AIM-UP! All Hands Meeting
January 2015

An overview AIM-UP!

Significant questions are centered on our ability to assess **change**.

- Climate change
- Habitat conversion
- Pollutants
- Introduction of exotics
- Loss of biotic diversity
- Emerging pathogens & diseases

Baseline conditions or historical information are crucial to documenting environmental change.
Issues that future generations will be grappling to mitigate.

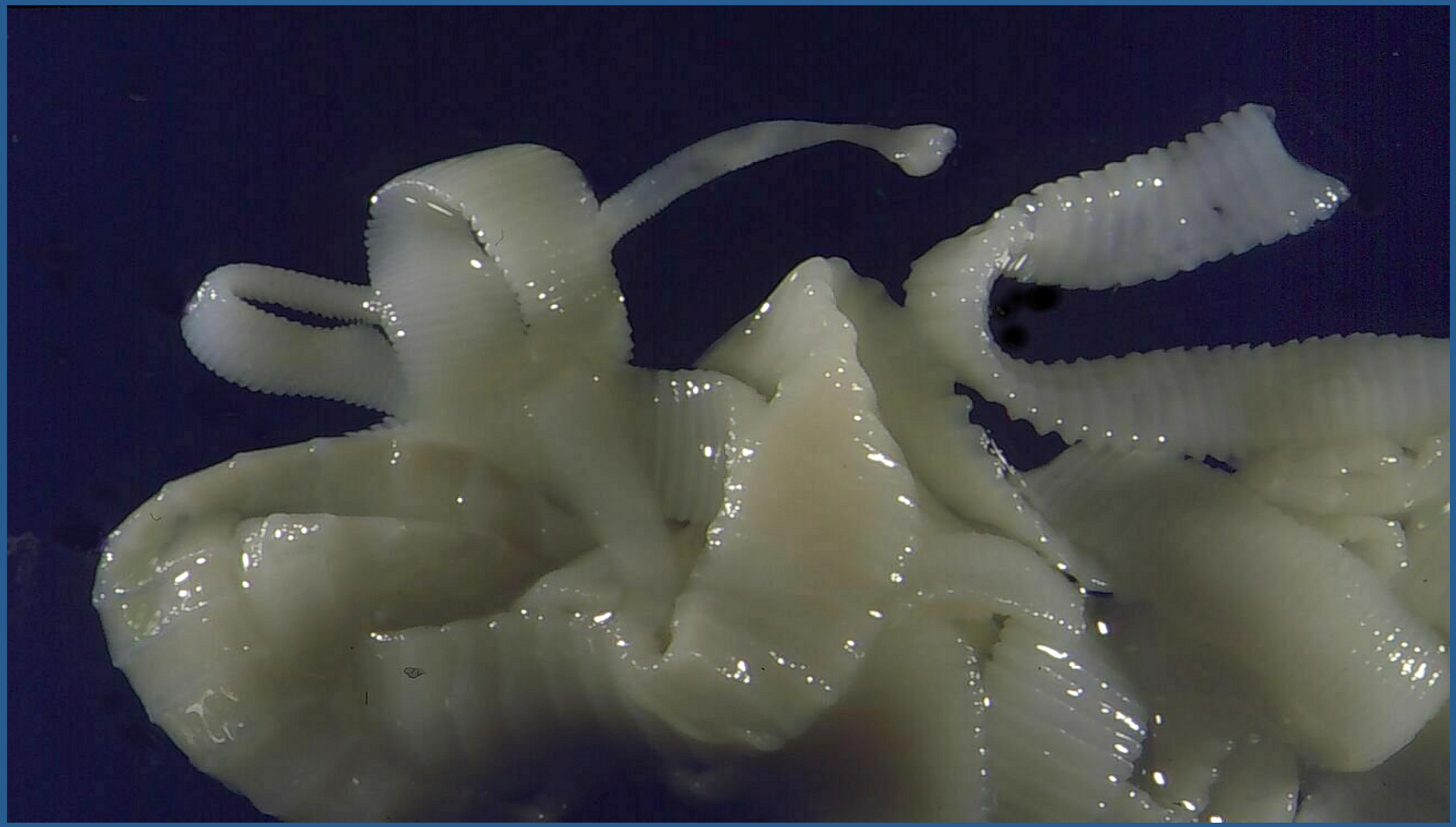
Building Critical Scientific Infrastructure for Key Societal Issues

Museums have a key role!

- Integrated and Digitized Archives
  Lead to Unintended Consequences

- Building Human Capacity
  - Revitalizing Biology Undergrad Education
  - Broadening Participation
  - New Generation of Museum Professionals

Integrated Archives



Integrated Archives

- Diverse Data Connected Through Voucher Specimen
  - Frozen Materials for Molecular Biology
  - Parasites Tied to Hosts
  - Temporally Deep
  - Geographically Broad, Site Intensive
  - Geo-referenced
- Searchable Web-accessible Databases
  - Research, Policy, Education

Arctos

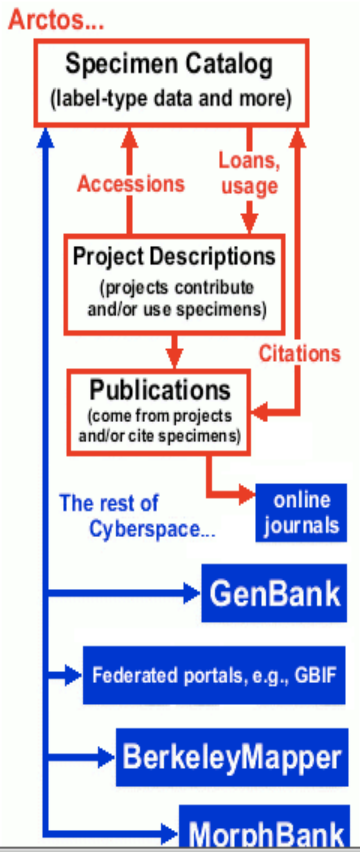
Multi-Institution, Multi-Collection Museum Database

- Participation
- Components
- System Requirements
- Browser Compatability
- Data Usage
- FAQ
- Suggestions?
- Search:
  - All Collections
  - University of Alaska Museum
    - UAM Bird more...
    - UAM Bryophytes more...
    - UAM Earth Science more...
    - UAM Fish Observation more...
    - UAM Fishes more...
    - UAM Herbarium more...
    - UAM Herpetology more...
    - UAM Insect Observation more...
    - UAM Insects more...
    - UAM Insects and Observations
    - UAM Invertebrates more...
    - UAM Mamm Observation more...
    - UAM Mammals more...
  - Museum of Southwestern Biology

Arctos is an ongoing effort to integrate access to specimen data, collection-management tools, and external resources on the internet. Nearly all that is known about a specimen can be included in Arctos, and, except for some data encumbered for proprietary reasons, data are open to the public.

Features:

- Vaporware-free since 2001. All this stuff and much more really exists in a usable state, and we'll never claim proposed or limited funtionality exists.
- Media link images, movies, sound files, and documents to specimens, taxonomy, publications, projects, events, or people.
  Multi-page documents organize, paginate, and print PDFs of scanned media such as field notes. TAGs comment on specific areas of images, or relate them to nodes such as specimens, places, and people.
- Users may annotate specimens, taxonomy, projects, publications, and media.
- Virtual Private Databases (VPD), also known as Row-Level Security (RLS), allow collections to maintain control of their data while sharing certain nodes, such as Agents and Taxonomy. The cool kids call this Cloud Computing or Grid Computing. It allows us to confidently support most any application, not just the ones we write.
- Everything is over the web in real time, and independent of client-side operating systems. You need moderate bandwidth, a modern browser,



Museum Data Available on Web

NSF's Advancing Digitization of Biological Collections

TACC TEXAS ADVANCED COMPUTING CENTER
Powering Discoveries That Change The World
THE UNIVERSITY OF TEXAS AT AUSTIN

Arctos

VertNet

Critical Scientific Infrastructure for Key Societal Issues

- Integrated & Digitized Archives
- **Building Human Capacity**
  - **Revitalizing Biology for Undergrads**

Stimulate Change in Undergraduate Education

- **Vision and Change—AAAS (2009)**
- **PULSE – (2012) Partnership for Undergraduate Life Sciences Education (**NSF, HHMI and NIH)
  40 Leadership Fellows
- **PCAST (Feb 2012) Engage to Excel**

replace standard laboratory courses with discovery-based, relevant research courses

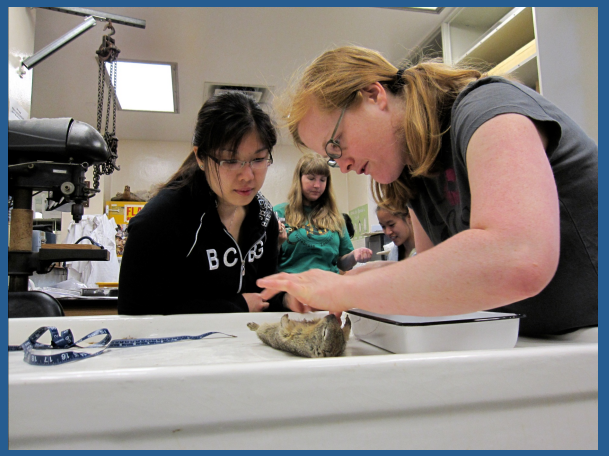
What do collections-based approaches add to undergrad education?

- Integration
  - biotic and abiotic
  - genomic to organismal to ecosystems
- Scale—time and space
- Complexity-multiple views
- Web-based Discovery
- Database exposure
- Scientific Process
  - Experiential vs passive

Challenges

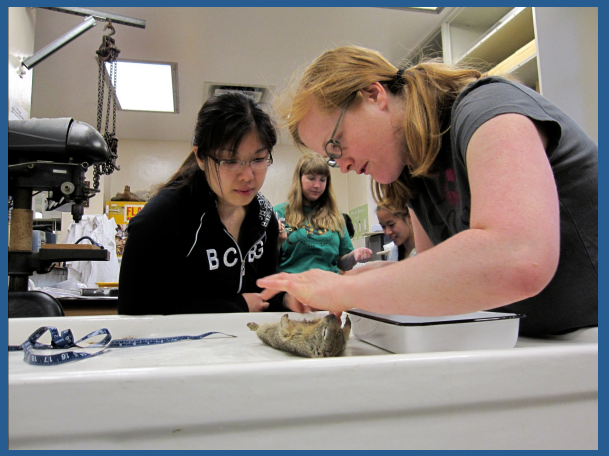
- Few educators (& fewer students) seem to know:
  - about natural history collections
    or their role in development of key concepts
  - how to access museum information (data)
  - how to incorporate specimen data in teaching

A Few More Challenges



- Collections (and databases) have limitations
  - Specimen availability
    - Regional, smaller university museums***

A Few More Challenges



- Collections (and databases) have limitations
  - Specimen availability
  - Narrow view of possibilities
    - Systematics & natural history,
    - "Unintended Uses"

    Now extended to other disciplines
      - E.g., isotope ecology, developmental biology, molecular genomics, pathogen discovery, geography, art

Other Challenges

- Collections (and databases) have limitations
  - Collections developed for **research**,
  - Databases developed for **collection management**, not education or outreach.

NSF: RCN-UBE

- RCN-Undergraduate Biology Education

---focuses on improved participation and learning in undergraduate biology curricula.

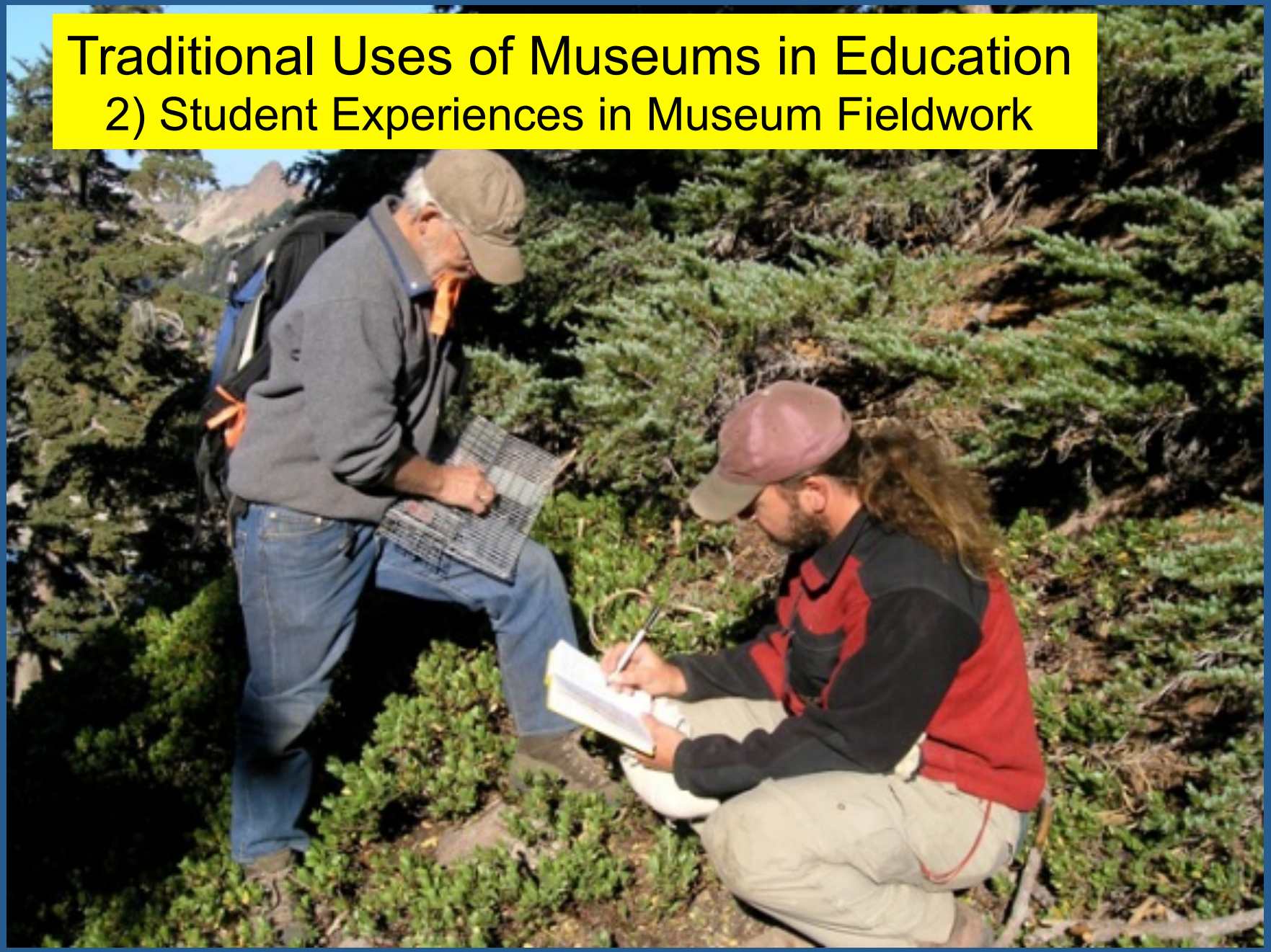
Goal: create new directions in education coordinating activities across disciplinary, organizational, geographic and international boundaries.

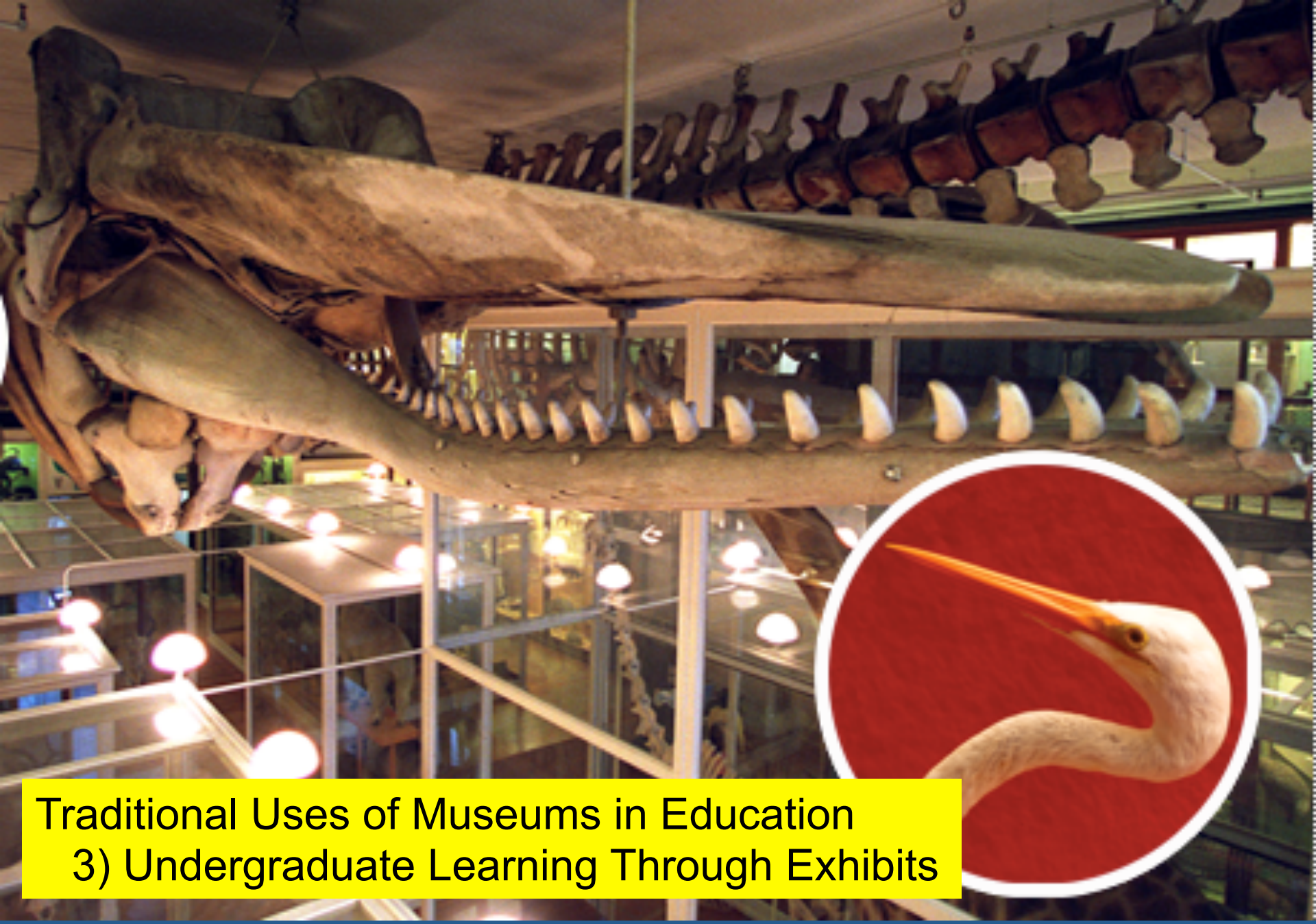
Traditional Uses of Museums in Education

1) Student Experiences in Curation

Traditional Uses of Museums in Education

2) Student Experiences in Museum Fieldwork





Traditional Uses of Museums in Education
3) Undergraduate Learning Through Exhibits

Traditional Uses of Museums in Education

4) Research Experiences Based on Collections

Traditional Uses of Museums in Educatio

5) Specimens Used in Classrooms

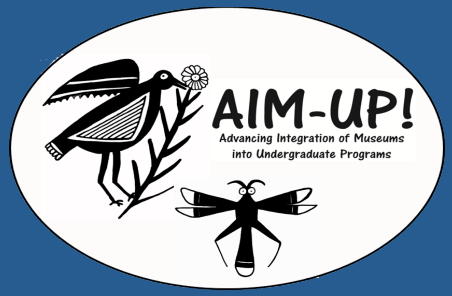
Newer Uses of Museums in Education

Specimens Used in Classrooms

AIM-UP!
Advancing Integration of Museums into Undergraduate Programs

- Crossing Taxonomic Borders
- Educators-Museum Staff
- Biologists-Education Specialists
- Informatics--Databases
- Art and Geography
- Others (GenBank, Agencies)

AIM-UP!--the network



Universities, Community Colleges and Tribal Colleges:

U Alaska, UC Berkeley, Harvard U, U New Mexico
U Michigan, Texas A&M, U Texas, U Colorado, U Arizona, U Kansas, UAS, UAA, CNM, NM Highlands University, Ohio State U, Occidental College, Northern Arizona University, U of Florida, Massachusetts College of Liberal Arts, University of Idaho, Arizona State U, Oglala Lakota

Agencies and Free-standing Museums: USDA National Parasite Lab, USGS Molecular Ecology Lab, USNM, Denver Museum of Nature & Science, NY State Museum

International: U Guelph, U Nacional Montevideo,

Extension to High Schools and Citizens: Highland High (urban) and Sitka High (rural)


CANADA
MEXICO
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO
THE BAHAMAS
CUBA
ARCTIC OCEAN
BERING SEA
GULF OF ALASKA
CANADA
PACIFIC OCEAN
HAWAII
PACIFIC OCEAN
ALASKA
ARCTIC OCEAN

Annual Conceptual Themes:

1) Integrative Inventories (MSB-2011)
2) Making Sense of Geographic Variation (UAM-2012)
3) Evolutionary Dynamics of Genomes (MCZ-2013)
4) Biotic Response to Climate Change (MVZ 2014)
5) The Human Dimension of Natural History (MSB-2015)

AIM-UP!
Advancing Integration of Museums into Undergraduate Programs

Workshops & Seminars

1) Fluid Taxonomy -- on the dynamic practice of classification (Susan Anker)

2) Cataloguing Wonder -- collecting through the senses (Brandon Balengée)

3) Morphology and Evolution -- investigating change in nature and culture through place and time (Brian Conley)

Art and Natural History Collections

Educational Modules

Island Biogeography:
Species Richness Across a Northern Archipelago

Key Concepts and Skills:

Evolution & Ecology

- Body size on islands
- Competitive exclusion/release
- Isolation and Divergence
- Island biogeography

Conservation biology

Scientific process & hypothesis testing

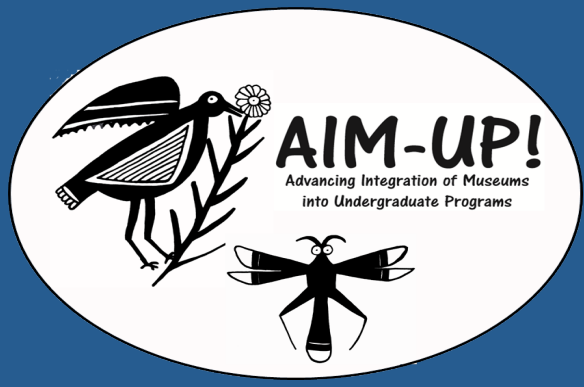
Statistical methods

Management & analyses of large-scale databases

Evolutionary Genomics and the Museum

Potential Topics for Educational Modules

- Tree of Life
- Spatial and Temporal Genetic Variation
- Scientific Process (Replication--without vouchers, difficult to impossible)
- Connecting Big Data (GenBank to GIS Applications)
- Genes and Developmental Biology
- Founder Effects, Island Syndrome



Climate Change Educational Module-MAD

- With warming conditions individuals/populations
  - Move
    - up in elevation—(Grinnell Project)
    - to higher latitudes (musk-ox lungworm parasite)
    - Explore Velocity of Change
    - Species Distributions
    - Niche Envelops
  - Adapt
    - Life history changes
    - Phenology

5th Annual All-Hands Meeting

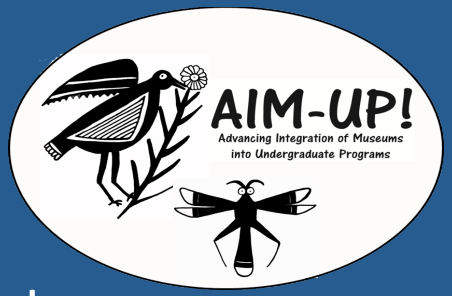
- Exchange Perspectives on Teaching

  Human Dimensions of Natural History
- Explore Educational Modules & Dissemination
- Evaluation
- Plan Initiatives

AIM-UP!
Advancing Integration of Museums into Undergraduate Programs

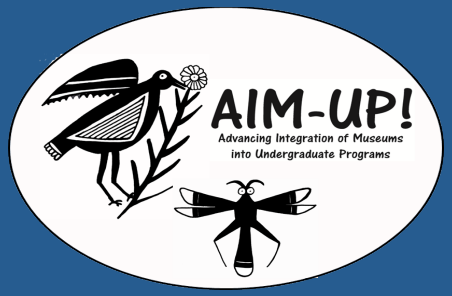
Updates (since Asilomar 2014)

- American Society of Mammalogists Symposium-OK City
- Museums & Indigenous Educators Workshop-Flagstaff
- Life Discovery (ESA)Realizing Vision and Change-
  - Workshop, San Jose
- AIM-UP! Webinar –Josh Whorley
- Small Collections Workshop—Kurt Galbreath
- Workshops—Planning the next steps
  - Hale Key, FL & Moss Landing, CA
- Presentations at Meetings
  - iDigBio Education and Outreach Workshop
  - SPNHC, Cardiff, Wales (X2) July
  - Society for Vertebrate Paleontology, Berlin
  - Collections for the 21st Century Symposium, Gainesville



Updates (since Asilomar 2014)

- Initiated On-line Surveys w/ iDigBio
- Videos—Peter Erb
- *BioScience* publication
- Climate Change manuscript
- Spring 2014 Web-based Seminar
  - –Climate Change (from UC Berkeley)
- Fall 2014 Web-based Seminar
  - –Human Dimensions (from UNM)



The Human Dimension of Natural History

Remotely Distributed Seminar-Fall 2014

- Anthropology
  - Horse Domestication—Will Taylor
- Geography
  - Biogeography of Cannabis—Chris Duvall
- Parasitology and Zoonotics
  - Climate Change & Emerging Pathogens—Eric Hoberg
  - Food Security—Susan Kutz
  - Tick Borne Pathogens—Jessica Light
  - Hantavirus Discovery and Evolution-Ric Yanagihara

Human Dimensions of Natural History
Remotely Distributed Seminar
Fall 2014

- Art
  - An Artist's Perspective—Szu-Han Ho
- Biology
  - Crop Domestication—Allison Miller
  - Belly Button and Urban Diversity---Robb Dunn
  - Aleutian Island Paleomiddens—Nancy Huntly
  - "Invasive" Tamarisk and others—Matt Chew

Overall Products

- **Seminars**
- **Better Understanding of Existing Programs**
- **Surveys of Educators and Students**
- **Stimulate Interdisciplinary Use of Specimens**
- **Publications/Videos—**
  - Perspectives, Surveys, Educational Venues, Texts
- **Educational (Dispersion) modules** centered around themes

Grow the Educational Community of Users

LIFE DISCOVERY - DOING SCIENCE

Realizing Vision & Change, Preparing for Next Generation Biology

OCTOBER 3-4, 2014 - SAN JOSÉ STATE UNIVERSITY, SAN JOSÉ, CA

Saturday, October 4, 2014 1:30 pm – 3:30 pm (2 hour workshops)

Natural History Collections as Resources for Vision and Change in Undergraduate Education

Student Union Ballroom 1

Saturday, October 4, 2014 1:30pm – 3:30pm

Eileen Lacey, Tali Hammond, UC Berkeley; Joe Cook, Museum of Southwestern Biology; Steffi Ickert-Bond, UA Museum of the North; Corey Welsh, Biology Scholars Program, UC Berkeley.

UA MUSEUM RESEARCH APPRENTICESHIPS

MRAP 288 or 488, 1 or 2 credits (3 or 6 hrs/week)

Many varied opportunities: Email for instructor approval

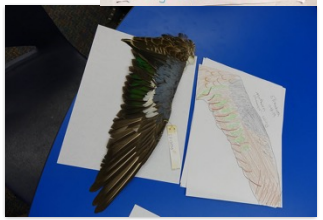
Syllabus: www.museumresearchapprentice.org

Alaska Science Literacy Project (aSLP)

Ute Kaden
School of Education, UAF

Tanana City SD
Delta Greely School District
Nenana School District
Yukon-Koyukuk School District
Denali BSD
Yukon Flats School District
aSLP
UAF School of Education

Teacher Professional Development 2014-2015



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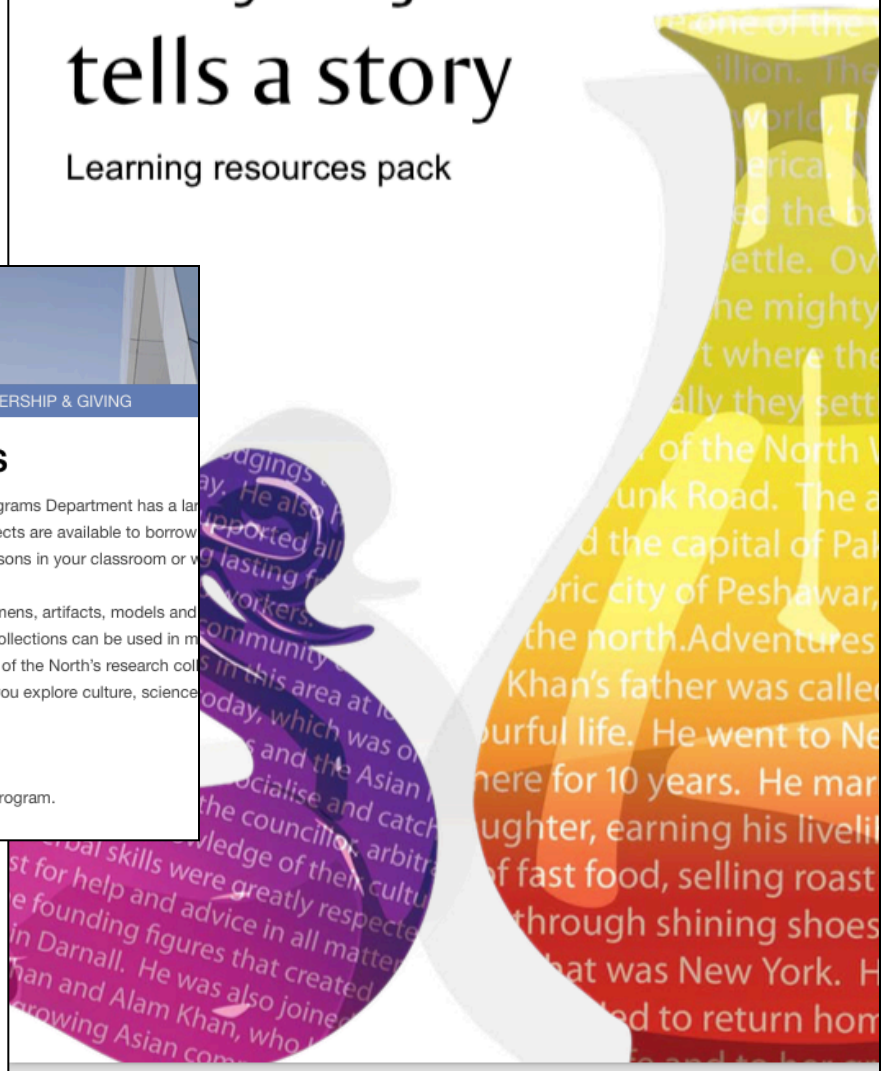
The purpose of the aSLP grant is to provide professional development to K-12 teachers on how to integrate science/math learning into reading and writing lessons with a focus on the new Alaska Standards.

- Increase educators' knowledge and skills in science/math to meet the new Alaska Standards.
- Introduce best practices for science/math and literacy teaching including place-based approaches.
- Connect with researchers and field based research projects.
- Provide teachers with current web based resources and technology applications that have the potential to making teaching and learning more meaningful, relevant, and fun.

every object tells a story

Learning resources pack



UNIVERSITY OF ALASKA
MUSEUM OF THE NORTH

PLAN YOUR VISIT | EDUCATION | EXHIBITS & DIGITAL MEDIA | RESEARCH & COLLECTIONS | MEMBERSHIP & GIVING

- K-12 Teachers & Educators
  - Field Trips
  - Activities & Resources
  - Kits & Hands-on Objects
    - Earth Science
    - History
    - Borrow a Kit
    - Native Cultures
    - Natural History
    - Natural History/Birds
    - Space Science

MUSEUM KITS & HANDS-ON OBJECTS

The Education & Public Programs Department has a lar
displays. Many kits and objects are available to borrow
objects to enhance your lessons in your classroom or v

Museum Kits contain specimens, artifacts, models and
for hands-on learning, the collections can be used in m
diversity of the UA Museum of the North's research coll
teaching collection to help you explore culture, science

Click on each kit's title for full descriptions and pictures.

Click here to borrow kits, make an online request and learn about our loan program.

Every Object Tells a Story


Welcome

Quotes from students

"This workshop gave me the opportunity to learn about resources the museum provides for my classroom. My kids will love to use the herbarium press to collect local plants and contribute to the ARCTOS data base. This is real place-based science."

"What do I do about the ants in my…kitchen, house, bedroom, etc, … now, when people ask me what I study but only want to hear about how it impacts them, I can be less annoyed and think more about how I could make their interests into an interesting study…"