Citizen science as a tool for expanding biodiversity research across ecological fields

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The Big Challenge
~10% of US specimens are digitized
Citizen Science

projects in which volunteers partner with scientists to answer real-world questions

(Cornell Lab of Ornithology)

collection and analysis of data; development of technology; testing of natural phenomena; and the dissemination of these activities by researchers on a primarily avocational basis

(OpenScientist)
Clay Shirky’s “Cognitive Surplus”

200 billion hours
a year spent watching TV by US adults

http://www.informationisbeautiful.net/2010/cognitive-surplus-visualized/
Digitizing Biodiversity Specimens

• Transcribing Specimen Label and Ledger Text

• Georeferencing

• Annotating
Digitizing Biodiversity Specimens

- **Transcribing Specimen Label and Ledger Text**
- Georeferencing
- Annotating
PLANTS OF OKLAHOMA
ROBERT BEBB HERBARIUM
The University of Oklahoma

Oklahoma County

Scrophulariaceae

Penstemon oklahomensis Penn.

SE corner of Tinker AFB. T11N R2W Sec. 26.
Herbaceous perennial. 2-3 dm tall. Flowers white.

F. L. Johnson
TNK017

4 May 1994

Plant Inventory of Tinker Air Force Base by Oklahoma Biological Survey

Natural Order:

generic name: Penstemon
specific name: Penstemon oklahomensis
vernacular name: Oklahoma Penstemon
Habitat: Mixed-Grass Prairie
Collector: F. L. Johnson
Remarks: 4 May 1994

F. M. Bailey.
TRANSCRIBE MUSEUM RECORDS

Notes from Nature

Choose a Group and Start Transcribing!

- Plants
- Bugs

- 5 Expeditions Available
- 1,223 Registered Volunteers
- 34,608 Classifications
- 21,033 Subjects
- 10,394 Retired Subjects

www.notesfromnature.org
WeDigFLPlants on Notes from Nature

Notes from Nature
Active Expeditions for Herbaria

WeDigFLPlants’ Mints of Florida—More than Mojitos
90.00% complete

WeDigFLPlants’ Laurels of Florida—Fight Laurel Wilt
79.79% complete
WeDigFLPlants on Notes from Nature
WeDigFLPlants on Notes from Nature
Atlas of Living Australia
volunteer.ala.org.au/
Digitizing Biodiversity Specimens

• Transcribing Specimen Label and Ledger Text

• **Georeferencing**

• Annotating
Experiment at FSU and Tulane

• How accurate are student georeferencers compared to software and to experts?
• What method is most effective at estimating the most accurate georeference?

Verbatim Locality: titi bog, Apalachicola National Forest, near Wilma.
Habitat: in a sphagnous area, presently dry, titi bog
Student georeferences averaged 4.62km from experts

(range 0.18–37.08 km)
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(range 0.18–37.08 km)

Median of student points provides a better locality estimate than mean
Digitizing Biodiversity Specimens

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- Georeferencing
- Annotating
“Outline the wings of the specimen”

*Ampulex compressa* (F.) from the Museum für Naturkunde Berlin ([morphbank.net/?id=102143](http://morphbank.net/?id=102143))
Challenges

• Not all labels are citizen science-friendly
  – Illegible handwriting
  – Outdated name and place names
  – Imprecise locality information
  – Limited knowledge of
    • Collection techniques, i.e., botanists collect along roadsides
    • Habitats
    • Scientific terminology
• Innate student ability and interest
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Considerations and Future Directions

• Citizen scientists make valuable contributions to data mobilization efforts
• Usefulness dependent on downstream use
• Room to grow:
  – Reach out to new volunteers, e.g., experienced naturalists, armchair geographers
  – Improve training and online platforms
  – Sort labels regionally or taxonomically to provide volunteers local specimens
• Broaden participation through interactive events like...
Worldwide Engagement for Digitizing Biocollections
What is WeDigBio?
Worldwide Engagement for Digitizing Biocollections

A citizen science event of mass digitization that focuses on science, biodiversity, community building, and our collections.

2015 WeDigBio event at the Field Museum, Chicago, Ill.
WeDigBio Goals

• Increase the rate of digitization of biodiversity collections
• Raise the profile of collections and their significance in science, society, and education
• Build our global biodiversity crowdsourcing community

2015 WeDigBio event at BRIT, Fort Worth, TX
Citizen scientist participation

Onsite
at museums, universities, and schools

Online
distributed around the world

Online Transcription Platform
- DigiVol (Atlas of Living Australia)
- Les Herbonautes (Paris Herbarium)
- Notes from Nature (Zooniverse)
- Smithsonian Transcription Center
- Symbiota
Pilot Year: WeDigBio October 22-25, 2015

- Hundreds of participants from >150 countries
- 50,000+ transcription tasks
- 20 onsite events
Enhancing the Experience

- Onsite participants received tattoos, stickers, and prizes
- Researchers gave lectures and tours of collections
- University classes used WeDigBio lesson plans and games
- Everyone shared photos and stories via social media, AdobeConnect
Logistical Documents at wedigbio.org

For onsite hosts

• Press Kit
• Event Planning
• Tasklist
• Timeline

For participants

• Find a project
• Find an onsite event

Follow along with visualizations, twitter feed, videos, recently transcribed images, and more.
Education and Outreach in WeDigBio 2015

Games

- Habitat bingo and morphology bingo
- GEOLocator
- Timeline Tracker

2015 WeDigBio Event with University of Florida Plant Taxonomy class

Undergraduate lesson plan developed with collectionseducation.org
BIOSPEX

BIOdiversity SPecimen digitization EXpeditions
easily contribute images from a collection to an online transcription platform

biospex.org
Follow us!

wedigbio.org
biospex.org
Thank you!

o.fsu.edu
Hourly Transcription Rates
Before (Blue), During (Red), and After (Green) WeDigBio
Enhancing the Experience

Q?rius Lab at the Smithsonian

CRABS bingo at Natural History Museum of LA County

Visit from a researcher (Paul Mayer) at the Field
Participant motivations

I already volunteer as a transcriber for the NYBG and wanted to bring a friend along.

I love bees and I wanted to help people to get more information about them.

I wanted to know more about the various different types of specimens that exist and help catalogue them so others can access them.

After listening to the presentation given during my biology lecture, I was interested in learning about the specimen preserved in the institution.

I wanted to help with the research efforts after hearing a presentation about the number of undocumented specimens.

The Doctor Soltis family made me do it.

I thought it would be interesting to see how to organize data about species.

I like the idea of contributing to scientific knowledge.

Also, donuts, volunteer hours, class credit, just for fun...