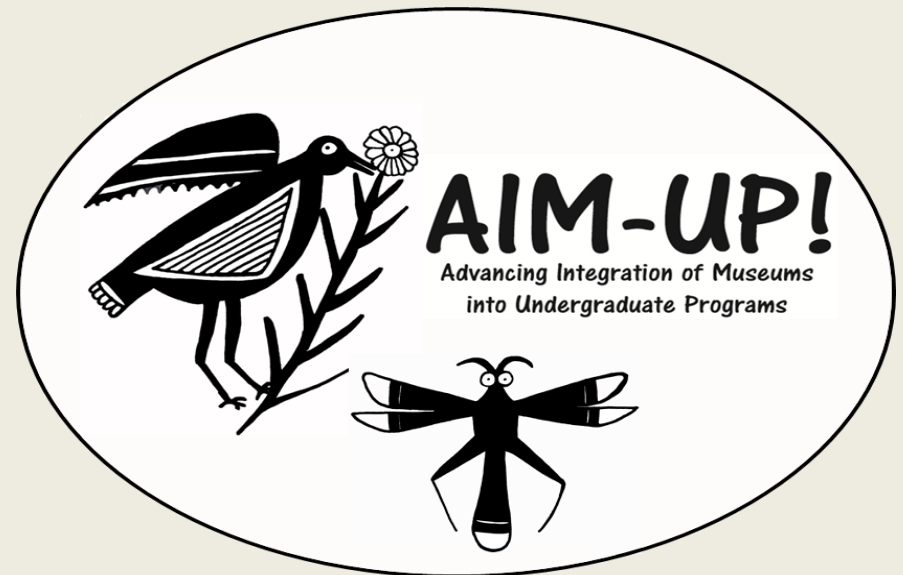


MUSEUM COLLECTIONS AND CLIMATE CHANGE BIOLOGY

An Introduction to AIM-UP!
**Advancing the Integration of Museums into
Undergraduate Programs**



Asilomar 27 February 2014

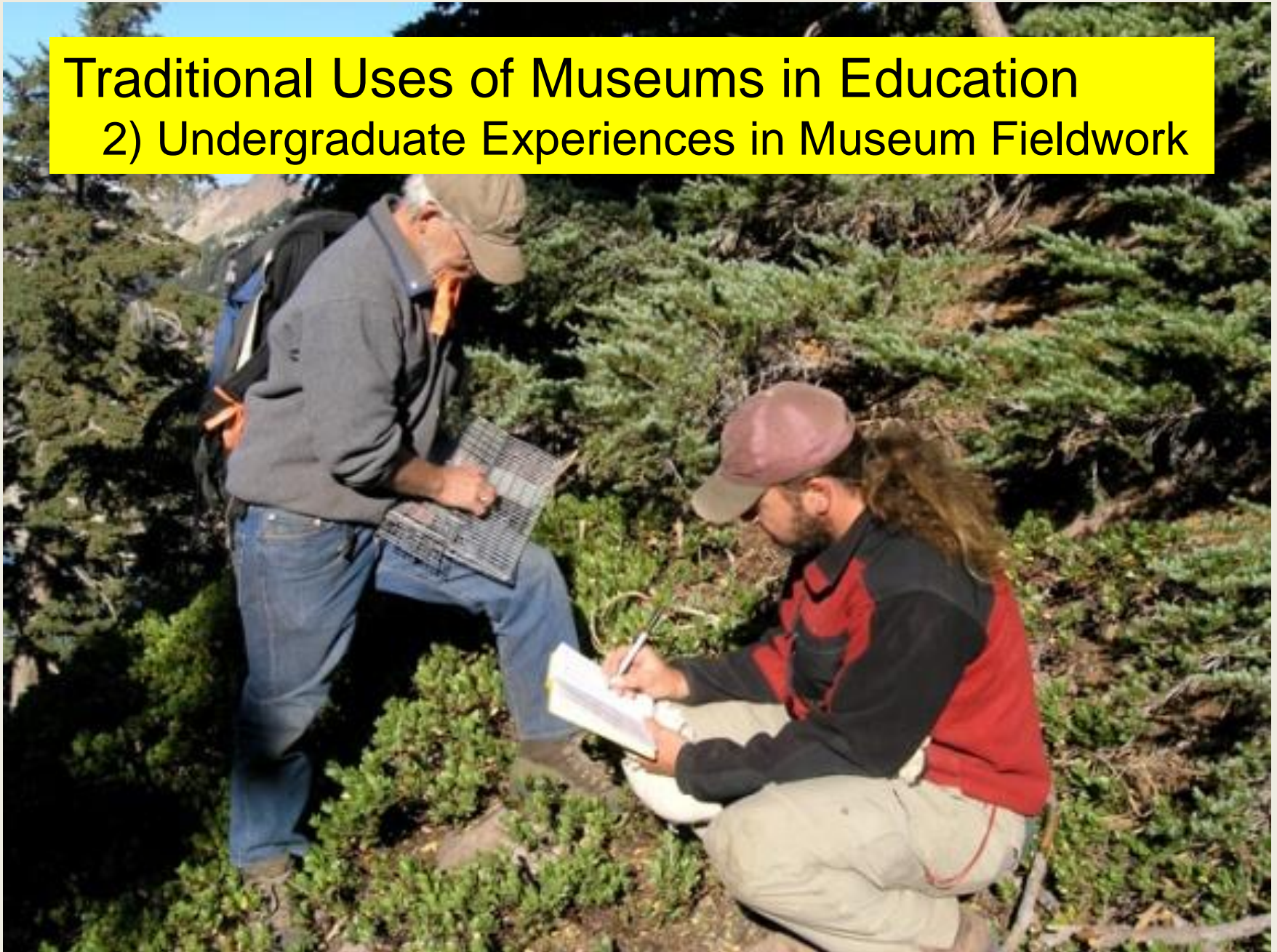
Traditional Uses of Museums in Education

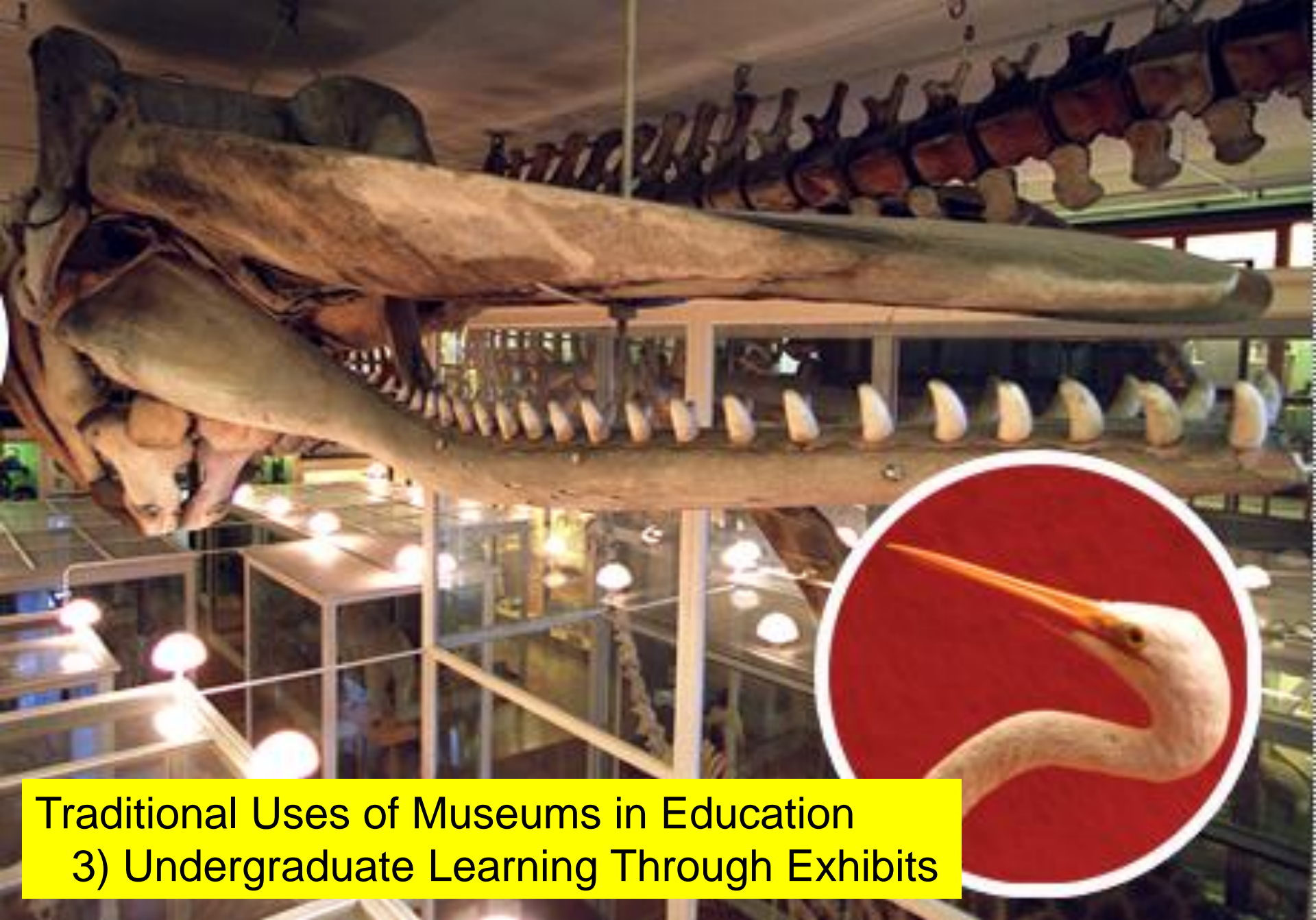
1) Undergraduate Experiences in Curation



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) Research Experiences Based on Collections





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

Newer Uses of Museums in Education

Specimens Used in Classrooms



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.



What do collections-based approaches add to undergrad 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



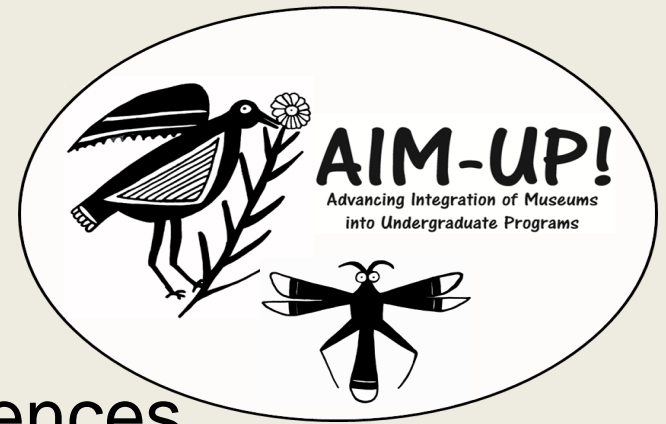
- Few educators (& fewer students) seem to know:
 - about natural history collections
 - or their role in development of key concepts
 - or potential role in key societal issues
 - how to access museum information
 - how to incorporate specimen data in teaching

A Few More Challenges



- 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!



Expand traditional museum experiences

- Develop novel ways of using collections and data.
- Increase accessibility of natural history collections to educators/public through databases.
- Develop tools, guidelines, and “front-end” entry into databases to facilitate on-line use by educators.
- Partner with other non-traditional museum users
(e.g., Behavior, Geography, Art)
- Develop international collaborations
– (Latin America & Spanish language)

AIM-UP!--the network

Universities, Community Colleges and Tribal Colleges:

U Alaska, UC Berkeley, Harvard U, U New Mexico

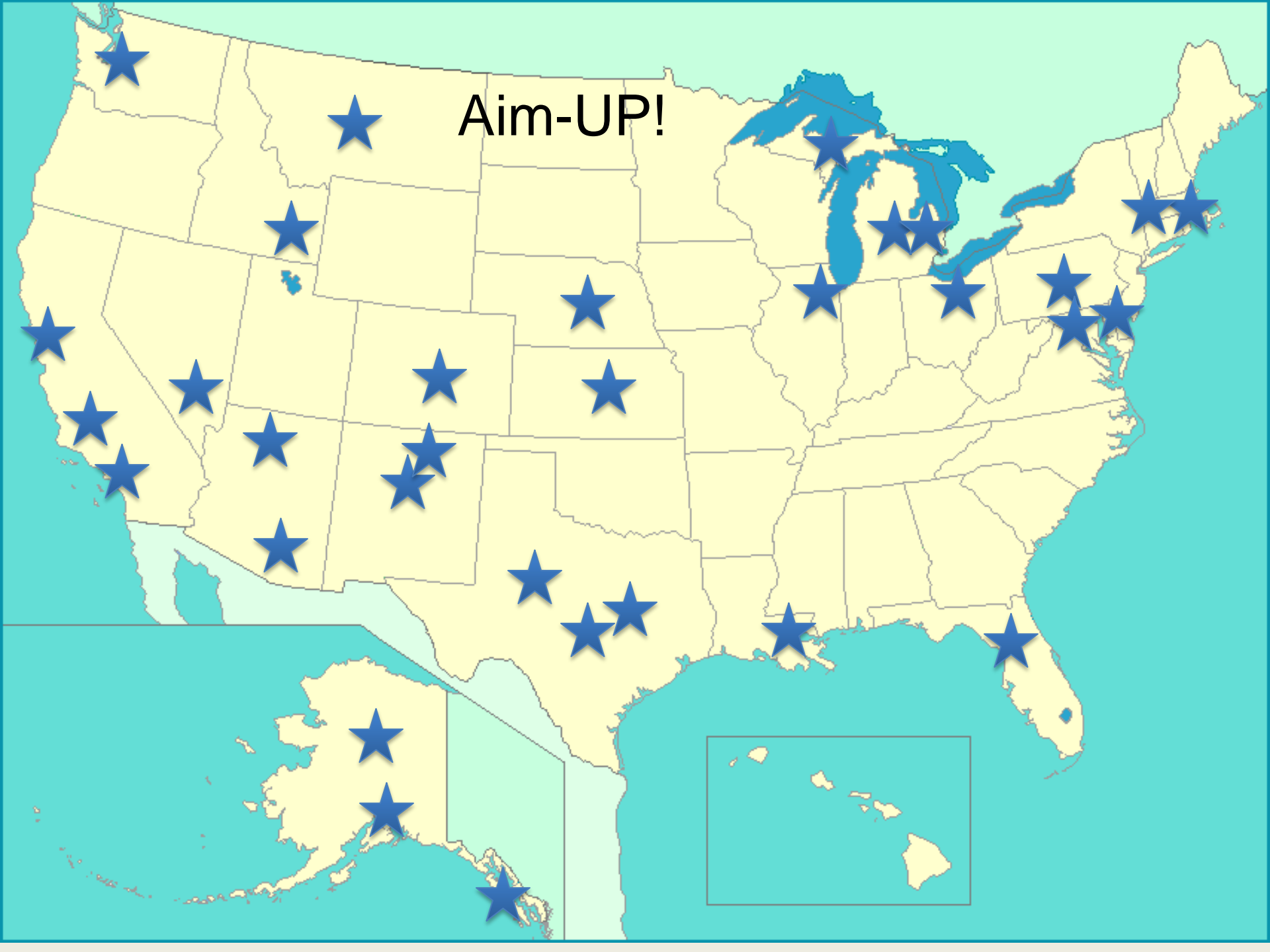
U Michigan, Texas A&M, U Texas, U Colorado, U Arizona, U Kansas, UAS, UAA, CNM, NM Highlands University, Ohio State U, Occidental College, Northern Arizona University, U of Florida, Massachusetts College of Liberal Arts, University of Idaho, Arizona State U, U of Florida, Tulane, Idaho State U, Northern 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)

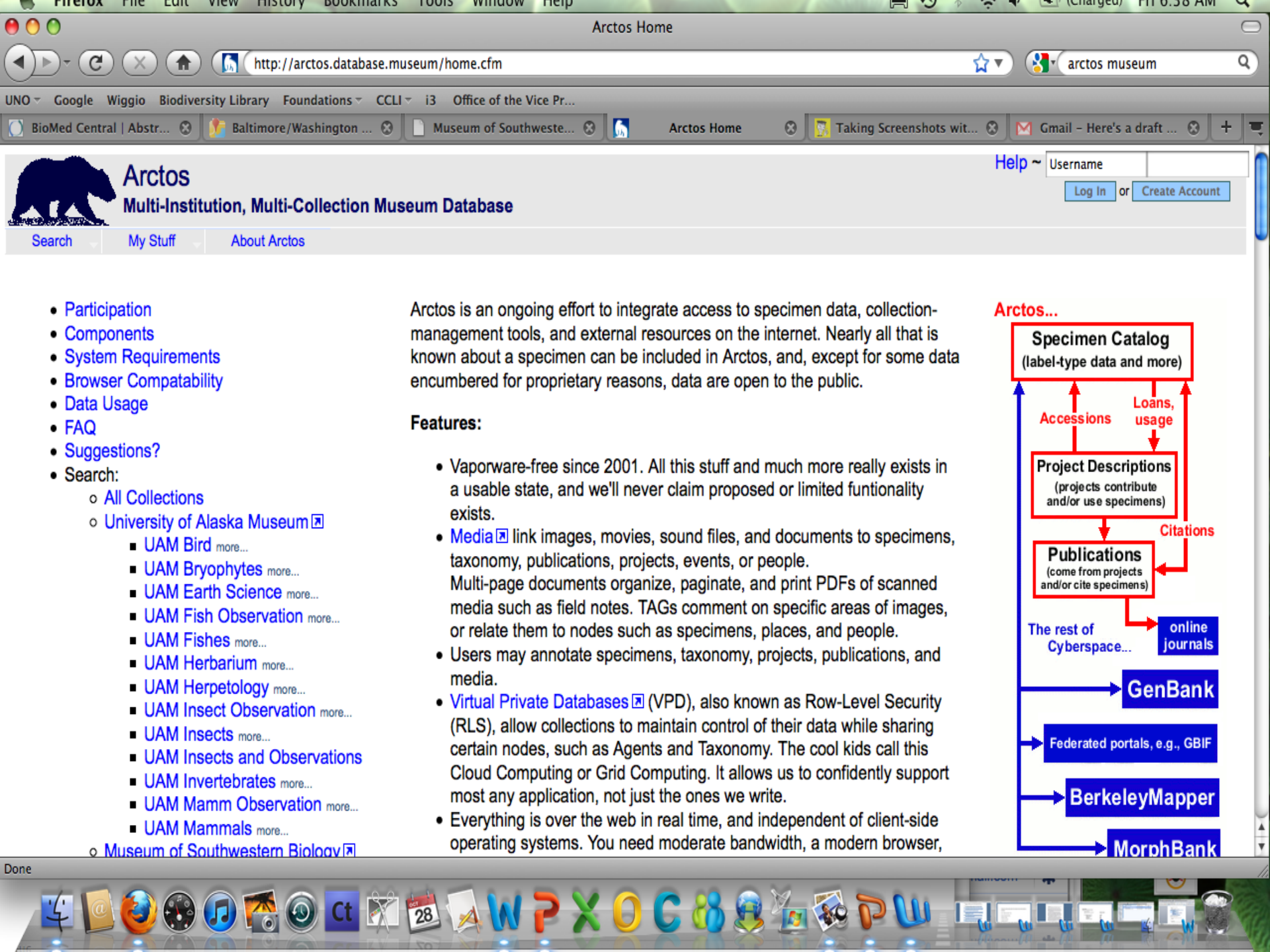
Aim-UP!



AIM-UP!--the network

(spawned from Arctos)





Arctos

Multi-Institution, Multi-Collection Museum Database

Help ~ Username
 or

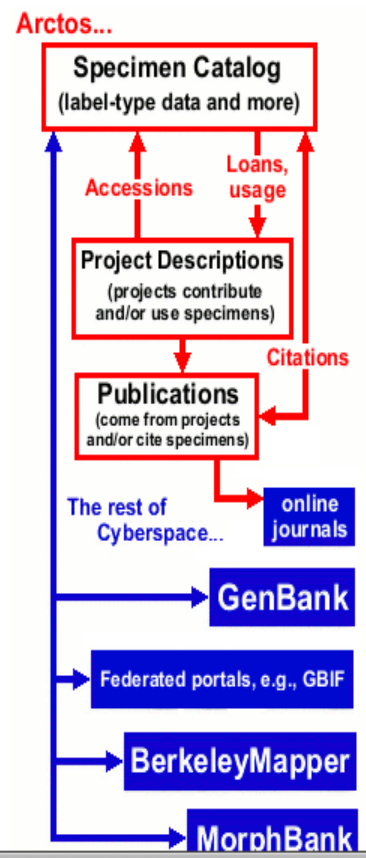
- Search
- My Stuff
- About Arctos

- [Participation](#)
- [Components](#)
- [System Requirements](#)
- [Browser Compatibility](#)
- [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 functionality 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,



Products

- **Better Understanding of Existing Programs**
- **Survey of Educators and Students**
- **Stimulate Interdisciplinary Use of Specimens**
- **Publications—**
 - Perspectives, Surveys, Educational Venues, Texts
- **Workshops**
- **Educational (Dispersion) 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



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

Educational Modules

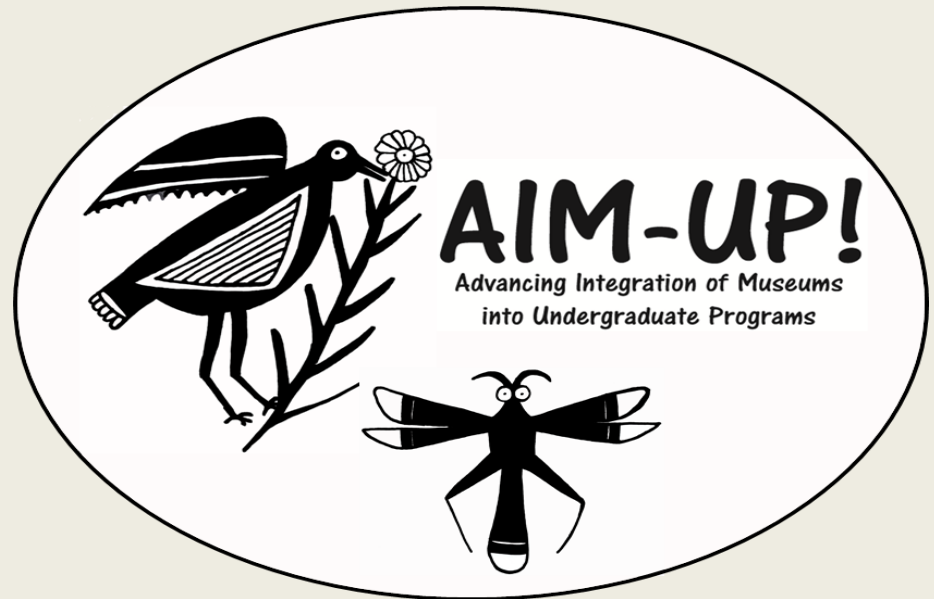
- [CO-EVOLUTION: Art + Biology Modules](#)
- [Coal Balls](#)
- [GIS and Bats](#)
- [How to Read a Scientific Paper](#)
- [Island Biogeography](#)
- [Phylogenetics Activities and Project](#)
- [Plant Range and Distribution in Alaska](#)
- [Stomatal Density & Climate Change](#)

iPhone Apps

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



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