“Fossils in the Cloud”
Advancing the Broader Impacts of iDigBio through Paleocollections

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Talk Outline

- Rationale and strategy
- PIRE and Fossils of Panama digitization project
- STEM Teachers Partnership
- Fossil clubs, digitization & the FOSSIL project
- Wrapup: Intended outcomes and goals
Rationale

• Why paleocollections?

• Approx. 100 million fossil specimens are curated in non-federal natural history museums in the U.S.

• Once these are digitized into a Cloud for research, they become available for education and outreach (E&O) to downstream users.

• **Downstream User**—someone who uses digitized paleocollections other than for research.
Strategy

- The potential for downstream uses of digitized data are mind-boggling, for example--
  - Formal K12 education
  - Museums, other informal learning settings
  - Volunteers, citizen scientists
- Although Broader Impacts are an expectation of merit review, in the research directorates (R&RA), funding is limited for these activities.
- For iDigBio, we have used the limited funding from BIO to leverage BI for paleocollections, so--
  - Partner ("piggy-back") with existing projects
  - Leveraging for new projects from other NSF directorates.
1. Advance discovery and understanding while promoting teaching, training, and learning

2. Broaden participation of underrepresented groups

3. Enhance infrastructure for research and education

4. Broad dissemination to enhance scientific and technological understanding

5. Benefits to Society

Panama PIRE*

*Partnerships in International Research & Education
NSF 0966884

Block of 19-million-year-old fossils
Cucaracha Formation, Panama
Goal—digitize Panama specimens in FLMNH

Growth of FLMNH Panama collections

- Vertebrates (lots)
- Vertebrates (spms)
- Invertebrates (lots)
- Invertebrates (spms)

Panama PIRE
Develop on-line atlas
e.g., FLMNH Florida fossil bivalves
Miocene Gatun Formation, Panama
PCP PIRE Teach
Research Experience for STEM Teachers
(NSF 1237203*, 1321453*, 1377275**)

Centenario Bridge, Panama, 2012

*Supplement to 0966884; **new RET award (GEO)
Teachers and students: Gatun, Panama
Engaging underserved learners

Gatun Panama, 2013
Evening reflection and brainstorming, Panama, 2013
Learning & digitization in the classroom

AP Biology, Harbor High, CA, 2012
Fossil clubs, digitization & the FOSSIL project

“Fossils in the Cloud” talk
—SW Florida Fossil Club
Evolution of paleocollections workflow

20th century

21st century
Digital Imaging of fossil collections

- 2 dimensional—relatively easy, digital photo
- 3 dimensional—more advanced technology
Advantages of digital imaging

Assuming that specimen data and images are uploaded to the cloud, then:

• Fossil specimens can be studied without having to go to the museum.

• Some techniques, e.g., 3-D images can be non-invasive when previously they were not.

• 2-D and 3-D printouts and exact replicas
Applications of 3D printing technology
Fossil clubs and lifelong learning

Nebraska badlands

What is it?
How will this work for fossils?

- Feedback indicates high degree of interest among amateur paleontologists
- Willingness to be trained and volunteer to help curator digitize collections.
Common themes and FAQs

- How can I learn to digitize my collections?
- What data do I need to capture?
- Can I donate these to a museum, or display on the web?
- I’d like to help museums (volunteerism)
- Can I upload my collections to the cloud?
- Can the portals have common names or visual (image) recognition?
FOSSIL project*
(Fostering Opportunities for Synergistic STEM with Informal Learners)

- Networked between fossil clubs (red) and professional paleontologists
- More added recently
- “Big data” digitization impressed reviewers as learning model

*1322725– NSF EHR (DRL)
Members’ Interest in Science Topics

- Identifying and organizing fossils and fossil collections ("curation")
- Paleontology as a scientific discipline
- Geology as it relates to fossils
- Fossil collections in U.S. natural history museums
- Evolution based on the fossil record
- Climate change interpreted from the fossil record

Number of Clubs

- Very low
- Low
- Neither high nor low
- High
- Very high
FOSSIL Activities

- The two target audiences will collaborate in cyberenabled learning
- Activities will be mediated by myFOSSIL Community of Practice (CoP)
- Fossil club members will be trained about digitization
  - To help professionals with collections
  - Some will digitize their own fossil collections
Wrap-up:

Intended outcomes—Paleocollections E&O

- Bring digitized paleocollections to downstream users
- K12 outreach—formal education
- Lifelong learning in fossil clubs
- Feedback loop—these target audiences could engage in the national digitization effort

**Overarching strategic goal:**

Through **access** and **education**, downstream users better understand the **value** and **relevance** of digitized collections in the 21\(^{st}\) century society.