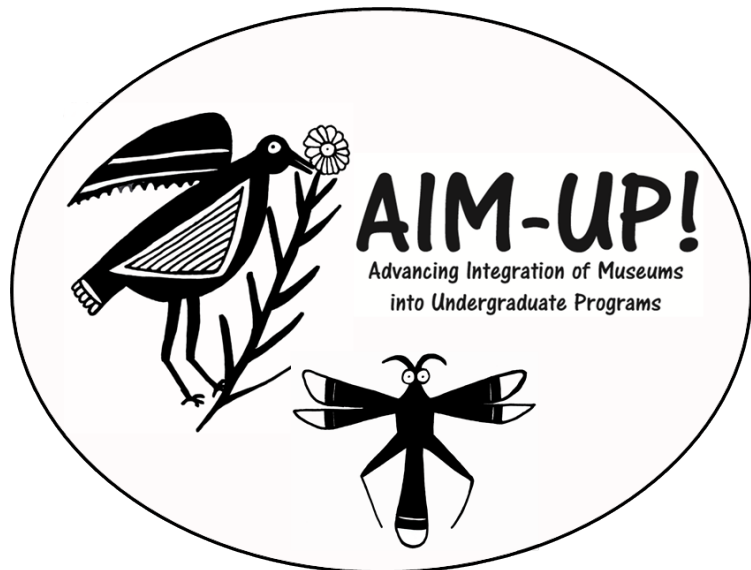


Using Museum Specimens and Place-based Approaches for Engaging Students from Underrepresented (UR) Groups

Dr. Corey Welch
Program Manager
STEM Scholars Program
Iowa State University



Outline:

- 1. Brief summary of Indigenous AIM-UP at Northern Arizona**
- 2. Why Place-based Approaches of using Museum databases are an ideal way to connect with students?**
- 3. Tribal Colleges and Reservations are important**
 - a. Navajo Ant Project**
 - b. Manuscript idea: Museums collections and usefulness to Tribal communities. Present preliminary data.**
- 4. Deer Mouse as a model for place based modules**

Brief summary of Indigenous AIM-UP at Northern Arizona

Dr. Neil Cobb (NAU): Entomologist

Dr. Joe Cook (UNM): Gadfly, attractant of Diptera, with the personality of a Botfly

Dr. Gary Albert (Harvard): Navajo Ant Project

Beverly Maxwell (Northern Arizona); Dine; Masters student at NAU (Neil Cobb advisor); Insects (ants and other)

Dr. Melody Basham: AZ State University; insect collections; Doctorate in Education, MS Museum studies (anthropology) making science accessible and how cultures view and interact with the world. iDigBio

Melvin Foster: (Navajo Tech University); Dine, teacher biology/chemistry;

Dr. Ed Galindo (Idaho State University); Yaqui; Education PhD and Engineering;

Dr. Corey Welch (UC Berkeley); Northern Cheyenne

Dr. Stephan Summer (Northern AZ): Ecologist

Tribal Priorities rankings (survey by Ed Gillespe):

#1 Natural resources,

#2 Education,

#3 Health,

#4 Economics,

#5 Tribal sovereignty

The Joe Slide!



Tribal Priorities rankings (survey by Ed Galindo):

#1 Natural resources,

#2 Education,

#3 Health,

#4 Economics,

#5 Tribal sovereignty

Why Place-based Approaches of using Museum databases are an ideal way to connect with students?

Students' perspective:

- Often relevant to their personal/family/cultural history and values.
- Taps into existing experiences and knowledge base (ex: TEK)
- It provides a way to reduce the isolation of the academic learning and creates connections with their homes/families.
- Native Americans = spatial thinking is culturally common.

Faculty/Curator perspective:

- Museum people = wealth of natural history knowledge of local area + their research experiences.
- Extension of Public Outreach activities
- Adaptable to nearly any scale (county to global)
- Adaptable to lecture/lab/field teaching

Why Place-based is an ideal way to connect with students?

EXAMPLE:

Tribal Colleges and Universities Biology Programs are incorporating tribal-specific traditional ecological knowledge hands-on learning styles consistent with Indigenous philosophies increasingly directing scientific research activities on reservations

(Cole 2006, Corbyn 2011)

Indian tribes manage ~100 million acres across the US and are home to critical habitat for a variety of threatened and endangered species.

Biodiversity surveys and museum collections from these lands are typically spotty.

-My data collection of museum records

The Navajo Ant Project (NAP)

Collaboration between the Navajo Nation's Diné College and the college's Diné Environmental Institute in Shiprock, New Mexico
Harvard University Native American Program and
Harvard University's Museum of Comparative Zoology

The Navajo Ant Project (NAP) is also a participating member of the Global Ant Project and is also collaborating with the Colorado Plateau Museum of Arthropod Biodiversity.

Individual Contributors include:

Gary Alpert

Arnold Clifford

David Lubertazzi

Amy Mertl

Beverly Maxwell

Aphaenogaster huachucana forager
Image 3 of 3



Brief summary of Indigenous AIM-UP at Northern Arizona

Navajo Ant Project's goal is to integrate traditional Navajo cultural values with the modern scientific method as it explores the ant biodiversity on the Navajo Reservation.



Navajo/Dine Ant Project

- 1. Surveyed western half of largest reservation in country**
- 2. Involved local researcher and required tribal spiritual and government approval of activities that took several weeks before collection work could begin**
- 3. Preliminary data has demonstrated multiple range extensions and understanding of biodiversity**
 - 4a. Ant-wiki, link “Ants_of_the_Navajo_Reservation” 5000 records in MCZ and another couple thousand in the pipeline.**
 - 4b. Description of the project goals. <http://www.navajonature.org/ants/navajo-ants.html>**

Pull up websites and show us some ants!!!!

Manuscript on incorporating Museum Collection Data into Tribal College curriculum and across Indian Country

- a. The potential and unmet need (e.g. the ranked priorities)
- b. Examples of TEK and museum records
 - a. Navajo Ant Project, Hanta Virus story
- c. The barriers/challenges (cultural taboos, relevancy, lack of experts)
- d. Recommendations for working on reservations

Surveying vertebrate museum records on Reservations

Using VertNet

Intend to sample 5-10 of the largest reservations?

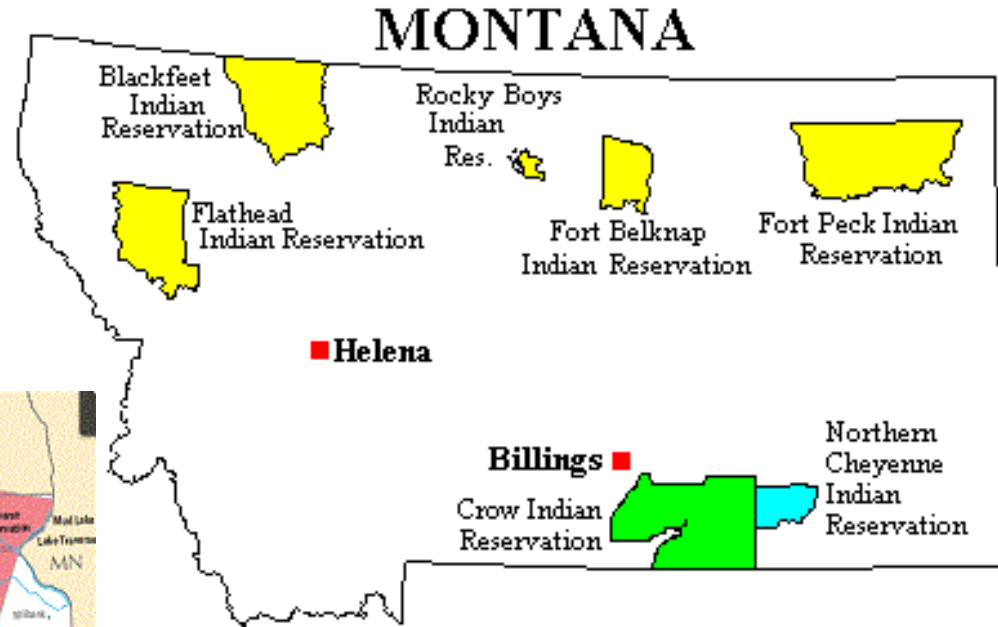
Should sample by State or Biogeographic region instead?

1. Analysis of the following:
 - A. Total number of records
 - B. Year (# > 1964; e.g. within last 50 years)
 - C. Number of records on Genbank
 - D. Breakdown of records by Vertebrate Classes
Amphibians, Reptiles, Birds, Mammals, Fish
2. Preliminary data on 4 reservations?

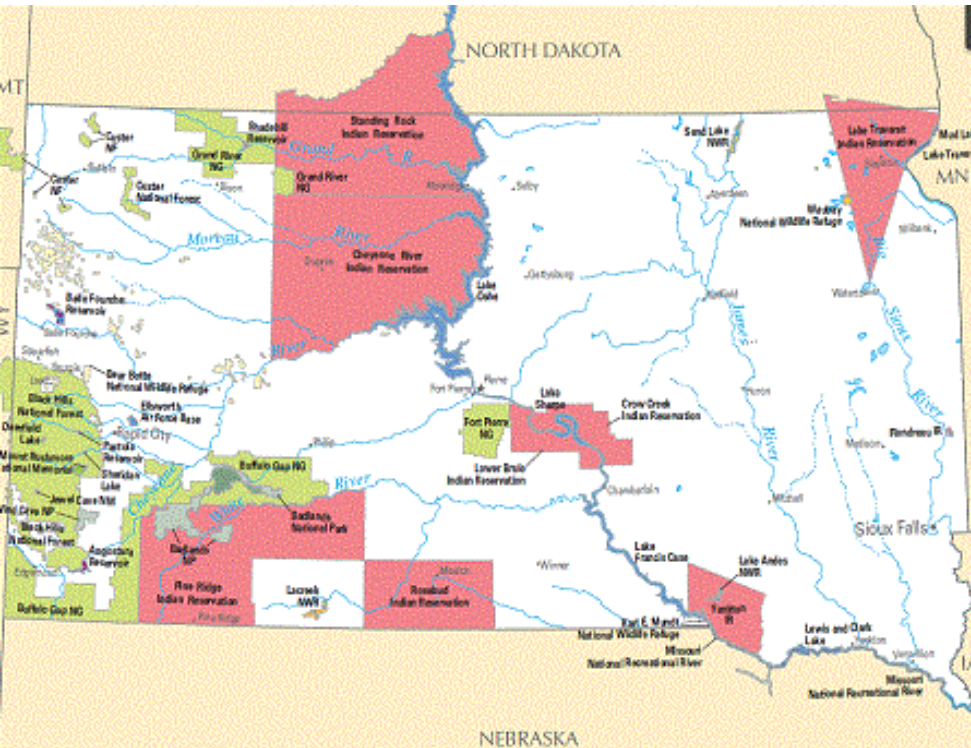
Surveying vertebrate museum records on Reservations

Preliminary data: 4 reservations (2 MT, 1 SD, 1 ND)

Standing Rock (SD+ND)
Cheyenne River Sioux (SD)



Crow Indian (MT)
Northern Cheyenne (MT)



Surveying vertebrate museum records on Reservations

Preliminary data: 4 reservations (2 MT, 1 SD, 1 ND)

Reservation	State	Size Ranking	# Records (all)	Since 1964	Genbank
Cheyenne River Sioux	SD	4	54	36	24
Standing Rock	SD+ND	5	110	76	68
Crow	MT	6	255	10	197
Northern Cheyenne	MT	36	56	9	48

Reservation	# Records (all)	Birds	Mammals	Amphibians	Reptiles	Fish
Cheyenne River Sioux	54	2	20	2	8	22
Standing Rock	110	12	22	2	5	68
Crow	255	122	39	38	52	4
Northern Cheyenne	56	23	2	15	9	7

Using the Deer Mouse for place-based teaching modules



The Ecology and Evolutionary History of an Emergent Disease: Hantavirus Pulmonary Syndrome

TERRY L. YATES, JAMES N. MILLS, CHERYL A. PARMENTER, THOMAS G. KSIAZEK, ROBERT R. PARMENTER, JOHN R. VANDE CASTLE, CHARLES H. CALISHER, STUART T. NICHOL, KENNETH D. ABBOTT, JONI C. YOUNG, MICHAEL L. MORRISON, BARRY J. BEATY, JONATHAN L. DUNNUM, ROBERT J. BAKER, JORGE SALAZAR-BRAVO, AND CLARENCE J. PETERS

Outbreak of Hantavirus Infection in the Four Corners Region of the United States in the Wake of the 1997–1998 El Niño–Southern Oscillation

Brian Hjelle^{1,2} and Gregory E. Glass³

¹Departments of Pathology and Microbiology, University of New Mexico Health Sciences Center, Albuquerque, New Mexico
²Division, TriCore Corp., Albuquerque, New Mexico
³Department of Microbiology, University of New Mexico Health Sciences Center, School of Hygiene and Preventive Medicine, Albuquerque, New Mexico

Hantavirus cardiopulmonary syndrome (HCPS), a rodent-borne zoonosis, emerged in the Americas for at least several decades. It is hypothesized that the 1997–1998 El Niño–southern oscillation (ENSO) caused increased precipitation that allowed rodent population densities to increase, thereby increasing the possibility of transmission. A major outbreak of the disease in the Four Corners states of the United States occurred in 1993–1994, after a period of public education about the risks of hantavirus infection that began during the 1997–1998 outbreak. The caseload of HCPS increased 5-fold above baseline in the Four Corners region in 1998–1999. Regions that had received increased rainfall in 1998 were especially affected. A large majority of the 1998–1999 case patients reported indoor exposure to rodents. Hantavirus outbreaks can occur in response to abiotic events, even in the face of

In the spring of 1993, a previously undescribed disease emerged in the Southwest, killing 10 people during an 8-week period in May and June. Early during an infection, victims experienced flu-like symptoms for several days, but their condition suddenly and rapidly deteriorated as their lungs filled with fluids; death usually occurred within hours of the onset of this crisis period. There was no cure, no successful medication or treatment, and the disease agent (virus, bacterium, or toxin) was completely unknown. For the first few weeks, the mortality rate was 70%.

Researchers from many disciplines immediately focused on the outbreak, attempting to identify the agent and understand the causes and dynamics of the disease. Within weeks, scientists at the Centers for Disease Control and Prevention (CDC) identified the agent as a previously unknown hantavirus (Bunyaviridae), subsequently named Sin Nombre virus, or SNV (Nichol et al. 1993). Because hantaviruses were known

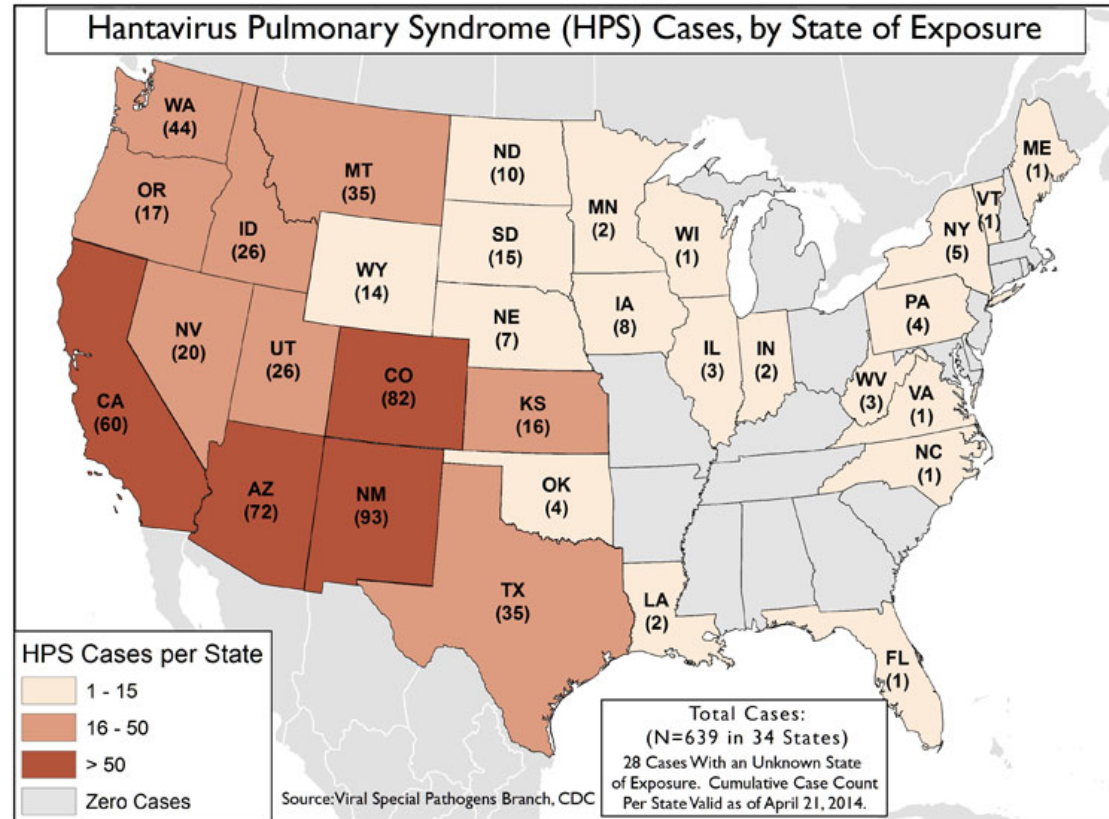
EVIDENCE FROM TWO EL NIÑO EPISODES IN THE AMERICAN SOUTHWEST SUGGESTS THAT EL NIÑO-DRIVEN PRECIPITATION, THE INITIAL CATALYST OF A TROPHIC CASCADE THAT RESULTS IN A DELAYED DENSITY-DEPENDENT RODENT RESPONSE, IS SUFFICIENT TO PREDICT HEIGHTENED RISK FOR HUMAN CONTRACTION OF HANTAVIRUS PULMONARY SYNDROME



1. Widespread in USA/Canada,
2. Commonly caught (field),
3. Good representation in collections.
4. Scale: local to continent.



Peromyscus maniculatus





Ecology: morphological/behavioral differences across its range

Disease: Hanta Virus, Lyme's Disease, public health, host-specificity, climate change (El Nino)

Behavior (across the Genus): Mating Systems *P. californicus* vs. *P. maniculatus*

Population Genetics (coat color genes and burrowing behavior): Hopi Hoekstra work

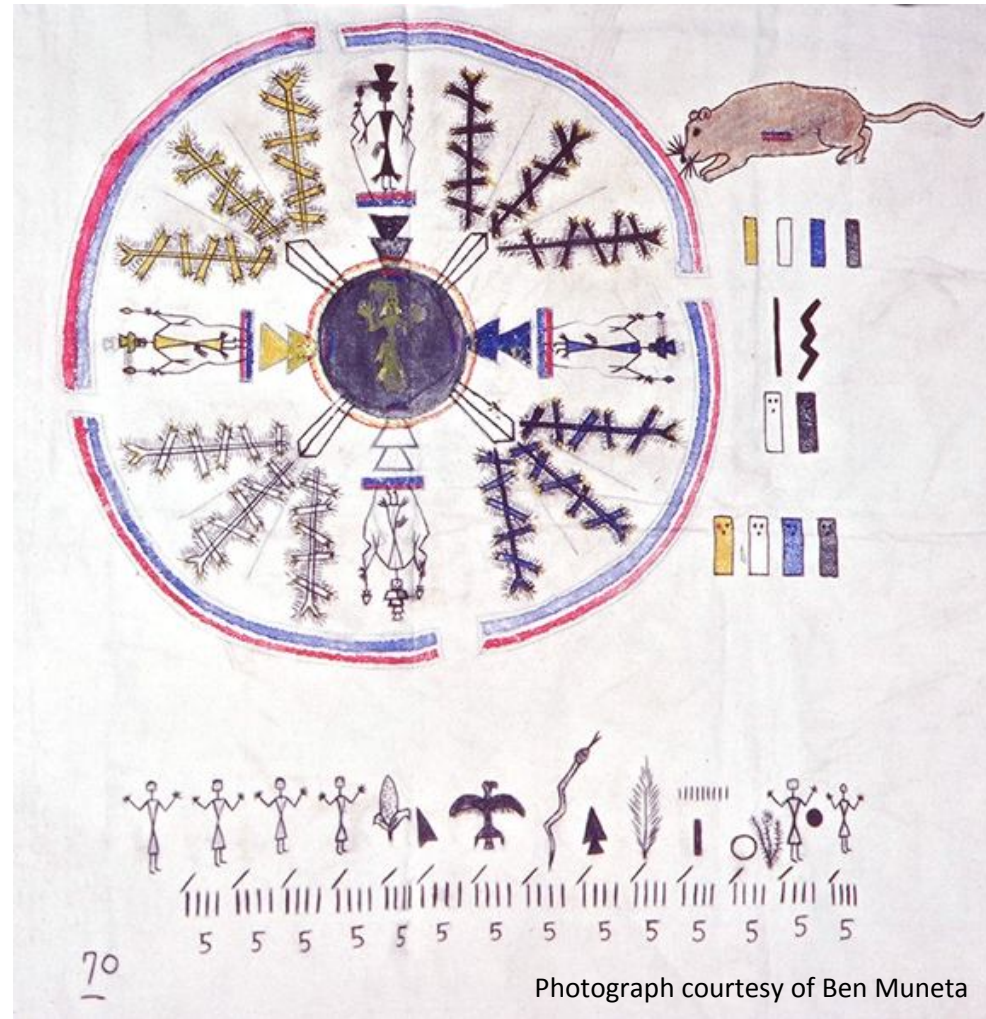
Physiology: Hemoglobin elevational adaptation work of Jay Storz

Populations genetics and habitat fragmentation in New York City: *P. leucopus* by Jason Munshi-South's work

TEK and Hanta Virus Discovery

Involvement of Navajo Traditional Ecological Knowledge that helped in identifying rodents as the source of hanta virus through observation of pinyon nuts, wet years (El Nino), and illnesses.

Traditional practice/taboo of rodents in one's hogan and the cleaning is in line with public health recommendations for control of hanta.

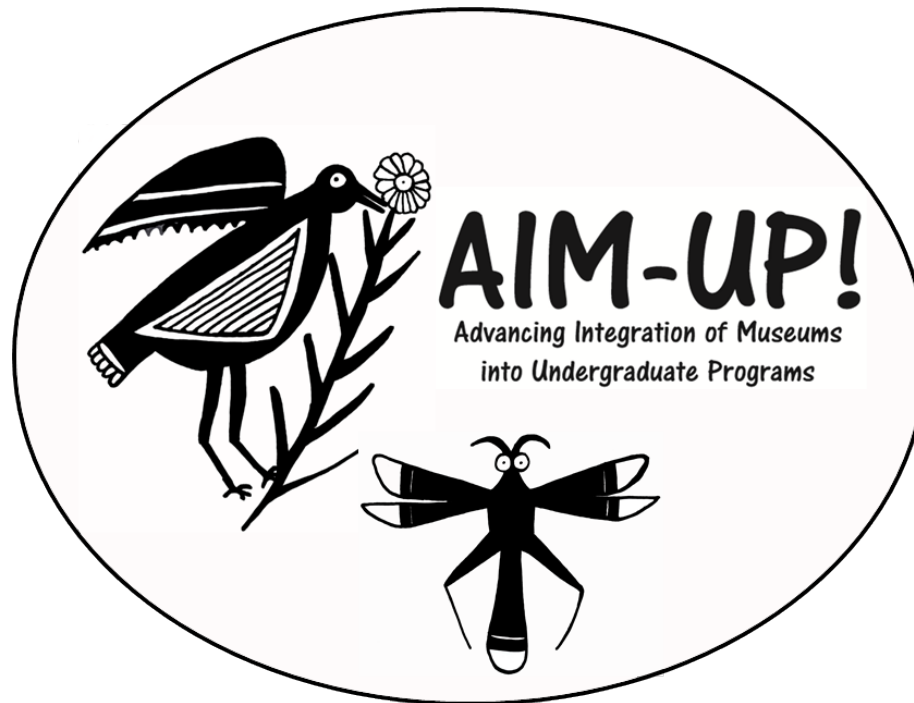


Photograph courtesy of Ben Muneta

Navajo/Dine Art that includes Deer Mouse and Annual Harvest .

AIM-UP!

(Advancing Integration of Museums into Undergraduate Programs)



A NSF-funded RCN

Another Joe Slide????



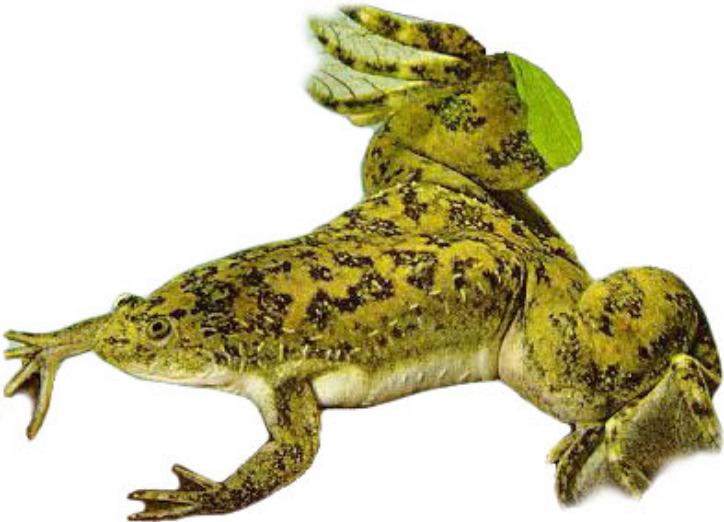
Last example: particular relevant to farmers, farm communities, and farm works (Latino/Hispanic Populations).

Atrazine and Vertebrate Endocrinology Disruption

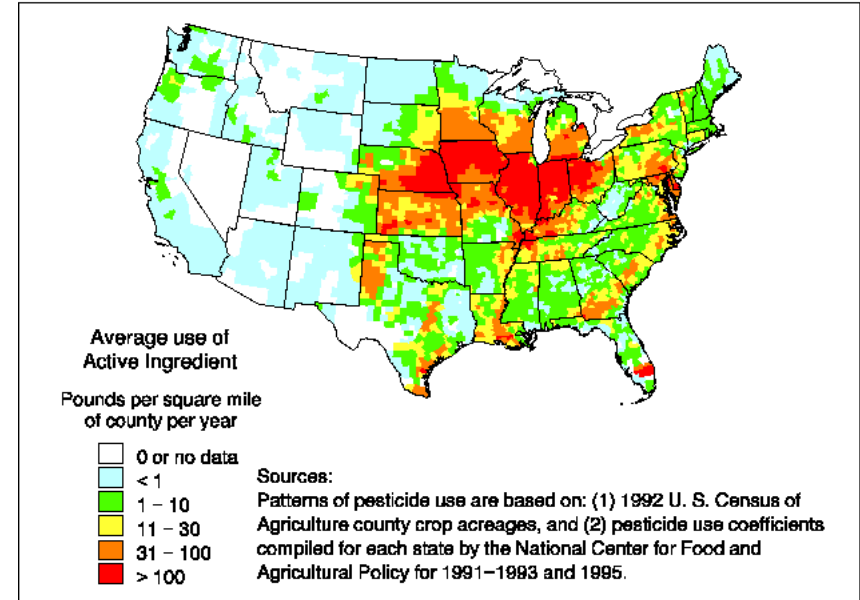
Atrazine Use and Endocrine Disruption in Vertebrates



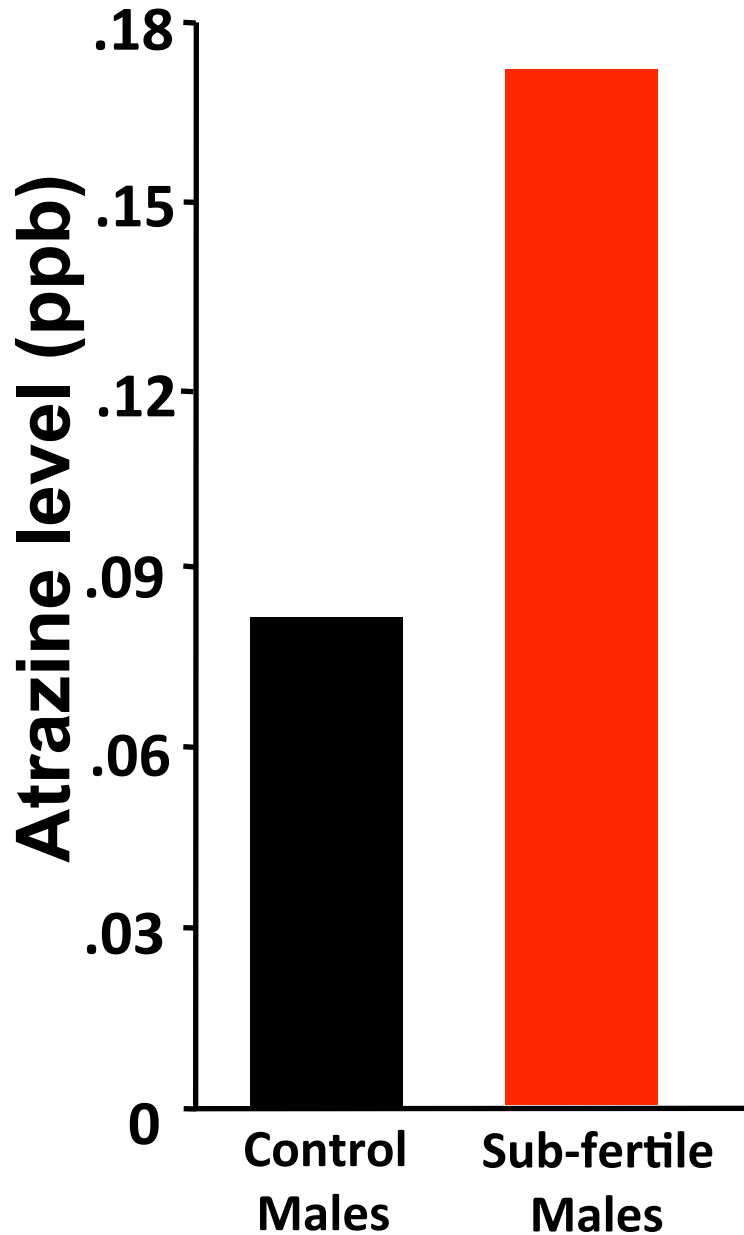
Dr. Tyrone Hayes



ATRAZINE
ESTIMATED ANNUAL AGRICULTURAL USE



Atrazine and human males



In humans
Swan *et al.* 2003

***P* < 0.009**

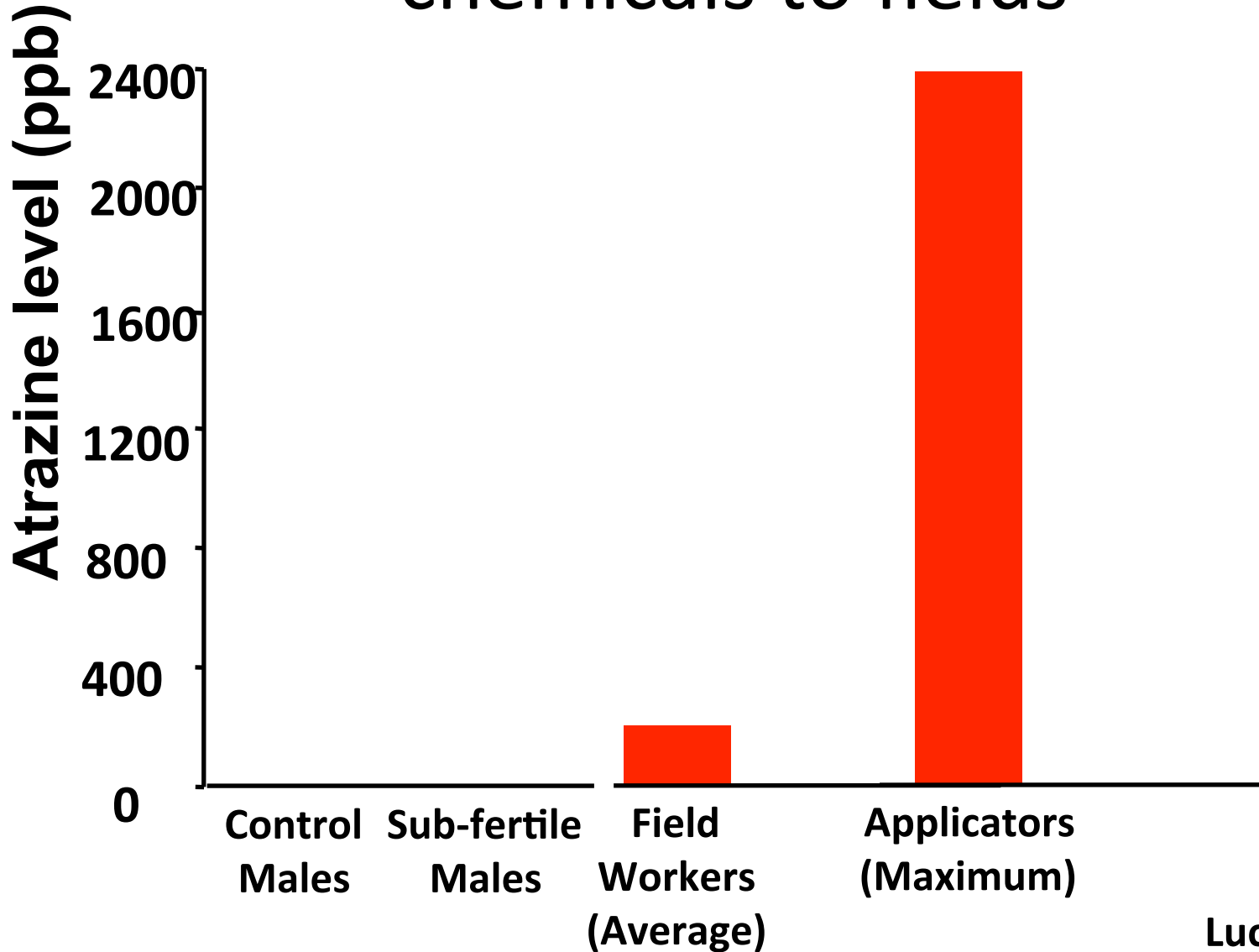
Missouri Males

Levels of atrazine in field workers



Lucas et al. 1993

Levels of atrazine in workers that apply the chemicals to fields



One last recommendation for increasing retention of UR students in your labs and at your university.

Get your undergraduate and graduate students to present at SACNAS.

-they give many, large travel awards too.



SACNAS

40 Years of Advancing Hispanics/Chicanos
& Native Americans in Science

Society for the Advancement of Hispanic/ Chicanos and Native American Scientists

Mission: Scientists fostering the success—from college students to professionals—to attain advanced degrees, careers, and positions of leadership in science.

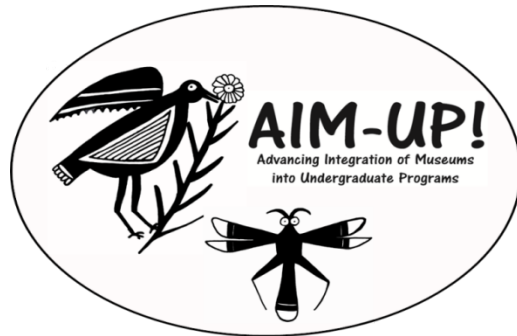
Over 23,000 members, 90+ campus chapters, regional conferences, and an annual National Conference. \$15 to be a member.

- 1300 undergraduate presentations (travel awards)
- 200 graduate/post doctoral presentations
- PhD/MD recruitment and workshops

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