



iDigBio

Integrated Digitized Biocollections

2016 Annual Summit

Chattanooga Tennessee

November 1-3



Welcome

Dear colleagues,



Welcome to the 6th annual iDigBio-hosted summit for ADBC scientists and students! Again this year the summit is a large event with an anticipated 110 participants, including those from 18 TCNs AND PENs, other colleagues working with biodiversity collections data, guests from the NSF, and iDigBio. As in past years, we have a packed agenda of presentations and breakout groups, but we also have plenty of opportunities for networking and discussion. The latter include daily morning and afternoon breaks, lunches, an evening reception at the Tennessee Aquarium, a free evening to organize your own discussion group, and an open meeting space that is available any time of day for small groups to gather and discuss topics of specific interest to them.

The national effort to digitize information in biocollections has been successfully catalyzed by funding from NSF and activities of TCNs and iDigBio. As a community, we have defined digitization priorities, integrated best practices into workflows, provided cyberinfrastructure resources including a search portal, addressed major challenges via working groups, and built collaborations with data providers/users. We have improved digitization practices, increased involvement in digitization and training, and adopted informatics tools that improve the efficiency and scalability of digitization in all types of collections.

In its 6th year, iDigBio is working with staff in more than 500 collections in 275 institutions. We have communicated with our stakeholders to increase access to collections data through workshops, webinars, the iDigBio Spotlight, and social media. During its first 5 years, iDigBio sponsored attendance of 3,083 participants from 484 institutions to 82 workshops that targeted digitization-related topics. iDigBio has ingested 842 recordsets (up from 638 a year ago) containing almost 73 million specimen records and 16.5 million images and other media (up from 46 million and 13 million a year ago). Because of the way in which specimens in collections are organized, with some stored individually (e.g., plants on herbarium sheets, birds in drawers), and others stored as “lots” (several specimens of fishes or tadpoles in jars of alcohol, many fossils in a shared matrix), we estimate that an average “specimen record” refers to about 3 specimens. This suggests that the number of specimens represented digitally in iDigBio is close to 220 million.

All data ingested are indexed so that queries and other types of index-based access are supported. Searches can be done through a Web-based graphical interface or through APIs. Search and analytical tools enable users to mine diverse data such as taxonomy, location, images, traits, and vocalizations. As TCNs generate increasingly complete and valuable data, iDigBio is placing a greater emphasis on data improvement and use in research and outreach. iDigBio data have been used in recent publications ranging from identification of areas of endemism in plant bugs (Miridae) and their botanical hosts, to analyses of niche differentiation in allopolyploid plants relative to their diploid progenitors, and iDigBio cyberinfrastructure is being linked to other biodiversity resources such as the Open Tree of Life to enable novel integrative research. Outreach activities developed with TCNs include the creation of education-specific portals and innovative applications using specimen data and images, and educational modules using biodiversity data for K-12 and undergraduate audiences. We also are engaging directly with the public through online platforms and at events such as WeDigBio.

The national resource created by NSF through ADBC will be increasingly recognized as essential for digitized information on biodiversity. Our work is continuing, and the results are increasingly visible to the scientific community. Let's make Summit VI a catalyst for even greater success!

A handwritten signature in black ink that reads "Larry Page". The signature is fluid and cursive, with a long horizontal stroke at the end.

Larry Page, Director
iDigBio



Contacts for Questions or Problems

If you encounter logistical issues prior to or upon your arrival in Chattanooga and require assistance, we encourage you to contact Project Assistant Cathy Bester at 352.214.5043, or Project Manager David Jennings at 352.870.7562.

Travel to Chattanooga, TN

If you are an iDigBio-supported participant, your travel arrangements have been coordinated and finalized by Cathy Bester, and you should have already received all travel details in a separate email. If you have any remaining travel questions or concerns, please contact Cathy at cbester@flmnh.ufl.edu. If your travel is not being supported by iDigBio, you are responsible for your own travel arrangements.

Transportation from the Chattanooga Metropolitan Airport to Hotels

Upon your arrival into the Chattanooga Metropolitan Airport, you should take a taxi or Uber to your hotel located in downtown Chattanooga. The fare should be approximately \$25-\$30 for a one way taxi between the airport and downtown (approx. 9 miles) and \$13-\$17 for an UberX. iDigBio provided participant arrival flight information via a separate email the week prior to the Summit, and participant ride sharing is strongly encouraged.

Conference and Hotel Locations

Conference facilities are located at the TechTown Foundation, 325 Market St. #200, Chattanooga TN 37402. TechTown's telephone number is 423.308.7730, and the website is <https://gotectown.org/>. Note that TechTown is located inside the Chattanooga Lifestyle Center. There will be an iDigBio Banner on the railing to indicate you are at the correct location.

Hotel locations are as follows:

- **Doubletree by Hilton**, 407 Chestnut St, Chattanooga, 423.756.5150
<http://doubletree3.hilton.com/en/hotels/tennessee/doubletree-by-hilton-hotel-chattanooga-downtown-CHACHDT/index.html>
- **Hampton Inn and Suites Chattanooga Downtown**, 400 Chestnut St., Chattanooga, 423.693.0500
<http://hamptoninn3.hilton.com/en/hotels/tennessee/hampton-inn-and-suites-chattanooga-downtown-CHADNHX/index.html>
- **Hilton Garden Inn Chattanooga Downtown**, 311 Chestnut St., Chattanooga, 423.308.9000
<http://hiltongardeninn3.hilton.com/en/hotels/tennessee/hilton-garden-inn-chattanooga-downtown-CHADTGI/index.html>

Hotel and Conference Check-In

A block of rooms has been reserved for summit participants, out of which you were responsible for making your own reservations at our discounted group rate [\$149/night plus taxes]. Conference materials may be picked up from Jillian Goodwin or Cathy Bester at TechTown throughout the day on November 1 as you arrive and from 8:00-8:30am on November 2 during Summit Check-in. Wireless network access will be available onsite throughout TechTown for all Summit participants.



Summit VI Wiki

For the most up-to-date information regarding the Summit agenda, participants, logistics and other items of interest, please visit the event wiki page at: https://www.idigbio.org/wiki/index.php/IDigBio_Summit_2016
Recorded presentations and reports will be posted on this site following the Summit for future reference.

Meals and Other Activities

Break refreshments will be provided at TechTown on November 1, 2, and 3 during the Summit sessions and related activities. Lunch is on your own every day, and a list of area restaurants will be provided. Dinner is on your own during the evenings of November 1 and 3. There will be a catered reception on November 2 from 7:00 - 10:00 pm at the Tennessee Aquarium located at 1 Broad St., Chattanooga TN 37402 [see below for additional information].

For those funded by iDigBio, meals not provided as workshop functions will qualify for reimbursement at our per diem rate [see below for reimbursement procedures].

Tennessee Aquarium Reception – Wednesday, November 2, 7:00 - 10:00pm

The Tennessee Aquarium is generously co-sponsoring the Summit reception this year at their public aquarium located at 1 Broad Street in beautiful downtown Chattanooga. Heavy hors d'oeuvres and a cash bar will be among the offerings. Dr. Anna George, Director and Chief Research Scientist, will be our main presenter at this event. The Aquarium exhibits will be open for our guests to enjoy throughout the evening.

Transportation from the Hotels to the Chattanooga Metropolitan Airport

You should arrange for taxi pick-up for your departure flight with the front desk of your hotel. The fare should be approximately \$25-\$30 for a one way taxi between downtown and the airport (approx. 9 miles). iDigBio will provide participant flight information via a separate email, participant ride sharing is strongly encouraged.

Reimbursements

Project Assistant Cathy Bester will send an email to iDigBio-funded participants following the Summit regarding reimbursement procedures. Any meals not provided as Summit functions will be reimbursed at the State of Florida's per diem rate (breakfast \$6, lunch \$11, dinner \$19); no receipts are needed. Lodging, mileage, taxi fares, parking fees, and baggage fees may qualify for reimbursement – please retain your original receipts showing form of payment. If you have any questions, please contact Cathy at 352-249-1949 or cbester@flmnh.ufl.edu.

Adobe Connect

To the extent possible, the Summit sessions will be broadcasted and recorded using Adobe Connect. Meeting hosts will monitor the chat to address questions/concerns. To connect, go to <https://idigbio.adobeconnect.com/summit6/> and chose "Enter as a Guest", type your first name and surname, then click "Enter Room". Remote participants are strongly encouraged to visit the iDigBio Web Conferencing Wiki prior to connecting, for more information: https://www.idigbio.org/wiki/index.php/Web_Conferencing

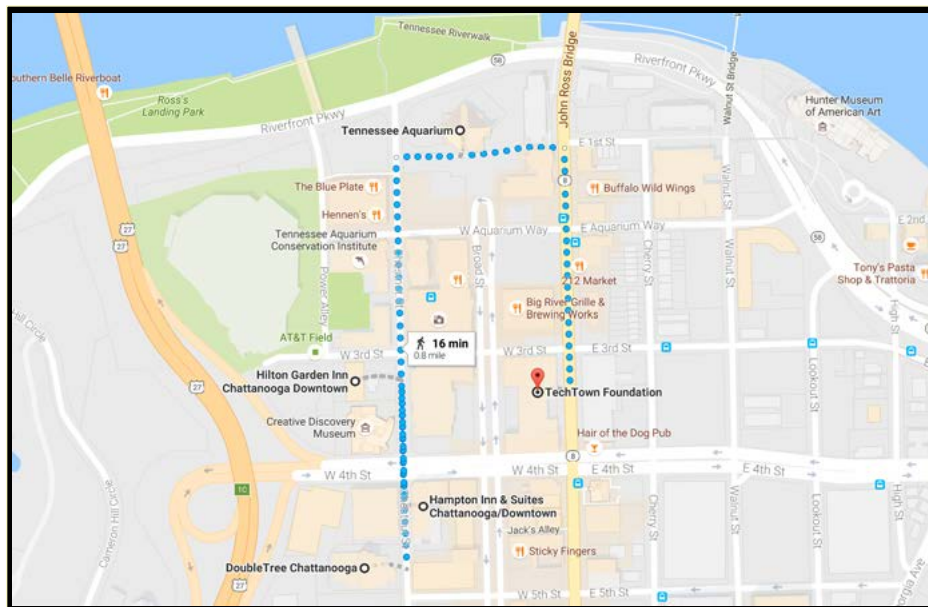


Lookout Mtn. attraction tickets may be purchased at any of the following locations



Chattanooga Area Map

- Location of **FIRST TENNESSEE** Financial Centers & ATMs





Area Restaurants (all are Chattanooga 37402 unless noted otherwise)

212 Market Restaurant (Farm-to-Table)

212 Market Street

<http://www.212market.com/>

Big River Grille & Brewing Works (American)

222 Broad Street

<http://www.bigrivergrille.com/>

Easy Bistro & Bar (Modern Bistro)

203 Broad Street

<http://www.easybistro.com/>

The Blue Plate (Metropolitan Diner)

191 Chestnut Street

<http://www.theblueplate.info/site/>

Hair of the Dog Pub (Pub Fare)

334 Market Street

<http://hairofthedogpub.net/>

Lupi's Pizza Pies (Pizza)

406 Broad Street

<http://www.lupi.com/>

Sticky Fingers Ribhouse (American)

420 Broad Street

<http://www.stickyfingers.com/>

Rodizio Grill of Chattanooga (Steak House)

439 Broad Street

<http://www.rodiziogrill.com/chattanooga/>

Taziki's Mediterranean Café (Mediterranean)

432 Market Street

<http://www.tazikiscafe.com/>

Thai Smile (Thai)

219 Market Street

<http://www.thaismilechattanooga.com>

Cashew (Plant-Based Vegan)

149 A River Street (North side of river)

Chattanooga 37405

<http://www.cashewchattanooga.com/>



Tuesday, November 1, 2016 - Travel Day / Business Meetings / Orientation

Time	Corridor or Other	Main Space	Cultural Arts	Kilobytes	Robotics	Studio	Lounge
Daytime	Travel Day for Participants						
Morning	Breakfast on your own						
8-8:30	Summit Check-in						
8:30 - 10:00			Reserved for NSCAIalliance Board Meeting	LepNet TCN Kickoff Meeting	Reserved for EAB		Open Meeting Space
10:00 - 10:15	Break						
10:15 - 11:30			Reserved for NSCAIalliance Board Meeting	LepNet TCN Kickoff Meeting [continued]	Reserved for EAB		Open Meeting Space
11:30 - 1:00	Lunch on your own				EAB meeting with iDigBio Leadership		Open meeting space
1:00 - 3:00			Reserved for NSCAIalliance Board Meeting	LepNet TCN Kickoff Meeting [continued]	Reserved for EAB		Open Meeting Space
3:00 - 3:15	Break						
3:15 - 5:00		iDigBio Orientation Session	Reserved for NSCAIalliance Board Meeting		EAB meeting to finalize discussion		Open Meeting Space
5:00	Adjourn						
Evening	Dinner on your own						

Wednesday, November 2, 2016 - Summit Day 1

Time	Corridor or Other	Main Space	Cultural Arts	Kilobytes	Robotics	Studio	Lounge
Morning	Breakfast on your own						
8-8:30	Summit Check-in						
8:30- 9:00		Welcome					Open Meeting Space
9:00 - 9:30		National Digitization Effort					Open Meeting Space
9:30 - 9:50		Q & A					Open Meeting Space
9:50-9:55	Transition						
9:55 - 10:10		2011 TCN Lightning Presentations					Open Meeting Space
10:10 - 10:25		2011 TCN Q&A					Open Meeting Space
10:25- 10:55	Break						



Wednesday, November 2, 2016 (continued)

Time	Corridor or Other	Main Space	Cultural Arts	Kilobytes	Robotics	Studio	Lounge
10:55 - 11:15		2012 TCN Lightning Presentations					Open Meeting Space
11:15 - 11:35		2012 TCN Q&A					Open Meeting Space
11:35 - 1:40	Transition						
11:40 - 11:55		2013 TCN Lightning Presentations					Open Meeting Space
11:55 - 12:10		2013 TCN Q&A					Open Meeting Space
12:10 - 1:15	Lunch on your own						
1:15 - 1:30		2014 TCN Lightning Presentations					Open Meeting Space
1:30 - 1:45		2014 TCN Q&A					Open Meeting Space
1:45 - 1:50	Transition						
1:50 - 2:00		2015 TCN Lightning Presentations					Open Meeting Space
2:00 - 2:10		2015 TCN Q&A					Open Meeting Space
2:10 - 2:15	Transition						
2:15 - 2:30		2016 TCN Lightning Presentations					Open Meeting Space
2:30 - 2:45		2016 TCN Q&A					Open meeting space
2:45 - 3:15	Break						
3:15 - 3:30		Overview of Working & Interest Groups					Open meeting space
3:30 - 3:45		Day 1 wrap-up Q&A					Open meeting space
3:45 - 5:00	Meeting rooms open for TCN meetings, working group meetings, Q&A, etc.			Symbiota Working Group Meeting		Paleo TCNs Meeting	Specify Users Meeting
5:00	Adjourn						
7:00 - 10:00	Evening program at the Tennessee Aquarium - cash bar and heavy hors d'oeuvres provided Speaker: Dr. Anna George, Director of the Tennessee Aquarium Conservation Institute (TNACI) "Harnessing the Power of Living and Natural History Collections for Southeastern Aquatic Conservation."						



Thursday, November 3, 2016 - Summit Day 2

Time	Corridor or Other	Main Space	Cultural Arts	Kilobytes	Robotics	Studio	Lounge
Morning	Breakfast on your own						
8-8:30	Arrival						
8:30-9:00		Welcome					Open Meeting Space
9:00 - 9:30		Inspiration & Collaboration					Open Meeting Space
9:30 - 10:15		Open Room Discussion					Open Meeting Space
10:15 - 10:30	Break						
10:30 - 11:45		Expanding your audience	Sustainability of TCNs	What to digitize next?	Data Quality		Open Meeting Space
11:45 - 12:00	All groups write up their summaries in bullet-point format: Summary Powerpoint						
12:00 - 1:00	Lunch on your own		NSF Meeting				
1:00 - 2:15		Tools and skills for using the iDigBio data services for research	Effectively managing your digitization project	Data quality for downstream use	Outreach		Open Meeting Space
2:15 - 2:30	All groups write up their summaries in bullet-point format: Summary Powerpoint						
2:30 - 2:45	Break						
2:45 - 4:00		Attribution and Citation	Sustainability of the national digitization effort	Extending data schemas	Educational resources		
4:00 - 4:15	All groups write up their summaries in bullet-point format: Summary Powerpoint						
4:15 - 4:30	Break						
3:45-5:00		Open Room Discussion - Bringing it all together					
5:00	Adjourn						



Tuesday, November 1, 2016

Business Meetings; Travel Day for All Other Attendees

Morning	Breakfast (on your own)	
8:00am - 8:30am	Summit Check-in	Pre-function
8:30am - 10:00am	LepNet TCN Kickoff Meeting <ul style="list-style-type: none"> • Introduction and major issues • Lightning Roundtable • Digitization 	Kilobytes
8:30am - 10:00am	Reserved for NSC Alliance Board Meeting (closed session)	Cultural Arts
8:30am - 10:00am	Reserved for iDigBio External Advisory Board Meeting (closed session)	Robotics
10:00am - 10:15 am	Morning Break (provided)	Pre-function
10:15am - 11:30am	LepNet TCN Kickoff Meeting (continued) <ul style="list-style-type: none"> • Imaging protocols 	Kilobytes
10:15am - 11:30am	Reserved for NSC Alliance Board Meeting (closed session)	Cultural Arts
10:15am - 11:30am	Reserved for iDigBio External Advisory Board Meeting (closed session)	Robotics
11:30am - 1:00pm	Lunch (on your own)	
11:30am - 1:00pm	EAB Lunch Meeting with iDigBio Leadership	Robotics
1:00pm - 3:00pm	LepNet TCN Kickoff Meeting <ul style="list-style-type: none"> • Research Capacity • Education-Outreach LepXlore, LepSnap, Pokemon • Summary 	Kilobytes
1:00pm - 3:00pm	Reserved for NSC Alliance Board Meeting (closed session)	Cultural Arts
1:00pm - 3:00pm	Reserved for iDigBio External Advisory Board Meeting (closed session)	Robotics
3:00pm - 3:15pm	Afternoon Break (provided)	Pre-function
3:15pm - 5:00pm	iDigBio Orientation Session <ul style="list-style-type: none"> • Introduction & history [Larry Page] • Alphabet soup [Deborah Paul] • How to get data to iDigBio [Joanna McCaffrey] • What to expect in your first year [David Jennings] • How to get involved [Shelley James] • Questions & Answers 	Main Space
3:15pm - 5:00pm	Reserved for NSC Alliance Board Meeting (closed session)	Cultural Arts
3:15pm - 5:00pm	Reserved for iDigBio External Advisory Board Meeting (closed session)	Robotics
5:00pm	Adjourn	
Evening	Dinner on your own	

Wednesday, November 2, 2016

Summit Day 1



Morning	Breakfast (on your own)	
8:00am - 8:30am	Summit Check-in	Pre-function
8:30am - 9:00am	Welcome & Orientation <ul style="list-style-type: none"> Logistics Welcome Welcome 	Main Space David Jennings Muriel Poston, NSF David Reed, FLMNH
9:00am - 9:30am	National Digitization Effort - Talks <ul style="list-style-type: none"> iDigBio ADBC BCON 	Main Space Larry Page Roland Roberts Robert Gropp
9:30am - 9:50am	National Digitization Effort - Questions, Answers, & Discussion	Main Space
<i>9:50am - 9:55am Transition</i>		
9:55am - 10:10am	2011 TCNs - Lightning Talks - 5 minutes, 5 slides each <ul style="list-style-type: none"> Lichens & Bryophytes (LBCC) New England Vascular Plants (NEVP) 	Main Space Tom Nash Patrick Sweeney
10:10am - 10:25am	2011 TCNs - Questions, Answers, & Discussion	
<i>10:25am - 10:55 am Morning Break (provided)</i>		
10:55am - 11:15am	2012 TCNs - Lightning Talks - 5 minutes, 5 slides each <ul style="list-style-type: none"> Paleoniches Macrofungi (MaCC) SCAN 	Main Space Bruce Lieberman Matthew Foltz Neil Cobb
11:15am - 11:35am	2012 TCNs - Questions, Answers, & Discussion	
<i>11:35am - 11:40am Transition</i>		
11:40am - 11:55am	2013 TCNs - Lightning Talks - 5 minutes, 5 slides each <ul style="list-style-type: none"> Vouchered Animal Communication (VACS) Macroalgal Consortium Fossil Insect Collaborative (FIC) 	Main Space Mike Webster Chris Neefus Talia Karim
11:55am - 12:10pm	2013 TCNs - Questions, Answers, & Discussion	
<i>12:10pm - 1:15pm Lunch (on your own)</i>		
1:15pm - 1:30pm	2014 TCNs - Lightning Talks - 5 minutes, 5 slides each <ul style="list-style-type: none"> Great Lakes Aquatic Invasives (GLI) InvertEBase SERNEC 	Main Space Ken Cameron Petra Sierwald Zack Murrell
1:30pm - 1:45pm	2014 TCNs - Questions, Answers, & Discussion	
<i>1:45pm - 1:50pm Transition</i>		



Wednesday continued

1:50pm - 2:00pm	2015 TCNs - Lightning Talks - 5 minutes, 5 slides each <ul style="list-style-type: none"> • Microfungi (MiCC) • Fossil Marine Invertebrates (EPICC) 	Andy Miller Erica Clites	Main Space
2:00pm - 2:10pm	2015 TCNs - Questions, Answers, & Discussion		
2:10pm - 2:15pm	<i>Transition</i>		
2:15pm - 2:30pm	2016 TCNs - Lightning Talks - 5 minutes, 5 slides each <ul style="list-style-type: none"> • Cretaceous World • LepNet • Mid-Atlantic Megalopolis (MAM) 	Bruce Lieberman Neil Cobb Cynthia Skema	Main Space
2:30pm - 2:45pm	2016 TCNs - Questions, Answers, & Discussion		
2:45pm - 3:15pm	Afternoon Break (provided)		Pre-function
3:15pm - 3:30pm	Overview of Working & Interest Groups	Deb Paul	Main Space
3:30pm - 3:45pm	Day 1 wrap-up - Questions, Answers, & Discussion		Main Space
3:45pm - 5:00pm	Paleo TCNs Meeting		Studio
3:45pm - 5:00pm	Specify users Meeting		Lounge
3:45pm - 5:00pm	Meeting of the Symbiota Working Group <i>Funding and Technological Developments.</i> <i>Building Symbiota</i> <i>What do we want to be and where do we want to go?</i>		Main Space
3:45pm - 5:00pm	Meeting rooms open for TCN meetings, working/interest group meetings, Q&A, etc.		
5:00pm	Adjourn		
7:00pm - 10:00pm	Evening program co-sponsored by the Tennessee Aquarium <i>Cash bar and heavy hors d'oeuvres provided</i> <ul style="list-style-type: none"> • Larry Page: Introduction • Anna George: "Harnessing the Power of Living and Natural History Collections for Southeastern Aquatic Conservation" • Aquarium open for viewing 		

Thursday, November 3, 2016

Summit Day 2



Morning	Breakfast (on your own)		
8:00am - 8:30am	Arrival		Pre-function
8:30am - 9:00am	Welcome & Orientation <ul style="list-style-type: none"> Logistics Welcome Why Digitize? 	David Jennings Doug Jones, FLMNH 2 videos	Main Space
9:00am - 9:30am	Inspiration & Collaboration <ul style="list-style-type: none"> GGBN GUODA Conservation 	John Coddington Jennifer Hammock Mary Klein	Main Space
9:30am - 10:15am	Open Room Discussion <i>Concentrating on our priorities for the next five years: Where do we go from here? What does our future look like? What are our common goals? What is most important for us to concentrate on?</i>		Main Space
10:15am - 10:30am	Morning Break (provided)		Pre-function
10:30am - 11:45am	<u>Expanding your audience</u> <i>We will brainstorm new opportunities to engage the public in collections-centered digitization and research. Topics might include future innovations for the Worldwide Engagement for Digitizing Biocollections (WeDigBio) event and citizen science cyberinfrastructure.</i>	Austin Mast Andre Poremksi	Main Space
10:30am - 11:45am	<u>Sustainability of TCNs</u> <i>This session will brainstorm sustainability strategies for TCNs. Discussion topics will include, but are not limited to: (1) Understanding the basics of TCN sustainability planning; (2) Partnerships: Critical mass of active cooperating TCN collections, Effective use of PENS, collaborating with other TCNs and 3rd party projects; and (3) TCNs beyond 2021.</i>	David Jennings Neil Cobb	Cultural Arts
10:30am - 11:45am	<u>What to digitize next?</u> <i>Now that ADBC is in its sixth year and the number of institutions digitizing collections has expanded exponentially, many collections are using past experiences and future needs to refine digitization goals. In this session, we will discuss and reflect on how institutions prioritize digitization activities. What factors go into making selections about which specimens to digitize next? How do gaps in currently available digital data impact what institutions choose to digitize? What strategies have been used to make prioritizations? Should prioritizations be limited to individual institutional goals, or are there methods for collaborative prioritization across a network of institutions? What strategies have been developed for tracking digitization success?</i>	Gil Nelson Matt Collins Shelley James Deborah Paul Rich Rabeler	Kilobytes
10:30am - 11:45am	<u>Data Quality</u> <i>Audience: New TCNs, veteran TCNs, informatics people, portal managers, data generators, recap of getting data to iDigBio (depending on audience) (1) An informational session with ample time for questions, answers, and feedback; (2) GUIDs and rights continue to be a challenge for many; (3) Special attention to Symbiota users : identifiers and (re)publishing; (4) Attribution for data and images.</i>	Joanna McCaffrey Dan Stoner Patrick Sweeney Ben Brandt	Robotics



Thursday continued

11:45pm - 12:00pm	All groups write up their summaries in bullet-point format: Summary Powerpoint		
12:00pm - 1:00pm	Lunch (on your own)		
12:00pm - 1:00pm	iDigBio meeting with NSF		Cultural Arts
1:00pm - 2:15pm	<p>Tools and skills for using the iDigBio data services for research</p> <p><i>Our group will brainstorm a list of tools for synthetic biodiversity research using digitized specimen data. We will discuss both tools that are currently available and need to be more accessible and those that don't yet exist but that would be broadly useful. We will also discuss the skills that researchers will need to use such tools and how iDigBio and others can foster important training in data skills and analysis. For the most promising tools identified, we will explore ideas for testing and implementation and what funding might be available to do so.</i></p>	Matt Collins Pam Soltis Deborah Paul Rüdiger Bieler	Main Space
1:00pm - 2:15pm	<p>Effectively managing your digitization project</p> <p><i>This session will brainstorm strategies for effectively managing your digitization project. We will discuss the importance of project management and administration in keeping your digitization project on time and within budget. We will brainstorm ideas and techniques based on collective experience and lessons learned.</i></p>	Gil Nelson David Jennings Andy Miller Tom Nash Ben Brandt	Cultural Arts
1:00pm - 2:15pm	<p>Data quality for downstream use</p> <p><i>During the ingestion of data from our many publishers, iDigBio standardizes certain data fields and provides data quality flags indicating potential issues for providers and data users. Which biodiversity data fields are increasingly being needed for research applications? Do standards, vocabularies, and data flags need to be updated or developed to help with improving data quality for downstream use? How can the ADBC community become more involved?</i></p>	Gil Nelson Matt Collins Shelley James Deborah Paul Rich Rabeler	Kilobytes
1:00pm - 2:15pm	<p>Outreach</p> <p><i>This session will begin with an introductory brainstorming round about TCN outreach: What does outreach mean to the different projects? How can TCNs more actively engage in outreach? and what is the distinction between outreach, marketing, and community engagement? The session will conclude with Bruce MacFadden introducing the concept of a Virtual Museum as a collective outreach project for all of ADBC and beyond.</i></p>	Bruce MacFadden Molly Phillips Adania Flemming Ken Cameron	Robotics
2:15pm - 2:30pm	All groups write up their summaries in bullet-point format: Summary Powerpoint		
2:30pm - 2:45pm	Afternoon Break (provided)		Pre-function
2:45pm - 4:00pm	<p>Attribution and Citation</p> <p><i>As biodiversity data are increasingly used in large-scale, big data projects, how can the collections community provide sufficient and appropriate information to ensure attribution and tracking? What recommendations can be relayed to literature publishers and researchers in the ADBC community and beyond to ensure that data within data downloads from biodiversity data aggregators can be cited adequately, within the article or supplementary information? Help us brainstorm, as we explore both sociological and technical aspects of this important topic.</i></p>	Pam Soltis Shelley James Michael Denslow	Main Space



Thursday continued

2:45pm - 4:00pm	<p>Sustainability of the national digitization effort <i>The NIBA Strategic Plan included a call for a sustained effort to digitize the nation's biodiversity collections. Responses by NSF have included the ADBC program to catalyze new digitization activities and the BCoN RCN to support the development of a sustainable community of practice to ensure that all U.S. collections are digitally available. This session will concentrate on identifying what elements of the national digitization effort are most important to sustain and what mechanisms are most likely to sustain those elements.</i></p>	<p>Larry Page Zack Murrell Neil Cobb</p>	Cultural Arts
2:45pm - 4:00pm	<p>Extending data schemas <i>Much of biodiversity data does not fit nicely into the existing Darwin Core and other schemas that are included in biodiversity tools and repositories. In this session, we will: (a) Create a list of data types that are not well represented, (b) Discuss strategies for defining new data fields and schemas, (c) Discuss strategies for building consensus on the new fields and schemas, and (d) Discuss strategies for formalizing new data fields and schemas for broader community.</i></p>	<p>Greg Riccardi Alex Thompson Andy Bentley</p>	Kilobytes
2:45pm - 4:00pm	<p>Educational resources <i>In this breakout, our focus is on sharing available training and education resources for digitization, biodiversity informatics, and managing and using collections data. We'll begin with an informational format and then move to brainstorming about what new resources might be developed to enhance digitization and biodiversity skills. Specifically, what webinars, workshops, symposia, and conferences are needed to address these topics in the next 5 years? What is needed to sustain digitization and biodiversity informatics moving forward? Following the brainstorms, we'll try to synthesize next steps.</i></p>	<p>Gil Nelson Deborah Paul Bruce MacFadden Jon Hendricks</p>	Robotics
4:00pm - 4:15pm	All groups write up their summaries in bullet-point format: Summary Powerpoint		
4:15pm - 4:30pm	Break		Pre-function
4:30pm - 5:00pm	<p>Open Room Discussion <i>Bringing it all together: What did we learn? Where do we go from here? How do we work together to achieve our common goals? What are the ADBC Community action items?</i></p>		
5:00pm	Adjourn		
Evening	Dinner on your own		

**Project Summary**

The Biodiversity Collections Network (BCoN) is a five-year national initiative funded by the U.S. National Science Foundation to support the development of a new, sustainable community of practice that will ensure that all U.S. biodiversity collections are digitally available for research, education, informed decision-making, and other scholarly and creative activities.

Scientists have amassed, annotated, and curated more than one billion specimens in more than 1,600 institutions across the United States. Although these specimens and their associated data are heavily used for research and education, their benefits could be exponentially increased if the data could be accessed and mined online.

BCoN is an outgrowth of recent scientific meetings in which scientists have articulated a need to digitally capture biological specimens and associated data held in natural science collections for use in research, education, and for the public interest. The initiative was founded by the American Institute of Biological Sciences, the Society for the Preservation of Natural History Collections, the Natural Science Collections Alliance, and is currently supported by 33 organizations.

BCoN Goals

- Advance engineering of the U.S. biodiversity collections cyber-infrastructure to support efficient workflows, innovative research, effective policy, and educational engagement.
- Enhance training of existing collections staff and create the next generation of biodiversity information managers.
- Increase buy-in and participation from a broader range of stakeholders.
- Establish an enduring and sustainable knowledge base.
- Infuse specimen-based learning and exploration into formal and informal science education.

Project Sponsor

American Institute of Biological
Sciences
NSF Award Number 1441785

Principal Investigators

Robert Gropp & Andrew Bentley

Project Website

<http://bcon.aibs.org>

**Natural Sciences Collections Alliance
(NSC Alliance)****Project Summary**

The Natural Science Collections Alliance is a Washington, D.C.-based nonprofit association that supports natural science collections, their human resources, the institutions that house them, and their research activities for the benefit of science and society.

Our members are part of an international community of museums, botanical gardens, herbariums, universities and other institutions that house natural science collections and utilize them in research, exhibitions, academic and informal science education, and outreach activities.

Membership in the NSC Alliance links you to a network of institutions, scientists and other professionals in North America through which you can share news, information and common concerns - and help shape the future of our community.

President Joseph Cook

Policy Director Robert Gropp

Project Website

<http://www.nscalliance.org/>

Project Summary

Integrated Digitized Biocollections (iDigBio) is the national coordinating center for the Advancing Digitization of Biodiversity Collections (ADBC) program funded by the U.S. National Science Foundation (NSF). iDigBio is enabling digitization of data and media for millions of biodiversity specimens from U.S. natural history collections and is making the data available online for the research community, government agencies, students, educators, citizen scientists and the general public to promote understanding of biodiversity and societal consequences of environmental issues.

The vision for ADBC is a permanent repository of digitized information from all U.S. biodiversity collections that leads to new discoveries through research and a better understanding and appreciation of biodiversity through improved outreach, which then leads to improved environmental and economic policies.

The mission of iDigBio is to develop a national infrastructure that supports the vision of ADBC by overseeing implementation of standards and best practices for digitization; building and deploying a customized cloud computing environment for collections; recruiting and training personnel, including underserved groups; engaging the research community, collections community, citizen scientists and the general public through outreach activities; and planning for long-term sustainability of the national digitization effort.

iDigBio Goals

Develop efficient and effective digitization standards and workflows

- Provide portal access to biodiversity data in a cloud computing environment
- Respond to cyberinfrastructure needs

Facilitate use of biodiversity data to address environmental and economic challenges for

- Researchers
- Educators
- General public
- Policy-makers

Plan for long-term sustainability of the national digitization effort

- Expand participation: partners and data sources

Project Sponsors

University of Florida

Florida State University

NSF Cooperative Agreement Number EF-1115210 & DBI-1547229

Principal Investigators

Larry Page (Principal Investigator)

José Fortes (Co - Principal Investigator)

Bruce MacFadden (Co - Principal Investigator)

Greg Riccardi (Co - Principal Investigator)

Pam Soltis (Co - Principal Investigator)

Project Website

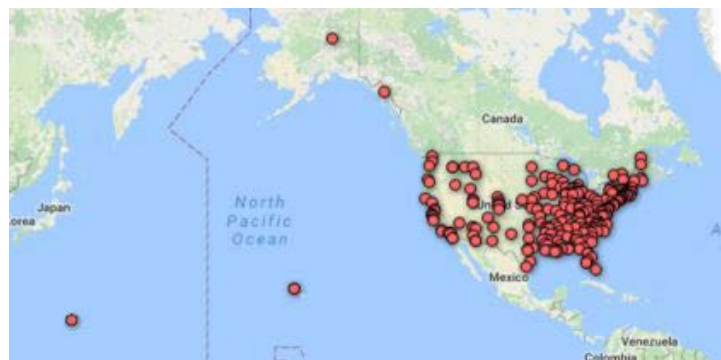
<http://www.idigbio.org>

Social Media

<https://www.facebook.com/idigbio>

<https://twitter.com/idigbio>

<https://vimeo.com/idigbio>



**Thematic Collections Networks At a Glance**

TCN	Funding Period	PI	Email	Software Interface with iDigBio
InvertNet	2011 - 2016	Chris Dietrich	dietrich@inhs.uiuc.edu	Symbiota
Tri-trophic [TTD]	2011 - 2016	Toby Schuh, Rob Naczi	schuh@amnh.org rnaczi@nybg.org	Arthropod Easy Capture, Symbiota, Specify and others
Lichens & Bryophytes [LBCC]	2011 - 2016	Corinna Gries, Tom Nash, Ed Gilbert	cgries@wisc.edu tom.nash@asu.edu	Symbiota
New England Vascular Plants [NEVP]	2012 - 2016	Patrick Sweeney	patrick.sweeney@yale.edu	Symbiota, EMu
MacroFungi Collection Consortium [MaCC]	2012 - 2017	Barbara Thiers	bthiers@nybg.org	Symbiota
PaleoNICHES	2012 - 2016	Bruce Lieberman	blieber@ku.edu	Specify
Symbiota Collections of Arthropods [SCAN]	2012 - 2016	Neil Cobb	neil.cobb@nau.edu	Symbiota
Fossil Insect Collaborative [FIC]	2013 - 2018	Talia Karim	talia.karim@colorado.edu	Specify, EMu and others; iDigPaleo Portal
Macroalgal Herbarium Consortium [MHC]	2013 - 2017	Chris Neefus	chris.neefus@unh.edu	Symbiota



Organisms	Digitization Methods	# of Specimens / Images	# of Collaborators
arthropods	robotic scanning of vials, slides and drawers, crowd-sourcing of label data from images	56.1M / 890K	16 (1 PEN)
insects: Hemiptera, Hymenoptera; vascular plants	imaging herbarium sheets with the Photo eBox Plus and direct transcription of insect labels into a database without imaging	1.2M (insects) / 1.2M (plants) / 611K	32
lichens, bryophytes	label imaging, using OCR for data capture	2.3M / 2.3M	76 (4 PENS)
vascular plants	robotic scanning apparatus for herbarium sheets, specimen-by-specimen label data capture	1.29M / 1.29M	18 (2 PENS)
macrofungi	label imaging, crowd-sourcing of label data	1.39M / 1.3M	39 (2 PENS)
fossils: arthropods, brachiopods, echinoderms, mollusks, cnidarians, vertebrates	specimen-by-specimen label data capture	930K / 4K	8 (2 PENS)
ground dwelling arthropods	visionary digital workflow, specimen-by-specimen label data capture, plus specimen image suites	730K / >15K	16 (4 PENS)
fossil insects	standard macrophotographic imaging including focus stacking, data capture via hand keystroke and voice recognition	500K / 200K	7 (1 PEN)
macroalgae	imaging herbarium sheets with the Photo eBox Plus	1.14M / 1.14M	50

**Thematic Collections Networks At a Glance**

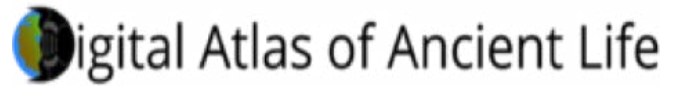
TCN	Funding Period	PI	Email	Software Interface with iDigBio
Vouchered Animal Communication Signals (VACS)	2013 - 2017	Michael Webster	msw244@cornell.edu	Symbiota
Great Lakes Invasives (GLI)	2014 - 2017	Ken Cameron	kmcameron@wisc.edu	Symbiota
InvertEBase	2014 - 2018	Petra Sierwald	psierwald@fieldmuseum.org	Symbiota, Arctos
The Key to the Cabinets (SERNEC)	2014 - 2018	Zack Murrell	murrellze@appstate.edu	Symbiota
Fossil Marine Invertebrates (EPICC)	2015 - 2019	Charles Marshall	crmarshall@berkeley.edu	Specify, EMu and other
Microfungi Consortium (MiCC)	2015 - 2018	Andrew Miller	amiller7@illinois.edu	Symbiota
Lepidoptera of North America Network (LepNet)	2016 - 2020	Neil Cobb	neil.cobb@nau.edu	Symbiota
The Cretaceous World	2016 - 2019	Bruce Lieberman	blieber@ku.edu	Specify
The Mid-Atlantic Megalopolis (MAM)	2016 - 2019	Cynthia Skema	cskema@upenn.edu	Symbiota



Organisms	Digitization Methods	# of Specimens / Images	# of Collaborators
birds, frogs, fish and insects	digitizing analog sound recordings, imaging specimens & labels	>58K / 23K	7
fish, clams, snails, mussels, algae, plants	imaging herbarium sheets and animal specimen lots with the Photo eBox Plus	>637K plants, >102K fish lots, >44K mollusk lots	29
invertebrates: insects, arachnids, mollusks	data capture from labels, label images, voice recognition and OCR	>2M	7 (1 PEN)
plants	rapid imaging coupled with citizen science based label transcription and collaborative georeferencing	>3M	45
fossil marine invertebrates	specimen-by-specimen label data capture, imaging exemplar specimens and historic labels, collaborative georeferencing	1.6M / 85K	9
microfungi	label imaging, crowd-sourcing of label data, batch georeferencing	>1.2M / 1.3M	38
insects: Lepidoptera	specimen-by-specimen label data capture; LepSnap	2M / 214K	26
fossils: arthropods, brachiopods, echinoderms, mollusks, cnidarians, vertebrates	specimen-by-specimen label data capture	164K / 1.6K	14
vascular plants	imaging herbarium sheets, specimen-by-specimen label data capture	700K / 700K	11



The Cretaceous World: Digitizing Fossils to Reconstruct Evolving Ecosystems in the Western Interior Seaway



Project Summary

Between 65 and 100 million years ago, during the time that dinosaurs walked the earth, a large, tropical seaway covered the central part of what is now North America. This seaway teemed with marine life. Snails and clams lived on the seafloor; ammonites, along with giant mosasaurs, plesiosaurs, sharks, and fish, swam about; at the same time early birds and pterosaurs floated on or flew above the seaway. What remains today is a prolific fossil record that has been collected by paleontologists for over 100 years. Notable fossils from this time period and region are on display at museums around the world. However, the vast bulk of fossils collected from this region are locked away in museum drawers. To provide scientists and the general public access to these fossils and their associated data, this project proposes to digitize invertebrate and vertebrate fossils from this time period and region, making information accessible through searchable electronic databases. Additionally, a variety of online resources illustrating and describing these fossils and mapping their distributions will be developed. A freely accessible online textbook of paleontology will be generated and a website and App will be developed to highlight the appearances, occurrences, and ages of constituent species, to help students and aspiring paleontologists identify and learn about these fossils. The project plans to generate a variety of curricular materials for K-12 education, including 3-D scans of fossils for free download and printed 3-D models for classroom use. Products of this project will also include workshops to engage science teachers and items to augment public programs and exhibits at participating institutions.

This work will greatly increase the scientific value of eight major U.S. museum collections of fossils. The museum collections contain large amounts of data useful for studying what causes marine species to migrate, go extinct, and evolve during a long period of greenhouse climate conditions similar to those our planet may soon experience. These data have relevance for evaluating how global change has and will continue to affect life on earth. An estimated 164,000 specimens collected from thousands of locations, in the region once occupied by the Western Interior Seaway, will be databased and georeferenced. Representatives from each of roughly 1,500 microfossil, invertebrate, and vertebrate species will be imaged. The digitized records will be made available online via individual museum databases, iDigBio, and iDigPaleo. The resultant data will enable scientists to answer questions about how different species interact and ecosystems change in the face of environmental shifts during a key time in the history of life. Moreover, the data will be ideal for use with an assortment of modern quantitative tools - including paleoecological niche modeling (PaleoENM) - and will help improve paleoclimate and paleoceanographic models. Finally, several undergraduate and graduate students will be trained. Results of the project will be published at the following url: <http://www.digitalatlasofancientlife.org>.

Current Research

Proposed research uses of data generated through The Cretaceous World project include:

- Revealing how ancient marine species and ecosystems responded to the dynamic environment that characterized this greenhouse system,
- Understanding interactions between a diversity of species, their endemism, ecosystems, and environmental changes,
- Paleoecological niche modeling, and
- Improving paleoclimate and paleoceanographic models.

Project Leadership

University of Kansas
[NSF Award 1602067](#)

Principal Investigators

Principal Investigator - Bruce Lieberman
Co-Principal Investigators - James Beach,
K. Christopher Beard, Maribeth Price,
Laurie Anderson



Project Collaborators

American Museum Natural History - Neil Landman, Ruth O'Leary (NSF Award 1601891)

Fort Hays State University - Laura Wilson (NSF Award 1601944)

Paleontological Research Institute - Jonathan Hendricks (NSF Award 1645520)

San Jose State University - Jonathan Hendricks (NSF Award 1601790)

South Dakota School of Mines & Technology – Laurie Anderson, Maribeth Price

University of Colorado at Boulder - Talia Karim (NSF Award 1601729)

University of New Mexico - Corinne Myers (NSF Award 1601878)

University of Texas at Austin - Ann Molineux, Rowan Martindale, Matthew Brown (NSF Award 1602101)

Yale University - Susan Butts, Christopher Norris (NSF Award 1601884)



Lepidoptera of North America Network: Documenting Diversity in the Largest Clade of Herbivores



Project Summary

Lepidoptera (butterflies and moths) are one of the most diverse groups of organisms on the planet: worldwide there are approximately 160,000 species, including around 14,300 species in North America. Moths and butterflies are a conspicuous component of terrestrial habitats and one of the most diverse groups of plant-feeding animals worldwide. This group insect includes species of great economic importance. Their juveniles feed on plants useful to humans, including grains, cotton, tobacco, and timber and shade trees. However, many of the adults are beneficial as pollinators and are icons of conservation as evidenced by Monarch butterflies. Given their economic importance and sheer beauty, butterflies and moths are one of the most abundant insect group in museum collections, but only a fraction of the approximately 15 million specimens in non-federal collections have had their specimen label information digitally recorded and accessible to researchers and educators. Of those specimens that have been digitized, fewer than 10% of the North American Lepidoptera species have sufficient, accessible occurrence data to make reliable predictions about habitat use, susceptibility to global change impacts, or other ecologically important interactions. This project will digitize and integrate existing, unconnected collections of lepidopterans to leverage the outstanding potential of this group of organisms for transformative research, training and outreach.

The Lepidoptera of North America Network (LepNet) comprises 26 research collections that will digitize approximately 2 million specimen records and integrate these with over 1 million existing records. LepNet will digitize 43,280 larval vial records with host plant data, making this the first significant digitization of larvae in North American collections. LepNet will produce ca. 82,000 high-quality images of exemplar species covering 60% of North American lepidopteran species. These images will enhance remote identifications and facilitate systematic, ecological, and global change research. In collaboration with Visipedia, LepNet will create LepSnap, a computer vision tool that can provide automated identifications to the species level. Museum volunteers and student researchers equipped with smartphones will image >132,000 additional research-quality images through LepSnap. Up to 5,000 lepidopteran species will be elevated to a “research ready” status suitable for complex, data-driven analyses. LepNet will build on the existing data portal (SCAN) in consolidating data on Lepidoptera to the evolution of lepidopteran herbivores in North America. Access to these data will be increased through integration with iDigBio. Data for a broad range of research, including the evolutionary ecology of Lepidoptera and their host plants in the context of global change processes affecting biogeographic distributions will be generated. The LepXPLOR! program will spearhead education and outreach efforts for 67 existing programs, engaging a diverse, nationwide workforce of 400+ students and 3,500+ volunteers. Overall, LepNet will generate a sustainable social-research network dedicated to the creation and maintenance of a digital collection of North American Lepidoptera specimens (<http://www.lep-net.org/>).

Current Research

Proposed research themes and uses for the data digitized and mobilized through the Lep-Net project include:

- Evolutionary and ecological interactions, ecological niche modelling,
- Studies on environmental change and human disturbance and habitat destruction,
- Predictions concerning habitat use, susceptibility to global change impacts, or other spatially/temporally deep-scale interactions,
- Insect-host plant interactions, evolution of host plant use,
- Systematic/taxonomic, ecological, and global change research,
- Automatic identification tools,
- Phenological change and color pattern evolution,
- Conservation ecology,
- Understanding the biogeography of lepidoptera species, and
- Identifying and unraveling cryptic species and mimicry complexes.

**Project Leadership**

Northern Arizona University
[NSF Award 1602081](#)

Principal Investigators

Principal Investigator - Neil Cobb
Co-Principal Investigator - Ben Brandt

Project Collaborators

AArizona State University - Nico Franz, Melody Basham, Sangmi Lee (NSF Award 1601659)
Clemson University – Michael Caterino
Colorado State University - Boris Kondratieff, Paul Opler (NSF Award 1600937)
Denver Museum of Nature and Science - Frank Krell, Jeff Stephenson (NSF Award 1601275)
Drexel University, Academy of Natural Sciences – Jon Gelhaus
Harvard University - Naomi Pierce (NSF Award 1601124)
Kansas State University – Gregory Zolnerowich
Michigan State University - Anthony Cognato (NSF Award 1600556)
Mississippi State University - Richard Brown (NSF Award 1601164)
New Mexico State University – Scott Bundy
Ohio State University, C.A. Triplehorn Insect Collection – Norman F. Johnson
Oregon State University - Christopher Marshall (NSF Award 1601888)
Purdue University - Jennifer Zaspel (NSF Award 1601957)
University of Alaska-Fairbanks - Derek Sikes (NSF Award 1600774)
University of California-Davis - Lynn Kimsey (NSF Award 1601443)
University of Florida - Akito Kawahara, Jaret Daniels (NSF Award 1601369)
University of Georgia - Joseph McHugh (NSF Award 1601002)
University of Idaho, William F. Barr Entomological Museum – Stephen Cook
University of Minnesota-Twin Cities - Robin Thomson, Ralph Holzenthal (NSF Award 1601461)
University of Nevada – Reno – Lee Dyer
University of Utah, Natural History Museum of Utah – Christy Bills
Western Washington University - Merrill Peterson (NSF Award 1600824)
Yale University - Lawrence Gall (NSF Award 1600616)

Unfunded collaborators

Tall Timbers Research Station – Gil Nelson, Kevin Robertson, Jim Cox
University of Oklahoma, Sam Noble Museum of Natural History – Katrina Menard



The Mid-Atlantic Megalopolis: Achieving a greater scientific understanding of our urban world

Project Summary

In light of the increasingly urban future of our planet, a thorough understanding of the biological processes at work in urban areas is necessary for the continued survival of Earth's inhabitants, including humans. The first step in that understanding is to know what thrives, survives, or perishes in cities, now and in the past. The Mid-Atlantic Megalopolis (MAM) Project begins this study by looking at vascular plants, with the digitization of roughly 700,000 herbarium specimens from eleven institutions, including public and private universities, state agencies, arboreta, museums, and botanic gardens, in the urban corridor from New York City to Washington, D.C. As the largest, oldest, and most populated urban corridor in the U.S., this area and its flora present a unique opportunity for the study of urbanization, particularly given its rich herbarium collections, containing specimens collected over the last 400 years. The data mobilized in this effort will help us achieve a better scientific understanding of living urban systems, a critical need for urban planners, restoration ecologists, environmental engineers, (landscape) architects, and conservationists engaged in creating more sustainable and better designed cities, including the constructed and restored natural environments of our urban areas.

Digitization of each specimen in the MAM Project will result in a high resolution image, a databased record of collection metadata, and a georeferenced point, all of which will be made publicly available online. Building on already successful regional programs, the MAM Project will partner with schools, universities, botanical clubs, and the general public to crowd source databasing efforts and to recruit citizen scientists to help build urban floras online, enabling not only increased digitization efficiency, but educational and research opportunities as well. The MAM Project also includes new developments for data cleaning and standardization in Symbiota, which will expedite the use of digitized specimen data for research, and new reporting features which will advance digitization workflow and project management. This award is made as part of the National Resource for Digitization of Biological Collections through the Advancing Digitization of Biological Collections program, and all data resulting from this award will be available through the national resource (<https://www.iDigBio.org>).

Current Research

The data mobilized in this digitization effort will enable an advancement in the scientific understanding of urbanization, which species have occurred and when in urban floras, how those species assemble in microhabitats within urban and industrialized areas, and how this heterogeneity in urban habitat and biodiversity relates to land use and land cover patterns. The project will enable the study of the adaptation of floras to cities, and how characteristic traits are correlated with adaptation, extirpation or invasion.

Project Leadership

University of Pennsylvania
[NSF Award 1601697](#)

Principal Investigators

Principal Investigator - Cynthia Skema
Co-Principal Investigator - Tim Block

Project Collaborators

Academy of Natural Sciences Philadelphia - Tatyana Livshultz, Richard McCourt (NSF Award 1601503)
Arizona State University – Nico Franz, Ed Gilbert
Delaware State University - Cynthia Hong-Wa (NSF Award 1601393)
Howard University - Janelle Burke (NSF Award 1600976)
Maryland Department of Natural Resources – Christopher Frye
Muhlenberg College – Richard Niesenbaum
New York Botanical Garden - Barbara Thiers, Kim Watson (NSF Award 1600981)
Rutgers University, New Brunswick - Lena Struwe, Myla Aronson (NSF Award 1601101)
Staten Island Institute of Arts and Sciences / Staten Island Museum Herbarium – Audrey Malachowsky
Towson University – David Hearn, Christa Partain
University of Maryland College Park - John Hall, Maile Lee (NSF Award 1601429)



TENNESSEE AQUARIUM

Thank you to the Tennessee Aquarium for their generous support of the iDigBio Summit 2016 Reception.



we are neutral

The iDigBio Summit 2016 is Carbon Neutral!

The carbon footprint of the conference was calculated and offsets were provided by We Are Neutral. We Are Neutral is a Gainesville based environmental non-profit that believes local offsets do the most good. These offsets were generated by planting native longleaf pine, performing free energy upgrades for low-income families, and through local methane abatement projects. If there's an event or business that you'd like to make carbon neutral, get in touch with them today!

Offsetting 4.63 tons of CO2e per year is equivalent to:



.68
vehicles taken off the road



164
incandescents switched to LEDs



120
tree saplings grown for 10 years

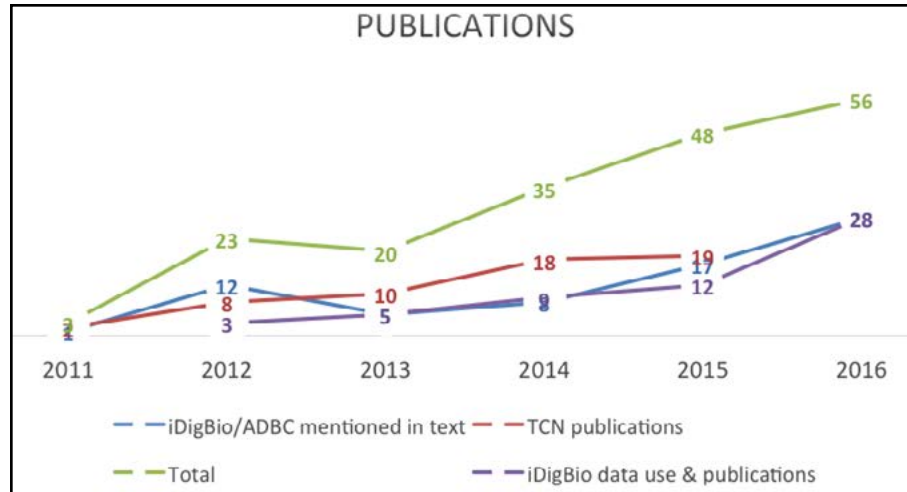
*Values sourced from the EPA's Greenhouse Gas Equivalencies Calculator



Publications Resulting from iDigBio Data Use

iDigBio tracks the citation of ADBC, iDigBio and TCNs and the use of data shared via iDigBio within publications, and makes the bibliography available through the Mendeley iDigBio Public Library, accessible at <https://www.mendeley.com/groups/7777901/idigbio-public-library/papers/>

From 2011 to October 2016, more than 110 publications have resulted from NSF’s ADBC program, with 71 publications mentioning iDigBio and the ADBC program, more than 57 resulting from TCN activities with another 57 publications directly resulting from the iDigBio project or as a result of portal data being used in research activities. The number of publications increases with each year of the ADBC program, and this trend is expected to continue into the next 5 years of NSF-ADBC funding.



The following publications and blogs comprise the list of publications that have cited the use of iDigBio data, to October 2016.

Baumgardner, R.W., W.A. DiMichele, and N. de Siqueira Oliveira. 2016. An early Permian coastal flora dominated by *Germaropteris martinsii* from basal sediments in the Midland Basin, West Texas. *Palaeogeography, Palaeoclimatology, Palaeoecology*. 459: 409–422. [link](#)

Cardoso, P., P. Stoev, T. Georgiev, V. Senderov, and L. Penev. 2016. Species Conservation Profiles compliant with the IUCN Red List of Threatened Species. *Biodiversity Data Journal* 4: e10356. [link](#)

Ciccotto, P.J., and L.M. Page. 2016. Revised diagnosis of the genus *Gonorhynchus* McClelland (Teleostei: Cyprinidae: Labeonini) with redescription of *G. latius* (Hamilton) and revalidation of *G. wattanah* (Sykes). *Zootaxa* 4127: 471. [link](#)

Deck, J., R.P. Guralnick, R.L. Walls, S. Blum, M. Haendel, A. Matsunaga, and J. Wieczorek. 2015. Meeting report: Identifying practical applications of ontologies for biodiversity informatics. *Standards in Genomic Sciences* 7 - 25 10: 1–6. [link](#)

Ellsworth, Z.T. 2016. Evaluating the reproductive habits and the breeding season of the hog-nosed skunk (*Conepatus leuconotus*). Angelo State University. [link](#)

Gezon, Z.J., E.S. Wyman, J.S. Ascher, D.W. Inouye, and R.E. Irwin. 2015. The effect of repeated, lethal sampling on wild bee abundance and diversity. *Methods in Ecology and Evolution* 6: 1044–1054. [link](#)



- Gnezdilov, V.M., C.R. Bartlett, and T. Bourgoïn. 2016. A New Tribe of Tropicuchidae (Hemiptera: Fulgoroidea) with Revision of the genus *Buca* and Description of Asymmetric Hind Leg Spinulation. *Florida Entomologist* 99: 406–416. [link](#)
- Goldstein, P.Z., and J.S. Ascher. 2016. Taxonomic and Behavioral Composition of an Island Fauna: A Survey of Bees (Hymenoptera: Apoidea: Anthophila) on Martha's Vineyard, Massachusetts. *Proceedings of the Entomological Society of Washington* 118: 37–92. [link](#)
- Hendricks, J.R., A.L. Stigall, and B.S. Lieberman. 2015. The Digital Atlas of Ancient Life: delivering information on paleontology and biogeography via the web. *Palaeontologia Electronica* 18.2.3E: 1–9. [link](#)
- James, S., and M. Phillips. 2016. Dusting off the spatial data hidden in museum collections. *SpatialReserves*. [link](#)
- La Rosa, R and M. Fishbein. 2016. Patterns of adaptive trait evolution across the North American *Asclepias*. [link](#)
- Lachaud, J.-P., H. Klompen, G. Pérez-Lachaud, A. De Bary, J.-P. Lachaud, G. Pérez-Lachaud, L. Peralta, et al. 2016. *Macrodynechus* mites as parasitoids of invasive ants: an overlooked parasitic association. *Scientific Reports* 6: 29995. [link](#)
- Marchant, D.B., D.E. Soltis, and P.S. Soltis. 2016. Patterns of abiotic niche shifts in allopolyploids relative to their progenitors. *New Phytologist*. [early view] [link](#)
- McDonough, C. 2016. Leveraging the Power of Biodiversity Specimen Data for Ecological Research. *PLoS Ecology Community*. [link](#)
- McHugh, J. V., and C.S. Chaboo. 2015. Beetles (Coleoptera) of Peru: A Survey of the Families. *Erotylidae* Latreille, 1802. *Journal of the Kansas Entomological Society* 88: 274–282. [link](#)
- Oleniacz, B.A., B. Lieberman, A. Bentley, and L. Krishtalka. 2016. A novel approach to data prioritization in digitization of paleontological collections. University of Kansas. [link](#)
- Pensoft Editorial Team. 2016. How to import occurrence records into manuscripts from GBIF, BOLD, iDigBio and PluToF. *Pensoft Blog*. [link](#)
- Schuh, R.T. 2016. *Scholtzicoris linnavuorii*, new genus and new species of Myrtaceae-Feeding plant bug from Western Australia (Hemiptera: Heteroptera: Miridae: Phylinae: Semiini: Exocarpocorina). *Entomologica Americana* 122: 156–163. [link](#)
- Schultz, N.G., M. Lough-Stevens, E. Abreu, T. Orr, and M.D. Dean. 2016. The Baculum was Gained and Lost Multiple Times during Mammalian Evolution. *Integrative and Comparative Biology* icw034: 1–13. [link](#)
- Senderov, V., T. Georgiev, and L. Penev. 2016. Online direct import of specimen records into manuscripts and automatic creation of data papers from biological databases. *Research Ideas and Outcomes* 2: e10617. [link](#)
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iDigBio Glossary of Terms

https://www.idigbio.org/wiki/index.php/Glossary_of_Terms

Abbreviation	Long Name	Tag
ACIS	Advanced Computing and Information Systems Laboratory	organization
ADBC	Advancing Digitization of Biodiversity Collections	project
AIM-UP!	Advancing Integration of Museums into Undergraduate Programs	education
ALA	Atlas of Living Australia	data aggregator
API	Application Programming Interface	protocol, software
ARPHA	Authoring, Reviewing, Publishing, Hosting and Archiving	data repository, publishing
BCoN	Biodiversity Collections Network	community
BHL	Biodiversity Heritage Library	literature
BISON	Biodiversity Information Serving Our Nation	data aggregator
CMS	Collections Management System	data management, hardware, software
CONABIO	Comisión Nacional Para el Conocimiento y Uso de la Biodiversidad	data aggregator
CRIA	Centro de Referência em Informação Ambiental	organization
CSIRO	Commonwealth Scientific and Industrial Research Organisation	organization
DAMS	Digital Asset Management Systems	data management, hardware, software
DOI	Digital Object Identifier	identifier
DwC	Darwin Core	standard
EOL	Encyclopedia of Life	data aggregator
ePandda	Enhancing Paleontological and Neontological Data Discovery API	API
GBIF	Global Biodiversity Information Facility	data aggregator, data repository
GRBio	The Global Registry of Biodiversity Repositories	data repository
GUID	Globally Unique Identifier	identifier



Abbreviation	Long Name	Tag
ICBN	International Code on Botanical Nomenclature	nomenclature
ICZN	International Commission on Zoological Nomenclature	nomenclature
IGSN	International Geo Sample Number	identifier
IPT	GBIF Integrated Publishing Toolkit	software
ITIS	Integrated Taxonomic Information System	nomenclature
IUCN	International Union for Conservation of Nature	data aggregator, organization
NEON	National Ecological Observatory Network	data management, data repository, project
NSC Alliance	Natural Science Collections Alliance	community
NSF	National Science Foundation	Federal Agency
OCR	Optical Character Recognition	software
ORCID	Open Researcher and Contributor ID	identifier
PaleoDb	Paleobiology Database	data aggregator
PEN	Partner to Existing Network	ADBC, TCN
RCN	Research Coordination Network	project
SPNHC	Society for the Preservation of Natural History Collections	organization
SYNTHESYS	Synthesis of Systematics Resources	project
TCN	Thematic Collections Network	project
TDWG	Biodiversity Information Standards Taxonomic Database Working Group	organization
USVH	United States Virtual Herbarium project	community, data aggregator
UUID	Universally Unique Identifier	identifier
VertNet	Vertebrate Network	data aggregator
WeDigBio	Worldwide Engagement for Digitizing Biocollections	citizen science, transcription



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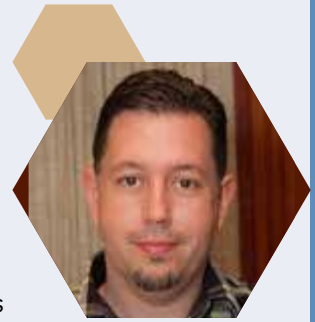
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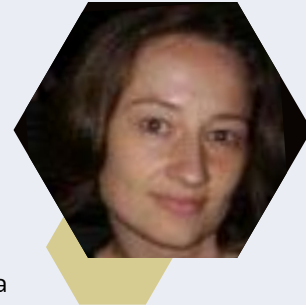


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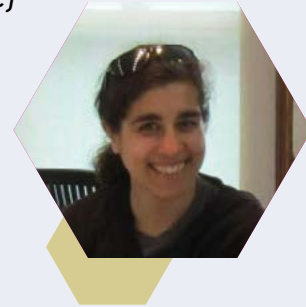


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Liz is Curator of Invertebrate Paleontology and Micropaleontology at the Burke Museum and faculty in the Earth Science Department University of Washington. Her research focuses on changes in Cenozoic molluscan faunas along the eastern Pacific margin, and on methane seep assemblages.



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Larry is Curator of Fishes at the Florida Museum of Natural History and Adjunct Professor of Biology at the University of Florida in Gainesville. His primary research interests are the systematics, ecology and conservation of freshwater organisms.

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Nicole is a recent Linguistics PhD from Yale University with a life-long passion for natural history, and entomology in particular. She is now based at the Yale Peabody Museum of Natural History where she works on multiple digitization grants with an eye towards workflow optimization.

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Nick is a PhD candidate in the Ecology, Evolution, and Conservation Biology program at University of Nevada, Reno. His research interests include community ecology and how biotic and abiotic factors shape the strength of ecological interactions and network structure.

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Deborah is based at the Florida State University School of Information in Tallahassee, Florida. She is involved in all aspects of iDigBio, but focuses primarily on the professional development of the collections and research communities and building national and international collaborations related to digitization and research use of the digitized data.

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Katelin Pearson (nee Stanley) is a PhD student with Austin Mast and the Curator of the FSU herbarium. Her research interests include plant biogeography and phylogenetics, phenology, and using collections data. Katelin has been involved with iDigBio E&O projects such as WeDigBio and currently co-leads the Outlier Detection and Documentation by Collectors Working Group.



Molly Phillips
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A biologist by training, Molly is responsible for coordinating and implementing iDigBio's education and outreach activities and communicating and facilitating coordination and networking among the TCNs. Molly also edits the iDigBio newsletter, *iDigBio Spotlight*, and co-manages iDigBio's social media efforts.



Jorrit Poelen
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Jorrit is a freelance open data / open source software engineer based in Oakland, CA. He helps mobilize and integrate existing biodiversity datasets on a global scale by building tools like globalbioticinteractions.org, effechecka.org and gimmefreshdata.github.io.



Andre Poremski
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Andre Poremski is the founder of Fieldguide, a machine learning platform that provides image recognition capabilities. Fieldguide is partnering with LepNet to launch "LepSnap", an iPhone and Android app that can be used to photo-catalog collection specimens as well as record field observations.

Muriel Poston
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Muriel is the Division Director for the Division of Biological Infrastructure at the National Science Foundation. A plant biologist by training, her teaching and research interests at Pitzer College are in plant systematics/ environmental studies and the participation of underrepresented groups in biodiversity sciences.



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Rich is Senior Collections Manager and Associate Research Scientist at University of Michigan Herbarium in Ann Arbor. His research interests focus on Caryophyllaceae floristics and phylogeny and efficient data capture from herbarium specimens.



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David is the Curator of Mammals at the Florida Museum of Natural History in Gainesville, FL. His research includes the study of host/parasite coevolution, and especially the use of lice to infer the evolutionary history of primates including humans. He also studies the effects of historical climate change on populations of bats on Caribbean islands. He currently serves as the Associate Director of Research and Collections at the Florida Museum.



Greg Riccardi
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Greg has been active in biodiversity informatics projects since 2004. He is the director of the Morphbank image repository and co-PI on the iDigBio Project. Greg is based at Florida State University in Tallahassee.

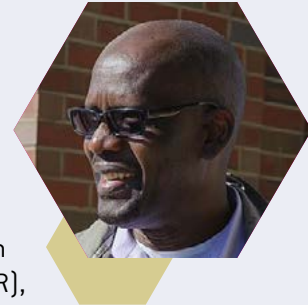


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Dawn Roberts is the Director of Collections with the Chicago Academy of Sciences/Peggy Notebaert Nature Museum in Chicago, IL and is responsible for oversight, preservation, and access to all the natural history and cultural collections.

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Roland is a Program Director with NSF's Division of Biological Infrastructure (DBI) in the Directorate for Biological Sciences where he manages the Collections in Support of Biological Research (CSBR), Advancing Digitization of Biodiversity Collections (ADBC) and NEON Operations.

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Laura provides data cleaning and data publishing support to institutions with biodiversity data to bring them into VertNet, iDigBio and GBIF. Laura is invested in improving the quality of data and advancing the technological infrastructures for sharing and using data online for research.

Joey Shaw
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Joey is a Professor of



Biology at the University of Tennessee at Chattanooga. He has research programs in molecular studies, field studies, and herbarium curation and modernization. He is an author and one of five editors of the Guide to the Vascular Plants of Tennessee, PI on the Tennessee portion of the SERNEC TCN, and President of the Association of Southeastern Biologists.

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Petra is an Associate Curator at The Field Museum in Chicago. Her research interests include evolutionary biology; biodiversity, phylogeny, biogeography and systematics of Arthropoda; morphological evolution; and museum collections analyses.

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Randy is a PhD student and Core Team member of iDigBio based at the Florida Museum of Natural History at the University of Florida in Gainesville. Randy's PhD work focuses on collections communications of ichthyological collections.



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Cynthia is a research botanist at the Morris Arboretum of the University of Pennsylvania in Philadelphia. Her research interests include plant evolution and systematics. She teaches field botany, a general plant course, and a public garden course at Penn.



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Annika is a first year graduate student at the University of Florida in the Biology Department. Her research is focused on the evolution of flowers. She is also interested in extracting morphological data from herbarium images.

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Pam is the Director of Research at iDigBio, based out of the Florida Museum of Natural History in Gainesville. She is a plant biologist interested in the origins and relationships of species of flowering plants. She is particularly interested in how to harness the power of natural history specimens for integrative research.



Dan Stoner
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Dan is part of the Advanced Computing and Information Systems (ACIS) laboratory at the University of Florida. He is a member of the iDigBio Cyberinfrastructure Implementation Team with a focus on data ingestion.



Lena Struwe
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Lena Struwe is the Director of the Chrysler Herbarium at Rutgers University. She is also a botanist focusing on phylogeny, medicinal and other useful plants, and urban weeds. She runs Personal Bioblitz projects and teaches evolution and plant diversity (and more).



Gavin Svenson
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Gavin is based at the Cleveland Museum of Natural History in Cleveland. His research is focused on praying mantis taxonomy, systematics, and evolution.



Patrick Sweeney
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Patrick is based at the Yale Peabody Museum of Natural History where he manages the herbarium. A botanist by training, Patrick's interests are far ranging and include flowering plant systematics and evolution, North American floristics and biodiversity informatics.

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Jordan is currently the collection manager in the Botany Department at the Academy of Natural Sciences of Drexel University. He recently finished his PhD on systematics and evolution in the grass family Poaceae in the Evolution, Ecology and Population Biology program at Washington University in St. Louis.

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Alex is the Software Products Lead at the University of Florida's Advanced Computing and Information Systems laboratory and the IT Infrastructure Lead for the iDigBio project.

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Kim is the Digital Asset Manager at The New York Botanical Garden. She is responsible for training and supervising all herbarium specimen digitization staff, installing and maintaining imaging equipment, and for managing, post-processing, and archiving the resulting ±400,000 image files generated annually.



Mike Webster
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Mike is a Professor at Cornell University and Director of the Macaulay Library at the Cornell Lab of Ornithology. His research and teaching centers on the evolution of sexual signals in birds and other organisms.



Jason Weintraub
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Jason is the Entomology Collection Manager at the Academy of Natural Sciences in Philadelphia. He specializes in systematics and evolution of Lepidoptera, particularly moths in the families Callidulidae and Geometridae. Ongoing research interests include studies of lepidopteran phylogeography, revisionary taxonomy, and conservation biology, as well as the evolutionary ecology of fern-feeding moths.





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Ryan is a graduate student and entomologist working in the Mississippi Entomological Museum at Mississippi State University with Richard Brown. His research focuses on taxonomy and systematics of weevils.



Jennifer Zaspel

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Jen is an assistant professor of Entomology and Director of the Purdue University Entomological Research Collection (PERC). Her program is focused on systematics, taxonomy, and the evolution of feeding behaviors in Lepidoptera.



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David works at the University of Colorado Boulder Museum of Natural History. His background is in biology and he is charged with various tasks associated with invertebrate paleontology collection. Insects are his particular interest, and ants his specialty.



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Greg is a professor of entomology at Kansas State University. His interests include systematics of parasitic Hymenoptera, systematics in support of biological control, and biodiversity of prairie insects. He is also the curator for the departmental insect collection.



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Steven is the collections manager for the Bohart Museum of Entomology at the University of California at Davis. He is responsible for the day to day operations of the museum and will be responsible for the students and staff working on the LepNet project.



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Erica Krimmel is the Assistant Collections Manager at the Chicago Academy of Sciences / Peggy Notebaert Nature Museum. Her background in library & information science is particularly relevant to biodiversity informatics and digital collections management.



Notes

