

# GOLD PAN

## PHYSICS AT NMT THE WORKMAN ERA AND BEYOND





### *Greetings, NMT Alumni and Friends*

I hope this edition of Gold Pan finds all of you to be healthy and safe during this global pandemic. Whether you are an early career graduate or retired, I know that all of you have faced challenges and hardships over the past year. I trust that your Techie ingenuity and resolve served to help you weather the storm of 2020 and the continuing challenges of 2021.

We made it through 2020 thanks to our faculty and staff's dedicated and challenging work, as well as the remarkable resilience of our students. The collegiality and resolve I witnessed on campus – largely via Zoom – are what make New Mexico Tech a very special academic community for education, research, work, and study. I cannot overstate the pride I have in our campus community for overcoming these obstacles and still completing a successful fall semester.

It is hard to comprehend student life during a pandemic when we all know that university life is about social, personal, and intellectual interactions. Our current students are among the most vulnerable of Techies; and we have gone to great lengths to ensure the safest environment possible on campus. In October, we launched a new online form for students to report their symptoms - the NMT Student Daily CV19 Symptom Screening page. Students were encouraged to fill out this form every day. The initial response was robust -- in the first week we received more than 2,500 responses. By the end of the semester we had received almost 24,000 responses. I must admit we have offered an "incentive package" to our students involving new versions of gaming devices! We are continuing with this self-reporting initiative in 2021 in the hope and expectation that this seemingly small task can have a significant impact on the spread of the virus and the health of our campus community.

With the start of the Spring 2021 semester, we have expanded COVID-19 testing opportunities in Socorro requiring all of those students coming to campus to

be tested. We are encouraging our NMT community members to register for the COVID-19 vaccination to get as many people vaccinated as possible. In mid-January, New Mexico began taking delivery of vaccines, statewide distribution, and a thoughtful and measured approach to prioritizing vaccinations.

Last November, we hosted the third annual Americas Conference of Universities, along with a dozen of our partner universities in Mexico. The three-day event focused on best-practices for COVID-19 response as well as how universities can learn from each other and be leaders in our two nations and globally. We did not know what our attendance might be, so we were somewhat shocked to find that more than 15,000 people logged in to the event and nearly 150,000 engaged in the online discussions. I found the event both inspirational and motivational; academic leaders from both sides of the border working together to find solutions to the complex issues we face during this pandemic. As institutions of higher learning, we can leverage our strengths in research and innovation to find practical and meaningful solutions. There is a light at the end of the tunnel, and we can get through these tough times by respecting science, working together, and staying vigilant.

I want to extend my heartfelt thanks to everyone in the New Mexico Tech campus community for your efforts and ingenuity in adapting to the challenges of 2020 and looking ahead to continued efforts in 2021. Difficult times can test our resolve, but I've found it reassuring to see the NMT community come together to support each other and adapt to adversity.

Warm Regards,

A handwritten signature in black ink, appearing to read "Steve Wells". The signature is fluid and cursive, written over a white background.

Dr. Stephen G. Wells  
*President, New Mexico Tech*

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## PRESIDENT'S CLUB 2020

Dear President's Club members,

We missed you last year.

Halfway through the spring semester of 2020, the world changed overnight. Schools were cancelled. Graduations were postponed. Stores were closed. Jobs were lost. And for the first time ever, the President's Club reception was cancelled.

But the members of the President's Club show us unwavering support all year. Not only did many of you reach out this spring, but you continue to provide critical funds essential to New Mexico Tech's mission. The President's Club was created to honor you for your support and vision for future generations of Techies.

The President's Club reception has become one of President Wells' favorite events because it allows him to spend a bit of time with you, to get to know you, to understand what NMT means to you and last but not least, to thank you.

Though 2020 will be remembered in history in ways we cannot yet ascertain, it is the acts of compassionate people, people who trust what science and data tell them, and people who put others first that will long be remembered as the shining point of the year.

When we can raise a glass with you in person again, we will toast the resilient spirit of NMT - that spirit we see in our faculty, our students, our alumni and our donors.



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## CORRECTIONS

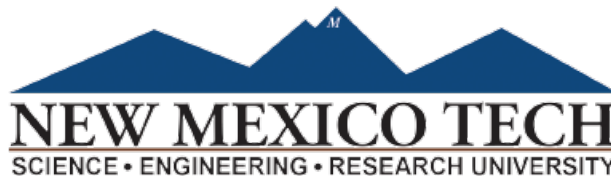
A note from **Nelson E. Welch** (B.S. Mathematics, 1964): "Since my older brother, Lester, commented on a previous error, I feel compelled to point out another error concerning memories. In the summer edition of the Gold Pan, concerning the Lonnie Zamora UFO incident [page 36], Dr. Stirling Colgate was not the President of New Mexico Tech at that time. Dr. Colgate did not come on board until 1965. Take care..."

Our apologies to **Linda Frank-Supka** (B.S. Environmental Engineering, 1988), whose name was omitted from the Summer 2020 "Alumni Trips - Sierrita Mine Tour" [page 4] comment credited to her husband, Richard Supka.

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## PRESIDENT'S MEDAL 2020 *Kelly Family*

Each year, New Mexico Tech honors an important individual who has had a profound impact on the university. President Wells created the President's Medal in 2017 to have an official award for the people who have helped build this institute's reputation and worldwide stature.

In 2020, President Wells chose to honor a special family that has very deep roots at New Mexico Tech. The Kelly family has been associated with the university since the 1940s, and their collective impact has been immense. Family members are: John Martin "**John**" Kelly, **Esther** Kelly, **Joseph** James Kelly, **Patricia** Elizabeth (Kelly) Kyle, **Mary Ann** (Kelly) Twitty, and John Michael "**Mike**" Kelly.



*The Kelly family*

Patriarch John first came to Socorro in 1932 as an undergraduate at what was then known as the New Mexico School of Mines. He earned two degrees, first in Mining (1936) and then in Petroleum Engineering (1939). Those years in Socorro proved to be pivotal in Kelly's life – and in the future of New Mexico Tech.

He and his wife, Esther, married in 1938, and they had their four children. John embarked on an illustrious career and was a stout supporter of New Mexico Tech for his entire life.

## PRESIDENT'S MEDAL 2020

### *Kelly Family*

Mr. Kelly left Socorro and headed to southeast New Mexico, where he and Esther would settle down and make their home. He worked in public service for five years, including time as the director of the New Mexico Bureau of Mines and Mineral Resources. John then started Elk Oil Co. in Roswell, NM.



*John Kelly*

John's stature in the industry led him to even higher public service. In 1961, President John F. Kennedy appointed Mr. Kelly as the Assistant Secretary of the Interior for Mineral Resources. He held that position until he resigned in June 1965 to return to private business in Roswell.

Throughout his career John took an interest in New Mexico Tech, which honored him with an honorary Doctor of Science degree in 1963 and appointed him to its Board of Regents in 1975, a post he held only for two years before he passed away in 1977.

During his brief tenure on the Board, he played an important part in the founding of the Petroleum Recovery Research Center (PRRC). The PRRC's building was dedicated in October 1978 and named the John M. Kelly Petroleum Building. Today, we commonly refer to the PRRC facility as the Kelly Building, keeping the Kelly family legacy alive.

Mike has carried on the family tradition of service to New Mexico Tech. Mike earned his degrees from NMT – a B.S. in 1972, a M.S. in 1996, and a Ph.D. in 2000, all in Petroleum Engineering. He later joined the Board of Regents, serving from 1992 to 1997. He has been an adjunct faculty member as well as

an independent oil consultant.

In 1995, during Mike's time on the Board, Esther and the Kelly children established the John and Esther Kelly Scholarship at New Mexico Tech. For more than 25 years, the Kelly family members have faithfully supported the scholarship fund and have been steadfast champions for the institution.

These scholarships help both undergraduate and graduate students each year. The undergraduate scholarships go to new students from New Mexico who are studying petroleum, mining, or Earth Science. The graduate scholarships go to students who have research projects of interest to New Mexico petroleum producers.

All of the Kellys have been longtime major supporters of New Mexico Tech. Mike chaired the Commitment to Excellence Capital Campaign in 2001, an initiative that raised millions of dollars for NMT, in part thanks to the Kelly family's support.

The 2020 President's Medal is truly a lifetime achievement award for the entire family. Mr. John Martin Kelly started a legacy of giving, public service, and civic duty when he first stepped foot on campus more than 80 years ago.

Since then, the Kelly family has maintained that sense of loyalty, generosity and a deep connection to the institution. Throughout the years, the Kellys have provided the bedrock support that a small university needs to be successful, and they've done so without any need for recognition. They've been foundational benefactors who have flown under the radar without any need for accolades.

New Mexico Institute of Mining and Technology is honored to announce the presentation of this award to the entire Kelly family – John, Esther, Joseph, Patricia, Mary Ann, and Mike.

**BY LISA MAJKOWSKI**

*We are delighted to feature Dr. Claudia Wilson, Associate Professor in the Civil & Environmental Engineering Department at New Mexico Tech.*

***Dr. Wilson, when did you become interested in engineering?***

As a child, I really enjoyed math and science and because of that, from an early age, I knew I was going to follow a career that was somehow related to math, science or engineering. In addition, my father is a chemical engineer, and since we were very young, he and my mom exposed my brother and me to engineering, science, and how fun these fields could be. I initially applied to universities in Brazil, in my hometown of Belo Horizonte.

In Brazil, each university offers its own entrance exams. Students are required to declare their major as they apply to take the entrance exam and they compete for a set number of seats for that major. I debated between architecture and civil engineering, but after talking to my parents, I ended up selecting civil engineering because we believed it would give me more opportunities. I attended approximately half a semester at the Federal University of Minas Gerais (UFMG), but decided to move to the US and attend the Florida State University when I was offered a swimming scholarship. Sports are not part of the university system in Brazil and continuing my swimming career while attending UFMG had proven to be extremely difficult due to the 45 minute to one hour commute from the swim club (where I practiced twice a day) to the university. Florida State made it so easy! After my B.S., I ended up staying for an M.S. and a Ph.D., all in civil engineering.

***What brought you to New Mexico Tech?***

As a Ph.D. candidate at Florida State, I had the opportunity to teach a Statics class. This was unheard of in the Civil and Environmental Engineering Department, but because I had been working as a TA for several years, Dr. Makola Abdullah, my advisor, convinced the department to let me teach the class. He assured them that he would oversee my work, sit in a few of my lectures, and make sure that the class was taught properly. I absolutely loved teaching that class!

When I started looking for a job, I knew that the ideal place for me would be a university that valued teaching as much as research and that had a low student-to-faculty ratio. New Mexico Tech came highly recommended by a couple of professors at Florida State who were familiar with the work of Tech's hydrology professors, so I decided to apply. I was thrilled when I was offered the position! The Civil Engineering program was just starting here at Tech and as the first full-time faculty member in Civil Engineering, I had the unique opportunity to assist in the development of the curriculum.



*Ph.D. commencement, Florida State University's Legacy Fountain, 2005*

## FACULTY SPOTLIGHT

***Claudia Wilson, Ph.D.***

My first impression of Socorro was an interesting one: I was charmed by the architecture of New Mexico Tech's campus, I felt welcomed by the faculty and the staff I met during my visit, and I instantly knew I would be happy working here. However, I was a little worried about the weather - first, I had no idea how to dress for an all-day interview when the temperature was expected to change from 28°F at 7AM to 76 °F by mid-afternoon.

Second, I was worried about the frequency with which baseball-sized hailstorms occurred in the area as several roofs on campus and around town were being replaced and severely dented cars sported "I survived the 2004 Socorro Hail Storm" stickers. Finally, I was concerned about whether I could adapt to life in a small town - having lived in large cities my entire life, I used to refer to Tallahassee as a tiny town (it had around 160,000 residents when I lived there...).

Fifteen years after moving to New Mexico, I am still charmed by the people at NMT and by the campus, I have learned to dress in layers, I have not experienced severe hailstorms (knock on wood), and I cannot imagine living in a large city ever again!

### ***Can you tell us a bit about your current research?***

My research interests are quite diverse. I enjoy the dynamic aspects of Civil Engineering. For my Master's, I worked with the Florida Department of Transportation (FDOT) to investigate the feasibility of transforming existing bridge fender systems into bridge pier protection against barge impact. For my Ph.D., I continued working with dynamic loads, but this time I focused on developing fuzzy logic controllers to regulate the damping properties of magnetorheological (MR) dampers to reduce structural vibrations on seismically excited civil structures.



Since joining New Mexico Tech, in addition to extending my work on the control of MR dampers, refining the tuning techniques, increasing the number of stories of the structures analyzed, and incorporating multiple dampers, I have had the opportunity to explore new areas. I worked on several projects for the New Mexico Department of Transportation (NMDOT) involving the development of standards for tire-bale erosion control systems (with Drs. Ghosh, Razavi, Harrison, and Budek), the effectiveness of snow barriers (with Dr. Budek), the improvement of contract management practices (with Drs. Anselmo and Ulibarri), the assessment of CADD content management software (with Dr. Razavi), and a Peer Exchange for the DOT of five different states (with Dr. Reinow), among others. I also worked with the New Mexico Department of Homeland Security and Emergency Management and several students to conduct a seismic assessment of 72 essential facilities in New Mexico using the Rapid Visual Screening Method.

Currently, I am working on two projects for the NMDOT; the first relates to determining best practices for decarbonizing transportation. My co-PIs on this project are Dr. Frank Reinow, Dr. Haoying Wang, and Dr. Youngbok Ryu and we are being assisted by two students: Britney Green and Miyue Zhong. We are investigating the effectiveness of decarbonization strategies adopted by different states such as incentivizing the sale and the use of electric vehicles, expanding electric vehicle charging infrastructure, using gas tax alternatives, electrifying public transportation, school buses, and freight vehicles, etc.



The second project involves the provision of project management services to the NMDOT Research Bureau. For this project, Dr. Reinow and I are overseeing seven students (Joseph Apodaca, Olivia Brewer, Gabe Chavira, Adam Hamm, Drew Krajeck, Liz Quan, and Daniella Sanchez) as they manage research projects for the NMDOT. This has been a very valuable and unique opportunity for our students who are thoroughly enjoying the experience.

Finally, I am also very interested in Engineering Education. Over the years I had the chance to work on a couple of engineering education projects funded by the National Science Foundation and currently I am collaborating with professors from seven different universities on two papers to be presented at the 2021 American Society for Engineering Education Conference. The first relates to the development of virtual workshops held during the summer of 2020 to encourage faculty to collaboratively create material relating civil infrastructure to current events, specifically, the COVID-19 pandemic, Black Lives Matter, and systemic racism. The second paper relates to the development of a teaching module on the impacts of COVID-19 on transportation systems and stakeholders and its implementation at four different universities, including NMT.

***What is the best part of your job as a professor?***

The part of my job I enjoy the most is teaching. I love being in the classroom, trying new teaching techniques, helping students grasp new concepts, seeing their progress; it's extremely rewarding. I also love when I hear back from our alumni - after following their work here at Tech for four or more years, hearing their goals and plans for the future, writing recommendation letters, I can't wait to hear from them and find out how they are doing.

With respect to research, I enjoy collaborations the most, with both other faculty members and with students. I love sharing ideas and working together to solve different problems.

***What do you do for fun?***

My husband (Dr. Afonso Souza), our 9-year old son, André, and I love to travel and we enjoy a variety of outdoor activities. We swim, mountain bike, hike, I ski, and they snowboard. We also enjoy board games and good movies.

*Dr. Wilson's website can be found at: <http://www.nmt.edu/academics/ceeng/faculty/cwilson.php>*

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## **NEW MEXICO TECH FACE MASKS**

New Mexico Tech alumni, staff, and students have been snapping up our new face masks.

Anton (I, Professor Emeritus of Geology) and Anita (r, *Master of Science Teaching, 1971*) Budding were among the first to show off their New Mexico Tech (classic) face masks. Stylish, indeed!

We thank all our alumni and friends who purchased face masks during the fundraiser (net proceeds supported the Random Acts of Kindness fund).



# TRADITIONS AT TECH - THE SOCIAL DISTANCING WAY!

During the restrictions due to COVID-19, it was important to find ways to creatively continue our Tech traditions this fall and winter. Here are some of the highlights:

## President's Golf Tournament

As a fleet of golf carts headed out over the course, golfers at the 2020 President's Golf Tournament had their temperature checked at registration and practiced social distancing by limiting each golf cart to one person, using individual tee times, and enjoying Grab & Go meals.

At a time when so many events were cancelled, our alumni and donors were happy to have the opportunity to participate in this fun outdoor tourney and they appreciated the extra efforts and precautions taken on behalf of their safety by New Mexico Tech.

Even during this time of pandemic, the tournament raised almost \$170,000!



## 49ers - Twilight Zone

Travel restrictions pretty much put the brakes on most 49ers on-campus activities. While we missed seeing our alumni in person and on campus for 49ers, we were delighted that so many of you were able to join us for the digital events in the "**Twilight Zone**." Virtual events included:

*Science of Star Trek*

with Dr. Michelle Creech-Eakman,

*Ghost Stories from Mammoth Caves*

with President Stephen Wells,

*Fire and Ice: New Mexico Tech's Research in Antarctica*

with Dr. Nelia Dunbar,

*A Distant Thunder*

with alum Ed Fries,

*My Topic? There is no topic, just like my lectures!*

with Dr. Frank Etscorn,

and - of course -

*"Isolation Tapes"* encore performance by The Vigilantes

(photo at right); watch at: <https://www.youtube.com/watch?v=L3eWL4kfgvE&feature=youtu.be>



### Face Mask Contest Winners!

Alumni 1st Place - Jeff Pesula (left)

Student 1st Place - Carmen Apodaca (right)

# TRADITIONS AT TECH - THE SOCIAL DISTANCING WAY!

## Holiday Lights

Starting three years ago, Advancement and the Office of the President teamed up to add a Tech event to Socorro's annual Holiday Electric Light Parade. The front of campus along Leroy Place was adorned with holiday inflatable decorations and luminarias. Holiday revelers could take a "sleigh ride" from the Plaza to Brown Hall, where they would enjoy a treat of cookies and hot chocolate.

Understandably, the parade and sleigh rides had to be cancelled this year, but the decision was made to continue our new tradition of Holiday Lights. Everyone in the Socorro area was invited to take a walk or drive down Leroy Place to enjoy the display.



# RON BROADHEAD: PETROLEUM GEOLOGIST EXTRAORDINAIRE

BY KRISTIN PEARTHREE, RESEARCH SCIENTIST  
NEW MEXICO BUREAU OF GEOLOGY & MINERAL RESOURCES

When Ron Broadhead was a child, he lived in a house in Danville, Illinois with hard shale rock flooring. A fitting precursor of things to come.

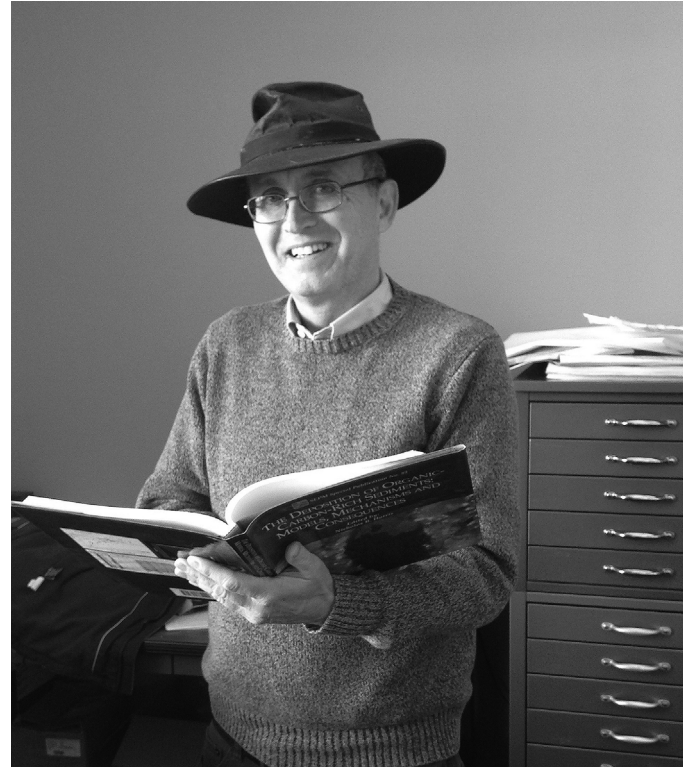
As a graduate student at the University of Cincinnati, he would study shale rocks containing hydrocarbon resources in northern Ohio. And thirty years later, when horizontal fracturing made possible the extraction of unconventional gas resources from shale rocks, he would again return to the subject as a petroleum geologist at the New Mexico Bureau of Geology and Mineral Resources. In March 2020, Ron retired from the Bureau of Geology and gained emeritus status, all while sporting his signature hat.

Ron was born in Racine, WI in 1955 on the western shore of Lake Michigan. His family moved through a few Midwestern states before settling in Illinois. His parents tried to interest him in many things to see what stuck. They even gave him a paleontology kit one year for Christmas.

While in his senior year of high school, he elected to take a semester of earth science and a semester of geography, both courses his counselor assured him were for “the students who could not pass any other kind of science.” But he took them anyway. Through these courses, he developed a keen interest in the earth sciences.

His high school had a room with filing cabinets full of literature from potential colleges. Ron found the postcard for New Mexico Tech and mailed it to request more information. He received a glossy brochure in return. When he showed New Mexico Tech’s earth science curriculum to his teacher, she said it looked good. Ron decided to move from the rainy prairies of Illinois to the dusty town of Socorro, NM in 1973.

He dove right into challenging classes that, “kept him out of trouble,” or so he says. Ron was introduced to his future employer, then called the New Mexico Bureau of Mines and Mineral Resources, during the summer of his junior year.



**Ron in his office with his signature hat.**  
*Photo courtesy of Ron Broadhead.*

Ron had just completed a geologist rite of passage: field camp. The professor teaching the class asked him if he would like to have a job for the rest of the summer working on a joint project led by the professor and the petroleum geologist at the Bureau. Ron then spent the rest of the summer examining metamorphic and igneous rocks in thin section. In the fall of his senior year, the petroleum geologist, Sam Thompson, offered Ron a job working on a project examining and logging well core cuttings. The end result was a junior authorship on a publication.

From there, global events shaped Ron’s path into petroleum geology. When looking at graduate school options, Ron thought, “Where can I make a living?” The answer: petroleum geology.

In 1973, the Organization of Petroleum Exporting Countries (OPEC) issued an oil embargo on the United

## RON BROADHEAD: PETROLEUM GEOLOGIST EXTRAORDINAIRE

States in response to the U.S.'s decision to supply the Israeli military during the Arab–Israeli War. The embargo banned petroleum exports to the U.S. and introduced cuts in oil production. There were nationwide oil shortages and the price of oil skyrocketed. This spurred domestic oil exploration and production, ensuring job opportunities in the industry.



**Ron (right) on a core logging expedition with fellow University of Cincinnati graduate student Greg Hinterlong, December, 1978.** Photo by Roy C. Kepferle. Courtesy of Ron Broadhead.

So, for his graduate research at the University of Cincinnati, Ron studied approximately 400 million-year-old Upper Devonian gas shales in northern Ohio along Lake Erie. The study of gas shales was a very new field of study at the time, but one that would become essential in the future. Using stratigraphy, petrology, organic geochemistry, cores and rock outcrop studies, Ron conducted an integrated stratigraphic analysis of the shale rocks, and then related his results to where drillers had encountered natural gas.

Conventional oil production targets concentrated pockets of oil and gas in the subsurface with vertical drilling. In shale rocks, oil and natural gas are distributed within the formation and extraction by conventional means is not economically feasible. Technological developments in industry would later open up these “unconventional” resources. “People asked me at the time, “Why are you looking at shales?”” Ron remembers, “Now we know.”

When Ron graduated in 1979, the only real jobs available for him were in the oil industry. He joined Cities Service Company working as a petroleum geologist in Oklahoma for two years. He went out to wells during the drilling process to verify if they should be completed or abandoned, developed drilling prospects in Oklahoma, Arkansas and Texas, and evaluated lease requests by other companies to drill on his company's land. “I learned a lot. It was a lot of responsibility for somebody that young but I think I did pretty well. I made a couple of mistakes but I was determined not to repeat them,” says Ron. A lesson anyone can relate to.

But then one night, Ron returned to his apartment late after sitting on a well that was being drilled. He went into his kitchen. He had thrown out his copy of the American Association of Petroleum Geologists (AAPG) Explorer magazine and sticking out of the waste basket was a page with an advertisement for a petroleum geologist position at the New Mexico Bureau of Mines and Mineral Resources. Ron was tired. He thought, “Why not apply for it?” A month or two later, the Bureau called and asked him to come in for an interview.

And so Ron returned to Socorro in 1981. “I think I hit the ground running. The first day...the director at the time, Frank Kottowski, came into my office and gave me a couple of assignments, so I took off with them,” Ron remembers. Over the next 38 years, Ron became “Mr.



**Ron logging cuttings in the old Bureau of Geology building in 2000.** Photo courtesy of Ron Broadhead.

## RON BROADHEAD: PETROLEUM GEOLOGIST EXTRAORDINAIRE

New Mexico, when it comes to resources,” according to Oklahoma State University Emeritus Professor Dr. John Shelton.

Ron conducted a pioneering study in the late 1980s on the Tukumcari Basin in the east-central part of the state. The basin was not a productive oil and gas province at the time.

Using a number of fundamental geologic methods, Ron pieced together the basin’s subsurface structure and stratigraphy. He then looked at how the structure influenced the location of source rocks, which produce oil and gas, versus reservoir rocks, where hydrocarbons become trapped. Reservoir rocks are targets for oil and gas exploration, and of keen interest to industry.

He returned again to the Tukumcari Basin in the early 2000s following a grant from the New Mexico State Land Office. By then hydraulic fracturing combined with horizontal drilling, a process commonly referred to as fracking, had changed the face of oil and gas exploration.

Hydraulic fracturing involves injecting a fluid usually mixed with sand into a target rock formation in the subsurface. The high pressure of the fluid injection generates fractures within the rock that are then held open by the sand. This increases connectivity in the rocks, allowing oil and gas to flow together through a spider web of fractures, becoming more concentrated and thereby increasing the ease of extraction.

In horizontal drilling, a well begins as a traditionally vertically-drilled well at shallow depths. Then, the well veers to a horizontal orientation when approaching the depth of the target rock formation. The horizontal orientation of the well ensures it intersects as many of the newly-formed fractures as possible. Hydraulic fracturing and horizontal drilling opened the door to “unconventional” oil and gas resources, like those present in the Tukumcari Basin and in the gas shales Ron studied as a graduate student.

“When I published the results of the grant, industry activity went wild and companies started leasing all over the place, including on state trust lands,” says Ron.

Later in his career, Ron began working in the San Juan Basin in northern New Mexico, studying the Mancos Shale. Industry was just starting to take notice of the Mancos as a target formation for unconventional oil and gas extraction. As the Bureau’s petroleum geologist, Ron was in a unique position to develop a basin-wide overview by mapping the potential distribution of resources.



**Receiving his 35 Year Service Award from University President Stephen Wells.** Photo courtesy of Ron Broadhead.

One of Ron’s most significant contributions to geoscience, however, comes from his investigations of the geology of helium resources. Helium gas is indispensable in modern society. It is used to cool the magnets in MRI machines, to make fiber optic cables and computer screens, and in mass production of computer chips. “And it makes you talk funny,” Ron chuckles. Helium co-occurs with other natural gases, but not often in high enough concentrations to justify the expense required to extract it.

Ron mapped concentrations of helium-rich gases throughout the state. With helium resources becoming increasingly scarce, New Mexico stands to benefit from Ron’s work. “[It’s] still an up and coming resource,” says Ron, “And nobody had [mapped statewide helium concentrations] before in any state.” In helium, as in gas shales, Ron was ahead of the curve. Ron intends to continue investigating the geology of helium resources in his emeritus position at his new office on the third floor of the Bureau of Geology’s building.

## RON BROADHEAD: PETROLEUM GEOLOGIST EXTRAORDINAIRE

Ron may be known for his wide-ranging knowledge of resources in New Mexico, but his work extends beyond just research and into teaching and professional service.

Ron taught Petroleum and Subsurface Geology at New Mexico Tech for 32 years, educating as many as 400 to 500 students. When he began teaching, he found that sometimes there was not any published literature that he could assign to his students, so he ended up writing it himself.

He has interacted constantly with geologists working in industry and for other state and federal agencies. Members of the public approach Ron with questions about land they own and potential resources. "He just is a wealth of knowledge about New Mexico and geology in general," says MARs Exploration and Energy petroleum geologist Mike Raines, "He's passionate about it [and] he's dedicated to it; I know he spends a lot of late hours. I've called him when I thought I'd be leaving a voice mail on his office phone and he was there. He answered the phone and he just [took] 30 to 40 minutes to talk to me about it."

Indeed, among his many awards, Ron received the Monroe G. Cheney Science Award from the Southwest Section of the AAPG "for singular contributions and service toward the understanding of petroleum geology in the Southwest Region."

"So that tells you about Ron, that he's regarded as being a major contributor to the petroleum geology of New Mexico and the surrounding area in particular... those aren't handed out willy-nilly," says Shelton. "You have to do something for them, and certainly he did more than his share."

Ron's service extends into the professional organization sphere. He served as editor for the online AAPG publication *Search and Discovery* for two and a half terms. Why a half term? Because he served two terms and then voluntarily stayed on for an extra year until a new editor could be appointed. "Ron did well beyond what he was expected to do and he actually kept working when he could have easily said, 'Look, this is in your ball court,'" says Shelton, "And [that's] typical of Ron from what I know of him. He goes the extra mile in whatever he does." And that really gets to the heart of Ron as a person. "My second favorite thing about Ron is how knowledgeable he is about New Mexico and how passionate he is about geology in general," says Raines, "My favorite thing is how he treats people."

### Sources:

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## NEW MEXICO TECH: THANKS FOR THE MEMORIES

### **My Time at NM Institute of Mining and Technology** *Philip W. Kriegh, PE (B.S. Mining Engineering, 1981)*

The time spent at New Mexico Tech was a defining moment in my life. My life was shaped by a lot of really good teachers, but I had two great teachers at Tech. They were **Dr. Ross Lomanitz** (Freshman Physics) and **Dr. Kalmon Oraveoz** (Rock Mechanics).

Not only were they dynamic teachers and masters of the subject material, but explained how conclusions are reached through a logical thought process. The application of a logical thought process can be applied to any situation, not just physics or rock mechanics.

After seeing the beauty of theoretical physics through Dr. Lomanitz's eyes I contemplated changing my major from mining engineering to physics, but decided that majoring in physics would be too hard with limited future job opportunities. A decision I never regretted, even when I did not get a job in the mining industry after Tech. Tech was an important step in a lifetime of learning.

I remember the happy and sad times spent in Socorro.

A good memory was sitting in front of roaring fire at the Stone House on a cold night surrounded by friends on old sofas. At that moment, I felt at peace with myself and everyone in the room.

A good memory was eating lead burgers in the cafeteria with Al Hansen and people of widely different backgrounds, harmoniously listening to Ed Brandt tell jokes.

A good memory was Phil Poirier (*B.S. Metallurgical Engineering, 1986; 3/24/1950 – 9/15/2005*) greeting me loudly in front of the Brown Hall entrance with, "Hi Crash." About 100 students looked in my direction wondering who goes by the name of "Crash."



A good memory was the comradeship of dorm life, visiting with others, having others visit, living with friendly roommates, lounging at the swim pool, and playing billiards with people of various backgrounds.

A good memory was living like there was no tomorrow.

A good memory was receiving good grades in recognition of hard work done in the company of others and alone.

An especially good memory was receiving help and support when I really needed it.

I'm out of steam reminiscing about good memories, and do not have the energy or desire to write about bad memories.

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*Would you like to share memories about your time at Tech? We would like to include them in this ongoing series.*

*Submissions can be from one sentence to 300 words; photos eagerly welcomed! Please include an approximate year. Send to [rebecca.clemens@nmt.edu](mailto:rebecca.clemens@nmt.edu). Subject: NMT Memories.*



# PHYSICS AT NEW MEXICO TECH

## THE WORKMAN ERA

BY MEGAN SCHWINGLE

*In the 1940's, the New Mexico School of Mines had long been known for its excellence in mining and petroleum engineering but it was the convergence of world affairs, the perceptive leadership of Dr. E.J. Workman, and the talent that followed him that would transform the School of Mines into the Institute of Mining and Technology and put the university on the map as a premier research institution.*

### **Dr. E.J. Workman**

Dr. Everly John Workman, known as E.J. by some and Jack by others, received his Ph.D. in physics from the University of Virginia in 1930. Following graduation and postdoctoral research at the Bartol Research Foundation (now Institute) and California Institute of Technology, Workman headed to New Mexico to transform not one but two universities.

Workman arrived in Albuquerque in 1933 after receiving a job offer in the physics department at the University of New Mexico. He accepted the position but, in typical Workman style, not until after voicing his concerns about the campus technology and need for modernization. Just three years later, at the age of 36, Workman was promoted to head of the department and more importantly, to organize and lead UNM's new Research and Development Division (R&DD).

With a meager budget of about \$300 and a passion for thunderstorms, Workman and his colleague Robert Holzer got to work measuring, observing, and building a foundation of basic knowledge on storm behavior. Their observations eventually led to questions about cloud electrification.

Storm behavior was a young, wide-open field of inquiry, and the pioneering exploration of it could be done for practically nothing. For all intents and purposes, Workman was founding his own science.  
*Storms Above the Desert*

In 1941, Workman's thunderstorm research had to take a rain check. The United States had just entered World War II and with New Mexico central to the Manhattan Project and explosives testing, Workman and his R&DD team were called in to help. Workman paused his research and put his efforts towards developing the proximity fuse. Thanks to the influx of military research dollars, just five years later, Workman's operation had grown to a 200-member department.

### **Workman's Move to the School of Mines**

It was during this time that friction started building between Workman and UNM's new president. Workman had grown UNM's R&DD into a very successful operation but the lucrative military contracts were with Workman personally, not UNM. The president's push for the contracts to go through the university eventually pushed Workman out. The story of Workman's departure from UNM is a great illustration of the personality and shrewdness of Workman, soon to be 11th president of the New Mexico School of Mines.

The president of UNM was persistent that contracts go through the university. Workman wasn't going to stand for it. He arranged for the Board of Regents of both UNM



E.J. Workman

# PHYSICS AT NEW MEXICO TECH

## THE WORKMAN ERA

and the School of Mines to meet on a Saturday with the Governor of New Mexico in attendance. At that meeting Workman orchestrated the movement of the R&DD to the School of Mines. It was approved by both Boards of Regents and the Governor, essentially leaving the president of UNM with no say in the matter. *Dr. Van Romero, VP Research, (B.S. 1977 and M.S. 1979, Physics)*

The powers had spoken. Workman was hired at the School of Mines, taking his R&DD contracts and much of the R&DD and UNM physics department staff with him. With no suitable facilities in Socorro, Workman and his team operated out of the Sandia's Girls School in Albuquerque. Upon the conclusion of his lease there, a dispute about the future of the facility led to a court battle and the Atomic Energy Commission paying Workman \$600,000 for the space. Workman now had the funds to move his operation to Socorro and create what would become the Terminal Effects Research and Analysis Group (TERA) or as we know it today, the Energetic Materials Research and Testing Center (EMRTC).

### **Workman the President**

Workman came to the School of Mines to continue his research but was soon thrust into the position of interim university president, a position he was reluctant to take but that quickly became permanent. As president, at the top of Workman's to do list was increasing the school's academic rigor. He revamped the curriculum and made calculus a required course for graduation in every major. Its rigorous curriculum and commitment to excellence is something that NMT is still known for today.

I don't know how rigorous the school was before Workman, but I do know that once Workman got here it became more and more rigorous. That's what's going to keep people attracted to New Mexico Tech. A degree at New Mexico Tech is hard work and you have to put a lot of effort into it but when you're done, you've accomplished something. I think that's probably the greatest gift that Workman gave to the School of Mines and it's a big part of his legacy. *Dr. Van Romero*

In addition to increasing the school's rigor, Workman wanted the school's name to reflect what he envisioned the school would become.

Workman saw that this school could be a real gem. New Mexico Institute of Mining and Technology, which was almost the New Mexico Institute of Technology, sounds a whole lot like Caltech and MIT, right? That's what Workman was doing. He was going to make the School of Mines into a Caltech or an MIT. *Dr. Van Romero*

And so to match his vision, in 1951 the New Mexico School of Mines was renamed the New Mexico Institute of Mining and Technology.

### **Dr. Irving Langmuir and Cloud Seeding**

Around this time, New Mexico caught the attention of General Electric scientists as the perfect place for a different kind of research involving clouds. A Nobel laureate in Chemistry, Dr. Irving Langmuir's study of supercooled clouds and



*E.J. Workman, 1948 Porphyry*

# PHYSICS AT NEW MEXICO TECH

## THE WORKMAN ERA

aircraft icing led to more extensive experiments in cloud seeding. After his team, made up of Dr. Vincent Schaefer and Dr. Bernard Vonnegut, proved they could successfully induce precipitation; the group secured funding from the military and in 1948 Project Cirrus came to the Land of Enchantment.

The project came to New Mexico because of Workman's R&DD involving the thunderstorm but also because New Mexico's clouds and weather were perfect for this type of work. The GE team seeded hundreds of clouds near Albuquerque and Socorro and Workman was not far from the action. He briefly paused his thunderstorm work to see what all the fuss was about. While cloud seeding did work, many had reservations about influencing the weather. Langmuir, a firm believer, presented conclusions about cloud seeding that many scientists found unsubstantiated, including Workman, and interest died down early in the 1950's.



*E.J. Workman and crew*

Langmuir was interested in the research Workman was doing here because he was pretty famous in this area. So they started working together. Then Langmuir made a prediction that what was done in New Mexico could trigger thunderstorms in the midwest. Workman didn't agree. From a scientific standpoint, they had a pretty big disagreement and parted ways. *Dr. Van Romero*

Despite their disagreements, Workman would honor Langmuir's influence and affiliation with New Mexico Tech and Socorro about a decade later.

### ***The Pioneers***

By the mid 1950's Workman had assembled a distinguished group of atmospheric scientists to make up the NMT physics department and continue NMT's excellence in the study of the thunderstorm.

In 1948, Workman recruited Dr. Marvin Wilkening fresh from his doctoral studies at the Illinois Institute of Technology in Chicago. Wilkening had gained notoriety because of his work on the Manhattan Project under the famous Dr. Enrico Fermi and was one of the few scientists present for both the first man-made nuclear reaction and the testing of the atom bomb at the Trinity Site. The bulk of Wilkening's research at NMT involved understanding the movement of air in the atmosphere by tracing naturally-occurring radon.

A few years later in 1954, Dr. Marx Brook joined the department. Brook was a recent graduate in physics from UCLA where he studied under the distinguished Dr. Joseph Kaplan. Like Workman, Brook's research interests were lightning and electrification in thunderstorms. This work was not new to Brook, who was a student of Workman's at UNM and contributed to Workman's research on both the thunderstorm and proximity fuse. Brook was known to be a master at designing and building research equipment. The use of radar became central to much of his early research at NMT.

The third instrumental member was Charlie Moore. An anomaly in the field, Moore came to the group with years of practical experience but only a bachelor's degree. Moore's studies in chemical engineering at Georgia Tech were inter-

# PHYSICS AT NEW MEXICO TECH

## THE WORKMAN ERA

rupted by WWII where he served as a weather equipment officer in the China-Burma-India theater. Soon after the war, Moore graduated and got involved in Project Mogul, an effort of the US government to detect nuclear testing using polyethylene balloons carrying microphones. He was first introduced to NMT through his research with Dr. Vonnegut, (the same Vonnegut who worked with Langmuir's cloud seeding experiments), on Mt. Withington, NM in 1956 as a part of the Arthur D. Little Corporation but he didn't become a formal member of NMT faculty until the mid-1960s.

Moore became a pioneer in the use of balloons as research tools. His work with balloons became intrinsically linked with the Roswell incident.

When the "Roswell Incident" became the top UFO sighting of all time in the 1970s, Moore then conjectured that it was a mis-identification of the large polyethylene Skyhook balloons launched from Alamogordo in the late summer of 1947. However, in the early 90s, UFO researcher Robert Todd concluded that the "Roswell Debris" came directly from the MOGUL launches Moore assisted with in June of 1947. The MOGUL balloon trains were a much better match for the neoprene weather balloons and shredded radar reflectors found near Roswell. Todd tracked down Moore, and convinced him that MOGUL was responsible for the Roswell sighting. Moore went on to assist Col. Richard L. Weaver and 1st Lt. James McAndrew with the government's detailed Roswell Report, which had been mandated by Congress to explain the incident. The strongest link turned out to be the fanciful, hieroglyphic-like designs which appeared on tape used to reinforce the flimsy radar reflectors. Moore clearly recalled these curious symbols, which became the "smoking gun" to those who considered the debris to be part of an extraterrestrial craft. *Dave Thomas, Staff Scientist/Software Engineering, IRIS PASSCAL (B.S. Mathematics, 1977; B.S. Physics, 1979; and M.S. Mathematics 1980)*



*Charlie Moore on Magdalena*

### **Langmuir Laboratory for Atmospheric Research**

Moore and Vonnegut spent three years conducting experiments on Mt. Withington and saw many years of research ahead of them. Reluctant to continue commuting from Cambridge, MA to Mt. Withington, Moore longed for a permanent mountaintop lab and on his way out of town in 1956, mentioned the idea to Brook.

With the truck loaded, Moore and Brook sat in a bar in the nearby village of Magdalena. Moore proposed that they jointly build a small, permanent lab on Withington. Brook was interested in the idea and soon passed it on to Workman. *Storms Above the Desert*

Everyone agreed they needed a permanent mountaintop lab but the road getting there was going to be a rough one, literally and figuratively.

It was decided, not without disagreement, that the future home of the lab would be the South Baldy Peak in the Magdalena Mountains. After three years fighting the Forest Service for a road permit, construction finally began in 1961.

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## THE WORKMAN ERA

With the help of TERA, the road was completely roughed out by the beginning of 1962 and cost \$35,000, well under the Forest Service's estimate of a 1967 completion date and cost of \$220,000.

With a road roughed out and plans drawn up, construction on the lab was ready to begin but Workman needed to do one more thing. He wrote to Dr. Irving Langmuir's widow, Marion Mersereau, to ask permission to name the lab in honor of Langmuir. Perhaps it was a strategic move to benefit the university or maybe a way to apologize to Langmuir for their disagreement, but Marion gave her blessing and construction on the lab began the summer of 1962.

The Langmuir Laboratory of Atmospheric Physics was completed a year later and dedicated to Dr. Irving Langmuir on July 4, 1963.

### ***Leaving a Legacy***

As if elevating the curriculum, changing the school's name, establishing a research division, attracting world-class faculty, and building Langmuir Lab are not enough accomplishments for a lifetime, Workman transformed NMT in other ways as well.

Workman built the Research Building, West Hall, and faculty housing. He remodeled Driscoll Hall and expanded Weir Hall. He beautified the campus by closing all of the interior roads. He planted trees and grass, developed recreation fields, replaced the swimming pool, and built his pride and joy, the NMT golf course.



*E.J. Workman, 1964 Poryphyry*

During his tenure, enrollment rose to numbers never before seen at NMT. Prior to Workman's arrival at the School of Mines, five degree options were available. By the time he retired, there were additional B.S. degree options in Mathematics, Basic Science, and Physics. A high point in Workman's tenure was the establishment of the Graduate Program and the world-renowned Hydrology Program. Also added were M.S. degrees in Mathematics, Chemistry, Geology, Geophysics, and Physics, and a Ph.D. in Geophysics.

Workman retired in the mid 1960's after 19 years at New Mexico Tech and went on to become the first director of the Cloud Physics Observatory at the University of Hawaii.

Workman truly did pave the way for NMT to become the research institution it is today. He forever changed New Mexico Tech and his legacy will be remembered and honored.

*This is far from the full story of the impact Workman and incredible pioneers of the NMT physics department had on the university and the world of science; we simply did not have enough space. Alumni have shared wonderful memories about the resourcefulness of Workman, the kindness of Wilkening, the intensity of Brook, and enthusiasm of Moore. We hope that this sparks a few memories for you and that you will share them with us.*

*Much of the historical content for this article was found in "Storms Above the Desert" by Joe Chew and "College on the Rio Grande: The Story of a Small School" by Paige W. Christiansen. We thank them for their investment in these works that honor New Mexico Tech and its history.*

# PHYSICS AT NMT

## ALUMNA SPOTLIGHT: Aileen O'Donoghue, Ph.D.

BY MEGAN SCHWINGLE

Oftentimes it is the enthusiasm of a special teacher that changes the way we view a subject and ignites in us a love for learning. In the case of **Aileen O'Donoghue**, (M.S. Physics, 1988; Ph.D. Physics, 1989), that teacher was her very first geology professor, Dave Clark of Colorado Mountain College.

Aileen's introduction to geology in college, a course not offered at her high school, made her realize that studying science about the sky, mountains, and weather was possible.

It was the Earth and sky that got me interested in physics. I took a geology course and was blown away that science was about nature, about the world outside!

Unlike in high school, I enjoyed math in college. I struggled with physics at first, but as it started to make sense, I realized that I liked it better than my geology courses. I still wanted my studies to be based on learning about the natural world I could see and astronomy gave me that opportunity.

Like many before her, including her New Mexico Tech mentor Dr. Jean Eilek, the Very Large Array (VLA) had a great influence on Aileen's decision to come to Socorro.

The VLA and Tech being a small school brought me to Socorro. I was very lacking in confidence and figured I'd have enough access to my professors to succeed at Tech and I was correct. Also, when I visited and met Jean, I saw someone I could connect with. The other university I was considering didn't have any women faculty and Jean was so engaging! [She] and Frazer Owen, my NRAO advisor, were great for me. They helped me but also made sure I stepped up to meet the challenge of completing my Ph.D.

Aileen was lucky enough to secure a job before finishing her Ph.D. Instead of heading into a postdoc or research career, she followed her passion for teaching to Canton, NY and was hired, all but dissertation (ABD), as a professor of physics at St. Lawrence University (SLU) in 1988. She came back to NMT over Christmas and Spring breaks to finish her Ph.D.

The earth science class I had my first year in college inspired me to become a teaching professor so I might be able to do for someone else what Dave Clark had done for me.

Aileen's six years at New Mexico Tech are filled with many dear friends and great memories spanning from reflections at the Old San Miguel Mission to visits to the Capitol Bar.

The party after my Ph.D. defense (on March 17, 1989) that Jean Eilek, Frazer Owen, and other friends threw was a very special memory. That and of course getting hooded at Commencement later that year.



Aileen O'Donoghue (left) and former student Shawn Golley (right) at Arecibo in 2008. They are standing in a doorway of the Gregorian Dome suspended from the platform (in which their instruments were housed), looking out at the 430 MHz line feed (receiver) broken by Hurricane Maria.

# PHYSICS AT NMT

## ALUMNA SPOTLIGHT - Aileen O'Donoghue, Ph.D.

While teaching is her calling, Aileen didn't completely leave research in the rearview mirror. Aileen has conducted observations at the VLA and Arecibo radio telescopes. She has observed dwarf galaxies at the Vatican Advanced Technology Telescope and the optical spectra of stars using the 90" Bok telescope at Kitt Peak and the 1.5m telescope at Cerro Tololo, Chile.

Aileen also didn't leave New Mexico Tech far behind. In 2005, she got involved with the Arecibo Legacy Fast ALFA survey (ALFALFA). The survey was a tremendous effort requiring over 4,000 hours of observing time so Aileen called on a few friends at New Mexico Tech to join her on the ALFALFA Undergraduate Team (UAT).

Other Tech grads I knew were also at primarily undergraduate institutions with heavy teaching loads so I invited them to join the UAT. David Craig (*M.S. Physics, 1988*), Grant Denn (*B.S. Physics, 1988*), and I were all at a UAT workshop in Green Bank, WV when Mark McKinnon (*Ph.D. Physics, 1989*), the project director of the Next Generation VLA, gave a talk. So we had four Tech physics (astronomy) alums at Green Bank together.

Aileen's story is one of perseverance and knowing yourself well enough to follow your star (pun intended!) Aileen's decision to follow her passions of teaching, research, and astronomy has led to a meaningful 33 year career as a professor of physics at St. Lawrence University.

My career at SLU has been good. I've had two grads get Ph.D.'s in physics/ astronomy, two more are working on their dissertations, and one went observing at Arecibo last Thanksgiving with the last group from the UAT to observe at Arecibo. I'm also the University Marshal so I get to lead the Matriculation and Commencement processions which I find extremely fun. I do love teaching and always tell people that I teach for free but the university has to pay me to grade.

When her eyes aren't towards the sky and when she isn't teaching the next generation of astronomers, Aileen likes to read, spend time with her two cats, and walk the trails around the quaint village where she lives. Aileen also likes to write. In 2007 she published her first book, "The Sky is Not a Ceiling", a story about her journey reconciling faith and reason.

Last but not least, Aileen offers this wonderful advice to current NMT students,

Keep going, no matter how unsuccessful you feel. Achieving a career mostly takes perseverance, not brilliance! Everyone I knew in graduate school who wanted to get their Ph.D., did. Not all of them at Tech, but the only ones who didn't achieve their dreams are the ones who gave up (on themselves). Be courageous and tenacious and you will get to where you want to go.



**Green Bank Observatory, June 2017** (l to r): Mark McKinnon, Aileen O'Donoghue, David Craig, and Grant Denn. Mark had just given a Colloquium on the NG VLA while the Undergraduate ALFALFA Team, the research group that Aileen, David, and Grant participate in, were there having an undergraduate workshop (all had undergraduate students with them).

# PHYSICS AT NEW MEXICO TECH

## FACULTY EMERITA SPOTLIGHT - Jean Eilek, Ph.D.

BY MEGAN SCHWINGLE

New Mexico Tech's legacy in physics may have started in the area of atmospheric physics but has since grown to include astrophysics, in large part because of the groundwork former NMT President Stirling Colgate laid in the late 1960's and early 1970's, as well as creating access to the nearby research facilities including the National Radio Astronomy Observatory (NRAO), Very Large Array (VLA), and Magdalena Ridge Observatory (MRO).

It hasn't been long since the world of science was almost entirely populated by male scientists and professors. That was the case for the New Mexico Tech physics department until **Dr. Jean Eilek** arrived in 1980, becoming NMT's first female physics professor.

Eilek was born and raised north of the San Francisco Bay area and attended the University of California, Berkeley for her undergraduate degree in astronomy. The decision to study astronomy seemed like an easy one for Eilek.

I started to become interested in astronomy in high school. I read some popular books about the sky and that was it. Oh, and I liked science fiction too.

As she said, "that was it." There were, however, a few experiences that indicated to Eilek that she was on the right path.

Between my professors and summer jobs, I was definitely exposed to front line, high level science. Summer jobs I had in the astronomy department and taking classes from physicists who were working in the radiation lab doing particle accelerator work, I definitely caught the bug. It confirmed what I was doing.

After graduation Eilek left the U.S. to start her graduate work at the University of British Columbia in Vancouver, BC. It was there she was encouraged by seeing another woman in the physics world, her professor, who eventually became a friend and mentor.



There aren't very many women in the field. There were fewer then. There was one woman on the faculty during my graduate work. She had a temporary position which eventually became permanent. Just the fact that she was there and could do it ahead of me, I called her a mentor. She was very supportive. She was a friend.

After graduating with her Ph.D. Eilek went on to the University of Sussex, in Brighton, England, for a postdoc. It was there she found her true passion within astrophysics and is also a link that eventually led her to the NRAO and Socorro.

I really fell in love with radio astronomy in Sussex, through some colleagues there. So I applied for an additional postdoc at the NRAO and that has really been the focus of my science ever since.

Eilek left England for a postdoc at the NRAO in Charlottesville, Virginia where she fell further in love with radio astronomy; it is also where she met her husband, Dr. Frazer Owen, a longtime NRAO staff member.



# PHYSICS AT NEW MEXICO TECH

## FACULTY EMERITA SPOTLIGHT - Jean Eilek, Ph.D.

After her postdoc at the NRAO Eilek started looking for her next step. It was a small world in radio astronomy during that time and in a lot of ways still is. A colleague who had recently taken a job at New Mexico Tech encouraged her to apply. New Mexico Tech didn't ring any bells for Eilek at the time but the fact that the VLA and NRAO were close by was enough to bring Eilek out west.

I hadn't heard about Tech. It was really the VLA, the NRAO, and the science that was the draw for me. Ever since I've been at Tech I've always had an adjunct position at the NRAO. Before they built the offices in town, I would go out to the site once a week on the bus to do my science out there. It has always been my other home.

As far as research goes, Eilek calls herself a theorist who likes to work with observers.

What interests me is the interface between physics and observations, usually tied to radio astronomy. So a radio telescope goes out and looks at a galaxy and sees certain data, certain spectra, certain brightness. Really what this means is understanding what is going on inside that galaxy. What are the stars doing, what is the interstellar medium doing, what are the cosmic rays doing, in order to make the radio waves that we see? As far as what objects interest me, my first love has always been radio galaxies.

Eilek's favorite radio galaxy is Messier 87 (M87), one of the largest galaxies in the local universe. She was a part of the group effort that produced the first images of the M87 black hole in 2019.

It was really a technological tour de force. They combined telescopes essentially at dividends of the Earth to create an image of the black hole. M87 is one of my favorite galaxies. I've worked on it a lot because it's beautiful. It has very classic radio jets and a large radio structure. It is a galaxy with so much interesting stuff going on, there is so much information there. It is such a pretty source.

Eilek's research interests are extensive but include studying clusters of galaxies, pulsars, and magnetic fields. Recently she has been a minor author on work in radio emission and magnetic fields in clusters of galaxies. Recent research she was more actively involved with was on pulsar radio emissions as well as a few papers with colleagues involving radio and ultraviolet observations of the radio galaxy Centaurus A.

While Eilek enjoys working with students, her focus is the science.

The science is what brought me here. I enjoy teaching but in the end, science is what makes my heart sing. Right now I am working with two students. One is working on magnetic fields in galaxy clusters and what the VLA tells you about them. The other is working on pulsars. He is interested in the magnetized atmosphere around the pulsar. I am semi-retired, I don't have to do this but when there is a good relationship with the students, I do enjoy getting involved and helping when I can.

When asked what she'd like to instill in her students Eilek said,

I would like them to leave here scientifically and intellectually mature. I'd like them to know how to approach a problem critically and evaluate the inputs and assumptions and ask if something makes sense. To know how to go forward intellectually.

Her hopes for NMT and the future of astrophysics also lie with the students.

# PHYSICS AT NEW MEXICO TECH

## FACULTY EMERITA SPOTLIGHT - Jean Eilek, Ph.D.

It is a priority to train up the students. We need to keep students involved with the NRAO because once they gain experience here, they go on to all kinds of places and do all kinds of great things.

In addition to being a scientist, professor, and mentor, Dr. Eilek also financially supports the university as a donor. Being retired faculty, Eilek has a good idea about the needs of the department and once again, students are the priority.

I try to help when I can and aim my support towards students and things that will help the department as a whole. Our greatest need is keeping the students funded, having enough TAs, being able to provide junior faculty with graduate students, and financial support for our graduate students.

It is difficult to imagine Eilek ever fully closing this chapter in her life but there are a few things that fill her time when she isn't pondering the big questions of the universe. She enjoys reading, history, and is a self-proclaimed gym rat and a frequent visitor to the NMT gym.

She and Dr. Owen often escape to their mountain home in beautiful Pagosa Springs, Colorado. Eilek is also an animal lover. She has volunteered for the Animal Protective Association of Socorro (APAS) for a number of years and is currently Vice President of the organization. Her rescue cat, Ghost, even stopped by to say hello during this interview.

It is clear that Dr. Eilek deeply cares about her work, the future of astrophysics, and New Mexico Tech. She has dedicated over 40 years to her work at NMT and the NRAO and both institutions are better because of her dedication and commitment to furthering our knowledge in astrophysics.

Thank you, Dr. Jean Eilek, for all you do for New Mexico Tech and our world's future astrophysicists.



Amidst all the fear and uncertainty of 2020, it was the New Mexico Tech family who showed us a glimmer of hope.

In April, the Random Acts of Kindness (RAK) Campaign was kicked off to provide emergency aid to New Mexico Tech students impacted by COVID-19.

The outpouring of support was overwhelming. NMT alumni and friends donated over **\$200,000**, directly impacting more than **500** students.

**Thank you**, from the students, staff, and faculty of New Mexico Tech!

## PHYSICS AT NMT (STAR) PARTIES, (ENDLESS) PATIENCE, AND (CORNY PUNS) Remembering Dan Klinglesmith, Ph.D.

Longtime NMT professor and researcher Dr. Daniel A. Klinglesmith, III passed away July 27, 2019; his In Memoriam was published in the Winter 2020 Gold Pan.

In addition to serving as a research scientist for the Magdalena Ridge Observatory, he was a student mentor, club faculty advisor, and champion of multiple outreach programs - longtime host of the Summer Science Program for high school students, a driving force behind the Enchanted Skies Star Parties, and more.

We spoke with **Jon Spargo** (Honorary M.S. in Astronomical Instrumentation, 2000), longtime friend and cohort of Dr. Dan's, and **Curtis Warren** (Bachelor of General Studies, 2016), one of the first students employed/mentored by Dr. Klinglesmith, about their memories of his outreach work and student interactions.

### Outreach

Jon Spargo, now retired after working for NRAO for 38 years, met Dan in the late 1980's in Socorro while Dan was on sabbatical from NASA Goddard Space Flight Center in Maryland. After Dan retired in the 1990's, he and his wife, Gerry, moved to New Mexico; Dan was hired by Magdalena Ridge Observatory (MRO) to do technical work on the interferometer. Dan managed to get some funding to do outreach - he bought a small trailer, loaded it up with a few telescopes, and visited schools at Alamo, Isleta and other pueblos. That was just the start of his long-running outreach efforts. The Summer Science Program, based out of The Thatcher School in Ojai, CA, brings 36 high school students to NMT to study astronomy for six weeks. Dr. Klinglesmith, according to Jon, was always "up to his ears working with the kids," helping them learn to observe and track asteroids for several evenings at the Etscorn Observatory. If done correctly, those observations could be used to calculate the asteroids' orbits.



Dr. Dan setting up at a Star Party



Dan and Jon regularly hosted First Saturday Star Parties at Etscorn Observatory, setting up small outside telescopes and the 20" inside the dome. They coordinated with the VLA tours; visitors could tour the VLA in the morning, get some dinner in the area, then come to the Star Party. Dan loved having kids visit - he'd tell them "I'm going to show you aliens on Mars" on NASA's "Astronomy Picture of the Day" website (<https://apod.nasa.gov/apod/astropix.html>). He'd pull up a photo of the Mars Rover observed from orbit; Dan would remind the kids "the aliens are us!"

Jon and Dan also hosted star parties in southern New Mexico. After years of requests from camping and astronomy enthusiasts in the Alma, NM (near Glenwood) area, they worked with park rangers and found a location on forest service land to create a dark sky campground. It took several years to bring it to fruition, but when the world opens up again, enthusiasts can camp at one site and set up their scopes at a

# PHYSICS AT NMT

## Remembering Dan KlingleSmith, Ph.D.

separate, but nearby, dark sky site.

Jon considered Dan his friend, colleague, and partner in projects and mischief for decades. Jon appreciated Dan's wholehearted passion for sharing his enthusiasm, whether about astronomy, learning, or puns. Especially puns.

### **Mentoring**

Curtis Warren, who started at NMT as a Physics major, joined the Astronomy Club in the Spring of 2011, and soon took over as club president; Dan was the club's faculty advisor. Needing a summer work study job that year, Curtis emailed Dr. Dan to ask if he knew of any openings and they arranged a short meeting (their first face-to-face meeting). They wound up talking for two hours - both were from Missouri, it turns out.

Dan hired Curtis to track asteroids; the first was 1036 Ganymede. Within a year, there were six more students tracking and monitoring, each assigned their own asteroid (although not enough telescopes to go around). According to Curtis, Dan's goal was for every one of his NMT students to first publish their own single-author paper on their asteroid, then publish as part of the group (each working on different aspects). In all, the group published 29 papers.

Curtis fondly remembers Dan's youthful exuberance, endless patience, gifted communication, and expansive interests. Dan was a Navajo rug weaver (and taught a few classes), knew Navajo astronomical names, baked cookies for his students at Christmas, had an elaborate train set up around his house (for a while), loved chocolate, and adored puns ("Started a new program for chocoholics...never be 12 steps away").



*Curtis Warren (l) and Dan KlingleSmith (r) at Etscorn Observatory*

### **Honoring Dan**

Recently, the Kids Science Café in Magdalena, NM has begun construction on the ***KlingleSmith Children's Astronomical Observatory***. When completed, it will include a domed structure with a 9" refractor telescope and an immersive science exploration activity area. Check out the café's website and construction photos at <https://kidssciencecafe.org/>.

If you'd like to remember Dan, his family requests donations be made to the Socorro Rotary Foundation, PO Box 972, Socorro, NM 87801. Please designate "Imagination Library" on the memo line.

Visit our **Giving Page** to see the many ways you can support New Mexico Tech students, research, and activities. Go to **[www.nmt.edu](http://www.nmt.edu)**, then click **Give** at top right.

# PHYSICS AT NEW MEXICO TECH

## ENDOWMENT SPOTLIGHT - *Dr. Marvin Wilkening Endowment Fund*

BY MEGAN SCHWINGLE

### *The Dr. Marvin Wilkening Endowment Fund*

The Dr. Marvin Wilkening Endowment Fund was established by Marvin's daughter Laurel Wilkening, a notable scientist herself, to provide support for the graduate students and faculty of New Mexico Tech's physics department. New Mexico Tech owes many thanks to Laurel and her commitment to furthering her father's legacy.

The Wilkening Endowment has supported many NMT graduate students with their research in physics. Additionally, in 2017, the department honored longtime Professor Dr. Kenneth Minschwaner with the title of the Wilkening Endowed Professor. The endowment provides partial salary support to Dr. Minschwaner and has allowed the department to hire a new junior faculty member. As Dr. Minschwaner noted,

Being able to leverage the Wilkening endowment will allow the department to bring on fresh, new, energetic faculty to keep the department going and then when I retire, we can do it again.

It is especially appropriate that Dr. Minschwaner should be named the Wilkening Endowed professor, as he was Chair of the Physics Department when Laurel visited campus to set up the endowment. He was also neighbors with the Wilkenings when he first moved to Socorro.

It is very much an honor to take the title as the Wilkening Endowed Professor. I was Chair when Laurel came here to set up the endowment and I also knew Marv. He was already retired when we moved here in '94 but Marv and Ruby lived two houses down from us on Tech Hill. It was really nice having them as neighbors. They had us over at their house a few times. They treated our young kids to snacks and always had great stories to tell. Marv was clearly an outdoorsman. A stand out memory was the bear, or maybe it was a cougar, in his house that he had got when he was down in the Gila. And while we hardly ever talked about research or work, from everything that I have read and heard, he was a tremendous scientist.

### *Dr. Marvin Wilkening*

Dr. Marvin Wilkening was born in Oakridge, Missouri and taught high school science and math until he graduated from Southeast Missouri State University in 1939. Wilkening then continued his studies in physics at the University of Chicago. It was there that he met Dr. Enrico Fermi, began his work with the Manhattan Project, and secured his place in history. Wilkening, still a graduate student at the time, and his wife Ruby followed the Manhattan Project from Oak Ridge, TN to Richland, WA and finally to Los Alamos, NM.

Following the Manhattan Project, Wilkening returned to finish his doctoral work at the Illinois Institute of Technology in Chicago. He graduated with his masters and doctorate in physics in three years, having continued his studies uninterrupted while working on the Manhattan Project.

With the Manhattan Project and graduation behind him, Wilkening started looking for his next move and just couldn't shake the impression New Mexico had made. The crowded, cold streets of Chicago left much to be desired when recalling the fair weather and serenity out west. A call from Dr. John Harty, the chair of the New



*Wilkening, 1949 Porphyry*

# PHYSICS AT NEW MEXICO TECH

## ENDOWMENT SPOTLIGHT - *Dr. Marvin Wilkening Endowment Fund*

Mexico School of Mines Physics Department, was a welcome one. Fresh out of his doctoral work, Wilkening packed up and headed to Socorro to start as New Mexico School of Mines newest research professor in physics in 1948. Soon after Wilkening's arrival, the School of Mines became the New Mexico Institute of Mining and Technology.

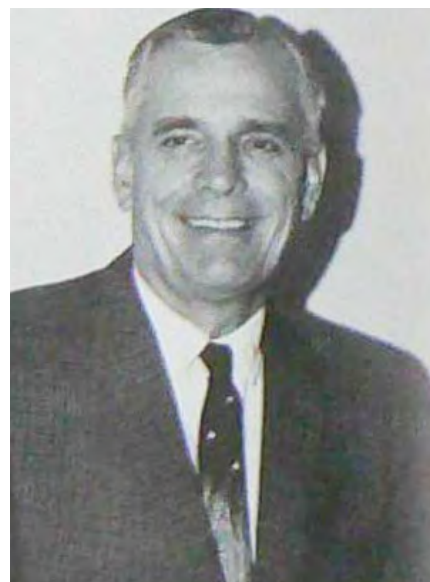
Upon Wilkening's arrival, he was taken under the wing of Dr. William Crozier. Wilkening and Crozier worked together on Mount Withington studying the radioactivity of aerosols. This research eventually brought Willkening into contact with another notable figure in New Mexico Tech history, Charlie Moore. Wilkening joined Moore and his research involving charged particles. Wilkening was interested because of radioactivity, Moore because the separation of charged particles often led to what he was looking for, lightning.

The study of lightning and the thunderstorm was not new at New Mexico Tech. It was a passion of President Dr. E.J. Workman, who had a dream of building a mountaintop thunderstorm lab. After a long battle determining the site and negotiating the cost, he secured approval for construction in 1961 and called on Wilkening for help.

Wilkening played a significant role in the construction of Langmuir Lightning Lab and led much of the scouting and plans for a road up South Baldy. He became the chairman of the Langmuir Laboratory Committee in 1963, the same year the lab was officially dedicated and served in that position until 1969.

Wilkening continued his research in atmospheric radioactivity and as a physics professor, eventually also serving as Dean of Graduate Studies, at New Mexico Tech until his retirement in 1984.

New Mexico Tech is proud to have been home to one of the greats like Dr. Marvin Wilkening. He will forever be a significant figure in New Mexico Tech history and it is because of the foundation and legacy scientists like him have left that we can hope to become home to many more.



*Wilkening, 1981 Porphyry*

### ***Dr. Kenneth Minschwaneer***



*Minschwaneer and friend*

Dr. Minschwaneer officially joined New Mexico Tech faculty in 1994 but his introduction to the university was a few years earlier as a master's student.

I was aware of New Mexico Tech because when I was working on my master's at Florida Atlantic University, part of my summer research was to make measurements at Fritz Peak Observatory near Rollinsville, CO. A couple of times, on my way to Colorado, I would stop in Socorro. I just showed up on campus and started talking with people. One time I even had lunch with some of the faculty. I was struck by how friendly everyone was and the work that they were doing, particularly on lightning, I found to be really interesting even though I wasn't working in that area.

After finishing his two year postdoc at the National Center for Atmospheric Research in Boulder, CO and with a good impression of NMT from his visits

## PHYSICS AT NEW MEXICO TECH ENDOWMENT SPOTLIGHT - Dr. Marvin Wilkening Endowment Fund

while a master's student, Minschwaner applied for an opportunity with the physics department and officially joined the NMT family in 1994.

My background was in atmospheric physics within a physics department. There aren't many places like that, but New Mexico Tech is. Most of the atmospheric research that is done in the country is in departments separate from physics, such as meteorology or atmospheric science. It is not very often that you have a significant component of the physics department working in atmospheric physics. New Mexico Tech is kind of unique in that respect.

Since receiving his degree in 1992, Dr. Minschwaner's research has mostly been inspired by working on problems in climate change. His doctoral thesis involved trying to understand different feedbacks in the climate system, specifically water vapor feedback, and he continued this research in his early days at NMT.

In 2007, the Intergovernmental Panel on Climate Change (IPCC) won the Nobel Peace Prize for the collaborative work of thousands of scientists who contributed to informing the connection of human activities to global warming. Although he doesn't see it as a large contribution, Dr. Minschwaner was one of those scientists.

We evaluated the global warming potential for different greenhouse gases which was something people were interested at that time. Policy makers wanted to know which greenhouse gases we needed to make the most investment in to try to curb emissions. So we made this assessment and were part of the IPCC project. I don't consider it to be that great of an accomplishment because it is one of the things that we do, write papers and summarize the science for policymakers. But it is kind of cool.

Dr. Minschwaner considers his work on reassessing the lifetime of chlorofluorocarbons (CFCs) to be a greater contribution to science than his work with the IPCC.

A couple of years ago I was involved as a co-author working on a re-evaluation of the lifetime of some of the chlorine containing molecules, CFC's and CFC substitutes that can remain in the atmosphere for a long time. These CFCs have been regulated since the Montreal Protocol but we still didn't have a good idea of how long they stay in the atmosphere. This evaluation helped us understand that and while it didn't get much recognition, it was useful for policymakers to be able to understand how long gasses stay in the atmosphere.

More recently, Dr. Minschwaner's interests have shifted to identifying sources of methane. With seed money from the NMT President's Office, Minschwaner and a few other collaborators from NMT and Los Alamos National Laboratory are trying to better understand sources and sinks for methane in the atmosphere.

After CO<sub>2</sub>, methane is the second most powerful man made greenhouse gas and it is increasing like crazy. CO<sub>2</sub> hasn't quite doubled from preindustrial times but methane is almost four times higher. We've equipped a drone with instruments that can accurately measure winds and methane amounts. We are using the drone to look for regions of elevated methane and with the wind direction, we can figure out where it came from. That is the idea at least.



*Minschwaner relaxing*

# PHYSICS AT NEW MEXICO TECH

## ENDOWMENT SPOTLIGHT - Dr. Marvin Wilkening Endowment Fund



*Minschwanner and team*

Currently this project is focused on areas of oil and natural gas activity and on dairy operations around New Mexico. The group is hoping this research will attract the interest of other funding agencies so they can build more sophisticated instruments and secure additional drones to do coordinated observations.

When asked about what he considers his biggest research accomplishment Minschwanner names his most recent published research, “*Detection and classification of laminae in balloon-borne ozone-sonde profiles: application to the long-term record from Boulder, Colorado.*” This paper analyzes over 20 years of balloon measurements from the NOAA Earth System Research Laboratory.

It turns out to be a very interesting exercise. It involves a merging of the data as well as winds from sophisticated models. I think this research will allow us to learn a lot more about how ozone behaves in the atmosphere. Notably, the second author who developed some of the analysis techniques was a NMT undergraduate physics major.

Dr. Minschwanner has contributed significantly to the science community and has dedicated almost 30 years to New Mexico Tech. His retirement is a few years away, but when that time comes you will likely find him outdoors. He enjoys fly fishing in the high-country streams of New

Mexico, backpacking and fishing in the Gila, and traveling back to Florida where he grew up to, you guessed it, fish! He also spends time in the cabin he built in the Nacimiento Mountains near Cuba, NM. Joining him on his adventures, of course, is his wife Cheryl, and their two pit bulls Charlie and Frankie.

*Physics at New Mexico Tech has benefited greatly from the research, innovation, development and teaching by faculty like Dr. Wilkening and Dr. Minschwanner. Thanks to their efforts, and the collaboration and support of countless other faculty, staff, and students past and present, the future of Physics at New Mexico Tech looks bright indeed.*

*Some historical details in this article are from “Storms Above the Desert - Atmospheric Research in New Mexico, 1935-1985,” by Joe Chew, University of New Mexico Press, 1987.*

Has your address, email, or phone number changed?  
Prefer to go digital only? Prefer postal mail only?

Send contact updates to [rebecca.clemens@nmt.edu](mailto:rebecca.clemens@nmt.edu)



# NMT ALUMNI VIRTUAL HAPPY HOUR EVENTS

**FEBRUARY**

**17**

## **Virtual Tour of the Mineral Museum**

Featured Guest: Dr. Virgil Lueth

Time: 6:15 p.m. - 7:15 pm (Mountain Time)

**MARCH**

**3**

## **Virtual Tour of the MRO**

Featured Guest: Dr. Van Romero

Time: 6:30 p.m. - 7:30 p.m. (Mountain Time)

To RSVP, contact  
Sandi Lucero at  
575-835-5618 or  
[sandi.lucero@nmt.edu](mailto:sandi.lucero@nmt.edu)

## **WATCH FOR FUTURE EVENTS**

<http://nmt.edu/advancement/Events.php>

## **Virtual Alumni Events**

Our Virtual Alumni Receptions and events have been so popular, we're planning to continue them indefinitely.

### ***Do you have a topic or guest speaker you'd like us to schedule?***

A favorite NMT professor? An area of NMT research? An interesting field of science or engineering?

### ***Would you like to be a featured presenter?***

We've had some great topics!

Drones; Wine; Sip & Paint; How Water Supply Affects Craft Beer; Department Updates; and more!

Contact Sandi Lucero at [sandi.lucero@nmt.edu](mailto:sandi.lucero@nmt.edu) or 575-835-5618

## RECENT ACHIEVEMENTS

**Caitlyn Clarkson** (B.S. 2014, M.S. 2015 Materials Engineering) completed her Ph.D. in Materials Engineering at Purdue University in 2020. She is now at the Air Force Research Laboratory in Dayton, OH, working as an NRC postdoc for Dr. Hilmar Koerner in the Materials & Manufacturing directorate - Composites Division..

**Mike Crepeau** (B.S. Environmental Engineering, 1998) has been promoted to Associate at Parkhill, Smith & Cooper Inc.

Mike is a member of PSC's Environmental Sector. He has over 20 years of experience and is an expert on regulatory monitoring and compliance for state and federal air, groundwater, and surface water quality standards. Mike is a New Mexico Environment Department Qualified Groundwater Scientist responsible for NPDES compliance and air quality (Title V) regulations for Parkhill's private and public sector clients.

He and his wife, Lisa, have been married for 33 years, and they have two daughters, Caycie and Christine.

**Kathleen Huynh** (B.S. Chemical Engineering with Minor in Biology, 2015) It began in the middle of 2019, I just got married and my husband and I decided to pick up and move from Albuquerque, NM to Portland, OR for a change in scenery.



**Kathleen Huynh and Justin (Toledo) Huynh**

We've been living and working in Portland, then everything with the pandemic hit and caused a lot of unexpected turns, but fortunately I was still able to work and

got promoted. Something that has been both exciting and uncertain, due to our current state of things, but has been a dream of mine.

While 2020 started out with a lot of unknowns, one

thing I'm thankful for and excited about is that I'm able to end 2020 with a great career change, as I am now an Engineer at Nike!



**Appropriate latte**

Looking back, I am especially thankful for everything that Tech taught me because it helped build me into the engineer I am today. And I'm happy to represent Tech and the Southwest up here in the PNW!

**James Kirkland** (B.S. Geology, 1977). I just got promoted to Senior Scientist for the Geological Mapping and Paleontology Program with the Utah Geological Survey.

China has flown me over 10 times and I have toured Chinese Geological Survey strat groups through Utah twice. Lot of work in Spain as well.



**In Mongolia**



Recent major publication can be found at <https://giw.utah-geology.org/giw/index.php/GIW/article/view/73>.

**Canyonlands Inventory November 2020**

**Jim Ruff** (M.S. Physics, 1989) For the last few months I've been hosting the Social Distance Open Mic every Wednesday on Zoom. I used to run an open mic at The Cap, and when COVID-19 hit we got to missing our music friends.

This has filled the void and lets us "zee" each other once a week. There are usually 12 to 15 players (more than we ever got at the Cap!) and about that many listeners. It's the next best thing to being there!

## IN MEMORIAM - FACULTY AND FRIENDS



Paul Cooper

*Guest Lecturer,  
Mechanical Engineering  
Department*

Paul W. Cooper, 83, one of the world's foremost explosives experts, passed away peacefully September 7, 2020 after a long battle with Parkinson's disease.

During his close to 40-year career at Sandia National Laboratories, Paul built a global reputation, searching for nuclear weapons in Iraq and investigating disasters ranging from the explosion of a gun turret on the USS Iowa in 1989 to the crash of TWA Flight 800 over New York

in 1996. Paul also served on a presidential commission that found the U.S. Bureau of Alcohol, Tobacco and Firearms and FBI acted legally in the 1993 siege of the Branch Davidian compound in Waco, Texas, and was called upon by the state of Oklahoma to look at technical evidence in the trials of the 1995 Oklahoma City bombers. He also participated in many other classified operations in service to our nation.

Paul taught explosives safety and technology to more than 1,000 engineers at Sandia National Laboratories and hundreds more at private and government facilities nationwide, including the U.S. Army's Aberdeen (MD) Proving Ground.

Born in Brooklyn, NY, in 1937, Cooper was a natural in front of a class. He taught with expertise, humor, and a dash of irreverence. His classes remained popular because of the scarcity of formal explosives training in the U.S.

A chemical engineering graduate of the Brooklyn Polytechnic Institute, Paul joined Sandia National Laboratories in 1964 after working in explosives at the Illinois Institute of Technology's Armor Research Foundation. He worked in explosive components at Sandia until 1977 when he was recruited by the labs' Underground Nuclear Testing arming and firing group, where he stayed until he retired in January 1997. His work focused on the design of explosive systems.

In 1979, Paul joined the national Nuclear Emergency Search Team, NEST, an atomic bomb squad of sorts, charged with locating and disarming clandestine or homemade atomic bombs. He was a NEST member until the mid-1990s.

Paul authored "Explosives Engineering," a book that remains the definitive text on explosives, used in university and industrial engineering programs worldwide. He also wrote, with co-author Stanley R. Kurowski, "Introduction to the Technology of Explosives."

Quick witted and a natural storyteller, Paul took pleasure in regaling his wide network of friends and family with colorful stories he accumulated during his life and was always ready with a one liner. He traveled extensively with his wife, Judi, was an avid reader, passionate about the blues, and a world-class prankster.

Paul is survived by his wife of 43 years, Judi Cooper. He is also survived by three daughters, Cindy Cooper Killian (Mark), Alice Lubbers (Jim), Joyce Johnson (Terry) and two grandchildren, Tia Lubbers and James Lincoln.

Cooper presented numerous seminars in the Mechanical Engineering Department at New Mexico Tech, which were widely attended and student favorites.

In January 2020 NMT President Dr. Stephen Wells presented Cooper with an honorary doctorate from the university. Read the full article at [https://www.nmt.edu/news/2020/honorary\\_doctorate\\_paul\\_cooper.php](https://www.nmt.edu/news/2020/honorary_doctorate_paul_cooper.php).



Named for the founding year of the New Mexico School of Mines, the **1889 Society** recognizes those individuals who have designated a bequest for New Mexico Tech in their wills, trusts, life income gifts, retirement plans, life insurance designations, and other planned gifts.

1889 Society members leave a legacy to the university and provide essential support to ensure that New Mexico Tech is able to provide a world-class education to students for generations to come. New Mexico Tech considers it a great honor to be remembered in your will or estate plan.

## 1889 SOCIETY MEMBERS

Ray Bellande  
Jim and  
Corale Brierley  
Raul Deju  
Mark Donnell  
John Dowdle  
Anonymous  
Frank Etscorn  
Cora Lee Everett  
Anonymous  
Mike and  
Mary Jaworski  
Susan Keeney  
Anonymous  
Anonymous

Bill Marble  
Randy Martinez  
Jerry Mericle  
Charles Millar  
Richard J. Miller  
Anonymous  
Marty Nelson  
Anonymous  
Deborah Peacock  
Mark Person and  
Deborah Bankson  
Brian Peterson  
Jack and  
Rita Purson  
Anonymous

Donna Rogers  
Sally Shipman Breeden  
Anonymous  
Harry and  
May Towne  
Anonymous  
Anonymous  
LaVerne and  
Melvin Yazzie

### **In Memoriam**

Richard Gochnauer  
Charles Headen  
James Murdock  
Jim Post

## DR. ROBERT I. MCNEIL AND NEW MEXICO TECH

BY MRS. JANICE FEISTEL-MCNEIL

My husband, Robert Irving McNeil, III (*B.S. Chemistry, 1969*), died peacefully at home on May 29, 2020 at the age of 71, after a courageous battle with pancreatic cancer. Son of Robert Irving McNeil, Jr. of El Paso, TX, and Sylvia Sanford McNeil of Shawnee, OK, Bob was born on October 8, 1948 in Shawnee but grew up in New Mexico.

Over the last fifty-plus years, Bob spoke of NMT so frequently it was a running challenge to find any activity or interest which did not in some way circle back to his years on campus. Bob's passion for learning and great enthusiasm for science were cultivated and focused by his experiences at Tech.



Bob arrived at NMT as a sixteen-year-old freshman in 1965. He had just graduated as valedictorian of his high school class in Gallup and loved math, so he chose the discipline as his major. By the end of his first year, he would switch his major to chemistry and never look back. The change was the result of the mentorship and friendship of Professor C.J. Keizer and his wife Ruth, a biology teacher with an incredible hothouse full of orchids, and many of the other Tech chemistry faculty.

Bob was enrolled in freshman chemistry with Professor Cliff Keizer, but it was the Sunday socials hosted by Cliff and Ruth that drew Bob closer to science. Every Sunday afternoon, the Keizers would invite freshman students (and feed them) to socialize and discuss a range of topics. Bob was fascinated by the breadth of topics covered and encouraged to delve deeper into science to understand how it fit into this new, expanding world. Dr. Keizer's freshman chemistry class became a creative outlet and inspiration.

In later years, after each visit to the Keizer home on trips back to New Mexico, Bob would depart remembering the many ways the faculty and chemistry program at NMT opened his world and provided opportunities. Before Bob graduated from New Mexico Tech, Dr. Keizer helped him obtain a semester placement at Argonne National Laboratory and encouraged him to pursue graduate school. Another Tech Chemistry professor, Dr. Melvin Hatch, made organic chemistry into a complex problem-solving activity. Bob's subsequent graduate work in organic chemistry at the University of Illinois at Urbana-Champaign sprang from that influence. His move from Illinois to work with Dr. Francon Williams at the University of Tennessee, Knoxville was an opportunity to delve into the relatively new field of radiation chemistry at a time when emerging technology began to permit understanding reactions at a molecular level. His Ph.D. in physical organic chemistry also tied back to NMT, as he determined his foundational coursework at New Mexico Tech more than adequate, and often superior, to the preparation of graduate students he worked with from other universities. In post-doctoral appointments at University of Notre Dame and Vanderbilt University, he tried to emulate the questioning and mentoring he had received at NMT.

For the rest of his life, Bob celebrated NMT to anyone who would listen and found chemistry in every rock, plant, process and discipline. He worked in the oil and gas industry for more than thirty years (lastly with Shell), but also studied the chemistry of archeological discoveries. He collected minerals, particularly Rare Earth Elements, organizing and selecting his samples by their electron configurations, so he owned samples of each specie of a mineral. He looked at a roadcut and saw the elements and minerals contributing to the color and nature of the stones. He put together demonstrations for school children, and he mentored graduate students in petroleum geology at The University of Texas at Austin and Rice University so they would be more grounded in the oil chemistry which existed beneath the surface and sometimes proved challenging to understand.

Bob attributed much of his professional success and no small amount of his personal happiness to chemistry, and he

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## DR. ROBERT I. MCNEIL AND NEW MEXICO TECH

wanted to give back. Before his diagnosis of pancreatic cancer in 2019, he contributed to the Hatch Prize (for subject knowledge among undergraduate chemistry majors) and started the process of establishing a graduate student assistantship endowment to honor Dr. Keizer. He had hoped to build that endowment so a summer graduate assistantship could be made every year. Sadly, he was not able to fulfill that dream, and the endowment remains to be completed by his wife, Janice Feistel McNeil, and by generous friends and donors.



*This young Crimson Spire oak tree and a plaque dedicated to Bob's memory and to his love for NMT stand outside the west end of the Chemistry Building*

The **Robert McNeil Award for the C.R. Keizer Chemistry Summer Graduate Assistantship Endowment** honors the memory of Dr. Robert Irving McNeil, whose love for life and learning knew no bounds. It was important to Dr. McNeil to recognize Dr. Keizer as a brilliant teacher and outstanding mentor. Dr. Keizer came to New Mexico Tech in 1964 as the new head of the Chemistry Department and he worked tirelessly to strengthen and grow the Chemistry program at the university. The Robert McNeil Award honors Dr. Keizer's legacy by supporting the Chemistry Department's goal to recruit and graduate more Masters and Ph.D. students.

To honor Bob McNeil and Dr. Keizer, and support the Chemistry department by contributing to the McNeil Award, donations can be made to the NMT Foundation (designate McNeil Award on the check memo line) and mailed to: NMT Foundation, 801 Leroy Place, Socorro, NM 87081 or on-line at <https://advancement.nmt.edu/giving> (select McNeil on the designation dropdown menu).

CONTRIBUTING WRITER LISA MAJKOWSKI

### MATCHING GIFTS

# DOUBLE THE IMPACT

- 1 you give
- 2 your employer matches

**YOU** designate the scholarship, program, or department your gift will benefit.

**YOUR EMPLOYER'S** matching gift will go to the same fund.

Did you know that your employers may double or even triple your gift to New Mexico Tech?

Many employers sponsor matching gift programs and will match most charitable contributions made by their employees. Some even match gifts made by retirees!

Please contact your HR department to learn if your employer supports matching gifts and let us know! If you have trouble finding out, please contact [advancement@nmt.edu](mailto:advancement@nmt.edu) and we will help you!

Here are some incredible companies that support NMT through matching gifts.

The logos for Dell, Freeport-McMoRan, Raytheon, Lockheed Martin, and Intel are displayed in a row. Each logo is in its respective brand colors and font.

# Who Can **CREATE A LEGACY?**

Anyone who wants to make a difference  
beyond their lifetime can plan a legacy gift.

## WHY LEAVE A LEGACY?

When choosing to leave a gift in your will or estate plans, you can feel good knowing that you are providing critical financial support for future generations of New Mexico Tech students. Leaving a legacy gift may be one of the most fulfilling decisions you ever make, and it's easier than you might think!


### *Benefits of planning a legacy gift:*

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- You have the use of your assets during your lifetime.
- Your estate will receive a beneficial tax receipt.
- Your gift can be altered at any time should your circumstances change.



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 801 Leroy Place, Socorro, NM 87825

## IN MEMORIAM - ALUMNI



Eli Whitney  
Blake, III

**B.S. Mathematics and  
B.S. Chemistry, 1985**

**E**li Whitney Blake, III passed away peacefully on July 10, 2020 in Phoenix, AZ after a heroic battle with neuroendocrine cancer. Eli was born August 7, 1962 in Albuquerque, NM.

He was a curious boy who won school spelling bees, enjoyed board games and baseball, and was a voracious reader of encyclopedias and atlases.

While at Tech, he played rugby, he was baptized into the Church of Jesus Christ of Latter Day Saints, and he also began developing his life-long interest in politics and social justice and worked for local democratic candidates.

He continued his education and political activism at the University of Montana in Missoula where he graduated with a M.S. in Mathematics. He considered continuing for a Ph.D., but decided to become an educator, a passion to which he dedicated the rest of his life.

His first teaching job was in Phoenix but he soon returned to Albuquerque and began teaching at TVI (now CNM) Community College in 1991. He was active on the Faculty Senate and instrumental in starting the employee union, something he was very proud of accomplishing.

While at TVI, he married Tressa Dennis, whom he had reconnected with in Socorro during a visit in 1986. They married in 1992 in Cedar City, UT, and began their life together with their daughter Valorie in Las Lunas, NM. Shortly thereafter, they moved to Moriarty, NM, and welcomed the twins – Leah and Maranda – in 1996.

He left TVI in 1997 and they settled in Joseph City, AZ where he began his career with the Northern Pioneer Community College (NPC) system. For the rest of his life, he was dedicated to the Navajo community, serving both as an outstanding educator and a community advocate for the people of the reservation.

In Joseph City, he was active in the LDS Allen's Camp Ward, and was engaged in a range of social and political work in the community. He was the Democratic Precinct Committee person and worked on numerous local, state, and national campaigns; he served as the Navajo County Democratic Party Chair in 2012.

He was a prolific blogger, starting his blog "Deep Thought" in the early 2000s, and was recognized by the Arizona State Press Association in 2006 in the lead-up to the Obama election. All of it led back to his beloved family and community.

He is survived by his daughters, Leah Blake, Maranda Blake, and Valorie Brooks (Hunter) and their daughters, April, Andrea, Brooklyn, and Baylee; by Tressa Blake; by his sister Miriam Blake (Sue Hine); and by best friend, Misti Lee.

The family requests that donations be made in his name to either the Midwest Food Bank Arizona Division (the donation should be directed to Helping Hands for the Navajo Nation in his name) at <https://www.midwest-foodbank.org/locations/gilbert-az/donate-arizona> or the Neuroendocrine Tumor Research Foundation at <https://netrf.org/get-involved/give-now/>.



Phillip "Larry"  
Boucher

**B.S. Physics, 1968  
M.S. Physics, 1982**

**P**hillip "Larry" Boucher, July 26, 1945 - February 22, 2020, grew up in Belen, NM.

He attended Carnegie Tech, now Carnegie Mellon, then transferred to the NM School of Mines.

Larry worked for Global Star at



Johnson Space Center in New Mexico, where he was involved with the satellite program. He later moved to San Jose, CA, to work for Lockheed Martin's global communication department, traveling to Europe, Africa and Central and South America to install ground satellite communications.

While at Carnegie Tech, Larry became a piper in the Kiltie Band, playing the bagpipes throughout his life. His many hobbies included spelunking, mountain climbing and collecting Native American pottery.

An avid hot air balloonist, Larry was one of the earliest pilots to fly in the Albuquerque International

Balloon Fiesta, and taught pilot balloon safety classes nationally. He ultimately owned and flew nine balloons. Not just a pilot, Larry also crewed internationally for the beloved Darth Vader balloon.

Larry served in the U.S. Army as a chaplain's assistant SP5 in Vietnam. While enlisted, he received the National Defense Service Medal, the Bronze Star Medal, Vietnam Campaign Medal with 60 Devices, and the Vietnam Service Medal with two Bronze Service Stars.

He was also a member of the Masonic Lodge, Scottish Rite of Free Masonry and the Albuquerque Aerostat Ascension Association.

He passed away after a valiant fight with Parkinson's Disease brought on by Agent Orange exposure while in Vietnam.

Larry is preceded in death by his daughter, Dawna Leigh Boucher; his wife, Marijean Boucher; and his father, Mayo Terry Boucher. He is survived by his mother, Mary Catherine Lake Boucher; his sister, Terri Sue Vrabel (Charles); niece, Kim Wickens (Mike); nephew, Robert Boucher; great-nephew, Conner Wickens; stepson, Jeff Balding; stepdaughter, Patty D'Amore (Marc); sister-in-law, Barbara Carmack; aunt, Eleanor Love; and many nieces, nephews and cousins.



### Kent George Fry

#### **B.S. Mathematics, 1963**

**K**ent George Fry passed peacefully in his sleep on April 21, 2020. He had been battling Parkinson's Disease for the past several years.

Kent was buried in Santa Fe, NM at the National Cemetery on May 8, 2020. A committal service with

honors will be scheduled and celebrated at a later date.

He was born on February 12, 1940 in Chicago, IL to Arthur and Bertha Fry. Kent graduated high school from the Morgan Park Military Academy in Chicago and continued his education at New Mexico Tech. He also holds master's degrees from the University of Southern California in Education and Bowie State University in Computer Science.

Kent retired as Lieutenant Colonel from the United States Air Force after serving for 25 years with multiple decorations and commendations. He served during Vietnam and was stationed throughout the United States and overseas during his USAF career. His last duty before retiring was as a Commander at the National Security Agency.

After moving to Simi Valley, CA,

Kent began a second career at NASA/JPL in Pasadena as a Technical Group Supervisor and Scientific Applications Software Engineer and provided 20 years of service.

He is survived by his children Kent G. Fry, Jr (Kathy), and Kelly Fry Gallivan (Daniel) as well as four grandchildren, Sara L Fry, Rebecca Gallivan, Jonathan Gallivan, and Maria Gallivan. He was predeceased by his wife, Davetta in 1996 and his second wife Francine in 2013.

He loved hiking and camping, rose gardening, traveling and fast cars. He spent his life, living, learning, and teaching the word of God with his church of worship, serving the community of Trinity Lutheran Church in Simi Valley. He led weekly bible study and cared for the homeless population at TLC. He is with our Lord and Savior.

## IN MEMORIAM - ALUMNI



Jeffrey M.  
Morrissey

**B.S. Engineering (Chemical Processes), 1994**

Jeffrey M Morrissey, 52, of Fountain Hills, AZ, passed away suddenly on August 2, 2020.

He led an active life and left this world in the same manner, he died of a heart attack while on his morning run.

He was born June 1, 1968 in St. Paul, MN. He is survived by his wife, Vanae, his son Perry and stepson Orlando Laughter.

He graduated from Stillwater High School in 1986 and joined the U.S. Army shortly after.

After he graduated from New Mexico Tech he worked at FTI Flow Technology for 23 years.

He was a devoted husband and father. Jeff will be lovingly remembered for his laughter and joviality for life.

The family asks his memory be honored through gifts to Hospice of the Valley, <https://www.hov.org/donate/> or Arizona Autism Charter Schools, <https://www.autismcharter.org/apps/pages/donate>.



Marshall Vaughn  
Scanland

**B.S. Petroleum Engineering, 1958**

Marshall Vaughn Scanland was born August 9, 1936 in Southgate, CA.

He died of complications associated with lung cancer on October 10, 2020 in Conroe, TX.

His early childhood was spent on Alcatraz Island in San Francisco Bay where his father was employed by the US Bureau of Prisons.

In 1948, he moved to Anthony, NM when his father was transferred to the nearby Federal Prison at La Tuna, TX.

At Gadsden High School, he played basketball and football. After graduating from NMT he accepted employment in Venezuela with Mobil Oil Company.

After several years in the Venezuelan oil fields, he returned to the US where he continued an oil industry career lasting over 40 years. He specialized in the evaluation of oil and gas properties for the purpose of sale or purchase.

Vaughn was a member of the Society of Petroleum Engineers, a member and past President of the Society of Petroleum Evaluation

engineers, and was a Registered Professional Engineer in Texas.

After his retirement in 2000, he and his wife Nance built their dream home, the Last Resort, on Lake Conroe in Texas where they lived until 2018 when health problems forced a move to Strake Place in Conroe, TX.

He is survived by his beloved wife of over 40 years, Nancy Rae (Purvis) Scanland; a son, Charles Marshall Scanland II; a daughter, Cynthia Michelle Vimont; daughter-in-law, Cynthia Ann Scanland; son-in-law, Burton Vimont; grandsons, Burton, Foster, and Logan Vimont, and Matthew and Eric Scanland; granddaughters, Hannah, Savanna, and Makayla Vimont; several great grandchildren.

He is also survived by numerous friends including the old farts at April Sound Tennis Club and Walden Racquet Club.

# THE LAST WORD

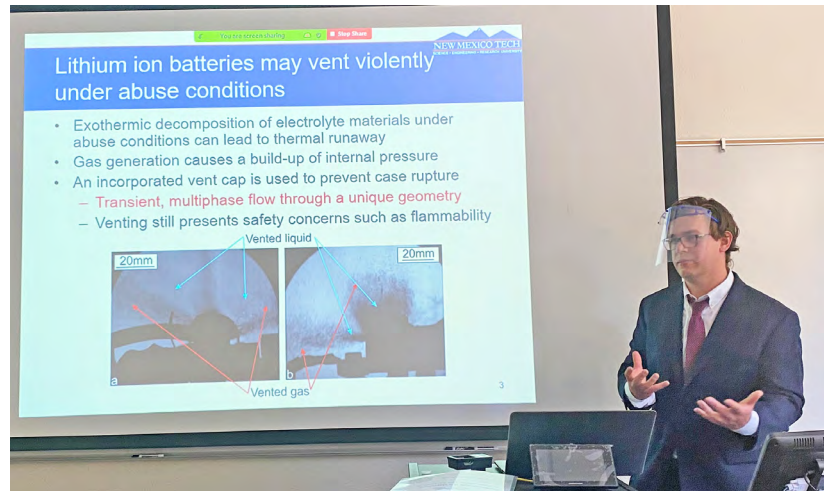
## MECHANICAL ENGINEERING GRADUATES FIRST PH.D. STUDENTS

New Mexico Tech's Mechanical Engineering Department established a *Ph.D. in Mechanical Engineering with Dissertation in Intelligent Energetic Systems* program in Fall 2017.

Frank "Austin" Mier and Kyle Winter were the first students to enter the program and are now the first two Ph.D. graduates, set to receive their degrees at the May 2021 Commencement ceremony.

**Frank "Austin" Mier** started as an undergraduate in 2012 and has earned three degrees in Mechanical Engineering at NMT (*B.S. in 2016, M.S. in 2018, and Ph.D. awarded in September 2020*). He came from California and said that one of the best things about being at NMT is that the great students, faculty, and staff made every day on campus feel like home.

His Ph.D. research investigated lithium ion battery failures and the venting of flammable gases from the failed battery cells. This work was funded by Sandia National Laboratories and has resulted in numerous presentations and publications. He is now a postdoctoral researcher at the University of Wyoming, performing research in subsonic wind tunnels and developing unsteady pressure measurement techniques for aerodynamic applications and teaching a graduate class on optical diagnostics. His goal is to become a university professor in the near future.



*Austin Mier presenting his dissertation defense*



*Kyle Winter presenting his dissertation defense*

**Kyle Winter** came to NMT to pursue a M.S. in Mechanical Engineering with Specialization in Explosive Engineering in 2015, before the Ph.D. program was developed. His passion for explosives and shock waves led him to pursue the Ph.D. when the program was initiated.

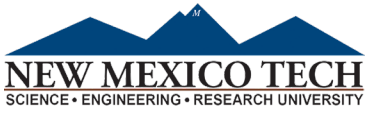
He has been researching three-dimensional shock wave propagation and interactions for both his M.S. (2018) and Ph.D. (2021) research, working on projects funded by the US Air Force, Defense Threat Reduction Agency, and a small business SBIR program.

Kyle has accepted a job at Sandia National Laboratories where he will continue to apply his knowledge of explosives and optical diagnostics to problems of national interest.

Both Austin and Kyle were advised by Dr. Michael Hargather, Associate Professor of Mechanical Engineering. Dr. Hargather is proud of the work these students performed and looks forward to the impact they will have

on the academic and research communities in the future.

Dr. Hargather says, "Austin and Kyle have been, and will continue to be, phenomenal ambassadors for NMT and outstanding representatives for our department to show the quality, impact, and importance of our Ph.D. educational program and ongoing research."



**New Mexico Institute  
of Mining and Technology**

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