

# New Opportunities from the National Cave and Karst Research Institute



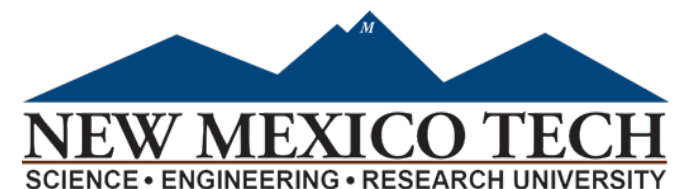
**Daniel S. Jones**

*Earth and Environmental Science*

*New Mexico Institute of Mining and Technology*

*National Cave and Karst Research Institute*

*daniel.s.jones@nmt.edu, @geomicrobe*



# New Opportunities from the National Cave and Karst Research Institute

- Introduction
  - NCKRI
  - What is karst anyway?
- Current opportunities
  - National grant programs
  - Internal grant opportunities
  - NMT student support and other opportunities
  - Open positions with NCKRI
- Looking ahead, and discussion



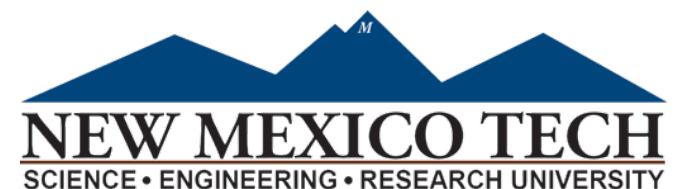
**Daniel S. Jones**

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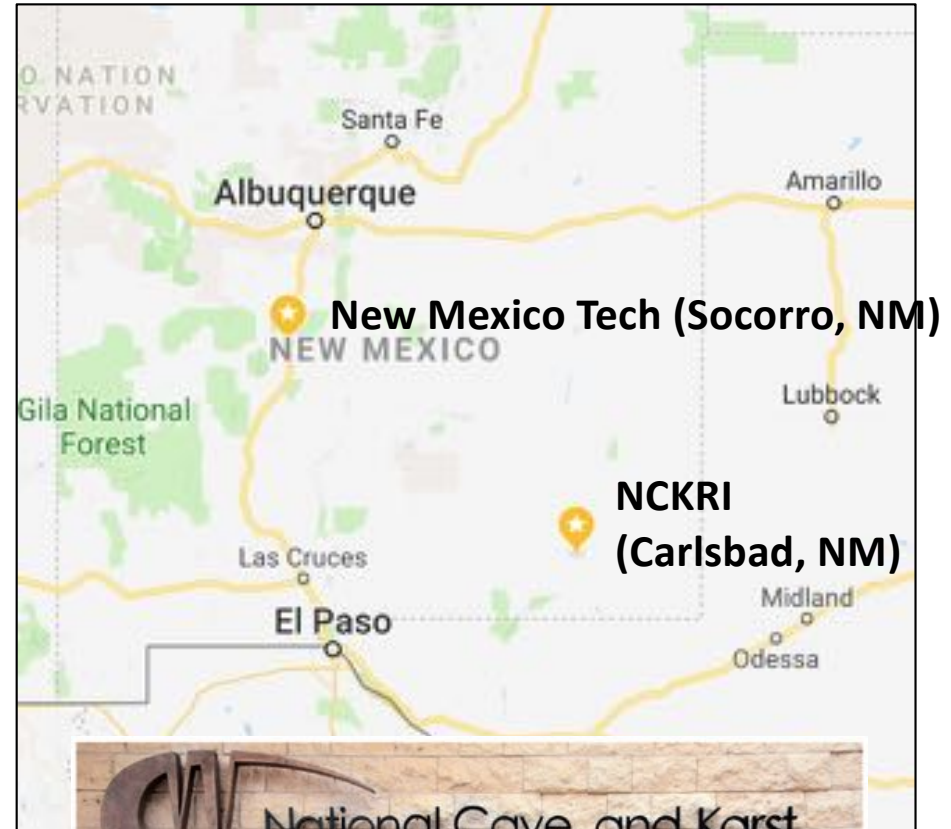
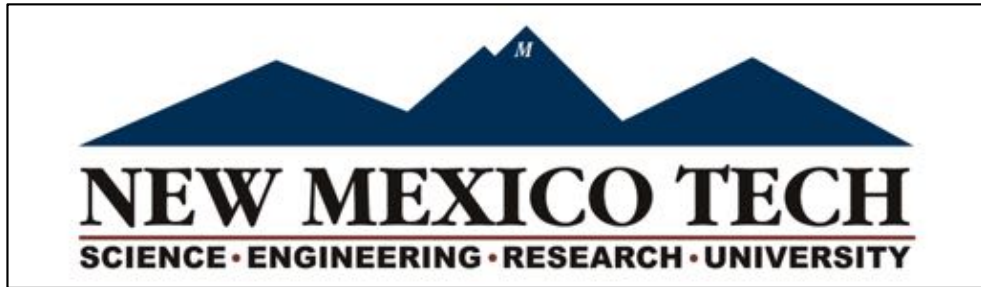
*New Mexico Institute of Mining and Technology*

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# NMT and the National Cave and Karst Research Institute (NCKRI)




[http://www.nckri.org/about\\_nckri/annuals/NCKRI\\_19-20\\_Annual\\_Report.pdf](http://www.nckri.org/about_nckri/annuals/NCKRI_19-20_Annual_Report.pdf)



George Veni, NCKRI Executive Director

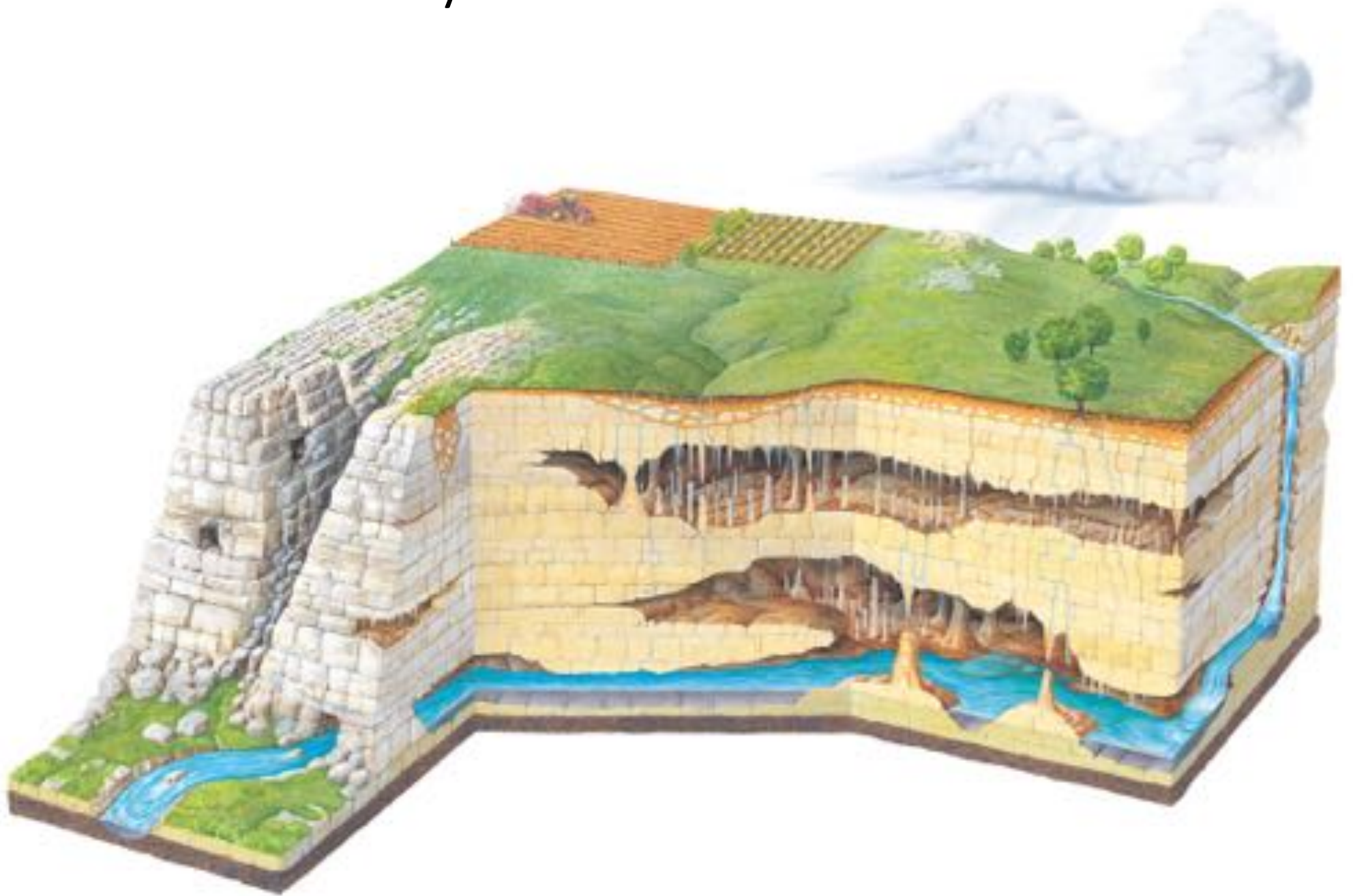
NCKRI photo by Vicky Gonzales.



The Stone Forest in Southern China,  
Yunnan Province

**Karst** is a landscape that is formed by the dissolution of soluble rocks, like limestone and dolomite

# Karst is cave country





<http://iyck2021.org/>

# Who are we?

- George Veni (Executive Director)
- Patricia Seizer (Cave and Karst Management Science Director)
- Vicky Gonzalez (Operations Manager)
- Lewis Land (Karst Hydrologist)
- Jorja Waide (Office Manager)
- Dan Jones (Academic Director)
- Open positions! Education Director and Cave and Karst Science Specialist



NCKRI was created by the U.S. Congress in 1998 with 6 goals

- Further the science of speleology;
- Centralize and standardize speleological information;
- Foster interdisciplinary cooperation in cave and karst research programs;
- Promote public education;
- Promote national and international cooperation in protecting the environment for the benefit of cave and karst landforms; and
- Promote and develop environmentally sound and sustainable resource management practices.

NCKRI is a research center of NMT, and was created by the US Congress in 1998 in partnership with the National Park Service, State of New Mexico, and the City of Carlsbad. Federal and state funding for NCKRI is administered by the New Mexico Institute of Mining and Technology.



# Some of NCKRI's activities include

- Workshops
  - e.g., Sinkhole Conference Series
- Research
  - e.g., sinkhole formation, Snowy River passage of Fort Stanton Cave, Lampenflora in Carlsbad Caverns
- Information
  - e.g. Karst Information Portal, <http://digital.lib.usf.edu/karst>, hosted by the U of South Florida)



NCKRI photo by George Veni  
*New Mexico Tech graduate student and NCKRI scholar Zoë Havlena measures air flow and temperature at the base of the Giant Domes (see photo on page 13), one of the lampenflora study sites in Carlsbad Cavern.*

Carbonates Evaporites (2012) 27:97-102  
DOI 10.1007/s13146-012-0105-6

ORIGINAL ARTICLE

**Geophysical prospecting for new cave passages:  
Fort Stanton Cave, New Mexico, USA**

Lewis Land



**KARST** INFORMATION PORTAL

The Karst Information Portal is a digital library linking scientists, managers, and explorers with quality information resources concerning karst environments.

HOME THIS COLLECTION ONLY ADVANCED SEARCH FULL-TEXT SEARCH BROWSE COLLECTION HELP

Search This Collection [input] [Go] Advanced Search

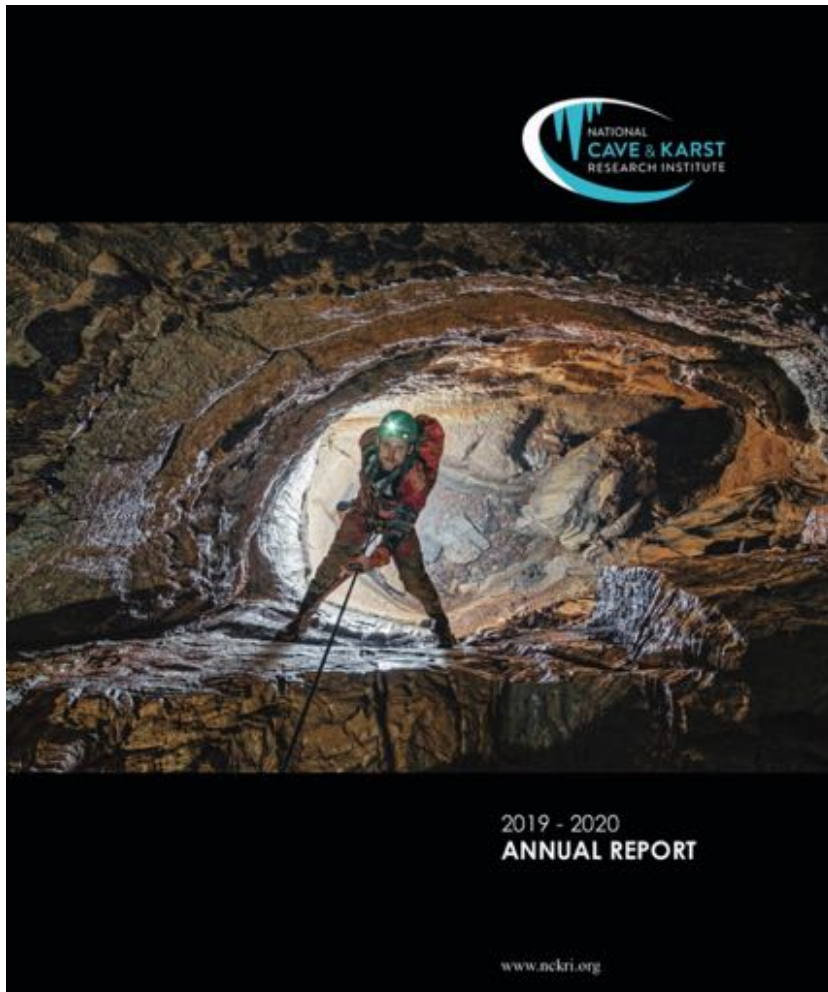
**Karst Information Portal**

**Browse collection**

The Karst Information Portal is an open-access digital library linking scientists, managers, and explorers to quality information resources in order to inform research, to enhance collaboration, and to address policy decisions concerning karst environments.

**What is Karst?** Globally, more than a billion people depend on karst terrains for their water supplies. These environments host great biodiversity that is poorly understood and contains rare and endangered species. The spectacular geology of karst, as well as significant archaeological and paleontological

Check out our latest annual report if you would like to know more about NCKRI's activities



## STUDENT ACTIVITIES

### Cave and Karst Studies of NMT

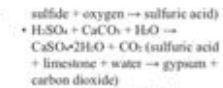
*Cave and Karst Studies at New Mexico Tech (NMT) is NCKRI's Academic Program, and this was another exciting year for the program. Dr. Daniel Jones, NCKRI's Academic Director, taught classes on Earth History, Geomicrobiology, Special Topics in Cave and Karst Processes, and supervised various student independent studies.*

Dr. Jones continued his research program, and recently was awarded a grant from NASA to study biosignatures in gypsum deposits in the Frasassi Caves, Italy. He and his students did fieldwork in Frasassi last summer and are continuing their research on cave geomicrobiology and extremophiles from different environments. Below are some details on NCKRI's Academic Program and the students and programs it is supporting.

### Student Research Projects

**Zoř Havlena** is a PhD student in the Earth and Environmental Sciences Department at New Mexico Tech. As part of her PhD research, she is studying Lehman Caves in Great Basin National Park, Nevada.

Some of the world's largest and most spectacular limestone caves, including Carlsbad Cavern and Lechuguilla Cave in New Mexico, were formed by a process known as "sulfuric acid speleogenesis" (cave formation by sulfuric acid). These caves form where groundwaters charged with hydrogen sulfide (H<sub>2</sub>S) are exposed to oxygen in cave air or in fresh surface waters. Hydrogen sulfide is the gas that gives rotten eggs their "rotten" smell and is an especially reactive form of sulfur that is unstable in the presence of oxygen. As this hydrogen sulfide is exposed to oxygen, it reacts to form sulfuric acid, thus:



Lehman Caves may have formed by sulfuric acid speleogenesis several million years ago, and some passages preserve features consistent with this process. Until recently, little was known about the geological history and evolution of the cave system, and the geomicrobiological processes that affect the modern cave have not been explored.

Ms. Havlena is applying isotopic and mineralogical analytical techniques to help understand Lehman's past and is using molecular tools to explore how microorganisms may continue to impact the cave today. She

presented some of her research at the 2019 Geological Society of America Convention.

In addition to her work on Lehman Cave, she is studying microbial communities associated with gypsum in Italy's Frasassi Caves and is trying to understand how gypsum could be used as a microbial habitat and might preserve biosignatures of ancient microbial life.

**Mackenzie Best** is a Master's student in the Earth and Environmental Sciences Department at New Mexico Tech. For her Master's research, she is studying extreme acid-adapted microbes from sulfidic caves.

Sulfidic caves are hotspots for life in Earth's subsurface. These caves are fed by hydrogen sulfide gas (H<sub>2</sub>S), which supports chemo-synthetic microorganisms that "eat" hydrogen sulfide in the same way



NCKRI photo from Dan Jones. NCKRI Cave and Karst Studies students Zoř Havlena (left) and Mackenzie Best (center) in the Frasassi Caves, Italy, with Dr. Dan Jones (right).

[http://www.nckri.org/about\\_nckri/annuals/NCKRI\\_19-20\\_Annual\\_Report.pdf](http://www.nckri.org/about_nckri/annuals/NCKRI_19-20_Annual_Report.pdf)

# Funding opportunities from NCKRI

- NCKRI National Seed Grant Program
  - Currently open
- NCKRI Scholar Fellowships (student awards)
  - Currently open
- NCKRI-NMT Internal Seed Grant Program

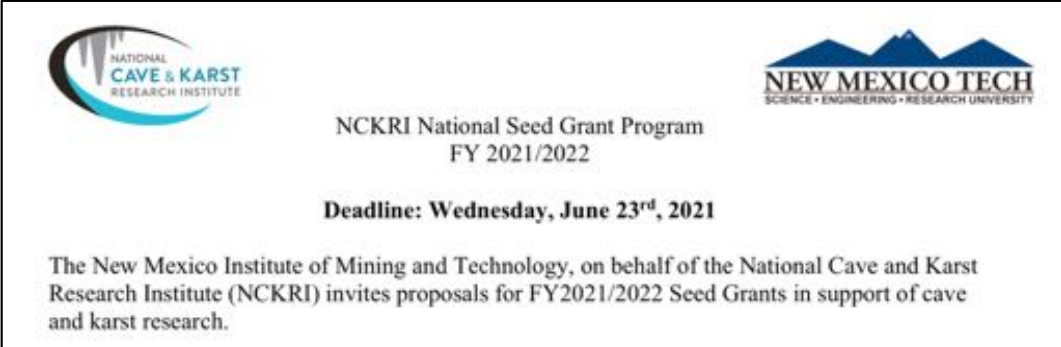
*More information (including RFPs) at:*

<https://www.nmt.edu/research/organizations/nckri.php>



- Additional opportunities for NMT students through the Cave and Karst Studies program

# NCKRI National Seed Grant Program

- NCKRI seed grants are intended to enable investigators to initiate new cave and karst research, and encourage new scientists to enter the field.
- Up to \$25K for 1 year
- Application criteria:
  - New research
  - Clear relevance to cave and karst science
  - Research that addresses the priorities of the NPS (encouraged but not required)
  - Outreach
- 5 page proposal  
(+ budget/CVs/letters)
- Currently open



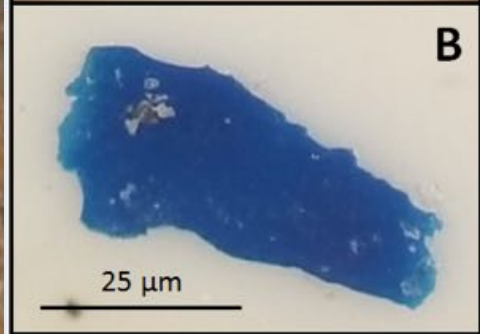
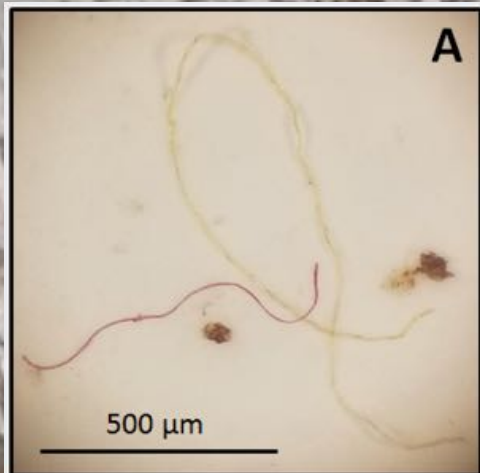
The graphic contains the following information:

-  NATIONAL CAVE & KARST RESEARCH INSTITUTE
-  NEW MEXICO TECH  
SCIENCE • ENGINEERING • RESEARCH UNIVERSITY
- NCKRI National Seed Grant Program  
FY 2021/2022
- Deadline: Wednesday, June 23<sup>rd</sup>, 2021**
- The New Mexico Institute of Mining and Technology, on behalf of the National Cave and Karst Research Institute (NCKRI) invites proposals for FY2021/2022 Seed Grants in support of cave and karst research.

*More information (including RFPs) at:*  
<https://www.nmt.edu/research/organizations/nckri.php>

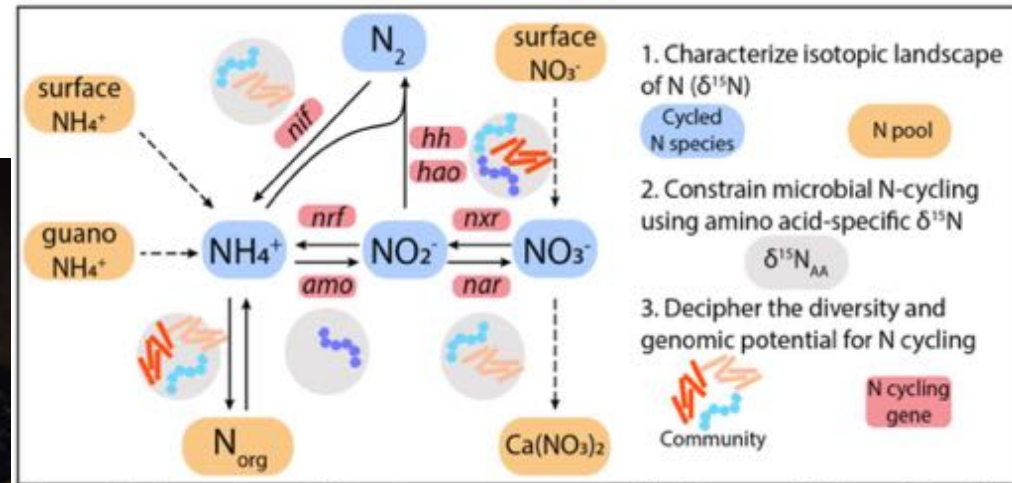
Dr. Elizabeth Hasenmueller: *Quantifying microplastic debris transport and sourcing for a karst aquifer*

Saint Louis University, Department of Earth and Atmospheric Sciences



# Dr. Maggie Osburn: *Constraining the Mammoth Cave Nitrogen Cycle with a Combined Sequencing and Isotopic Approach*

Northwestern University, Dept. of Earth and Planetary Science



You Retweeted



**Dr. Maggie Osburn**  
@ProfMaggie

\$\$\$ alert! I was awarded a NCKRI seed grant this past year and it has catalyzed a whole new research direction in the group. Love me some caves!

**Dan Jones** @geomicrobe · Apr 22

Calling all researchers interested in caves and karst!

@NCKRI is now inviting proposals for its next round of seed grants AND student scholarships! Please help spread the word!

Info here: [nmt.edu/research/organ...](https://nmt.edu/research/organ...)

#Cave #Karst #NCKRI #CaveScience #grants

[Show this thread](#)

3:48 PM · Apr 22, 2021 · Twitter for iPhone

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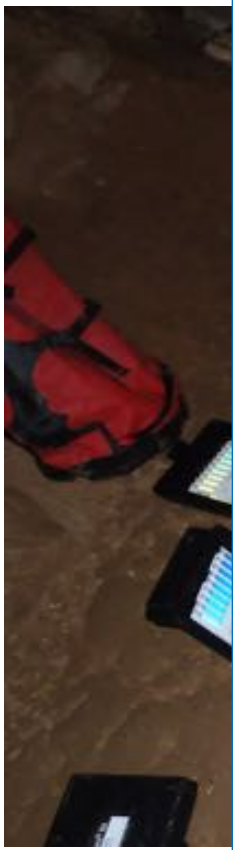
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#Cave #Karst #NCKRI #CaveScience #grants

[Show this thread](#)



3:48 PM · Apr 22, 2021 · Twitter for iPhone

Characterize isotopic landscape  
( $\delta^{15}\text{N}$ )  
d  
ies  
N pool  
strain microbial N-cycling  
amino acid-specific  $\delta^{15}\text{N}$   
 $\delta^{15}\text{N}_{\text{AA}}$   
pher the diversity and  
nic potential for N cycling  
N cycling  
gene  
community



# NCKRI Scholar Fellowship Program

- NCKRI Scholar Awards are designed to support cave and karst research by exceptional graduate and undergraduate students
- 2 graduate and 2 undergraduate awards (\$5K and \$2.5K)
- Application criteria:
  - Clear relevance to cave and karst science
  - Research that addresses the priorities of the NPS (encouraged but not required)
  - Outreach
  - Diverse applicants are encouraged
  - Currently enrolled in an academic or research institution; US citizens or permanent residents only
- 2 page proposal  
(+ personal statement/  
budget/CV/letters)
- Currently open



NCKRI 2021 Scholar Fellowship Program

**Deadline: Tuesday, June 8<sup>th</sup>, 2021**

The New Mexico Institute of Mining and Technology, on behalf of the National Cave and Karst Research Institute (NCKRI), invites proposals for 2021 student scholarships in support of cave and karst research.

*More information (including RFPs) at:*  
<https://www.nmt.edu/research/organizations/nckri.php>



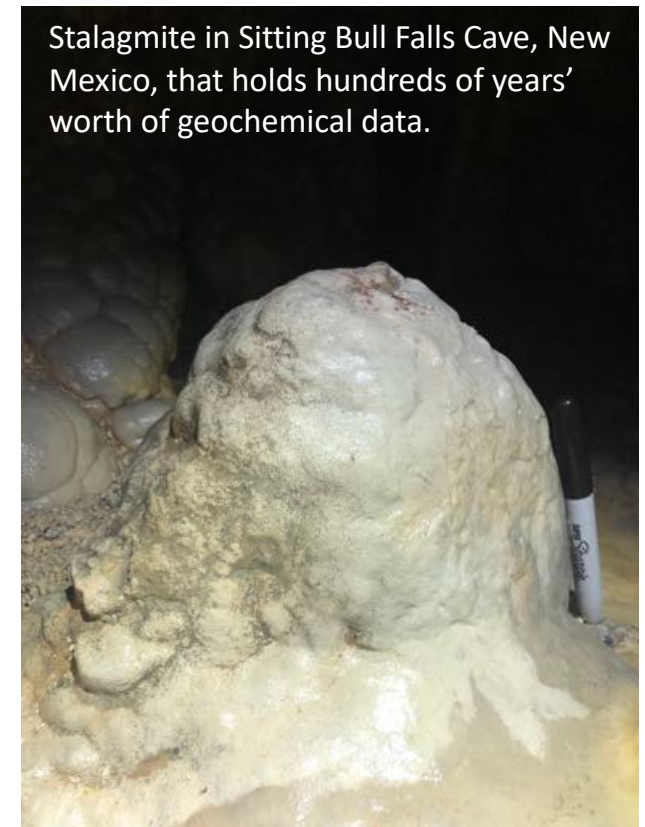
**Heidi Aronson** (Ph.D. Student, USC): Geochemical and Cultivation-Based Investigation of Gypsum-Hosted Microbial Communities in the Frasassi Caves, Italy



**William Coleman** (Ph.D. student, Texas State): Variance in Genetic Diversity of an Endangered Freshwater Beetle Before and After an Adverse Climatic Event



**Natasha Sekhon** (Ph.D. student, UT Austin): Decoding Dry and Wet Conditions in Semi-Arid New Mexico by Studying the Mineral Deposits in a Cave



# NCKRI-NMT Internal Seed Grant Program

Internal seed grants are intended to enable NMT investigators to initiate new cave and karst research, and expand NCKRI's research footprint by enhancing collaborations with NMT faculty and students.

- Up to \$25K for 1 year
- Application criteria:
  - New research
  - Clear relevance to cave and karst science
  - Research that addresses the priorities of the NPS (encouraged but not required)
  - Collaborations with NCKRI staff (encouraged but not required)
  - Outreach
- 5 page proposal  
(+ budget/CVs/letters)

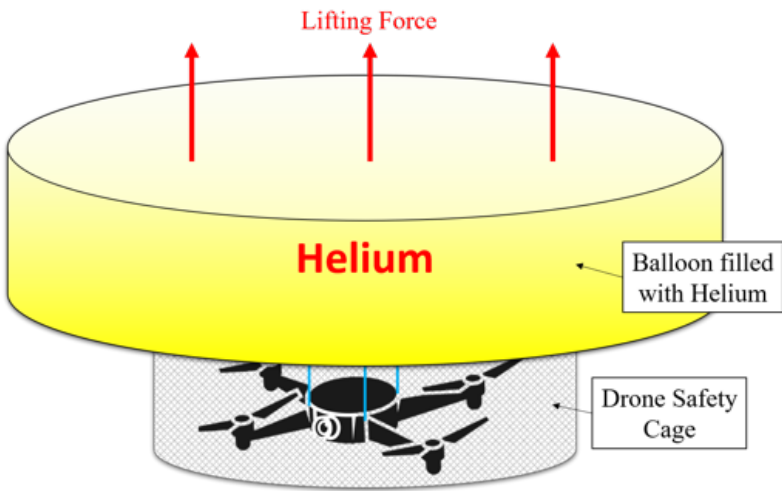
Not currently open – more information about the next call coming soon

*More information (including RFPs) at:*  
<https://www.nmt.edu/research/organizations/nckri.php>

Dr. Thomas Kieft (NMT Biology): *Culture-independent high-throughput analysis of viral communities in Carlsbad Cavern pools*



# Kooktae Lee (NMT Mechanical Engineering): *Development of a Hybrid Drone for Sustainable Cave and Karst Research*



# Cave and Karst Studies at NMT

Interested in cave research?  
Contact me!



Opportunities at NMT include:

- NMT Seed Grants
- Undergraduate research fellowships
- Communications internship
- NCKRI Seminar Series
- And more!



# Funding opportunities for NMT undergraduates



## **Undergraduate Research Opportunities in Caves and Karst (UROCK) Summer and Fall 2021**

The National Cave and Karst Research Institute (NCKRI) and the Cave and Karst Studies (CKS) Program at New Mexico Tech invite applications for Undergraduate Research Opportunities in Caves and Karst (UROCK) fellowships for Summer or Fall 2021.

**Application deadline:** Friday, May 14<sup>th</sup>, 2020, 11:59 p.m. MDT

### **I. Goals**

The UROCK program is designed to create undergraduate research opportunities in cave and karst science at New Mexico Tech. Student awardees (“UROCK fellows”) receive a fellowship to work with a faculty member on a cave and karst research project during the academic year or over the summer. Two awards of \$1500 each are anticipated each semester.

### **II. Requirements**



Open to current NMT students and faculty/staff mentors. Students or mentors that were funded in a previous cycle may apply if they have completed their project and submitted a final report.

Student awardees and mentors will be featured on the CKS website. At the end of the semester or summer, students and mentors are required to submit a 1-2 page report on their activities and results. Reports will be archived on the CKS website, summarized in the NCKRI annual report, and possibly be published as part of NCKRI's Report of Investigation series.

# Undergraduate Research Opportunities in Caves and Karst (UROCK)

Designed to create undergraduate research opportunities in cave and karst science at New Mexico Tech. Student awardees (“UROCK fellows”) receive a fellowship to work with a faculty member on a cave and karst research project during the academic year or over the summer

- Open to current NMT students and faculty/staff mentors
- 3 page double spaced proposal (from and by the student, with guidance from mentor)
- Awards are \$1500 (+\$300 for supplies if needed)
- Limited travel support is available for students after completion of their projects



**Undergraduate Research Opportunities in Caves and Karst (UROCK)**  
Summer and Fall 2021

The National Cave and Karst Research Institute (NCKRI) and the Cave and Karst Studies (CKS) Program at New Mexico Tech invite applications for Undergraduate Research Opportunities in Caves and Karst (UROCK) fellowships for Summer or Fall 2021.

**Application deadline:** Friday, May 14<sup>th</sup>, 2020, 11:59 p.m. MDT

# Research opportunities in cave and karst studies at NMT



## Undergraduate Research Opportunities in Caves and Karst (UROCK) Spring 2020

The National Cave and Karst Research Institute (NCKRI) and the Cave and Karst Studies (CKS) Program at New Mexico Tech invite applications for Undergraduate Research Opportunities in Caves and Karst (UROCK) fellowships for Spring 2020.

**Application deadline:** Monday, December 16<sup>th</sup>, 2019, 11:59 p.m. MDT



## A Review of Models for the Formation of the Guadalupe Mountains Cave and Karst System

UROCK RESEARCH PROPOSAL

-KEITH DIEGEL

Keith Diegel, Fall 2019 UROCK  
recipient and UNM Valencia alum!



Other UROCK projects have included origin of unusual “cone-in-cone” structures (Ethan Haft), extremophilic microbes in caves and karst features (Brianna Green), geophysical characterization (Jared Ciarico)



Photo courtesy of Ryan Leary and Ethan Haft.

Thin section photomicrograph showing cone-in-cone structures that occur at a microscopic scale.



NCKRI photo by Dan Jones.

Colorful microbial biofilms surround a travertine spring near Soda Dam, New Mexico.



NCKRI photo by Dan Jones.

Brianna Green working in NMT's Geobiology lab.



Photo courtesy of Ethan Haft.

Cone-in-cone structures in the Cretaceous Mancos Shale, Socorro County.



# New communications internship for NMT undergrads



## NCKRI Communications Internship Program (NCIP) Summer 2021

Are you interested in helping to make science accessible and developing your communication skills? The National Cave and Karst Research Institute (NCKRI) and the Cave and Karst Studies (CKS) Program at New Mexico Tech are excited to invite applications for a new science communication internship.

The NCKRI Communications Internship Program (NCIP) is a new partnership between NCKRI, New Mexico Tech, and the Blue Marble Space Institute of Science (BMSIS), and was established in 2021 in honor of the International Year of Caves and Karst ([www.iyck2021.org](http://www.iyck2021.org)). Over the course of the summer, interns will receive training in science communication as part of BMSIS' Young Scientist Program (YSP), and will work with a NCKRI scientist on one or more projects celebrating cave science. Projects could involve written communication, graphic design, social media efforts, podcasting, or video logging. The program will run from June-August, 2021, with an option to continue into Fall 2021 for an additional stipend.



The program is open to all current NMT undergraduate students. Prospective interns must submit an application to both BMSIS' Young Scientist Program (<https://bmsis.org/ysp/>) and to NCKRI; if accepted into the Young Scientist Program, NCKRI will provide a stipend of \$1000. Interns should expect to dedicate at least 5 hours each week during the 3 months of the program.

**Application deadline:** 5:00 PM Mountain Time, Thursday, April 15<sup>th</sup>, 2021

# New communications internship for NMT undergrads

- In partnership with BMSIS's Young Scientist Program
- \$1000 stipend (~5 hrs/week); interns will receive training in science communication (w/ Dr. Graham Lau) and work on scicomm projects cave science



<p>Dr. Graham Lau</p>	<p>Communicating Topics in Earth and Space Science</p>	<p>Science communicators stand on the front line of community engagement and the public understanding of science. Making science accessible for everyone requires developed skills in communication as well as an understanding of human nature. The Research Associates who work on this project will develop these skills while writing about science by creating short jargon-free pieces for the BMSIS website. Accepted individuals will also receive training in the use of social media for science</p>	<p>Online</p>	<p>Good writing skills are necessary but will also be developed during the project. The ability to read and understand scientific peer-reviewed research is required. Applicants do not need to have their own social media accounts.</p> <p>NMT students can contact Dr. Daniel Jones (<a href="mailto:daniel.s.jones@nmt.edu">daniel.s.jones@nmt.edu</a>) for further inquiries.</p>
				
<p><a href="mailto:grahamlau@bmsis.org">grahamlau@bmsis.org</a></p>				
<p>Optional co-mentorship through NMT and NCKRI</p>				
				
<p>(students of New Mexico Tech can apply for this separately)</p>				

## New classes and cave and karst science (Fall 2021 and Spring 2022)

- EARTH 289 (Fall 2021): Introduction to Caves and Karst
  - NO prerequisites! Open to students from any major
  - 2 credits
  - Possible field trips (pending COVID-19-related travel restrictions)
  - Topics include an introduction to caves and cave formation; karst water and contamination; climate archives; humans and karst; cave life and astrobiological significance
- EARTH 450/GEOL 550 (Spring 2022): Cave and Karst Systems
  - Co-taught with Dr. Talon Newton
  - 3 credits(?); students will participate in the Fort Stanton Cave Conference in April 2021
  - Topics include cave and karst formation; carbonate chemistry; hydrology, contaminant transport, and water quality ; and a case study on Fort Stanton Cave.

# NCKRI Seminar Series



NCKRI photo by Dan Jones.  
**Dr. Diana Northup gives her invited seminar at New Mexico Tech.**



NCKRI photo by George Veni.  
**Dr. Dan Jones (left) introduces Dr. Muammar Mansor (right) and his NCKRI Seminar lecture.**



# NCKRI is currently adverting 3 open positions!

Three searches, will open on Friday

- Operations Manager
- Education Director
- Cave and Karst Science Specialist
  
- Positions will be based at the NCKRI headquarters in Carlsbad, NM
- Look for an announcement on Friday, and please help spread the word about these new opportunities



Zoë Havlena

Mackenzie Best



Discussion and looking ahead?

