

Using Digitized Data From Insect Collections

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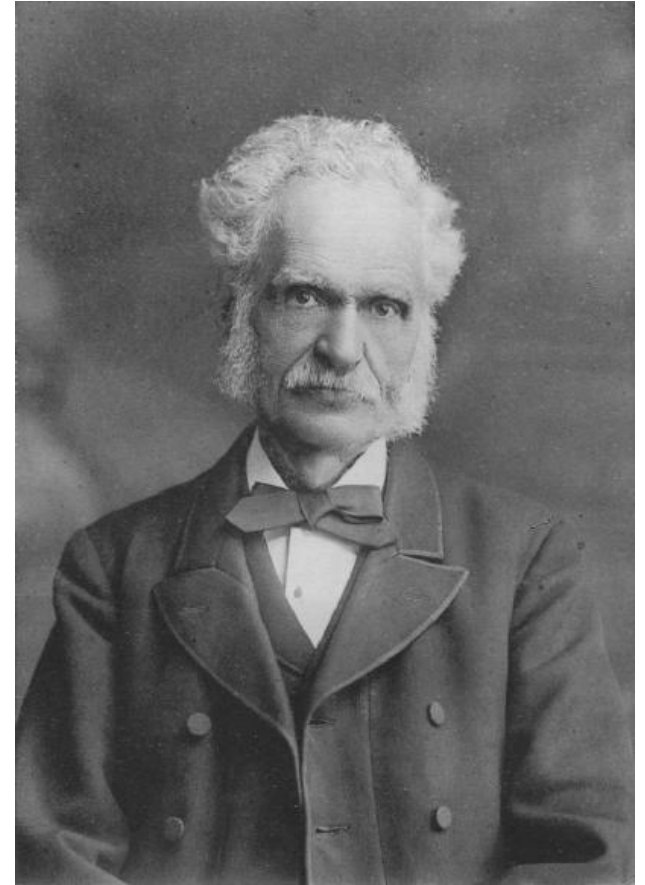


“The nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased, and not impaired, in value.”

- Theodore Roosevelt, *Speech before the Colorado Live Stock Association, Denver, Colorado, August 19, 1910*



“I am quite convinced that Insects offer better or clearer illustrations of the problems you occupy yourself with than any other class of animals or plants. It is so easy with them to obtain great series of examples and have them before you in a small compass, which is one advantage they have.”

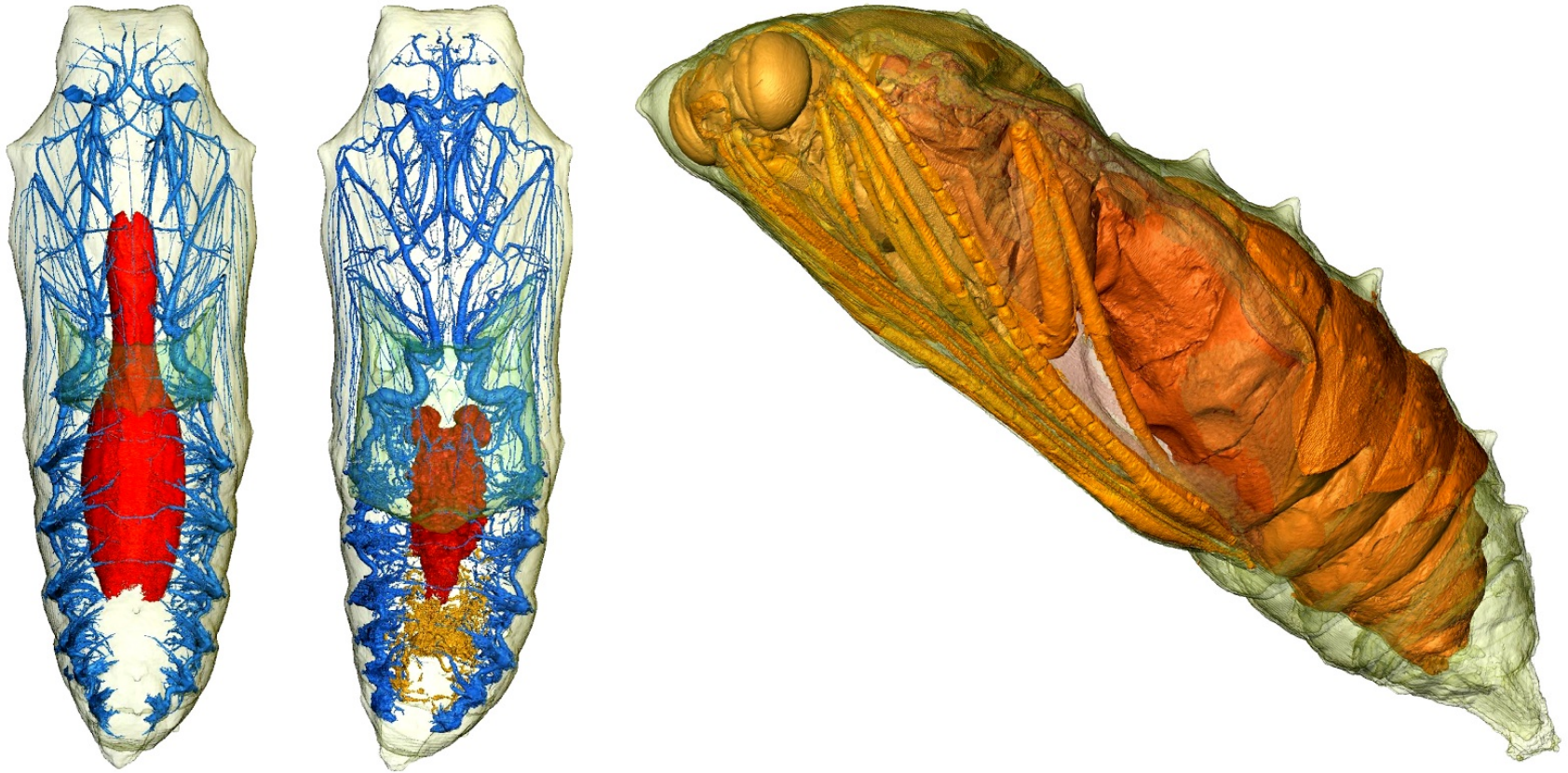


- **H.W. Bates**, in letter to C.R. Darwin (1861)
<http://www.darwinproject.ac.uk/entry-3104>

Metamorphosis revealed: time-lapse three-dimensional imaging inside a living chrysalis

Tristan Lowe, Russell J. Garwood, Thomas J. Simonsen, Robert S. Bradley and Philip J. Withers

J. R. Soc. Interface 2013 **10**, 20130304, published 15 May 2013

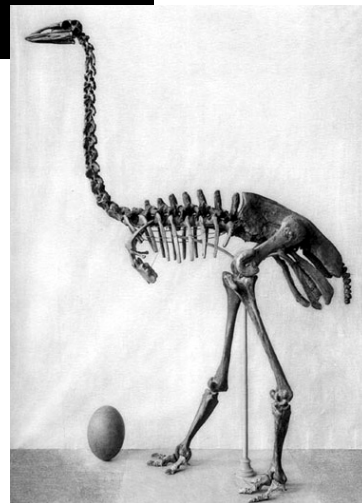


<http://www.livescience.com/>

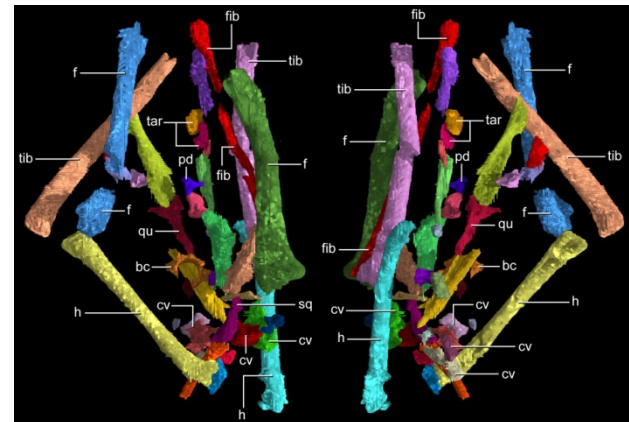
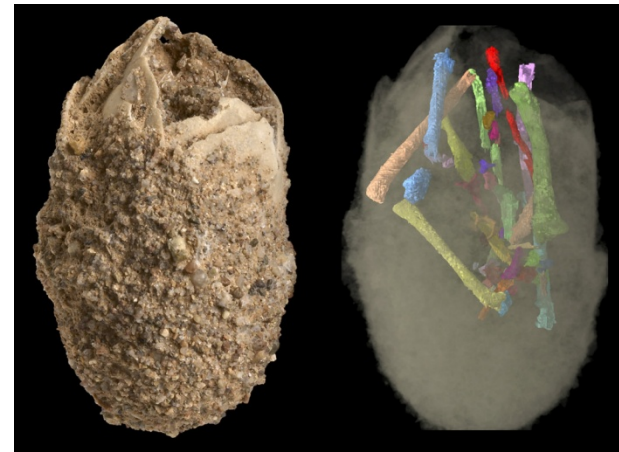
Vanessa cardui pupa

Digitized Specimen Data

Life size printout of bone from
elephant bird embryo



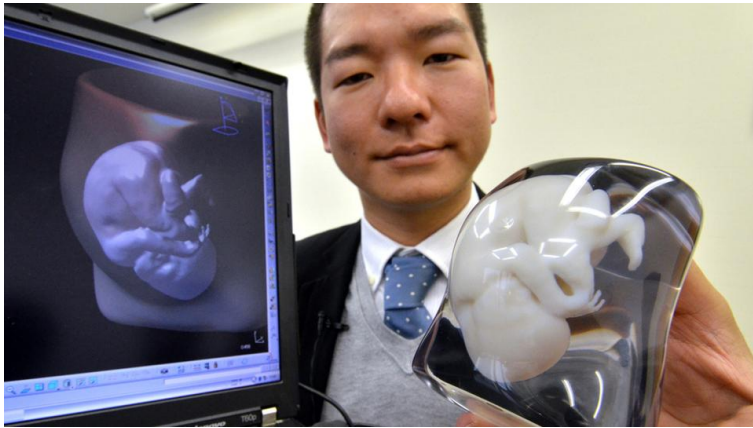
Neoceratopsian dinosaur egg/embryo



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

Digitized Specimen Data

- Digital (i.e. non-destructive) dissection
- Quantify complex morphological variation morphology
- 3-D printers: digital specimen loan



<http://www.bbc.com/future/story/20130514-weird-wild-world-of-3d-printing>

Quantifying Use of Digitized Data

- Publications
- Grants
- Log Books
- Downloads
- Impressions
- Search Hits
- Page Views
- Google Analytics
- Data Visualization Tools

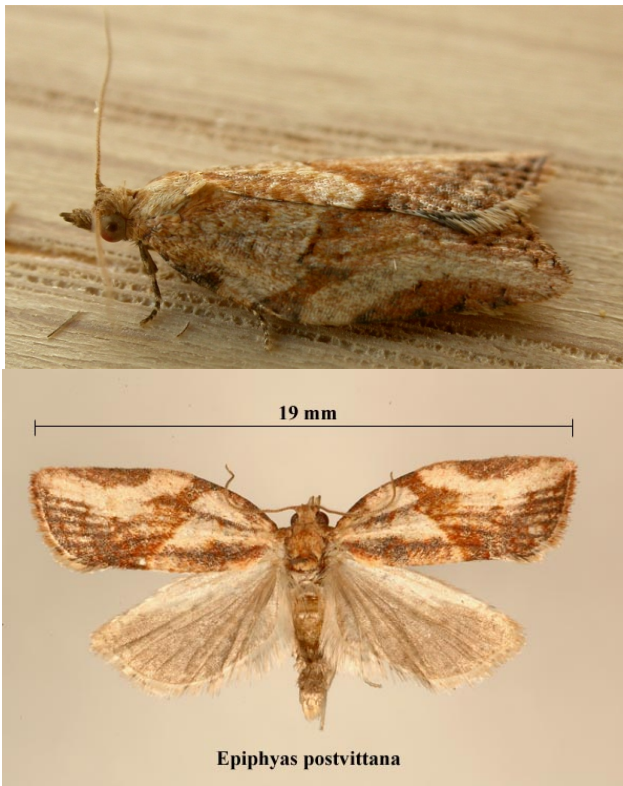
Digitized (Specimen) Data

- Images
 - Entire specimens or subsets
 - Labels
- Video/Sound
- Text/Marked up data
 - Transcribed labels
 - Populated databases
- “Children”
 - Tissues
 - Skeleton
 - Skins
 - Nests
- Results/Data
 - Sequences, transcriptomes
 - Measurements
 - Phylogenetic Matrices
 - Phylogenetic Trees
 - CT scans
 - Publications

Historical Uses of Collections

- Examine specimens for taxonomic and phylogenetic study
- Reference for identification
- Document spatial occurrence
 - Arrivals of invasives
 - Extinction
 - Range changes
- Test hypotheses of evolution
- Preserve record of biodiversity
- Deposit vouchers
- Ecological study?
 - Community ecology
 - Interactions
 - Change over time
- Outreach
- Education

UHIM demonstrates eradication of invasive pest



Epiphyas postvittana, Light Brown Apple moth introduced 1890's, nearly gone from Oahu in 2008




UHIM demonstrates extinction of endemic species

Crocidosema leprarum (Tortricidae): not seen since 1950's



Crocidosema leprarum
(male)
Honolulu, Oahu, BM

“Citizen Science”



UNIVERSITY of HAWAII at MĀNOA

Pulelehua Project
College of Tropical Agriculture and Human Resources

Home How to Identify Host Plants Submit a Sighting Map of Sightings Project Staff References

Welcome to the Pulelehua Project!

The Kamehameha butterfly (*Vanessa tameamea*) is endemic to Hawai'i, meaning it is found nowhere else in the world. It was named our official State Insect in 2009, in response to a proposal by a group of elementary school students. Although the butterfly is historically known from all the main Hawaiian Islands (Kaua'i, O'ahu, Moloka'i, Lana'i, Maui, and Hawai'i), it is no longer found in some areas where it used to be common (e.g. Tantalus on O'ahu), and it may be declining. The Pulelehua Project is an effort to map current populations of the Kamehameha butterfly using observations submitted by the public, in combination with surveys of remote areas by scientists. Pulelehua is the Hawaiian word for butterfly.

We need your help! We are calling upon anyone who sees a Kamehameha butterfly, caterpillar, egg, or chrysalis to **submit their photos and observations**. Your data will be used to map the current distribution of the Kamehameha butterfly, and help determine how and why it has declined. You can also use this site to learn more about how to find and **identify** the different life stages and **host plants** of the Kamehameha butterfly.

The Pulelehua Project was developed by scientists at the University of Hawai'i at Mānoa, College of Tropical Agriculture and Human Resources, with funding from the State of Hawai'i Department of Land and Natural Resources.

- State Insect: *Vanessa tameamea* (Kamehameha Butterfly; Pulelehua)
- Users submit photos and location to website
- Researchers verify record and investigate habitat
- Part of larger project
 - Identify critical habitat
 - Identify natural enemies
 - Plant host *Pipturus albidus* (māmaki)

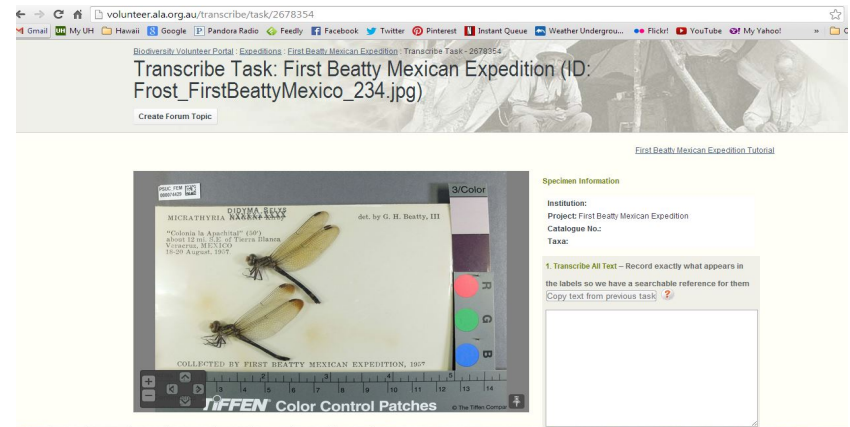
<http://www.ctahr.hawaii.edu/pulelehua/>

“Crowdsourcing” Biodiversity

- Attempt to circumvent bottleneck problems with “traditional” transcription
- Recruit remote volunteers to transcribe via web interfaces and images



Notes From Nature



Atlas of Living Australia

Limitations of Crowdsourcing

- Oversaturation of “market” (*it is going to get worse!*)
 - Everyone is asking for funding or work
 - Many efforts are deserving
 - Biodiversity research is not special to the average person
- Limited value in casual contributors
- Lack adequate recruiting efforts
 - Promotion
 - Motivation
- Lack incentive
- Lack personalized, interactive tutorials or support

Uses of Digitized Data for...

- Outreach
 - Public displays
 - Tours
 - “one off” educational experiences
- Education
 - Courses, laboratories, etc.
 - “formal” education
 - Captive audience

Collections and Education

- Get people excited about biodiversity
- Examine/handle specimens
 - Taxonomic diversity
 - Morphological diversity



Developing Educational Resources

- External links to blogs and news stories
- No original content
- Nothing useable in a classroom



Researchers

[Browse our specimen portal](#)



Collections Staff

[Learn how your collection can benefit from our work](#)



Teachers & Students

[Learning resources & opportunities to engage](#)



Teachers & Students

[Download lesson plans about using digitized specimens](#)



K-12 Material

In January 2014, iDigBio hosted an Education and Outreach (E & O) Workshop with topics relating to using digitized specimen data in classroom and field activities. The links below were shared and may be of interest to educators.

[Why So Few? Women in Science, Technology, Engineering and Mathematics](#)

<http://www.aauw.org/resource/why-so-few-women-in-science-technology-engineering-and-mathematics/>

(includes a research review and actions you can take, in text format, but also ppt formats so you can easily present to your students / colleagues)

[Unsettling Stats about Women in Science \(Thanks Joseph Cook\)](#)

<http://www.the-understory.com/2014/01/23/unsettling-stats-about-women-in-science/>

[Vision and Change in Undergraduate Biology Education \(Thanks Tanya Dewey\)](#)

<http://visionandchange.org/>

and also from Tanya

[EEB/BioKIDS field trip delights and inspires](#)

http://webapps.lsa.umich.edu/eeb/news_events/events/biokids.asp

[U-M program boosts Detroit science test scores](#)

http://www.ur.umich.edu/0506/Feb06_06/01.shtml

Developing Educational Resources

- Typical instructors lack knowledge of what biodiversity data is and how to use it
- Content providers must collaborate with educators


October 4, 2013

New Sallans

Scientists,
Education, Team
Events

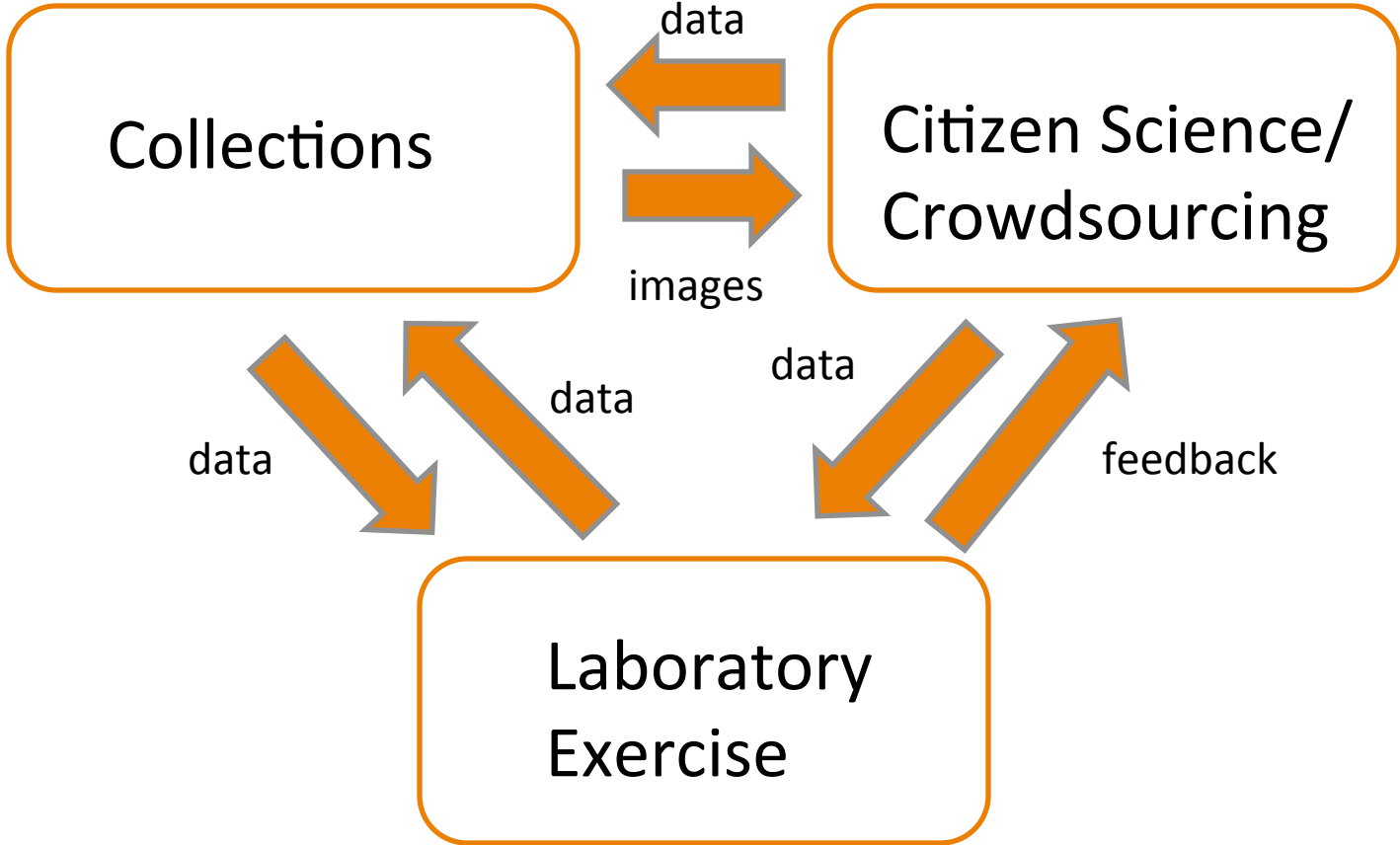
Are you a teacher?

One thing the Notes from Nature team has been interested in doing from the start, but hasn't yet found the time to squeeze in, is to develop educational materials utilizing the Notes from Nature content and release it via the Zooniverse ZooTeach site. For those who have never heard of ZooTeach, it is described as a place "where educators can share high quality lesson plans & resources that compliment the Zooniverse citizen science projects."



Are you a teacher?
Do you love Notes from Nature? Would you like to integrate it into your curriculum? If yes, please reply to this post with a comment to begin a conversation about how to do this. We're eager to reach a broader audience and partner with you!

<http://blog.notesfromnature.org/2013/10/04/are-you-a-teacher-2/>



Incentivizing Digitization Efforts with grades

- Appropriate for grade level 6? And up
- Good for home school curriculum
- Simple transcription assignments (students experience data collection)
- Laboratory exercises
- Research projects

Developing Educational Resources

- Coordinate efforts *directly* with instructors
- Match lessons to state BOE curriculum standards, learning outcomes, etc.
- Modify according to various pedagogical trends
 - Inquiry based, etc.
- Check Institutional Review Board to see if approval is needed for use of Human Subjects
- Connect *locally*

Biology 114 Learning Outcomes: Evolution

- Successful students will be able to explain the mechanisms of microevolution.
- Successful students will be able to use concepts associated with microevolution and macroevolution to **explain patterns of speciation and extinction**.
- Successful students will be able to explain mechanisms of sexual selection and the evolution of social behavior.
- Successful students will be able to describe methods used to infer evolutionary relationships.
- Successful students will be able to **explain the relationship between evolutionary hypotheses and the biological classification system**.
- Successful students will be able to use the geologic time scale to identify when major biological evolutionary events occurred.

Biology 114 Learning Outcomes: Population and community ecology

- Successful students will be able to **explain ecological phenomena related to populations and communities** in terms of basic mathematical models.
- Successful students will be able to trace chemicals and energy through an ecosystem to explain human and global impacts of perturbations.
- Successful students will be able to **describe the interrelationship between biodiversity and community interactions, such as predation, competition, and symbiosis.**

Conclusions

- Digitization adds value to specimens & collections
- Value of specimens and digitized specimen data depends on its use
- We need to develop innovative educational uses for digitized data
- We need to demonstrate value in new ways

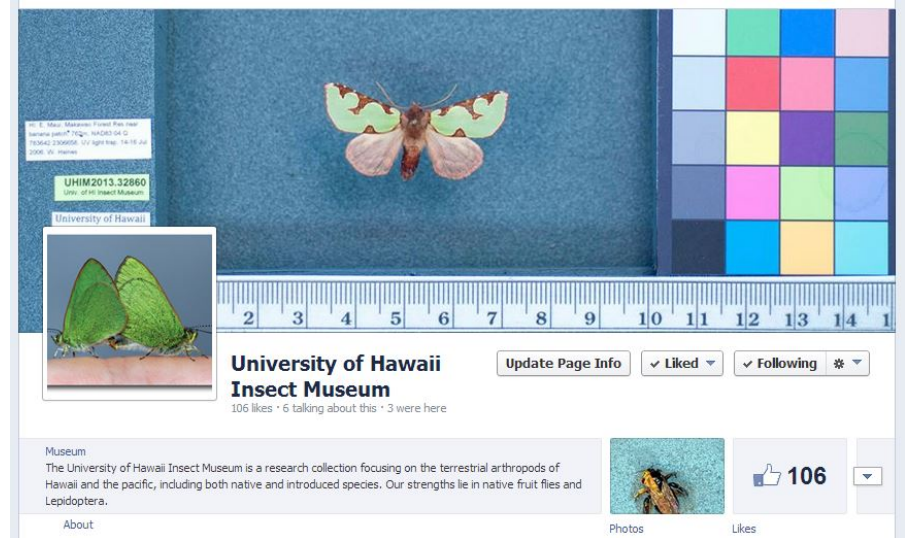
Mahalo!

- Gil Nelson and iDigBio
- NSF DEB: Collections in Support of Biological Research (CSBR)
- Dan Rubinoff (UHIM Director)
- UHIM Staff: Will Haines, Luc Leblanc, Mike San Jose, Andersonn Prestes



Web & Social Media Presence

- Goals
 - connect with local citizens and spread awareness of the UHIM mission
 - Update followers on research
 - Conduit for crowdsourcing efforts between citizen scientists and UHIM staff



Web: ctahr.hawaii.edu/insectmuseum/

Facebook: facebook.com/UHInsectmuseum

Blog: uhawaiiinsectmuseum.wordpress.com/

Flickr: flickr.com/photos/uhmuseum/