

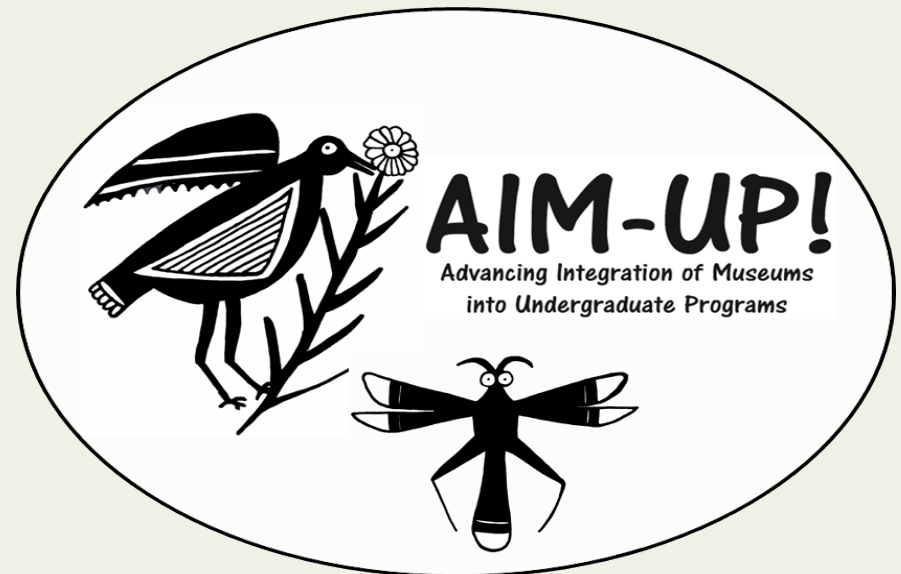
An Introduction to AIM-UP!

Advancing the Integration of Museums into Undergraduate Programs

PI - Joseph Cook

University of New Mexico

Museum of Southwestern
Biology



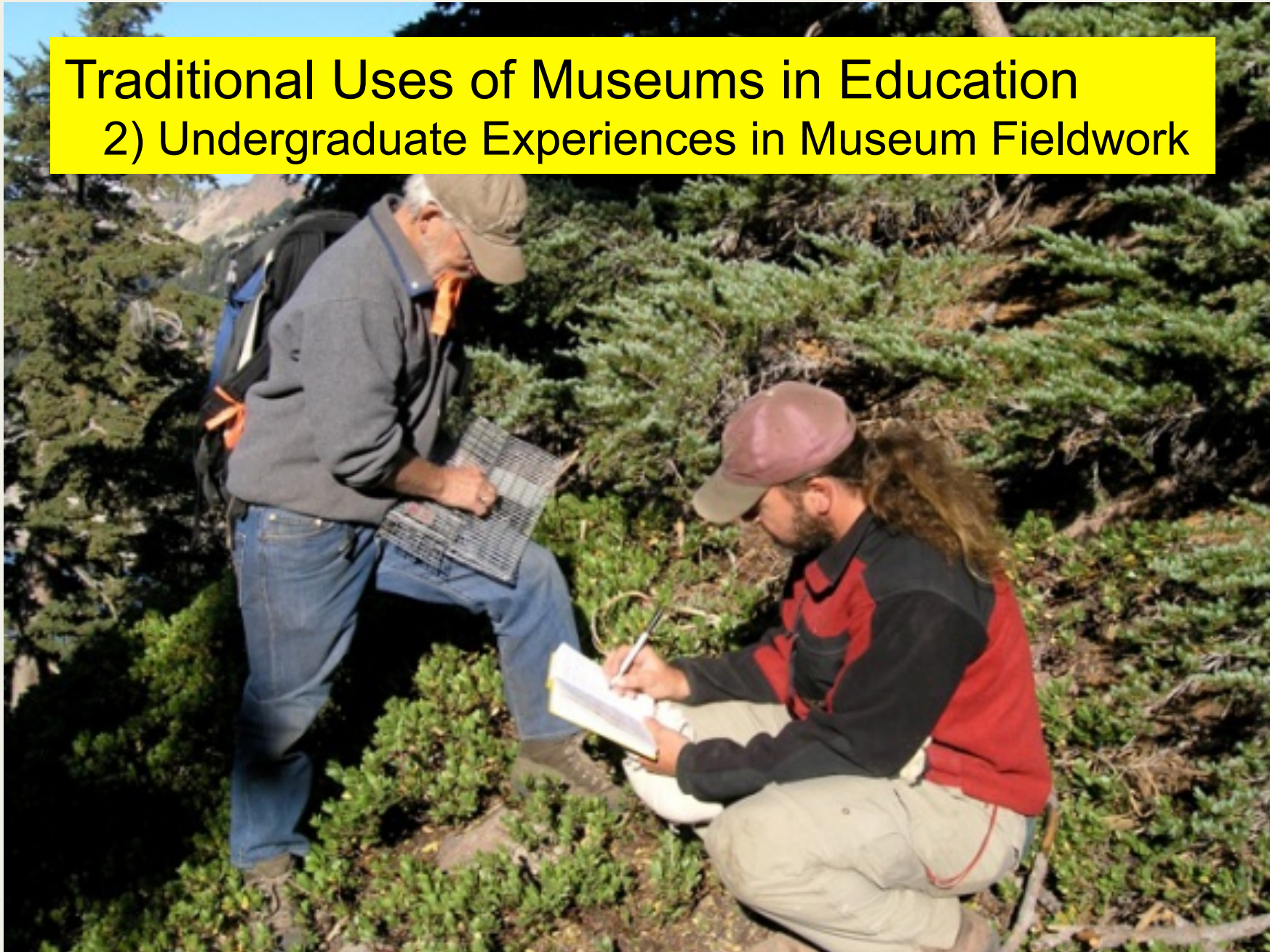
Traditional Uses of Museums in Education

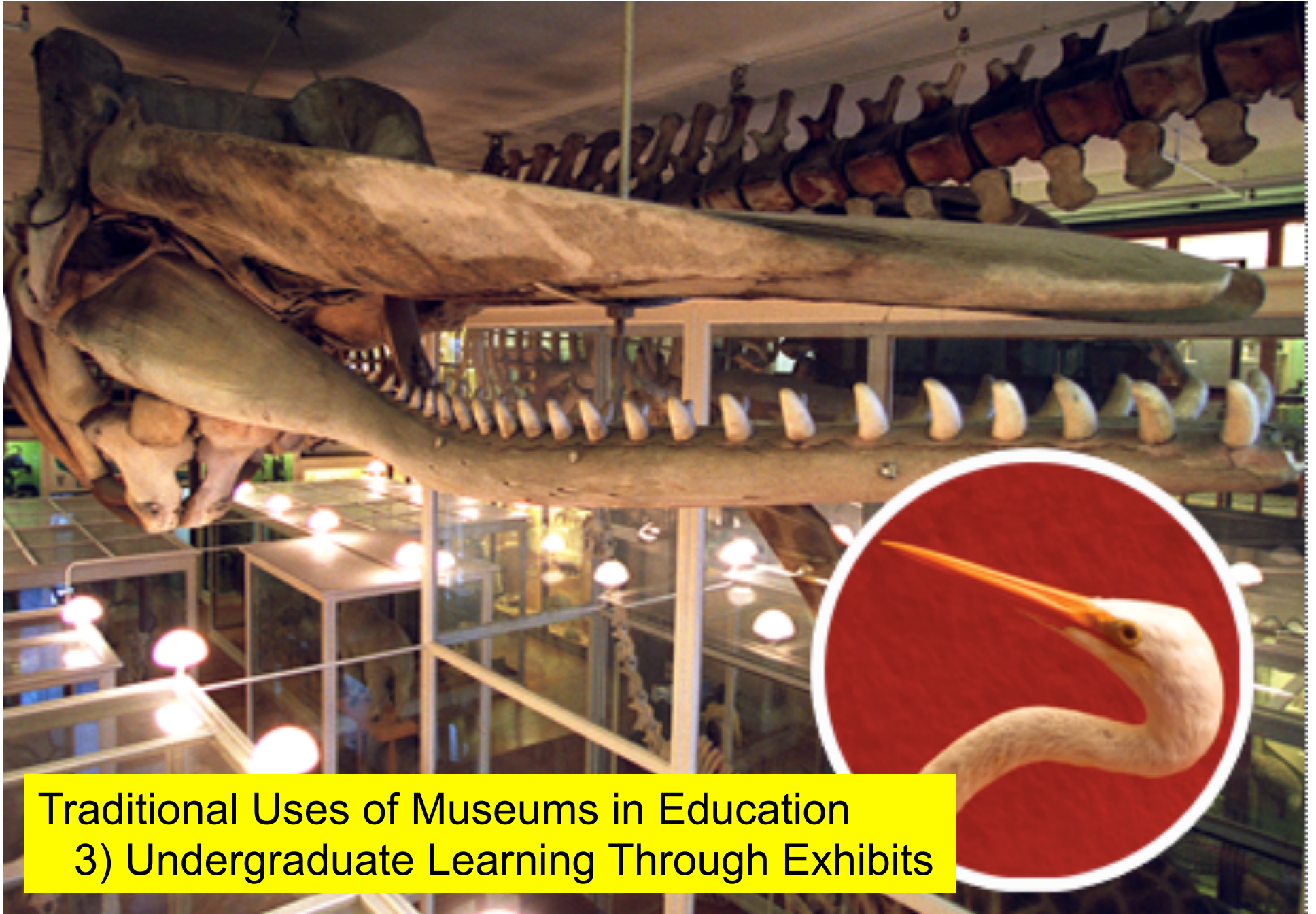
1) Undergraduate Experiences in Curation



Traditional Uses of Museums in Education

2) Undergraduate Experiences in Museum Fieldwork





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



Traditional Uses of Museums in Education
4) Specimens Used in Classrooms

Traditional Uses of Museums in Education

5) Research Experiences Based on Collections



What do collections-based approaches add to undergraduate education?

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



Challenges to leveraging collections for education (from the perspective of educators)

Few educators (& fewer students) seem to know:

- about natural history collections
 - or their role in development of key concepts
 - or potential contributions to key societal issues
- how to access museum information
- how to incorporate specimen data in teaching



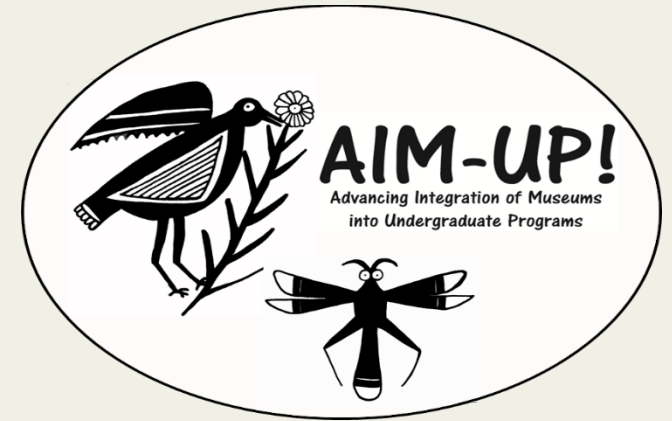
A few more challenges (from the perspective of collections)



- Collections (and databases) have limitations
 - Specimen availability
 - Narrow view of possibilities
 - **Systematics**, now to other disciplines
 - (samples plus time and space stamps)
 - “Unintended Consequences”
 - Collections developed for **research**,
 - How do we unleash potential for teaching?
 - (formal and informal)
 - Databases developed for **collection management**, not education or outreach.

AIM-UP! NSF-funded RCN

Expanding beyond traditional museum experiences by...



- developing novel ways of using collections and data
- increasing accessibility of natural history collections to educators/public through online resources
- developing tools, guidelines, and “front-end” entry into databases to facilitate on-line use by educators/students
- partnering with other non-traditional museum users (e.g., Behavior, Geography, Art)
- developing international collaborations

www.aim-up.org

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, U of Florida, Tulane, Idaho State U, Northern Michigan U, Central Michigan U, U Nebraska

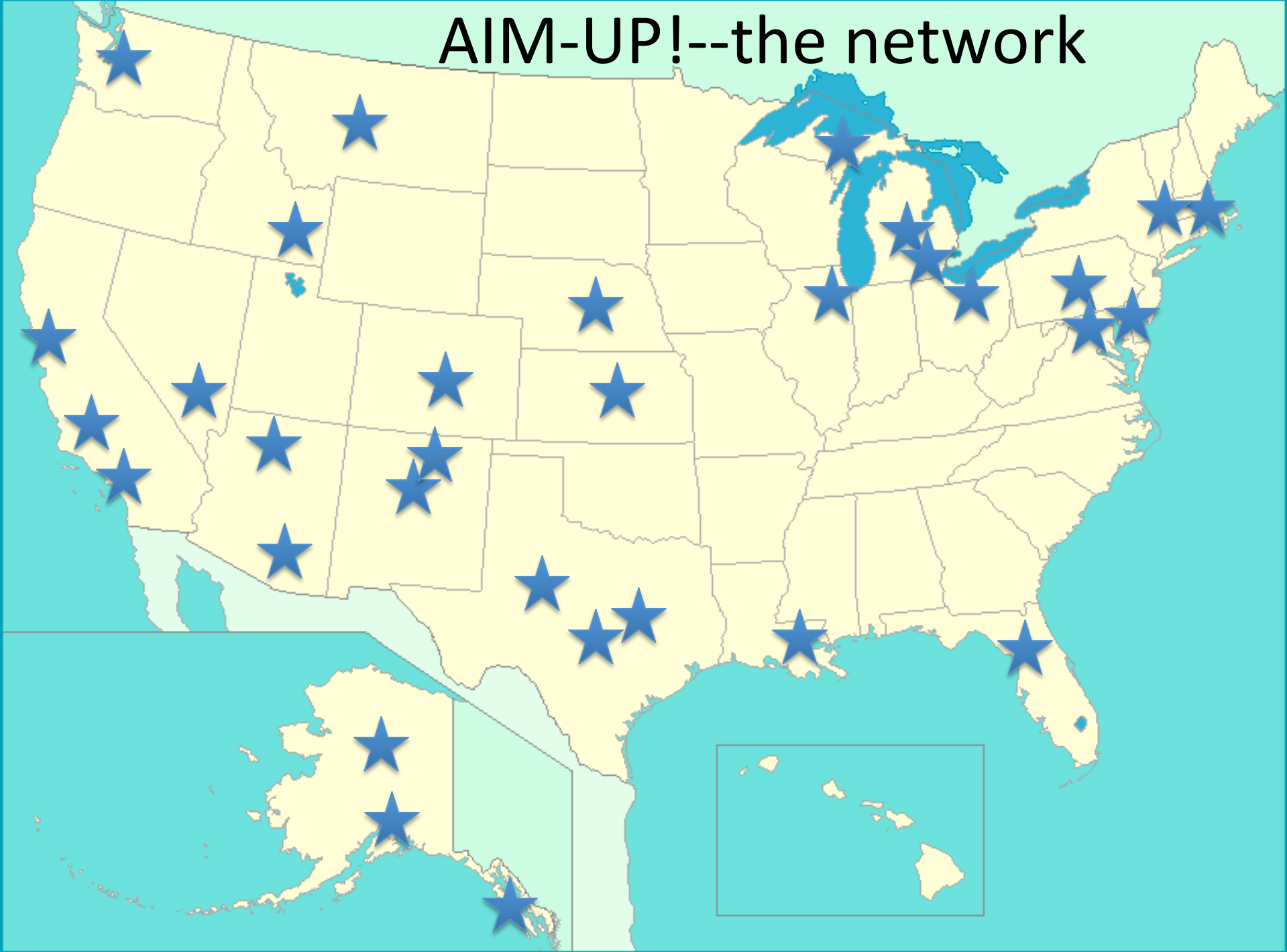
Agencies and Free-standing Museums: USDA National Parasite Lab, USGS Molecular Ecology Lab, USNM, Denver Museum of Nature & Science, NY State Museum

International: U Guelph, U Nacional de la Republica (Montevideo)

High Schools: Highland High (urban) and Sitka High (rural)

*original network participants

AIM-UP!--the network



AIM-UP! (inspired by the Arctos database)



Arctos

Multi-Institution, Multi-Collection Museum Database

[Search](#) [Portals](#) [My Stuff](#) [About/Help](#)

Access to 2,073,289 records

[Search](#) [Clear Form](#) [Use Last Values](#) See results as:

Type: any Require Tissues?

Identifiers Customize Show More Options	
Collection: <input type="checkbox"/> [all] <input type="checkbox"/> [none]	Catalog Number: <input type="text"/>
<input type="checkbox"/> Alaska Lepidoptera	GUID: <input type="text"/>
<input type="checkbox"/> COA Birds	
Identification and Taxonomy Show More Options	
Identification <input type="text"/>	Include previous IDs? <input type="checkbox"/> Match Type
	Current ID only <input type="text"/> contains <input type="text"/>
Locality Show More Options	
Any Geographic Element: <input type="text"/>	Select on Google Map
Date/Collector Show More Options	
Help <input type="text"/> Collector or Preparator <input type="text"/>	
Biological Individual Show More Options	
Part Name: <input type="text"/>	Define Add = for exact match
Usage Show More Options	
Basis of Citation: <input type="text"/>	Define
Media Show More Options	
Media Type: <input type="text"/>	Define
Relationships Show More Options	
Relationship: <input type="text"/>	

[Search](#) [Clear Form](#) [Use Last Values](#) See results as:



- [Data Providers](#)
- [Report a bug or request support](#)

Try something random [Hide This](#)

[Population dynamics of *Spemophilus* over the past 20,000 years](#)

[UAM Mammals 88644 *Myopus schisticolor*](#)

Stone, A., Sabrosky, C. W., Wirth, W. W., Foote, R. H., Coulson, J. R. 1965. A Catalog of the Diptera of America North of Mexico. Agricultural Research Service, United States Department of Agriculture. Washington, D.C. pp iii-1696.



[U.S.D.A. Forest Service. 2011. BigBug database \(as of 2011\)](#)

[Chamberlin, R.V. 1921. Linyphiidae of St. Paul Island.](#)

AIM-UP! (inspired by the Arctos database)

The Arctos network and small collections:

- Minimal up-front investment in technology
- Data security and data servers handled elsewhere by IT professionals
- Database templates for different types of collections (herbarium, vertebrate, invertebrate, etc.)
- Built for data sharing and linking between databases, not only internal collections management
- Website: arctosdb.org

AIM-UP! Educational Modules

- online resources to help educators use museum specimens and/or data to enhance their teaching

AIM-UP

▼ **AIM-UP**
Annual Reports
CO-EVOLUTION: Art + Biology in the Museum
Contact
Evolutionary Dynamics of Genomes
Integrative Inventories
Meetings
Museums & Museum Networks
Participants
Presentations & Publications

▼ **Educational Modules & Tutorials**
AIM-UP! Student Project Examples
CO-EVOLUTION: Art + Biology Modules
Coal Balls
GIS and Bats
How to Read a Scientific Paper
Island Biogeography

[Educational Modules & Tutorials >](#)
Stomatal Density & Climate Change

In this activity, students learn that physiological changes in plants (e.g., stomatal density) are related to rising levels of atmospheric carbon dioxide. Students explore the implications of such changes.

Below are links for the lesson plan (LessonPI_StomatalDensity.pdf; which includes the activity objectives, list of necessary materials, and worksheets) and a carbon dioxide handout (. The Module_Feedback.doc is an evaluation form that we ask you email back to us at aim-up@aim-up.org. This activity also requires accessing data from the internet and contains the instructions for that.

LessonPI_StomatalDensity.pdf (98k)	Kayce Bell, Jan 15, 2013, 8:31 AM	v.2	↓
Module_Feedback.doc (24k)	Kayce Bell, Jan 15, 2013, 8:32 AM	v.1	↓
co2_data_mlo.pdf (128k)	Kayce Bell, Jan 15, 2013, 8:31 AM	v.1	↓

Some other modules include:

- Coal Balls
- GIS and Bats
- How to Read a Scientific Paper
- Island Biogeography
- Phylogenetics Activities and Project
- Plant Range and Distribution in Alaska

AIM-UP! Educational Collaborations



Seminar and workshop that brought student artists into the Museum of Southwestern Biology



Julia Anderson

AIM-UP! Products

- **Better Understanding of Existing Programs**
- **Survey of Educators and Students**
- **Stimulate Interdisciplinary Use of Specimens**
- **Publications—**
 - Perspectives, Surveys, Educational Venues, Texts
- **Workshops**
- **Educational modules** centered around themes

Grow the Community of Users

Annual Conceptual Themes:

- 1) Integrative Inventories: Exploring Complex Biotic Associations Across Space and Time (MSB)
- 2) Decoding Diversity: Making Sense of Geographic Variation (UAM)
- 3) Evolutionary Dynamics of Genomes (MCZ)
- 4) **Biotic Response to Climate Change (MVZ)**
- 5) Coevolving Communities and the Human Dimension (MSB)



5 Annual All-Hands Meetings

2010-2015

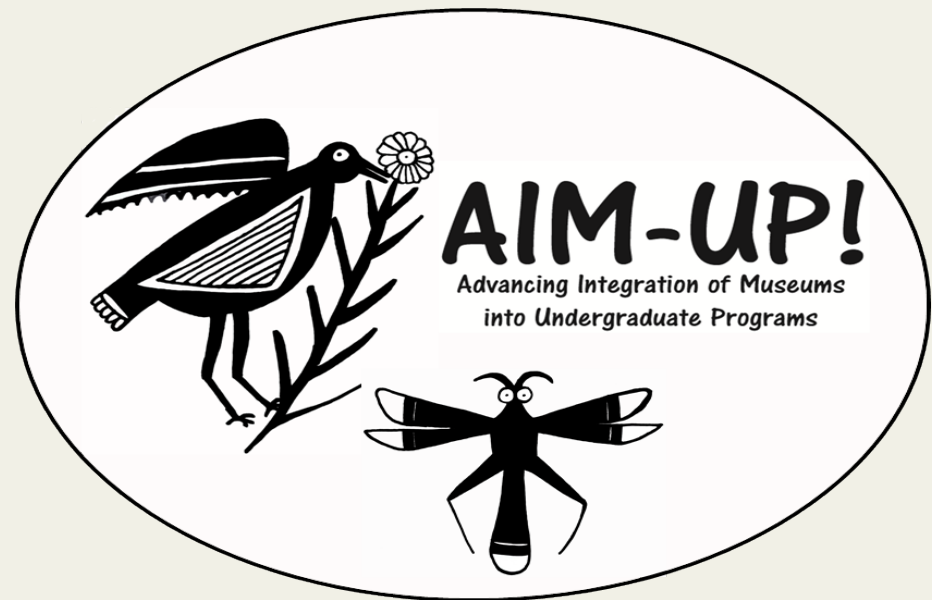
- Exchange Perspectives on Teaching
 - *Museums and Climate Change* –
- Asilomar, Ca----26 Feb-3 March 2014
- Explore Educational Modules & Dissemination
- Evaluation



MUSEUM COLLECTIONS AND CLIMATE CHANGE BIOLOGY

Potential Topics for Educational Modules

- Spatial and Temporal Genetic Variation
- Scientific Process (Replication--without vouchers, difficult to impossible)
- Climate change
 - Move
 - Adjust/Adapt
 - Extirpation



Workshops & Seminars--Spring 2012



- 1) Fluid Taxonomy -- on the dynamic, ever shifting practice of classification
- 2) Cataloguing Wonder -- collecting through the senses
- 3) Morphology and Evolution -- investigating change in nature and culture through place and time

More Possibilities

Educational Modules

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

NSF-RCN

Research Coordinating Network

- Goal: create new directions in research & education by communicating and coordinating activities across disciplinary, organizational, geographic and international boundaries.
- Crossing Taxonomic Borders
- Educators-Museum Staff
- Biologists-Education Specialists
- Informatics--Databases
- Art and Geography
- Others (GenBank)



RCN-UBE

- RCN-Undergraduate Biology Education
 - focuses on improved participation and learning in undergraduate biology curricula.

