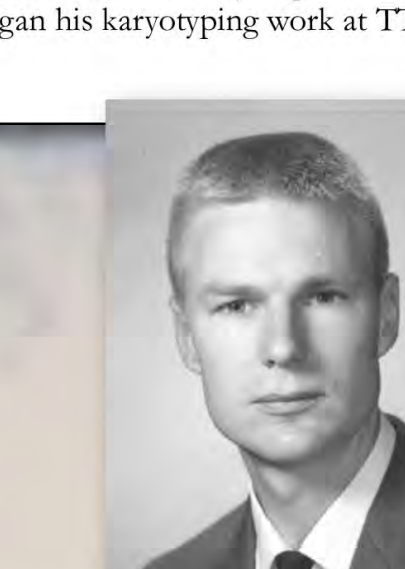
HISTORY OF THE NATURAL SCIENCE RESEARCH LABORATORY, MUSEUM OF TEXAS TECH UNIVERSITY

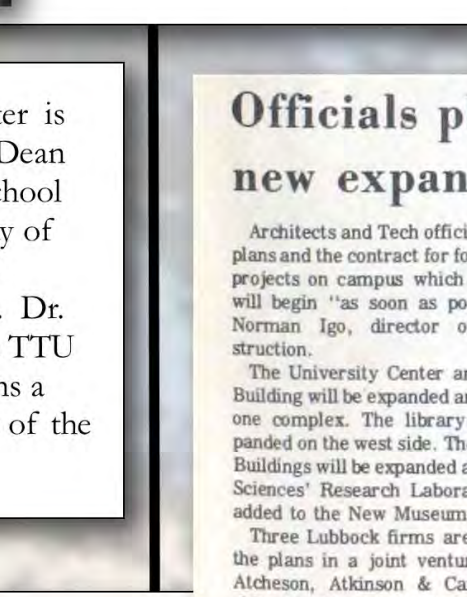
Dr. Robert L. Packard is hired as the first mammalogist in the TTU Department of Biological Sciences. He brings with him a collection of about 350 mammal specimens from his research while at Stephen F. Austin State University. He and his students actively begin fieldwork to grow the collection.

Dr. Robert J. Baker is hired as the second mammalogist in the Department of Biological Sciences. His research focus is on mammalian cytogenetics. Cell suspensions and karyotype slides are maintained in Dr. Baker's laboratory in the Department of Biological Sciences. In later years, PCR amplification techniques that can produce DNA sequences from these cell suspensions, and even from scrapings from karyotype slides, are developed. Thus, Dr. Baker was fond of saying that the NSRL's Genetic Resources Collection "actually began in 1967," when he began his karyotyping work at TTU (but see 1977).



Dr. J. Knox Jones, Jr ., is hired as Dean of the Graduate School of TTU, and is named Acting Director of the Museum and serves in that position for one year. Dr. Jones is named Associate Vice-President for Research in 1972 and Vice-President for Research and Graduate Studies in 1974.

Dr. Dilford C. Carter is hired as Associate Dean of the Graduate School and joins the faculty of the Department of Biological Sciences. Dr. Carter retired from TTU in 1990, and remains a Research Associate of the NSRL.



Officials plan new expansions

Architects and Tech officials discussed plans and the contract for four expansion projects on campus which construction will begin "as soon as possible," said Norman Igo, director of new construction.

The University Center and the Music Building will be expanded and joined into one complex. The library will be expanded on the west side. The Psychology Buildings will be expanded and a Natural Sciences' Research Laboratory will be added to the New Museum.

Three Lubbock firms are drawing up the plans in a joint venture. They are Atcheson, Atkinson & Cartwright Architects, Schmidt & Tisdel Architects, and Stiles, Roberts, Messersmith, & Johnson Architects.

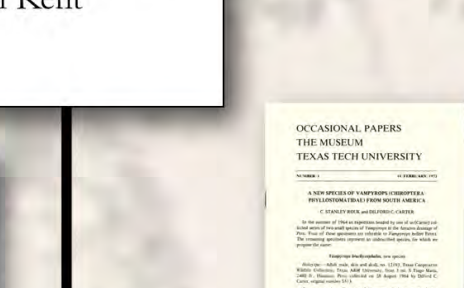
The first PhD degree in mammalogy is granted from the Department of Biological Sciences. Herschel Walker, advised by Dr. Packard, produces a dissertation entitled "Population Dynamics, Reproduction, and Activities of the Kangaroo Rat, *Dipodomys ordii*, in Western Texas."

August 1971, *University Daily* article – Architects and Tech officials announce several expansion projects to begin "as soon as possible", including a new expansion of the Museum, to be named the Natural Science Research Laboratory. The design of the NSRL is based on plans created by Drs. Robert J. Baker, Robert L. Packard, J. Knox Jones, Jr., and Dilford C. Carter.

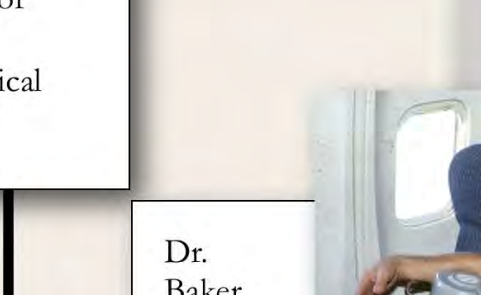
October–December 1972, *Museum Digest* – Curators of the Museum for biological collections include: Hugh H. Genoways, Mammalogy; Craig C. Black, Vertebrate Paleontology; John Brant, Invertebrate Paleontology; John Mecham, Herpetology/Ichthyology; and Raymond C. Jackson and David Northington, Botany. Research Associates of the Museum in biological collections include: Robert J. Baker, Dilford C. Carter, J. Knox Jones, Jr. (mammalogy); Robert W. Mitchell (invertebrates); and Michael Kent Rylander (ornithology).

Construction of the Natural Science Research Laboratory building begins, south of and adjoining the Museum.

The collections of the Biological Sciences Division of the Museum—mammals, birds, herps, fishes, invertebrates, and vertebrate paleontology—are moved into the new NSRL facility. The botany collection of TTU remains at the Department of Biological Sciences.



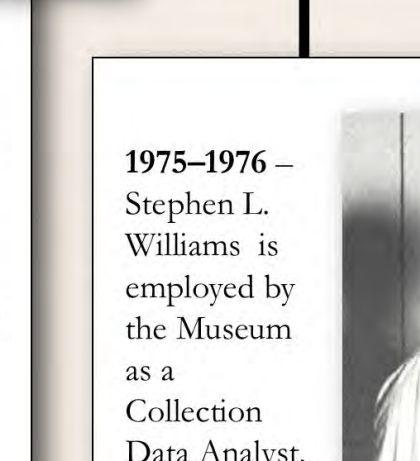
The first issues of *Occasional Papers* and *Special Publications*, publication series conceived and established by Dr. J. Knox Jones, Jr., are published. Dr. Jones served as Editor of both series from 1972 until his passing in 1992, at which time Dr. Baker became Editor. Dr. Robert D. Bradley has served as Editor since 2014.



Dr. Baker and his students begin collecting tissues from specimens in the field and placing them directly into liquid nitrogen dewars. During this same period, cultured cell lines from karyological research are being preserved in liquid nitrogen dewars and in an ultracold freezer in the Biology Department, and tissues are used for electrophoretic techniques to visualize DNA and proteins by molecular size. These early tissue samples are "used up" and not saved.

January–March 1975, *Museum Digest* – Current Curators are: Hugh H. Genoways , Mammalogy; John Mecham, Herpetology/Ichthyology; Raymond C. Jackson, Botany; Robert W. Mitchell, Invertebrate Zoology; David E. Foster, Entomology; Danny B. Pence, Medical Zoology; Craig C. Black, Vertebrate Paleontology; John Brand, Invertebrate Paleontology; and Michael Kent Rylander, Ornithology.

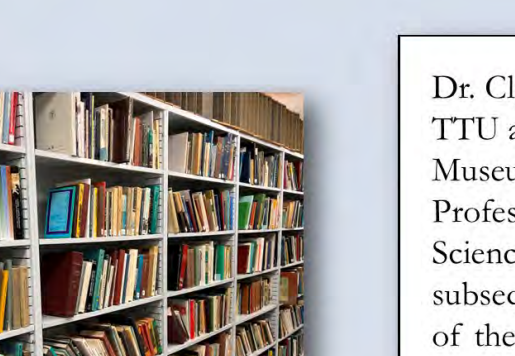
1975–1976 – Stephen L. Williams is employed by the Museum as a Collection Data Analyst.



ca. 1975–1977 – Dr. Baker is appointed as the "Curator of Living Tissues", a new collection, and as Curator of Mammalogy (the exact dates of these appointments are uncertain). Two ultracold freezers containing frozen cell lines and tissue samples are transferred from Biology to the NSRL. The freezers are located in Room 204, which at the time is a laboratory and prep space.

"Freezer location," "tissue cultured," and "electrophoretic tissue" are added as data fields to TK pages.

January–April 1977, *Museum Digest* – In a feature article about the new Living Tissues Collection, Dr. Baker mentions the concept of loaning cell lines to other scientists for research purposes. Research Associates of the Museum that are mammalogists include Drs. Dilford C. Carter, Jerry R. Choate, J. Knox Jones, Jr., Robert L. Packard, Carleton J. Phillips, and David J. Schmidly.

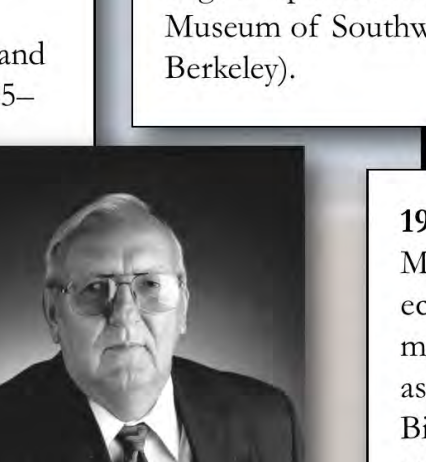


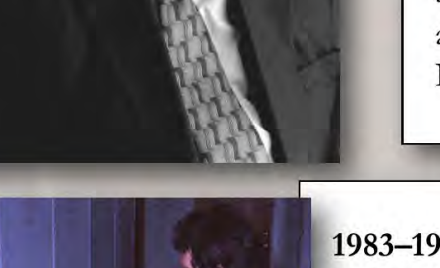
The Robert L. Packard Natural History Library is established with the donation of Dr. Packard's research library upon his death.

The Invertebrate Collection is transferred to the purview of the Department of Plant and Soil Sciences (then known as the Entomology Department) and combined with that department's collections.

The Medical Zoology Collection, while remaining a component of the Museum, is moved to the laboratory of Dr. Danny B. Pence at the TTU Health Sciences Center.

Dr. Clyde Jones is hired by TTU as Director of the Museum (1982–1985) and Professor of Biological Sciences (1982–2015), and subsequently serves as Chair of the Museum Science Department (1985–1987) and Curator of Mammals (1985–2015).





Check boxes for "liver, kidney, heart, muscle, and blood" are added to TK pages.

In a survey of mammal and tissue collections, Dr. Baker reports that the NSRL holdings in the Frozen Tissues Collection include "5,000 frozen tissues for electrophoresis, 500 frozen cell lines, and 10,000 karyotypes" as of July 1983. The TTU tissue collection is the 3rd largest reported in that survey (after the Museum of Southwestern Biology and UC Berkeley).

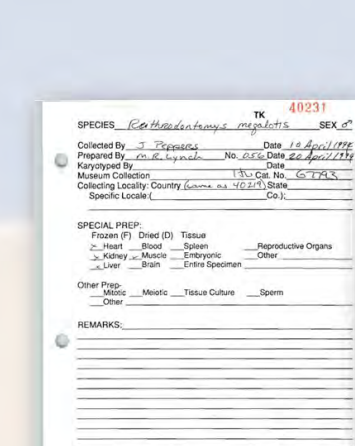
1983–2005 – Dr. Michael Willig, ecologist and mammalogist, serves as Professor of Biological Sciences and a research associate of the NSRL.

1983–1989 – Dr. Robert Owen serves as Collection Manager of the NSRL.

Dr. J. Knox Jones, Jr. steps down from his administrative roles and returns to full-time teaching and research in Biological Sciences, and he is named Curator of Mammals.

Drs. Robert Owen, Ronald Chesser, and Clyde Jones receive funding from Digital Equipment Corporation for "Development of Museum Computer Operations".

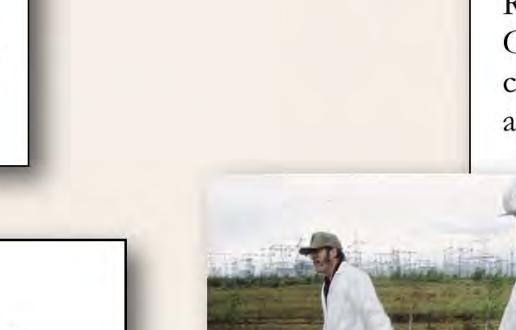
Drs. Robert J. Baker and Robert D. Owen are awarded an NSF grant of $131,130 for "Updating and Enhancement of the Recent Mammal Collections, Texas Tech University." The grant funds the purchase of archival-quality metal specimen cases and drawers, an additional ultracold freezer, and the move of the Tissue Collection from Room 204 (a prep lab, at the time) to a dedicated room, Room 203.



Drs. Baker and Bradley update the TK page to include "spleen, brain, embryonic, reproductive organs, and entire specimen". TK "books" also are changed to 3-ring binders with hole-punched TK pages, rather than bound books. This change allows for easier data recording and copying (and later digitizing) and for completed pages to be archived by the Curator of Collections between collecting trips, thus reducing the risk of data loss if a TK book is lost or damaged.

Dr. Ronald K. Chesser returns to the Department of Biological Sciences at TTU as Professor of Biological Sciences and Research Associate of the NSRL.

ca. 1993 – subsampling of tissues, rather than loaning whole tubes, becomes the standard loan policy of the NSRL.



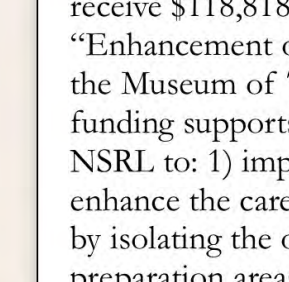
The Chernobyl collection of radioactive vouchers and tissue samples is established at the NSRL, resulting from a long-term research effort in the Chernobyl region led by Drs. Ronald K. Chesser and Robert J. Baker . The Radioactive Collection of the NSRL now consists of 14,371 tissue samples and >3,000 voucher specimens.

1995–2003 – Dr. R. Richard Monk is employed in the NSRL as Collections Manager (1995–1996) and as Curator of Collections (1996 –2003).

The Texas State Legislature establishes line item funding for Texas Tech University to develop a Biological Database for the State.

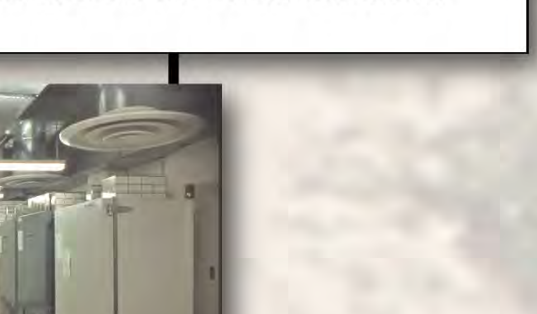
1996 – present – In 1996, Lisa Bradley (M.S., Wildlife Biology) is hired as a Research Associate by Dr. David Schmidly, then Graduate Dean of TTU. Over the years, her position evolves to include production of the *Occasional Papers* and *Special Publications* series, development of grant proposals, coauthoring of manuscripts and books, website management, and other contributions to the productivity of the NSRL.

The Invertebrate Zoology collection (now including the Entomology Collection of ~465,000 specimens) is transferred from the Department of Plant and Soil Sciences to the NSRL and reaccessioned by the Museum.



Dr. Marilyn Houck is appointed as Curator of Invertebrate Zoology.

Drs. Robert Bradley, Robert Baker, David Schmidly, Clyde Jones, and Richard Monk receive $118,818 in NSF funding for "Enhancement of Collections and Safety at the Museum of Texas Tech University." This funding supports a major renovation of the NSRL to: 1) improve workflow efficiency; 2) enhance the care and safety of the collections by isolating the office, collections, and preparation areas from one another, 3) allow for growth of the collections by taking advantage of space made available by the transfer of the Vertebrate Paleontology collection to the Museum basement. As part of the renovation, Rooms 202 and 201A are combined and renovated to accommodate 11 ultracold freezers for the Tissue Collection.



Dr. Clyde Jones is appointed Horn Professor.

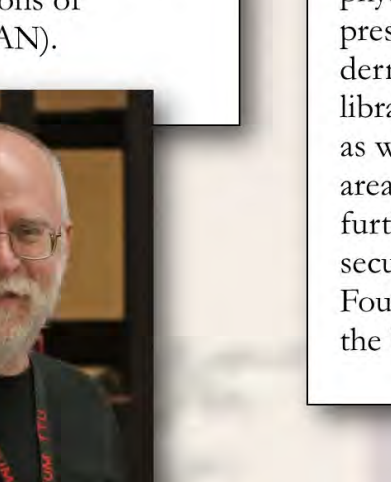
2000—present. In June 2000 Heath J. Garner began work as a Research Assistant at the NSRL. In 2003 when Richard Monk departed, he took over the duties of Curator of Collections, a position he would officially obtain in 2005. During his time, Heath redesigned the main vertebrate database and expanded the online database. He also designed the barcode generator that the NSRL currently uses. As the longest tenured Curator of Collections, he also led the first comprehensive inventory of the vertebrates to the drawer level.

Dr. David J. Schmidly, President of Texas Tech University, and Chancellor John Montford commit part of a large private donation to the university for the construction of a new wing of the NSRL, which will nearly double the footprint of the NSRL.

The NSRL's 100,000th mammal specimen is cataloged.

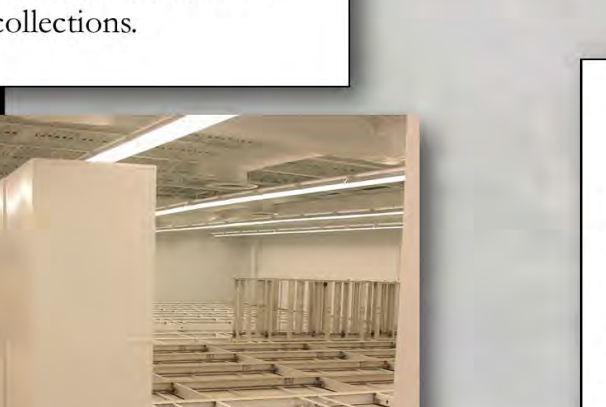
2003–2007 – Donations from James E. Sowell provide funding for international collecting expeditions to the Caribbean, Ecuador, Honduras, Mexico, Malaysia, Ukraine, and the Kyrgyz Republic. These expeditions result in valuable collections of mammal specimens and tissues, in terms of quantity, diversity, and research value, as well as student educational experiences and numerous publications.

2003–2015 – James Cokendolpher serves as Assistant Curator of Invertebrate Zoology and Research Scientist. In 2012, receives funding as part of a collaborative NSF grant to digitize and enter records of arthropods of the southwestern US into the Symbiota Collections of Arthropods Network (SCAN).



The Frozen Tissue Collection is officially renamed the Genetic Resources Collection (GRC).

Drs. Bradley and Baker receive $224,999 in NSF funding for "Collection Enhancement, Enlargement, and Compactorization at the Natural Science Research Laboratory." This funding supports additional staffing and the physical move of the mammal and fluid-preserved collections, preparation lab, dermestid beetle colony, student offices, library, etc., into the new wing of the NSRL, as well as a reorganization and repurposing of areas in the original wing of the NSRL. In further support of this project, Gary Edson secures funding from the Helen Jones Foundation for additional museum cases for the bird and mammal collections.



Dr. Robert J. Baker retires; Dr. Robert D. Bradley is named Director of the NSRL.

Dr. Caleb D. Phillips is hired by the Department of Biological Sciences and is named Curator of the GRC. He holds a joint appointment between Biology and the Museum.

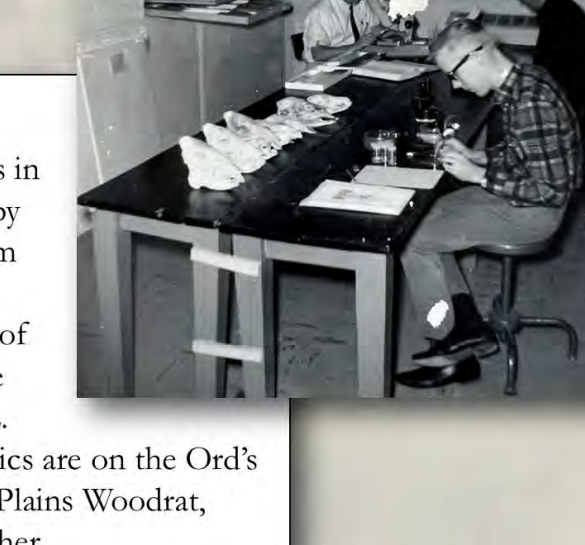
The Wolcott Wound Care Collection is established when a local medical doctor donates funds to purchase a liquid nitrogen freezer designated for microbiome samples from human wounds. This donation is in support of a collaborative microbiome research project led by Dr. Caleb D. Phillips.

Dr. Jennifer C. Girón begins volunteering in the Invertebrate Zoology Collection, and is soon tasked with "reopening" the collection for loans and research. Dr. Girón is later given the title of Acting Collections Manager and hired as a Research Aide.

NATURAL
SCIENCE
RESEARCH
LABORATORY

The current collections of the NSRL number: Mammals, >156,500 specimens; GRC, >470,000 samples from > 110,000 specimens and ~1,400 species; Birds, >6,000 specimens; Invertebrate Zoology, >4.6 million specimens. Current staff of the NSRL are: Dr. Robert D. Bradley, Director and Curator of Mammals; Dr. Caleb D. Phillips, Curator of the Robert J. Baker Genetic Resources Collection; Dr. Nancy E. McIntyre, Curator of Birds; Dr. Richard D. Stevens, Curator of Mammals; Dr. Jennifer Girón, Acting Collections Manager, Invertebrate Zoology; Heath J. Garner, Curator of Collections; Kathy MacDonald, Collections Manager, Robert J. Baker Genetic Resources Collection; Lisa C. Bradley, Production Editor for Publications; Heidi Stevens, Research Aide.

1962 · 1964 · 1967 · 1970 · 1971 · 1972 · 1973 · 1974 · 1975 · 1976 · 1977 · 1978 · 1979 · 1981 · 1982 · 1983 · 1984 · 1986 · 1988 · 1989 · 1990 · 1991 · 1992 · 1994 · 1995 · 1996 · 1998 · 1999 · 2001 · 2002 · 2003 · 2004 · 2006 · 2015 · 2018 · 2022



The first graduate degrees in mammalogy are granted by TTU. Paul Desha, William Grabowski , and Duane Ikenberry receive Master of Science degrees under the direction of Dr. Robert L. Packard. Their thesis topics are on the Ord's Kangaroo Rat, Southern Plains Woodrat, and Mexican Pocket Gopher.

Dr. Baker devises the TK ("Tech Karyotypes", later the "Tissues and Karyotypes") system for organizing karyotype samples and slides housed in his laboratory. (Initially, karyotypes are numbered with a "Z" acronym; the use of TK begins with TK301.) The Z and TK pages are hand-written with the Z or TK number and information such as species, sex, and locality. This hand-written system is used until 1972.

The newly constructed building for The Museum of Texas Tech University on 4th Street and Indiana Avenue is completed, and the collections of The Museum (History, etc.) are moved into the facility from their former location at Holden Hall . The collections include Vertebrate Paleontology.

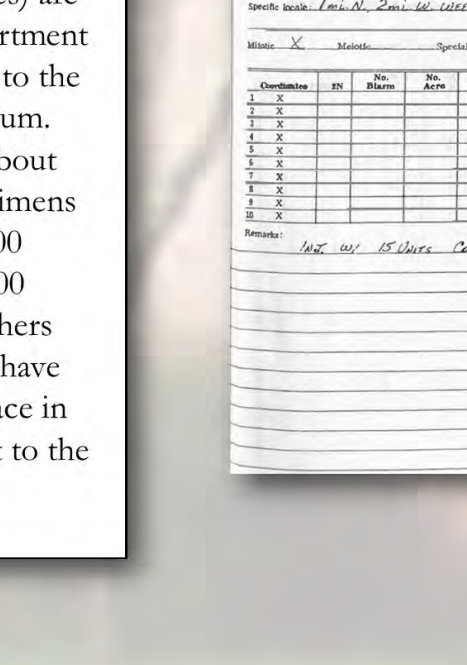
Museum, November 1970

1970–1977 – Dr. Packard serves as "Museum Coordinator for Research" and later "Curator of Biology".

Curators within the "Division of Biological Sciences" of the Museum are Drs. Packard (Biology), John "Jack" Mecham (Herpetology/Ichthyology), and Craig C. Black (Vertebrate Paleontology). Research Associates of the Division include Drs. Robert J. Baker, Dilford C. Carter, Hugh H. Genoways, and J. Knox Jones, Jr. (all mammalogists).

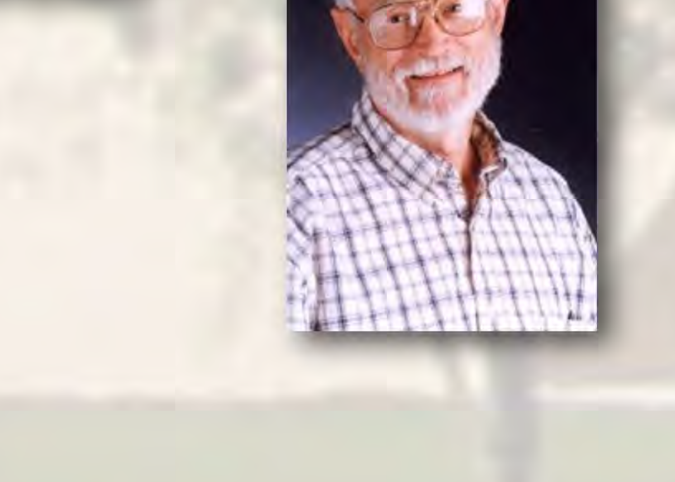
The biological collections (mammals, birds, herps, fishes, and invertebrates) are moved from the Department of Biological Sciences to the basement of the Museum. The collections total about 26,500 vertebrate specimens (15,000 mammals; 1,000 birds; 7,000 herps; 3,500 fishes). Senior researchers and graduate students have office and research space in the basement, adjacent to the collections.

The first standardized, printed TK page (template) is created for recording karyotype and specimen information. From the template, blank pre-numbered TK pages are printed en masse and hard bound with red cloth covers. TK page templates evolve many times over the years to reflect changing research needs and methodologies (see 1977, 1983, 1990, 1998, 2015).


TK 5001

Annual Report of the Museum – During the period November 1970 to August 1972, the Division of Biological Sciences produced 43 scientific publications (41 on mammals and 2 on reptiles/amphibians), and an 15 additional papers were accepted. The senior authors were: J. Knox Jones, Jr. (11), Robert J. Baker (10), students (9), Hugh H. Genoways (5), Dilford C. Carter (4), Robert L. Packard (3), and John Mecham (1).

Curators at the time are: Hugh H. Genoways, Mammalogy; John Mecham, Herpetology/Ichthyology; Raymond C. Jackson, Botany; Robert W. Mitchell, Invertebrate Zoology; Craig C. Black, Vertebrate Paleontology; John Brand, Invertebrate Paleontology; and Michael Kent Rylander, Ornithology.



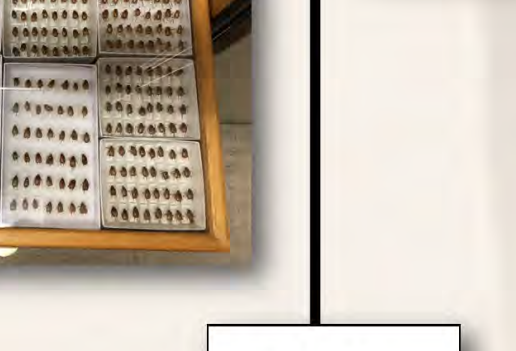
August 26, 1974, notes of Museum Curator's meeting – Dr. Danny B. Pence is Curator of the new Medical Zoology collection, originated in 1973; Dr. David E. Foster is Curator of Entomology; Dr. Alfred Bjelland (Coordinator of Education, and a skilled taxidermist) is Associate Curator of Ornithology.

1975–1976 – Dr. Hugh H. Genoways serves as Acting Coordinator of Research for the Museum after Dr. Packard steps down.

The Mammal Collection is accredited by the American Society of Mammalogists. The collection at the time numbers about 25,000 specimens.

Dr. Hugh H. Genoways leaves TTU for a position at the Carnegie Museum, but he remains a Research Associate of the NSRL to the present day. Dr. Baker is named Museum Coordinator for Research.

The Invertebrate Zoology Collection is estimated to contain 250,000 specimens of 100,000 species.



The Bird Collection contains approximately 3,000 study skins and 300 sets of eggs.

Dr. Robert J. Baker is appointed Horn Professor, the highest faculty honor bestowed by TTU Texas Tech University. At the time, Dr. Baker was the youngest faculty member ever to receive that honor (age 37).

1981–1989 – Dr. Ronald K. Chesser serves as Assistant and then Associate Professor in the Department of Biological Sciences, where he directs several graduate students in mammal-based research. While at Texas Tech, Chesser contributes substantially to the Museum Science program, especially in database management and computerization of the collections.

June 1982 - The first documented loan from the NSRL's Frozen Tissues Collection (six liver samples from bats) is made to Dr. Mark Weiss at Wayne State University, Detroit, Michigan. At that time, entire vials of tissue are "loaned" and subsequently destroyed in the process of research.

ca. 1983–1984 – Dr. Robert J. Baker is named Director of the NSRL (a new designation). The exact date of this appointment is uncertain.

March 29, 1983, *University Daily* – In a feature article about the mammal collection, the NSRL is said to hold the 15th largest mammal collection in the US.

Museum's science lab researches mammals

The NSRL's 40,000th mammal specimen is cataloged.

Dr. J. Knox Jones, Jr. is appointed Horn Professor of Biological Sciences and Museum Science.

February 1988 – The NSRL's 50,000th mammal specimen is cataloged. Lubbock Mayor Peck McMinn declares the day as "Natural History Day."

October 18, 1988, *University Daily* – Dr. Robert D. Owen, Collection Manager, states that the mammal collection is "one of the best maintained and largest in the nation" despite being a young collection, with 80-90% if the specimens collected in the past 20 years. Dr. Owen mentions that the Frozen Tissue Collection holds 17,000 frozen samples from 8,000 individuals preserved in ultracold freezers, and that the NSRL has received an extension of the 1986 NSF grant, with an additional $125,000 for maintenance and organization of tissues and hiring of a graduate assistant.

THE UNIVERSITY DAILY TUESDAY, OCTOBER 18, 1988

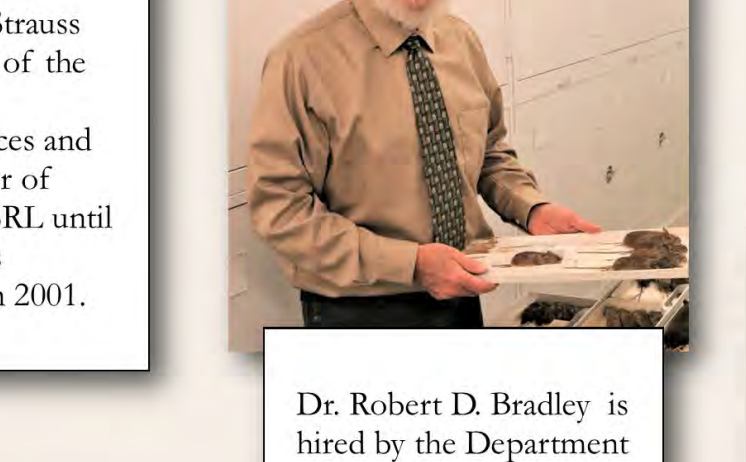
Museum lab collects mammal specimens

Collected specimens

The Frozen Tissues Collection is reported to consist of approximately 25,000 samples from 11,000 specimens.

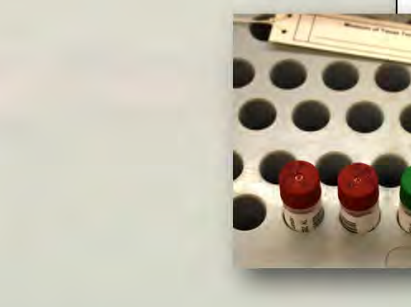
1990–1995 – Stephen L. Williams returns to TTU as a Collection Manager in the NSRL and as an Adjunct Professor of Museum Science.

Dr. Richard E. Strauss joins the faculty of the Department of Biological Sciences and serves as Curator of Fishes at the NSRL until that collection is deaccessioned in 2001.

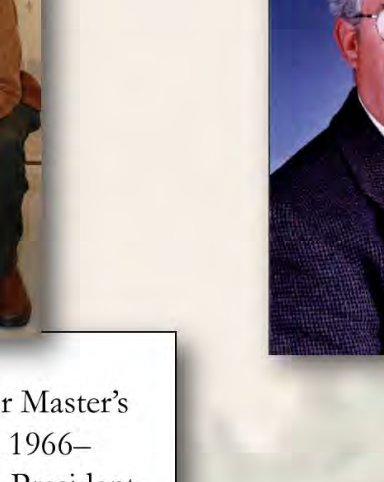


Dr. Robert D. Bradley is hired by the Department of Biological Sciences and is named Curator of Mammals. He holds a joint appointment between Biology and the Museum.

Dr. Monk initiates a Data Enhancement Project that includes: transforming the existing flat database into a relational database (then known as "WildCat"); expanding the TK system to include all specimen parts; publishing one of the first searchable mammal collections on the web (1997); and adding bar codes on mammal specimen tags and tissue tube labels. The NSRL was one of the first natural history collections in the US to implement bar codes broadly throughout collections to reduce transcription errors of specimen data and to reduce the potential thawing of frozen samples during processing. The Tissue Collection at this time is estimated to contain 50,000 samples.

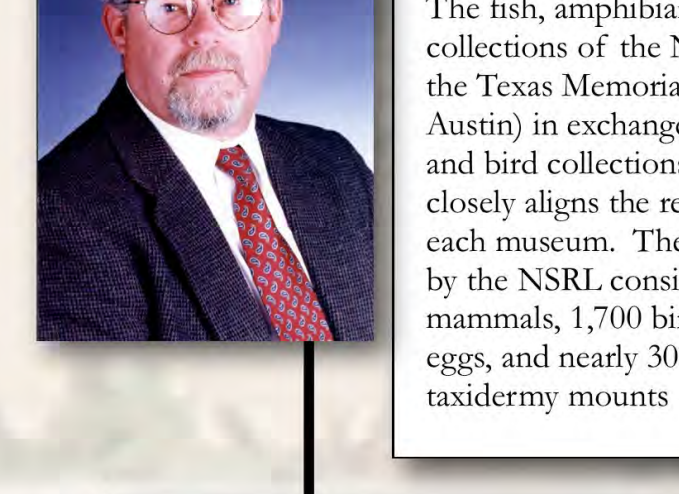


Vertebrate Paleontology becomes a separate Division of the Museum, and that collection is moved from the NSRL to the basement of the Museum.



Dr. David J. Schmidly (former Master's student of Robert L. Packard, 1966–1968), returns to TTU as Vice President for Research, Graduate Studies, and Technology Transfer, and Graduate Dean (1996–2000), and then as President of TTU (2000–2003). He also serves as Professor of Biological Sciences and Research Associate of the NSRL.

After many years of professional association with J. Knox Jones, Jr., Hugh H. Genoways, Robert J. Baker, and others affiliated with the NSRL, Dr. Carleton J. Phillips is hired as Department Chair and Professor of Biological Sciences, and he serves as a Research Associate of the NSRL.

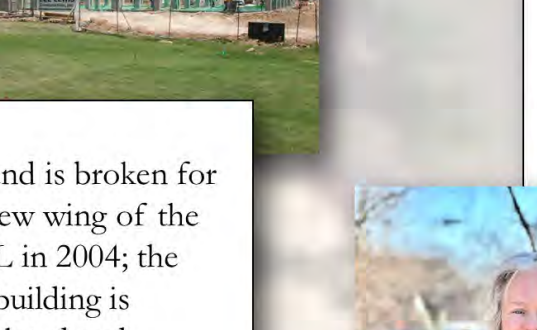


The TK page design is significantly altered, including options for several new tissue and preparation types, and the addition of UTM or lat/long coordinates. The latter change is in recognition of the importance of accurate locality data and the more common use of GPS technology in the field.

The fish, amphibian, and reptile collections of the NSRL are traded to the Texas Memorial Museum (UT Austin) in exchange for their mammal and bird collections. This trade more closely aligns the research strengths of each museum. The collection acquired by the NSRL consists of nearly 7,000 mammals, 1,700 birds, 800 clutches of eggs, and nearly 300 bird and mammal taxidermy mounts

The Medical Zoology Collection onsisting of 33,057 catalogue entries of about 70,000 invertebrate specimens is returned to the NSRL from Dr. Pence's laboratory at the TTU Health Sciences Center.

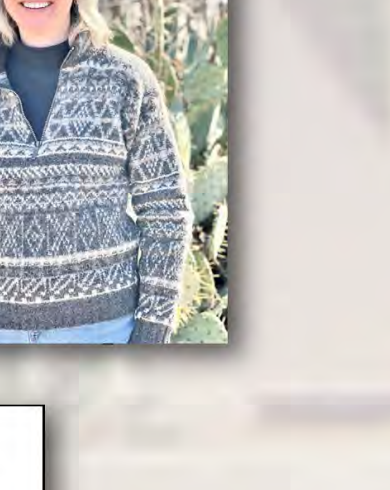
2002-present—Kathy MacDonald began work as a Research Assistant in 2002 when she was hired to lead a comprehensive inventory and reorganization of the then Frozen Tissue Collection. She led the initial push to seek funding to convert the collection to liquid nitrogen vapor storage and developed many of the current procedures in the collection. After functioning in this capacity for over a decade, Kathy became the first official Collection Manager of the GRC in 2016.



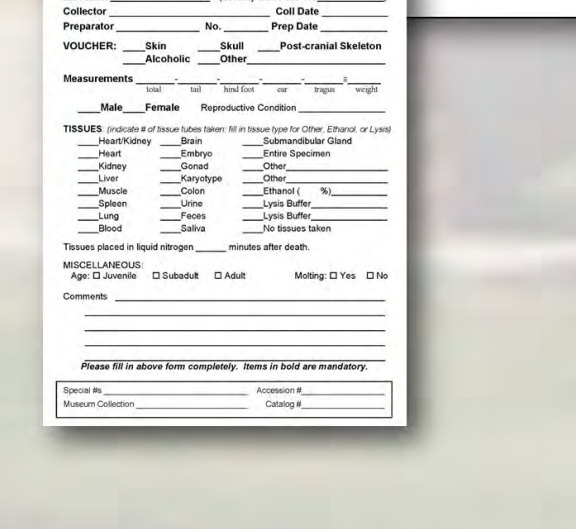
Ground is broken for the new wing of the NSRL in 2004; the new building is completed and occupied in 2005.

2003–2005 – A comprehensive inventory and reorganization of the entire tissue collection is conducted. Samples are organized numerically by TK number, and tissue vials are placed into 9x9 gridded cell boxes, rather than stored loosely in boxes or bags. The inventory reveals that the GRC by 2005 consists of more than 220,000 samples from more than 65,000 specimens and 900 species.

Dr. Nancy E. McIntyre, Department of Biological Sciences, is appointed as Curator of Birds.

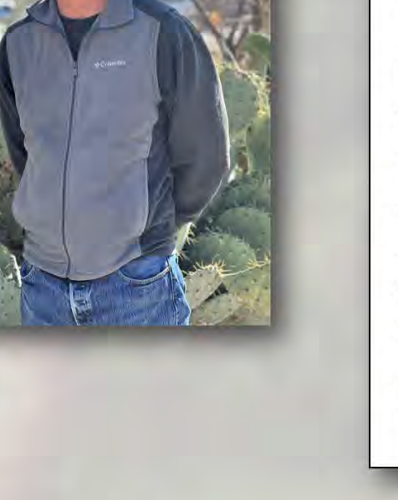


2015–2018 – James Cokendolpher retires in 2015, and before his position can be filled, budget cuts necessitate that the NSRL gives up the funding for that appointment. The funding is not restored, and the Invertebrate Zoology Collection remains "closed" and inactive for three years.



The NSRL curators and staff collaborate to update the TK template, adding even more tissue types as well as a field for recording the minutes after death that the tissues are placed in liquid nitrogen. Currently, TK pages contain options for more than 17 tissue types.

2015–2018 In 2015, Drs. Baker and Bradley are awarded $412,012 in NSF funding to purchase three vapor-phase liquid nitrogen (LN2) freezers to replace mechanical -80C freezers in the GRC, and for student assistant support for the project. This is a significant achievement to ensure preservation of the GRC samples at the highest standards of care. The TTU Offices of the President and Provost supplement the NSF funding for the purchase of two additional LN2 freezers and for renovations of the GRC facility. Renovations are completed and the first tissue samples are transferred to LN2 freezers in January 2016. At that time, the GRC consists of approximately 340,000 samples from 95,000



Dr. Richard D. Stevens, Department of Natural Resources Management, is named Assistant Curator of Mammals, and later (2021) Curator of Mammals.

The Genetic Resources Collection is renamed the Robert J. Baker Genetic Resources Collection in honor of Dr. Baker's contributions to the development of the GRC; the 150,000th mammal specimen is cataloged; and the GRC receives the first accreditation of a genetic resources collection by ASM.

The Systematic Collections Committee of the American Society of Mammalogists

Natural Science Research Laboratory, Museum of Texas Tech University

Certificate of Accreditation

15 December 2019