

**AIM-UP! RCN All-Hands Meeting**  
**Summary of Presentations and Discussions**  
**Hotel Santa Fe, Santa Fe, New Mexico**  
**15 & 16 October 2010**

**Participants**

**Joe Cook** – PI , Curator of Mammals, Museum of Southwestern Biology, University of New Mexico  
**Eileen Lacey** – PI , Curator of Mammals, Museum of Vertebrate Zoology, University of California, Berkeley  
**Scott Edwards** – PI , Curator of Ornithology, Museum of Comparative Zoology, Harvard University  
**Steffi Ickert-Bond** – PI, Curator of the Herbarium, University of Alaska Museum of the North  
**Carla Cicero**, Staff Curator of Birds, Museum of Vertebrate Zoology, University of California, Berkeley  
**John Demboski**, Curator of Vertebrates, Denver Museum of Nature and Science  
**Scott Gardner**, Curator of Parasitology, Harold W. Manter Laboratory of Parasitology, University of Nebraska, Lincoln  
**Bob Hanner**, Associate Director, Canadian Barcode of Life Network, University of Guelph  
**Bryan Heidorn**, Director of School of Information Resources and Library Science, University of Arizona  
**Eric Hoberg**, Curator, U.S. National Parasite Collection  
**Tricia Jones**, Senior Research Associate, Museum of Zoology, University of Michigan  
**Jeremy Kirchman**, Curator of Ornithology, New York State Museum  
**Dusty McDonald**, Arctos Programmer, University of Alaska Museum of the North  
**Phil Myers**, Curator, Museum of Zoology, University of Michigan  
**Tom Turner**, Director of MSB, Curator of Fishes, Museum of Southwestern Biology, University of New Mexico  
**Tomislav Urban**, Senior Software Developer, Data Management & Collections, Texas Advanced Computing Center, University of Texas, Austin  
**John Wieczorek**, Programmer/Analyst, Museum of Vertebrate Zoology, University of California, Berkeley  
**Chris Witt**, Curator of Birds, Museum of Southwestern Biology, University of New Mexico  
**Gordon Jarrell**, Research Associate, Museum of Southwestern Biology, University of New Mexico  
**Kayce Bell**, Museum of Southwestern Biology, University of New Mexico  
**Blake Eggemeyer**, University of Alaska

**Friday – 15 October 2010**

**Outline RCN (Joe Cook – Presentation SF1)**

- AIM-UP! is a NSF sponsored Research Coordinating Network (RCN) focused on developing innovative approaches to using museum collections and associated data in undergraduate education.
- Overview of structure, timeline, and plans. Accomplishments since June beginning.
- The RCN has on 5 annual themes (which are somewhat flexible):
  - o Year 1 – Integrated Inventories
  - o Year 2 – Geographic Variation
  - o Year 3 – Evolutionary Dynamics of Genomes
  - o Year 4 – Biotic Response to Climate Change
  - o Year 5 – Co-evolving Communities of Pathogens and Hosts as Related to Emerging Disease

- Some of these themes overlap. Should we consolidate or include new themes?
- Due to online access, museum collections and associated data are now readily available for instructional activities based on active learning.
- Our plan is to begin to develop lessons and demonstrations that will work for a variety of courses (large/small, lecture/lab/field) and undergraduate research experiences in biology.

### **Museum based undergraduate education (Eileen Lacey — Presentation SF2)**

- Educational goals include increasing (a) value of collections, (b) awareness of organismal diversity, (c) interest in evolutionary biology, and (d) ability to use analytical tools
- Traditional uses for collections in education include “ology” courses, curatorial training, research assistantships, museum apprentice programs
- Audiences for educational activities include schools with collections, schools without collections
- We need to design activities for both targets, with emphasis on programs without collections
- There needs to be a fundamental shift in the way museum collections and data are perceived by educators and students.
- Keep the focus of RCN on undergraduate courses.

### **Museum databases: new approaches (Gordon Jarrell, John Wieczorek —Presentation SF3)**

- History of the Arctos database.
- There are many biodiversity information sources available on the internet.
- VertNET is a proposed database that will make it easy to upload and access data.
- VertNET would take the server burden off of institutions and allow for smaller collections of data to be uploaded and accessed.
- Map of Life: a proposed platform for production of expert species range maps.

### **RCN-Evaluation---Summary of Pre-meeting questionnaire (Phil Myers)**

- Participants felt they had a reasonable understanding of the RCN and the current year’s theme (Integrated Inventories) 3.75 & 3.5, respectively (on a scale of 1-5).
- Participants want the following from this meeting:
  - Clear up uncertainty over next steps
  - Gain and share information
  - Build the network
- Expectations: Define deliverables and path to their development. Identify the role of non-PI institutions and RCN expectations of them and funding for them to develop activities. Find ways to reach out to the broader communities.
- *Response from Cook*: There is funding available for non-PI institutions to be involved through requests to Steering Committee (Ickert-Bond, Edwards, Lacey, Cook) for expenses related to travel, web development, and outreach. Need to figure out how that will be distributed/requested.

### **Animal Diversity Web (Phil Myers – Presentation SF4)**

<http://animaldiversity.ummz.umich.edu/site/index.html>

- Animal Diversity Web (ADW) uses natural history-based active learning.
- ADW is written by and for college students, but open to a wider audience.
- College students formulate species accounts from a template.
- Accounts are structured on varying taxonomic levels with side articles.
- Quardvark is the querying tool for ADW.
- ADW is primarily a teaching tool, currently restricted to described species, could possibly be adapted for use as a teaching tool to describe new species.

### **Herbarium imaging (Steffi Ickert-Bond – Presentation SF5)**

- The University of Alaska Museum of the North (ALA) Herbarium houses mainly vascular plants from Alaska as well as Canada and Russia.
- Texas Advanced Computing Center (TACC) stores images of herbarium specimens, most of which has been digitized and is available on Arctos.
- Using ALA Herbarium collections to look at sheets and update Arctos based on information on specimen labels may be a good undergraduate activity.
- The Systematic Botany course uses both images and specimens to create keys.
- ALA Herbarium specimens could be used for structured activities for teachers.
- Sometimes time-intensive activities (such as digitizing the collection) are not recognized as traditional academic activities.

### **Discussion Breakout on Deliverables – Three Subgroups**

#### Non-museum institutions

- Target community colleges, historically minority colleges, and tribal colleges.
- Create scalable projects that could be developed and instituted at an institution with a museum, but also be transferable to a non-museum institution.
- Set up a targeted series of questions to teach the tools, then educators (and students) can set up their own activities.
- Make activities locally relevant.
- Students could build collections (invertebrates and plants) that apply to the activity.

#### Museum Institutions

- Online tools: Short videos and instructional manuals on specimen preparation
- Museum Course (e.g., engaging students in resurveys):
- EXAMPLES OF EXISTING PROGRAMS TO LOOK AT AS MODELS:
  - Operation Wallacea (students must generate their own funds to participate)
  - Coastal Marine Biolabs (engage undergrads in collecting-based surveys on Channel Islands, vouchers deposited in Santa Barbara Natural History Museum)

- Mentorship program: Develop ways to facilitate networking students with museum people (regionally) – how do students know who to contact in a certain area if they're interested in getting involved? Having museum people give presentations on what they do to classes at different levels.
- Improve discoverability of data in databases – easier to use interfaces, broader public dissemination of the diverse kinds of information available (digital media, specimen data, audio recordings, archives).

### Public Outreach

- Engaging teachers at all levels. K through Gray.
- Teachers need lesson plans and kits to do museum-based biology.
- Museum databases are hit and undergraduate programs are emphasized
- Link Animal Diversity Web to other education databases and to specimen databases
- Highlight the collections in classes and school
- Many museums visitors don't know how much is behind the scenes. Make it known.
- Museum or other collections in the public eye. Get the word out.
- Use a single specimen record as a portal to other kinds of data.
- Ecology
- Develop charismatic stories – to grab the attention of the public.
- We suggest Museum Outreach Professionals be invited to one of the annual all hands meeting. Perhaps Museum Education Departments contribute to our group.

### **End of Day General Discussion**

- How do we increase RCN publicity? Improve website. Social networking?
- Develop a general poster for meetings. Mention the RCN when presenting at meetings.
- Explore ways to integrate museum collections into early biology courses.

### **Saturday – 16 October 2010**

#### **iPlant (Tomislav Urban – Presentation SF6)**

- Texas Advanced Computing Center (TACC) has massive data storage, Data Management and Collections (DMC) group wanted to bring data to a competitive level of expertise.
- TACC has 2 particular sub-projects with education and outreach components.
  - o MyPlant – MySpace or Facebook for plant biologists. Organized by clade. Open to general public.
  - o DNA Subway – workspace, high school is the main target audience.  
<http://dnasubway.iplantcollaborative.org/>
- DNA Subway is similar to tools for scientists, but packaged for high school students.
- The explanation provided at the beginning of an activity is important to understand what is going
- This is similar to what we want to think about for museum tools.

### **Online parasite data (Scott Gardner – Presentation SF7)**

- Missions of the Manter Lab (University of Nebraska, Lincoln) are to train student scientists, conduct research, and use collections for education.
- One of the objectives of the lab is to document and describe the biodiversity of the planet before it is gone.
- It is important to get host and associated data, but there is a lot of additional data added by including parasites.
- The Manter Lab has an online database in the process of being transferred to Arctos.
- The lab also has virtual microscopy that can be used remotely. Images taken by remote users are uploaded into the Manter Lab image library.

### **Barcode of Life (Bob Hanner – Presentation SF8)**

- A barcode is a DNA-based identification system.
- Barcode requires a gene that is relatively invariant within species but variable between species.
- The Barcode Library is themed on eukaryotes, with a focus on bio-surveillance targets.
- There are several on-going collecting projects for barcoding.  
Barcode of Life Database has multiple aspects; management and analysis, identification engine, and external connectivity.
- The educational considerations are biodiversity informatics tools, specimen record digitization, specimen associations, taxonomic calibration, and translational taxonomy.
- eBOL is bioscience education through DNA barcoding. There is excellent potential for student collecting of specimens, followed by sending specimens to be barcoded.
- There is also opportunity for RCN to link and help develop eBOL.

### **Designing an evaluation plan (Phil Myers, connected remotely with Tricia Jones)**

- Need pre- and post-course evaluations for the seminar course.
- SALG allows for students to assess their own gains, can also ask content questions.  
[www.salgsite.org](http://www.salgsite.org).
- Track use of materials, including use on the webpage. There are different tools to track each of these things.
- Need clarification for goals in terms to student gains. Skills? Quality of Questions they ask? Get them to understand this is a legitimate form of research? Number of faculty that adopt the approach and/or the number of students reached? What are the component skills of how students are asking these questions?
- There are two main areas to evaluate, how well the network functions and the undergraduate education component.
- One objective is to engage students more actively in a lesson or in a lab. Can we measure levels of enthusiasm for the subject?
- How can students indicate if they felt their success was due to new curricula? In the past, just ask them at the end. Another way is to ask students at 3 points along the semester about their knowledge of how they do a task, their belief that they would be successful at that task, and their previous knowledge of how to do that task. You can then map a trajectory of learning.

- With the interface, you need to know if it is hard to do the task because of the difficulty of using the technology or the complexity of the research. Ask these kinds of questions correctly and you can tell if students are happy with content vs. the computer.
- We have to be careful to evaluate other goals, reaching out to certain communities, etc.
- We can get out lessons that can be beta-tested before the year four plan with 8 students.

### **Theme Year 1 - Integrated Inventories: what are we doing in Year 1? (Joe Cook – Presentation SF9)**

- Year 1 Seminar – integrating the types of collecting events, integrate information from one specimen, also integrating multiple collections into education
- Could use museum-based specimens to design and teach an entire curriculum.
- Museum collections are particularly useful for conveying issues related to temporal and spatial scale, using baselines from specimens.
- Many fundamental concepts and tests of ecology and evolution are derived from museum data.
- The specimen is a portal to a large array of information.
- The strength of specimens is in the comparison of individuals. Comparative biology is the area where specimen-based educational modules can make some great contributions

### **Discussion Breakout on Year 1 Theme Integrated (or Integrative) Inventories**

Three Subgroups

#### Non-Museum Institutions

- Have an exercise for all the things this specimen was used for. Can there be an interface for that? So that it would be usable by a non-museum institution.
- Develop themes around historical specimens to demonstrate importance of baselines and history.
- Use an activity where you give students 20-50 images of organisms and tell them to categorize them, teaching principals of evolution such as individual variation and relatedness.
- Images of real specimens are more interesting than abstract drawings. Using good images of characters, look up things from keys to see what it looks like, captures and conveys variation.
- Museums could develop kits for the non-museum institutions. Kits could be checked out for certain lessons along with demonstrations that stimulate students' interest.
- Activity
  - o Develop mobile inventory kits.
  - o Go to internet, checked records for the area, to make predictions for what they would find.
  - o Schools start collections, opportunity for comparisons over time.

#### Public Outreach Group

- Define and identify integrative data sets.
- Answer a question that we had not thought about before.
- Citizen science? Alliance - pre app. form to allow use of a platform to classify things into certain groups. Galaxy forms.
  - o can we do this for plants?
  - o Phenology

- data that are not on labels
- Cal Photos - data on photographs that will enable
- Digitizing information that we have in the collection, combined with getting good data on an important questions that are placed on a "list."
- Filling in georeferencing gaps.
- Top ten list of missing georeferencing localities (we may know the spot name but not the real data). Face book or social network list. etc.
- Gardening and insect pests etc.
- Maps of distribution of organisms that can be verified by people.
- Niche models first and then asking people to go out and verify the absence of species.
- Provide a check list of stuff at a site and design an activity around the checklist.
- Develop taxonomic check lists - what does not occur where, where does this occur for sure?
- We are not doing this one at a time we are mass communicating.

#### Integrative Data Sets and Museum Collections

- Museum exhibits – EXAMPLE: highlighting collections such as eggs, ways that they are useful for research (ecology, evolution, breeding phenology, etc.) and conservation (e.g., DDT)
- Develop lesson plans or workshops that we present at society meetings, hold short workshops for teachers at meetings or locally
- Develop lessons plans: emphasize that museums are long-term data sets, collectors can never anticipate how specimens will be used in future.
  - breeding phenology (egg and nest records)
  - link specimens to diverse resource
  - body mass data – example from Arctos: body size changes over time
  - Trophic data – example: using specimens and isotope analysis to look at how seabirds have changed diet (trophic level) over time:
- **Deliverable:** have this group come up with list of specific examples of how specimens have been used to study diverse, integrative questions
- Develop virtual collecting expedition – what happens with/to a specimen from the field through the museum workflow into the specimen case/jar, to research and publication
  - How do you decide where to go and what to do?
  - Kinds of permits you need to collect a particular specimen (mammals different than insects).
  - Kinds of gear you need to collect different kinds of specimens
  - Kinds of data you need to record in field to maximize usefulness of specimen
  - Kinds of parts you should be collecting for different kinds of animals to maximize their value
  - 3D view of where you are collecting
  - Museum workflows: curation, georeferencing, dermestid cleaning, tissues, etc.
  - Use of specimen in different kinds of integrative studies

## End of Day Discussion

- Future directions – make the fall seminar for undergraduate students (too?).
- Have the fall semester hosted somewhere besides UNM, have another institution host it.
- Next year, switch to undergraduate course out of UNM, webinar to Berkeley, UAF, and others.
- Evaluation of specific deliverables will develop as deliverables identified.
- Next meeting will be spring 2012 in Fairbanks.
- Think about new people/institutions to bring into the network.
- Improve public interfaces.
- Give talks at research meetings you are attending.
- Continue to develop fall seminar. Encourage graduate students to think about novel ways to use museum data in undergraduate education (as part of their graduate program).
- Develop undergraduate seminar – give them exercise and help them work through them. See what the educational products are from Fall 2010 seminar.
- Design a museum-based project as part of another course.

## Needs and activities

1. Better web presence (Gordon, Steffi, Blake, Tomislav):
  - Better public interface
  - Online forum for communication among network participants
  - Logo
  - Connect with CollectionsWeb RCN
2. Talks at relevant professional society meetings
  - SPNHC, NCSA (May 2011) (Carla)
3. Modification of fall seminar (Joe, Eileen)
  - Shift to undergrads for 2011
  - Offer online at multiple institutions (MSB, MVZ, UAM)
  - Develop curriculum to point that it can be distributed more widely
4. Begin developing one-off modules for undergrad courses (Eileen, ??)
  - GRSP as foundation for database exercise
  - Identify key concepts to convey
  - Link to specific specimens
5. Develop specific evaluation activities (Phil, Tricia)
  - To be informed by progress of above, comments from first workshop

## Summary of proposed deliverables for year 1:

- Public website, network forum (RCN Participants contribute web material, images)
- Poster presentation
- Seminar syllabus
- Draft database exercise
- Evaluative summaries of above