

# NSRL NEWS

Natural Science Research Laboratory  
Museum of Texas Tech University

Volume 2, Spring 2016



## NSRL Upgrades Genetic Resources Collection to Liquid Nitrogen Preservation

In 2015, Dr. Robert D. Bradley (Director of the NSRL) and Dr. Robert J. Baker (Former Director of the NSRL, now retired) received funding from the Collections in Support of Biological Research program of the National Science Foundation (NSF) to transfer the frozen tissues of the Genetic Resources Collection (GRC) from mechanical  $-80^{\circ}\text{C}$  freezers to vapor-phase liquid nitrogen (LN) freezers. This upgrade will ensure the collection's long-term preservation and availability for scientific research. The 3-year NSF project (September 2015–August 2018) will include the transfer of all frozen tissue vials to five Taylor-Wharton™ LABS freezers supplied with liquid nitrogen via an exterior bulk tank.

Substantial construction and renovations to the GRC facility were necessary to accommodate the LN system. A fenced, concrete pad was constructed outside the NSRL building to house the 1,500-gallon liquid nitrogen bulk tank, and a vacuum-jacketed piping system was routed across the roof

of the building and into the GRC to supply the LN freezers. Renovation of the GRC included new flooring, new paint, and the complete remodeling of an adjacent, vacant room to create a dedicated Processing Room for the Collection Manager and student assistants, including installation of stainless steel countertops and sink, cabinetry, upgraded lighting, paint, and flooring. Renovations began in July 2015 and were completed in January 2016.

In early January, the liquid nitrogen freezers were delivered, lifted by crane to the second floor of the NSRL, and moved into the GRC facility. The bulk tank was then delivered, installed, and filled. Under the direction of Taylor-Wharton technical representatives, the GRC staff was trained on the operation of the freezers and the control system, the freezers were connected to the LN supply system, and three of the freezers were filled with liquid nitrogen. The remaining

*see LIQUID NITROGEN on page 2*



*The 1,500-gallon bulk tank installed outside the NSRL building automatically supplies the freezers with liquid nitrogen via a vacuum-jacketed piping system.*



*Four of the five liquid nitrogen freezers in the newly renovated GRC facility. A smaller fifth freezer (not shown) is dedicated for the Radioactive Tissues collection.*



*GRC Collections Manager Kathy MacDonald removes a box of tissue vials from the rack of a liquid nitrogen freezer.*

freezers will be supplied with LN as the transfer process progresses.

GRC Collections Manager Kathy MacDonald and student assistants hired with NSF funds have begun the process of transferring the samples from the -80°C freezers to the new system. All samples will be transferred to new, custom-made stainless steel boxes with polypropylene cell dividers. This process of transferring tissues to the new boxes and racks and installing them in the LN freezers will be time and labor intensive, but will allow for confirmation and updating of the GRC's existing inventory of the frozen tissues, as well as the upgrading of some vials with new label stock and barcodes (as needed). Dr. Caleb Phillips (Curator of the GRC) and Kathy MacDonald are incorporating the best museum practices in tissue archival and database methodologies as this transition takes place.

Other outcomes of this project will include: expanded storage capacity of the GRC, allowing for growth of the collection;

annotation of the NSRL public database with genetic sequence database numbers; annotation of the NSRL's internal database to indicate samples obtained from virus-positive vouchers and designation of those samples with color-coded labels; labeling of symbiotype and holotype genetic samples with color-coded labels; education and training of graduate and undergraduate students in collection management practices; a public exhibit highlighting the significance of genetic resource collections to science and society; outreach materials for high school educators; testing of cryolabels and other archival supplies; and reduced energy consumption by the transition to a green technology. We will be partnering with the Education Division of the Museum to identify mechanisms to inform the Tech campus, area public schools, and the community about the GRC, the liquid nitrogen project, and its impacts on science and education.

We are extremely pleased to be moving forward on this project. It will position the NSRL to be one of the finest genetic resource collections in the world. For those of you unfamiliar with the GRC, we have provided below a quick synopsis of this collection and its importance to natural history research.

## **What is the GRC and Why is it Important?**

The GRC of the NSRL contains more than 340,000 tissue samples from more than 95,000 individuals representing approximately 1,100 species of mammals and other taxa. It is among the largest, fastest growing, and most utilized collection of its kind. These samples are used by researchers from around the world to address questions vital to science and society, such as advancing our understanding of global biodiversity, the impact of humans and their activities on the natural world, and the transmission of disease between wildlife and humans. Each tissue sample is unique and irreplaceable, as it represents an individual at a specific point in time and space. The samples are of unlimited actual and potential value to the science community in terms of on-going and future research.

It is crucial that these tissues be preserved at the highest standards to ensure their long-term availability for maximum scientific research potential and discovery. Since its establishment in the 1970s, the GRC had relied upon traditional -80°C mechanical freezers for storage of the GRC's frozen samples. However, these freezers have a short lifespan and are subject to frequent malfunction or complete failure, as well as to power outages, thus putting samples at risk for degradation or total loss. More importantly, current and developing scientific disciplines require that tissue samples be preserved at temperatures below -132°C to preserve the entire spectrum of genomic data they contain (e.g., RNA, viruses, bacteria). Storage in liquid nitrogen, which maintains samples near -190°C, thus has become the "gold standard" for preservation of tissue collections.

The NSRL wishes to sincerely thank the administration of Texas Tech University, including the Office of the Provost, Dr. Lawrence Schovanec, the Office of the Vice President for Research, Dr. Robert Duncan, and the Office of the President, Dr. Duane Nellis, for their generous support of this project. TTU provided the funding for the renovations of the GRC facility, as well as the purchase of two of the five LN freezers necessary to house the frozen tissues inventory and allow for growth of the collection. Without the University's support and dedication to the vision and mission of the NSRL, these vital upgrades to the Genetic Resources Collection would not have been possible.

## NSRL FACULTY CURATORS



**Dr. Robert D. Bradley** is Director of the NSRL, Curator of Mammals, and Professor of Biological Sciences. Dr. Bradley's research foci are systematics and molecular evolution of New World rodents; hybridization; infectious zoonotic diseases; and natural history of mammals. He has been a faculty member since 1994. He is currently directing 3 PhD and 4 MS students. He has graduated 18 MS, 2 MA, and 9 PhD students, and he has published 157 peer-reviewed articles.

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**Dr. Nancy McIntyre** is the NSRL Curator of Birds and a Professor of Biological Sciences. She is a landscape ecologist whose research focuses on how land conversion and climate change are fragmenting migratory habitats for wildlife in the Great Plains of North America. Dr. McIntyre has served as Curator of Birds since 2006. She is currently directing 2 PhD and 1 MS students, and mentoring several undergraduate students, in her lab.

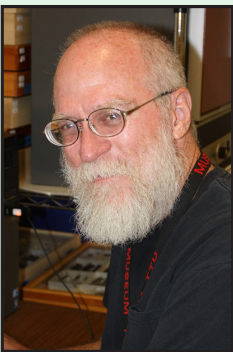
[nancy.mcintyre@ttu.edu](mailto:nancy.mcintyre@ttu.edu)



**Dr. Caleb D. Phillips** is the Curator of Genetic Resources of the NSRL and an Assistant Professor of Biological Sciences. The Phillips' lab studies how gene expression and microbiome communities evolve in support of mammalian life histories; bioinformatics; and the evolutionary/developmental process of mammalian divergence. Dr. Phillips joined the TTU faculty and NSRL in 2015. He currently is directing 1 PhD and 2 MS students.

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## NSRL CURATORIAL AND SUPPORT STAFF



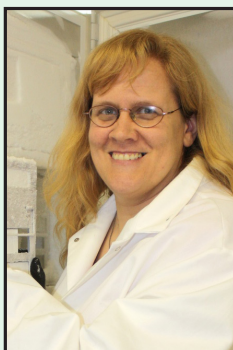
**James Cokendolpher** is the NSRL Assistant Curator of Invertebrate Zoology and a Research Scientist. His research experience includes work with invertebrates, vertebrates, and botany. He is an authority on two Orders of arachnids and has published papers and books on a variety of animal and plant taxa.

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**Heath Garner** is the NSRL Curator of Collections. His role is to facilitate the daily operations and maintenance of the NSRL collections. His duties include specimen processing, cataloging, and tracking, loan processing, student worker and volunteer training and supervision, documentation, and collections preventative conservation.

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**Kathy MacDonald** is the Collections Manager for the Genetic Resources Collection. Her primary duties include the organization and processing of incoming samples and the subsampling and processing of loans. Other duties include maintaining the NSRL website, assisting with specimen tracking in the collections, and data management and design.

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**Lisa Bradley** is the Production Editor for Occasional Papers and Special Publications. Her duties include coordinating the review and revision process, copy editing, and final layout and design. She also assists in the writing and editing of scientific articles published by NSRL staff, the preparation of grant proposals, and the development of NSRL exhibits for the Museum.

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# NSRL COLLECTIONS - SUMMARY AND STATISTICS

The Natural Science Research Laboratory (NSRL) is a division of the Museum of Texas Tech University that archives biological samples and their associated data. These collections serve as a library of our natural heritage for education and research purposes. Natural history collections provide the foundation for our understanding of biodiversity. They serve as a historical reference for documenting changes in our environment and the effects of those changes on wildlife and, ultimately, on humans.

The collections maintained by the NSRL are available to researchers at academic, scientific, and government institutions around the world for scientific investigation, discovery, and problem-solving in the natural sciences. The causes and/or effects of animal-borne diseases, environmental pollutants, parasites, climate change, habitat loss, geographic isolation, and natural evolutionary processes and speciation are just a few examples of the investigations that can be conducted utilizing specimens and tissues archived in a natural history collection. Further, the resources of the NSRL are utilized by the academic and scientific communities to train and educate students at the undergraduate and graduate levels for careers in the natural sciences as well as museum science.

## Mammal Collection



The Mammal Collection currently contains 120,979 cataloged specimens of an estimated 1,437 species. Specimen preparation types include preserved skins, skeletal materials, alcohol-preserved specimens, and taxidermy mounts. From July through December 2015, the Mammal Collection cataloged 1,779 specimens and granted 9 loans of 249 specimens.

## Bird Collection



The Bird Collection currently contains 5,507 cataloged bird specimens, as well as eggs and nests, of approximately 890 species. From July through December, the Bird Collection cataloged one new specimen and granted one loan of 6 specimens.

## Invertebrate Zoology Collection



The Invertebrate Zoology Collection contains an estimated 4.5 million specimens. These include insects, crustacea, endo- and ecto-parasites, and arachnids. Specimen preservation methods include dried, fluid (ethanol or formalin), slide-mounted, and frozen. From July through December 2015, the collection staff cataloged 19,655 specimens. The entire catalog may be searched here: <http://symbiota4.acis.utl.edu/scan/portal/collections/index/index.php>

## Genetic Resources Collection



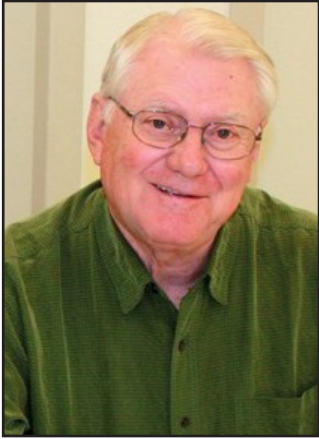
The Genetic Resources Collection contains >340,000 samples of tissues, blood, and extracted DNA from >95,000 specimens of mammals and other taxa. From July through December 2015, the GRC granted 17 loans totalling 665 samples. The Collection grew by 7,030 samples obtained from 1,659 individuals.

As a whole, the NSRL hosted 237 visitors from July through December, including researchers utilizing the collections, students taking classes, and individuals and groups on tours. The NSRL also filled 82 data requests by researchers. Twenty-five students (7 graduate, 18 undergraduate) were employed by the NSRL during all or part of the July through December time period.

## **Society Needs a Biology that Includes Natural History**

*David J. Schmidly, Professor Emeritus and Past President, Texas Tech University*

(Current Address and Title: Research Professor and Past President, the University of New Mexico)



“Write and speak with appreciation for all that you have been gifted. Recognize that politics with no biology, or politics without field biology, or a political platform in which human biological requirements form but one plank, is a vision of the gates of hell.” These words, written by literary critic and writer Barry Lopez, who also is a Distinguished Scholar at Texas Tech, warn us of the consequences of a world society without a robust science of natural history (Lopez, B. 2001. *The Naturalist*. Orion Autumn 2001:38–43).

Yet, just a year before Lopez’ article, an editorial appeared in the most prestigious journal for higher education warning of the demise of natural history at American universities (Wilcove, D.S., and T. Eisner. 2000. *The Impending Extinction of Natural History*. *Chronicle Review*, *Chronicle of Higher Education* 47(3):B24). The authors wrote that the “deinstitutionalization of natural history looms as one of the biggest scientific mistakes of our time, perpetuated by the very scientists and institutions that depend upon natural history for their well-being.”

Many of the predictions made by Wilcove and Eisner have come true. It is well documented that teaching and research in natural history have been on a steep decline curve at the same time we are witnessing a dramatic threat to the earth’s biodiversity.

Why would higher education go so far as to lose a field of science that provides some of the purest facts about our natural world? Scholars who have written about this blame factors such as the ascendancy of the hard sciences in the era of the atomic bomb and Sputnik, the separation of people and nature associated with the desertion of the farm for nature-impoverished cities and suburbs, and more recently the widespread appeal of reductionism in science and a certain “technophilia” that have accompanied the rise of molecular biology together with powerful, institutionalized pressures to deliver fast results and garner large research grants.

All of this adds up to a serious consequence for society should, in fact, natural history disappear from American universities. What’s at stake is the continued vibrancy of ecology, of animal behavior and botany, and much of molecular biology, and even of medicine and biotechnology.

The late Carl Woese, a molecular biologist and a member of the National Academy of Sciences, warned about a society that permits biology to become an engineering discipline that is focused on changing the living world without trying to understand it (Woese, C. 2004. *A new biology for a new century*. *Microbiology and Molecular Biology Reviews* 68 (2): 173-186). To quote Woese, “A biology obsessed with reductionism that strips the organism from its environment, ignores its history and evolutionary flow, and shreds it into parts to the extent that a sense of the whole – the whole cell, the whole multicellular organism, the biosphere – is effectively gone is a danger to itself.”

We need a biology that teaches us to live in harmony with the rest of the living world, not one that is a distorted and incomplete reflection of that world. Society needs to appreciate that biology is here to understand the world, not primarily to change it. Natural history, with its focus on the whole organism in its living environment, using the powerful tools and understanding of molecular biology is one of the best ways to achieve this understanding. That is why we must teach students about both.

The cornerstone of natural history research and education for the past 200 years has been the specimen collections associated with governmental, private, and academic-affiliated natural history museums. The voucher specimens housed in these collections constitute most of society’s scientific knowledge about the diversity, distribution, and life history of North American wildlife, and they are a key link to understanding the impact of climate change in our country. The field expeditions that produced these collections have constituted the basis for educating generations of professional, scientific naturalists. Unfortunately, these collections also have steadily declined as funding and support for natural history collections has waned over the last 50 years.

*see SOCIETY on page 6*

So, in lieu of all of this, how does natural history education and research stack up at Texas Tech University? The Natural Science Research Laboratory (NSRL), which is a Division of the Museum, has contributed significantly to the research and education mission of the University, placing Tech front and center in natural history research and education in the U.S. Consider the following accomplishments:

- The NSRL houses four major collections—the Mammal Collection, the Bird Collection, the Invertebrate Collection, and the Genetic Resources Collection—and these collections benefit TTU by increasing the University’s visibility and reputation for excellence in teaching, research, and publication.
- The Mammal collection houses about 121,000 specimens, ranking it 5<sup>th</sup> in size among academic-affiliated collections and 8<sup>th</sup> among all mammal collections in the U.S.

- The Genetic Resources Collection, which contains >340,000 samples of tissues, blood, and DNA from >95,000 specimens of mammals and other taxa, is among the largest genetic resource collections in the U.S.
- Since 2000, faculty and students associated with the NSRL have produced >350 natural history publications utilizing the specimens of the NSRL.
- Since 2010, 60 TTU graduate students received a combined 200 years of training and education, and 38 graduate degrees were granted, as the result of NSRL-based research and education activities in natural history.

And, just as significant, through its various academic departments, TTU continues to offer courses in natural history, including all of the “ologies,” as well as specimen-based field work and expeditions. Everyone associated with Texas Tech University and the NSRL should be proud of its approach and achievements in maintaining an emphasis on natural history research and education.

## STUDENT PRESENTATIONS

During the period July through December 2015, at least 12 graduate and 1 undergraduate students gave 9 oral and 7 poster presentations of their research at local, regional, national, and international conferences and society meetings. These meetings included, among others, the Annual Symposium of the North American Society for Bat Research, the 3rd International Southeast Asian Bat Conference, and the II Colombian Congress and III Latin American Congress of Mammalogy.

Two students won awards for their presentations:

**Whitney Watson.** Undergraduate student. First Place (undergraduate category), CISER Scholar Research Forum, Texas Tech University.

**Kendra Phelps.** Graduate student. Oral Presentation Award, 3rd International Southeast Asian Bat Conference.

## STUDENT GRANTS AND AWARDS

**Daniela Arenas-Viveros.** Graduate student. Rene Fonseca Memorial Endowed Scholarship, TTU Department of Biological Sciences Special Scholarships in Mammalogy, \$500; J Knox Jones, Jr., Memorial Endowed Scholarship, TTU Department of Biological Sciences Special Scholarships in Mammalogy, \$1,500.

**Narayan Kandel.** Graduate student. Doctoral Dissertation Completion Fellowship, TTU Graduate School (2015-2016).

**Garret D. Langlois.** Graduate student. Travel Grant, American Society of Mammalogists, \$300.

**Iroro Tanshi.** Graduate student. Bat Conservation International Student Research Fellowship (2015-2019); Michelle Knapp Memorial Graduate Research Award, TTU Biological Sciences.

## FACULTY RECOGNITION

Congratulations to **Robert Bradley**, who was selected by the TTU Office of the Provost as an Integrated Scholar for 2015-2016. According to the announcement: “Integrated Scholars are faculty who dedicate themselves to a course of lifelong learning and advance Texas Tech’s role in educating, serving and inspiring others to do the same. Integrated Scholars are not only outstanding in teaching, research and service, but they are also able to generate synergy among the three functions. Faculty members who are Integrated Scholars consistently promote active learning and infuse the results of their research and scholarship in courses and other learning experiences. Integrated Scholars publish results of their teaching innovations in peer-reviewed journals. Finally, Integrated Scholar faculty members plan and execute service commitments to complement their teaching and research goals.”

## FACULTY AND STAFF GRANTS (active July – December 2015)

**Baker, R. J.**, and **R. D. Bradley**. “Natural History: Development of a liquid nitrogen system for the Genetic Resources Collection, Natural Science Research Laboratory, Museum of Texas Tech University”. NSF (Collections in Support of Biological Research).

Boal, C., **R. J. Baker**, and **R. D. Bradley**. “SNL/Bird & Bat Environmental Study for the Experimental Wind Farm”. Sandia National Laboratory.

Boyles, J. G., and **L. P. McGuire**. “Autumn migration of Indiana bats (*Myotis sodalis*) and northern myotis (*Myotis septentrionalis*) in eastern Illinois.” Jointly funded by private energy company and US Fish and Wildlife Service.

Boyles, J. G., and **L. P. McGuire**. “A regional-scale assessment of spring migration of Indiana bats (*Myotis sodalis*) and northern myotis (*Myotis septentrionalis*) in the Indiana bat Midwest Recovery Unit”. US Fish and Wildlife Service.

Boyles, J. G., and **L. P. McGuire**. “A regional-scale assessment of autumn migration and swarming movements of Indiana bats (*Myotis sodalis*) and northern myotis (*Myotis septentrionalis*) in the Indiana bat Midwest Recovery Unit”. US Fish and Wildlife Service.

**Cokendolpher, J.**, et al. “Southwest Collections of Arthropods Network (SCAN): A Model for Collection Digitization to Promote Taxonomic and Ecological Research.” National Science Foundation, Digitization TCN (Collaborative Research).

Griffis-Kyle, K. L., and **N. E. McIntyre**. “Landscape Connectivity of Isolated Waters in the Sonoran Desert for Wildlife.” U.S. Bureau of Reclamation - Desert and Southern Rockies Landscape Conservation Cooperatives.

Griffis-Kyle, K. L., and **N. E. McIntyre**. “Assessment of landscape conservation success for non-target species at risk.” Western Association of Fish & Wildlife Agencies - Grassland Initiative.

Hoffmann, F., and **D. Ray**. “piRNA Dynamics in the Absence of Active TEs.” National Science Foundation.

Johnson, E., **R. D. Bradley**, and C. Saffel. “Mechanical Assist System Installing/Retrofitting Project”. The CH Foundation.

**Kingston, Tigga**. “Southeast Asian Bat Conservation Research Unit.” National Science Foundation.

Longing, S., R. Cox, **N. McIntyre**, C. McKenney, and C. West. “Demonstration of pollinator conservation practices and a framework for regional implementation on the Southern

High Plains.” USDA Natural Resources Conservation Service-Conservation Innovation Grants.

**McGuire, L. P.**, J. G. Boyles and R. M. Brigham. “Going the distance: Does heterothermy facilitate long-distance migration in goatsuckers?” National Geographic Committee for Research and Exploration.

**McIntyre, N. E.**, and K. Hayhoe. “Collaborative Proposal: Climatic and Anthropogenic Forcing of Wetland Landscape Connectivity in the Great Plains.” NSF-Macrosystems Biology.

**Stevens, R. D.** “Habitat affinities and day roost characteristics of the northern long-eared bat (*Myotis septentrionalis*) in Louisiana.” Louisiana Department of Wildlife and Fisheries.

**Stevens, R. D.** “White-nose Syndrome (WNS) surveillance in Louisiana. Louisiana Department of Wildlife and Fisheries.

**Stevens, R. D.**, **D. Ray**, R. N. Platt, and **R. D. Bradley**. “RFP No. 209f for Endangered Species Research Projects for the Texas Kangaroo Rat.” Texas State Comptroller.

Williams, G., J. Cañas, J. Dwyer, S. Jang, and **N. E. McIntyre**. “RMR-TTU: Recruitment, Mentoring, and Research in Mathematics and Science at Texas Tech University.” NSF-PRISM (Proactive Recruitment in Introductory Science and Mathematics).

Pires Costa, L., **J. Salazar-Bravo**, et al. “Gradients of biodiversity: Closing the gaps in the distribution patterns, genetic diversity and morphology of mammals of Espiritu Santa State.” FAPES (Brasil).

Rico, A. I. Moya and **J. Salazar-Bravo**. “Development and strengthening of the Bolivian program on ecology and evolution of emergent disease ecology.” Swedith International Development Cooperation Agency.

Rico-Cernohorska, A., **J. Salazar-Bravo**, et al. “Generación de fortalezas para la determinación de enfermedades zoonóticas en el norte de La Paz (PBE4 - Phase II). Proyectos Concursables De Investigacion E Interaccion Social (IDH), Bolivia.

**Salazar-Bravo, J.** Multiple dimensions of host-pathogen biodiversity: rodents, virus in South American habitats. Texas Tech University’s International Research Seed Grants competition.

**Salazar-Bravo, J.** “International symposium on Neotropical mammals and zoonoses”. Manter Laboratory of Parasitology Foundation.

## OCCASIONAL PAPERS AND SPECIAL PUBLICATIONS OF THE MUSEUM OF TEXAS TECH UNIVERSITY

The NSRL produces two peer-reviewed publication series, Occasional Papers and Special Publications, both of which are edited by Dr. Robert D. Bradley, Director of the NSRL. These series provide outlets for scholarly works resulting from museum-based natural history research. Relevant topics include, but are not limited to, taxonomic studies, faunal lists, species descriptions, zoonoses research, distributional records, and field and museum techniques and methodology, including molecular methods that are applicable to field or museum research. Publication in these series is available to all authors without regard to their association with Texas Tech University. Authors who plan to submit manuscripts to these series should refer to both the Museum Publications Policy and the Guidelines and Procedures for Authors, available at our website, [www.nsrl.ttu.edu/publications](http://www.nsrl.ttu.edu/publications), for more information.

Lisa Bradley serves as the Production Editor for both series. Our goal is to produce 10–12 Occasional Papers and 1–2 Special Publications per year. Feel free to contact Lisa, [lisa.bradley@ttu.edu](mailto:lisa.bradley@ttu.edu), if you are interested in submitting manuscripts or monographs to the Occasional Papers or Special Publications series.

### **Publications produced July–December 2015:**

**Occasional Paper 332.** Distribution and natural history of Nelson's Pocket Mouse (*Chaetodipus nelsoni*) in the Guadalupe Mountains in southeastern New Mexico. Kenneth N. Geluso and Keith Geluso.

**Occasional Paper 333.** Mammalian records from southwestern Kansas and northwestern Oklahoma, including the first record of Crawford's Desert Shrew (*Notiosorex crawfordi*) from Kansas. Cody A. Dreier, Keith Geluso, Jennifer D. Frisch, Brittney N. Adams, Alyx R. Lingenfelter, Anthony E. Bridger, Patricia W. Freeman, Cliff A. Lemen, Jeremy A. White, Brett R. Anderson, Hans W. Otto, and Curtis J. Schmidt.

**Occasional Paper 334.** Small mammals of Guandera Biological Reserve, Carchi Province, Ecuador, and comparative Andean small mammal ecology. Thomas E. Lee, Jr., A Rachel Ritchie, Sarah Vaca-Puente, Joshua

M. Brokaw, Ma. Alejandra Camacho, and Santiago F. Burneo.

**Occasional Paper 335.** The mammals of Caprock Canyons State Park, Texas. Clyde Jones, Franklin D. Yancey, II, and Richard W. Manning.

**Occasional Paper 336.** Emendation of *Glyphobothrium* and *Glyphobothrium zwerleri* (Tetrphyllidea) collected from *Rhinoptera bonansus* (Myliobatiformes: Myliobatidae) in Campeche, Mexico, with details of the bothridial suckers. Scott Monks, Griselda Pulido-Flores, and Scott L. Gardner.

**Occasional Paper 337.** Coccidia (Apicomplexa: Eimeriidae) from small mammals of the southwestern sandhills in Nebraska, USA. Kaleb J. Thomas and Scott L. Gardner.

**View and download Occasional Papers and Special Publications at the NSRL website:**  
[www.nsrl.ttu.edu/publications](http://www.nsrl.ttu.edu/publications)

## OUTREACH NEWS

**Jorge Salazar-Bravo**, along with Scott Gardner of University of Nebraska-Lincoln, organized a symposium on "Neotropical Mammals and Zoonoses" at the 3rd Latin American Congress of Mammalogy, 1–5 December 2015, in Bogota, Colombia. The symposium included presentations by researchers from the US (University of Nebraska-Lincoln, Texas Tech University and the CDC), France (Museum National d'Histoire Naturelle), Colombia (Instituto de Investigaciones en Biología Tropical, Universidad de Montería), Brazil (Universidade Federal do Paraná), Australia (University of Queensland), and Mexico (Universidad Autónoma de Yucatán), among others.

**Nancy McIntyre** recently was invited to give presentations at two scientific meetings. In July, she presented "Changes in connectivity among southern Great Plains wetlands over the past 30 years as a function of land-use change" at the World Congress of the International Association of Landscape Ecology in Portland, Oregon. In August, she presented "Patterns of biotic population and community structure in built environments" at the annual meeting of the Ecological Society of America, in Baltimore, Maryland.



# RECENT PUBLICATIONS BY NSRL FACULTY, STAFF, AND STUDENTS

- Benjamin, L., M. Struebig, S. Rossiter, and **T. Kingston**. Mounting concern over trade in bat souvenirs from Southeast Asia. *Oryx* 49:204-204
- Collins, S. D., and **N. E. McIntyre**. Modeling the distribution of odonates: a review. *Freshwater Science* 34:1144-1158.
- Kingston, T.** Cute, Creepy, or Crispy – how values, attitudes and norms shape human behavior toward bats. Pp 571-595. In: *Bats of the Anthropocene* (eds. CC Voigt, T. Kingston). Springer International AG. Doi: 10.1007/978-3-319-25220-9\_18
- Kingston, T.,** L. Aguirre, K. Armstrong, R. Mies, P. Racey, B. Rodriguez-Herrera, and D. Waldien. Networking Networks for Global Bat Conservation. Pp 539-569 in *Bats of the Anthropocene* (eds. CC Voigt, T. Kingston). Springer International Press. Doi: 10.1007/978-3-319-25220-9\_18
- McDonough, M. M., R. Sümbera, V. Mazoch, A. W. Ferguson, **C. D. Phillips**, and J. Bryja. Multilocus phylogeography of a widespread savanna-woodland adapted rodent reveals the influence of Pleistocene geomorphology and climate change in Africa's Zambezi region. *Molecular Ecology* 24:5248-5266.
- McIntyre, N. E.,** K. Knowles-Yáñez, and D. Hope. Urban ecology as an interdisciplinary field: differences in the use of “urban” between the social and natural sciences. In: *Urban Ecology: Critical Concepts in Geography* (I. Douglas, ed.). Routledge Publishing. [A compilation of the “classic” papers from urban ecology and urban geography. Article originally published in *Urban Ecosystems* 4:5-24; 2000].
- Moya, I., E. Aliaga-Rossel, A. Rico, R. Galeón and **J. Salazar-Bravo**. Los mamíferos del valle de La Paz. [Mammals of the Valley of La Paz] Pp. 671-722 in *Historia Natural de un Valle en los Andes: La Paz* (Moya M.I., R.I. Meneses & J. Sarmiento, eds.) Segunda Edición. Museo Nacional de Historia Natural. La Paz, Bolivia 801 p.
- Muylaert, R. L., **R. D. Stevens** and M. C. Ribeiro. Threshold effect of habitat loss on bat richness in savanna-forest landscapes. *Ecological Applications*, In Press.
- Pacheco L.F., J. Aparicio, C. Benavides, M. Escobar, R. Galeón, E. García, F. Guerra, M.I. Gómez, D.M. Larrea-Alcázar, M. Limachi, D. Maldonado, B. Miranda, D. Morales, M.I. Moya, A. Rico, **J. Salazar-Bravo**, and L. Tellería. Interacciones entre plantas y animales [Animal-plant interactions]. Pp: 406-416 in *Historia Natural de un Valle en los Andes: La Paz* (Moya M.I., R.I. Meneses & J. Sarmiento, eds.) Segunda Edición. Museo Nacional de Historia Natural. La Paz, Bolivia 801 p.
- Pardiñas UFJ, P. Teta, P.E. Ortiz, JP Jayat, and **J. Salazar-Bravo**. Genus *Necromys* Ameghino, 1889. Pp. 232-247 in *Mammals of South America. Volume 2 - Rodentia* (J Patton, UFJ Pardiñas and G D'Elía, eds.). University of Chicago Press.
- Phillips, C. D.,** and **R. J. Baker**. Gene recruitment by alternative splicing underlies Vampire Bat salivary adaptations and convergences with sanguivorous leeches. *Frontiers in Ecology and Evolution*, DOI:10.3389/fevo.2015.00122.
- Platt II, Roy N., Cody W. Thompson, Brian R. Amman, Megan S. Corley, and **Robert D. Bradley**. What is *Peromyscus*? Evidence from nuclear and mitochondrial DNA sequences for a new classification. *Journal of Mammalogy* 96:708-719.
- Rowan, N., S. Lee, N. Saho, A. Kanaan, S. B. Cox, **C. D. Phillips**, and E. Wang. The role of viruses in the clinical presentation of chronic rhinosinusitis. *International Forum of Allergy and Rhinology* 29(6):e197-e200.
- Salazar-Bravo, J.** and J. P. Jayat. Genus *Andinomys* Thomas, 1902. Pp. 75-77 in *Mammals of South America. Volume 2 - Rodentia* (J Patton, UFJ Pardiñas and G D'Elía, eds.). University of Chicago Press.
- Salazar-Bravo, J.** Genus *Chinchillula* Thomas, 1898. Pp. 78-79 in: *Mammals of South America. Volume 2 - Rodentia* (J Patton, UFJ Pardiñas and G D'Elía, eds.). University of Chicago Press.
- Salazar-Bravo, J.** Tribe Phyllotini Vorontsov, 1959. Pp. 465-469 in *Mammals of South America. Volume 2 - Rodentia* (J Patton, UFJ Pardiñas and G D'Elía, eds.). University of Chicago Press.
- Salazar-Bravo, J.** Genus *Auliscomys* Osgood, 1915. Pp. 472-479 in *Mammals of South America. Volume 2 - Rodentia* (J Patton, UFJ Pardiñas and G D'Elía, eds.). University of Chicago Press.
- Salazar-Bravo, J.** Genus *Calomys* Waterhouse, 1837. Pp. 481-507 in *Mammals of South America. Volume 2 - Rodentia* (J Patton, UFJ Pardiñas and G D'Elía, eds.). University of Chicago Press.
- Salazar-Bravo, J.** Genus *Galenomys* Thomas, 1916. Pp. 522-523 in *Mammals of South America. Volume 2 - Rodentia* (J Patton, UFJ Pardiñas and G D'Elía, eds.). University of Chicago Press.
- Stevens, R. D.** A mammalian species new to the fauna of Louisiana. *Southwestern Naturalist*, In Press.
- Stevens, R. D.,** M. Johnson and E. S. McCulloch. Geographic variation of wing morphology of *Artibeus lituratus*: environmental, genetic and spatial correlates of phenotypic differences. *Biological Journal of the Linnean Society*, In Press.
- Thompson, C. W., F. B. Stangl, Jr., and **R. D. Bradley**. Ancient hybridization modeling and subsequent mitochondrial capture in ground squirrels (genus *Ictidomys*). *Occasional Papers, Museum of Texas Tech University* 331:1-24.
- Voigt, C.C and **T. Kingston** (eds.). *Bats of the Anthropocene: conservation of bats in a changing world*. Springer International Press.
- Voigt, C.C. and **T. Kingston**. Bats in the Anthropocene. Pp 1-9. In: *Bats of the Anthropocene* (eds. CC Voigt, T. Kingston). Springer International Press. Doi: 10.1007/978-3-319-25220-9\_1.
- Wolcott, R. D., J. D. Hanson, E. Rees, L. Koenig, **C. D. Phillips**, R. Wolcott, S. B. Cox, and J. White. Analysis of the chronic wound microbiota of 2963 patients by 16S rDNA pyrosequencing. *Wound Repair and Regeneration*, DOI:10.1111/wrr.12370.
- Teta, P., UFJ Pardiñas, **J. Salazar-Bravo**, and G. D'Elía. Genus *Loxodontomys* Osgood, 1947. Pp. 531-535 in *Mammals of South America. Volume 2 - Rodentia* (J Patton, UFJ Pardiñas and G D'Elía, eds.). University of Chicago Press.
- Salazar-Bravo J.** Genus *Tapecomys* Anderson and Yates, 2000. Pp. 556-559 in *Mammals of South America. Volume 2 - Rodentia* (J Patton, UFJ Pardiñas and G D'Elía, eds.). University of Chicago Press.

# NSRL Improves Fluid Collection and Packard Library with Compacting Shelving System

The NSRL recently acquired and installed a mechanical-assist, high-density compacting shelving system (i.e., “compactors”) in both the Fluid Collection and the Packard Library. The compactors were donated by a local business, R. E. Janes Gravel Company, who was looking to relocate the system from a building they had purchased. The CH Foundation initiated the idea of transferring the system to the Museum, and they generously granted the funding for the parts and labor necessary to dismantle, move, retrofit, and reassemble the system in the respective NSRL collection areas.

About two-thirds of the compactor system was installed in the NSRL Fluid Collections Room. This collection contains approximately 20,000 specimens (nearly all mammalian) that are preserved in 70% ethanol. These specimens are extremely valuable to scientists researching soft anatomical questions (e.g., digestive, nervous, muscular systems). More recently, techniques have been developed that allow specimens in this collection to be used as a DNA source for genetic-related studies. The compactors are a much-welcomed addition to the Fluid Collection! The NSRL essentially had exceeded the capacity of the previous room configuration of stationary cabinets. The addition of compactors allows for a much more efficient use of the existing space. The upgrade has significantly increased both capacity and usefulness from a curatorial/research perspective.

The remaining compactors were utilized in the NSRL Packard Library. The Packard Library contains the personal profes-

sional libraries (donated to the NSRL) of many noted mammalogists, including Robert Packard, E. Llendell Cockrum, Robert Baker, David Schmidly, Dildford Carter, J Knox Jones, and others, as well as a substantial collection of materials on the topics of invertebrate zoology and ornithology. This collection contains approximately 3,000 books and over 25,000 reprints of scientific articles. Much of this material is representative of the older scientific literature (late 1800s thru 1970s) and is extremely valuable from a historical as well as scientific perspective. The addition of compactors in the library has been a significant advancement for this literary collection and will provide a more efficient use of current space. In addition to increasing storage capacity, it allows greater accessibility to the reprints that were previously stored in filing cabinets.

This much-needed increase in storage capacity will allow these two collections to grow unimpeded for an estimated 10–15 years. Further, the compacting system allows for improved organization of and access to specimens and literature by curators and researchers and further facilitates the NSRL being a world-wide resource for scientific investigation and discovery.

The NSRL is very grateful to the R. E. Janes Gravel Company for donating the compactors, The CH Foundation for granting the funding to install the system, and the Museum administration for supporting the NSRL’s acquisition of the system to address our immediate needs for collections storage and our long-term capacity for growth.



*Compactors housing the NSRL Fluid Collection. The jars are organized and labeled by taxa and locality. The increased storage capacity and efficiency of the system will allow for long-term growth of the collection.*

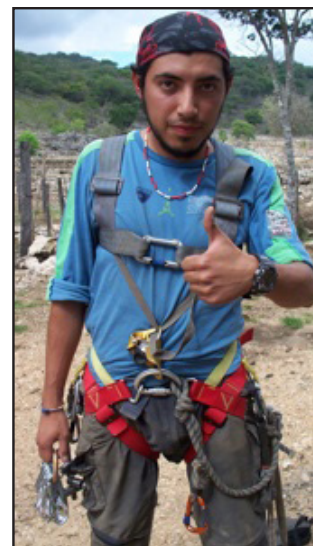


*A compactor row in the NSRL Packard Library. As part of the library reorganization, all reprint files will be inventoried, new acid-free archival boxes will be labeled accordingly, and all wood reprint boxes will be phased out.*

## COLLECTION HIGHLIGHT: INVERTEBRATE ZOOLOGY

### First Protoschizomidae (Arachnida) from the USA and first member of the Family outside of Mexico (Monjaraz-Ruedas et al.)

**James Cokendolpher** (Research Scientist and Assistant Curator of Invertebrate Zoology) first came to TTU in 1978 to study under the guidance of Dr. Oscar F. Francke (then Curator of Entomology at the Museum and Professor of Biological Sciences at TTU). Since those decades long ago, Oscar moved to Mexico and among other things became the Curador, Colección Nacional de Arácnidos, Instituto de Biología, Universidad Nacional Autónoma de México (UNAM). In what will be their 16th publication together, they are co-authoring an upcoming paper with a recent student of Oscar's from UNAM, Rodrigo Monjaraz-Ruedas (*pictured*). The new paper describes three new species of cavernicolous *Agastoschizomus* from the states of México, Tamaulipas, and Texas. The Texas species is known only from one cave in Seminole Canyon State Park. The manuscript was submitted in November 2015 and is expected to appear in print in 2016.



**Rodrigo Monjaraz-Ruedas**  
“Good to go” on rope.

Members of the arachnid order Schizomida occur in most tropical and sub-tropical regions of the world. Most occur in leaf litter or soil, many are found in subterranean habitats (like the new species), and a few species are known from ant and termite colonies. These animals are incompletely known because of their small size and cryptic habits. There are less than 250 described species, but many others remain unstudied.

### NSRL Staff Collaborates in Study of Potentially Endangered *Cicurina* Spiders from the San Antonio Area

Recent funding from the Texas Department of Transportation (TxDOT) allowed staff of the NSRL and Department of Biological Sciences to investigate the genetics and morphology of *Cicurina* cave spiders from Bexar and surrounding counties of Texas. Those involved in the study included: **Robert J. Baker**, former Horn Professor of Biological Sciences and former Director of the NSRL; **James C. Cokendolpher**, Assistant Curator of Invertebrate Zoology, NSRL; Julie A. Parlos, former Ph.D. student in Biological Sciences; **Caleb D. Phillips**, Assistant Professor of Biology and Curator of the Genetic Resources Collection, NSRL, as well as Stirling Robertson of TxDOT and Jean Krejca of Zara Environmental, LLC.

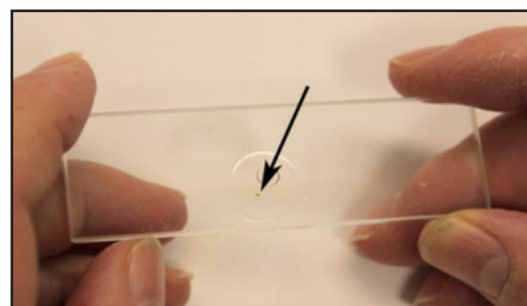
Bexar County is home to a diverse fauna of endemic species found in the karstic areas in and around the Edwards Aquifer region and associated springs. The fauna of Bexar County are experiencing increased anthropogenic pressures resulting from suburban development and human expansion. Among this fauna are troglobitic species of the genus *Cicurina* several of which are already listed as endangered by the USFWS. Adult specimens rarely are observed, with most species only being recognized by differences in sexual reproductive anatomy of one or a few specimens. Immature specimens are more commonly observed, but still require extensive field work to observe or collect. By using morphologically identified adult specimens and genetics of immature specimens, we characterized distributions of phylogenetic clades across the karst faunal regions of Bexar County. The development of this paired morphologic and genetic database will serve to improve the identification of species from immature specimens, which are most commonly obtained during suburban excavation projects.

Two manuscripts are in preparation on 1) the genetic boundaries of the species, and 2) macroscopic (combined focus-stacked) photography of the reproductive organs that are used in the taxonomy of this group of spiders.



*Cicurina* spider. Photo by Dr. Jean K. Krejca, Zara Environmental LLC.

Genitalia of a female *Cicurina* spider.



## RECENT M.A., M.S., AND PH.D. GRADUATES (AUGUST AND DECEMBER 2015)

**Cibele Caio, Ph.D.** Chair: Robert J. Baker. Dissertation title: Significance of karyotypic evolution in phyllostomid bats (Chiroptera: Phyllostomidae) as revealed by chromosome painting. Current position: Post-doctoral Fellow, Brazilian National Council for Scientific and Technological Development, Brasilia, Brazil.

**Nurul Ain Elias, Ph.D.** Chair: Tigga Kingston. Dissertation title: The influence of roosting ecology and insect resources on the reproductive phenology of Malaysian rainforest insectivorous bats. Current position: University of Science, Malaysia.

**Jon H. Falcone, M.S. (Range and Wildlife Management, Sul Ross State University).** Co-chairs: Patricia Moody Harveson (Sul Ross State University) and Robert D. Bradley. Thesis title: The taxonomic and conservation status of the Pecos River Muskrat. Present position: Technical and Support Specialist, International Environmental Associates Inc., Houston, Texas.

**Nicholas Goforth, M.S.** Chairs: Robin Verble and Tigga Kingston. Thesis title: Short-term effects of wildfire on bat activity on the Valles Caldera National Preserve, New Mexico.

**Chun-Chia Huang, Ph.D.** Chair: Tigga Kingston. Dissertation title: Diversity and conservation of bats in a coffee-forest landscape in Sumatra, Indonesia. Current position: Biodiversity Research Center, Academia Sinica, Taipei.

**Megan Keith, Ph.D.** Chair: Robert D. Bradley. Dissertation title: Phylogenetic relationships, divergence, and radiation within the subfamily Neotominae (Rodentia: Cricetidae). Current position: Faculty, South Plains College, Levelland, Texas.

**Julie Parlos, Ph.D.** Chair: Robert J. Baker. Dissertation title: Estimating genetic boundaries with the application of multiple operational criteria. Current position: Senior Research Associate, The Institute of Environmental and Human Health, Texas Tech University.



*Robert Bradley and students with a day's catch at Matador Wildlife Management Area.*



*Jorge Salazar-Bravo and field crew in central Texas.*

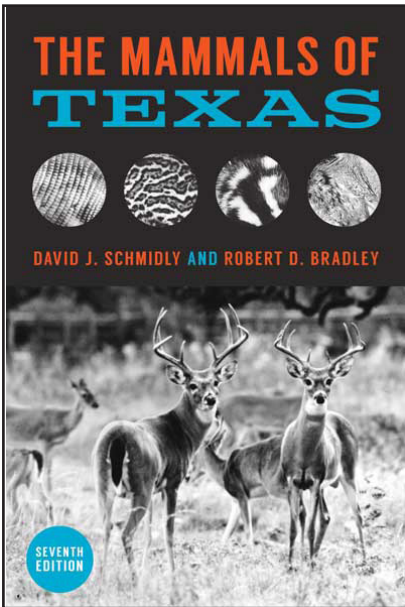


*A graduation selfie! Robert Baker with Ph.D.'s Cibele Sotero-Caio and Julie Parlos.*

## New Leadership for the Museum of Texas Tech University



The NSRL welcomes **Gary Morgan** (Ph.D., Monash University, Melbourne, Australia), as the new Executive Director of the Museum of Texas Tech University! Gary hit the ground running, and has been a strong leader for the Museum from the moment he began his new position in November of 2015. He has ambitious plans for revitalizing the Museum and strengthening its connections with the Lubbock community, the University, researchers, donors, and more. Gary's educational and research background is in invertebrate marine zoology, but he has a great appreciation for art, history, culture, and all that museums can offer to society. He has held positions of leadership at several museums worldwide, including the Australian Museum, Western Australian Museum, and Michigan State University Museum. His varied experience and background in scientific research, education, and museum leadership makes him an ideal fit for the Museum of Texas Tech University. The NSRL is excited to be working with Gary as he leads the Museum toward a vibrant future of growth and change that promises to be educational, engaging, and inspiring.



## Seventh Edition of *The Mammals of Texas* co-authored by David J. Schmidly and Robert D. Bradley

The 7<sup>th</sup> edition of *The Mammals of Texas* is due to be published by University of Texas Press in August 2016. Robert D. Bradley was invited by David J. Schmidly to co-author this latest revision. Including physical descriptions, life history information, and images for 202 terrestrial and marine mammals, this edition incorporates the latest updates in the taxonomy, distribution, population status, and conservation status for each species. *The Mammals of Texas* (ISBN: 978-1-4773-0886-8) is now available for pre-order from the website of UT Press at [www.utexaspress.com](http://www.utexaspress.com).



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## Upcoming Publication on Phyllostomid Bats is Career Highlight for Robert J. Baker

Retired Horn Professor **Robert J. Baker**, former Director of the NSRL, has just completed his work on the relationships of one of the most diverse families of bats known to science. The paper, titled “Higher Classification of Phyllostomid Bats with a Summary of DNA Synapomorphies”, is co-authored by Sergio Solari, Andrea Cirranello, and Nancy Simmons and will be published in *Acta Chiropterologica* in 2016 (see Abstract below). Baker initiated his work on this project when he was a graduate student at the University of Arizona in 1966. He published several attempts to classify this group in earlier papers, but only with the development of DNA sequencing and electronic databases has it been possible to resolve the relationships of these bats and provide statistical support for monophyletic groups. This family came from insectivorous bats, and evolved into vampire bats, nectar feeders, fruit eaters, and others. This research resulted in an accurate and detailed description of a very complex biological radiation.

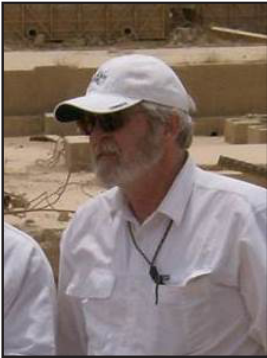
### Abstract

The family Phyllostomidae is recognized as representing the most extensive radiation known in any mammalian family. Creating a Linnaean classification for this clade has been difficult and controversial. In two companion papers, we here propose a revised classification drawing on the strengths of genetic and morphological data and reflecting current ideas regarding phylogenetic relationships within this monophyletic clade. We recognize 11 subfamilies (Macrotinae, Micronycterinae, Desmodontinae, Phyllostominae, Glossophaginae, Lonchorhininae, Lonchophyllinae, Glyphonycterinae, Carollinae, Rhinophyllinae, and Stenodermatinae), 12 tribes (Diphyllini, Desmodontini, Macrophyllini, Phyllostomini, Vampyrini, Glossophagnini, Brachyphyllini, Choeronycterini, Lonchophyllini, Hsunycterini, Sturnirini, and Stenodermatini), and 9 subtribes (Brachyphyllina, Phyllonycterina, Anourina, Choeronycterina, Vampyressina, Enchisthenina, Ectophyllina, Artibeina, and Stenodermatina). The proposed arrangement avoids non-monophyletic associations, only keeping those detected based on analyses of DNA sequence data. We propose that a classification based on the strengths of the most complete morphological and genetic data sets will provide the most robust classification for multiple uses by science and society.



## TTU FACULTY ASSOCIATES OF THE NATURAL SCIENCE RESEARCH LABORATORY

The following faculty at Texas Tech University have research programs that both contribute to and benefit from a working relationship with the Natural Science Research Laboratory. Graduate and undergraduate students of these faculty members, as well as those of the faculty Curators of the NSRL, conduct field-based research studies that result in growth of the NSRL collections and conduct laboratory-based research utilizing the resources of the NSRL to advance the sciences of mammalogy, ornithology, invertebrate zoology, wildlife ecology, and many other disciplines. The NSRL's strong history of field-based and organismal research, and continued commitment to such endeavors, set us apart from many other natural history programs.



**Dr. Ron Chesser** is a Professor of Biological Sciences and the department Chair. His research program focuses on assessing radioactive contamination, reconstructing flow of radioactive materials into the environment, and modeling the impacts and recovery of mammal populations affected by radiation. He has conducted research at Chernobyl, Ukraine since 1992. He worked in Iraq for 8 years (2005–2013) dismantling the former nuclear infrastructure, and he has contracted with the US Department of State, Department of Energy, International Atomic Energy Agency, Great Britain Ministry of Industry, US Civilian Research & Development Foundation, and the European Commission.

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**Dr. Tigga Kingston** is an Associate Professor of Biological Sciences. Her research and activities are dedicated to the conservation ecology of Paleotropical bats. She has been working on the conservation ecology of bats of Southeast Asia for >20 years, with projects in Malaysia, Indonesia, Myanmar, Philippines, and Vietnam. More recently, she has student projects and collaborations in Africa, specifically Nigeria, Kenya, and South Africa.

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**Dr. Liam McGuire** is an Assistant Professor of Biological Sciences. His research focusses on the ecology and physiology of bats and birds in situations of energy limitation (e.g., migration, hibernation) and the strategies these animals use to cope with environmental variation, often in the context of conservation issues. He takes an integrative approach using techniques ranging from molecular biology and biochemistry, to whole animal physiology, behavioral and movement ecology. Current research foci include the physiological ecology of bat migration, and the physiological ecology and pathophysiology of hibernating bats affected by white-nose syndrome, a devastating fungal disease responsible for killing millions of North American bats.

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**Dr. David A. Ray** is an Associate Professor of Biological Sciences. The Ray laboratory focuses on the study of genomes and genome evolution with an emphasis on transposable elements and their role in the diversification of species. Model organisms include bats, several other mammals, and crocodylians.

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**Dr. Brenda Rodgers** is an Associate Professor, Department of Biological Sciences. Her research centers on the impacts of radiation on small mammals, mechanisms of adaptation to low dose radiation in pregnant females and fetuses, and human health issues in contaminated environments. She has worked on mammal population impacts at Chernobyl, Ukraine since 1997. She worked for eight years in Iraq evaluating human impacts in contaminated regions and training scientists on laboratory practices, and she has contracted with the US Department of Energy (Low-dose Program), US Department of State, and the Civilian Research & Development Foundation.

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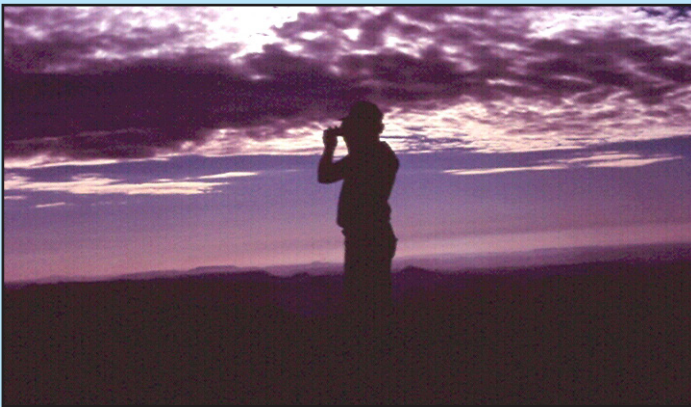
**Dr. Jorge Salazar-Bravo** is an Associate Professor of Biological Sciences. His research revolves around two basic themes: developing and testing phylogenetic hypotheses for mammalian taxa at various hierarchical levels; and using first principles in ecology and evolution to understand the triggers for disease emergence. Research topics he has pursued, as represented in his publications, include: Systematics, biogeography, evolution, and conservation of Neotropical mammals; the Ecology and Evolution of virus/host co-evolution, and the interplay between ecology and disease.

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**Dr. Richard Stevens** is an Associate Professor of Natural Resources Management. He is a bat and rodent community ecologist, macroecologist, and biogeographer. His lab does collections-based ecological work in Paraguay, Colombia, Mojave Desert and Texas. They also conduct morphometric studies to try to better understand the relationship between form and function in bats as well as how phenotypic variation contributes to large scale patterns of biodiversity.

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*Looking for good students! Bradley in Davis Mountains, Texas.*

## A Message to Prospective Students:

Faculty and staff associated with the NSRL are very active in field- and specimen-based research. Our faculty and students have interests in mammalogy, ornithology, invertebrate zoology, molecular systematics, genomics, ecology, and museum science. Most of the undergraduate and graduate students that are affiliated with the NSRL receive degrees in the Department of Biological Sciences or the Department of Natural Resources Management. We

also have students who are part of the Museum Science program. Together, we have a strong core of faculty and undergraduate and graduate students, and we are always on the look-out for potential new students. If you are interested in pursuing a graduate degree or undergraduate research opportunities, please contact any of the faculty members highlighted in this newsletter.



## PLEASE SUPPORT THE NSRL

Dear Former Students, Colleagues, and Friends:

In 2015, a fund-raising initiative for the NSRL was established. The NSRL Fund for Excellence is designed to help support the many collections activities of the NSRL. Our goal is to use these funds to establish a student curatorial position. This position would enable the NSRL to improve curatorial and collection management activities, as well as help support students with a professional interest in natural history collections. As this fund grows, we envision that we will be able to financially support multiple students.

Your contribution to the Natural Science Research Laboratory Fund for Excellence is very important to the future of the NSRL. With limited, and often declining, funding from state and federal sources, the NSRL needs your help to ensure our continued service to the academic and scientific communities. We appreciate your consideration in giving a tax deductible donation in support of the NSRL's operations and research. Many of you benefited from the resources provided by the NSRL, now we ask that you help the NSRL continue its quest to be among the premier natural history collections in the world.

Donations to the NSRL Fund for Excellence may be made through the Texas Tech Foundation, Inc. To donate by check, please make the check payable to Texas Tech Foundation, designate NSRL Fund for Excellence on the memo line, and mail to: Texas Tech University System, Financial Services, Box 45025, Lubbock, TX, 79409-5025. To give by phone, call toll free: 1-866-448-3888. To donate online, visit the website of TTU Institutional Advancement at <https://apps.texastech.edu/onlinegiving/> and enter Natural Science Research Laboratory Fund for Excellence in the search box.

**YOUR SUPPORT IS APPRECIATED! THANK YOU!**

*NSRL News* is produced biannually by Lisa Bradley with assistance from the staff, research scientists, and graduate students of the NSRL. Please contact Lisa to request a hard copy or to submit comments or contributions for upcoming issues of *NSRL News*.

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