCR output to establish a correlation between previously processed specimens and then uses this information to populate fields of the unprocessed record based on measures of similarity.

Poster Session 3

TH 05/21/2015 AM

### **EMERGENCE OF THREE VOUCHER-BASED NEOTROPICAL BIODIVERSITY PORTALS**

**Gilbert, Edward E.**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501; **Franz, Nico M.**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501; nico.franz@asu.edu; **Brandt, Benjamin**, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501; **Miller, Matthew J.**, Smithsonian Tropical Research Institute, Washington, DC 20521-9100

We report on progress in creating and populating three new, voucher-based biodiversity data portals for the Neotropical region that utilize the Symbiota software platform (<http://symbiota.org/> and <http://bdj.pen-soft.net/articles.php?id=1114>). The portals' themes and URLs are as follows. (1) Smithsonian Tropical Research Institute Symbiota Portal - <http://stricollec-tions.org/>. Emphasis on STRI collections, in particular vertebrate groups. (2) Neotropical Arthropod Portal - <http://symbiota.org/neotrop/entomology/>. An extension of SCAN (<http://symbiota4.acis.ufl.edu/scan/portal/>), currently with an emphasis on Costa Rican and Panamanian arthropods. (3) Neotropical Flora Portal - <http://symbiota.org/neotrop/plantae/>. Includes snapshots of relevant data held by major North American collections. These portals are open for expansion and addition of new collections and feature several recently developed modules, such as custom "skins" to configure the user interfaces, interactive "organism of the day" features, and new map-based search and labeling options that facilitate comparative, research-focused voucher queries.

Spec. Full Circle Symp. 3

TH 05/21/2015 10:50 AM

### **INCLUSION OF BOTANY-NAIVE UNDERGRADUATES IN DIGITIZATION WORKFLOWS: IT IS POSSIBLE!**

**Gillespie, Emily L.**, Department of Biological Sciences, Marshall

University, Huntington, WV 25755; gillespiee@marshall.edu; **Hamrick, Joshua J.**, Department of Biological Sciences, Marshall University, Huntington, WV 25755; **Hammond, Kristen N.**, Department of Biological Sciences, Marshall University, Huntington, WV 25755

Digitization efforts in the southeastern United States have recently been given a significant push forward as a result of recent NSF ADBC Thematic Collections Networks funding for the "Key to the cabinets: Building and Sustaining a Research Database for a Global Biodiversity Hotspot." As a result, 100+ herbaria in the Southeast are beginning to build workflows involving undergraduate and graduate students, in addition to faculty researchers and the general public. Here, a framework focusing on inclusion of young undergraduates in this project is presented. At the Marshall University Herbarium (MUHW), we are including students as early as freshman year in our project, and we have developed a protocol for training and maintenance, particularly geared toward these typically botany-naive students. We present suggestions for how to promote sustaining relationships with university offices such as Federal Work Study that can provide student labor for our efforts. We also present a framework for employing students as 'middle managers' in order to facilitate both peer-training and maximizing cross-training. Topics discussed include training in plant taxonomy and herbarium structure, specimen management, digitization workflows, bottlenecks and data relating to student workflow efficiency. We strongly argue that students at all levels can and should be included as equal partners in our emerging and continuing digitization efforts.

General Session 6

TH 05/21/2015 04:30 PM

### **COMMUNITY COLLECTIONS: PARTNERSHIP PROGRAMS AT THE DENVER MUSEUM OF NATURE & SCIENCE**

**Godoy, Eric**, Partnership Programs, Denver Museum of Nature & Science, 2001 Colorado Blvd., Denver, CO 80205; eric.Godoy@dmns.org

Partnership Programs at the Denver Museum of Nature & Science is comprised of Passport to Health and Urban Advantage Metro Denver. Passport to Health (P2H) is a free, multifaceted, bilingual hands-on education program designed for fifth graders, their families, and their teachers. The goal of P2H is to increase students', families', and teachers' understanding of health science, raise their health literacy, and inspire them toward healthy lifestyles. P2H impacts over 3,900 Denver-area fifth grade students, their families, and teachers annually.

UA Denver is a partnership among three major cultural institutions—Denver Museum of Nature & Science, Denver Zoo, and Denver Botanic Gardens—and two of Colorado's largest and most diverse public school districts—Denver Public Schools and Aurora Public Schools. The program is designed to improve science literacy and reduce science achievement gaps among underserved middle school students by engaging in authentic science investigations. UA Denver serves over 3,500 seventh-grade students, their families, and teachers.

Education Collections from DMNS serve to enrich the learning experiences of P2H and UA students and teachers. Health science collections are utilized in on-site body systems labs, with authentic specimens providing a window to their own unique bodies. Within UA, teachers can tap the collections when teaching object-based inquiry lessons, encouraging the students to examine the objects with careful observations that spark their curiosity and help them develop testable questions to investigate. Access to the education

collections deepens the learning and provides experiences not normally available in formal science education.

General Session 3

W 05/20/2015 02:10 PM

### **SCIENTIFIC COLLECTIONS: ENGAGING ACROSS DISCIPLINARY BOUNDARIES TO COMBAT EMERGING INFECTIOUS DISEASES**

**Graham, Eileen**, Scientific Collections International, Smithsonian Institution, 10th & Constitution Ave NW, Washington, D.C. 20013; [grahame@si.edu](mailto:grahame@si.edu); **Schindel, David E.**, National Museum of Natural History, Smithsonian Institution, 10th & Constitution Ave NW, Washington, D.C. 20013

It is estimated that 60% of emerging diseases have jumped from wild or domesticated species to humans. Emerging infectious diseases (EIDs) pose an increasing threat to society both as the speed of modern travel increases and as sprawling development brings humans in greater contact with disease reservoirs and transmission vectors. How will society meet the threat to global public health that EIDs represent? The research communities devoted to biomedicine, wildlife biology, veterinary science, microbiology, natural history, and others must become a collaborative network capable of research on diseases that cross species boundaries. An international and interdisciplinary workshop, hosted by Scientific Collections International (SciColl), explored the potential impact that object-based scientific collections can have on the study, prevention, early identification, and control of EIDs. Workshop participants identified four main findings as a result of the discussions: (1) Collections are currently constructed for the needs of a particular discipline and new collecting practices are needed to expand impact. (2) Increased access to collections and their data is needed across disciplines. (3) The study of EIDs is a big data challenge and needs appropriate mechanisms to meet supply and demand. (4) Collections need to be managed and expanded based on their potential for future impact. Interactions among a wider range of stakeholders in all scientific communities are needed to ultimately change the long-standing culture of single-research-discipline collecting.

Poster Session 1

W 05/20/2015 AM

### **THE CONSERVATION PROJECT FOR THE BOUND HERBARIA OF MICHAŁ FEDOROWSKI**

**Grenda, Magdalena**, Academy of Fine Arts in Warsaw, Warsaw Rising Museum, Grzybowska 79, 00-844 Warsaw, Poland; [grenda.magdalena@gmail.com](mailto:grenda.magdalena@gmail.com)

This poster presents the outcome of a six-month long conservation treatment of Michal Fedorowski's herbaria which belong to the collection of the Biology Department of the University of Warsaw. Michal Fedorowski (1853-1923) was a Polish ethnographer and ethnobotanist whose work has been recently rediscovered and studied with interest by some Polish botanists. In 2012, the conservation treatment of the first bound herbarium, dated 1893, was completed and the findings were published on the Biology Department's Herbaria website. In 2014 the Ministry of Culture and National Heritage of Poland funded the conservation of the remaining thirteen volumes of Fedorowski's herbaria with the help of the Promotion of Creativity Fund Scholarship. The Fund made it possible to carry out instrumental analysis on the objects. They were analyzed with a XRF scanner (macro XRF) and SPME/GC (Solid Phase Micro Extraction coupled with Gas Chromatography) to determine their condition, features and a possible pesticide contamination of the specimens. Another part of the project

was concerned with micro-fading tests. The analysis revealed the objects' vulnerability to light and assessed different risks of fading, both of the specimens and the paper.

The treatment itself included a temporary removal of some loose specimens, as well as dry cleaning, filling in the areas of loss and mending the tears in the paper support. The broken spines in the bound herbaria volumes were backed along the main fold with an additional layer of Japanese paper. As needed they were re-sewn or the stiches were only reinforced in weakened areas. The loose pieces of the specimens were reattached, and those remaining pieces which were too small or impossible to assign, were saved and placed in an archival quality envelope. Each bound volume in Fedorowski's herbaria collection received a custom-made archival housing.

Plenary Session

T 05/19/2015 11:30 AM

### **BUILDING A NETWORKED NATIONAL COMMUNITY: NIBA RESEARCH COORDINATION NETWORK**

**Gropp, Robert**, American Institute of Biological Sciences, 1444 I Street, NW, Suite 200, Washington, DC 20005; [rgropp@aibs.org](mailto:rgropp@aibs.org)

In recent years, the scientific community has developed a national strategy for a Network Integrated Biocollections Alliance (NIBA) to establish a framework for leveraging the wealth of resources represented by the nation's biocollections through digitization of specimens and associated metadata, creating a massive, distributed tool for addressing grand challenges across a wide range of scientific endeavor. Significant progress has been made toward the implementation of NIBA, but much more work remains. In 2014, the National Science Foundation funded a Research Coordination Network (RCN) grant to support efforts to foster the continued engagement with and development of a sustainable, networked community of practice. The NIBA RCN is working with the community to evaluate current and future needs. This talk will summarize work and findings thus far, as well as solicit input on future activities.

Spec. Full Circle Symp. 2

W 05/20/2015 01:50 PM

### **BIODIVERSITY INFORMATION SERVING OUR NATION (BISON), THE INTEGRATED TAXONOMIC INFORMATION SYSTEM (ITIS) AND THE FEDERAL ECOSYSTEM OF BIODIVERSITY DATA**

**Guala, Gerald F.**, United States Geological Survey, National Headquarters, MS 302, 12201 Sunrise Valley Dr., Reston, VA 20192; [gguala@usgs.gov](mailto:gguala@usgs.gov)

Two years after public release, Biodiversity Information Serving Our Nation (BISON, [bison.usgs.gov](http://bison.usgs.gov)) serves more than 200 million records and has had a major impact on biodiversity science and management in the United States. As the primary application of the US Node of the Global Biodiversity Information Facility (GBIF), it is also dramatically increasing the global recognition of US biodiversity data. Numerous spinoffs and utilities allow users to explore their own museum's data alone or in concert with others and easily produce maps, charts and other visualizations dynamically on their desktop or on their own websites without programming. Integration with the Integrated Taxonomic Information System (ITIS, [www.itis.gov](http://www.itis.gov)) has yielded a dramatic increase in search efficiency and usefulness. New updates in ITIS have extended its global coverage as well as enhanced its nearly comprehensive coverage in North America. Both systems are part of the recently released EcoINFORMA strategy and applications for Federal environmental data management (see: [ecosystems.data](http://ecosystems.data)).



gov). The capabilities and interrelationships of these products as well as their relationship to other Federal and non-Federal efforts will be discussed.

General Session 1

W 05/20/2015 09:10 AM

### **THE VERTNET DATA MIGRATOR: CLEANING UP THE COMMUNITY'S DIRTY LAUNDRY**

**Guralnick, Robert**, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611-7800; robgur@gmail.com; **Bloom, David**, 3101 Valley Life Sciences Bldg, University of California, Berkeley CA 94720-3160; **Wieczorek, John**, Museum of Vertebrate Zoology, 3101 Valley Life Sciences Bldg, University of California, Berkeley CA 94720-3160; **Cicero, Carla**, Museum of Vertebrate Zoology, 3101 Valley Life Sciences Bldg, University of California, Berkeley CA 94720-3160; **Spencer, Carol**, Museum of Vertebrate Zoology, 3101 Valley Life Sciences Bldg, University of California, Berkeley CA 94720-3160; **Koo, Michelle S.**, Museum of Vertebrate Zoology, 3101 Valley Life Sciences Bldg., University of California, Berkeley, CA 94720-3160; **Russell, Laura**, Biodiversity Institute, 1345 Jayhawk Blvd., Dyche Hall, Room 606, University of Kansas, Lawrence, KS 66045-7561

VertNet works with a large community of vertebrate collections to mobilize their data online. Since its inception, VertNet has helped 182 institutions (518 collections) publish more than 168 million species occurrence records. These records are simultaneously made available to other aggregators, such as GBIF and iDigBio. VertNet strives to catalyze critical innovations in biodiversity data standards, cloud-based data publishing, data reporting, and—most needed for research use of records—data quality. We will present the data quality tools built into our cloud-based publishing workflows, with special attention paid to the VertNet Data Migrator, a key tool in our publishing workflows. The Data Migrator performs a series of data quality checks on incoming data from publishers, including geography and taxonomy, and produces clean data in Darwin Core formatted outputs that feed back to the providers and forward to the published version of datasets available from VertNet. Critical for broader use, VertNet maintains publicly available migrator vocabularies for use in validation, along with an archive of all the non-valid values found in publisher databases. Finally, the VertNet portal now indicates to data consumers, which datasets have been improved by the Migrator. This presentation will explore the technical and social challenges addressed by the VertNet Data Migrator including the processes, vocabularies, and outputs necessary to clean up the biodiversity community's dirty data laundry.

Spec. Full Circle Symp. 2

W 05/20/2015 03:50 PM

### **AN UPDATE ON THE NOTES FROM NATURE PROJECT: BRINGING A PROOF OF CONCEPT INTO FULL PRODUCTION**

**Guralnick, Robert**, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611-7800; **Denslow, Michael W.**, SERNEC, Department of Biology, Appalachian State University, ASU Box 32027, Boone, NC 28608; michael.dens-low@gmail.com

Notes from Nature (<http://www.notesfromnature.org>; NFN) is a citizen science tool focused on public engagement and label transcription of natural history specimens. The project was developed collaboratively by biodiversity scientists, curators, and experts in citizen science, within the well-established Zooniverse platform. This project currently brings together digital images representing biodiversity records that include ledgers, herbarium sheets and pinned insects from multiple projects and collections.

Volunteer citizen scientists transcribe textual data contained in the specimen images. Since its launch in 2013, NFN has amassed >1,000,000 transcriptions from >6,800 registered volunteers worldwide. The platform engages volunteers through scientific content, and a "talk" platform where users discuss specimens and ask questions to one another, developers and domain scientists. The software stack is open source, built using the latest web technologies. While successful, NFN has been difficult to scale up for broadest community use, both for natural history collections providers and citizen scientists. This talk focuses on next steps to overcome current limitations. We discuss forthcoming improvements for: 1) Creating more meaningful provider- and user-generated "expeditions," or sets of images based on themes; 2) Tools to build consensus and quality metrics for the transcriptions to further enhance data quality; 3), Better workflows to support image loading and repatriation of data to our providers. We also discuss engagement efforts and interoperability with other biodiversity informatics tools. Such improvements help NFN take its place as a critical component of an ecosystem of tools needed to unlock the vast legacy biodiversity data for broad public good.

Contributions Small Nat. Hist. Coll. Symp. 2

TH 05/21/2015 02:30 PM

### **GETTING STARTED: DIGITIZING MULTIPLE SMALL COLLECTIONS AT UCSB**

**Hannah, Laurie**, Cheadle Center for Biodiversity and Ecological Restoration, University of California, Harder South, MS-9615, Santa Barbara, CA 93106; hannah@cber.ucsb.edu

The Cheadle Center for Biodiversity and Ecological Restoration (CCBER) is the home of the University of California, Santa Barbara's biological research and teaching collections. Begun in 1956 with the creation of the herbarium and the zoology collection, these collections have grown and broadened to include close to 200,000 vertebrate, invertebrate, algal, plant anatomy, and microfossil specimens, as well as faculty archives. The collections range from 700 to 90,000 specimens in size and are, for the most part, largely focused on the central coast of California. Though housed on a medium-sized state university campus, resources for curation, digitization, and preservation of these collections are slim to none. However, through a series of state and federal grants, strategic planning, creative leveraging of staff responsibilities, serendipity, and the generosity of others, CCBER staff and volunteers have made considerable progress towards digitizing the collections. This presentation is aimed at small institutions who are unsure how to begin a digitization project and who need guidance in deciding what collection(s) to digitize and how to find funding. I will discuss the challenges CCBER faced as a small center with no permanent collections staff and few additional resources, the strategies used to successfully undertake the digitization of five distinct collections, and some lessons learned along the way.

General Session 6

TH 05/21/2015 02:50 PM

### **INTEGRATING CITIZEN SCIENCE INTO HIGH SCHOOL CLASSROOMS USING NOTES FROM NATURE**

**Harris, Kari M.**, Department of Biological Sciences, Arkansas State University, PO Box 599, State University, AR 72467; kharris@astate.edu; **Czerwonky, Jill L.**, Department of Biological Sciences, Arkansas State University, PO Box 599, State University, AR 72467

With the global push for digital information, citizen science is quickly becoming a vital component in the digitization process. Our

plan brings this approach directly into high school classrooms. The lesson plan we have developed integrates citizen science and high school science frameworks. The lesson plan has been modified to fit frameworks for twelve states included in the Southeast Regional Network of Expertise and Collections (SERNEC). This plan teaches biodiversity and technology and familiarizes students with scientific nomenclature. While learning, students are actively participating in large-scale science. We will use this lesson plan with three local high schools to determine affectability. Students will be given pre and post tests and teachers will provide feedback on their overall impression. All of this information will be handed over to SERNEC to be integrated into high schools across the south east in an effort to promote scientific knowledge in classrooms and to assist SERNEC's goal to digitize all plant specimens in the South Eastern United States.

Contributions Small Nat. Hist. Coll. Symp. 1 TH 05/21/2015 11:10 AM

### MANAGING MULTIPLE SMALL COLLECTIONS IN AN INTERDISCIPLINARY MUSEUM

**Hernandez, Lena F.**, Museum of Science & History, 1025 Museum Circle, Jacksonville, FL 32207; lhernandez@themosh.org

You are always going to be short on something—time, supplies, or expertise—when working with small collections. Usually, you are short on everything. This problem is exacerbated when your collections are very diverse. Meeting the needs of your collections, no matter the size or composition always depends on three universal responsibilities: advocating for your collection, identifying and utilizing your available resources to their fullest, and lots of carefully planned work. Fulfilling these responsibilities will help you meet the needs of your collections both now and in the future. The diverse collections of the Museum of Science & History of Jacksonville include: living animals; historical artifacts; archives; and herbaria, vertebrate, invertebrate, paleontological, and geological specimens. MOSH's collections will serve as a reference, illustrating proper collections stewardship when managing multiple small collections.

Spec. Full Circle Symp. 2 W 05/20/2015 04:50 PM

### MOBILIZING FOSSILS FOR GLOBAL CHANGE RESEARCH

**Holroyd, Patricia A.**, Museum of Paleontology, University of California, Berkeley, CA 94720; pholroyd@berkeley.edu; **Marshall, Charles R.**, Museum of Paleontology and Dept. of Integrative Biology, University of California, Berkeley, CA 94720

The fossil record provides key data need to understand the impacts of climate change on the biota. Unfortunately, mobilization of paleontological data lags behind that of other biodiversity data sources, and there is a strong need to accelerate the pace. As part of an initiative funded by the Gordon and Betty Moore Foundation and W.M. Keck Foundation to the Berkeley Natural History Museums, the University of California Museum of Paleontology was tasked with web-mobilizing during a one-year period our data for the last 100,000 years of terrestrial California history, to be incorporated into a joint analysis with modern biodiversity data to address questions about the future of the state. As our uncataloged backlog of fossils numbers in the hundreds of thousands and the funding time frame was short, we developed an approach to rapidly mobilize data that employed strategic sampling of major taxonomic groups, rare taxa, and the widest possible geographic extent in order to best capture the ranges of all taxa. Priority was placed on improved

georeferencing of localities and primary cataloging of specimens representing both coastal and inland communities. To accelerate workflows, cataloging and georeferencing were done in parallel, with georeferencing being done at the same time as the zoological records in our partner museum. We used all existing taxonomic identifications (even if only to higher taxonomic group) to document the fossil resource and highlight areas for future work as well as relying on the greater efficacy of software tools to provide future updates. Other key elements were selection of motivated students with prior data entry experience and building a team-oriented approach in which task-sharing was encouraged and successive goals were celebrated. The result was the new cataloging and web mobilization of more than 30,000 specimen records representing more than 700 animal genera and 500 locations.

Poster Session 2

W 05/20/2015 PM

### SCRIPTING TO SAVE TIME AND SANITY

**Hoskin, C. Julie**, NMNH Collections Program, Smithsonian Institution, 10th & Constitution Ave, Washington, DC 20560; hoskinj@si.edu; **Mansur, Adam T.**, Department of Mineral Sciences/Smithsonian Institution/10th & Constitution Ave, Washington, DC 20560

With the pressure felt by all organizations housing collections to digitize and increase the accessibility of their holdings, we are all attempting to find new and improved methods of capturing and processing specimen information. Scripts—short, focused programs designed to complete a given task—can be powerful tools as we work toward this goal, streamlining time-consuming and tedious tasks. Key benefits of using scripts include reducing both errors and staff time required for digitization projects, ultimately resulting in a more efficient workflow and an improved digitization rate.

Here we describe how we employed scripts to help complete a project to digitize dozens of collections ledgers at NMNH. Each ledger required hundreds of images, and each image needed to be renamed, resized, and linked to a database record. Even basic processing of the images took several hours per ledger when done manually. To preserve staff time and sanity, a series of simple scripts were developed to rename files, to resize and correct images, to bind images into PDFs, and to link images in our database. The scripts allowed a single staff member to complete the project in less than half the time it had previously taken.

Poster Session 4

TH 05/21/2015 PM

### ORGANIZATION, EXPANSION, AND DIGITIZATION OF THE LARVAL FISH COLLECTION AT THE VIRGINIA INSTITUTE OF MARINE SCIENCE

**Huber, Sarah K.**, Fisheries Science, Virginia Institute of Marine Science, Rt. 1208 Greate RD, Gloucester Pt., VA 23062; skhuber@vims.edu; **Konstantinidis, Peter**, Fisheries Science, Virginia Institute of Marine Science, Rt. 1208 Greate RD, Gloucester Pt., VA 23062; **Hilton, Eric J.**, Fisheries Science, Virginia Institute of Marine Science, Rt. 1208 Greate RD, Gloucester Pt., VA 23062; **Steinberg, Deborah K.**, Fisheries Science, Virginia Institute of Marine Science, Rt. 1208 Greate RD, Gloucester Pt., VA 23062

The Virginia Institute of Marine Science Nunnally Ichthyology Collection contains a large collection of uncataloged larval fishes (ca. 50,000+ lots). This collection is unique among all ichthyoplankton collections on the East Coast in its scope and size, and consists of



collections made in the Caribbean, the Mid- and South Atlantic Bights, and the Chesapeake Bay, as well as ichthyoplankton in samples from long-term time-series and other plankton studies from the Atlantic, Pacific, and Southern Oceans. Many of the plankton samples deriving from these large, interdisciplinary research projects are complemented by extensive environmental data, including depth, temperature, salinity, and dissolved oxygen, and by phyto- and zooplankton assemblage information. Here we will report on the current progress of sorting, identification, and digitization of this collection, which was recently funded by the National Science Foundation. As part of our current NSF CSBR grant, we will host two-week long workshops at VIMS that will include a three-day primer on larval fish identification led by four invited guest larval fish taxonomists, followed by identification of selected samples from VIMS collections will focus on specimen identification and other topics in larval fish taxonomy. Participants will sort and identify ichthyoplankton samples to the family level under expert guidance. In this poster we will provide additional details on the workshop scheduled for the fall of 2015.

Contributions Small Nat. Hist. Coll. Symp. 2 TH 05/21/2015 02:50 PM

### **RECRUITING AND MANAGING VOLUNTEERS IN SMALL COLLECTIONS**

**Islam, Melissa B.**, Research & Conservation, Denver Botanic Gardens, 909 York Street, Denver, CO 80206; melissa.islam@botanicgardens.org

Volunteers are a valuable resource to small collections when thoughtfully recruited, trained and recognized. As collections work expands to include virtual management in addition to physical management, properly trained, flexible volunteers can follow this shift in priorities and contribute significantly to digitizing small collections. As the Denver Botanic Gardens herbaria has increased in professional staff and collection management, we transformed our relationship with volunteers. Previously, volunteers were not consistently trained, poor quality work was overlooked, and staff scrambled to meet the needs of volunteers. We then implemented a certification program, job descriptions, and trained volunteers with clearly articulated protocols and procedures. Within a year, the dynamic between staff and volunteers changed dramatically. Volunteers are now well-trained, independent and flexible in shifting tasks. They are open to learning new protocols as these are improved and better understand their contribution to collection care as well as natural history. In nine months, staff and volunteers imaged 54,000 specimens to link to our previously databased records. Although we continue to spend quite a bit of time managing volunteers, the amount of work that is accomplished could not occur by staff alone. Volunteers image newly accessioned or annotated specimens, database from images, and georeference specimens in addition to their work with the physical collections. Digitization has also attracted a different group of volunteers to our collections thereby expanding our volunteer base. Our team of volunteers are an asset to the collections as well as an advocate for them.

General Session 4

W 05/20/2015 02:30 PM

### **CRUNCHED FOR SPACE: EXPANSION AT THE NEW YORK BOTANICAL GARDEN HERBARIUM**

**Jones, Lance E.**, Herbarium, New York Botanical Garden, 2900 Southern Blvd., Bronx, NY 10458; ljones@nybg.org; **Tarnowsky, Nicole**, Herbarium, New York Botanical Garden, 2900 Southern

Blvd., Bronx, NY 10458

While interest has grown in the utilization of natural history collections, space for these repositories of biological information has not always kept pace. For over 100 years, the New York Botanical Garden herbarium has grown steadily through the efforts of garden scientists and collaborators. Due to unexpected growth in cryptogamic collections and the unique challenges of housing palm specimens, this has created inadequate space and curatorial difficulties, hampering growth for future collections.

To bring all of these collections up to accepted best practices, 33.5 extra tall cabinets have been installed with the capacity of 2,278 additional cubbyholes. These new cabinets replace 34 open shelf units on the first floor of the herbarium, which previously held the H.H. Rusby ethnobotany collection of the NYBG Institute of Economic Botany. This collection of over 3,100 glass bottles, mostly of dried contents, was moved to another building on grounds, while allocating room for palm and lichen collections and the planned acquisition of approximately 100,000 algae specimens from the Field Museum of Natural History. This expansion is expected to allow for a further 5 years of growth.

In keeping with the herbarium's mission of disseminating information associated with specimens, an effort has begun to improve the curation of the palms and digitize their contents and collection data. Improving current housing of bryophytes, algae, fungi, lichens and palms and capturing their data for scientific use are needed to improve understanding of these under-studied groups with demonstrated ecological importance.

Poster Session 1

W 05/20/2015 AM

### **INSTALLING MOBILE COMPACT STORAGE ON AN EXISTING FOOTPRINT**

**Jones, Lynn A.**, Yale Peabody Museum of Natural History, 170 Whitney Ave., New Haven, CT 06520; lynn.jones@yale.edu; **White, Tim**, Yale Peabody Museum of Natural History, 170 Whitney Ave., New Haven, CT 06520

The Yale Peabody Museum of Natural History is constantly trying to improve the manner in which their collections are housed to ensure the safety and accessibility of objects and specimens. Anthropology collections storage, in the former Bayer Pharmaceutical Inc. headquarters, was partially renovated with an initial two to three year projection for occupation. With the economic downturn in 2008, the former Bayer manufacturing facility has been transformed into the Collections Study Center (CSC) where the Peabody collections are temporarily housed, along with objects from the Yale University Art Gallery and the Institute for the Preservation of Cultural Heritage. With support from the Institute for Museum and Library Services (IMLS) and Yale University, the museum is relocating the Peabody's Oceanic ethnographic collections from the 1926 Peabody museum building in New Haven into improved environmentally conditioned space in the CSC. Funding from IMLS and Yale University have allowed for further renovation of the existing anthropology collections space. Relocating existing anthropology material and installation of compact mobile storage within the space will accommodate the Oceanic ethnographic material. Some initial design elements of the construction and cabinetry installation required modification during renovation because of details such as floor loading capacity, budgetary concerns, and fire code restrictions.

### OPTIMIZING A COMPRESSION FOSSIL DIGITIZATION WORKFLOW AT THE UNIVERSITY OF COLORADO

**Karim, Talia S.**, CU Museum of Natural History, University of Colorado, 265 UCB, Boulder, CO 80309; talia.karim@colorado.edu; **Walker, Lindsay J.**, CU Museum of Natural History, University of Colorado, 265 UCB, Boulder, CO 80309

We have developed a workflow that incorporates curation, databasing, data cleanup, imaging, and data publishing to complete the digitization of about 110,000 fossil terrestrial arthropod specimens as part of the Fossil Insect Collaborative TCN. The workflow has been continually revised and updated for optimization. Digitization begins with a curation phase, where new field collections are unpacked, specimens identified, catalog numbers assigned, labels created, and collecting information recorded onto paper catalog sheets. The latter are hand keystroked to create digital collection object records in Specify. Once curated, high-resolution digital images of the specimens are recorded. The workflow is optimized to avoid frequent lens changes, duplication of imaging specimens, and overlap in work schedules so that the station is being used close to 40 hours/week. A standardized file and folder naming system is used to help with semi-automated scale bar insertion, batch upload into Specify, and downstream data quality control issues. Imagers also note identification and other curatorial updates in a logbook while imaging; these updates are later hand keystroked into Specify. Any uncataloged specimens identified during imaging are tagged and passed back to a mini-curation module, with the possibility of being returned to the imaging module. The data cleanup module includes standardization of date formats and type status terminology, and updating determinations and body descriptions in Specify. Backup copies of images and data are made on a monthly basis, or more often if needed. A written protocol for this workflow has been developed and revised over the past year.

Special Interest Group Session

TH 05/21/2015 01:30 PM

### WEDIGBIO: WORLDWIDE ENGAGEMENT FOR THE DIGITIZATION OF BIOCOLLECTIONS

**Kimberly, Paul G.**, Collections Program, Smithsonian Institution, National Museum of Natural History, 10th and Constitution Ave NW, Washington DC, 20560; kimberlyp@si.edu; **Flemons, Paul K. J.**, Australian Museum Research Institute, Australian Museum 6 College Street Sydney NSW 2010 Australia; **Guralnick, Robert P.**, Department of Ecology and Evolutionary Biology, University of Colorado Museum of Natural History, Henderson Building, 15th and Broadway, Boulder, CO 80309; **Mast, Austin R.**, Department of Biological Science, 319 Stadium Drive, Florida State University, Tallahassee, FL, 32306; **Ellwood, Libby**, iDigBio, University of Florida, Gainesville, FL 32611; **Paul, Deborah**, Institute for Digital Information, 234 LSB, Florida State University, Tallahassee, FL 32306; **Love, Kevin J.**, iDigBio, University of Florida, Gainesville, FL 32611

Crowdsourcing as a means of increasing capacity to digitize collections has been adopted by many natural history collections around the world. Transcription centers such as Notes from Nature, DigiVol, the Smithsonian Institution's Transcription Center and Les Herbonautes are now well established, allowing communities to contribute in a way that was not previously possible. Transcription blitzes have dramatically increased the rate of transcription on crowdsourcing sites. Worldwide Engagement for the Digitization of Biocollections (WeDigBio) is a new initiative

to build collaboration between transcription centers and natural history collections around the world. WeDigBio is organizing an event of mass digitization, October 22-25, 2015. The event will focus attention on science, biodiversity and collections to engage and build communities through existing transcription centers. We think this has potential to be an annual event, and with that in mind we plan to start with a modest event, exceed expectations and build on that in subsequent years. The 2015 event will focus on providing a communication and media framework for transcription centers around the world to participate and interact, develop interoperability capabilities and build a critical mass that will deliver significant benefits to the whole biodiversity data community. Please come join us for this one-hour meeting to learn more and discover how you and your institution can get involved.

Contributions Small Nat. Hist. Coll. Symp. 1

TH 05/21/2015 09:10 AM

### SMALL COLLECTIONS WORKING TOGETHER: COLLECTIONSEUCATION.ORG

**Krimmel, Erica R.**, Sagehen Creek Field Station, 11616 Sagehen Rd, Truckee CA 96161; ekrimmel@gmail.com; **Morris, Ashley B.**, Middle Tennessee State University, 1301 E Main St, Murfreesboro, TN 37130; **Marsico, Travis D.**, Arkansas State University, 2105 E Aggie Road, Jonesboro, AR 72401; **Monfils, Anna K.**, Department of Biology, Central Michigan University, Mt. Pleasant, MI 48859; **Ruhfel, Brad R.**, Eastern Kentucky University, 521 Lancaster Ave, Richmond, KY 40475; **Linton, Debra L.**, Central Michigan University, 1200 S Franklin St, Mt Pleasant, MI 48859

Because small natural history collections often depend heavily on the motivation and inspiration of only one or several individuals, collaborations between such collections is essential. CollectionsEducation.org is the result of a cross-collection collaboration between five herbarium managers at five diverse institutions. The project designed a curriculum for an updated university-level botany course that integrates traditional taxonomic practices, ongoing citizen science initiatives, and digital-age herbarium curatorial skills. This course was taught by two of the collaborators in Fall 2014 and two in Spring 2015. Through it, students produced research-grade observations that have already become part of our national biodiversity archive, and moreover, the students created research-ready plant collections that can more readily be accessioned by the curators into valuable, accessible specimens with less backlog time than many standard student-to-herbarium workflows. This presentation will cover a brief overview of our collaboration process, as well as research findings demonstrating the success of, and areas for further improvement in, our curriculum.

Spec. Full Circle Symp. 1

W 05/20/2015 09:30 AM

### MINING HERBARIUM DATABASES TO DISCOVER PLANT SPECIES ASSOCIATIONS IN CENTRAL ARIZONA

**Lafferty, Daryl L.**, School of Life Sciences, Arizona State University, 1151 S Forest Ave., Tempe, AZ 85287; dlaffe@asu.edu; **Landrum, Leslie R.**, School of Life Sciences, Arizona State University, 1151 S Forest Ave., Tempe, AZ 85287

The SEINet database of herbarium specimens was queried to discover associations between 81 species of trees and shrubs of central Arizona based on the associated species field and coordinate data. Mathematical techniques to quantify associations were developed. Many associations correspond to previously

described biotic communities (e.g., Rocky Mountain Subalpine Conifer Forest, Southwestern Interior Chaparral, Sonoran Desertscrub). Various approaches to using data, programming and presenting results are demonstrated and discussed. Non-plant organisms (e.g., mammals, insects, fungi) can be included in an analysis if there are sufficient adequately georeferenced specimens. The programs show promise for developing whole community concepts based on museum specimen data of all kingdoms of organisms.

DemoCamp Session

TH 05/21/2015 03:30 PM

### **THE NEW VIRTUAL SILURIAN REEF; HOW BUILDING A WEBSITE WITH THE MUSEUM'S DATABASE CAN STREAMLINE WEB DEVELOPMENT**

**Lambruschi, Marc**; Department of Technology, The Field Museum of Natural History, 1400 South Lake Shore Dr., Chicago, IL 60605; mlambruschi@fieldmuseum.org; **Webbink, Kate**, Department of Technology, The Field Museum of Natural History, 1400 South Lake Shore Dr., Chicago, IL 60605; **Grant, Sharon**, Department of Technology, The Field Museum of Natural History, 1400 South Lake Shore Dr., Chicago, IL 60605; **Mayer, Paul**, Fossil Invertebrates, The Field Museum, 1400 South Lake Shore Dr., Chicago, IL 60605; **Coorough Burke, Patricia**, Geology Department, Milwaukee Public Museum, 800 W. Wells Street, Milwaukee WI 53233; **Herbst, Pete**, Action Center, The Field Museum of Natural History, 1400 South Lake Shore Dr., Chicago, IL 60605

Digitizing collections enables a vast amount of information to be accessible to a wide audience. With funding from the Grainger Digital Initiative, The Field Museum has been hard at work digitizing a portion of its 25 million objects. However, presenting this information digitally to the web can bring a new set of problems regarding time and effort for the collections staff. This demonstration will use The Virtual Silurian Reef to highlight how collection staff can use a combination of EMu collections management software and a Drupal-integrated SOLR core to simplify the process of web development.

Starting from the initial data entry, we will go over what is currently in the database along with mapping the previous websites structure to be compatible with EMu's Narratives Module. In order to streamline the process of publishing data, we will also demonstrate how the new SOLR core module for Drupal connects a field in EMu to a location on a webpage. Finally we will demonstrate how collection staff can use EMu to update content and publish directly to the website.

From the data entry to final website product, we will address how this approach can help save time and effort while making collections and research more accessible to the public.

General Session 5

TH 05/21/2015 11:30 AM

### **STITCHING DATA TOGETHER**

**Landis, Margaret L.**, Paleobotany, Micropaleontology, & Mineralogy Collection, Sam Noble Oklahoma Museum of Natural History, 2401 Chautauqua Ave. Norman, OK 73072-7029; paleocatstar@ou.edu; **Lupia, Richard A.**, Paleobotany, Micropaleontology, & Mineralogy Collection, Sam Noble Oklahoma Museum of Natural History, 2401 Chautauqua Ave. Norman, OK 73072-7029

Legacy specimens with less than ideal data by modern standards may have more value and data than thought. Legacy data come in a variety of formats (e.g. field notes, processing records, labels,

photos) and sources (e.g. collectors, researchers, conservators). Most legacy data are analog data that may or may not have retained association with specimens. Each of these formats and sources can provide "pieces" of the "overall" specimen data. These "pieces" may not be currently associated with a specimen's record in a database, giving a false sense that there is no value for that field. As these original and/or legacy data sources are digitized, it becomes easier to discover the connections between these data sources, thereby allowing collection data to be virtually "stitched" together to give specimens back their complete records. For instance, a limited label specimen, can be linked to field notes on the locality. Those field notes reference a publication, which the Collection has. The Collection's copy of the publication copy provides both additional geological information and a handwritten note referring to processing records. Those processing records have abbreviations that now make sense from the methods section of the publication as well as a higher degree of accuracy in identification and an identity to the specimen (as the processing record had no specimen number recorded). The specimen which had been known at a higher taxonomic level can now be identifies to genus. This process results in more complete, useful specimens and greater research value for these legacy specimens.

Spec. Full Circle Symp. 2

W 05/20/2015 04:30 PM

### **THE PROCESSES, END USES AND UNEXPECTED BONUSES OF HIGH RESOLUTION IMAGING OF ENTOMOLOGY COLLECTION ITEMS**

**Lillywhite, Peter K.**, Entomology-Arachnology, Museum Victoria, GPO Box 666, Melbourne 3001, Victoria, Australia; plwhite@museum.vic.gov.au

High resolution digital imaging techniques are becoming common place in natural history museums. From the use of single shot through to both vertical and horizontal multi-image stacking processes the creation of very detailed, often highly magnified reproductions of collection items are been created. Museum Victoria (MV) used these multi-images stacking techniques initially to create an online identification systems for Australian biosecurity use; the Pest and Diseases Image Library (PADIL). Although created for use within Australia, at last count there were over 70 countries using PADIL. From there MV went on to record their Insect Primary types (pinned) and, more recently, experimented with a multi-shot Hasselblad to create 1GB images of whole draws of insects.

Images are now being used to supplement and, in many cases, replace physical borrowing of fragile, irreplaceable type material. These type images also appear on MV's Collections Online and the Atlas of Living Australia websites. MV Ant type images can be found on Antweb as well.

Ultimately it is envisioned that virtual collections mirroring the real thing will become possible. NM will pilot this featuring the 60 draws that make up their Australian Buprestidae (Jewel beetles) reference collection. Inspection will be available of a whole draw, zooming in to view specimen trays of single species and further opening up to a high resolution image of a representative specimen. It is theoretically possible to create such virtual draws from multiple sources enabling investigators to view the entire multi-institutional holdings of a taxonomic group.



## INSECT: AN INNOVATIVE TOOL FOR AUTOMATING DIGITIZATION OF NATURAL HISTORY COLLECTIONS

**Livermore, Laurence**, Natural History Museum, Cromwell Road, London SW7 5BD UK; l.liver-more@nhm.ac.uk; **Blagoderov, Vladimir**, Natural History Museum, Cromwell Road, London SW7 5BD UK; **Hudson, Lawrence**, Natural History Museum, Cromwell Road, London SW7 5BD UK; **Price, Benjamin**, Natural History Museum, Cromwell Road, London SW7 5BD UK; **Warner, Hillery**, Natural History Museum, Cromwell Road, London SW7 5BD UK; **Smith, Vincent**, Natural History Museum, Cromwell Road, London SW7 5BD UK

Entomological specimens make up a significant proportion of natural history collections: at the Natural History Museum, London over 30 million of the 80 million specimens are pinned insects. Currently the cost and time required to digitize these collections are relatively high. Whole drawer scanning has been a potential low-cost method for effective mass digitizing pinned insects but has limited practical use without software to rapidly crop and annotate individual specimens.

As part of the European Commission-funded SYNTHESYS project (<http://www.synthesys.info/>) we have developed a cross-platform open-source application, Insect, that automates selection of specimens using image processing algorithms. In addition Insect supports streamlined manual specimen selection, specimen reviewing and metadata annotation.

We have used Insect to segment and annotate images of the entire pinned Ephemeroptera collection at the Natural History Museum as part of a concerted curatorial, databasing and data publication project. Rapid capture and annotation of the dorsal habitus image of each specimen in the collection has facilitated efficient specimen databasing in the museum's collections management system, allowed remote examination of the collection and streamlined loan requests.

We will discuss: the development and features of Insect; the application of Insect in digitizing an entomological collection; and future applications of Insect and automated imaging in natural history collections.

General Session 4

W 05/20/2015 02:50 PM

## KURATOR: AN EXTENSIBLE, OPEN-SOURCE WORKFLOW PLATFORM FOR USERS AND MAKERS OF DATA CURATION TOOLS

**Ludäscher, Bertram**, University of Illinois at Urbana-Champaign, 501 E Daniel ST, Champaign, IL 61820; ludaesch@gmail.com; **Hanken, James**, Museum of Comparative Zoology, Harvard University, 26 Oxford ST, Cambridge, MA 02138; **Lowery, David**, Museum of Comparative Zoology, Harvard University, 26 Oxford ST, Cambridge, MA 02138; **Macklin, James A.**, Agriculture and Agri-Food Canada, 960 Carling Ave. Ottawa, Ontario K1A 0C6, Canada; **McPhillips, Timothy M.**, University of Illinois at Urbana-Champaign, 501 E. Daniel ST, Champaign, IL 61820; **Morris, Paul J.**, Museum of Comparative Zoology, Harvard University, 22 Divinity Ave, Cambridge, MA 02138; **Morris, Robert A.**, Harvard University Herbaria, 22 Divinity Ave, Cambridge, MA 02138; **Song, Tianhong**, Department of Computer Science, University of California Davis, 1 Shields Ave, Davis CA 95616

The recently funded Kurator project builds upon earlier experiences with workflow-based approaches for quality control of biodiversity data. We are developing workflow components ("actors") to examine data collections and perform checks, e.g.,

on scientific names, name authorship, collecting date, collector name (recorded by), georeference, locality, and phenological state (where applicable). Kurator is based on a number of ideas: 1) We allow "cleaning data with data": In addition to checking the internal consistency of records, we can employ external resources to spot quality issues and suggest repairs. 2) Human curators remain in control: Kurator tools keep track of processing history and data lineage (computational provenance) to show original records, alternative forms and the respective sources, thus allowing human curators to make informed decisions about which suggested repairs and flagged records require action. 3) Kurator aims to serve both makers of data curation tools and end users. Initially, we are focusing on a modular, easily extensible approach to data curation workflows and scripts so that curation tool makers (ourselves included) are empowered to quickly develop new curation functionality. We also need to expose curation sources and curation logic to make programming of new features easy and transparent. In the second phase, the Kurator toolkit will also include a web interface for end users who might not be programmers or tool makers themselves. The ultimate goal is to allow users who don't think of themselves as tool makers to build more complex curation workflows from simple components, thus diminishing the gap between makers and users.

DemoCamp Session

TH 05/21/2015 04:50 PM

## YESWORKFLOW: HOW TO RENDER A DATA CURATION SCRIPT AS A WORKFLOW IN UNDER 10 MINUTES

**Ludäscher, Bertram**, University of Illinois at Urbana-Champaign, 501 E Daniel ST, Champaign, IL 61820; ludaesch@gmail.com; **McPhillips, Timothy M.**, University of Illinois at Urbana-Champaign, 501 E. Daniel ST, Champaign, IL 61820; **Song, Tianhong**, Department of Computer Science, University of California Davis, 1 Shields Ave, Davis CA 95616; **Hanken, James**, Museum of Comparative Zoology, Harvard University, 26 Oxford ST, Cambridge, MA 02138; **Lowery, David**, Museum of Comparative Zoology, Harvard University, 26 Oxford ST, Cambridge, MA 02138; **Macklin, James A.**, Agriculture and Agri-Food Canada, 960 Carling Ave. Ottawa, Ontario K1A 0C6, Canada; **Morris, Paul J.**, Museum of Comparative Zoology, Harvard University, 22 Divinity Ave, Cambridge, MA 02138; **Morris, Robert A.**, Harvard University Herbaria, 22 Divinity Ave, Cambridge, MA 02138

Workflow management systems offer features for composing complex computational pipelines from modular building blocks, for executing the resulting automated workflows, and for recording the provenance of data products. Despite these advantages, many automated scientific and data curation workflows continue to be implemented as scripts, e.g., in Python. We are developing YesWorkflow (YW), an open source toolkit that aims to provide users of scripting languages with many of the benefits of scientific workflow systems. The key idea is to annotate existing scripts with special comments that reveal relevant workflow structure and dataflow otherwise implicit in these scripts. YW tools then extract and analyze these comments, and represent this information in terms of entities of a typical scientific workflow model.

We will give a live demonstration of a simple data curation script (e.g., to validate scientific names, georeferences, etc.) that wasn't written with workflow automation in mind. We then show how a simple comment-based annotation of the script is used by YW to yield three different graphical workflow views, i.e., a data-oriented, process-oriented, and a combined workflow view. We also illustrate the modeling freedom that a script writer has by showing different levels of annotation, resulting in higher level



or more detailed workflow graphs. Workflow views are rendered using a third-party graph layout tool. Future YW versions will allow the prospective provenance of data products of curation scripts to be queried in ways similar to those available to users of scientific workflow systems.

General Session 1

W 05/20/2015 11:50 AM

### INTRODUCING SEQDB FOR COMPREHENSIVE MANAGEMENT OF SPECIMEN-DERIVED DNA SEQUENCES

**Macklin, James A.**, Agriculture and Agri-Food Canada, 960 Carling Ave. Ottawa, Ontario K1A 0C6, Canada; james.macklin@gmail.com; **Bilkhu, Satpal**, Agriculture and Agri-Food Canada, 960 Carling Ave. Ottawa, Ontario K1A 0C6, Canada; **El-Kayssi, Nazir**, Agriculture and Agri-Food Canada, 960 Carling Ave. Ottawa, Ontario K1A 0C6, Canada; **Lewis, Christopher T.**, Agriculture and Agri-Food Canada, 960 Carling Ave. Ottawa, Ontario K1A 0C6, Canada

Agriculture and Agri-Food Canada (AAFC) Ottawa is home to a world-class taxonomy program based on Canada's national agricultural collections for Botany (DAO), Mycology (DAOM & CCFC) and Entomology (CNC). These collections are valuable resources for authoritative identification material in DNA barcoding, metagenomic sequence identification and whole genome sequencing applications. AAFC's internally developed sequence and specimen management web application, SeqDB, manages source specimen information, DNA extractions, PCR reactions, and sequence reactions leading to DNA sequences. The database adheres to the Biodiversity Information Standards (TDWG) Darwin Core standard, as well as the Genome Standards Consortium (GSC) Minimum Information about any (X) Sequences (MIxS) specification. AAFC is also a core member of the international DINA Consortium who are developing a new, modern and open source, web-based collection management system for gathering, managing and sharing data associated with natural history collections. This system will consist of a collection of components integrated through web services APIs. Collection housing institutions will be able to utilize desirable functionality, extend the system with custom modules and integrate with external components and systems. AAFC is in the process of making SeqDB open source and will contribute it as a DNA module for DINA.

Poster Session 2

W 05/20/2015 PM

### WHAT ARE \*YOUR\* DATA CURATION CHALLENGES? PLEASE TELL US!

**Macklin, James A.**, Agriculture and Agri-Food Canada, 960 Carling Ave. Ottawa, Ontario K1A 0C6, Canada; james.macklin@gmail.com; **Hanken, James**, Museum of Comparative Zoology, Harvard University, 26 Oxford ST, Cambridge, MA 02138; **Lowery, David**, Museum of Comparative Zoology, Harvard University, 26 Oxford ST, Cambridge, MA 02138; **Ludäscher, Bertram**, University of Illinois at Urbana-Champaign, 501 E Daniel ST, Champaign, IL 61820; **McPhillips, Timothy M.**, University of Illinois at Urbana-Champaign, 501 E. Daniel ST, Champaign, IL 61820; **Morris, Paul J.**, Museum of Comparative Zoology, Harvard University, 22 Divinity Ave, Cambridge, MA 02138 **Morris, Robert A.**, Harvard University Herbaria, 22 Divinity Ave, Cambridge, MA 02138, **Song, Tianhong**, Department of Computer Science, University of California Davis, 1 Shields Ave, Davis CA 95616

The Kurator project, recently funded by the National Science

Foundation, is developing a novel, extensible, open-source toolkit (Kurator) for automated and semi-automated workflows with diverse curation services to aid downstream biodiversity research and other applications. The considerable challenges to digitizing natural science collections in the U.S. and globally necessitate a focus on digitization efficiencies, but the quality of the data produced and its fitness for purpose remain paramount for research. Kurator will consist of both a user-friendly web interface for users to configure and launch workflows while maintaining provenance, and a workflow platform for rapid development of new curation services and workflow variants. Thus, it will be valuable to data curators with novice to expert informatics skill. We are currently focused on components ("actors" in workflow speak) which evaluate scientific names, georeferences and collectors/authors using a combination of authoritative services available from the community and the "data cleaning data" principle. The output of a user-constructed workflow will include a "clean" data set with metadata to support any validation, recommendations, and uncertainties based on the services evoked along with a provenance trail to insure transparency and reproducibility. Members of SPNHC represent our frontline users, many of whom are responsible for data curation. So don't be shy, and tell us about the challenges \*you\* have with your data and what functions or tools would really help you out! We will use your input to help set priorities, so please "annotate" our poster or follow the barcode on it to our virtual poster and share your suggestions, hopes, and dreams with us!

General Session 2

W 05/20/2015 11:50 AM

### VERTEBRATE ZOOLOGY AT THE ILLINOIS STATE MUSEUM

**Mahoney, Meredith J.**, Research & Collections, Illinois State Museum, 1011 East Ash ST, Springfield, IL 62703; mjmahoney@museum.state.il.us

The Illinois State Museum, established in 1877, is an accredited museum system with six facilities located throughout the state. The Illinois State Museum collections are comprehensive, combining natural history (zoology, botany, and geology) with anthropology and the visual arts to tell the story of the land, life, people, and art of Illinois. The vertebrate zoology collections (~58,500 specimens) comprise fish, amphibians, reptiles, birds (including eggs and nests), and mammals. Other zoology collections include insects (52,000 specimens), spiders (2,600), freshwater snails and mussels (30,000), and marine mollusks (60,000). Within the vertebrate collections, a key strength is the comparative osteology collection focused on Midwestern United States fauna. Skeletal materials constitute about half of the cataloged specimens and are used for research in zoology, paleontology and zooarchaeology. Another significant component of the collection is a diverse group of taxidermy mounts. These mounts have come from donations, former exhibits, and orphan collections. They are used in temporary and permanent exhibits as well as public educational programs and are very popular on 'behind the scenes' tours. The vertebrate collections database was recently converted to Specify Software. This transition became the impetus for a systematic inventory of the collections conducted primarily by volunteers and interns and supervised by the collections curator. Future goals are to make the collections publicly searchable online and add to a "virtual museum" through digitization efforts, photography plus 3D-scanning and printing.

### RESTORING NATURAL HISTORY COLLECTIONS OF NATIVE AMPHIBIANS AND REPTILES IN SOUTH DAKOTA

**Maltaverne, Gabrielle A.**, Department of Natural Resource Management, South Dakota State University, Brookings, SD 57007; Gabrielle.Maltaver-ne@jacks.sdstate.edu

This project involved the construction and restoration of two small natural history and teaching collections located at South Dakota State University and Oak Lake Field Station. It also contributed to collections and academic research at the University of South Dakota and Black Hills State University. The primary objective of this project was to generate a complete teaching collection for the Survey of Reptiles and Amphibians course taught at South Dakota State University. Secondary objectives included finding innovative ways to utilize teaching collections that will encourage future research and conservation efforts. Combining field and laboratory identification techniques with citizen science training, students in this course were introduced to several ways they could contribute to global conservation efforts. With global declines of amphibian and reptile populations on the rise, there is an increased need for understanding biological diversity. Having these natural history collections establishes a foundation for this understanding and will ultimately aid future research and conservation efforts in this region.

General Session 3

W 05/20/2015 01:30 PM

### COOPERATIVE PROTECTION OF SENSITIVE SPECIES DATA: A PARTNERSHIP BETWEEN NATURAL HERITAGE PROGRAMS AND THE COLLECTIONS COMMUNITY IN THE NORTHEASTERN USA

**Marcus, Aaron**, Vermont Fish & Wildlife Department, Wildlife Diversity Program, 1 National Life Drive, Davis 2, Montpelier, VT 05620-3702; **Allard, Dorothy J.**, University of Vermont Plant Biology Department, Pringle Herbarium, 27 Colchester Ave., Burlington, VT 05405; djallard@uvm.edu; **Sweeney, Patrick**, Yale University Herbarium, Peabody Museum of Natural History, Yale University, 170-210 Whitney Avenue, New Haven, CT 06511; **Gilbert, Edward**, Arizona State University, School of Life Science, PO Box 874501, Tempe, AZ 85287-4501; **Popp, Robert**, Vermont Fish & Wildlife Department, Wildlife Diversity Program, 1 National Life Drive, Davis 2, Montpelier, VT 05620-3702

As we move forward with digitization of collections and release of data over the internet, the potential consequences of greater access to locality information for rare and endangered species has become a concern for biologists in state agencies and other conservation organizations whose job it is to track, manage and protect these populations. To address this concern, a partnership has been formed between members of the Consortium of Northeast Herbaria, the staff of several Natural Heritage Programs in New England, and the Symbiota Software Project. We are working together to identify plant species on a state by state basis that may benefit from locality data protection, and to develop methods to limit the availability of these data in Symbiota portals. This paper will discuss the methods being used and the progress of the work to date.

Contributions Small Nat. Hist. Coll. Symp. 2 TH 05/21/2015 04:50 PM

### THE ROLE OF SMALL NATURAL HISTORY COLLECTIONS IN CONTRIBUTING TO UNDERSTANDING SPECIES' DISTRIBUTIONS

**Marsico, Travis D.**, Department of Biological Sciences, Arkansas

State University, PO Box 599, State University, AR 72467; tmarsico@astate.edu; **Caron, Jeremy J.**, Department of Biology, Central Michigan University, Mt. Pleasant, MI 48859; **Carter, Richard**, Department of Biology, Valdosta State University, Valdosta, GA 31698; **Gillespie, Emily**, Department of Biological Sciences, Marshall University, 1 John Marshall Drive, Science Building Room 350, Huntington, WV 25755; **Krimmel, Erica**, Sagehen Creek Field Station, University of California, Berkeley, PO Box 939, Truckee, CA 96160; **McCauley, Ross**, Department of Biology, Fort Lewis College, Durango, CO 81301; **Morris, Ashley B.**, Department of Biology, Middle Tennessee State University, MTSU Box 60, Murfreesboro, TN 37132; **Nelson, Gil**, iDigBio, Florida State University, College of Communication and Information, Tallahassee, FL 32306; **Monfils, Anna K.**, Department of Biology, Central Michigan University, Mt. Pleasant, MI 48859

How do small natural history collections contribute to our understanding of biodiversity patterns through space and time? To begin addressing this question, collaborators in eight states (AR, CA, CO, FL, GA, MI, TN, and WV) gathered vouchered vascular plant collection information from large and small institutions in their respective states. In each state, 40 species were randomly selected, 10 from each of four categories: rare S1, rare S2, common native, and invasive. Collection data were partitioned by size of herbarium into two classes, large (>100,000 specimens) and small (<100,000 specimens) collections. From the resulting data sets, occurrence data were analyzed by collection size, county, specific locality, and date of collection. The four species categories were compared to determine the relative contribution of small collections to the distribution information available in the states. We found that small collections contribute to county-level and even more so to site-level spatial distribution knowledge, and that the proportion of these contributions differ by state, species category, and geographic focus and research interests of personnel from individual collections. Our study quantifies and summarizes the patterns. We conclude that small collections are important, often uniquely so, in documenting distribution of species through space and time. Therefore, in order to accurately characterize biodiversity, it is imperative to include small collections in national digitization and data sharing efforts.

Plenary Session

T 05/19/2015 10:30 AM

### WEDIGBIO—PUBLIC PARTICIPATION IN DIGITIZATION OF NATURAL HISTORY COLLECTIONS HITS ITS STRIDE

**Mast, Austin R.**, Department of Biological Science, Florida State University, 319 Stadium DR, Tallahassee, FL 32306; amast@bio.fsu.edu

Public participation has recently emerged as an important strategy for closing digitization backlogs, sustaining digitization beyond project funding cycles, increasing biodiversity science literacy, and increasing local support for collections. As just one example, the >100 herbaria in the Southeastern Regional Network of Expertise and Collections (SERNEC) project are using the online public participation site Notes from Nature (NfN) to transcribe >3 million specimens. A 2015 BioScience article by Libby Ellwood and colleagues provides an overview of developments in this area, including the first workshop on the topic in 2012 and work to build critical cyberinfrastructure (e.g., two hackathons and biospex.org at iDigBio). At the 2014 CITStitch Hackathon, representatives from three online transcription sites (Paul Flemons from Atlas of Living Australia's DigiVol, Paul Kimberly from the Smithsonian Transcription Center, and Rob Guralnick from NfN) and Austin Mast, Libby Ellwood, Deborah Paul, and Kevin Love from iDigBio

fleshed out a plan to capitalize on developments in this area by organizing an annual global transcription blitz starting in Fall 2015. The event—WeDigBio (Worldwide Engagement for Digitizing Biocollections)—is planned to engage both widely distributed participants and participants in transcription parties at collections. The latter can be used to strengthen local support for collections and biodiversity research. For example, SERNEC held its first public digitization blitz at Florida State University's Robert K. Godfrey Herbarium in 2014, which the herbarium then used to launch a successful crowdfunding campaign. I will reflect on these activities and suggest new directions for collaborations and research in the field.

Spec. Full Circle Symp. 3

TH 05/21/2015 11:30 AM

### **FOLLOW A FOSSIL FULL CIRCLE FROM COLLECTION TO RESEARCH TO OUTREACH AND INTERPRETATION THROUGH THE FIELD MUSEUM'S SILURIAN REEF DIGITIZATION PROJECT**

**Mayer, Paul S.**, The Field Museum, Gantz Family Collection Center, 1400 South Lake Shore Drive, Chicago, IL 60605; pmayer@fieldmuseum.org; **Layng, Alex P.**, The Field Museum, Gantz Family Collection Center, 1400 South Lake Shore Drive, Chicago, IL 60605; **Albright, Kathryn**, The Field Museum, Gantz Family Collection Center, 1400 South Lake Shore Drive, Chicago, IL 60605; **Manzuk, Ryan**, The Field Museum, Gantz Family Collection Center, 1400 South Lake Shore Drive, Chicago, IL 60605

A tropical sea covered the Great Lakes region 430 million years ago. The richest biodiversity communities the world had seen up until then thrived around 100-meter tall reefs built by stromatoporoids and tabulate corals. The reefs were buried as environmental conditions changed, preserving hundreds of different species. Many Silurian fossils were collected while the Chicago Drainage Canal was excavated during the 1890s. The fossils were cataloged, assigned a number, and labeled, and they have been part of the Field Museum's collection for over 120 years, resulting in over 300 scientific publications.

The specimens are being digitized as part of a 3-year IMLS-funded Silurian reef digitization project. The specimens and labels are photographed and label data entered into our EMu database. Digitizing specimens allows researchers to study fossils in new ways, and makes the data available to teachers, students, and the general public. Scientific illustrators use these fossils to interpret how they may have appeared as living animals. Students and teachers will explore and learn about these specimens and the geologic history of Illinois from an educational outreach website generated directly from the database. So far (two out of three summers completed) 9,078 Silurian fossil catalog entries have been created in the database and linked to 7,785 images from the first summer, with 24,828 images generated in the second summer still to be added. Digitization times have been cut nearly in half, the average time dropping from 9 minutes 51 seconds to 4 minutes 41 seconds. These time savings are due to changes in workflow, increased computer/software speed due to upgrades in the database server, and eliminating the need for photo editing by interns.

General Session 5

TH 05/21/2015 11:10 AM

### **RISK UNDER THE MICROSCOPE: RISK MANAGEMENT FOR MUSEUM VICTORIA'S SCIENTIFIC SLIDE COLLECTION**

**Meaday, Danielle**, Conservation, Strategic Collection Management, Museum Victoria, GPO Box 666, Melbourne,

Victoria, 3001 Australia; dmeaday@mus-eum.vic.gov.au; **Cannon, Alice**, Integrated Collection Processes, Strategic Collection Management, Museum Victoria, GPO Box 666, Melbourne, Victoria, 3001 Australia; **Waller, Robert**, Protect Heritage Corp., 622 Simoneau Way, Ottawa, ON K4A 1P4 Canada

Museum Victoria is undertaking an institution-wide comprehensive risk assessment for its collections, adapted from the Cultural Property Risk Assessment Model (CPRAM), and implemented as a five year cycle. The risk assessment of the museum's collection of microscope slides presented a variety of challenges due to the complex and varied materiality of the specimens and their storage environments. Approximately 78% of the microscope slide collection is currently unregistered, and there is limited digital documentation of specimens and their data. Failing adhesives, faded ink inscriptions and conservation issues arising from incompatible storage materials, such as Byne's disease, are among the risks identified.

The project benefited from the successful collaboration of collections, conservation and facilities management staff and utilized existing condition reports and brief surveys to extrapolate the data required to complete the assessment. The completed risk profile details the most pressing risks to the microscope slides as a discrete collection and as a component of the state collection as a whole. These assessments are invaluable in directing the allocation of resources for the preventative care of the state collection, and become the baseline to build upon in the next cycle. This paper will discuss the process and experience of applying the risk assessment model to the slide collection, the results and identified mitigation strategies.

Poster Session 4

TH 05/21/2015 PM

### **INVESTIGATING CALCIUM GROWTHS IN MUSEUM VICTORIA'S FLUID-PRESERVED MARINE INVERTEBRATE COLLECTION**

**Meaday, Danielle**, Conservation, Strategic Collection Management, Museum Victoria, GPO Box 666, Melbourne, Victoria, 3001 Australia; dmeaday@mus-eum.vic.gov.au; **Goodall, Rosemary**, Conservation, Strategic Collection Management, Museum Victoria, GPO Box 666, Melbourne, Victoria, 3001 Australia; **Taylor, Joanne**, Marine Invertebrates, Sciences, Museum Victoria, GPO Box 666, Melbourne, Victoria, 3001 Australia; **MacKenzie, Melanie**, Marine Invertebrates, Sciences, Museum Victoria, GPO Box 666, Melbourne, Victoria, 3001 Australia; **Rowley, Chris**, Marine Invertebrates, Sciences, Museum Victoria, GPO Box 666, Melbourne, Victoria, 3001 Australia; **Walker-Smith, Genefer**, Marine Invertebrates, Sciences, Museum Victoria, GPO Box 666, Melbourne, Victoria, 3001 Australia

Inside a fluid preserved specimen's jar, organic materials leach from animals into the preserving fluid, creating a unique micro-environment of chemical interactions. Two varieties of unusual white growths, attributed to a reaction between organic acids and calcium carbonate from specimen's cuticles, have been observed in ethanol preserved specimens from Museum Victoria's Marine Invertebrate Zoology Collection. The first, a cottony white suspension in the fluid, was initially suspected to be fungal growth. The second variety presented as series of hard spherical growths forming on and beneath the exoskeleton of crustacean specimens. Analysis of samples from effected jars with Fourier Transform Infrared Analysis (FTIR) identified the growths as being composed of calcium lactate and calcium stearate. These results provided a baseline of data from which to investigate this issue. The research considers the specimens' molt cycles and internal



calcium availability, and the circumstances of the preparation, fixation and preservation specific to these specimens which contribute to the generation of the growths. Future analytical pathways discussed in this poster will inform the conservation treatment and management of these specimens.

Contributions Small Nat. Hist. Coll. Symp. 1 TH 05/21/2015 09:30 AM

### **CITIZEN SCIENCE: A SYMBIOTIC FUTURE FOR RESEARCH AND EDUCATION USING BIOLOGICAL COLLECTIONS**

**Meineke, Emily K.**, Entomology, North Carolina State University, Campus Box 7613, Raleigh, NC 27695-7613; emily.meineke@gmail.com; **Frank, Steven D.**, Entomology, North Carolina State University, Campus Box 7613, Raleigh, NC 27695-7613

Museum collections offer a lens into the past and a way to predict the future. These functions are especially valuable now as we try to anticipate how biodiversity will change with global shifts in climate and land use. Collections also offer a way to learn about the species that live with us in our most immediate environments, species that arguably should have the most pronounced effects on our wellbeing. Several recent projects leverage small collections from the past and larger, more recent collections built by the public to ask questions in biology while connecting citizens to native biodiversity. At NCSU, we house several such projects at various stages of development that use large and small collections for education. The most developed project, School of Ants, forged new symbioses between science and education. The most nascent of our projects will use herbaria to track herbivory across unprecedented scales of space and time. Here, we present this project as an example of how traditional research on small collections can be expanded to include a public component that builds larger collections and involves K-12 students in science.

Contributions Small Nat. Hist. Coll. Symp. 2 TH 05/21/2015 04:30 PM

### **A LIST OF U.S.-BASED NATURAL HISTORY COLLECTIONS**

**Michonneau, François**, iDigBio, Florida Museum of Natural History, Gainesville, FL 32611-7800; francois.michonneau@gmail.com; **Page, Larry**, iDigBio, Florida Museum of Natural History, Gainesville, FL 32611-7800

While herbaria are listed in an actively managed directory since 1935—the index herbariorum—no similar directory exists for zoological collections. Yet, a comprehensive list of natural history collections is critically needed by the community to facilitate the location of specimens of interest and improve collaboration across institutions. Specifically, this list will allow the identification of collections that are not digitized. Here, we present an initial draft of this list that includes over 1,000 collections across the U.S. We will present an overview of their geographical locations, their taxonomic scope. This list is available on the iDigBio website, and we welcome updates from the community, on the information listed and suggestions for collections that may not be included.

Spec. Full Circle Symp. 1 W 05/20/2015 10:50 AM

### **PROVIDING THE COMPUTING SKILLS FOR THE NEXT GENERATION OF BIODIVERSITY SCIENTISTS**

**Michonneau, François**, iDigBio, Florida Museum of Natural History, Gainesville, FL 32611-7800; francois.michonneau@gmail.com; **Paul, Deborah**, Institute for Digital Information, 234 LSB, Florida State University, Tallahassee, FL 32306

Global change and the biodiversity crisis define our times, yet several knowledge gaps remain in our understanding of the biosphere. Species ranges, the ecological and evolutionary factors that limit these ranges, and how anthropogenic activities impact these ranges are poorly understood. In addition, for many groups, species limits and the amount of cryptic diversity are difficult to evaluate. Technological advances both in DNA sequencing and computing technologies are facilitating the documentation of biodiversity. For instance, the aggregation of museum records across institutions, in conjunction with niche modelling, enables the creation of more accurate distribution maps. DNA sequence analysis is now part of the taxonomists' toolkit, and is commonly used to identify complexes of cryptic species. However, to take advantage of the full potential of these approaches, collecting practices need to be adjusted, and new analytical skills need to be taught. Here, we show how tracking specimen and station data from the time of collecting to manuscript publication is allowing the investigation of geographical patterns of diversification in a species complex of sea cucumbers. We will also present how we are developing curriculum and teaching workshops in order to facilitate the use of specimen associated data in biodiversity research by teaching basic computing skills that allow the use of reproducible analyses based on large datasets.

Plenary Session T 05/19/2015 09:00 AM

### **EVIDENCE OF EVOLUTION: DARWIN'S CABINET OF CURIOSITIES**

**Middleton, Susan**, California Academy of Sciences, 4403 A 20th Street 55 Music Concourse Dr., San Francisco, CA 94118; s\_middleton@igc.org

Drawn from her book, "Evidence of Evolution" (Abrams), Susan Middleton's presentation will take viewers into natural history museum collections, sharing her photographs of scientific specimens from the beautiful to the bizarre, which illustrate aspects of Darwin's theory of evolution. Taxonomic specimens serve as the tangible evidence of evolution; they are endless repositories of meaning, limited only by our tools to perceive, and those tools are becoming increasingly more sophisticated. The specimens stay fixed while our understanding grows. As virtual reality predominates in our the modern era, the specimens remain real and authentic. Middleton uses her photographs of taxonomic collections to educate, inspire and delight the viewer.

General Session 2 W 05/20/2015 09:50 AM

### **FOSSIL EXHIBIT EVOLUTION AND SURVIVAL OF THE FITTEST COLLECTIONS MANAGEMENT PLANS: MANAGING THE COLLECTIONS DE-INSTALLATION OF THE SMITHSONIAN NATIONAL MUSEUM OF NATURAL HISTORY FOSSIL HALLS**

**Millhouse, Amanda M.**, Department of Paleobiology, Smithsonian National Museum of Natural History, PO Box 37012, MRC 121, Washington, DC 20013-7012; millhousea@si.edu; **Hollis, Kathy A.**, Department of Paleobiology, Smithsonian National Museum of Natural History, PO Box 37012, MRC 121, Washington, DC 20013-7012

The National Museum of Natural History's Fossil Halls are undergoing the largest and most complex renovation in the Museum's history. Preparing for the opening of the new Fossil Halls is a multi-year process that began in the spring of 2013 and ends with the hall opening in 2019. The first step was planning and executing the de-installation of over 2,000 specimens spread across 30,000 square-feet.



Paleobiology Collections Management was responsible for developing workflows for de-installing specimens (specimen removal, photography, housing, tracking, and data collection), determining the best order to de-install specimens, and updating all exhibit specimen records. We tried to do as much contingency planning before work began, and often our best-laid collections management plans were completely revised. On the surface, data collection and updates to the database seemed like a simple matter, but many exhibit specimens lacked databased catalog records, or had significant data and numbering errors and inconsistencies. De-installation timing often involved organizing the schedules of 10 separate teams that needed access to the specimens or exhibit area before, during, and after de-installation. Having flexible plans allowed us to handle contingencies as they arose.

After being de-installed, specimens were moved into a newly renovated 13,000 square-foot space for staging and long term storage. We developed a flexible floor plan that allowed the space to evolve along with the project. Our detailed planning of both the de-installation and storage space gave Paleo Collections Management the flexibility to quickly adjust to issues that would have otherwise caused long delays.

Poster Session 3

TH 05/21/2015 AM

#### **COLLECTIONS HELP TO CONTROL INVASIVES AT BORDERS**

**Mitrow, Gisèle F.**, Agriculture and Agri-Food Canada, 960 Carling Ave., William Saunders Bldg., Central Experimental Farm, Ottawa, ON K1A 0C6 Canada; gisele.mitrow@agr.gc.ca; **Catling, Paul**, Agriculture and Agri-Food Canada, 960 Carling Ave., Ottawa, ON K1A 0C6, Canada; **Macklin, James A.**, Agriculture and Agri-Food Canada, 960 Carling Ave., Ottawa, ON K1A 0C6, Canada; **Matin, Sara**, Agriculture and Agri-Food Canada, 960 Carling Ave., Ottawa, ON K1A 0C6, Canada; **Smith, Tyler**, Agriculture and Agri-Food Canada, 960 Carling Ave., Ottawa, ON K1A 0C6, Canada; **Ward, Amanda**, Agriculture and Agri-Food Canada, 960 Carling Ave., Ottawa, ON K1A 0C6, Canada; **Côté, Marie-Josée**, Canadian Food Inspection Agency, 3851 Fallowfield, Ottawa, ON, K2H 8P9, Canada; **Kerr, Donald**, Canadian Food Inspection Agency, 3851 Fallowfield, Ottawa, ON, K2H 8P9, Canada; **Blain, Alexandre**, Canadian Food Inspection Agency, 3851 Fallowfield, Ottawa, ON, K2H 8P9, Canada; **Leduc, Lisa**, Canadian Food Inspection Agency, 3851 Fallowfield, Ottawa, ON, K2H 8P9, Canada

Billions of dollars can be saved when organisms potentially dangerous to agriculture and the environment are prevented from entry at country borders. Consequently, a project funded by the Genomics Research and Development Initiative entitled: "Protection of Canadian Biodiversity and Trade from the Impacts of Global Change Through Improved Ability to Monitor Invasive Alien and Quarantine Species" was begun in 2011. The botany component involved collaboration between Agriculture and Agri-Food Canada (AAFC) and Canadian Food Inspection Agency (CFIA). The objective was to ensure accurate identification of organisms at Canadian borders using DNA barcodes along with traditional methods for identification. Herbarium specimens can be used as standards of reference for highly efficient identification using DNA barcodes based on them. Plant specimen sampling started at the AAFC National Collection of Vascular Plants (DAO) and the National Collection at the Canadian Museum of Nature (CAN), but some of the required material in these collections was non-existent or required expert determination. In such cases, the AAFC collection, as part of an international collections network played an important role in locating and requesting loans of the missing targeted species. Experts in AAFC and worldwide were consulted to provide the most accurate identifications. This

project, scheduled to be completed in 2016, includes a total of thirty nine plant species targeted along with their close relatives based on the most recent and comprehensive plant classifications. This project highlights the ever-increasing value and role that collections play including saving money, protecting agriculture and the environment, and serving international policy.

Poster Session 2

W 05/20/2015 PM

#### **THE GLOBAL PLANTS INITIATIVE: DAO HERBARIUM**

**Mitrow, Gisèle F.**, Agriculture and Agri-Food Canada, 960 Carling Ave., William Saunders Bldg., Central Experimental Farm, Ottawa, ON K1A 0C6 Canada; gisele.mitrow@agr.gc.ca; **Macklin, James A.**, Agriculture and Agri-Food Canada, 960 Carling Ave., Ottawa, ON K1A 0C6, Canada; **Cole, Heather**, Agriculture and Agri-Food Canada, 960 Carling Ave., Ottawa, ON K1A 0C6 Canada; **Glendinning, Robert**, Agriculture and Agri-Food Canada, 960 Carling Ave., Ottawa, ON K1A 0C6 Canada

The Global Plants Initiative (GPI) sponsored by the Andrew W. Mellon Foundation is an international collaboration of herbaria and botanical gardens aiming primarily to make botanical type specimen data and high-resolution images publically available. The Agriculture and Agri-Food Canada National Collection of Vascular Plants (DAO) joined this project in 2012 and have completed the digitization of its 5000 type specimen holdings and added over 500 to the number as more types in the collection were discovered. We captured the images of each type using the provided "HerbScan" and databased the label data. An interesting challenge was the transferring annotations made on type folders to the actual herbarium specimen sheets to better preserve them and so that they would appear on the images. DAO also benefited in many ways from this project. Our type specimens were traditionally stored in the open compactor system with the general collections and this gave us an opportunity to transfer these to new herbarium cabinets providing greater protection. As additional information was found, an annotation slip was added to the specimen improving the value of the herbarium material. The GPI project made our management more aware of the risks to irreplaceable material which provided funds for improvements to the collection facilities and a feasibility study for rehousing the herbarium. This initiative will provide DAO a greater exposure of its botanical resources to the global community, and will benefit us as experts provide valuable feedback and annotations based on discovery and digital access to our type specimens.

Spec. Full Circle Symp. 1

W 05/20/2015 11:30 AM

#### **THE DIGITAL ROUNDABOUT: DATA FLOW FROM FIELD PROJECT TO ARCHIVE TO NEW PROJECT**

**Molineux, Ann**, Non-vertebrate Paleontology Lab, Jackson School of Geosciences, The University of Texas at Austin, Pickle Research Campus Bldg 122, 10100 Burnet Road, Austin, TX 78758; annm@aus-tin.utexas.edu; **Appleton, Liath E.**, Non-vertebrate Paleontology Lab, Jackson School of Geosciences, The University of Texas at Austin, Pickle Research Campus Bldg 122, 10100 Burnet Road, Austin, TX 78758

Geological data gathering is increasingly digital, proactive digitization is essential and new ways of using those data are inevitable. This paper examines the flow of data from the standpoint of a repository, illustrating ways in which data is acquired, stored and reused within the realm of the archive itself and the broader research and education, public and academic, domains.

This project is phase two of our efforts to accelerate and

improve the accuracy and efficiency of digital data gathering, and its subsequent inclusion into the active database, providing a more robust resource for subsequent access and reuse. Fresh data may be products of new fieldwork or derived from collections being absorbed into the repository from other sources. Internal templates for pre-database data collection are used within the archive to improve the quality of data entering the database and the efficiency of untrained students and volunteers.

The current range of available information concerning a specimen and its provenance vary widely. Providing a similar template for proactive digitization to students and researchers in the field will encourage more complete future information. The structure of the template spreadsheet facilitates data quality checks and upload of multiple records in a standard format. Spontaneous field observations are expected and connections made to any field samples or images gathered. It a standalone product which does not require internet connection, only a digital input device. The researcher can also travel with an untethered edition of the database, and is able to refer to previously uploaded data.

Contributions Small Nat. Hist. Coll. Symp. 1 TH 05/21/2015 08:10 AM

### **WHY SMALL COLLECTIONS—WHAT IS UNIQUE, VALUABLE AND IMPORTANT?**

**Monfils, Anna K.**, Department of Biology, Central Michigan University, Mt. Pleasant, MI 48859; monf1ak@cmich.edu; **Nelson, Gil**, iDigBio, Florida State University, College of Communication and Information, Tallahassee, FL 32306

The national digitization initiative is gathering momentum, and small natural history collections are joining the effort to data base biodiversity. The inclusion of small collections is critical. Small collections are a valuable data resource and pivotal in training the next generation of collections professionals. Small collections have unique holdings, representative of their field stations, local botanical communities and expertise of their collections staff. Often affiliated with primarily undergraduate educational institutions, small collections have an opportunity to directly engage and train undergraduates in the skills and competencies needed in the next generation of scientists. The inclusion of a diverse group of collections professionals provides the depth and breadth of training to stabilize the digitization effort and insure the growth and continuation of curation science. The outreach potential of small collections can be tailored to the immediate regions, and often involves close association with state and federal agency personnel and local societies. Small collections provide a personal and regional method of advocating for a collections and collection use, and serve an institutional advantage by increasing the profile and networking capacity of the affiliated museum, university or college. This talk will cover recent initiatives and efforts to promote, enhance, and sustain small natural history collections and the unique potential for small collections to advance collections based research, education and outreach.

DemoCamp Session

TH 05/21/2015 04:30 PM

### **A SCIENTIFIC WORKFLOW TOOL FOR TARGETED DATA QUALITY IMPROVEMENT OF NATURAL SCIENCE COLLECTION DATA**

**Morris, Paul J.**, Museum of Comparative Zoology, Harvard University, 22 Divinity Ave, Cambridge, MA 02138; mole@morris.net; **Ludäscher, Bertram**, University of Illinois at Urbana-Champaign, 501 E. Daniel Street, Champaign, IL 61820; **Köhler,**

**Sven**, UC Davis Genome Center, University of California, Davis, 451 Health Sciences Drive, Davis, CA, 95616; **Hanken, James**, Museum of Comparative Zoology, Harvard University, 26 Oxford ST, Cambridge, MA 02138; **Lowery, David**, Museum of Comparative Zoology, Harvard University, 26 Oxford ST, Cambridge, MA 02138; **Macklin, James A.**, Agriculture and Agri-Food Canada, 960 Carling Ave. Ottawa, Ontario K1A 0C6, Canada; **McPhillips, Timothy M.**, University of Illinois at Urbana-Champaign, 501 E. Daniel ST, Champaign, IL 61820; **Morris, Robert A.**, Harvard University Herbaria, 22 Divinity Ave, Cambridge, MA 02138, **Song, Tianhong**, Department of Computer Science, University of California Davis, 1 Shields Ave, Davis CA 95616

Many uses of the biodiversity data associated with natural science collections impose fitness-for-purpose requirements on the accuracy of the scientific names, georeferences, collecting dates and other such information. The Kurator project is developing platforms for the application of data quality control workflows that will enhance such data. We have refined reusable software components (“actors”) that examine data fields related to scientific names, localities, georeferences, collectors and collecting events, and check those fields for internal and logical consistency and against external, authoritative data sources. We will demonstrate validation of a local authority file of scientific names and authors against an external authoritative source of scientific names, using a workflow that combines a data-loading actor, a nomenclaturally oriented scientific name validation actor, and an actor that outputs cleaned results and provenance. We will also demonstrate quality control of a set of specimen data with a workflow that composes actors which load an occurrence file from a DarwinCore archive, validate the scientific names in a taxonomic orientation, validate georeferences, validate collecting event dates, and output enhanced data plus provenance. We will further demonstrate a tool that can post-process this output to a spreadsheet that highlights issues in the data, as reports for scientific data consumers who are most interested in validated parts of the data set, and as reports for data curators who are most interested in actionable problems in the data organized in ways that facilitate data-cleaning tasks. These tools are available for download and are embedded in FilteredPush deployments.

Contributions Small Nat. Hist. Coll. Symp. 2 TH 05/21/2015 03:50 PM

### **THE ROLE OF HUMAN INFRASTRUCTURE IN BIODIVERSITY INFORMATICS: SERNEC AS A MODEL FOR COMMUNITY DEVELOPMENT**

**Murrell, Zack E.**, Department of Biology, Appalachian State University, Boone, NC 28608; murrell-ze@appstate.edu; **Denslow, Michael W.**, Department of Biology, Appalachian State University, Boone, NC 28608; **McKenna, Joseph**, Department of Biology, Appalachian State University, Boone, NC 28608; SERNEC Community

A robust cyberinfrastructure is the foundation of continental and global scale biodiversity informatics data management and mobilization. Although we recognize the value of the human infrastructure involved, we often overlook the complexities of human infrastructure development and maintenance. The SouthEast Regional Network of Expertise and Collections (SERNEC) offers an example of infrastructure development that has been very successful in encouraging and facilitating curators from small and mid-sized herbarium collections to embrace community best practices. We can trace the history of development from regional and state-level efforts over the past century. Within the past decade, this group was funded by NSF as a Research Coordination

Network and then more recently as an NSF ADBC Thematic Collections Network called the “Key to the Cabinets.” We have joined the Society of Herbarium Curators as the Southeast Chapter to provide governance structure for long term sustainability. Our efforts have explored the resource needs of the 233 herbaria in the Southeast US, examined the diversity of expertise associated with these collections, and developed an effective communication structure to facilitate collaborations. Activities have led to collaborations with curators from other taxonomic domains, interactions with state natural heritage programs, and the development of education modules for outreach to primary and secondary schools. We intend to continue these efforts in order to strengthen our interconnections and also our ties within our individual institutions and communities. We perceive that our ongoing efforts can have positive impacts on the health of natural history collections, conservation, science and science education.

Contributions Small Nat. Hist. Coll. Symp. 2 TH 05/21/2015 02:10 PM

### SCNET: SUPPORTING DIGITIZATION IN SMALL NATURAL HISTORY COLLECTIONS

**Nelson, Gil**, iDigBio, Florida State University, College of Communication and Information, Tallahassee, FL 32306; gnelson@bio.fsu.edu; **Monfils, Anna K.**, Department of Biology, Central Michigan University, Mt. Pleasant , MI 48859

The Small Collections Network (SCNet) developed from a series of meetings of curators, managers, and directors of small collections. SCNet is devoted to supporting small to moderately sized natural history collections, especially in specimen digitization and in the mobilization of biodiversity data. Such collections constitute a major source of information for understanding global biodiversity. Typically regional in scope and often with strong ecological, taxonomic, and geographic biases, they may hold specimens that are unduplicated in larger collections and can represent intense samplings of community composition that have the potential to significantly expand our knowledge of landscape-level biogeography. As a result, small collections constitute a singularly important resource for the study of regional and continental ecosystems both past and present. SCNet believes that digitizing and sustaining these collections will expand their accessibility, enhance the impact of the data they generate, ensure incorporation of these data into ongoing biological and paleobiological research, and foster a support network of like-sized institutions.

General Session 6 TH 05/21/2015 03:30 PM

### BROADENING PARTICIPATION IN THE BIOLOGICAL SCIENCES

**Nelson, Gil**, iDigBio, Florida State University, College of Communication and Information, Tallahassee, FL 32306; gnelson@bio.fsu.edu; **Riccardi, Greg**, iDigBio, Florida State University, College of Communication and Information, Tallahassee, FL 32306

During its first two years reaching out to natural history collections, iDigBio, the National Science Foundation’s coordinating center for biodiversity specimen digitization and mobilization, noted extremely low participation of certain populations. Of the 528 iDigBio-sponsored attendees during the first two years of the project, no participant self-reported as black or African American, less than 1% as American Indian, and just under 7% as Hispanic or Latino. In 2000, the US population was 75% white, 12% black, and 12% Hispanic. Yet, during the period 1993-2002 only 2.6% of new PhDs in biology were awarded to black candidates and only 3.7%

to Hispanic candidates, and in 2002 the proportion of tenure-track biology faculty was 89% white, 1% black and 2% Hispanic. In an attempt to address this issue, especially at the undergraduate level, Florida State University was awarded an NSF grant to develop a workshop series targeted to these populations. To date, we have conducted two workshops and a two-day museum shadowing event for undergraduate students. Here, I report on the planning and execution of these workshops and strategies for our third workshop upcoming in October 2015.

Federal Collections Session

W 05/20/2015 03:30 PM

### CHALLENGES AND OPPORTUNITIES FOR THE MANAGEMENT OF U.S. FEDERAL SCIENTIFIC COLLECTIONS

**Norris, Christopher**, 170 Whitney Avenue, Yale University, New Haven, CT 6520; christopher.norris@yale.edu

SPNHC represents a broad community of people who have responsibility for the management of publicly-owned collections in the U.S.A., including both employees of Federal agencies and collections care staff from non-Federal repositories. Recent initiatives both within and outside government have placed new emphasis on the vital importance of these collections as mission-critical science infrastructure for the Nation. At the same time, they have highlighted the many challenges the community faces in improving standards of collection care, documentation, accountability, and usage. In this special session, we will bring together a panel of representatives from collections-holding agencies, non-Federal repositories, and other stakeholders to discuss a variety of issues affecting the management of Federal collections, including permits, repository agreements, collection inventories, intellectual property rights, and the development of best practices. The panel will explore some of the most commonly-encountered problems and consider ways in which communication and collaboration can be improved.

General Session 6

TH 05/21/2015 01:30 PM

### MUCH MORE THAN A “CABINET OF CURIOSITIES:” COMMUNICATING THE VALUE OF COLLECTIONS

**Norris, Christopher**, 170 Whitney Avenue, Yale University, New Haven, CT 6520; christopher.norris@yale.edu

Museums in the 21st Century operate in an environment where increasing pressures on discretionary spending make it ever more critical that we define and articulate the value of the collections that we hold. Outreach and advocacy strategies based solely on public popularity are unlikely to prove effective when museums are measured against essential services such as healthcare and basic education. As a community, we need to develop strategies that show, both qualitatively and quantitatively, how the work of museums supports these essential services, and the unique role we play in doing so. These strategies need to be scalable for all sizes of collections and adaptable for different disciplines. They need to emphasize use over preservation, be forward-thinking rather than backwards-looking, and involve narratives of success not crisis. Finally they need to be based around the concept of the “collection-centered museum,” where education, exhibit, and outreach programs are rooted—and are shown to be rooted—in well-curated and actively-used collections.



## EXPERIENCES WITH SALVAGE AND RESTORATION OF NATURAL HISTORY COLLECTIONS DAMAGED BY EARTHQUAKES AND SUBSEQUENT TSUNAMI IN EAST JAPAN, 2011

**Ôhara, Masahiro**, The Hokkaido University Museum, North 10, West 8, Sapporo, 060-0810 Japan; ohara@museum.hokudai.ac.jp; **Suzuki, Mahoro**, Iwate Prefectural Museum, 34 Uedamasuyashiki, Morioka, 020-0102 Japan; **Sakuma, Daisuke**, Osaka Museum of Natural History, 1-23 Nagai-koen, Higashi-sumiyoshi, Osaka, 546-0034 Japan; **Ishida, So**, Osaka Museum of Natural History, 1-23 Nagai-koen, Higashi-sumiyoshi, Osaka, 546-0034 Japan

The Great East Japan Earthquakes and subsequent tsunami on March 11, 2011 killed 18,000 people and destroyed many towns in the coastal area of northeastern Japan. Museum, libraries, and cultural and natural heritage collections were heavily damaged. Tsunami-damaged items were contaminated with dirty sea salt and various organic substances, and got moldy. The curators of Iwate Prefectural Museum, Morioka made and distributed protocols for cleaning damaged specimens of plants, insects and shells, and asked nationwide networks of museum curators for help. About 23,000 specimens were transferred to more than 40 museums and research institutions all over Japan for salvage and restoration.

Unfortunately, the collection of the Rikuzen-takata City Museum (RTCM), which was the oldest natural history museum in northeastern Japan and had an impressive specimen collection illustrating the biodiversity of its area, was also seriously damaged by the tsunami. The staff of the Hokkaido University Museum attempted to recover damaged insect specimens of RTCM into a conserved condition. Sixty-six people worked to restore the specimens over 11 days and preserved 1,001 beetle specimens. We tried to do the best conservation methods, but did not have established protocols for specimen restoration, a systematic rescue network, nor special funds to do this work. Some groups such as the Japanese Entomological Curators Association were consulted for the specimen salvage and restoration activities. We have reviewed the technical aspects of our activities, and discussed plans for a nation-wide cooperative network to assist in future disaster recovery efforts.

DemoCamp Session

TH 05/21/2015 01:50 PM

## SMITHSONIAN TRANSCRIPTION CENTER—DISCOVERING SMITHSONIAN COLLECTIONS THROUGH VOLUNTEER TRANSCRIPTION

**Orli, Sylvia S.**, Department of Botany, NMNH - MRC 166, Smithsonian Institution, Washington, DC 20013-7012; orlis@si.edu; **Gentili-Poole, Patricia**, Department of Entomology, NMNH - MRC 166, Smithsonian Institution, Washington, DC 20013-7012; **Bird, Jessica**, Department of Entomology, NMNH - MRC 166, Smithsonian Institution, Washington, DC 20013-7012

The Smithsonian Transcription Center (TC) has sought to engage the public to make our collections more accessible. The TC has worked with digital volunteers to transcribe historic documents and collection records. The National Museum of Natural History has two departments, Botany and Entomology, who use the TC to have their collection labels transcribed to digital format. Pressed plant specimens and bumblebees are actively transcribed by "volunpeers" (TC volunteers) throughout the world. In addition, several of the field books of the NMNH collectors are available for transcription in the TC, allowing the volunpeers to connect

content. A fluid system of data and image transfer to TC and back to the collection catalog has been in development to expedite the availability of the transcribed records online to the general public. We will demonstrate the TC in capacities of both transcriber and administrator, and discuss the workflows and intricacies of this system.

Poster Session 4

TH 05/21/2015 PM

## USE OF BLACK CARPET BEETLES (*ATTAGENUS UNICOLOR*) AS AN ALTERNATIVE TO CARRION BEETLES (*DERMESTES MACULATUS*) FOR CLEANING SMALL FRAGILE SKELETONS FOR NATURAL HISTORY COLLECTIONS.

**Osofsky, John J.**, Department of Vertebrate Zoology, Smithsonian Institution, 4210 Silver Hill RD, Suitland, MD, 20746; osofsky@si.edu

Many natural history museums have relied on carrion beetles (*Dermestes maculatus*) for fine cleaning of skeletal specimens. Unfortunately these beetles can damage fragile structures on very small specimens (e.g. small shrews, rodents and humming birds). Alternative techniques for these types of specimens include hand-picking and using only small larvae for cleaning. These techniques can be time consuming and may not always yield satisfactory results. Another dermestid, the black carpet beetle (*Attagenus unicolor*) is about half the size of the carrion beetle and is a much more delicate, though efficient, cleaning agent for small fragile specimens. This is particularly true for carcass material which has been soaked in ethanol, and thus has been desiccated, denatured and can be much more difficult to prepare. This material can be soaked in a weak ammonia solution (3%) and safely placed wet into a black carpet beetle colony. We maintain a small but active colony in a small separate tank for this purpose. Black carpet beetles are very inefficient cleaners of larger skeletal material and not a good alternative for most dermestid beetle cleaning, but are highly advantageous for cleaning very small, fragile specimens. As with any dermestid beetle care must be taken to avoid infestation of natural history collections.

Poster Session 3

TH 05/21/2015 AM

## TOWARD AUTOMATED IDENTIFICATION OF CHAGAS DISEASE VECTORS

**Owens, Hannah L.**, Biodiversity Institute and Department of Ecology and Evolutionary Biology, 1345 Jayhawk Blvd, University of Kansas, Lawrence KS 66045; **Komp, Edward**, Information and Telecommunication Technology Center, 2335 Irving Hill Rd, University of Kansas, Lawrence, KS 66045; **Ramsey Willoquet, Janine M.**, Centro Regional de Investigación en Salud Pública, 19 Pon y 4ta Norte, Tapachula, Chiapas, 30700; México; **Gonçalves, Rodrigo G.**, Laboratório de Parasitologia Médica e Biologia de Vetores, Área de Patologia, Faculdade de Medicina, Universidade de Brasília, Campus Universitário Darcy Ribeiro, Asa Norte, CEP: 70904-970, Caixa Postal: 4569, Brasília, Distrito Federal, Brazil; **Mellenbruch, Jarrett**, The Kansas City Art Institute, Roeland Park, KS 66205; **Campbell, Lindsay P.**, Biodiversity Institute and Department of Ecology and Evolutionary Biology, 1345 Jayhawk Blvd, University of Kansas, Lawrence KS 66045; lpcampbell@ku.edu; **Peterson, A. Townsend**, Biodiversity Institute and Department of Ecology and Evolutionary Biology, 1345 Jayhawk Blvd, University of Kansas, Lawrence KS 66045

Vector borne diseases are an important risk to human health, particularly in developing and remote regions, where gaps remain



regarding accurate identification and potential distribution of insect vectors. Triatominae is a subfamily of hemipteran insects, many species of which act as vectors for Chagas disease transmission across Mexico and Central and South America. In order to aid public health workers in identifying and reporting occurrences of triatomines, we developed a pilot study to explore the viability of an automated identification method. We collected landmark measurements obtained from images of museum specimens from Fundação Oswaldo Cruz (FIOCRUZ) and Universidade de Brasília in Brazil and the Institute of Biology at Universidad Nacional Autónoma de México (UNAM) and the Centro Regional de Investigación en Salud Pública in Mexico. Specimens were iteratively selected at random to generate ten calibration and extrinsic test sets to determine the most effective suite of landmark measurements, locality information, and clustering algorithm for identifying individuals to species. The most effective method of identification narrowed identification options by the locality of the specimen, and then utilized a naïve Bayesian classifier analyzing seven dorsal measurements; 76.2% of specimens were identified correctly to species. These results indicate that morphological landmark recognition technologies, along with current knowledge of species distributions, have the potential to identify vector species from field specimens. Incorporation of these technologies into a Smart Phone application will provide an opportunity to link field photographs, geographic coordinates, and probable species identification to an online public health database for further verification, monitoring, and surveillance purposes.

Plenary Session

T 05/19/2015 08:30 AM

### **IN DEFENSE OF SPECIMEN COLLECTING, NATURAL HISTORY COLLECTIONS, AND BIOETHICS**

**Page, Larry**, iDigBio, Florida Museum of Natural History, Gainesville, FL 32611-7800; lpage1@ufl.edu

Specimens in institutional collections provide the foundation upon which effective communication in much of biology depends, and they provide the most reliable and verifiable morphological, spatial and temporal data for evolutionary and ecological studies. Natural history collections are of necessity geographically and temporally limited, and the scientific value they provide depends on targeted supplementation, which requires additional fieldwork and collecting. Biological ethics has no more important goal than protecting the natural world at all spatial scales. Given the essential role that collecting and collections have in documenting species distributions, habitats, and habits, as well as in elucidating factors affecting ecosystem structure and function, reasoned analyses can only vigorously encourage collecting and collections.

Spec. Full Circle Symp. 3

TH 05/21/2015 10:30 AM

### **JOINING UP FOR DIGITIZATION—A PILOT PROJECT BETWEEN KEW AND THE NATURAL HISTORY MUSEUM**

**Paton, Alan**, Royal Botanic Gardens Kew, Richmond, Surrey TW9 3AB, UK; A.Paton@kew.org; **Phillips, Sarah**, Royal Botanic Gardens Kew, Richmond, Surrey TW9 3AB, UK; **Woodgyer, Elizabeth**, Royal Botanic Gardens Kew, TW9 3AB, UK; **Knapp, Sandy**, Natural History Museum, Cromwell Road, London, SW7 5BD, UK; **Howard, Theresa**, Natural History Museum, Cromwell Road, London, SW7 5BD, UK; **Gregson, Jonathan**, Natural History Museum, Cromwell Road, London, SW7 5BD, UK; **Cafferty, Steve**, Natural History Museum, Cromwell Road, London, SW7 5BD, UK; **Wajer, Jacek**, Natural History Museum, Cromwell Road, London,

SW7 5BD, UK; **Atkinson, Ben**, Natural History Museum, Cromwell Road, London, SW7 5BD, UK

European herbaria have traditionally had divergent practices: different paper sizes, different curatorial techniques and different management systems. For centuries we have lived with our differences, but this year Kew and the NHM-London decided that in order to efficiently move digitization of our joint holdings of plant diversity forward, we would do a pilot to the same standards—an experiment to see if we could overcome our historical differences to leverage the power of working together to make our collections digitally accessible. We will discuss the challenges we faced, the problems we overcame, the problems that turned out to be opportunities and our experience of how this coming together across London worked.

General Session 5

TH 05/21/2015 09:10 AM

### **CLEANING PROTOCOL FOR MERCURIC CHLORIDE CONTAMINATED HERBARIUM CASES**

**Peters, Melinda D.**, Smithsonian Institution, National Museum of Natural History, US National Herbarium, Washington, DC, 20013-7012; petersm@si.edu; **Fallon, Douglas**, Smithsonian Institution, Office of Safety, Health & Environmental Management (OSHEM), Washington, DC, 20024; **Hunt, Michael**, Smithsonian Institution, Office of Safety, Health & Environmental Management (OSHEM), Washington, DC, 20024

Mercuric chloride has been used to control insect and fungal infestations in herbarium collections for over two centuries. The US National Herbarium has instituted safe handling protocols for the past few decades. In collaboration with the Smithsonian Office of Safety, Health & Environmental Management, a new protocol has been developed for the proper cleaning of contaminated herbarium cases. The goal of this protocol was to clean the cases in a safer, efficient, and affordable manner in order to re-purpose the cases for future use. A methodology was developed to eliminate mercuric chloride residue in the herbarium cases to prevent contamination of future botanical specimens. A selection of cases was chosen based on previous baseline data of mercury levels measured with a Jerome 431-X Mercury Vapor Analyzer. This talk will focus on an overview of the material in the cases, details of the case cleaning procedure using 70% ethanol solution, and how airborne and surface mercury levels were measured before and after cleaning. The resulting statistical data of airborne and surface mercury levels before and after cleaning allowed us to determine the best method for case cleaning.

Contributions Small Nat. Hist. Coll. Symp. 2

TH 05/21/2015 1:50 PM

### **THE FAIRBANKS MUSEUM: A SMALL, RURAL, NEW ENGLAND NATURAL HISTORY MUSEUM'S CHALLENGE TO ADAPT**

**Prondzinski, Mary B.**, Alabama Museum of Natural History, University of Alabama, 356 Mary Harmon Bryant, Box 870340, Tuscaloosa, AL 35487; mbprondzinski@ua.edu

The 120-year-old Natural History Museum created by Franklin Fairbanks, a member of the illustrious Fairbanks Scales family, to house his burgeoning collection of specimens, was a gift to the people in the small rural hamlet of St. Johnsbury, Vermont. Though created as an educational institution, its collections still possess merit in their extraordinary stories of Victorian acquisition and splendor. Through the museum's website and database, we hope to bring these collections into public awareness to relate

their story of how they landed in a rural New England museum.

With technological advances and increased knowledge, the underpinnings of a Natural History museum built in the late 19th century are in desperate need of improvement. The expense and upkeep of such enhancements increases yearly, while support for these costs continues to decline. As the requirements for maintaining and showcasing collections become more complex, the value of preserving artifacts must be discerned by the public that they serve. The ability to absorb these costs into the community consciousness remains a challenge to the collection custodians who fight a daily battle with less-than-adequate provisions.

There are any number of small town libraries and schools that contain similar collections or dioramas donated by invested local residents. Most of these small collections are managed by volunteers or townspeople untrained in the complexities of maintaining and preserving collections who have no way to connect with the larger community of collections caretakers and professionals.

Spec. Full Circle Symp. 1

W 05/20/2015 11:10 AM

### THE NEW AND IMPROVED ARMCHAIR BOTANIST

**Rabeler, Richard K.**, Herbarium-EEB, University of Michigan, 3600 Varsity Drive, Ann Arbor, MI 48108-2228; rabeler@umich.edu

Formerly a derogatory term for someone who made conclusions from only material immediately at hand, recent digitization efforts have greatly increased the available resources that one can access from one's office chair. As both a creator and user of such content in my research, I will provide examples of both the power as well as some of the limitations one still faces in floristic and monographic studies.

General Session 1

W 05/20/2015 10:30 AM

### SKELETAL RECORDS ACCOMPANYING IMAGES—EFFICIENCY VS. LATER UTILITY

**Rabeler, Richard K.**, Herbarium-EEB, University of Michigan, 3600 Varsity Drive, Ann Arbor, MI 48108-2228; rabeler@umich.edu

Many collections are involved in projects that are creating images of herbarium specimens. The data that is being entered into "skeletal" records varies from not creating the skeletal records at all, adding only the filed-by name and barcode #, to several variations that include more collection details. Adding more information requires additional training for the imaging personnel and time to create those records. One other variable to consider is how data will be added to those skeletal records—by crowdsourcing, keyboarding, transcription via OCR or manually comparing images, etc. I will present examples of data "levels" to consider when determining how much data to capture, including being able to take advantage of widely held collections.

General Session 4

W 05/20/2015 04:10 PM

### SCAN: THE SCHISTOSOMIASIS COLLECTION AT THE NATURAL HISTORY MUSEUM

**Rabone, Muriel E.**, Dept, of Life Sciences, Natural History Museum, Cromwell Road, London, SW7 5BD, UK; a.emery@nhm.ac.uk; **Allan, Fiona**, Dept, of Life Sciences, Natural History Museum, Cromwell Road, London, SW7 5BD, UK; **Webster, Bonnie L.**,

Dept, of Life Sciences, Natural History Museum, Cromwell Road, London, SW7 5BD, UK; **Rollinson, David**, Dept, of Life Sciences, Natural History Museum, Cromwell Road, London, SW7 5BD, UK; **Emery, Aiden M.**, Dept, of Life Sciences, Natural History Museum, Cromwell Road, London, SW7 5BD, UK

SCAN at the Natural History Museum in London is a growing collection which enables research into schistosomiasis, a parasitic neglected tropical disease (NTD) infecting around 200 million people globally. Schistosomiasis is caused by blood-flukes, trematodes with a life cycle including a snail intermediate host as well as the human or veterinary definitive host. The collection incorporates a legacy of decades of research-focused collecting, including:

- Cryopreserved adult schistosomes (12 species) derived from laboratory culturing of field-collected specimens from 29 countries;
- Spirit-preserved snail intermediate hosts collected from the 1950s onwards;
- Larval schistosomes continuing to be collected directly from snails, humans and veterinary hosts (13 countries).

Schistosomes and host snails are difficult to collect, which means that providing specimens to the research community makes projects possible that otherwise could not go ahead. As tools and knowledge progress in a fast-moving field, the utility of specimens in a collection can be maximized by answering new questions with existing material. For example, as a collection originally established for isoenzyme electro-phoresis, our cryopreserved schistosomes have been used in recent projects to explore molecular genetic diversity, comparative genomics, and genetic marker development. Some of the new questions in schistosomiasis transmission center on human/veterinary schistosome species hybridization and previously unknown zoonotic reservoirs. We are continuing to expand our collections by working with projects investigating these and other questions, bringing together disease control teams, fieldwork specialists and bench scientists. SCAN is part-funded by the Wellcome Trust.

Poster Session 4

TH 05/21/2015 PM

### REHYDRATION OF DESICCATED FISH SPECIMENS IN THE ARKANSAS STATE UNIVERSITY MUSEUM OF ZOOLOGY ICHTHYOLOGY COLLECTION

**Rath, Mary**, Dept. of Biological Sciences, Arkansas State University, PO Box 599, State University, AR 72467; mary.rath@smail.astate.edu; **Hook, Alexandra**, Dept. of Biological Sciences, Arkansas State University, PO Box 599, State University, AR 72467; **Jones, Kenny**, Dept. of Biological Sciences, Arkansas State University, PO Box 599, State University, AR 72467; **Loerch, Starlene M.**, Dept. of Biological Sciences, Arkansas State University, PO Box 599, State University, AR 72467; **Martin, Lindsey**, Dept. of Biological Sciences, Arkansas State University, PO Box 599, State University, AR 72467; **Mross, Alexis**, Dept. of Biological Sciences, Arkansas State University, PO Box 599, State University, AR 72467; **Fluker, Brook L.**, Dept. of Biological Sciences, Arkansas State University, PO Box 599, State University, AR 72467

The Arkansas State University Museum of Zoology (ASUMZ) Ichthyology Collection represents an important resource for students of the university and the ichthyological community, particularly in the southeastern United States. The collection houses approximately 13,000 specimen lots from 23 of the contiguous states. Unfortunately, numerous lots (> 600) have experienced desiccation as a result of unsuitable storage

containers and intermittent curation in recent decades. As a part of a larger effort to restore the ASUMZ Ichthyology Collection into a viable teaching and research resource, this project had two main objectives: (1) reclaim dehydrated fish specimens; and (2) evaluate the efficacy of different rehydration methods. This poster details the success of specimen rehydration in terms of proportional weight gain/loss. Additionally, the efficacy of rehydration of select specimen lots is compared among two methods: (1) a simple surfactant-based method that used a soap solution; and (2) a simple method using only distilled water in a sealed, high humidity chamber.

General Session 2

W 05/20/2015 10:30 AM

### **THE RESEARCH AND OUTREACH POTENTIAL OF SMALL COLLECTIONS: ENGAGING STUDENTS TO BECOME FUTURE STEWARDS**

**Revelez, Marcia A.**, Department of Biology, Angelo State University, San Angelo, TX 76909-0890; mrevelez@angelo.edu

With only one full time collections manager, the ability to maintain the 150,000 specimens of the Angelo State Natural History Collections (ASNHC) is largely dependent on the successful recruitment and engagement of undergraduate students. The ASNHC is comprised of five small collections: mammalogy, ornithology, herpetology, frozen tissues, and the herbarium. The diversity of the ASNHC serves as an attractant and maximizes the breadth of training opportunities in collection stewardship. Developing a program to enlist and retain students should be formulated to educate and advocate the importance of natural history collections. The ASNHC accomplishes this through curator and student research, volunteer programs, study abroad courses, internship development, collaboration with area museums, publications, and most importantly – outreach. The successful execution of these activities ensures the future and sustainability of the ASNHC while creating an environment well-suited to fostering a new generation of students well-trained to endorse the value of collections.

General Session 1

W 05/20/2015 09:30 AM

### **COLLABORATIVE GEOREFERENCING AND DATA REPATRIATION: A CASE STUDY FROM THE FISHNET 2 PROJECT**

**Rios, Nelson E.**, Tulane University Biodiversity Research Institute, Belle Chasse, LA 70037; nrios@tulane.edu; **Bart, Henry L.**, Tulane University Biodiversity Research Institute, Belle Chasse, LA 70037; **Justin, Mann**, Tulane University Biodiversity Research Institute, Belle Chasse, LA 70037

FishNet2 ([www.fishnet2.net](http://www.fishnet2.net)) is a global network of fish collection databases that gives researchers access to data on roughly 4 million fish species lots, representing over 30 million specimens. In the fall of 2012 a collaboration among 12 of the FishNet institutions was formed to improve data within the network. In particular, the goals of this collaborative project were to georeference all localities without geographic coordinates and repatriate the results to data providers. Before the collaborative georeferencing project began, only about two-thirds of the records in Fishnet2 were georeferenced. We began by using the FishNet 2 API to harvest all records within the network and build geographically delimited datasets lacking geographic coordinates. The Collaborative Georeferencing Client (CoGe) of the GEOlocate Platform was used to evaluate the roughly 250,000 localities in FishNet2 lacking coordinates. Each of the twelve collaborating

institutions hired a full-time georeferencing technician to verify and correct the CoGe generated geographic coordinates for localities assigned to his or her institution. At the completion of the georeferencing phase of the project, 282,221 localities (equivalent to 1.4 million specimen lots) were evaluated and 247,501, localities (equivalent to 1.2 million specimen lots) were assigned coordinates and estimates of uncertainty. We are now in the repatriation phase of the project. We present here the process and results of the workflow described above.

General Session 5

TH 05/21/2015 09:50 AM

### **OVERCOMING THE INHERENT PROBLEM OF DETACHING HAIRS ON CARIBOU HIDES**

**Ritchie, Fran E.**; Former NMAI-Conservation, 1408 A St SE; Apt 202; Washington, DC 20003; FranRitchie@gmail.com

For generations humans in Arctic and Subarctic zones have relied on the insulating properties of caribou hides for survival. However, this life-sustaining material has a major flaw: the hollow guard hairs that provide warmth also molt, causing deterioration in the form of bald spots a problem for museums caring for caribou objects. There has been no previous conservation research done to address this concern beyond handling protocols. My research at the National Museum of the American Indian investigates consolidation of loosening hairs on hides, relying on an understanding of biological and cultural uses of the material. The problem reaches collections beyond anthropological requiring consultations with allied fields, including natural science. Phase One was devoted to gaining an understanding of caribou by placing the material in context. I consulted mammalogists on caribou physiology and reviewed literature about the native relationship with caribou. Artists, cultural institutions, and anthropologists helped in contacting contemporary skin sewers to determine how they care for hides. Phase Two focused on the experimental aspect of the project. Conservation literature pinpointed previously used consolidants, while taxidermists offered less-conventional solutions. I tested promising adhesives and applications on strips of commercially tanned caribou hide. The results singled-out the most useful techniques for working on areas susceptible to hair-loss. Hair stabilization is important not only to preserve the original look of these pieces but also to maintain their cultural value. Hopefully, the results will be utilized in the future to help combat the inherent problems of maintaining caribou hides in collections.

Poster Session 4

TH 05/21/2015 PM

### **COWBOY CONSERVATION: THE TREATMENT OF A TAXIDERMY LEATHERBACK TURTLE IN CORDOVA, ALASKA**

**Ritchie, Fran E.**; Natural History Conservator, 1408 A St SE; Apt 202; Washington, DC 20003; FranRitchie@gmail.com

An emerging conservator on a grant from the Museums Alaska Collections Management Fund traveled to a small town in Alaska to treat "Prince Willy," the Cordova Historical Museum's taxidermy leatherback turtle. Since its mounting in 1963, this turtle has become a beloved town mascot, but after over 50 years on display was in need of serious rehabilitation. Conservation treatment of the largest species of sea turtle included the cleaning of rancid oil, removal of flaking and unnatural taxidermist paint, repair of splits and gaps in the dried skin, and stabilization of limbs. Although a standard course of treatment was proposed, the limits of the small town hardware store and the effects of a wet climate required constant rethinking of the original plan and called upon the invaluable help of museum staff and



community members to meet a four week deadline. After ethical dilemmas were discussed with the museum curator and director, future display and treatment protocols were designed. For an emerging conservator on a first solo contract, the compromises and innovations with materials at hand created an atmosphere of wild conservation when compared to classroom theory, and thus “cowboy conservation” saved Prince Willy for generations to come.

General Session 5

TH 05/21/2015 11:50 AM

### **BEYOND “NO FOOD OR DRINK ALLOWED IN THE GALLERY:” BEST PRACTICES FOR FOOD IN CULTURAL INSTITUTIONS**

**Ritchie, Fran E.**; American Museum of Natural History-Natural Science Conservation, Central Park West, New York, NY, 10024; FranRitchie@gmail.com; **Palumbo, Bethany**, Oxford University Museum of Natural History, Parks Road, Oxford, OX1 3PW, UK; **Newberry, Rebecca**, Science Museum of Minnesota, 120 West Kellogg Bl., St. Paul, MN 55407

Museums, people and food are closely tied together. From staff members’ brown bag lunches, to the cafeteria or a catered donor event, food service is a necessity in modern museums and institutions. At the most basic level, food vendors feed visitors and generate revenue. On the other hand, the presence of food in the museum presents a challenge to the long-term preservation of museum collections. Incorrect disposal of food waste and insufficient house-keeping both contribute to pest infestation while food and beverages carried through areas with collections can spill and soil objects, causing damage which may not be reversible.

While balancing the necessity of food service and the needs of the collections is a challenging prospect, documented recommendations in regards to food management within museums are lacking. The Conservation Committee of the Society for the Preservation of Natural History Collections (SPNHC) has decided to address this dearth of information by creating the document Best Practices for Food in Museums. To prepare the document, members of the Conservation Committee reviewed existing resources and, in April 2014, presented an online survey about food use in museums and cultural institutions. 351 people from 21 countries participated in the online survey, which was publicized through 22 museum list serves and social media sites. The results of the survey guided the creation of a Best Practices for Food in Museums. The document will be published through the SPNHC website and will be reviewed periodically.

Poster Session 4

TH 05/21/2015 PM

### **PUBLIC ENGAGEMENT THROUGH VOLUNTEERS IN COLLECTIONS**

**Roberts, Dawn**; Collections Manager, The Chicago Academy of Sciences and its Peggy Notebaert Nature Museum, 2430 North Cannon DR, Chicago, IL 60614; droberts@naturemuseum.org

Public engagement is one of the primary initiatives for museums. Through public engagement, museums can share their stories, educate their visitors, and inspire donors. Despite being largely “behind the scenes,” collections staff can support their institution’s effort to engage the public in numerous ways, including participating in educational programs, curating exhibits, offering collection tours, and sharing digital images of their collections. Mentoring volunteers in their collections presents another opportunity – one that requires an investment on the part of the staff and the institution, but one that results in a unique relationship and benefits the collection.

Contributions Small Nat. Hist. Coll. Symp. 1 TH 05/21/2015 08:30 AM

### **HUMAN DIVERSITY AND THE OPPORTUNITIES TO ENGAGE STUDENTS IN SMALL COLLECTIONS**

**Roberts, Roland P.**, National Science Foundation, BIO-DBI, 4201 Wilson Boulevard, Arlington, VA 22230; rolrober@nsf.gov

Small collections potentially provide information that fills geographic gaps and improve our knowledge as we attempt to assess biodiversity and understand the factors influencing organismal distribution. These collections are usually built through the accumulation of vouchers resulting from the taxonomic interests of researchers, allowing for intensive, systematic sampling of taxa. Alternatively, small collections may represent comprehensive surveys of local biodiversity, providing opportunities to capture information not usually represented in larger collections. Thus, the taxonomic composition of small collections is usually unique and the specimens represent intensive local sampling of biodiversity. Along with this unique scope in their composition, small collections are also positioned to address unique educational and training opportunities. They can better interface with the local community, including 2-year colleges, in training and outreach activities. Additionally, faculty associated with small collections have the flexibility to embrace curriculum reform that addresses critical integrative training needs, including efforts to broaden participation, engaging communities not usually represented in biodiversity or natural history research. Highlighting these opportunities, in part, support the critical role that small collections play in satisfying research and workforce needs.

Poster Session 1

W 05/20/2015 AM

### **ROLE OF OFF-SITE MUSEUMS FOR RESTORATION-EXPERIENCES WITH SALVAGE AND RESTORATION OF NATURAL HISTORY COLLECTIONS DAMAGED BY EARTHQUAKES AND SUBSEQUENT TSUNAMI IN EAST JAPAN, 2011, PART II**

**Sakuma, Daisuke**, Osaka Museum of Natural History, 1-23 Nagai-koen, Higashi-sumiyoshi, Osaka, 546-0034 Japan; sakuma@mus-nh.city.osaka.jp; **Ôhara, Masahiro**, The Hokkaido University Museum, North 10, West 8, Sapporo, 060-0810 Japan; **Suzuki, Mahoro**, Iwate Prefectural Museum, 34 Ueda-masuyashiki, Morioka, 020-0102 Japan; **Ishida, So**, Osaka Museum of Natural History, 1-23 Nagai-koen, Higashi-sumiyoshi, Osaka, 546-0034 Japan

After the earthquakes and subsequent tsunami on March 11, 2011, we transferred 23,000 specimens from damaged museums to more than 40 museums and research institutions at remote-sites all over Japan. It is because restoration and stabilization processing needs human resources and good conditions for deliberate work. Working at off-site museums has several advantages compared to on-site efforts. 1) Logistics: freezers, containers, electricity, etc. were easily available. 2) Volunteer participation: experienced collectors and researchers, skilled volunteers in museums were a powerful task force. Many volunteers were ready to help damaged museums at that time. 3) Off-site restoration works made visible the situation in which the damaged museums and their communities. Botanical curators are used to exchanging specimens in their collections, it is very natural to receive items from the Rikuzen-takata City Museum (RTCM) collection by parcel, the difference in this situation is they were salt-soaked and damaged. We treated 750 damaged botanical specimens in the Osaka Museum of Natural History (OMNH, OSA), 1000 km away from the host museum. For molluscan shells, parcel transfer



was also possible and OMNH accepted small landsnail specimens. OMNH also dealt with entomological collection, but some heavily damaged specimens were not suitable for transportation, and geological specimens were too heavy and fragile. So we sent curators and professionals to the tsunami-damaged museums, to assist not only in conservation of specimens, but also repair of infrastructure and facilities. The RTCM set up temporary storage for its specimens and hired local people to work on their restoration and repair.

General Session 3

W 05/20/2015 01:50 PM

### **GLOBAL REGISTRY OF BIODIVERSITY REPOSITORIES (GRBIO): STATUS REPORT AND FUTURE DIRECTIONS**

**Schindel, David E.**, Consortium for the Barcode of Life, National Museum of Natural History, Smithsonian Institution, P.O. Box 37012, MRC-105, Washington, DC 20013-7012; schindeld@si.edu; **Crane, Adele E.**, Scientific Collections International, National Museum of Natural History, Smithsonian Institution, P.O. Box 37012, MRC-105, Washington, DC 20013

GRBio ([www.grbio.org](http://www.grbio.org)) is the web portal to a database of more than 7,000 institutions that own and manage biological collections around the world. The portal provides high-level information on location, contacts, governance, types of contents and preservation, and the staff members of repository institutions and the collections they maintain. The portal and database are operated by the Consortium for the Barcode (CBOL) of Life and Scientific Collections International (SciColl), and GRBio's content is a merger of institutional data from the National Center for Biotechnology Information, CBOL, Index Herbariorum, and Biodiversity Collections Index.

CBOL and SciColl support GRBio with two goals in mind: improving the visibility of access to collections and their contents, and providing an authoritative source of unique identifiers for institutions (specifically institutionCodes from the Darwin Core) and collections (collectionCodes). GRBio checks for the global uniqueness of new institutionCodes that are submitted and the uniqueness of collectionCodes within the submitting institution. Privately owned and personal research collections can also be registered in GRBio; the portal's next version will support registration of project collections overseen by researchers within institutions.

NSF's Advances in Biological Informatics Program (ABI) has supported a workshop to gather community input for the design of GRBio's next version. Topics addressed at the workshop include: additional descriptors of institutions and collections; web services needed to interoperate with other resources; GRBio's user interface and moderation functions; and how GRBio can support persistent unique specimen identifiers.

General Session 1

W 05/20/2015 09:50 AM

### **DNA BARCODING IS SPECIMEN DIGITIZATION**

**Schindel, David E.**, Consortium for the Barcode of Life, National Museum of Natural History, Smithsonian Institution, P.O. Box 37012, MRC-105, Washington, DC 20013-7012; schindeld@si.edu; **Trizna, Michael G.**, Consortium for the Barcode of Life, National Museum of Natural History, Smithsonian Institution, P.O. Box 37012, MRC-105, Washington, DC 20013-7012

'Specimen digitization' is normally done by capturing label data and digital images. DNA barcoding is also a form of digitization

using DNA sequences. It adds value to a collection and provides direct benefits for collection management. The reserved keyword 'BARCODE' identifies about 400,000 data records in GenBank, the European Nucleotide Archive and the DNA Data Bank of Japan that meet the data standard proposed by the Consortium for the Barcode of Life (CBOL). A web-based data validation system is under development to check compliance with the data standard prior to submission to GenBank.

The standard requires a voucher specimen identifier in the standard Darwin Core 'triplet' format institutionCode:collectionCode:catalogNumber. US National Museum voucher specimens in GenBank are hyperlinked to full specimen records in EMu through a triplet-based resolver. Linkages in GenBank increase the visibility and accessibility of museum specimens. In addition, the barcoding process and subsequent data quality checking help collection staff discover a range of problems: degraded tissue without usable DNA; mislabeling of tissue vials in the field or sample mix-ups during curation or in the lab; and misidentifications involving very closely related species or distant relatives with convergent morphology. In some rare but important cases, barcoding reveals genetic divergences within a morphological species, or morphological differences that had gone unnoticed. Examples will be described from systemic barcoding initiatives in the USNM bird and mammal collections.

As part of a barcoding project on endangered species, CBOL is experimenting with new datafields that characterize the reliability of taxonomic identifications.

Poster Session 2

W 05/20/2015 PM

### **INTEGRATING PHYSICAL AND INTELLECTUAL CURATION INTO DIGITIZATION WORKFLOWS**

**Schuettpelz, Eric**, United States National Herbarium, Smithsonian Institution, Washington, DC, 20013-7012; **Russell, Rusty**, United States National Herbarium, Smithsonian Institution, Washington, DC, 20013-7012; russellr@si.edu; **McKee, Gregory S.**, United States National Herbarium, Smithsonian Institution, Washington, DC, 20013-7012; **Tornabene, Michael W.**, United States National Herbarium, Smithsonian Institution, Washington, DC, 20013-7012

As greater emphasis is placed on the digitization of natural history collections, to improve accessibility and analysis, some aspects of project workflow are receiving insufficient attention. Whether a digitization project involves entering data from specimen labels or a catalog, or is utilizing an image first workflow, the existing state of intellectual and physical curation may adversely affect the quality of the outcome. A case study is presented from the United States National Herbarium focusing on preparations for the rapid digitization of the large pteridophyte collection (approximately 275 thousand specimens). We discuss how physical curation of the collection and the reorganization of specimens to reflect a modern classification will improve workflow efficiency, project cost, and quality of results.

Poster Session 3

TH 05/21/2015 AM

### **LOOKING FOR TREASURES IN A MEGADIVERSE COUNTRY: NATURAL COLLECTIONS IN ECUADOR**

**Segovia-Salcedo, Maria C.**, iDigBio, University of Florida, Gainesville, FL 32611 and Universidad de las Fuerzas Armadas - ESPE Casilla 17-12-85, Quito, Ecuador; maclaudiasegovia@yahoo.com; **Acosta-Buenano, Nestor A.**, Unidad de Monitoreo. Subsecretaria de Patrimonio Nacional Ministerio del Ambiente. Quito, Ecuador;

**Carrasco, Luis**, Unidad de Monitoreo. Subsecretaria de Patrimonio Nacional Ministerio del Ambiente. Quito, Ecuador

Ecuador is located in northwestern South America, bordering the Pacific Ocean, between Colombia and Peru. Despite its small size, only 109,483 square miles, Ecuador is one of the most biologically diverse countries on Earth. Its location at the intersection of the equator, the Andes and the Amazon contribute to its high biodiversity levels. Furthermore, Ecuador is home to the remote Pacific islands of Galapagos, a very special place for evolution. Great Naturalists, e.g., Baron Alexander von Humboldt (1802-1803), Jacques-Alexandre Goujoud Bonpland (1799-1805), and Charles Darwin (1835), have explored and collected in Ecuador, and many Ecuadorian specimens are located in the most important museums of natural history. In addition, Ecuadorian specimens are also held in many collections of local private and public institutions. Current holdings are unknown, because of lack of integration, and data is not available online. Data is also inaccessible to most biologists, policy-makers and the general public. These collections are real treasures for scientists, naturalists and nature lovers. Seventeen institutions (11 publics and 6 private) currently store an estimated 2 million specimens: 750,000 plants, 13,975 birds, 87,215 reptiles and amphibians, 28,012 mammals, 153,647 fish, and 1,175,133 invertebrates. Our goal is to create an inventory of all the specimens at Ecuadorian Institutions generating data about the utility, storage and maintenance. We seek to create a national digital database that documents existing biological collections in Ecuador. Improving our knowledge of biodiversity is fundamental for conservation and management.

General Session 4

W 05/20/2015 04:30 PM

#### **GOING BACK TO THE SOURCE: ENRICHING ACCESS THROUGH FIELD NOTES AND LITERATURE**

**Sheffield, Carolyn**, Smithsonian Libraries, Smithsonian Institution, P.O. Box 37012 MRC 154, Washington, DC 20013-7012; sheffieldc@si.edu; **Blase, Julia**, Smithsonian Libraries, Smithsonian Institution, P.O. Box 37012 MRC 154, Washington, DC 20013-7012; **Russell, Rusty**, Department of Botany, National Museum of Natural History, P.O. Box 37012 MRC 166, Washington, DC 20013-7012; **Morgan, Rebecca**, Department of Library Services, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024-5192

Natural history collections are integral to systematic and biodiversity research. One way to expand access to—and understanding of—these collections is to leverage their historical context; how and when they were collected, by whom, and what resulting analyses and discoveries have been published.

The Biodiversity Heritage Library (BHL) is an international consortium making biodiversity literature openly available to the world as part of a global biodiversity community. Through its extensive network of natural history and botanical libraries, over 45 million pages of biodiversity literature are now available through the BHL portal.

BHL is extending its scope to include primary source field notes and to make them available alongside the published literature. Through a partnership with the Smithsonian Field Book Project (FBP), open access to these materials is expanding on an unprecedented scale. Currently, over 500 field books from the Smithsonian are available on the BHL portal. Dozens of others have also been made available through special projects and more are on the way. The American Museum of Natural History is making great strides with their own field book collections. In

addition, partnerships with the Smithsonian Transcription Center are underway for both field notes and specimen labels. BHL is also exploring the role of gaming in transcriptions of field notes and OCR correction of the literature.

This session will present the innovative approaches and partnerships of BHL, its consortium partners, and the FBP to enrich access to literature and scientists' field notes. Special emphasis will be given to replicability and to the significance of this work in connection to specimen collections.

General Session 5

TH 05/21/2015 09:30 AM

#### **SMOKING UNDER SCRUTINY: EVALUATING METHODS FOR THE REMOVAL OF AMMONIUM CHLORIDE RESIDUE FROM FOSSILS**

**Shelburne, Edward C.**, Jackson School of Geosciences Nonvertebrate Paleontology Lab, University of Texas, 10100 Burnet Rd, PRC 122, Austin, TX 78758; es1256@live.com; **Thompson, Angella**, Jackson School of Geosciences Nonvertebrate Paleontology Lab, University of Texas, 10100 Burnet Rd, PRC 122, Austin, TX 78758

Smoking, the process of subliming and depositing ammonium chloride or other chemical powder onto specimens, has long been employed as a useful technique to enhance the relief of specimens during photography. Though many methods exist for applying ammonium chloride powder to specimens, there are few published explanations on how best to remove the residue powder after imaging. Ammonium chloride is acidic and dissolves in the presence of moisture, causing etching of delicate specimens. Residual ammonium chloride may also confound future chemical analyses, should the smoking procedure not be recorded. We smoked a series of calcitic invertebrate specimens and cleaned them using four commonly used cleaning techniques: brushing, 'puffing', breathing on, and rinsing in deionized water. After undergoing the appropriate cleaning method, each specimen was then thoroughly rinsed in deionized water. Using a silver nitrate solution, which precipitates silver chloride in the presence of chloride ions, we tested the rinse water for remaining ammonium chloride contamination. We performed six trials, each with six different specimens. Two were control specimens, and the remaining four were experimental specimens. Using this procedure, we found complete rinsing of the specimen to be the only viable method for removing all traces of contamination. Breathing on the specimen, a common removal method thought to dissolve or sublime the ammonium chloride residue, was ineffective, and likely exacerbates the problem of etching by solubilizing remaining residue. Should you decide to smoke your specimens, we recommend a case-by-case approach to ammonium chloride residue removal; preferably rinsing smoked specimens when possible.

General Session 2

W 05/20/2015 11:30 AM

#### **A RENAISSANCE FOR THE OREGON STATE ICHTHYOLOGY COLLECTION**

**Sidlauskas, Brian L.**, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR 97330; brian.sidlauskas@oregonstate.edu; **Markle, Douglas**, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR 97330; **Frale, Ben**, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR 97330; **Burns, Michael**, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR 97330

The Oregon State University Ichthyology Collection (OSIC)

represented a major center of ichthyological research and education in the mid-20th century, but eventually a lack of space for expansion and insufficient financial resources stymied its growth, proper curation and digitization. Herein, we report on the results of a four-year NSF and OSU-supported effort to rejuvenate the OSIC by installing mobile compact shelving, moving the facility into compliance with fish and earthquake safety codes, modernizing and georeferencing the collection's catalog, organizing its tissue collection and bringing its holdings online. As a result of these efforts, 20,000 lots of fishes from around the world are again available to the ichthyological community, dozens of students have gained training in curatorial practices, and the collection has again integrated tightly with research, teaching and outreach in the Pacific Northwest and beyond.

General Session 6

TH 05/21/2015 02:30 PM

### **UNLOCKING HIDDEN POTENTIAL: USING MUSEUM SPECIMENS TO ENGAGE AND EDUCATE CHILDREN WITH AUTISM**

**Singer, Randy A.**, iDigBio, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611; rsinger@flmnh.ufl.edu

Museum Specimens have historically been used in education and outreach in both primary and secondary education as visual aids, dissection media, and tools for field identification. More recently, museum specimens are being used in newer and more creative ways with regards to education and outreach. One such new frontier is the use of museum specimens to engage children with neurodevelopmental disorders such as autism. Autistic children learn and are engaged best through sensory experiences, most of which can be accomplished with the use of museum specimens. Natural history specimens and the museums in which they are housed provide ideal hubs for learning and positive experiences for children with all degrees of autistic expression.

Spec. Full Circle Symp. 1

W 05/20/2015 08:50 AM

### **SPECIMENS FULL CIRCLE: COLLECTION TO DIGITIZATION TO DATA USE**

**Smith, Dena M.**, STEPPE, Geological Society of America, 3300 Penrose Place, Boulder, CO 80301; dsmith@geosociety.org; **Paul, Deborah**, Institute for Digital Information, 234 LSB, Florida State University, Tallahassee, FL 32306; **Blagoderov, Vladimir**, Department of Life Sciences, The Natural History Museum, Cromwell Road, London SW7 5BD, UK

Novel field-collecting methods, maturing transcription and imaging techniques, and up-dated end-user interfaces are resulting in greater access to and use of specimen data for a variety of purposes. This has further facilitated the use of museum specimen data in research and in support of educational needs and outreach opportunities. This session highlights the new ways in which museum professionals are improving curation and digitization workflows to meet the needs of today's collections users. New tools have been developed that allow for data capture directly from the field and refined imaging methods have allowed for more efficient capture of labels and specimens. New analytical tools have facilitated the extraction of specimen data for analyses and digitization efforts have greatly enhanced the use of specimens and their associated data in research projects of all sorts. This session includes presentations that outline best practices, illustrate the joys and pains of imaging and workflow development and highlight the ways in which museum professionals are further enabling accessibility to end-users through creative new approaches.

Contributions Small Nat. Hist. Coll. Symp. 1 TH 05/21/2015 09:50 AM

### **COLLECTIONS INTERNSHIPS FOR COLLEGE STUDENTS: DESIGNING AN INTERDISCIPLINARY PROGRAM**

**Smith, Emily P.**, Randolph College Natural History Collections Project, 2500 Rivermont Ave, Lynchburg, VA 24503; esmith@randolphcollege.edu

Many colleges and universities have neglected their natural history collections, and are thus overlooking a tremendously valuable resource, which offers students the opportunity to apply their classroom learning to expand and develop marketable skills in nearly every academic discipline. In the Natural History Collections Project (NHCP) at Randolph College, undergraduate students in a variety of majors learn basic tasks of collections management, such as identification, conservation, tagging, digitization, and preparation of specimens, as well as utilizing collections for independent research, as reference material for art, and inspiration for creative writing. The NHCP also aims to make the collections accessible to the public through online catalogs, collaborative exhibitions, a student-maintained blog and social media, and outreach programs such as the science division's annual Science Festival. By approaching natural history collections from cultural, aesthetic, and historical perspectives, as well as from a scientific one, educators and museum specialists are in a better position to gain allies in the wider community and to receive funding and logistical support for maintaining their collections, while the next generation of collections specialists in a variety of disciplines acquires a wealth of training and inspiration. I will discuss methods for designing interdisciplinary opportunities which create partnerships between students and faculty, academic departments and the local community, resulting in the public perception of collections as a valued and vital resource.

General Session 6

TH 05/21/2015 01:50 PM

### **TEACHING WITH BONES: UTILIZING BIOARCHAEOLOGY REFERENCE COLLECTIONS FOR INTERDISCIPLINARY INSTRUCTION**

**Smith, Emily P.**, Randolph College Natural History Collections Project, 2500 Rivermont Ave, Lynchburg, VA 24503; esmith@randolphcollege.edu

Natural history collections have long been a valuable resource for bioarchaeologists. Nine students with the Natural History Collections Project (NHCP) at Randolph College recently assessed fragments of bone from a 6th-century cemetery site at Bir-el-Knissia, Tunisia, to provide insight into the ages, health, and ethnicities of individuals buried there. An attempt to estimate the minimum number of individuals (MNI) was also made. Non-human faunal remains from the site gave insight into the agricultural, culinary, and ritual use of animals. Using the Randolph College Natural History Collections, students learned about human and non-human vertebrate anatomy, and quantified bone specimens of each type. Teeth were assessed for wear patterns and age data using several dental attrition guides, and samples from the roots of teeth provided material for mtDNA sequencing. This multifaceted, interdisciplinary project illustrates how bioarchaeologists can utilize natural history collections for research, while also maximizing the potential of the collections for teaching and integrating principles of osteology, forensic anthropology, genetics, zoology, and human ecology at the undergraduate level.



**RESEARCH OPPORTUNITIES USING DATA FROM SMALL COLLECTIONS**

**Soltis, Pamela S.**, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611-7800; psoltis@flmnh.ufl.edu

Ongoing developments in phylogenetics coupled with emerging cyber-infrastructure and new data sources provide unparalleled opportunities for mobilizing and integrating massive amounts of information from organismal biology, ecology, genetics, climate, and other areas such that patterns in complex data will emerge, yielding new hypotheses for further study. Although most available specimen records come from large collections, small collections also have important roles to play. Attempts to integrate heterogeneous data across spatial and temporal scales reveal challenges and opportunities for our understanding of plant evolution. Workflows that integrate public data from taxonomy, distributions, climate, phylogeny, and predictions of global change through novel algorithms and workflows have demonstrated the capacity for data-driven science for discovery of new biodiversity patterns, with fundamental implications for conservation and management of plant species. Unfortunately, these integrated analyses are often limited by the absence of digitized data from small collections, which are often the most abundant source of data for nearby rare species. Although numerous questions and specific hypotheses may be addressed through integrated analyses of biodiversity and environmental data, perhaps the greatest value of such data-enabled science will lie in the unanticipated patterns that emerge. These patterns will be much richer when data from small collections are included. Examples of the value of small collections in research will be presented.

DemoCamp Session

TH 05/21/2015 04:10 PM

**TAKING COLLECTION DATA PLACES WHERE IT HAS NEVER GONE BEFORE—SPECIFY INSIGHT FOR THE IPAD**

**Spears, Rod**, Biodiversity Institute, University of Kansas, 1345 Jayhawk Boulevard, Lawrence, KS 66045; **Beach, James H.**, Biodiversity Institute, University of Kansas, 1345 Jayhawk Boulevard, Lawrence, KS 66045; beach@ku.edu

As a new age, the “Internet of Things” dawns in the late Anthropocene, the use of mobile apps has started to surpass the use of web browsers for information access on the internet. Ubiquitous tablets, smart phones and related mobile computing devices provide outstanding opportunities for expanding the influence of biological collection information on research, education and collection sustainability. Easy, intuitive and apps designed to take advantage of portable platforms and touch interfaces enable new kinds of uses and new kinds of users for collection information in professional, social and educational venues away from computing workstations, museum offices and galleries. Suddenly synoptic collection descriptions as well as complete catalogs of specimen data, maps and images can be easily conveyed into the hands of administrators, donors, students, and colleagues for collection information access, analysis and appreciation—anywhere, anytime.

This demonstration will highlight the Specify Software Project’s new integrative iPad app, Specify Insight. This new mobile outlet for institutional collection databases is taking collection data where they have never gone before. The collection data browsing and exploration capabilities of Specify Insight will demonstrated as well the process of exporting data from Specify 6 to Insight.

Other new biological collection applications for the iPhone will also be demonstrated. Specify Insight is available from the Apple Store for the iPad 2+.

DemoCamp Session

TH 05/21/2015 01:30 PM

**LIFEMAPPER’S SPECIES DISTRIBUTION MODELING BASED ON IDIGBIO BIOCOLLECTIONS**

**Stewart, Aimee**, Biodiversity Institute, University of Kansas, 1345 Jayhawk Boulevard, Lawrence, KS 66045; aimee.stewart@ku.edu; **Matsunaga, Andréa**, Department of Electrical and Computer Engineering, University of Florida, 339 Larsen Hall, Gainesville, FL 32611-6200; **Beach, James H.**, Biodiversity Institute, University of Kansas, 1345 Jayhawk Boulevard, Lawrence, KS 66045; **Grady, C. J.**, Biodiversity Institute, University of Kansas, 1345 Jayhawk Boulevard, Lawrence, KS 66045; **Cavner, Jeffrey**, Biodiversity Institute, University of Kansas, 1345 Jayhawk Boulevard, Lawrence, KS 66045; **Fortes, José**, Department of Electrical and Computer Engineering, University of Florida, 339 Larsen Hall, Gainesville, FL 32611-6200

Lifemapper (<http://lifemapper.org/>) is a complex biodiversity modeling software platform that creates and maintains an archive of species distribution maps computed from species occurrence data. It consists of a suite of biodiversity data and modeling tools that are published as web services for calculating single and multi-species distribution predictions and for providing macro-ecological biodiversity analyses. iDigBio (standing for Integrated Digitized Biocollections, <http://idigbio.org/>) is an NSF-funded project coordinating the digitization and dissemination of data for millions of biological specimens stored in US biocollections, including information on taxonomy, geographic location, images, vocalizations, and linkages to molecular resources. These data are provided via a customized cloud computing infrastructure and offer an immense, useful baseline for assessing the impacts of climate change, invasive species, and other issues related to sustaining biological diversity. This demonstration brings together these two complementary projects by creating an iDigBio-focused instance of the Lifemapper software infrastructure, adding value to the iDigBio repository by providing updated predicted species distribution maps computed from iDigBio holdings. This collaboration brings the power of Lifemapper analysis tools directly to iDigBio-cataloged specimen data by building, populating, and deploying the two Lifemapper logical components (LmServer and LmCompute) with Rocks Cluster Distribution Toolkit. The iDigBio Lifemapper installation is customized to query and retrieve data from iDigBio, and to handle all data management and communications required to compute current and predictive species distributions. Thousands of these distributions predicted using Global Climate Model outputs produced for the International Panel on Climate Change (IPCC) are made available to end-users via iDigBio through species-based queries with attribution to data providers.

General Session 2

W 05/20/2015 10:50 AM

**THE BOTANIC GARDEN MEISE: IN A NUTSHELL**

**Stoffelen, Piet**, Botanic Garden Meise, Nieuwelaan 38, B1860 Meise, Belgium; piet.stoffelen@br.fgov.be; **Bogaerts, Ann**, Botanic Garden Meise, Nieuwelaan 38, B1860 Meise, Belgium; **De Smedt, Sofie**, Botanic Garden Meise, Nieuwelaan 38, B1860 Meise, Belgium; **Diagre, Denis**, Botanic Garden Meise, Nieuwelaan 38, B1860 Meise, Belgium

The two-century-old Botanic Garden contains rich and diverse



collections, totaling about 4 million botanical objects. January 2014 was the dawn of a new era for the Garden: the National Botanic Garden of Belgium was transferred from the Federal Belgian Government to the Flemish Government and was renamed the Botanic Garden Meise. For visitors and visiting scientist, fairly nothing changed. But for employees, certainly for those working with the collections, this transfer had an important impact, and a huge amount of paperwork came into the picture. Why? Because it was decided that the Garden will house two different, still growing collections, with different owners; the “old” federal collection of almost 3.7 million objects and a Flemish collection which currently contains ca. 300,000 objects (mainly the Van Heurck Herbarium). In this presentation we will illustrate the impact of political events in Belgium on the genesis of our rich collections and we discuss how we are trying to implement the most recent political decision in the management of our collections.

Poster Session 1

W 05/20/2015 AM

### **NMNH PALEOBIOLOGY REGISTRATION: PAST, PRESENT AND FUTURE**

**Strotman, Jennifer L.**, Smithsonian Institution, NMNH, P.O. Box 37012, MRC 121, Washington, DC 20560; strotmanj@si.edu; **Florence, Mark S.**, Smithsonian Institution, NMNH, P.O. Box 37012, MRC 121, Washington, DC 20560; **Hollis, Kathy**, Smithsonian Institution, NMNH, P.O. Box 37012, MRC 121, Washington, DC 20560

There is a 100-year history of fossil registration and transaction activity in the National Museum of Natural History Department of Paleobiology. In the early years of NMNH-Paleo, all transactions were compiled and managed using extensive paper records. Over the years, the collections staff and workflows required to sufficiently manage open and overdue transactions fell out of sync with the volume of transactions processed per year. This resulted in a significant backlog of outstanding transactions. Overdue loans were recalled typically only during large scale loan recall projects, not routinely when loans were due. Inadequately documented loans were difficult to reconcile upon return. Improperly housed paperwork was as good as lost.

Currently, there are approximately 1000 open outgoing loans in NMNH-Paleo. With the hiring of new collections staff in 2014, NMNH-Paleo is now in the position to overcome metabolic deficiencies in managing transactions. The new NMNH-Paleo registration team is solely focused on clearing out the transaction backlog along with standardizing and streamlining transactions workflows. Since October 2014, 108 of 989 overdue outgoing transactions have been resolved, the oldest dating back to 1968. The team is implementing new technology, standards, and procedures to manage transactions quickly which will prevent a backlog from reoccurring along with ensuring the highest accountability of specimens.

Contributions Small Nat. Hist. Coll. Symp. 1 TH 05/21/2015 10:50 AM

### **TRANSFORMING ACCESSIBILITY TO THE RICH, SITE-BASED, MULTI-TAXON COLLECTIONS OF FIELD STATIONS; A CASE STUDY FROM ARCHBOLD BIOLOGICAL STATION**

**Swain, Hilary M.**, Archbold Biological Station, 123 Main Drive, Venus, FL 33960; hswain@archbold-station.org; **Nelson, Gil**, iDigBio, Department of Biological Science, Florida State University, 319 Stadium Drive, Tallahassee, FL 32306-4295

Field stations throughout North America, linked by the Organization

of Biological Field Stations, provide a network of people, natural observatories, and collection data. In a recent survey, 86% of 48 respondents supported on-site collections. Here we present a case study of one of the largest such collections, at Archbold Biological Station ABS, a renowned not-for-profit in Florida. ABS has a broad scientific research, education and conservation mission but is not formally affiliated with any university or museum. As a component of its long-term research, ABS curates a diverse, multi-taxon, specimen-based, research collection used by staff scientists and other investigators. The collection is a unique, irreplaceable record of regional biodiversity, with an emphasis on the Florida scrub habitat including threatened and endangered species, and non-natives. After 75 years of growth, the collection includes ~270,000 specimens identified to species including arthropods (95%) plants, bryophytes, mammals, birds, fish, and herptiles, representing ~10,392 species. In the last five years the collection has contributed to numerous research projects, descriptions of 12 new species, made hundreds of loans, been accessed on-site by 110 investigators, and resulted in 58 publications. ABS has made available on-line ~10,000 specimens of plants and arthropods, and has databased all the vertebrates, plants, and bryophytes. Remaining specimen data are not yet accessible online via www-based portals. Archbold is partnering with iDigBio, seeking support to database, image and migrate specimen data to the internet. We describe how such projects at field stations will advance biological research, promote benefits to conservation, and increase educational outreach.

Poster Session 2

W 05/20/2015 PM

### **DIGITIZING THE NATIONAL INSECT COLLECTION: CAPTURING A SPECIES LEVEL INVENTORY**

**Tancredi, Laura**, Collections Program, Smithsonian Institution, National Museum of Natural History, 10th and Constitution Avenue, Washington, D.C., 20560; tancredil@si.edu; **Gentili-Poole, Patricia**, Department of Entomology, Smithsonian Institution, National Museum of Natural History, 10th and Constitution Avenue, Washington, DC 20560

The Department of Entomology at the Smithsonian Institution's National Museum of Natural History contains over 35 million specimens representing approximately 400,000 individual species. The ability to capture a digital descriptive record for each individual specimen in a timely and cost-effective way, at our current rate of digitization, is impracticable. The department has developed an innovative approach towards cataloguing, using the “taxonomic lot” to capture a Species Level Inventory. Cataloguing at this level of granularity has allowed the process of digitizing the extensive collection to occur at a faster rate with completion of the first phase anticipated by 2017.

The project will be accomplished in three phases: Phase I, currently underway, involves recording each individual species within a discreet section of the collection, including author(s), year of publication, bioregion, and preparation; names are updated and storage is relabeled as needed completing the workflow. Phase II will involve the capture of specimen counts and distributions at the country level. Capturing images will complete Phase III.

The Species Level Inventory allows for a digital representation of the entire collection, until technology advances to the point where capturing data at a specimen level becomes efficient and cost-effective. It is a management tool that will provide information to better administer the collection, plan future projects and the growth of the collection, and increase accessibility of the collection to the public, educators and researchers.

**LARGE AND SMALL COLLECTIONS: PARTNERS IN A TIME OF CHALLENGES AND OPPORTUNITIES**

**Thiers, Barbara K.**, The New York Botanical Garden, 2900 Southern Blvd., Bronx, NY 10458; bthiers@nybg.org

There are about 73 million specimens in 600 herbaria in the U.S. Large herbaria (with more than 100,000 specimens) number 101; medium-sized herbaria (50,000-99,999 specimens) number 58, and small herbaria (fewer than 49,000 specimens) number 429. The majority of federal government collections are small, the medium category has the largest state government and university herbaria, and private institutions account for a larger proportion of the large herbaria. Herbaria are concentrated in the region of the country east of the Mississippi.

In general, small collections are regionally- or taxon-focused, often with a few main collectors, a larger proportion of whom may be lesser known. These collections may not be duplicated elsewhere, and may be less often included in inventories and monographic studies. Specimens in smaller collections will likely be more recently collected and more uniformly documented than those in larger collections. Specimens in larger collections most likely span a larger geographic, temporal and taxonomic range, are likely duplicated elsewhere, and are more frequently studied.

Because of the complementarity among small and large collections, consultation of both is needed for the broadest possible range of collection coverage. This creates a natural basis for collaboration in both digitization projects and the research projects that digitization projects have been designed to serve. To date, a disproportionately small number of small collections are involved in collaborative networks and digitization projects. This problem needs to be addressed both through greater awareness of the strengths of smaller herbaria on the part of larger ones, and through more action on the part of smaller herbaria to demonstrate their readiness for collaboration and to initiate collaborative projects.

Poster Session 1

W 05/20/2015 AM

**NHC3: A NOVEL APPROACH TO ENCOURAGE STUDENT PARTICIPATION IN NATURAL HISTORY COLLECTIONS PRESERVATION, RESEARCH, AND OUTREACH**

**Thigpen, Christopher S.**, Department of Biological Sciences, Arkansas State University, State University, AR 72467; christopher.thigpen@smail.astate.edu; **Hook, Alexandra**, Department of Biological Sciences, Arkansas State University, State University, AR 72467; **Rath, Mary**, Department of Biological Sciences, Arkansas State University, State University, AR 72467; **Marsico, Travis D.**, Department of Biological Sciences, Arkansas State University, State University, AR 72467

The preservation and curation of natural history collections has lost much of the public interest in recent years. Some institutions view the maintenance of these collections as a financial burden and elect to destroy or donate entire collections. However, student involvement in collection maintenance can provide both collection maintenance services and valuable experience in a museum setting. The Natural History Collections Curation Club is a student organization that aids in the preservation of every biological collection at Arkansas State University and provides valuable volunteer experience to undergraduate and graduate students. Our work includes specimen preparation, collection maintenance, research, and public outreach. We have added new

specimens to collections, managed specimens within collections, and provided exciting educational and volunteer experiences to local schools and students. NHC3 has even branched out to other universities around the nation. Since our forming in the spring of 2013, clubs have formed at the University of California Santa Barbara, Missouri State University, and the University of Georgia. We believe that clubs like ours can be a previously untapped resource to help save many deteriorating collections and inform the public of the importance of having access to the rich biological and historical data contained within natural history collections.

General Session 3

W 05/20/2015 02:50 PM

**AQUATIC INVASIVES: DOCUMENTING THE FISH, MOLLUSKS, ALGAE AND PLANTS THREATENING NORTH AMERICA'S GREAT LAKES**

**Toll, Jonathan W.**, Herbarium, The New York Botanical Garden, 2900 Southern Blvd, Bronx, NY 10458; jtoll@nybg.org; **Cameron, Kenneth M.**, Wisconsin State Herbarium, University of Wisconsin-Madison, Madison, WI 53706; **Tulig, Melissa**, Herbarium, The New York Botanical Garden, 2900 Southern Blvd, Bronx, NY 10458;

Invasive species threaten the environmental health of North America's Great Lakes which hold 21% of the Earth's fresh water supply. Biologists have documented more than 180 non-indigenous species and these occurrences are well documented as voucher specimens held within local herbaria and natural history museums—many of them small and with a strong regional focus. Unfortunately, these specimens, more often than not, are generally accessible only to a limited community of local scientists, are appreciated by only a few specialists who rarely consider species outside of their area of taxonomic expertise, and are inefficiently used as a primary source of data for constructing databases and other resources designed to track and monitor the spread of invasives. The Great Lakes Invasives is a Thematic Collections Network targeting the digitization of non-indigenous species and their congeneric taxa of: vascular plants (ferns & angiosperms), fish (agnaths & bony), green algae (charophytes), and mollusks (bivalves & gastropods) documented to be present in the Great Lakes Basin. We are also collaborating with our Canadian colleagues who maintain the national <http://Canadensys.net> resource. The unique methods of three-dimensional liquid preservation of whole vertebrates by ichthyologists compared to 3D preservation of mollusk shells by malacologists, and mostly two-dimensional preservation of pressed plant specimens by botanists, presents the digitizing challenges in our project along with developing an unprecedented data resource with scale and credibility.

Poster Session 1

W 05/20/2015 AM

**SHIFTING COLLECTIONS: A CASE STUDY ON HOW TO COORDINATE, IMPLEMENT AND COMPLETE MOVING OVER 160 CASES OF SPECIMENS**

**Toner, Meghann S.**, United States National Herbarium, Smithsonian Institution, Washington, DC, 20013-7012; TonerM@si.edu

Storage equipment plays a key role in the long-term conservation of specimens. It is the goal of all collections to have the highest standard of storage cabinets that are available in the industry. In the 1940's, wooden storage cases were constructed by Smithsonian Shops. The wood frames and inserts were sheathed in metal and covered with lead-based paint. In the 21st century these cases are

clearly substandard. New cases must be introduced and utilized to safeguard the collections. When these cases are replaced, issues arise with safely moving specimens from old spaces to new ones without having the process turn chaotic. Recently, the U.S. National Herbarium received a generous grant to replace 138 of our old wooden cases with 160 new metal cases. Our experience in the planning and implementation of this move provides a case study for shifting specimens in both small and large collections. All of the positive and negative issues will be discussed. Software technologies such as ArcGIS and collection assessment tools (CMAP) developed in-house help to coordinate this process. The importance of building a partnership between the collection staff, building services, and craft shops will also be discussed.

Plenary Session

T 05/19/2015 09:30 AM

### ENDLESS FORMS, MOST USEFUL

**Tripp, Erin A.**, Ecology and Evolutionary Biology, University of Colorado, Boulder, CO 80309-0334; erin.tripp@colorado.edu

In cultural institutions across the world, natural history collections serve diverse crowds and diverse interests. A natural history collection is in fact a heritage site whose full potential is still being realized. In this presentation, I will reflect on some of the ways in which collections have facilitated education and outreach in my own career, drawing on examples from research in the tropics to research very near home.

Poster Session 2

W 05/20/2015 PM

### USING THE DATA WE'VE DIGITIZED

**Utrup, Jessica A.**, Yale Peabody Museum of Natural History, 170 Whitney Avenue, New Haven, CT 06511; jessica.utrup@yale.edu; **Briggs, Derek**; Yale Peabody Museum of Natural History, 170 Whitney Avenue, New Haven, CT 06511; **Butts, Susan**; Yale Peabody Museum of Natural History, 170 Whitney Avenue, New Haven, CT 06511

The Division of Invertebrate Paleontology at the Yale Peabody Museum of Natural History is a Partner to an Existing Network (PEN) to the PaleoNiches TCN. This TCN, supported by iDigBio, has been developed to catalog and photograph specimens, georeference localities, and publish all of this data online for three distinct time periods and three geographic regions of the United States. This poster follows one accession of Pennsylvanian fossils from the midcontinent from its collection in the field, through its deposition at the museum, early research, cataloging attempts, digitization, and into current research. Between 1924 and 1931, George Condra, Carl Dunbar, and the Nebraska Geological Survey collected over 150 drawers of material that was donated to the Yale Peabody Museum. Condra and Dunbar (as well as many of their students) did extensive research on specimens from this accession, and they produced many widely known and well-respected publications from it. Through our work on the PEN, we have now georeferenced all localities from this accession and have catalogued most of the specimens. Many have also been photographed. One researcher has begun using this newly digitized data (in conjunction with that of the other member institutions of the TCN) to examine macroevolutionary questions regarding competition, extinction, and speciation. Planned collaborations with climate scientists will develop climate models to look at niche changes through time and the effect this has on extinction and speciation rates. The information gathered through this research may provide insight into the challenges threatening organisms today as they face climate change and its impacts.

Contributions Small Nat. Hist. Coll. Symp. 1

TH 05/21/2015 11:30 AM

### CHALLENGES AND OBSTACLES TO DIGITIZING SMALL PALEONTOLOGY COLLECTIONS

**Vietti, Laura A.**, Geology Department, University of Wyoming, Dept. 3006, 1000 University Ave, Laramie, WY 82071; lvietti@uwyo.edu

The Geology Department at the University of Wyoming is in the early stages of digitizing its paleontology collections (n~40,000 specimens) and has encountered many challenges and obstacles. Most of our digitization issues arise from variations in fossil color, composition, size, shape, preparations, and breadth of meta-data (field notes, lab notes, maps, photographs, georeferencing). Because fossil specimens vary across many of these fields, the digitization process differs specimen-to-specimen and requires an adaptive digitization workflow. In turn, adaptive workflows in the paleontology field require advanced equipment, extensive training, and specialized workers, which in the context of small collections is especially difficult to achieve due to limited funds and personnel. Here, I present examples of these various digitizing challenges and hope to stimulate discussion on methods for overcoming them.

Spec. Full Circle Symp. 3

TH 05/21/2015 09:30 AM

### PUTTING OUR IMAGES TO WORK: USING DIGITIZED FOSSIL BEETLES TO STUDY A GLOBAL CLIMATE TRANSITION

**Walker, Lindsay J.**, CU Museum of Natural History, University of Colorado, 265 UCB, Boulder, CO 80309; lindsay.j.walker@colorado.edu; **Smith, Dena M.**, CU Museum of Natural History, University of Colorado, 265 UCB, Boulder, CO 80309; **Karim, Talia S.**, CU Museum of Natural History, University of Colorado, 265 UCB, Boulder, CO 80309

The Invertebrate Paleontology section of the University of Colorado Museum of Natural History (UCM) has been digitizing its fossil insects since July 2013 as part of the Fossil Insect Collaborative TCN project. To date, the image capture and post-processing steps of this workflow have been primarily executed by graduate and undergraduate students, collectively spending 50-60 hours/week working with ~110,000 specimens (curated and uncurated). Resultant images of Coleoptera (beetles) from the Green River Formation are now being used to study insect response to Eocene climate change. Integrating specimen images into this project has not only helped fulfill research goals, but has also provided our digitization team insight into the pros, cons, and unknowns of using digital collections for research. We have begun developing methods for associating digitized specimens with collecting information, reorganizing the physical collections after imaging, processing and reorganizing images to make them useful for answering research questions, and consulting external researchers using only images. Based on this experience, the UCM's workflow and procedures for imaging compression fossils have been updated and streamlined to better accommodate anticipated research needs. Taken in its entirety, having access to digital collections has facilitated achievement of research goals despite complications encountered as the project progressed.



### ASSESSING RESEARCH POTENTIAL OF HISTORIC ARCHAEOLOGICAL COLLECTIONS: A CASE STUDY OF THREE FLORIDA ASSEMBLAGES

**Wallis, Neill J.**, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611-7800; [nwallis@flmnh.ufl.edu](mailto:nwallis@flmnh.ufl.edu); **Donop, Mark C.**, Department of Anthropology, University of Florida, Gainesville, FL 32611-7305; **Hall, Kristen C. D.**, Department of Anthropology, University of Florida, Gainesville, FL 32611-7305

Records of provenience are indispensable to most successful archaeological research programs that utilize museum collections. Generally, detailed and meticulous provenience records allow for the most nuanced research questions to be addressed. However, many museums are filled with historic collections for which provenience data are limited or flawed, the product of relatively crude field techniques and cavalier record keeping compared to modern standards. The real and perceived research limitations of such historic collections have caused most archaeologists to avoid them, leaving vast assemblages little-used and languishing on the shelves. Given the curation crisis in archaeology, in which it is difficult to find support for curating even highly significant assemblages excavated with modern precision, how can the continued curation of such historic collections be justified?

We consider this question by highlighting our approaches to three historic assemblages with compromised provenience records in the Florida Archaeology collection at the Florida Museum of Natural History: Palmetto Mound (8LV2), Shelly Mound (8LE6), and the Melton site complex (8AL169, 8AL5, 8AL7). Collected from the late 1800s to the early 1970s, these assemblages make up for their lack of provenience detail with scale, excavation size and number of artifacts. The vast scope of these collections allow for the refinement of pottery typologies and new understandings of vessel form and function, study of intra-site artifact distribution, and inter-site analysis on regional scales. When paired with targeted fieldwork at these largely destroyed sites, reconstructions are sometimes possible with even the scantest of original field observations.

### INTRODUCTION TO THE LEPIDOPTERA COLLECTIONS AT THE MCGUIRE CENTER FOR LEPIDOPTERA AND BIODIVERSITY AT THE FLORIDA MUSEUM OF NATURAL HISTORY

**Warren, Andrew D.**, McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, PO Box 112710, Gainesville, FL 32611; [hesperioidea@yahoo.com](mailto:hesperioidea@yahoo.com)

The McGuire Center for Lepidoptera and Biodiversity was established in 2004, when the Lepidoptera collections from the Allyn Museum of Entomology (in Sarasota, FL) and the Florida State Collection of Arthropods (in Gainesville, FL), were combined and moved into a new facility on the University of Florida campus in Gainesville. In the past 10 years, many additional Lepidoptera collections have been acquired, to form what is now one of the world's largest and most comprehensive assemblages of butterflies and moths. Being a new and rapidly growing institution, several Lepidoptera families remain incompletely curated, and only a small percentage of the specimens have been databased. Despite these challenges, the collections serve as an extremely valuable resource for anyone conducting research on Lepidoptera, and many exciting discoveries have been made among specimens housed in the McGuire Center collections; some of these discoveries will be discussed.

### BONE MACERATION AND BONE DEGREASING—A NECESSARY TOOL FOR PRESERVING NATURAL HISTORY COLLECTIONS

**Weber, Guenther**, MEDIS Medical Technology GmbH, Bachstr.9, D-35418 Buseck, Germany; [info@medisgmbh.com](mailto:info@medisgmbh.com)

A new method has been developed for use in museum bone preparation of vertebrate skeletal specimens and in human and veterinary anatomy studies. In all cases, bone material must first be macerated (complete fat-emulsification and elimination of all proteins) and degreased (all of bone fat extracted) to assure proper preservation and longevity of the specimens.

Maceration is the procedure of dissolution of organic tissue. It is best accomplished by the standard enzyme-maceration, where it is of utmost importance that the pH is constant and controlled at all times. It is therefore advisable to control the pH-value at all times, possibly by use of an "online" monitoring technique. Without an intensive degreasing of the bone specimens the bones will be decomposed by means of oxygen, light, heat and moisture. Optimum degreasing is accomplished by processing the specimens in a low temperature (41°C) controlled and sealed aerosol environment using dichloromethane (DCM) as the only allowed extracting agent. If any other degreasing agent is used, international health and safety regulations are ignored.

The issue: fat is not conservable! Oxidation and micro-organisms will produce acids that will degrade the specimen. Degreasing is not an optional step in bone preparation but rather a necessary one to avoid bone destruction. It is a necessary preservation technique and should be carried out in each museum in order to save the skeletal collections in a stable environment. The loss of valuable specimens due to omitted or inadequate degreasing is well known.

### TEN YEARS OF THE SOCIETY OF HERBARIUM CURATORS: PAST, PRESENT AND FUTURE

**Weeks, Andrea**, Department of Biology and Ted R. Bradley Herbarium, George Mason University, 4400 University Dr., Fairfax, VA 22030; [aweeks3@gmu.edu](mailto:aweeks3@gmu.edu)

The year 2015 marks the 10th anniversary of the Society of Herbarium Curators (SHC), an organization founded with the goal of uniting herbaria large and small. This presentation will chart SHC's inception from early meetings of curators in the southeastern United States, to its formal incorporation, to its recent emergence as a model for sustaining regional networks of herbaria over the long-term. The mission of SHC includes promoting and expanding the role of herbaria in botanical research, teaching, and service to the community at large, providing a forum for discussion and action on all issues confronting herbaria, and extending its influence towards the preservation of endangered herbaria. Our outreach newsletter, *The Vasculum*, social media presence and student research grant competition are some of the ways that we advance this broad mission. SHC also provides regionally based herbarium consortia with a framework for formalized democratic governance via SHC chapters. Activities of these chapters were originally envisioned to include local outreach activities, advocacy for small herbaria, and the development of community standards of curation. However, they now include the collection and management of digitized herbarium data across institutions. I argue that the long-term success of curating digitized herbaria, whether large or small, will



hinge on our community's ability sustain collaborations beyond the influence of any one herbarium, curator or research grant. I will also provide examples of our success in incorporating small or endangered herbaria from Tennessee and Virginia into regional digitization efforts in the southeastern United States.

General Session 5

TH 05/21/2015 10:30 AM

### **INTEGRATED PEST MANAGEMENT FOR THE ANGELO STATE NATURAL HISTORY COLLECTIONS: AN APPROACH FOR SMALL COLLECTIONS**

**Welch, Barbara F.**, Department of Biology, Angelo State University, San Angelo, TX 76909-0890; [bwelch1@angelo.edu](mailto:bwelch1@angelo.edu); **Dowler, Robert C.**, Department of Biology, Angelo State University, San Angelo, TX 76909-0890; **Revelez, Marcia A.**, Department of Biology, Angelo State University, San Angelo, TX 76909-0890

The Angelo State Natural History Collections (ASNHC) are located at Angelo State University, San Angelo, TX and are comprised of 5 collections: Mammalogy, Ornithology, Herpetology, Frozen Tissues, and the Herbarium. Of these collections, three are at high risk for potential pest infestations. Four species of pests have been detected in these collections: *Necrobia rufipes*, *Tineola bisselliella*, *Tineola pellionella*, and *Stegobium paniceum*. Prior to 2013, these infestations remained continuous but fluctuated in concentrations and attempts to manage the problems had been mostly reactive. A preventive approach is critical to ensure the longevity and safety of the 100,000+ specimens housed in the ASNHC. In July 2014, an IPM assessment of the ASNHC began to determine the sources of infestation with the goal of creating IPM policies and procedures designed to mitigate the problems. The assessment included a detailed inspection of all cases, an evaluation of current procedures, treatment options, behavior, and housekeeping. Monitoring the collections included monthly checks of blunder traps and moth traps placed in the collection areas. Additionally, the utilization of a robot vacuum was used to improve housekeeping practices but proved to be an excellent tool in monitoring pest activity as well. The robot vacuum ran twice a week in each collection area and the contents of the dustbin were identified and quantified. Pest activity has declined significantly with its use. Results of the assessment have determined the factors contributing to the pest problem are likely attributed to housekeeping, storage, human behavior, and building issues. The ways in which the ASNHC has begun to address these issues will be discussed.

Plenary Session

T 05/19/2015 11:00 AM

### **TIME TO GROW A PAIR: INSTITUTIONAL LEADERSHIP, TAXONOMY AND NATURAL HISTORY**

**Wheeler, Quentin**, Office of the President, SUNY College of Environmental Science and Forestry, 1 Forestry Dr., Syracuse, NY 13210; [qwheeler@esf.edu](mailto:qwheeler@esf.edu)

For the twin disciplines of taxonomy and natural history that have suffered similar fates of marginalization, it is crunch time. Much of what these disciplines can contribute to our knowledge of evolution, wild life conservation, secure ecological services, resilience to climate change, and options to sustain human prosperity depends on their immediate revitalization. The coming mass extinction of species has imposed a deadline on learning significant amounts of knowledge of the origins and organization of the biosphere. These sciences can only realize their full potential given the opportunity to pursue their own

agendas. After decades of failed intellectual appeasement, it is time for unapologetic clarification of the mission and needs of these fields and for courageous institutional leadership to do the right thing making investments in the workforce, collections, and infrastructure appropriate to the growth and success of these vitally important sciences.

Poster Session 2

W 05/20/2015 PM

### **ASSESSMENT OF STUDENT INVOLVEMENT IN THE UNIVERSITY OF IOWA PALEONTOLOGY REPOSITORY'S NSF-SUPPORTED PROJECT "CRITICAL RENOVATION AND REVITALIZATION OF THE UNIVERSITY OF IOWA FOSSIL PLANT COLLECTION."**

**Wilkins, Alyson E.**, Department of Anthropology, University of Iowa, 114 Macbride Hall, Iowa City, IA 52242; [alyson-wilkins@uiowa.edu](mailto:alyson-wilkins@uiowa.edu); **Wittman, Emily E.**, School of Art and Art History, University of Iowa, 150 Art Building West, 141 N Riverside DR, Iowa City, IA 52242; **TeRonde, Audrey J.**, Department of Earth and Environmental Sciences, University of Iowa, 115 Trowbridge Hall, Iowa City, IA 52242; **Adrain, Tiffany S.**, Department of Earth and Environmental Sciences, University of Iowa, 115 Trowbridge Hall, Iowa City, IA 52242

The University of Iowa Paleontology Repository (UIPR) recently completed a series of acquisitions of fossil plant material from the UI Department of Biology. Together with the UIPR's existing holdings, these represent a substantial paleobotany collection in need of full curation. A new project, "Critical renovation and revitalization of the University of Iowa Fossil Plant Collection" is supported by the National Science Foundation's CSBR program (DBI-1349322, 2 yrs., \$196,751). Undergraduate students are an integral part of the team working on this project—it could not be completed without them. Students have a variety of academic backgrounds that sometimes creates a challenge regarding interpretation of specimen data, but as they become familiar with new information, they bring a fresh perspective on collections management. Students may work on the project directly, or indirectly by assisting with other day-to-day collection activities. They may be supported through the NSF grant, or may be working for academic credit with an unpaid internship or service learning project through the UI Museum Studies Certificate Program, or a Directed Research Project in a faculty lab. They may be supported through an Iowa Center for Research for Undergraduates grant or a SROP/McNair Scholarship, or they may be volunteering. The tasks are varied, from numbering and labelling specimens, and moving collections to new storage, to preventive conservation and collections-based research. Team-work, self-evaluation, student supervision and training, and project management are vital components of the project. Here we review the students' experiences in the first year of the project.

General Session 4

W 05/20/2015 03:30 PM

### **WATER, WATER EVERYWHERE AND WHERE EXACTLY IS IT? CONSIDERATIONS FOR DESCRIBING OCEANIC COLLECTING LOCALITIES WHEN COORDINATES ARE NOT AVAILABLE**

**Williston, Andrew D.**, Ichthyology Collection, Museum of Comparative Zoology, 26 Oxford St, Cambridge MA 02138; [andrew.williston@gmail.com](mailto:andrew.williston@gmail.com)

Geographical descriptions of marine collecting localities deserve special consideration, particularly in light of collection digitization. Higher-level descriptions of terrestrial collecting localities can be structured hierarchically according to clear, geo-political

boundaries, for instance: Continent, Country, State, and County. However, these hierarchies do not always apply to Oceanic collections, particularly in the absence of coordinate data. Large oceanic water masses are often contiguous and their boundaries not well defined on most maps. Boundaries of smaller ocean features, like bays or seas, are even less well defined. Accurately describing oceanic collecting localities is critical because of the legal implications of national and local controls over marine areas and the need to make precise database queries and georeferences. Developing stable, widely available, and recognizable museum standards for descriptions of oceanic geography will be critical for making marine-based collections more available and accurate, especially as legacy data is digitized. This presentation will address current progress, challenges and possible future directions describing oceanic collecting localities.

Spec. Full Circle Symp. 1

W 05/20/2015 10:30 AM

### **THE UTILITY OF ACCESSIONED COLLECTIONS FOR CONSERVATION MANAGEMENT OF ENDANGERED SPECIES**

**Wisely, Samantha M.**, Department of Wildlife Ecology and Conservation, 110 Newins-Ziegler Hall, University of Florida, Gainesville, FL, 32611; wisely@ufl.edu; **Marinari, Paul M.**, Smithsonian Conservation Biology Institute, National Zoological Park, 1500 Remount Road, Front Royal, VA 22630; **Ryder, Oliver A.**, San Diego Zoo Institute for Conservation Research, 15600 San Pasqual Valley Road, San Diego Zoo Global, Escondido, California, 92027

Biological Resource Centers (BRC's) at zoos and museums store live tissues for future science-based research and conservation efforts. A BRC consists of cryopreserved somatic tissue, eggs, sperm, cell lines or embryos of specimens and provides unique genomic resources for a variety of techniques that lead to genetic restoration of a species. Collections of this type started in the 1980's and frozen gametes have aided in the conservation breeding and Species Survival Plans® of such species as the Giant Panda, Black-footed Ferret, and Snow Leopard. Not all species, however, lend themselves to the collection of gametes. Although cloning from somatic cells is not a functional tool for immediate conservation management applications at this time, BRC's have established the resources needed for the conservation cloning of *Hirola antelope* (Hunter's hartebeest), Arabian oryx, black-footed cat, Sumatran rhino, Tasmanian devil, and golden lion-tamarin. Many BRC's have focused on establishing a database of the biomaterials, but collections during the nascent years of development were often poorly documented. Reconstructing these early years can be critically important to assisted breeding efforts as these older collections represent animals that may be more genetically unique and therefore valuable. We provide an example of a BRC for the black-footed ferret, an endangered species with a small gene pool and high inbreeding. The Recovery Team is currently considering an array of reproductive technologies to assist in genetic restoration of this species and a plan to broaden the BRC of this species to include wild and captive bred individuals.

Spec. Full Circle Symp. 2

W 05/20/2015 02:10 PM

### **THE SCRUB-LOVIN' GRASSHOPPERS (ORTHOPTERA: ACRIDIDAE: MELANOPLUS: THE PUER GROUP) OF THE SOUTHEASTERN U.S.: INTEGRATING SPECIMEN DATA FROM THEN AND NOW FOR MAXIMUM EFFECT**

**Woller, Derek A.**, Entomology Dept., Texas A&M University, Minnie Belle Heep Center, Room 412, Campus MS 2475, College Station,

TX 77843-2475; asilid@gmail.com; **Song, Hojun**, Entomology Dept., Texas A&M University, Minnie Belle Heep Center, Room 412, Campus MS 2475, College Station, TX 77843-2475

One of the most ancient ecosystems in the southeastern U.S. is scrub, often associated with ridge systems, which are thought to have been used as refugia during Pleistocene sea level changes. Following recession of the waters, these habitats effectively remained islands due to unique soil composition and lack of plant diversity leading to a myriad of floral and faunal endemics. In particular, arthropod endemics abound, like those in the grasshopper genus, *Melanoplus* (Orthoptera: Acrididae: Melanoplineae). Many southeastern members of this genus possess short wings incapable of flight and are unable to easily distribute over large distances, which makes these *Melanoplus* species ideal candidates for examining speciation hypotheses. To test such hypotheses, the Puer Group (PG), comprised of 24 species with related morphology, was chosen. The group spans four neighboring states (FL, GA, SC, and NC), contains many scrub endemics, and its males exhibit great variation in their genitalia. A good beginning for delving deeper into the group's evolutionary history was determining current species ranges by georeferencing the close to 6,000 known specimens, borrowed from various U.S. collections and gathered in the field during recent expeditions. Via the creation of maps, detailed field notes, and anatomical photography, the overarching goal with this project is to collate as much data as possible for the PG and then disseminate it to a wide audience for the twin purposes of raising awareness of a fascinating system of study and creating a solid platform for future studies to build upon.

General Session 6

TH 05/21/2015 02:10 PM

### **SCIENCE COMMUNICATION OF FOSSIL NEWS IN CHINA**

**Ye, Facheng**, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, No. 39 East Beijing Road, Nanjing 210008, China; 279617274@qq.com

The distribution of science news on the internet in recent years, is undoubtedly one of most common means of presenting scientific information to the public in China. Among many kinds of science news, fossils are a favorite subject for the public; this is why news about fossils is one of the most popular types of science communication around the world. As the two largest countries in the world, behavior of network users in the United States and China can support interesting and contrasting images about the internet use and preferences. We collected data on news articles on fossils/paleontology from ten web portals and science news websites for one month, and examined the characteristics of science communication between these two countries.

Our data found that whether in timeliness, participation or interactivity of netizens, American websites have obvious advantages in presenting science news. However, China is still in the primary stage of this digital age, their scientific information were published on internet earlier in Chinese news portals, and most of these published science news were mainly translated from foreign websites, and a few local science news published officially from research organizations. However, fast and active science news distribution are ready with the internet development process, and especially, based on the public's growing interesting in science, and following fashionable new media platform such as WEIBO and WECHAT. The pattern and impact of science communication in China will certainly change dramatically in the near future.

### **DIGITIZING HERBARIUM COLLECTIONS IN PARTNERSHIP: A COLLABORATION BETWEEN THE NC MUSEUM OF NATURAL SCIENCES AND THE NC STATE UNIVERSITY VASCULAR PLANT HERBARIUM**

**Zbonack, Natalia**, Naturalist Center, North Carolina Museum of Natural Sciences, 121 West Jones Street, Raleigh, NC 27603; **Krings, Alexander**, Plant & Microbial Biology, North Carolina State University, Raleigh, NC 27695; Alexander\_Krings@ncsu.edu; **Turner, Steve**, Naturalist Center, North Carolina Museum of Natural Sciences, 121 West Jones Street, Raleigh, NC 27603; **Lincoln, Cindy**, Naturalist Center, North Carolina Museum of Natural Sciences, 121 West Jones Street, Raleigh, NC 27603

The North Carolina Museum of Natural Sciences is the largest museum of its kind in the southeastern United States, receiving approximately 1 million visitors annually. In addition to exhibition and education components, the museum also comprises diverse research collections, from paleontology to ichthyology. As part of an on-going effort to facilitate rapid and remote accessibility for researchers, resource managers, and the public, a number of collections have recently been made available online, including those of amphibians and reptiles, fishes, invertebrates, paleontology, birds, geology, mammals, and astronomy. Although not widely known, the museum also hosts a small herbarium collection, numbering about 2500 specimens. Specimens in this collection are mostly recent (collected between the years 1995-2008) and from throughout the eastern United States (primarily from North and South Carolina, Georgia and Florida). We here report on recent efforts to digitize this collection, in partnership with the North Carolina State University Vascular Plant Herbarium. We discuss workflow, equipment, rates of imaging, as well as progress to-date.

### **PRACTICAL IMPLEMENTATION OF BEST PRACTICE GUIDELINES FOR GENETIC RESOURCES ASSOCIATED WITH NATURAL HISTORY COLLECTIONS**

**Zimkus, Breda M.**, Museum of Comparative Zoology, Harvard University, 26 Oxford ST, Cambridge, MA 02138; bzimkus@oeb.harvard.edu; **Ford, Linda S.**, Museum of Comparative Zoology, Harvard University, 26 Oxford ST, Cambridge, MA 02138

Genetic resource collections are a high priority for natural history museums due to their importance in molecular studies; however, the long-term care of these collections is often challenging for institutions due to decentralized curation over multiple storage locations and other influencing factors, including budget, staffing and space. Unlike traditional natural history specimens, the research utility of genetic samples increases with lower storage temperatures and fewer freeze-thaw events and, in addition, use is consumptive, which necessitates careful consideration of loans/gifts on a case-by-case basis. Recently published best-practice standards accumulated for the management of genetic collections associated with natural history collections address all aspects of genetic sample curation and will assist those in making decisions regarding how to collect, store, track, process and distribute genetic specimen samples. These recommended practices are informed by general standards for biorepositories and augmented by current practices used by natural history museums provided via community survey data. These guidelines provide an organized method to evaluate the relative costs and benefits of various curation strategies, allowing users to make

informed decisions regarding how to improve curation and minimize risks to their genetic collections given their institution's goals and available resources. This information is applicable to those enhancing a single existing collection, as well as institutions forming a centralized repository composed of samples from multiple independent collections.

### **GEOREFERENCING AT NYBG—APPLYING A CENTRAL DATABASE AND SITE-BASED APPROACH TO STREAMLINE GEOGRAPHIC DATA ACQUISITION THROUGH THE POINT-RADIUS METHOD**

**Zimmerman, Charles J.**, New York Botanical Garden, 2900 Southern Blvd., Bronx, NY 10458; Czimmerman@nybg.org; **Kiernan, Elizabeth A.**, New York Botanical Garden, 2900 Southern Blvd., Bronx, NY 10458

The process of generating high-quality geographic data from libraries of preserved biological specimens featuring only written locality information is time-intensive and wrought with many challenges, but is essential for unlocking the full research potential of natural history collections. Steady funding for digitization projects have allowed herbarium staff at the New York Botanical Garden to photograph and catalogue an ever increasing portion of its library of plant specimens and their associated collection details. Nearly complete coverage of two regions in particular, Amazonian South America and Atlantic coastal Brazil, has set the stage for large-scale data-driven distributional modeling and predictive spatial analyses for many plant groups, pending that verbal locality descriptions can be translated accurately and efficiently into usable lat./long. coordinates.

In this talk we briefly outline our site-based approach to georeferencing, designed to leverage the possession of an existing central database of collection and locality details as a direct source for both locality coordinates and overall increases in work-flow efficiency. We document the efficacy of our system for eliminating unnecessary and damaging repeat georeferencing and allowing for the employment of selective strategies such as micro-region targeting, which we find eliminates redundant steps and significantly streamlines coordinate and uncertainty acquisition through the well-established point-radius method. Finally, we describe and evaluate our implementation of rigorous research practices, source verification, and process narration as part of a high-investment / high-reward strategy to yield precise, standardized, transparent and reliable georeferencing results at a practical pace while maximizing data quality and integrity.

### **THE RELOCATION, COMPOSITION AND UTILIZATION OF THE PHILLIP V. TOBIAS HOMININ COLLECTIONS, UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG, SOUTH AFRICA**

**Zipfel, Bernhard**, Evolutionary Studies Institute, University of the Witwatersrand, Private Bag 3, Wits 2050, Johannesburg, South Africa; Bernhard.Zipfel@wits.ac.za; **Kemp, Cynthia**, Evolutionary Studies Institute, University of the Witwatersrand, Private Bag 3, Wits 2050, Johannesburg, South Africa; **Jirah, Sifelani**, Evolutionary Studies Institute, University of the Witwatersrand, Private Bag 3, Wits 2050, Johannesburg, South Africa

The Phillip V. Tobias hominin collections of the University of the Witwatersrand began in 1924 with the discovery of the Taung skull, holotype of *Australopithecus africanus*. It was followed by numerous fossil discoveries, primarily from Sterkfontein

and Makapansgat. Further important hominin finds emanated from Border Cave, Drimolen, Gladysvale and Cooper's Cave. Until recently, the collections consisted of approximately 900 specimens—a substantial number in terms of hominins—curated at the School of Anatomical Sciences, University of the Witwatersrand. In 2008 the discovery of the site of Malapa yielded a further 833 hominin specimens of the new species, *Australopithecus sediba*, and in 2013, more than 1,751 specimens were recovered from the new hominin site of Dinaledi. With this rapid growth, the existing repository became too small; a new hominin laboratory and vault was established at the university's Evolutionary Studies Institute. Apart from the wealth of early material, these collections now include a number of complete skeletons, unprecedented in South African palaeoanthropology. In 2014 the precious material was methodically moved, without damage to the sometimes fragile specimens. This facility now houses the largest hominin collection in the world, containing a substantial record of human evolution. In order to maximize these resources, access to scientists is encouraged, innovative international workshops and scientific teams are established to ensure efficient and timely publication of research in high-impact journals. These projects provide a strong case for the way in which primary source materials can be curated, catalogued and studied within the spirit of open access and scientific best practices.



# MEDIS Medical Technology GmbH

*Your Partner for "Bone Preparation Techniques"*

*Save your valuable collections and do professional bone-preservation. A manual is available from MEDIS!*



Bonefat Extraction Uni MA-1370

#### Features and benefits:

- Process chamber dia. 500 or 1000mm
- Integrated DCM recycling module
- Bonefat extraction temperature: 41°C
- Bonefat extraction medium: Dichlormethane (DCM)
- Integr. gentle bone drying module at 41°C
- Modern electronic touchpanel control
- All functions also for manual operation
- Fully closed system
- Intergr. telemaintenance system
- Installed at all major European museums

Detailed informations, technical brochures, references and downloads see the internet under

[www.medisgmbh.com](http://www.medisgmbh.com)



Bone Maceration Unit MA-1366

#### Features and benefits!

- Optional one or two process chambers for specimen softening + maceration
- Each bath indiv. programmable
- Optional digital online pH-monitoring
- Adjustable oxygen supply modul
- Programmable bath circulation
- Extraction system for each chamber
- Fully closed, odor-free system
- Installed at all major European museums
- pH-value controlled enzyme activity
- Intergr. telemaintenance system

Detailed informations, technical brochures, references und downloads see the internet under

[www.medisgmbh.com](http://www.medisgmbh.com)

MEDIS Medical Technology GmbH  
Bachstr. 9  
D-35418 Buseck  
Germany

Phone: +49 6408 / 5035 - 0  
Fax: + 49 6408 / 5035 - 15  
E-Mail: [info@medisgmbh.com](mailto:info@medisgmbh.com)  
Internet: [www.medisgmbh.com](http://www.medisgmbh.com)

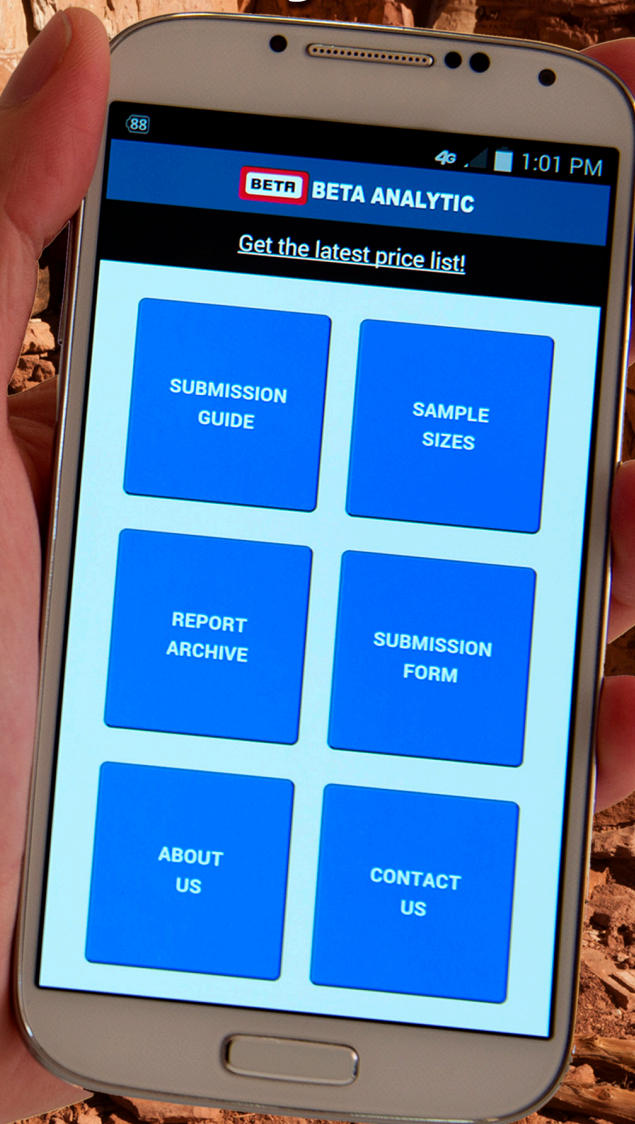


Anatomy-Forensic Medicine-Pathology

-Supporting member of the Anatomische Gesellschaft (GER), Anatomical Society (UK), the VDP and the SPNHC-



# Your Radiocarbon Results Our Expertise All in your Pocket



- High-quality results within 2-14 business days
- Consultation before, during and after analysis

**BETA**

Beta Analytic  
Radiocarbon Dating  
Since 1979

Discover the  
BETA app for free at:  
[radiocarbon.com/app](http://radiocarbon.com/app)

