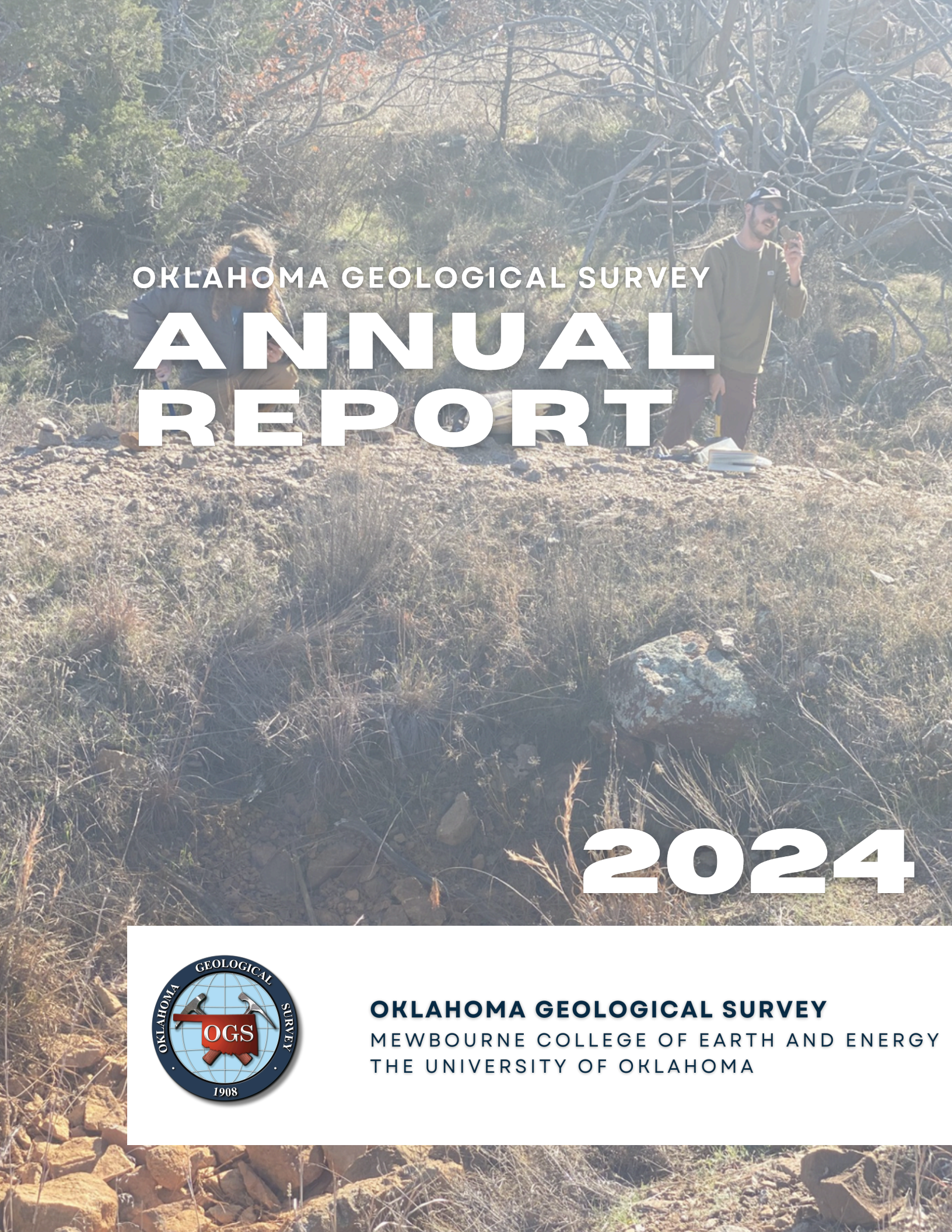


OKLAHOMA GEOLOGICAL SURVEY

ANNUAL REPORT

2024

OKLAHOMA GEOLOGICAL SURVEY

MEWBOURNE COLLEGE OF EARTH AND ENERGY

THE UNIVERSITY OF OKLAHOMA

CONTENTS

MISSION

The Oklahoma Geological Survey is a state agency for research and public service located on the Norman Campus of The University of Oklahoma and affiliated with the OU Mewbourne College of Earth and Energy. The Survey is chartered in the Oklahoma Constitution (70 OK Stat § 70-3310 (2014)). and is charged with investigating the state's land, water, mineral, and energy resources, and disseminating the results of those investigations to promote the wise use of Oklahoma's natural resources consistent with sound environmental practices.

COVER PHOTOS

Front. Brandon Mace and Carter Lewis collect samples for the STATEMAP project in the Wichita Mountains, Oklahoma. December 2024.

Back. Ison's Dam, Wichita Mountain Wildlife Refuge, Oklahoma. November 2024.

Publications produced by the Oklahoma Geological Survey are available to download from the OGS website (ou.edu/ogs). Publications on hard-copy can be purchased at the Oklahoma Petroleum Information Center:

OPIC, Oklahoma Geological Survey
2020 Industrial Blvd.
Norman, Oklahoma 73069
Phone: 405-325-1299
ogs@ou.edu | ou.edu/ogs

Suggested citation:

Oklahoma Geological Survey. (2025). *Oklahoma Geological Survey Annual Report 2024.* https://www.ogs.ou.edu

Prepared by
Carrie Miller-DeBoer
Molly Yunker

LETTER FROM THE DIRECTOR

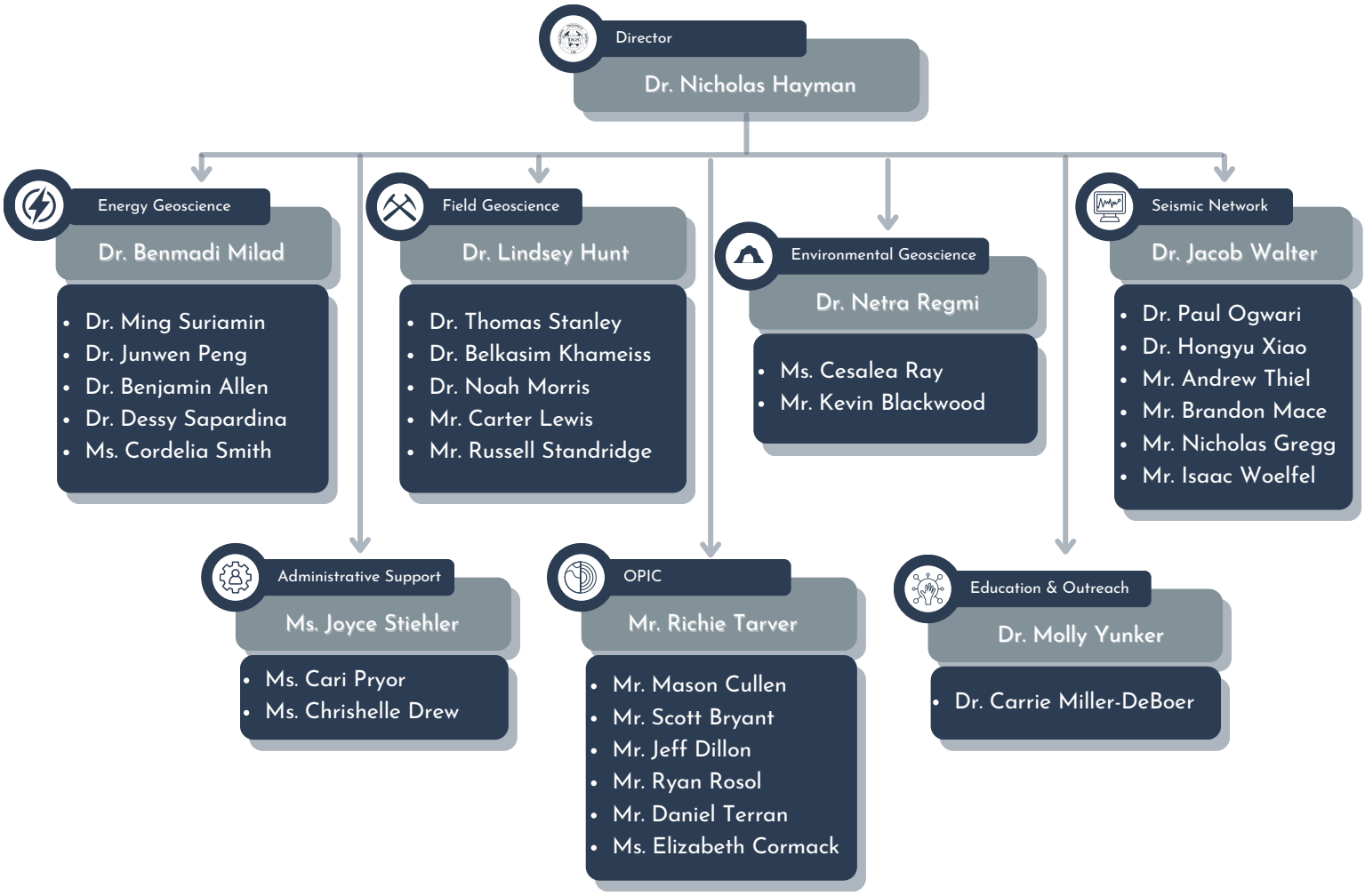
DR. NICHOLAS HAYMAN
OGS DIRECTOR AND
OKLAHOMA STATE GEOLOGIST

The second sentence of the January 20, 2025 White House Emergency Order begins: “We need a reliable, diversified, and affordable supply of energy to drive our Nation’s manufacturing, transportation, agriculture, and defense industries.” It is good to reflect on some definitions at a time like this: **energy** is *the ability to do work*, and **power** is *the amount of energy required to accomplish this work*. We sit at an amazing moment in history when power demand is exponentially increasing, sources of energy are more diverse than ever, and the means of storing energy are growing. In turn, the impacts of our energy production and power generation are felt every day. These can be the occasional felt earthquake, some climate-related event that scientists tie to excess greenhouse gases, or the decision whether or not to buy an E/V car.

Over the last year, OGS has relied on its new organizational structure to prepare for this moment, most significantly with grants from the DOE and the USGS that allow us to focus on mission areas in critical minerals and fossil fuels, including managing carbon dioxide and oil-field brines. Meanwhile, we continue to help the petroleum industry and the public think through the geology that enables our way of life. Yes, we evaluate the whole gamut of energy sources, notably the role of hydrogen in our fuel economy, and the potential for geothermal energy. Yet, we also continue the science of natural gas and liquid hydrocarbon generation, the former in the spotlight for increased development as an export commodity. Underpinning these nuts and bolts of resource geosciences is a deep appreciation and awe for the Earth we live on, which we strive to communicate to all Oklahomans and indeed all people.

I hope you enjoy this annual report, which highlights many of these efforts, and place faces to the names of those who take on this invaluable work. I also hope you see some ways you can engage with us, both to benefit from our work, and also to support it. I think you will find that we are poised to succeed in the coming years of change, for somebody who was NOT an AI once said, “the only constant is change.”

ORGANIZATION



COMMITTEES

Publications
Dr. Paul Ogwari
- Dr. Lindsey Hunt
- Dr. Netra Regmi
- Dr. Molly Yunker
- Mr. Andrew Thiel
- Mr. Carter Lewis
- Ms. Cesalea Ray

Information Technology
Mr. Richie Tarver
- Dr. Ming Suriamin
- Dr. Molly Yunker
- Mr. Nicholas Gregg
- Mr. Russell Standridge
- Ms. Joyce Stiehler

Facilities
Ms. Cesalea Ray
- Dr. Lindsey Hunt
- Dr. Ming Suriamin
- Mr. Scott Bryant
- Mr. Brandon Mace
- Ms. Joyce Stiehler

Awards
Dr. Lindsey Hunt
- Dr. Netra Regmi
- Dr. Junwen Peng
- Mr. Daniel Terran

Student Coordination
Dr. Jacob Walter
- Dr. Netra Regmi
- Dr. Ming Suriamin
- Dr. Molly Yunker
- Mr. Richie Tarver

OGS IMPACTS

13,302 FORMATION TOPS
Interpreted on
3,565 WELLS

4,998 OKLAHOMANS
63 Ask a Geoscientist
59 Programs & Events
3071 K-12 Students
SERVED

67 OU STUDENTS
6 Credit Hours Taught
31 Enrolled in Classes
12 Students Mentored/Advised
25 Microprobe Sample Prep Tutorials

8,478 EARTHQUAKES
111 Seismic Stations
8760 Hours Recorded
117 Citizen Reports

LARGEST
M5.1
Prague, OK

952 SAMPLES Collected & Archived

1425 SAMPLES Analyzed
1000 X-Ray Fluorescence
20 Microprobe Analysis
156 Thin Sections | 224 Core Plugs

216 SIMULATION HOURS

10 NEW HIRES

37 PUBLICATIONS
17 Journal Articles
13 Abstracts & Proceedings
4 Bulletins & Reports
3 Maps

$9.4+M ACTIVE GRANTS

1 WORKSHOP
Organized
48 Attendees

42,286 MILES DRIVEN

43 CONFERENCES
16 Presentations
10 Posters
17 Workshops

7 SINKHOLES

5 SITES ASSESSED
for underground storage potential

137,202 PAGE VIEWS

21,047 FILE DOWNLOADS

6 INTERVIEWS
2 Newspaper
4 Television

1,026 ROCK COLLECTIONS
started with GeoKids

2,968 FEET OF CORE DESCRIBED

ENERGY GEOSCIENCE

4

DR. BENMADI MILAD
GEOSTORAGE SPECIALIST

DR. JUNWEN PENG
GEOLOGIST

DR. DESSY SAPARDINA
GEOSTORAGE SCIENTIST

DR. FNU "MING" SURIAMIN
PETROLEUM GEOLOGIST
PETROPHYSICIST

DR. BENJAMIN ALLEN
GRANULAR PHYSICIST

MS. CORI SMITH
GEOSTORAGE RESEARCH ASSOC.

ESSENTIAL ROLE

Energy Geoscience explores underground energy sources and geological storage in Oklahoma. We map and research underground reservoirs and surface geology to provide reliable energy for Oklahoma and the United States.

ENERGY SECURITY

- Support established and developing energy economies in Oklahoma, including oil and gas, critical minerals, carbon storage, hydrogen, and geothermal.
- Identify critical mineral sources across the state and in oil and gas production byproducts.
- Develop extraction methods for unconventional sources of minerals.
- Describe the properties of oil-bearing rock layers and how oil moves within the layer.
- Collect data on temperatures underground to inform geothermal energy projects.
- Assess underground storage potential for hydrogen and carbon dioxide in Oklahoma and model expected plume behavior.
- 12 Projects in 2024 supporting critical minerals (3), carbon management (3), hydrogen (2), industry monitoring (2), geothermal (1), and oil & gas (1).

ECONOMIC DEVELOPMENT

- Build interdisciplinary networks to prepare Oklahoma for new energy economies, including geothermal and hydrogen.
- Prepare Oklahoma for commercial carbon storage projects.
- Partner to test new energy extraction and storage technologies and strategies.
- Inform stakeholders, coordinate agencies, and advise industry on Oklahoma energy resources and practices.

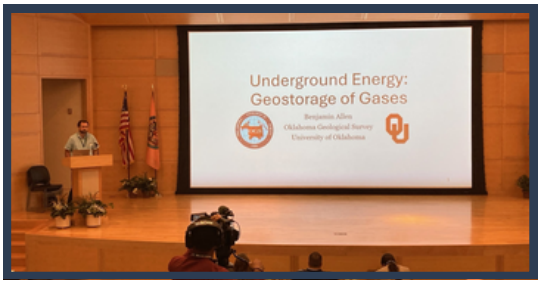
MONITORING AND SUPPORT

- Create monitoring system to detect methane leaks from orphan wells and pipelines.
- Report on a decade of fluid pressure monitoring of wells after earthquake swarms in the Arbuckle formation.
- Alert and inform regulatory agencies.
- Respond to geoscience and data inquiries from the public and local oil and gas companies.

OU ENERGY SUMMIT STRENGTHENS INDUSTRY COLLABORATION AND PUBLIC ENGAGEMENT

Partnering with the Caddo Nation, OGS Energy Geoscience joined the Institute for Community and Society Transformation (ICAST) and the Native Nation Center in hosting the Native Renewable Energy Symposium as part of the Transition to Green Energy in Gas Producing Regions (RANGE) initiative. Leaders and representatives from 36 Native Nations, industry partners, government officials, and a multidisciplinary group of university experts gathered to discuss strategies for successful renewable energy projects in Oklahoma.

> *"The whole idea about the symposium and OU participation came as part of the relationship building. It is a partnership. This is our homeland, and it's great to be able to partner and to see other agencies and tribes come together."*
>
> *Bobby Gonzalez, Caddo Nation Chairman*



Dr. Ben Allen, from OGS Energy Geoscience, spoke about several underground gas storage investigations, including projects from Energy Geoscience grants on carbon management and hydrogen storage.

The Carbon Management grant equips OGS to assess, facilitate, and educate stakeholders in Oklahoma on Carbon Management, while the Oklahoma Carbon Hub grant prepares sites for commercial development by injecting 54 million metric tons of carbon dioxide in Osage Reservation and Kay County. DISSPATCH H2 assesses the underground hydrogen storage feasibility in the Simpson Group of the Anadarko Basin, and RANGE H2 fosters an energy transition and convergent framework connecting engineering, geoscience, economics, and risk communication with the communities and general population of Oklahoma.

ENHANCING TECHNICAL CAPABILITIES WITH PETROGRAPHIC LAB EXPANSION

Two new microscopes expand and enhance the capabilities of the OGS Petrographic Lab. OGS petrographers provide detailed descriptions of samples from Oklahoma rock formations. This includes a list of minerals in a sample and tiny structures that can't be seen without magnification. These descriptions are valuable in resource exploration and identification, whether looking for oil and gas, critical minerals, or underground pore spaces for gas storage.

Dr. Junwen Peng, OGS expert petrographer, collects, archives, and analyzes samples using *thin sections.* These are rock slices fixed to glass slides and ground to the thickness of a human hair. He uses the Leica DMLP, a polarizing optical microscope for conventional analysis and the Zeiss Axioscope a fluorescence microscope that uses an X-Cite 120LED illumination system to highlight organic matter like oil or coal, trapped within the rock.

Leica DMLP polarizing light microscope .

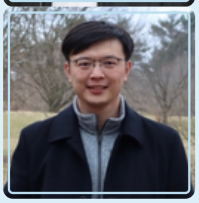
Zeiss Axioscope with X-Cite 120LED illumination system.

SEISMIC NETWORK

DR. JAKE WALTER

GEOPHYSICIST &
STATE SEISMOLOGIST

DR. PAUL OGWARI
GEOPHYSICIST



DR. HONGYU XIAO
GEOPHYSICIST
SEISMOLOGIST

MR. ANDREW THIEL
MR. NICHOLAS GREGG
SEISMIC ANALYSTS

MR. BRANDON MACE
MR. ISAAC WOELFEL
FIELD TECHNICIANS

ESSENTIAL ROLE

The seismic network detects, records, and reports earthquakes through a publicly available web portal. As of the end of 2024, the seismic network consists of 111 stations connected real-time through an IT infrastructure in the cloud.

RECORD

- Proactively monitor earthquake hazard in Oklahoma.
- Manage the Oklahoma seismic network.
- Maintain, standardize and expand seismic stations across the state.
- Upgrade earthquake identification software.

RESPOND

- Mitigate earthquake risks and promote public safety.
- Conduct planning exercises to enhance earthquake preparedness.
- Join Oklahoma Emergency Management in responding to large seismic events like the Prague M5.1 earthquake.

REPORT

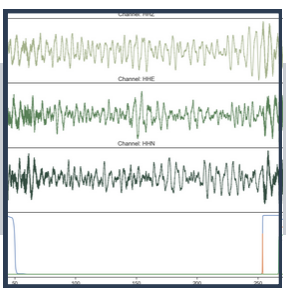
- Publish a real-time seismic event map available to the public online at no charge.
- Support the Oklahoma Corporation Commission with accurate data to oversee hydraulic fracturing operations.

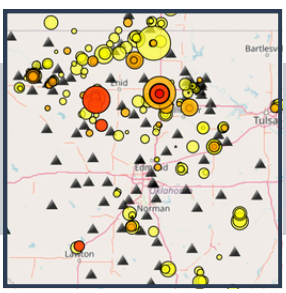
RESEARCH

- Secure additional funding from USGS as an Advanced National Seismic System partner.
- Submit proposals to DOE and NSF for geophysics research activities.
- Recruit and advise graduate students for Geoscience research.

COLLABORATIONS

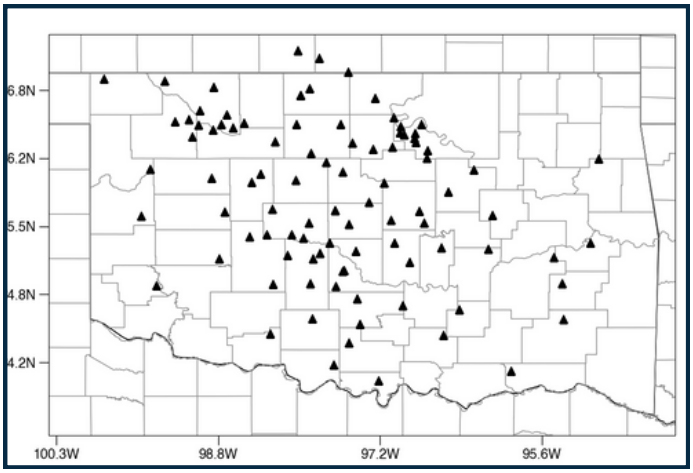
OGS Seismic Network collaborates with federal and state entities to ensure a robust system of monitoring is maintained at all times for the safety of Oklahomans.





SENATE BILL 1370 PROVIDES $4 MILLION FOR STATEWIDE SEISMIC NETWORK

Senate Bill 1370 legislates $4 million in funding for the Oklahoma Seismic Network. The OGS Seismology Team will deploy new stations and update existing equipment. This update create robust, uniform stations with standardized equipment for easy deployment and maintenance.



The addition of new stations will more than double the existing network of over 100 seismic stations. Data is analyzed and reported in real-time; maps of recent seismic events in Oklahoma are publicly available on the OGS website. Data is also integrated into USGS seismic maps and used by the Oklahoma Corporation Commission to implement the Stoplight Protocol for hydraulic fracturing operations as part of its Underground Injection Control program.

Brandon Mace checks seismic equipment in the field.

In 2024, OGS identified and located 8,478 earthquakes. The largest event was a M5.1 earthquake near Prague, OK, which damaged several homes in the immediate area. OGS responded quickly to deploy additional scientific equipment for enhanced monitoring.

FUTURE GEOSCIENCE LEADERS JOIN OU FOR FEDERALLY-FUNDED RESEARCH WITH OGS

The Oklahoma Geological Survey (OGS) is proud to welcome two new Geoscience graduate students, Luis Muñoz Santos and David Fleenor, to the University of Oklahoma, where they will contribute to cutting-edge, federally-funded research projects. Under the guidance of Dr. Walter and OGS experts, these students will play a key role in advancing geoscience knowledge while gaining hands-on experience in critical areas of earth science. Their work will support OGS's mission to provide valuable scientific insights for Oklahoma and beyond.

Andrew Thiel digs a hole for a new seismometer installation.

FIELD GEOSCIENCE

DR. LINDSEY HUNT
SENIOR PROGRAM MANAGER

DR. BELKASIM KHAMEISS
GEOLOGIST

MR. CARTER LEWIS
RESEARCH ASSOCIATE

DR. THOMAS STANLEY
FIELD GEOLOGIST

DR. NOAH MORRIS
GEOLOGIST

MR. RUSSELL STANDRIDGE
GIS SPECIALIST

ESSENTIAL ROLE

Field Geoscience creates maps from field investigations and geochemical reconnaissance of Oklahoma's surface landscapes and underground layers, explores Oklahoma's natural mineral resources, and describes its geologic history, linking modern landscapes to previous environmental conditions.

CRITICAL MINERALS

- Investigate the availability and economic potential of critical mineral resources in Oklahoma.
- Use cutting-edge technology and methods (XRF, EPMA, ICP-MS) to collect data and make it publicly available.
- Inventory Oklahoma mine waste as a possible source of critical minerals.
- Partner with USGS EarthMRI for funding.

> *"Critical minerals ... are essential to the economic or national security of the United States; the supply chain of which is vulnerable to disruptions."*
> *The Energy Act of 2020 (Public Law 116-260)*

MAPPING OKLAHOMA

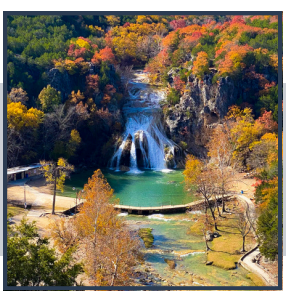
- Map Oklahoma's entire surface geology using new and existing data sources.
- Create detailed maps focused on areas of interest (e.g., urban, geologically complex).
- Compete annually to secure STATEMAP grant funding from USGS.

STATE STRATIGRAPHY

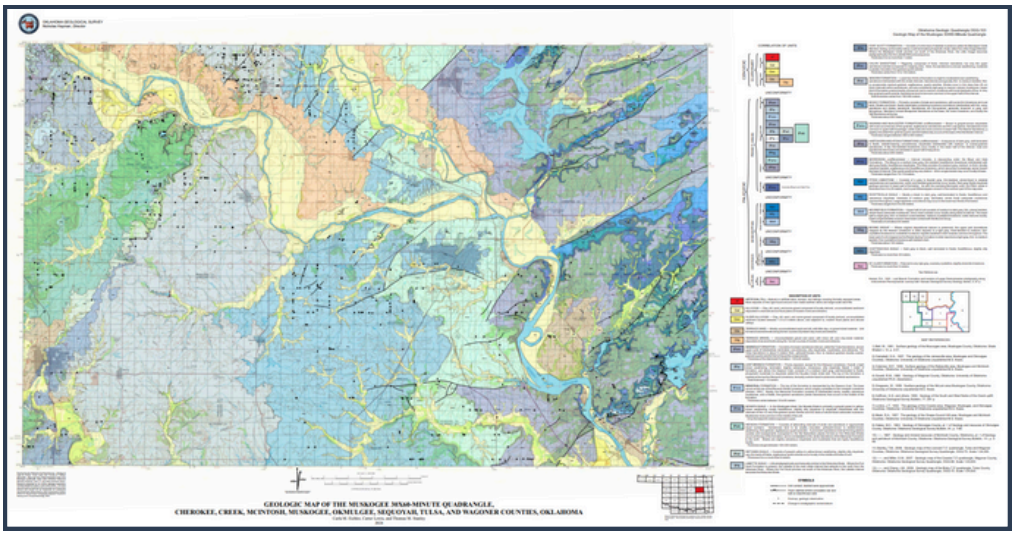
- Establish a common naming system for geologic features in Oklahoma.
- Analyze characteristics of rock layers, including fossils, chemistry, and position.
- Describe ancient environments and geologic processes that formed rocks and rock layers in Oklahoma.
- Assign ages and order events based on rock layer analysis.

COLLABORATIONS

OGS Field Geoscience routinely collaborates with sister surveys, academic departments, Tribal Nations, federal and state agencies.



MUSKOGEE 1° SHEET MAPS GEOLOGY OF MUSKOGEE QUADRANGLE IN FULL FOR THE FIRST TIME



Tom Stanley and the Field Geology team completed the Muskogee 30x60 Minute Quadrangle after a year of effort. Quadrangles, or "quads," are rectangular areas of land bounded by lines of latitude and longitude. These bounds are set by the USGS who maps the topography, or shape and elevation of the land across the U.S. The Muskogee quad extends north-south from 36° N to 35.5° N and east-west 95° W to 96° W, an area of nearly 2000 square miles that includes parts of eight counties.

Drafting a map at this scale begins with several months of field reconnaissance. To ensure a geologist lays eyes on the entirety of Oklahoma's surface within a quad, OGS geologists drive every road in the area, stopping to collect data and sketch field maps. Back in the office, the team reviews and finalizes a series of hand-drafted maps, delineating and describing major geologic features. These maps are eventually digitized and compiled into a coherent whole. Like nesting dolls, every map fits into another with an expectation of consistency. Matching rock units across locations can be tricky, as currently there is no standard guide to naming geologic formations. Geologists joke about "state line faults" where one continuous formation misleadingly appears as two distinct formations because it is named differently on either side of the border. While not an issue in the Muskogee quad, the OGS field team collaborated this year with its sister survey in Kansas to reconcile formation names in northeastern Oklahoma, ensuring clarity of information provided to the public.

> *"Every scientific endeavor in geology starts with a map."*
> *Dr. Tom Stanley*

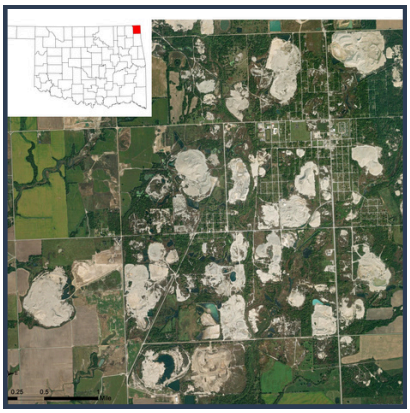
Clear geologic maps are essential to research and economic growth in Oklahoma. While detailed geology data is often kept behind a paywall, the Muskogee 1° sheet is publicly available for download on the OGS website, at no cost to users. Providing this service and information promotes research and scholarship and supports industry exploration for critical minerals, geologic storage sites, industrial minerals, and petroleum resources.

> *"Geology is full of opportunities for discovery and education; even a single stone tells you a story if you learn to listen." Dr. Noah Morris*

MEET DR. NOAH MORRIS, OGS GEOLOGIST

Noah joined OGS in November to work with the Field Geology Team looking for critical minerals in Oklahoma. He contributes expertise in identifying ancient environments that formed modern rock layers, including black shales with lead-zinc ore deposits. A native Oklahoman, Noah looks forward to using his passion and sense of discovery to provide insight into Oklahoma's critical mineral potential.

FIELD GEOLOGY AWARDED OVER $2 MILLION IN GRANTS FOR CRITICAL MINERAL EXPLORATION



Critical minerals are essential to economic stability, national security, and a sustainable future for the United States. Finding domestic sources for these elements ensures consistent production of materials used in aerospace applications, medical procedures and treatments, data storage and communications, industrial manufacturing, nuclear power production, and household products. Given Oklahoma's long history of mining, despite a lack of currently active metal mines, the OGS Field Geology team secured over 2 million dollars in grant funding to assess critical mineral potential across the state.

> *"As the demand for critical minerals continues to increase, it will be necessary to identify new potential sources and reexamine the potential of previously discarded sources and byproducts." Dr. Lindsey Hunt*

OGS is working on five projects funded by the USGS Earth MRI program. These will create the first comprehensive mine waste database for Oklahoma and identify potential sources of critical minerals. One project will evaluate chat piles and tailings ponds at Tar Creek, an EPA superfund site being remediated by the Quapaw Nation. A separate collaboration is underway in the Tri-State Mining District with the Kansas and Missouri Geological Surveys.

In Northeastern and Eastern Oklahoma, layers of shale contain phosphate nodules often found alongside critical minerals. Analyzing new samples and core archived at the Oklahoma Petroleum Information Center (OPIC) will inform the team of resource distribution within this formation and also provide insight into other sites formed by similar ancient environments.

Likewise, the Wichita Mountains hold the earliest rocks formed in Oklahoma, shaped by cooling magma and hydrothermal fluids. These rocks contain mineral deposits mined in the early days of Oklahoma. Finding critical mineral resources in the Wichita Mountains may also point to potential locations elsewhere in the state that include sediments eroded from the mountains. All databases, geochemical data, maps, and reports from these projects will eventually be hosted on the OGS website and made available to the public, free of charge.

> *"Rocks are like nature's time machines, and I get to read their stories every day." Dr. Khameiss*

MEET DR. BELKASIM KHAMEISS, OGS REGIONAL GEOSCIENTIST

Belkasim (*bell-kah-seem*)says, "I was drawn to geology because it combines history, science, and discovery in a way that lets us understand Earth's past and predict its future.

Growing up in Libya, surrounded by diverse landscapes–from deserts to ancient marine rocks–I became fascinated by how Earth's layers hold stories of vanished oceans, extinct creatures, and shifting climates. The thrill of uncovering these hidden stories, whether in a lab or the field, continues to fuel my passion for geology."

ENVIRONMENTAL GEOSCIENCE

11

DR. NETRA REGMI
HAZARDS GEOLOGIST

MS. CESALEA RAY
GIS SPECIALIST

MR. KEVIN BLACKWOOD
RESEARCH ASSOCIATE

ESSENTIAL ROLE

The Environmental Geoscience team studies how Earth's surface and underground processes interact, especially how water, geology, and human activity shape the environment. They research landslides, erosion, and land subsidence by analyzing rainfall, terrain, and climate. Using drones, satellites, LiDAR, and field surveys, they create hazard maps to help the public understand environmental risks.

LANDSLIDE INVENTORY MAPPING

- Remote sensing of landslides
- Preparation of landslide inventory in eastern Oklahoma
- Funded by FEMA through Oklahoma Emergency Management

MAPPING LAND SUBSIDENCE

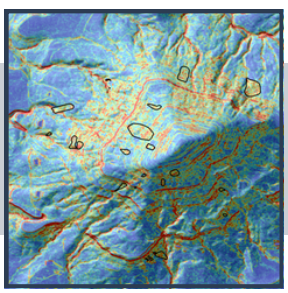
- Prepare a map of sinkholes in central and western Oklahoma

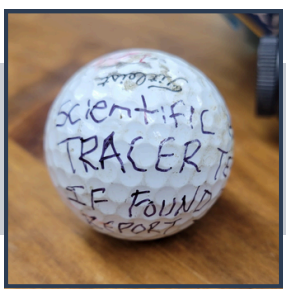
LANDSLIDE SUSCEPTIBILITY MAPPING

- Investigate causes and triggers of landslides in eastern Oklahoma
- Develop a machine learning framework for monitoring landslides
- Assessing the interactions among hillslope, rainfall, surface and sub-surface hydrology and climate to characterize landslides, erosion and land subsidence
- Funded by NASA Earth Surface and Interior

COLLABORATIONS

OGS Environmental Geoscience routinely collaborates with organizations within the OGS, local jurisdictions, and federal and state agencies.





OGS TAKES TO THE SKIES WITH NEW DRONE TECHNOLOGY

In 2024, the Oklahoma Geological Survey (OGS) expanded its research capabilities with the addition of a drone, bringing cutting-edge aerial imaging to its projects. This lightweight, high-resolution drone enhances the team's ability to capture 4K HDR video, operate in low-light conditions, and navigate safely with 360-degree obstacle avoidance and precision landing technology.

With two certified drone pilots, Kevin Blackwood and Cesalea Ray, OGS launched its first drone mission on July 7, 2024, at Roman Nose State Park. The flight was conducted to investigate a newly formed sinkhole on the park's golf course, marking the beginning of an exciting new era for field research.

In 2025, OGS anticipates increased drone usage, providing valuable aerial insights into OK's evolving landscape.

ENVIRONMENTAL GEOSCIENCE TEAM MAPS EARTH'S CHANGING LANDSCAPE

From shifting hillslopes to underground water movement, the Environmental Geoscience team is uncovering the forces shaping our landscape. Their research focuses on how rainfall, geology, and climate interact to cause landslides, erosion, and land subsidence–critical issues that impact communities and infrastructure.

To better understand these processes, the team uses cutting-edge tools, including drones, satellites, LiDAR technology, and on-the-ground field surveys. These advanced methods allow them to map terrain changes with high precision, improving our ability to predict and mitigate environmental hazards.

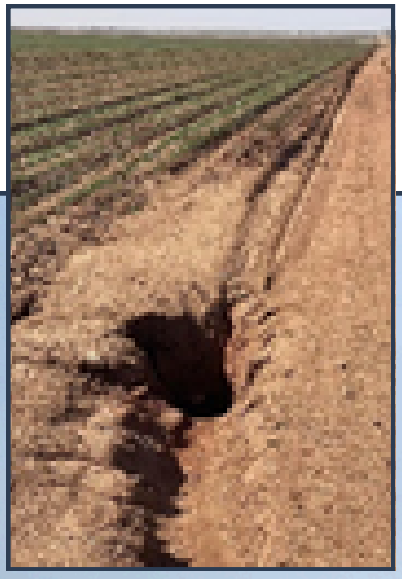
A key outcome of their work is the development of hazard maps, which provide valuable information to the public and policymakers. By identifying areas at risk, the team helps communities prepare for and respond to natural changes in the landscape, making science a vital tool for safety and resilience.

Two landslides in Cavanal Hil near Poteau, Oklahoma

MAPPING OKLAHOMA'S HIDDEN GEOHAZARDS

In 2024, the Oklahoma Geological Survey (OGS) remotely mapped over 3,000 karst features across western Oklahoma's evaporite formations using LiDAR and multispectral imagery. This cutting-edge approach helps identify potential geohazards, such as sinkholes and land subsidence, which can pose risks to infrastructure and public safety.

Sinkholes near roadways, in particular, create serious hazards. By overlaying road networks onto mapped karst areas, OGS can pinpoint high-risk locations where on-site field investigations can assess cavity depth, size, and development.



This research plays a critical role in safeguarding communities and guiding future land use planning.

The DJI Mini 4 Pro in Action.

EDUCATION & OUTREACH

DR. MOLLY YUNKER
COORDINATOR

DR. CARRIE MILLER-DEBOER
ASSOCIATE

> *"You're basically the Taylor Swift of Kids Club. They are begging for your tour to stop in our town, and they'll make mom wait in line for tickets all week if they have to."*
>
> Jaime Witt
> Chouteau Public Library

ESSENTIAL ROLE

Education & Outreach promotes Geoscience Education in Oklahoma and works with OGS scientists to communicate investigation findings for the benefit of all Oklahomans.

PUBLIC ENGAGEMENT

- Communicate OGS efforts in ways approachable to stakeholders with varying interests and expertise.
- Reply to public inquiries.
- Regularly open OGS offices and resources to welcome Oklahomans' geoscience interests and needs.

INDUSTRY & AGENCY SUPPORT

- Coordinate continued education opportunities for a technical audience.
- Facilitate communication among stakeholder groups in the region.

PROMOTING GEOSCIENCE CAREERS

- Provide OU students with service opportunities, public engagement and outreach experiences, and research and career mentorship.
- Develop and curate resources aligned with state science standards to support educators in Oklahoma.
- Deliver outreach programming in communities across the state, including rural settings.
- Encourage curiosity and passion in children, families, and community groups.

COLLABORATIONS

OGS Education and Outreach resources and programs receive financial, volunteer, and expert support from several collaborating partners. Their passion for Geoscience Education connects communities across the state and enables sharing of information useful to all Oklahomans.

BUILDING FOUNDATIONS FOR CARBON CAPTURE AND STORAGE IN OKLAHOMA

Hosted through a Department of Energy grant, OGS welcomed nearly fifty Carbon Capture and Storage (CCS) professionals from industry, government agencies, Tribal Nations, and academic research groups on December 6, 2024 for the workshop "Building Foundations for Carbon Capture and Storage in Oklahoma" to facilitate meaningful discussion among expert stakeholders.

"The set of participants led to very engaging discussion and provided opportunities for more collaboration."

Industry partners and research leaders shared successes and challenges encountered in regional CCS projects and presented their vision for the future of CCS in Oklahoma. Small group discussions identified CCS progress and needs in the region. A white paper is planned to gather and share these insights with the larger community.

"I loved being able to talk to new professionals in a laid-back but organized way."

INTERACTIVE DISPLAY INTRODUCES CCS TO MORE THAN 2500 OKLAHOMANS

Despite a history of state leadership in Carbon Capture and Storage (CCS), many Oklahomans remain unaware of this technology. Collaborating with OGS Energy Geoscience, Seismic Network, and Oklahoma Petroleum Information Center (OPIC) teams, Education & Outreach developed a series of hands-on activities to demonstrate the CCS process. Unique to OGS, the CCS Challenge invites visitors to choose a geological storage site for carbon dioxide compressed to a fluid. After overlaying simplified data maps of a single county on a light table, individuals applied four main criteria necessary for safe carbon storage to choose the best underground storage reservoir.

This CCS display was first deployed at the Women in STEAM Conference on October 8, 2024 where 1500 young women in grades 6-12 explored careers in science, technology, engineering, art, and mathematics - including developing career fields in carbon management. On October 26, 2024 the team presented the display at the Oklahoma Mineral and Gem Show at the State Fairgrounds in Oklahoma City where over 1100 geology enthusiasts and rockhounds gathered to find community, shop, and learn. The OGS table was of particular interest, especially for families as unlike many commercial vendors, we ask children to *"Please Touch!"* at our booth.

INSPIRING GEOLOGY EXPLORATION WITH NEW PROGRAMS FOR ALL AGES

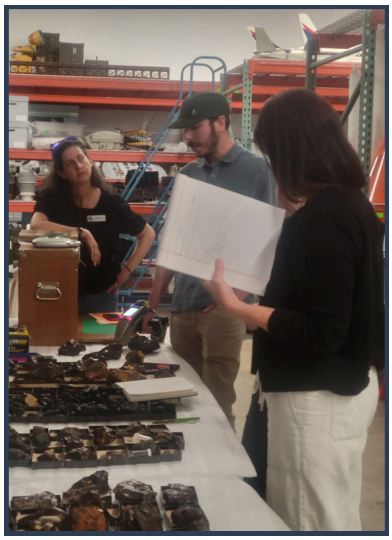
Other new outreach programs in 2024 included "Growing Geologists," a preschool program encouraging geology exploration through play, the addition of a "Kids Corner" for young learners in the OGS outreach room, and "Oklahoma's Changing Landscape," where students identify evidence from rocks and fossils to support an explanation of the changes in Oklahoma's landscape through time. This series of investigation stations meets Oklahoma Academic Standards for Science, 4th grade (4.ESS1.1).

METEOR STORM! HELPING OKLAHOMA SCIENCE MUSEUM WITH OVER 150 METEORITES FROM THE DR. ROBERT DUBOIS COLLECTION

"I am so thankful for the help... it made such a difference of what I could feel confident putting out on display.

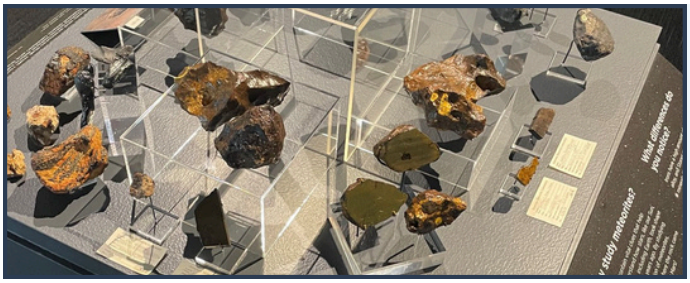
Hope to collaborate again."

Susan Berberet, Science Museum Oklahoma



What do you do with over 150 meteorites donated by the family of an Oklahoma geoscientist? Call OGS!

That is exactly what the Science Museum did when they needed to learn more about a collection of meteorites donated by the Robert DuBois family. The meteorites are well-organized and labeled with ID numbers, but the codex linking the ID number to information about each meteorite is missing. The Education & Outreach team was able to provide information on a few of the meteorites featured in Oklahoma Geology Notes, v. 61, no. 4, Winter 2001 while members of the Regional Geology team determined chemical composition with the X-ray fluorescence (XRF) device.



"Meteorites are a direct source of information about the physical and chemical processes that formed part of the Solar System, and about the age and timing sequence of processes that evolved the planets as they are today." Dr. Robert DuBois

Dr. DuBois joined Geology and Geophysics at OU in 1967 to lead the Earth Science Observatory in Leonard, OK. Dr. DuBois studied paleomagnetism, measuring changes in earth's magnetic field. Applying the same methods to archaeology, Dr. DuBois founded archaeomagnetism, aging artifacts from magnetic signatures. Dr. DuBois also joined NASA's SPACETEAM, working with other scientists to measure magnetic fields on the moon during the Apollo 14 mission.

OPIC
OKLAHOMA PETROLEUM INFORMATION CENTER

17

MR. RICHIE TARVER

OPIC MANAGER

MS. ELIZABETH CORMACK
RESEARCH ASSOCIATE

MR. DANIEL TERAN
RESEARCH ASSOCIATE

MR. SCOTT BRYANT
MR. RYAN ROSOL
WAREHOUSE COORDINATOR

MR. JEFF DILLON
CORE & CUTTINGS CUSTOMER LIAISON
MR. MASON CULLEN
ARCHIVIST

ESSENTIAL ROLE

The Oklahoma Petroleum Information Center maintains a public archive of geological and geophysical data, including a repository of rock core, cuttings, and well data.

DATA PRESERVATION

- Inventory and catalog geological and geophysical data collections
- Manage warehouse facility of geologic core and rock cuttings
- Preserve over a century of well data in a variety of forms including well logs, reports, aerial photos, scout tickets, and geologic maps.

OGS WELL VIEWER APP

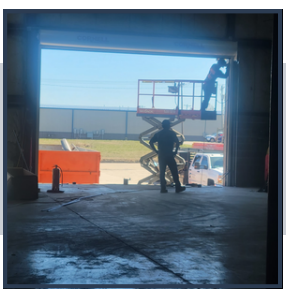
- Digitize collection materials into a single online source
- Provide a comprehensive database of Oklahoma's geoscience and natural resource data
- Significant effort on public information dissemination from an enormous collection with continual growth

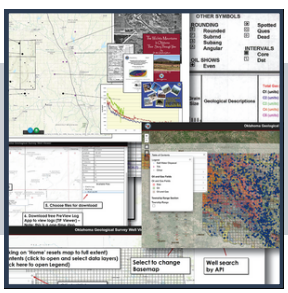
PUBLIC ACCESS TO DATA

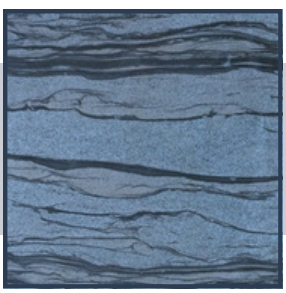
- Supports Oklahoma's oil & gas industry
- Open collection for 70+ visits per month
- Access for OU students and faculty, visiting scholars, workshops, and tours

COLLABORATIONS

OPIC receives donations of materials and equipment from industry partners and funding from federal grant opportunities. In 2024, Baker Hughes donated CT scanning equipment to OPIC which will provide additional data through non-destructive sampling of the core collection. OPIC also provides services to the local community, including educational tours and resources and temporary storage space for densified styrofoam logs from a local styrofoam recycling program.

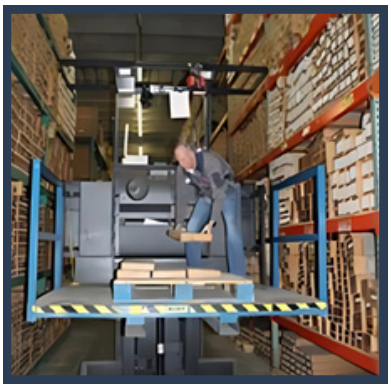


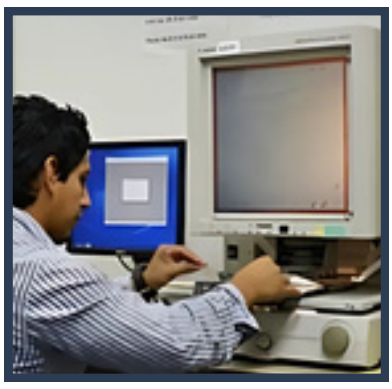




OGS WELL VIEWER APP PILOT GOES LIVE, LINKING OKLAHOMA WELL MAP TO DATA AND PUBLICATIONS

The Oklahoma Petroleum Information Center houses the most comprehensive well data and core repository in Oklahoma, supporting oil and gas exploration, one of the state's primary economic sectors. Kept in a warehouse facility the size of 3.5 football fields, the collection contains a staggering amount of physical and digital data from over a century of oil and gas exploration. A small staff works to process, catalog, and archive the ever-growing collection and make the data accessible to the public. Each month, over 70 visitors arrive to examine well data at the facility and OPIC is working to provide virtual access as well.



"OGS amassed a multitude of geological and geophysical data during its more than one hundred years of existence... [these] historically unique collections are not replicated elsewhere in the country." R. Tarver

Nearly two decades ago, OPIC completed a data inventory and identified 26 types of data that were added to the USGS National Geophysical Data Preservation Program (NGGDPP) digital archive. This data included well logs, completion reports, aerial photographs, production reports, scout tickets, rock cores and cuttings. After these efforts laid the groundwork for digital infrastructure and cataloging efforts, OGS began working on the *OGS Well Viewer App*, a map-based web portal to a comprehensive database of geoscience and natural resource data in Oklahoma, available to the public, free of charge. One of the largest public information dissemination undertakings of the OGS, the *OGS Well Viewer* links datasets and publications to individual oil and gas wells in the state. Oklahoma stakeholders, both energy industry professionals and citizens, can now access a single online source for information on Oklahoma's geological resources. A live pilot version of the *OGS Well Viewer* is available at https://uat-wellviewer.dig.ou.edu, and is updated as digitization efforts continue.

ELIZABETH CORMACK, RESEARCH ASSOCIATE

"I get to be up close and personal with rock samples that were taken from thousands of feet beneath the Earth's surface." Elizabeth Cormack

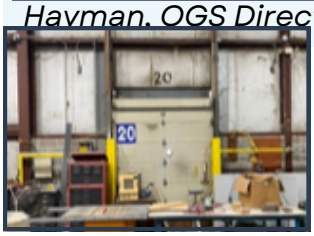
Elizabeth joined OPIC in November and works behind the scenes as a "Jill-of-All-Trades." In the machine shop, she prepares samples for researchers using wet saws and other heavy equipment. She enjoys the "detective work of piecing core together, cutting and arranging sections in a coherent way, and spotting the occasional fossil. She finds meaning in preserving OPIC's unique deep-earth samples as they will be used to address future research questions. Elizabeth also photographs core and digitizes vast swaths of OGS's historical paper records. She's discovered a locked pirate chest, but no one knows anything about it or its contents. Elizabeth's guess? Rocks.

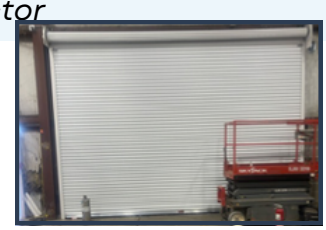
BAKER HUGHES DONATES EQUIPMENT FOR HIGH-RESOLUTION, NON-DESTRUCTIVE CORE SAMPLING

Baker Hughes donated state-of-the-art equipment to OGS, housed at OPIC and the OGS Electron Microprobe Lab. The donation includes a two CT scanners, a Phoenix Nanotom M and a GE Neutron Source, and a Geotek Multi-Sensor Core Logger with Olympus Vanta XRF and spectral core gamma.

This equipment provides an opportunity for OPIC to collect and archive a wide range of data from core without destroying the sample. Automation provides consistent and accurate data faster than traditional methods. These large datasets will be publicly available, supporting energy industries, critical mineral exploration, reservoir modeling, and more.

"Baker-Hughes' donation provides regionally importais a vote of confidence in the ability of OGS to provide access to data and cutting-edge facilities. with regionally important instrumentation." Nick Hayman, OGS Director





Baker Hughes representative Jason Angolano, now with OSU Hamm Institute for American Energy, coordinated efforts with the OU Foundation and OGS to move the scanners to OPIC. Relocation included a feasibility study with recommendations for renovations, including a larger warehouse door, isolated concrete foundation, and independent cooling system, to accommodate the installation of this sensitive equipment.

Geological CT scanners are the same as medical CT scanners, using energy like X-rays or neutrons to take a series of photographs through an object. A computer program combines these individual 'slices' into a 3D image with resolution precise enough to show structures smaller than a micron. One micron is the size of bacteria, mold spores, and smoke particles, not visible to the naked eye. Data will be visible to all users however as records are added to the OGS Well Viewer Application.

"...making the invisible visible..."
Baker Hughes

"You know that final scene in Raiders of the Lost Ark where they're putting away the Ark of the Covenant? Yeah, [my job is] like that." Mason Cullen

MASON CULLEN, OPIC ARCHIVIST

Mason took on the responsibility of archivist this year after working at OPIC since 2019. He enjoys the creating the hidden structure and logic behind programs with effective and efficient user experiences and is looking forward to implementing a relational database system that will organize and integrate core inventories, making information easier to find. He gives this advice to future geologists: "Do your parents tell you to stop picking up cool-looking rocks? It's a great habit, ignore them. If you still enjoy it as an adult, consider something with 'geo-' in the name."

ADMINISTRATIVE SUPPORT

MS. JOYCE STIEHLER
ASSISTANT TO THE DIRECTOR & OFFICE MANAGER

MS. CARI PRYOR
HR & FINANCIAL MANAGER

MS. CHRISHELLE DREW
FINANCIAL SPECIALIST

ESSENTIAL ROLE

The OGS Administration Team manages the front office, oversees department financials and coordinates staff gatherings to foster collaboration.

OFFICE MANAGEMENT

- The administrative team is often the first contact for people trying to get in touch with someone at the OGS.
- We help get people where they're trying to go, and we do it with a smile.

FOSTERING COMMUNITY

- Our spring 2024 get together was held outdoors, playing games, enjoying the weather, and some pizza.
- At our fall event, we took a trip down memory lane to the '80s with an arcade visit.

FINANCIAL OVERSIGHT

- Our team supports all of OGS to ensure invoices are paid, materials are purchased, and grant funds are spent appropriately.

OKLAHOMA BOARD ON GEOGRAPHIC NAMES 21

The Oklahoma Board on Geographic Names (OKBGN) was created by State Legislation in 1965.

(b) *The said Oklahoma Geological Survey shall have for its object and duties the following: (4) Act as the Oklahoma Board on Geographic Names and make recommendations to the United States Board on Geographic Names. [HB 810, section 310(b), (4)]*

OKBGN evaluates al proposals concerning name changes, new names, and name controversies of geographic features within the State of Oklahoma and makes official recommendations to the USBGN.

OKBGN CHAIR AND MEMBERSHIP

On August 1, the OKGBN elected Cesalea Ray as the new chair. Dr. Carla Eichler chaired the OKBGN from 2021-2024 and was instrumental in the recommendation to USBGN to approve the renaming of "Tarbone Mountain," which is now named "Tah-bone-mah Mountain." Carrie Miller-DeBoer also joined the OKBGN, voted in as a new member.

Members of the OKBGN, 2024

Cesalea Ray, Chair
G. Russell Standridge, Member
Carrie Miller-DeBoer, Member

CEREMONY OF HONOR FOR TAH-BONE-MAH (I-SEE-O)

The OKBGN was invited to attend the Ceremony of Honor for Tah-bone-mah (I-See-O) on November 9, exactly one year after the USBGN approved the renaming of "Tarbone Mountain" in the Wichita Mountains Wildlife Refuge to Tah-bone-mah Mountain. The ceremony included traditional Native American prayer, song, dance, and a banquet. The ceremony highlights the importance of the OKBGN's role in helping communities find the most appropriate names for their respective geographic features. The Board is grateful for the opportunity to attend this ceremony.

WHY CHANGE THE NAME OF A MOUNTAIN? THE STORY OF TAH-BONE-MAH (I-SEE-O)

Kim Wayne Shahan, President and Founder of Vision of Hope at Camp Y'Shua researched Tah-bone-mah's story. This excerpt comes from Mr. Shahan's invitation to OKBGN to the Ceremony of Honor.

> *"My name was first Tah-bone-moh - 'Sees Big Morning Star' ... when I was little I was very sick and dying. I had no name then and [my uncle] said, 'I will call him Tahbonemoh and maybe he will get well.'" From General Scott's personal diary*

"The following information provides you with the intent of the Ceremony of Honor and its relevance to the United States Army heritage and its connection to Fort Sill and the Wichita Mountains of Southwest Oklahoma.

The US Board of Geographic Names has granted a request based on my research and support material to change the name of a mountain in Southwest Oklahoma named Tarbone to Tah-bone-mah Mountain, which the north face of the mountain is on the property known as Camp Y'Shua. The US Board of Geographic Names approved my proposal to change the name on November 9, 2023. So on its first year anniversary, I'm holding this special day of honor in accordance with his service to the US Army and bring attention to his deserved service of America.

Harris & Ewing, photographer. (1925) left to right: Secretary of War J. Weeks, I-See-O and Senator J.W. Howell, of Oklahoma. Retrieved from the Library of Congress, https://www.loc.gov/item/2016894035/.

The intention behind such name change request was to bring due honor and recognition to a Kiowa warrior and the US Army Indian Scout, who served under General Hugh Scott from 1889 to 1927. General Scott said that his Kiowa ethnographic knowledge, as well as language fluency were invaluable. Tah-bone-mah was then promoted to the rank of Senior Duty Sergeant in the US Army, in recognition of his services. General Scott petitioned to make that rank permanent and Tah-bone-mah kept it until he died in 1927. We believe that this name change of the mountain now provides an accurate and true story of the mountain ridgeline of the Wichita Mountains from Mount Scott on the east to Tah-bone-mah Mountain on the west."

Compared to larger states, the OKBGN receives only 1-2 proposals per year.

WPA CHANNELIZED CREEK HOLDENVILLE, OK

In October, Mr. Doyle Tampleton contacted the OKBGN about naming a creek in Holdenville, OK. This inquiry is ongoing and requires approval by the Muscogee (Creek) Nation; further updates are anticipated for the 2025 OGS Annual Report.

COUNCIL ON GEOGRAPHIC NAMES AUTHORITIES (COGNA)

The OKBGN is a member of the Council on Geographic Names Authorities (CoGNA), an association of state and federal government agencies working to promote national standardization of the names of geographic features in the U.S. This September, Chair Cesalea Ray represented OKBGN at the annual CoGNA conference in Columbia, Missouri. The annual conference provides workshops, academic papers, and discussions that bring decision-makers from federal and state agencies, academia, and the public together.

PEER-REVIEWED JOURNAL ARTICLES

Allen, B., Murray, K., **Ogwari, P.**, **Suriamin, F.**, **Walter, J. I.**, & **Hayman, N. W.** (2024). Pressure monitoring of disposal reservoirs in North-Central Oklahoma: implications for seismicity and geostorage. *Journal of Geophysical Research: Solid Earth*, 129. https://doi.org/10.1029/2024JB029200

Allen, B. & **Hayman, N.** (in review). Patterns of fluid intrusion in visco-elasto-plastic media. *Journal of Structural Geology*.

Ho, L. M., **Walter, J. I.**, Hansen, S. E., & Sanchez Roldan, J. L. (2024). Evaluating automated seismic event detection approaches: an application to Victoria Land, East Antarctica. *Journal of Geophysical Research: Machine Learning and Computation, 1*. https://doi.org/10.1029/2024JH000185

Karplus, M. S., Nakata, N., Kaip, G., Harder, S., Gonzalez, L. F., Booth, A., Smith, E., Veitch, S., **Walter, J. I.**, Christoffersen, P., & Tulaczyk, S. (2024). Signal characteristics of surface seismic explosive sources near the West Antarctic Ice Sheet Divide, *Journal of Glaciology, 70*. https://doi.org/10.1017/jog.2024.41

Kibikas, W., Ghassemi, A., **Walter, J. I.**, & Carpenter, B. (in review). Experimental velocity anisotropy in crystalline basement rocks of the Midcontinental USA. *Journal of Applied Geophysics*.

Lamb, W. M., **Hunt, L. E.**, & Popp, R. B. (2024). Fluids in the shallow mantle of Southeastern Australia: Insights from phase equilibria. *American Mineralogist: 109*(12) 2013-2025. https://doi.org/10.2138/am-2022-8735.

McGlannan, A. J., Bonar, A., Pfeifer, L., Steinig, S., Valdes, P., Adams, S., Duarte, D., **Milad, B.**, Cullen, A., & Soreghan, G. S. (2024). An eolian dust origin for clastic fines of DevonoMississippian mudrocks of the greater North American Midcontinent—Reply. *Journal of Sedimentary Research, 94*(1), 156-157. https://doi.org/10.2110/jsr.2023.122

McKnight, J., **Ogwari, P.**, **Walter, J. I.**, Ng, R., Mansourian, D., & Saneiyan D. (in review), Geophysical assessment of surface sediment amplification of hydraulic-fracture triggered seismic ground motions. *Natural Hazards*.

Milad, B., Moghanloo, R. G., & **Hayman, N. W.** (2024). Assessing CO2 geological storage in Arbuckle Group in northeast Oklahoma. *Fuel, 356*. https://doi.org/10.1016/j.fuel.2023.129323

Milad, B., A. Tinni, P. A. Lo, R. Eljadi. (2024) Extended review and experimental setup development for continuous solvent and oil coinjection for asphaltene deposition in porous media. *Energy & Fuels, 38*(13), 11562-11581. https://doi.org/10.1021/acs.energyfuels.4c00252

Ng, R., Chen, X., Nakata, N., & **Walter, J. I.** (2024). Precise relative magnitude measurement improves fracture characterization during hydraulic fracturing. *Geophysical Journal International, 238*(2), 1040–1052. https://doi.org/10.1093/gji/ggae204

Ogbonnaya, O., **Suriamin, F.**, Shiau, B., & Harwell, J. H. (2024). Enhanced oil recovery formulations for liquid-rich shale reservoirs. *Fuel, 368*. https://doi.org/10.1016/j.fuel.131573.

Peng, J., Hu, Z., & Feng, D. (2024). Influence of quartz types on rock fabrics and bulk physical properties in organic-rich mudstone: a review. *Earth-Science Reviews, 249*. https://doi.org/10.1016/j.earscirev.2023.104670

Peng, J. (in review). The classification scheme for fine-grained sedimentary rocks: a review and a new approach based on five inherent rock attributes. *Gondwana Research*.

Regmi, N. R., Webb, N. D., **Walter, J. I.**, Heo, J., & **Hayman, N. W.** (2024). Mapping landforms of a hilly landscape using machine learning and high-resolution LiDAR topographic data. *Applied Computing and Geosciences, 24*. https://doi.org/10.1016/j.acags.2024.100203

Regmi, N. R., **Walter, J. I.**, Jiang, J., Orban, A. M., & **Hayman, N. W.** (2024). Spatial patterns of landslides in a modest topography of the Ozark and Ouachita Mountains, USA. *Catena, 245*. https://doi.org/10.1016/j.catena.2024.108344

Thapa, M., Jiang. J, & **Regmi, N. R.** (in review). Variability of landslide susceptibility models under different ground motion scenarios. *Engineering Geology*.

GEOLOGICAL MAPS

Campbell, J. (2024). Structural/tectonic map of Oklahoma. 1: 750,000. https://www.ou.edu/ogs/maps/geologicmaps

Eichler, C. M., **Lewis, C.**, & **Stanley, T. M.** (2024). Geologic map of the Muskogee 30X60-minute quadrangle, Cherokee, Creek, McIntosh, Muskogee, Okmulgee, Sequoyah, Tulsa, and Wagoner Counties, Oklahoma. Scale 1:100,000. https://www.ou.edu/ogs/maps/ogq

Stanley, T.M. (2024). Geologic map of the Woodward 2-degree sheet, Alfalfa, Blaine, Dewey, Ellis, Garfield, Grant, Kingfisher, Major, Roger Mills, Woods, and Woodward Counties, Oklahoma. Scale 1:250,000. https://www.ou.edu/ogs/maps/ogq

ABSTRACTS & CONFERENCE PROCEEDINGS

Barth, S., Jepson, G., **Regmi, N. R.** (2024). Monazite fission-track dating of river incision in the Nepalese Himalaya. Geological Society of America Abstracts with Programs, 56(5). https://doi.org/10.1130/abs/2024AM403574.

Bodunde, S., Jiang, J., Viteri-Lopez, J., **Walter, J.**, & Carpenter, B. M. (2024). Microseismic evolution, fault reactivation, and stress heterogeneity of crustal faults at Pawnee, Oklahoma. *American Geophysical Union, (AGU24)*.

Hayman, N., **Allen, B.** (2024). Force-chain dynamics imaged in an experimental granular pile, with implications for landslide and creep processes. *American Geophysical Union, (AGU24)*.

Hunt, L., **Hayman, N. W.**, **Lewis, P. C.**, & Eichler, C. (2024). Determining the critical mineral potential of the Wichita Mountains. *Geological Society of America Abstracts with Programs, 56*(5). https://doi.org/10.1130/abs/2024AM-403306

Jiang, J., Bodunde, S., **Walter, J.**, Carpenter, B. M., & Viteri-Lopez, J. (2024). Crustal rheological layering revealed in multiscale signals of natural and anthropogenic processes at Pawnee, Oklahoma. *Seismological Research Letters, 95*(2B), 1327. https://pubs.geoscienceworld.org/srl/issue/95/2B

Muñoz, L. F., **Walter, J.**, Pulliam, J., Leonel, J., & Polanco Rivera, E. (2024). Machine learning as a tool to build a comprehensive seismic catalog for the Island of Hispaniola. *Seismological Research Letters, 95(*2B), 1423. https://pubs.geoscienceworld.org/srl/issue/95/2B

Ogwari, P., **Walter, J.**, **Allen, B.**, **Thiel, A.**, **Woelfel, I.**, & Mace, B. (2024). Wastewater disposal and hydraulic fracturing interaction propagating seismicity in Oklahoma. *Seismological Research Letters, 95*(2B), 1328. https://pubs.geoscienceworld.org/srl/issue/95/2B

Regmi, N. R., **Walter, J.**, Jiang, J., **Hayman, N.** (2024). Characteristics of landslides in the Ozark and Ouachita Mountains, USA. *Geological Society of America Abstracts with Programs, 56*(5). https://doi.org10.1130/abs/2024AM-402990.

Thapa, M., Jiang, J., & **Regmi, N. R.** (2024). Optimizing landslide detection and validation through Sentinel-1 radar imagery: case studies of Hokkaido and Hiroshima in Japan. *Seismological Research Letters, 95*(2B), 1267. https://pubs.geoscienceworld.org/srl/issue/95/2B

Thapa, M., Jiang, J., & **Regmi, N. R.** (2024). Enhancing Landslide Detection with Low-Latency SAR Imagery: A Spectral Analysis Approach for Improved Accuracy and Mapping. *American Geophysical Union (AGU24)*.

Thapa, M., Pradhan, A. M., Chamlagain, D., Jiang, J., & **Regmi, N. R.** (2024). Landslide susceptibility assessment using earthquake ground motion for different return periods in Rasuwa District, Central Nepal. *Seismological Research Letters, 95*(2B), 1267. https://pubs.geoscienceworld.org/srl/issue/95/2B

Suriamin, F. M., **Sapardina, D. W.**, **Hayman, N.** (2024). Quantitative evaluation of CO2 storage potential in the Arbuckle Saline Aquifers, Oklahoma. Society for Sedimentary Geology.

Walter, J., **Ogwari, P.**, **Thiel, A.**, **Woelfel, I.**, **Mace, B.**, & **Hayman, N.** (2024). Seismic hazard analysis for hydraulic-fracture triggered earthquakes in Oklahoma. Seismological Research Letters, 95(2B), 1322-1323. https://pubs.geoscienceworld.org/srl/issue/95/2B

WHITE PAPERS, BULLETINS, & REPORTS

Jiang, J., **Regmi, N. R.**, **Walter, J.**, Carpenter, B. M., **Hayman, N.** (2024). Satellite remote sensing and Geodesy for hazard monitoring, resource management, and geoscience advances in Oklahoma. *NASA Earth Surface & Interior Section*.

Johnson, K. S. (2024). Correlation of Late Permian (Ochoan) Rustler, Alibates, Day Creek, and lower Cloud Chief Formations from West Texas and New Mexico to Oklahoma and Kansas. *Oklahoma Geological Survey Bulletin, 154*.

Murray, K., **Allen, B.**, & **Hayman, N.** (2024). Sub-Surface monitoring of Arbuckle Fluid Pressure. *Oklahoma Geological Survey Open-File Report, 1-2024*.

Regmi, N. R., Jiang, J., **Walter, J. I.**, **Hayman, N. W.** (2024). Monitoring Hillslope Dynamics Using SAR Time Series and Machine Learning. *Annual Report, NASA ESI Program*.

AWARDS & HONORS

EDITOR, SPECIAL ISSUE

Heo, J., Cho, H., & **Regmi, N.** (Eds.). (2024). Water modeling using combined machine learning and fieldwork investigation. *Water*. https://www.mdpi.com/journal/water/special_issues/18KBKTZ6K5

Hu, T., Jarvie, D. M., Song, Z., Han, Y., **Peng, J.**, & Pin, J. (Eds.). (2024). Shale oil micro-migration and its effect on shale oil differential enrichment. *Frontiers in Earth Science*. https://www.frontiersin.org/research-topics/67513/

Li, Y., Li, Z., Zhang, J., Qiu, Z., Kontakiotis, G., & **Peng, J.** (Eds.). (2024). Fine-grained sedimentary rocks: Sedimentary processes, diagenesis, geochemistry and their relationship with critical geological events. *Frontiers in Earth Science*. https://www.frontiersin.org/research-topics/62321/

Peng. J. & Pang, X. (Eds.). (2024). Petrography, sedimentology, and geochemical signatures of fine-grained sedimentary rocks in deep-water environments. *Minerals*. https://www.mdpi.com/journal/minerals/special_issues/0OB336ZI4Z

EXTERNAL AWARDS

Nick Hayman. (2024). Excellence in Transdisciplinary, Convergent Research. *University of Oklahoma*.

Junwen Peng. (2024). Outstanding Reviewer. *Marine and Petroleum Geology, ELSEVIER*.

Molly Yunker. (2024). Vice President for Research and Partnerships Annual Award for Excellence in Research Grants. *University of Oklahoma*.

SPECIAL FUNDING

An Act relating to the Oklahoma Low Carbon Energy Initiative, amending 17 O.S. 2021, Section 802.2. A.9. (2024-2025). Oklahoma Senate Bill 1307. *$4,000,000*. Walter.

DONATIONS

Cheryl “Cheri” Ann Graham Gem Collection. (2024). Troy Graham. Yunker.

GeoKIDS. (2024). The Oklahoma Geological Foundation. *$15,596 in materials*. Yunker.

Cheryl “Cheri” Ann Graham
Nov. 10, 1955 - Nov. 2, 2024
Shawnee, OK

ACTIVE GRANTS

DEPARTMENT OF ENERGY

A Multi-Scale Methane Monitoring System for Enhancing Emission Detection, Quantification and Prediction (2023-2024). FE0032292. *$77,400*. Collaborating partner.

Carbon Utilization and Storage Partnership (CUSP) for the Western USA. (2019-2024). FE0031837. *$193,338*. Collaborating partner.

Critical Minerals in Coaly Strata of the Cherokee-Forest City Basin. (2021-2024). FE0032056. *$197,166*. Collaborating partner.

Developing and Investigating Subsurface Storage Potential and Technical Challenges for Hydrogen DISSPATCH H2. (2023-2025). FE0032351. *$214,005*. Collaborating partner.

Oklahoma Geological Survey Coordination of Mid-Continent Carbon Management. (2024-2026). FE0032374. $999,999. **Hayman, Suriamin, Walter, Yunker,** Burkhart, Knapp.

FEDERAL EMERGENCY MANAGEMENT AGENCY

National Earthquake Hazards Reduction Program (NEHRP) Individual State Earthquake Assistance (ISEA). (2024). EMT-2024-GR05021. *$68,952*. **Walter, Yunker**.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Monitoring Hillslope Dynamics Using SAR Time Series and Machine Learning. (2022-2025). Earth Surface and Interior. *$279,991*. **Regmi**.

NATIONAL SCIENCE FOUNDATION

Acquisition of the IRIS instruments FullWaver device for monitoring active landslides in Oklahoma. (2023-2025). 230845. $173,341. Saneiyan, **Walter**.

Developing Integrated Agroecological Renewable Energy Systems through Convergent Research. (2023-2028). 2317984. *$96,000*. Collaborating partner.

Earth-System Responses to the Penultimate Icehouse-Greenhouse Transition. (2023-2028). 2317596. *$215,908*. Soreghan, Lupia, **Yunker**, Liu, Jepson.

Socially Sustainable Solutions for Water, Carbon, and Infrastructure Resilience in Oklahoma. (2020-2025). 1946093. *$199,280*. Collaborating partner.

The Role of Shear Margin Dynamics in the Future Evolution of the Thwaites Drainage Basin. (2023-2025). 1739027. *$579,061*. Collaborating partner.

ACTIVE GRANTS

UNITED STATES GEOLOGICAL SURVEY

Critical Mineral Potential in the Wichita Mountains, Oklahoma. (2022-2026). EarthMRI. *$297,067.* **Hunt**.

Data Preservation of Geological Resources. (2024-2025). National Geological and Geophysical Data Preservation Program. *$178,810*. **Tarver**.

FY2022 Proposed Investigation - Eastern Oklahoma and Woodward. STATEMAP. *$260,557*. **Stanley**.

Mine Waste Characterization at Oklahoma's Tar Creek Superfund Site. (2024-2027). EarthMRI. *$299,175*. **Hunt**.

Oklahoma Mine Waste Inventory. (2023-2026). EarthMRI. *$53,568*. **Hunt**.

Oklahoma STATEMAP FY2024-2026. (2024-2026). STATEMAP. *$467,242*. **Hunt, Stanley**.

Pennsylvanian Reconciliation and ArcGIS Database. (2023-2025). *$309,570*. **Stanley**.

Phosphatic nodules and associated shale units, Oklahoma. (2024-2027). EarthMRI. *$329,994*. **Hunt, Hayman**.

A selection of treasures from Geologist Office Hours.

COLLABORATIONS

THE UNIVERSITY OF OKLAHOMA

COLLEGE OF ATMOSPHERIC AND GEOGRAPHIC SCIENCES
- Center for Analysis and Prediction of Storms
- Department of Geography and Environmental Sustainability

COLLEGE OF LAW

DATA INSTITUTE FOR SOCIETAL CHALLENGES

DODGE FAMILY COLLEGE OF ARTS AND SCIENCES
- Department of Economics
- Department of Psychology
- Shyam Dev Patwardhan Department of Philosophy

INSTITUTE FOR COMMUNITY AND SOCIETY TRANSFORMATION

INSTITUTE FOR RESILIENT ENVIRONMENTAL AND ENERGY SYSTEMS

GALLOGLY COLLEGE OF ENGINEERING
- School of Electrical and Computer Engineering
- School of Sustainable Chemical, Biological and Materials Engineering

GAYLORD COLLEGE OF JOURNALISM AND MASS COMMUNICATION

MEWBOURNE COLLEGE OF EARTH AND ENERGY
- Mewbourne School of Petroleum and Geological Engineering
- School of Geosciences
  - Pick and Hammer Club

NATIVE NATIONS CENTER FOR TRIBAL POLICY RESEARCH

SAM NOBLE MUSEUM

INDUSTRY AND COMMUNITY PARTNERS

ADA GEM, MINERAL AND FOSSIL CLUB
BAKER HUGHES
CARBON SOLUTIONS LLC
CAPTUREPOINT
CONTINENTAL RESOURCES
COTERRA
CUSHMAN FOUNDATION FOR FORAMINIFERAL RESEARCH
DEVON
ENLINK MIDSTREAM
GTI ENERGY
MEWBOURNE OIL COMPANY
NEXGEN CARBON SOLUTIONS
OKLAHOMA GEOLOGICAL FOUNDATION
OKLAHOMA MINERAL AND GEM SOCIETY
ONEOK
PROJEO
SCIENCE MUSEUM OKLAHOMA
SOCIETY FOR SEDIMENTARY GEOLOGY
UNIVERSITY LUTHERAN CHURCH GREEN TEAM SCIENCE OLYMPIAD

ACADEMIC INSTITUTIONS AND RESEARCH GROUPS

CARBON UTILIZATION AND STORAGE PARTNERSHIP (CUSP) WEST
OKLAHOMA CITY UNIVERSITY SCHOOL OF LAW
OKLAHOMA STATE UNIVERSITY BOONE PICKENS SCHOOL OF GEOLOGY
SOUTHEAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP (SECARB)
TRANSITION TO GREEN ENERGY IN GAS PRODUCING REGIONS (RANGE)

COLLABORATIONS

FEDERAL AGENCIES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)
- Oklahoma Space Grant Consortium Educator Resource Center

NATIONAL SCIENCE FOUNDATION (NSF)

U. S. DEPARTMENT OF ENERGY
- Idaho National Laboratory
- Los Alamos National Laboratory
- National Energy Technology Laboratory
- National Renewable Energy Laboratory
- Pacific Northwest National Laboratory
- Sandia National Laboratories

U. S. DEPARTMENT OF THE INTERIOR

U. S. ENVIRONMENTAL PROTECTION AGENCY

U. S. FISH & WILDLIFE SERVICE
- Wichita Mountains Wildlife Refuge

U. S. GEOLOGICAL SURVEY (USGS)
- Advanced National Seismic System
- U. S. Board on Geographic Names

U. S. DEPARTMENT OF HOMELAND SECURITY
- Federal Emergency Management Agency (FEMA)

NATIVE NATIONS

CHEYENNE AND ARAPAHO TRIBES

QUAPAW NATION

STATE AGENCIES

COUNCIL OF GEOGRAPHIC NAMES AUTHORITIES
KANSAS GEOLOGICAL SURVEY
MISSOURI DEPARTMENT OF NATURAL RESOURCES
MISSOURI GEOLOGICAL SURVEY
OKLAHOMA CONSERVATION COMMISSION
OKLAHOMA CORPORATION COMMISSION
OKLAHOMA DEPARTMENT OF EMERGENCY MANAGEMENT
OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
OKLAHOMA DEPARTMENT OF MINES

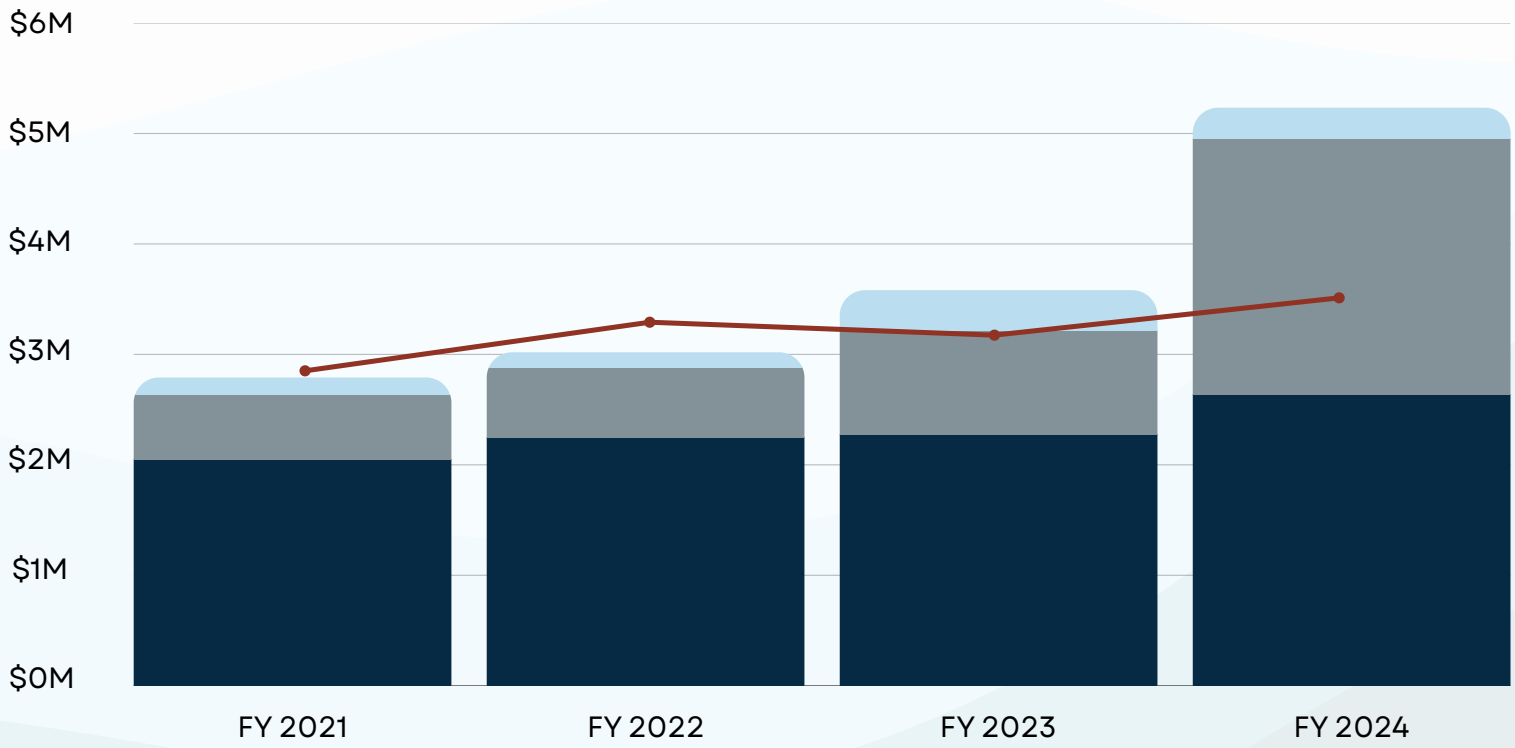


FINANCIAL REPORTS

FY 2024 BUDGETS & EXPENDITURES

State Appropriations (incl. M&O)
Grant Awards
OGS/OPIC Income
Annual Expenditures (approx.)

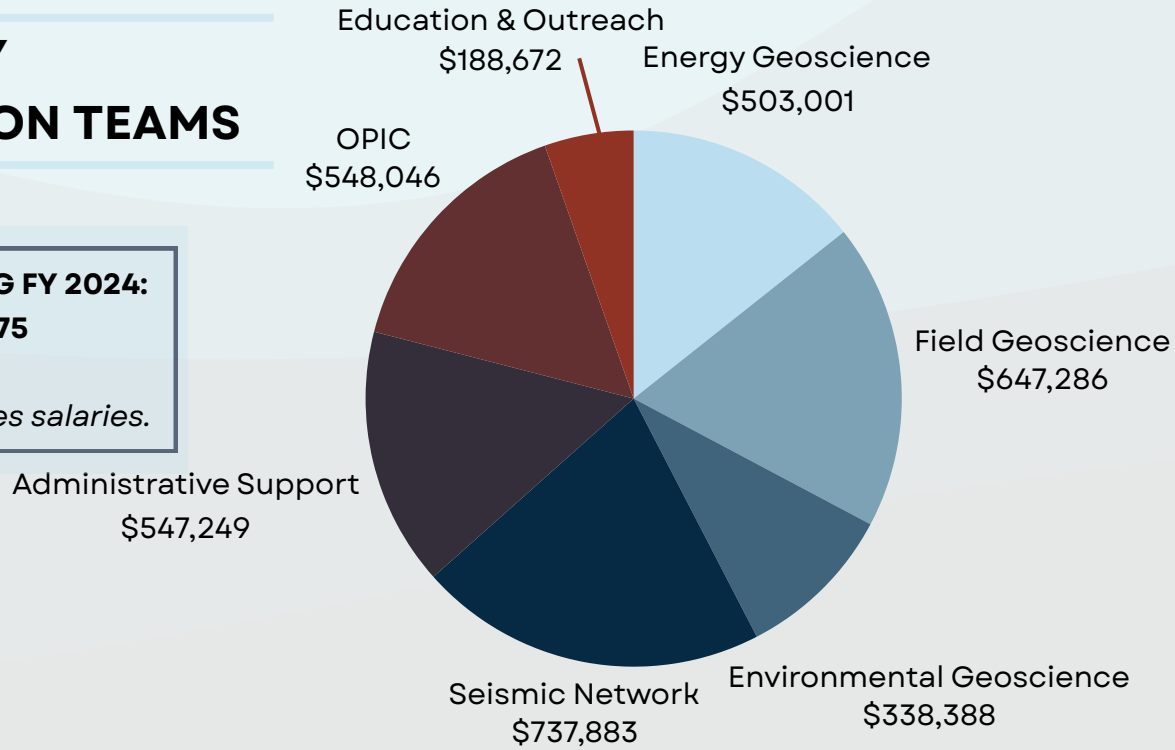
Base OGS Funding comes from the State's General Education budget, and is nearly entirely used to support the OGS staff. All other funding stems from External grants and contracts, and workshop fees and publication sales.



SPENDING BY ORGANIZATION TEAMS

TOTAL SPENDING FY 2024: $3,510,475

Spending includes salaries.



RESOURCES

OGS OFFICE

OPIC

MICROPROBE LAB

EDUCATION

EARTHQUAKE MAP

WELL VIEWER

PUBLICATIONS

MAPS

OGS AWARD RECIPIENTS, 2024

Dr. Ken Johnson gave his talents to the Oklahoma Geological Survey for nearly 40 years. The award in his name is given to an OGS employee who exemplifies Ken's dedication and stewardship in their commitment to the agency and the Oklahomans we serve.

MOLLY YUNKER
KEN JOHNSON STAFF AWARD

The Director's Circle of Excellence includes those employees who represent OGS with outstanding performance.

CHRISHELLE DREW
DIRECTOR'S CIRCLE OF EXCELLENCE

LINDSEY HUNT
DIRECTOR'S CIRCLE OF EXCELLENCE

RICHIE TARVER
DIRECTOR'S CIRCLE OF EXCELLENCE

ANDREW THIEL
DIRECTOR'S CIRCLE OF EXCELLENCE

CARTER LEWIS
KEEPER OF THE OGS GNOME

MAKE A GIFT

REPORT AN EARTHQUAKE

REPORT A SINKHOLE

ASK A GEOSCIENTIST