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THE PROFESSIONAL GEOLOGIST

VOLUME 63 NUMBER 2 APR.MAY.JUN 2026

National Conference Guide

National Election Officer Candidates

Mapping at East Canyon U-V Project in Utah, USA

Landfill Hydrogeology and the Law of Unintended Consequences

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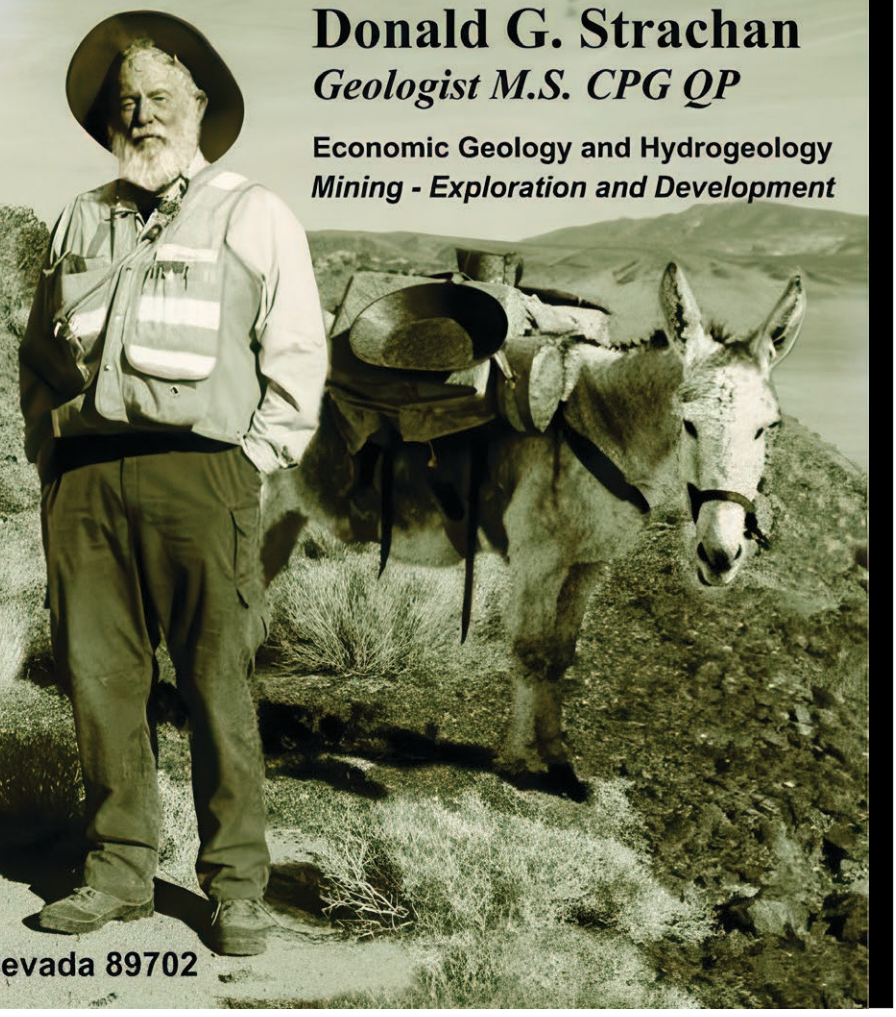
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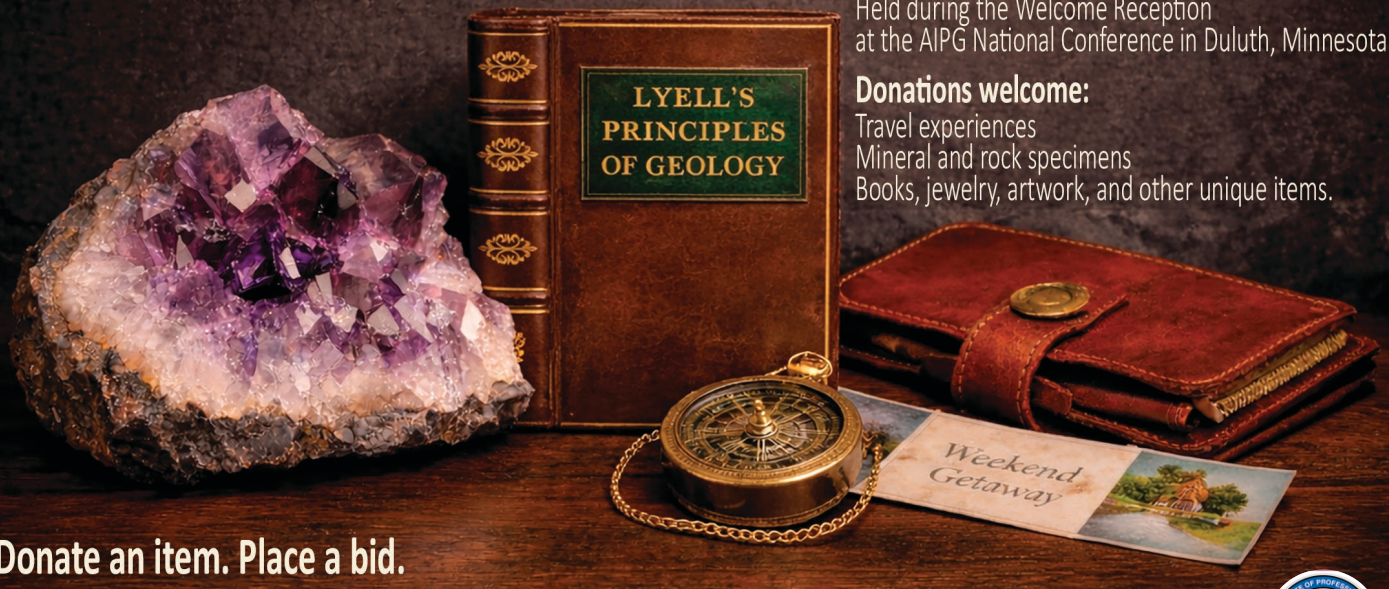
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The Professional Geologist

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On the Cover: 2026 Photo Contest Winner - Off the Beaten Path

Description: ***Petrified Wood in Blue Mesa Gully*** *– The Blue Mesa Trail in Petrified Forest National Park (Arizona) wanders through the Blue Mesa badlands. The badlands are dominated by the Blue Mesa Member of the Chinle Formation. This Triassic tropical floodplain unit includes bentonite clay which provides the bluish color. In this image of a small gully, the orangish color of the petrified wood stands out against the gray and bluish Blue Mesa Member.*

Photograph by ***Guy Swenson, CPG-07574,*** *AIPG Northeast Section, 2024.*
2026 Photo Contest: Off the Beaten Path

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AIPG Publication Policy, October 4, 2010. AIPG encourages submission of articles and editorials for publication in *TPG* on topics related to the science and profession of geology. Submittals shall be of interest to the members of AIPG, other professional geologists, and others interested in the earth sciences. Articles and editorials may be noted as follows at the discretion of the Editor, "The opinions, positions and conclusions presented herein are those of the author and do not necessarily reflect the opinions, positions or conclusions of the American Institute of Professional Geologists." All materials submitted for publication, including author opinions contained therein, shall include accurate and appropriate references. The Editor has the authority to solicit, edit, accept, or reject articles and editorials and other written material for publication. The Executive Committee has the authority if it so chooses to act on any particular case to support or overrule actions of the Editor regarding the solicitation, editing, acceptance, or rejection of any particular article, editorial, or other written material for publication.

American Institute of Professional Geologists (AIPG) is the only national organization that certifies the competence and ethical conduct of geological scientists in all branches of the science. It adheres to the principles of professional responsibility and public service, and is the ombudsman for the geological profession. It was founded in 1963 to promote the profession of geology and to provide certification for geologists to establish a standard of excellence for the profession. Since then, more than 12,000 individuals have demonstrated their commitment to the highest levels of competence and ethical conduct and been certified by AIPG.

The mission of the American Institute of Professional Geologists (AIPG) is to effectively advocate for the profession of geology and support members through activities and programs that advance professional growth and promote high standards of ethical conduct.

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For AIPG news and activities go to www.aipg.org.



How good are your field methods… and how good do they need to be?

Adam W. Heft, CPG-10265

Happy spring everyone!

I hope you enjoyed the 2026 Student Editon of T*he Professional Geologist*. Our feature article in this edition is on Mapping at East Canyon: A U-V Project in Utah by **Regina Molloy**, CPG-12345 – wasn't that number the combination of president spaceball's luggage in the 1987 movie Spaceballs? What a great member number to have! We also have an article on the law of unintended consequences, another on AOM, and a Tales from the Field entry – please keep them coming! This is also the edition that introduces you to the candidates that will stand for election to the National Executive Committee and presents you with the Annual Meeting information. Please give this issue a good read.

Since our feature article in this issue relates to mapping, I thought it would be appropriate to share the following experience that I recently encountered in my own professional career.

I was recently asked to be part of a team to help map the surface geology as part of a municipal infrastructure project. Part of my assignment was to map and describe bedrock outcrops in the project area. This was to include sketching and photographing each outcrop, recording the latitude/longitude, preparing a description of the lithology, and recording the strike and dip of bedding, joints, and fractures, as applicable to each outcrop.

Well, I don't know about most of you, but I haven't measured strike and dip since I was in college many, many years ago. So, before starting my assignment, I decided I had better brush up on the process. After digging out my Brunton compass and setting the declination for the project area, I decided to do an online search for a demonstration on how to make the measurements. Since there were several that came up in answer to my query, I selected one and watched the video.

By the time I was a bit over halfway into the video, I was frowning with discontent. The method being demonstrated was not the way I had learned the process. So I went back and tried another one. And then another. Each one I watched showed the same thing. After adjusting the declination, the instructor went to the "outcrop" (sometimes just a book propped against something to simulate a bedding plane), placed the compass against it so that it was level, and read the azimuth (or quad reading, depending on which model compass they had).

That is what stopped me. When I learned the use of a Brunton compass in my structural geology class, I was taught that you never, EVER, allowed your compass to touch the rock. Aside from being poor etiquette, there were two practical reasons for not having your compass in contact with the rock. The first was because there sometimes wasn't a large enough space on the surface you wanted to measure to fit the compass in the first place. Second, and more importantly, was the fact that most outcrops do not have a surface as flat and smooth as a book to measure. Most surfaces are bumpy and irregular. Placing your compass against that kind of surface means that it is likely that no two readings will be exactly the same depending on where you place it. And your reading could be off five to 10 degrees from what it should be.

The way I was taught was to extend the long sight arm out so it was on the same plane as the Brunton surface, then tip the peep sight up. You were to sight through the peep sight, looking through the hole in the mirror at the surface you wanted to measure to get in line with the surface while also looking in the mirror at the bullseye level to make sure you were reading on a level plane. Then you would make your reading while looking in the mirror. This sometimes had you contorted in an uncomfortable position while making your readings. The dip was similarly measured by holding the compass (not against the rock!) with the long arm and both peep sights extended so the surface you were measuring was in line with the arm and both sights. You would then adjust the inclinometer of the compass so the bubble showed it was level and that would give you the dip.

> *"Close enough may work in the classroom. In practice, a few degrees can carry technical, financial, and legal consequences.*

So, does it really matter whether you place the compass on the rock when making your readings you ask? What if you are measuring joint sets and you have no flat surface to put the compass on or against? Or suppose you do have a surface, but your readings might be off five or 10 percent. Isn't that close enough? It might be for an academic exercise, but what if you need to know whether that joint or fracture will intersect with a subsurface tunnel being dug 60 feet below the ground surface? And the measurement you make will be relied upon by the engineers designing the tunnel. The answer to that question may affect what method is used to excavate the tunnel or how the resulting tunnel needs to be shored or lined. And that may have big monetary or legal implications, particularly if you get it wrong.

It therefore behooves us to be as accurate as possible with our work (in whichever specialty field you practice in) and know what your fieldwork will be the basis for. If you don't, there is the possibility that you might be called to defend your methodology or results, and you might regret not doing so.

The closure of the Department of Earth and Atmospheric Sciences at the University of Nebraska-Lincoln is quite in keeping with the massive bureaucratic miasma of modern universities. According to the UNL budget, administrative salaries alone total $123,968,983. On top of that figure is another $35 million for retirement and benefits, and who knows how much for office space, equipment, and supplies. In other words, the total admin load is above $150 million. Meanwhile, the geoscience department's budget is likely under $3 million. Is it possible for the university president to cut the budget by eliminating administrative positions? I believe the time has come to take a close look at all university budgets. Everywhere I look, I see bloat and waste - all, of course, paid for by students, parents, and, in the case of public universities, taxpayers. What is critical is the mission's core: educating young people and conducting research, at a reasonable cost to the user.

John Dreier, CPG-11190
Golden, Colorado





AIPG Annual Conference Guide





Join Us at the 2026 AIPG Annual Conference! Connect, Learn, and Explore in Duluth

We're excited to welcome you to the 63rd AIPG Annual Conference, set along the breathtaking shores of Gichigami (Lake Superior). This year's event offers an exceptional blend of field experiences, opportunities to engage and connect with fellow geoscience professionals and industry experts, and a full lineup of expert-led technical sessions designed for geoscientists, students, and professionals across the industry.

Field Trips for Every Interest

Choose from a wide range of immersive field excursions, including:

- ☑ Bicycle tour of local geological landmarks
- ☑ Harbor boat trip to view key remediation sites
- ☑ Journey through historic Iron Range deposits
- ☑ Exploration of classic outcrops and new developing resource sites

Technical Talks from Industry Leaders

Gain knowledge from specialists presenting on today's most relevant topics, such as:

- ☑ Helium exploration and emerging opportunities
- ☑ Complex cleanup challenges at legacy contamination sites
- ☑ The essential role of geology in advancing cleaner, sustainable energy
- ☑ The fundamentals and important aspects of Minnesota's geology

Whether you're looking for adventure, discovery, or professional insight, there's a trip for you.

Shanna Schmitt, PG (MN), CPG ***Alex Steiner, PhD, CPG***

Co-Chairs, Organizing Committee

AIPG Annual Conference Schedule

Saturday, August 29, 2026

7:00 am - Noon	Registration Open
7:00 am - 5:00 pm	Field Trip - The Hidden High-Grade - Exceptional Nickel and Manganese Deposits of Minnesota
8:00 am - 12:00 pm	AIPG Executive Committee Business Meeting
8:00 am - 5:00 pm	Student / Early Career Professional Career Workshop
12:00 pm - 1:00 pm	Lunch
1:00 pm - 4:00 pm	AIPG Advisory Committee Meetings
4:00 pm - 4:30 pm	AIPG 2026-2027 Executive Committee Transition Meeting
4:30 pm - 5:30 pm	Foundation of the AIPG Meeting
5:00 pm - 9:00 pm	Student Welcome Reception, Speed Networking Reception and Trivia Game Night

AIPG Annual Conference Schedule

Sunday, August 30, 2026

7:00 am - 7:00 pm	Registration Open
7:00 am - 5:00 pm	Field Trip - Classic Outcrops of Northern Minnesota
11:30 am - 4:30 pm	Field Trip - **Foundation of the AIPG Fundraiser** - From Clean-up Projects to the Working Waterfront and Scenic Shorelines Boat Tour
10:00 am - 4:00 pm	Exhibitor Set-up
6:00 pm - 8:00 pm	Exhibitor Welcome Reception / Foundation Silent Auction

Monday, August 31, 2026

7:00 am - 5:00 pm	Registration Open
7:00 am - 7:50 am	Section Representative Meeting (open to all section registrants)
8:30 am - 9:30 am	Opening Welcome Session
9:30 am - Noon	Technical Presentations
10:00 am - 10:30 am	Visit Exhibits, Posters & Networking Break
10:30 am - 3:30 pm	Field Trip: Explore the Great Lakes Largest Estuary
Noon - 1:30 pm	Lunch with Keynote Speaker
1:30 pm - 5:00 pm	Technical Presentations
3:00 pm - 3:30 pm	Visit Exhibits, Posters and Networking Break
6:00 pm - 9:00 pm	Awards Banquet

Tuesday, September 1, 2026

7:00 am - 5:00 pm	Registration Open
7:00 am - 7:50 am	Past President's Breakfast (invitation only)
8:30 am - 9:30 am	Opening Welcome Session
9:30 am - Noon	Technical Presentations
Noon - 1:30 pm	Lunch with Keynote Speaker
1:30 pm - 5:00 pm	Technical Presentations
2:00 pm - 6:30 pm	Field Trip: Geology of the Munger trail by Bike and e-Bike
3:00 pm - 3:30 pm	Visit Exhibits, Posters and Networking Break
3:30 pm - 5:30 pm	Exhibitor Tear Down

Wednesday, September 2, 2026 (post-conference field trips)

7:00 am - 5:00 pm	Field Trip: Geology of the Biwabik Iron Formation on Minnesota's Mesabi Iron Range
7:00 am - 5:00 pm	Field Trip: Geology and Ore Deposits of the Mesoproterozoic Duluth Complex, Northeastern Minnesota

See you in Duluth!

Field Trips

The Hidden High-Grade – Exceptional Nickel and Manganese Deposits of Minnesota

Leader – Alex Steiner, CPG and Brian Goldner
Date – Saturday, August 29, 2026
Time – 7:00 am – 5:00 pm

Two world-class, high-grade metallic mineral deposits call Minnesota home: the Tamarack Cu-Ni-PGE deposit and the Emily Manganese Deposit. This tour will showcase drill core from these two incredible deposits and feature discussions on the unique geologic systems that give rise to ultra-high grade metallic deposits. This is a great opportunity to observe and learn about the enrichment of metals into exceptionally high-grade deposits in very different deposit types.

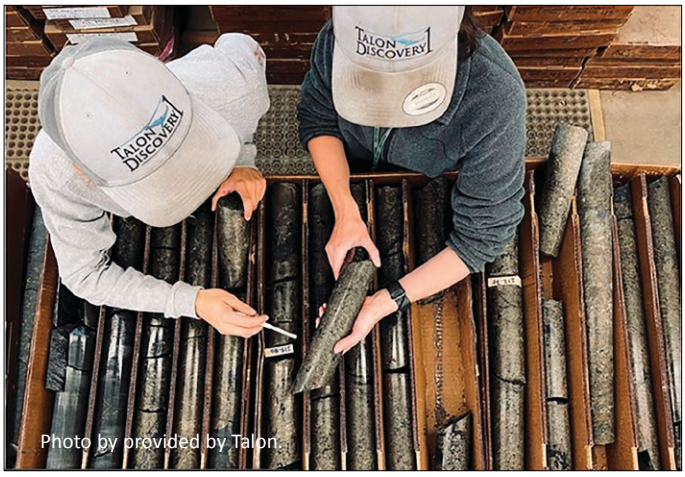


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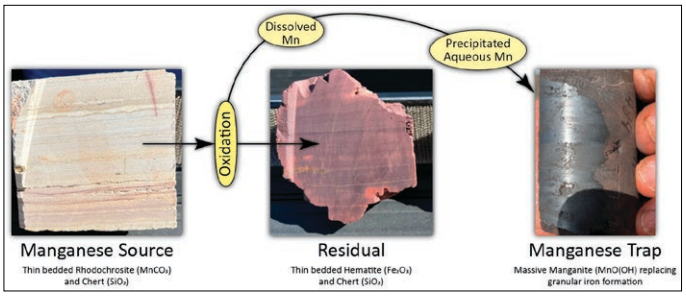


Photo by provided by Talon

After leaving Duluth, our first stop will be at the Talon Metals core facility in Tamarack, MN. There, we will have the opportunity to examine drill core from the Tamarack Intrusive Complex that hosts the nickel-rich magmatic sulfides. We will see a variety of mineralization types, including net-textured and massive sulfides, hosted in one of several olivine-rich intrusions. Examples of Tamarack massive sulfides were recently added to the collection at the Smithsonian due to their exceptional metal endowment.

We will then continue west from Tamarack to the cabin town of Emily, MN, where the North Star Manganese/Electric Metals core logging facility is located. Four recent (2023 drilling) drillholes will be on display. Participants will have the opportunity to observe high-grade manganese oxide drill core, primary iron-manganese carbonate facies iron formation, and breccia horizons possibly associated with the 1.85 Ga. Sudbury impact. We will discuss the formation and subsequent redistribution of manganese within the Emily Iron Formation.

Closed-toe shoes are required for this trip. Be prepared for a range of weather conditions, including temperature changes.

Foundation of the AIPG Fundraiser

From Clean-up Projects to the Working Waterfront and Scenic Shoreline

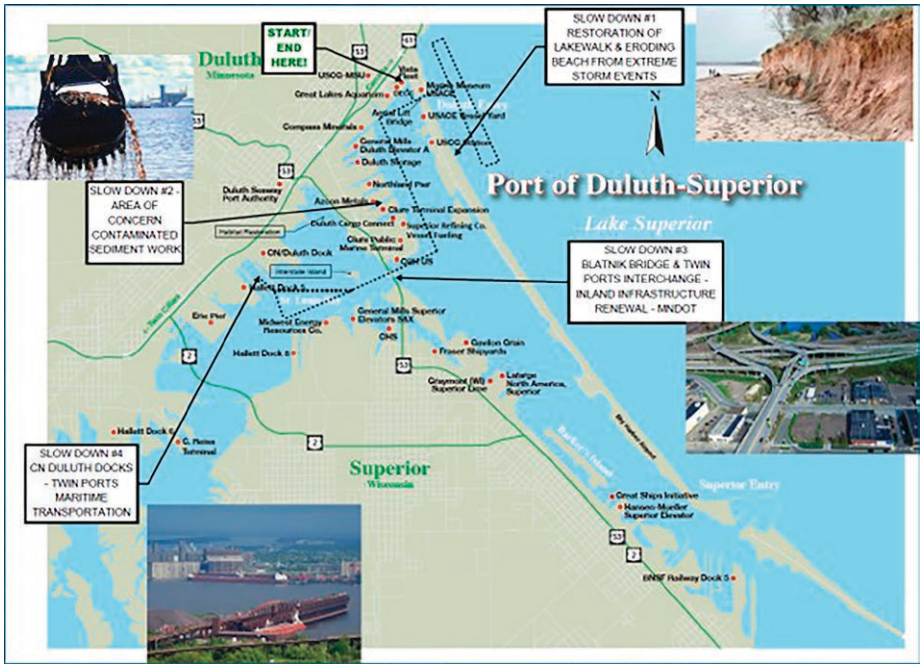
Leader – Shanna Schmitt, CPG
Date – Sunday, August 30, 2026
Time – 11:30 am – 4:30 pm

Join us for a water based tour hosted by representatives from several partner groups!

Our journey begins as we pass beneath Duluth's famous Aerial Lift Bridge, heading out to view the Park Point beach nourishment area and the recently restored sections of the Duluth Lakewalk. We'll enjoy lunch aboard the vessel on Lake Superior/Gichigami ("great sea").

- After lunch, we'll return under the Aerial Lift Bridge and begin our tour of key sites throughout the Duluth Harbor:
- William A. Irvin & Minnesota Slip – Learn about this high-profile sediment capping project at the historic ore boat's longtime home.
- Duluth Entertainment and Convention Center (DECC) – Hear about the major seawall renovation project underway at this iconic waterfront facility.

- Azcon Slip – Discover the completed contaminated sediment removal efforts that were part of the St. Louis River Area of Concern cleanup.
- Duluth Seaway Port Authority slips – Explore the operations, ships, and unique cargoes that move through the Duluth–Superior Port.
- John A. Blatnik Bridge – As we pass under one of only two bridges connecting Duluth, MN and Superior, WI, we'll discuss the contamination response actions planned during its 2026–2031 replacement.
- Ore Docks – Visit the docks managed by the Port Authority and learn about northern Minnesota's historic and ongoing iron ore industry.
- Erie Pier Confined Disposal Facility – Hear about this facility's vital role in harbor sediment and navigation channel management.
- Habitat Restoration Sites – We'll view the Interstate Island Habitat Restoration Project and the 21st Avenue project, learning what makes each effort unique. Along the way, we'll also highlight nearby parks and trails you can explore during your stay in Duluth.



Temperature changes are expected on the water. Please wear layers and don't forget your sunglasses and sunscreen.

Classic Outcrops of Northern Minnesota

Leader – George Hudak and Dean Peterson
Date – Sunday, August 30, 2026
Time – 7:00 am – 5:00 pm

This field trip will take a tour through the diverse Precambrian rock types and geologic systems found in northeastern Minnesota using some of the most illustrative and readily accessible outcrops. The trip will revisit many of the outcrops upon which so many historical discussions, many of them heated, occurred. The planned outcrops span almost three billion years of Earth history from the seafloor basalts and volcanoes in the Archean, to the Mid-Continent rift lavas and intrusions, up to recent glaciation. Stops in the Archean will showcase pillowed, sheet, and variolitic basalt lava flows, fragmental dacitic volcaniclastic rocks, greywacke-slate, shear zones, migmatites; and granitoids). We will stop at exposures and mines of the Paleoproterozoic Superior-type iron formation of the Mesabi Iron Range. Mesoproterozoic rocks of the Duluth Complex will include lavas along the north shore of Lake Superior and their intrusive components that host Cu-Ni-PGE bearing basal troctolites, sulfide-barren troctolites, layered troctolitic feeder dike, and Anorthosites. The youngest events we will observe are Quaternary and include remnant saprolite weathering and the Vermilion Moraine. The trip is mostly a roadside outcrops tour, but we will have short hikes that may be steep for short segments.

Please wear closed-toed hiking shoes for the short but sometimes steep hikes and be prepared for a range of weather conditions, including temperature changes.


Photo by Alex Steiner, MN.

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Explore the Great Lake's Largest Estuary

Leader – Deanna Erickson, Reserve Director
Date – Monday, August 31, 2026
Time – 10:30 am – 3:30 pm

Join staff from the Lake Superior National Estuarine Research Reserve in exploring the St. Louis River estuary, the vast river mouth spanning Superior WI, and Duluth, MN, at the headwaters of Lake Superior. This trip will begin at the Lake Superior Estuarium, a visitor's center that orients to the estuary and expansive restoration



Photo provided by Deanna Erickson, UW-Extension.

efforts taking place there. We'll check out the Reserve's real-time water monitoring stations, then have a short lunch before departing to the Pokegama River, a sub-estuary nested in the Superior Municipal Forest. After a short lesson on flatwater canoeing (no experience needed), we'll paddle down the Pokegama exploring this wilderness-like area within the city. Learning about wetland



Photo provided by Deanna Erickson, UW-Extension.

research, manoomin (wild rice) beds and a bit of birdwatching will ensue.

Please prepare for the weather, including sunscreen. Participants will need to get in and out of a canoe and paddle for about an hour and a half. Guests are welcome to make donations to the Friends of the Lake Superior Reserve (www.folsr.org).

Geology of the Munger Trail by Bike and e-Bike

Leader – Alex Steiner, CPG, Dean Peterson and Grey Small
Date – Tuesday, September 1, 2026
Time – 2:00 pm – 6:30 pm

Hemingway says that the best way to learn the land is by bicycle. That must mean that the best way to learn geology is also on two wheels. Join us for a guided half-day geological tour along the northern stretches of the Munger Trail from West Duluth to Jay Cooke State Park. Along the northern parts of the trail, outcroppings tell the story spanning almost two billion years. We will stop at many of these outcrops where local geologists will discuss the rock's place in northern Minnesota's geologic history. That history spans almost two billion years from the Paleoproterozoic sediments of the Thompson formation that were folded by the Penokean Orogeny, to the 1.1 Ga Mid-Continent rift lavas and gabbroic intrusions. We will see some of the first lavas to erupt during the Mid-Continent rift, the layered gabbros of the Duluth Layered Series intrusion, and examples of oxide-ultramafic intrusions that cut the earlier gabbros. Pleistocene glaciation and glacial lake outwash scoured, sculpted, and polished many of these outcrops into the forms we see along the trail. We will ride at a friendly pace for conversation and frequent stops for outcrops will keep the discussion lively. Ski-Hut adventures will provide us with a fleet of electric assist bikes and regular bikes to suit our rider's needs. The ride will be fully supported by a team hauling water, beverages, and snacks to keep us fueled up and ready to explore the glorious geology in the Duluth area.

Closed-toed shoes are needed. Large temperature swings are possible.



Geology and Ore Deposits of the Mesoproterozoic Duluth Complex, Northeastern Minnesota

Leader – Dean Peterson and Gabe Sweet
Date – Wednesday, September 2, 2026
Time – 7:00 am – 5:00 pm

Be prepared to throw away your petrology textbook (sort of)! An hour and a half north of Duluth, in the Pleistocene scoured bedrock terrane at the edge of the boreal forest, lies abundant outcrop exposures of the Mesoproterozoic (1.1 Ga) Duluth Complex, the Paleoproterozoic (1.9 Ga) Biwabik Iron Formation, and the Neoarchean (2.7 Ga) Vermilion granite-greenstone belt. This day long field trip will principally focus on the geology and world-class Cu-Ni-PGE ore deposits of the South Kawishiwi Intrusion (SKI) of the Duluth Complex whose in-situ metal value of Cu-Ni-PGE & TiO2-V-Fe deposits currently exceeds 1.15 trillion dollars.

We'll begin the trip by discussing and observing the magmatic initial conditions of the >2,000 km3 SKI, namely its troctolitic composition, phenocryst load & immiscible liquid sulfide content in context to the varied geometry into which the SKI intruded. The coupling of these initial condition parameters with a vast quantity of additional geological data (25,167 outcrops mapped, 2,496,045 feet of diamond drill core in 2,149 mineral exploration holes, and 113,758 geochemical analyses) generated over the last 75 years has led to some profound new understandings on the geology of mafic magmatic systems. Field trip stops will include numerous outcrops that specifically highlight many of these new insights on the formation of mafic intrusions. Depending on availability, we will also try to visit incredible exposures within a dimension stone quarry and a local company to examine drill core from the mineralized zones. This trip is sure to change the way you think about magmas and how magmatic sulfide deposits form.

Please wear closed-toed hiking shoes for the short but sometimes steep hikes and be prepared for a range of weather conditions, including temperature changes.



Photo provided by Dean Peterson, MN.



Photo provided by Dean Peterson, MN.

Geology of the Biwabik Iron Formation on Minnesota's Mesabi Iron Range

Leader – Phil Larson
Date – Wednesday, September 2, 2026
Time – 7:00 am – 5:00 pm

This field trip explores one of the most important geological systems for modern industry: the Biwabik Iron Formation in northern Minnesota's Mesabi Iron Range. The formation hosts iron ore deposits that have been mined continuously for 135 years representing the most economically significant mining district in the country. The earliest production spanning from the 1880s to the 1960s exploited weathered, hematite-rich "natural" ores. However, modern iron ore production utilizes taconite, hard magnetite-rich material, that is processed into pellets before shipment to the steel mills. During this trip, we will see examples of both ore types in operating and closed mines.



Photo by Gabe Sweet, MN.



Photo by Alex Steiner, MN.

We will start our trip in Hibbing and Eveleth with exposures of the Biwabik Iron Formation along the central Mesabi range. These exposures that exhibit the variety of rock types within the iron formation recording the rise and fall of ancient sea levels and blooms of life. There will be a good sample collecting opportunity by picking through the lean ore stockpiles. Lunch will be at the Hull-Rush-Mahoning mine overlook in Hibbing providing us with some incredible views of mine lands. For the afternoon, depending on mine schedules, we may have the opportunity to tour one of the large taconite mines. Before heading back to Duluth will visit the Mary Ellen Mine. The Mary Ellen is an old natural ore pit that has been converted to a dimension stone quarry and is renowned for its unique products that include stromatolites, storm beds, and exquisite sedimentary structures preserved in the iron formation. This trip is a great opportunity to explore one of the mining districts that helped build both American and world industry through iron.

Please wear closed-toed hiking shoes for the short but sometimes steep hikes and be prepared for a range of weather conditions, including temperature changes.

Mimi Garstang to receive MO State honorary doctorate

From February 20, 2026 Press Release by Strategic Communications

Missouri State University will grant its 25th honorary doctorate to alumna **Mimi Garstang, CPG-10185**.

Missouri State's Board of Governors approved the nomination today following recommendations from the Faculty Senate and President Dr. Richard B. Williams.

"Mimi is deserving of this doctorate because she is the embodiment of Missouri State's public affairs mission," said Dr. Bill Sandel, selection committee chair. "She has done so much for the field of geology and the state of Missouri."

A life dedicated to public service

Garstang devoted her career to public service through science, leadership and education.

In 1972, she graduated with a bachelor's degree in geology from what was then Southwest Missouri State University. In 1978, she joined the Missouri Geological Survey, part of the Missouri Department of Natural Resources. She rose through the ranks and made history as the first woman to serve as state geologist of Missouri and director of the Missouri Geological Survey in 2000.

In these roles, she led Missouri to rank among the top 10 states for mineral production, strengthening the state's economy while balancing environmental stewardship.

She also educated the public about environmental issues and protection, promoted sound environmental policies in the state legislature and organized continuing education for geologists and engineers to advance public safety and welfare.

Garstang has served students at all levels by fostering a love for science, creating scholarship opportunities for future scientists and mentoring young professionals.

Since retiring from public service about 15 years ago, she has continued to help improve and protect Missouri's natural resources.



Through the Association of Engineering and Environmental Geologists and the American Society of Civil Engineers, she supports continuing education for professionals, which also funds undergraduate scholarships.

Additionally, she continues legislative outreach, promoting scientific understanding through the Missouri Geologists Consortium and the American Institute of Professional Geologists (Missouri chapter).

About the honorary doctorate

Missouri State awarded its first honorary doctorate in 2003. The purpose of the award is to recognize extraordinary achievements by distinguished citizens in hope of encouraging others.

Recent previous recipients include Sgt. Major Lanny Asepermy, Roseann Bentley, Dr. Stephen Kleinsmith, Sara Lampe, Dr. John Bentley, Elise Crain and Tom Strong.

A.P.D. degrees are granted in recognition of the recipient's extraordinary achievements in public affairs.

Sponsorship Opportunities

Become a Sponsor Today!

All sponsors receive the following standard benefits:

- Company logo on the AIPG Conference website with a link to your website
- Signs displayed throughout the conference will include your company logo
- Company logo will be included in the online conference program

If you have a sponsorship idea that isn't on our list, we can create a custom package for your company.

**Ojibwe names*

Lake Superior ***Gichigami****	**Lake of the Woods** ***Pikwedina Sagainan****	**Red Lake** ***Miskwaagamiiwi-zaaga'igan****
Benefits	***Benefits***	***Benefits***
• Collection Bag Sponosr • One free exhibit booth (includes a free registration) or one free registration • Full page, full-color ad in *The Professional Geologist* (TPG) one issue • Recognition in AIPG Newsletter during the month of your choosing or August 2026 • Marketing material can be placed on a table available to registrants $3,000 *-Add $300 for an additional year of TPG, half-page, color advertisement, 4-issues ($100 Savings!)*	• Welcome Reception Sponsor with logo on signage at reception • One free registration • Half-page, full-color ad in *The Professional Geologist* (TPG) one issue • Marketing material can be placed on a table available to registrants $2,000 *-Add $300 for an additional year of TPG, half-page, color advertisement, 4-issues ($100 Savings!)*	• Lanyard Sponsor - lanyards provided by first sponsor • Quarter-page, full-color ad in *The Professional Geologist* (TPG) one issue $1,500 *-Add $100 for an additional year of TPG, quarter-page, color advertisement, 4-issues ($100 Savings!)*
Mille Lacs ***Misi-zaaga'igan****	**Leech Lake** ***Gaa-zagaskwaajimekaag****	**Lake Winnibigoshish** ***Wiinibiigoonzhish****
Benefits	***Benefits***	***Benefits***
• Lunch Sponsor • Company logo on lunch signage $1,000	• Break Sponsor • Company logo on signage at break/coffee tables $500	• Standard benefits as stated above, company logo visibility $250

Exhibitors

- **$700.00 Exhibit Booth - Includes one complimentary meeting registration**
- **$400.00 Additional Exhibitor Registrant**
- **$350.00 Year of TPG advertising, color, half-page, 4-issues ($100 savings)**

All exhibitors receive the following standard benefits:

- One complimentary meeting registration that includes the welcome reception on Sunday, and lunch, and breaks on Monday and Tuesday
- Skirted table with two chairs
- Company logo on the AIPG Conference website with a link to your website
- Signs displayed throughout the conference will include your company logo
- Company logo will be included in the online conference program
- Attend any of the technical session presentations

Exhibit Hours

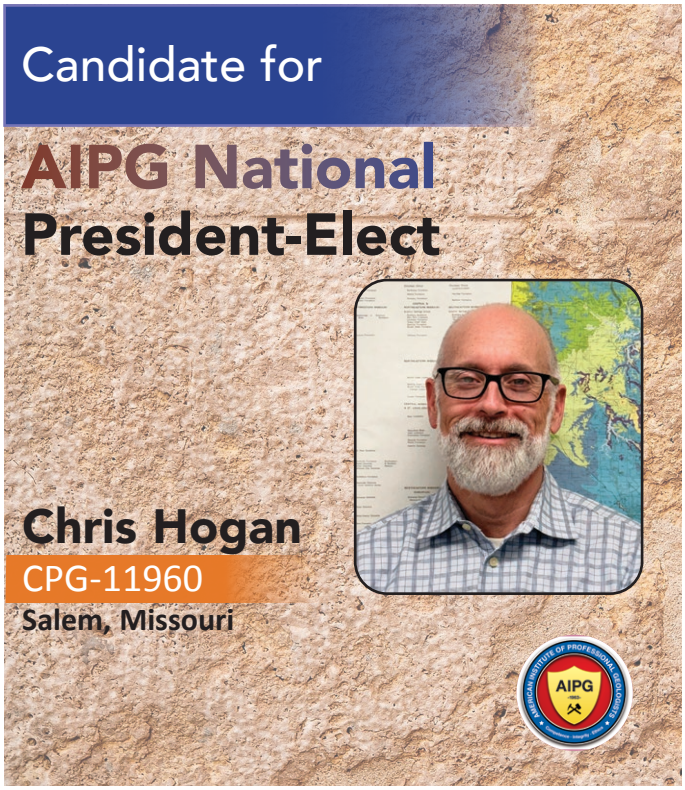
Set-up Sunday, August 30, 2026, 10:00 am – 4:00 pm
Sunday, August 30, 2026, 6:30 pm – 8:00 pm (reception/silent auction)
Monday, August 31, 2026, 8:00 am – 5:00 pm
Tuesday, September 1, 2026, 8:00 am – 3:30 pm
Tear down Tuesday, September 1, 2026, 3:30 pm – 5:30 pm

Space Assignments

All spaces and space location requests will be assigned on a first-come, first-served basis until filled.

Photographs and Video

By registering as an exhibitor, you acknowledge that photographs, video recordings, and other media may be captured during the conference, and you grant AIPG permission to use these images for advertising, display, audiovisual production, exhibition, or editorial purposes. You waive any right to compensation related to the use of such images.



I appreciate the opportunity and approval of the nominating committee to run for AIPG President-Elect. Upon joining the Institute, I found a fantastic camaraderie of welcoming members that took pride in their knowledge and application of our science in their fields. I have enjoyed the opportunities to join in AIPG's continued involvement in natural resource/economic geology/mining fields and an ever-inclusive audience of students and young professionals to help shape the future of our Institute.

With my background being nearly all in underground mine geology- and predominately in MVT deposits, belonging to AIPG has broadened both my professional network and geologic knowledge horizons. In addition, I have been afforded opportunities for involvement in the organization in the form of bringing members onsite to my company's underground lead mines in southeastern Missouri, along with hosting a webinar for "The Economics of Mine Geology" in 2022 as a part of the "Lunch 'n Earn" series. Through the forward vision at both the executive and elected official levels of AIPG for the last several years, I have witnessed increasing levels of Institute involvement across all walks of geological sciences both domestic and abroad. This also includes examples of logistical improvement to workflows- like streamlining of CPG applications and reviews to bring members into the organization.

When I began my career in mining in the zinc mines of East Tennessee, I was blessed to work with professionals that had decades of experience that were excited to share with me. I learned professional conduct from these individuals, along with many positives for the technical side of mine geology that I apply in my career as Mine Geology Superintendent for The Doe Run Company to this day. I learned principles of good stewardship of the ore and natural resources in our control and the responsibilities that a geologist carries onsite in a project. I have always felt it is my duty to offer that same level of care and mentoring relationship to young professionals just starting their career - to include those at the collegiate level that may be working toward a geology degree and are not fully aware of all the potential a geologist can influence in a company or regulatory agency. That personal ownership of all facets of a project and being a Qualified Person carries tremendous responsibility, and I find geologists openly shoulder this responsibility across all walks of our science; an impressive group to be associated with!

In my position as Mine Geology Superintendent, I've been able to host a variety of outreach opportunities to universities all around our region- to include field trips to the Viburnum Trend mines. This, along with involvement in our burgeoning ECP efforts- which directly related to efforts of the Institute is really increasing our growth among young geologists and student chapters at universities. I am blessed with a great staff of young geologists getting their careers started that are impressive, and we collectively take opportunities to speak at all our local public schools about the science of geology. Most recently, I served as 2025 AIPG Vice President with a talented team, and as the Field trip coordinator for the 2025 National Conference in St. Louis, Missouri. Being a part of our collective plans for an inclusive professional culture and steady education of legislators and regulatory agencies safeguard our future as key members that benefit all of society.

In closing, AIPG has many healthy workflows that appeal to our diverse group of professionals, and I support that growth and any efficiency improvements that can be implemented. For example, CPG recruitment, state and student chapter growth, along with a continued focus on our ECP workflows. Our YouTube channel is a fantastic platform to reach a broad audience that has opportunities, and between the online presence as well as national conferences and section field trips, we keep that close relationship that is so key to the organization. Our consistent values exemplified in our long-tenured members and steady focus toward reaching young professionals is key to our future. With this mindset, we stand to both grow our ranks and keep a firm foundation with state and federal licensing demands. Please reach out to me at chogan@doerun.com or find me on LinkedIn - I am honored to be considered by our membership for the role of President-Elect.

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Early in my career, I came to appreciate how essential mentorship and professional community are to long-term success. AIPG became the organization that provided that foundation and continues to shape my professional growth. Over the span of my membership, I have witnessed the powerful role it plays in developing leaders, strengthening professional standards, and elevating the geoscience profession.

After many years as a member, I stepped into a Section leadership role in 2020, when I was encouraged to run for President-Elect of the Kentucky Section. I was fortunate to be welcomed, guided, and positively influenced by the long-standing members of the Kentucky Section Executive Committee. The four years I spent serving strengthened my leadership skills and provided the mentorship and sense of community I deeply value. That experience reinforced the importance of active engagement and intentional leadership in sustaining strong Sections.

In 2023, my family and I moved from Lexington, Kentucky, to Charlottesville, Virginia. While the move was important for my family, it required me to rebuild professionally. I had developed a strong community in Kentucky and suddenly found myself starting over. Through my involvement with AIPG, I built professional connections and pursued opportunities that helped me secure a new position and remain engaged with the broader geoscience community. This experience reaffirmed that AIPG is not simply a professional affiliation but a lasting network that supports members through transitions and career growth.

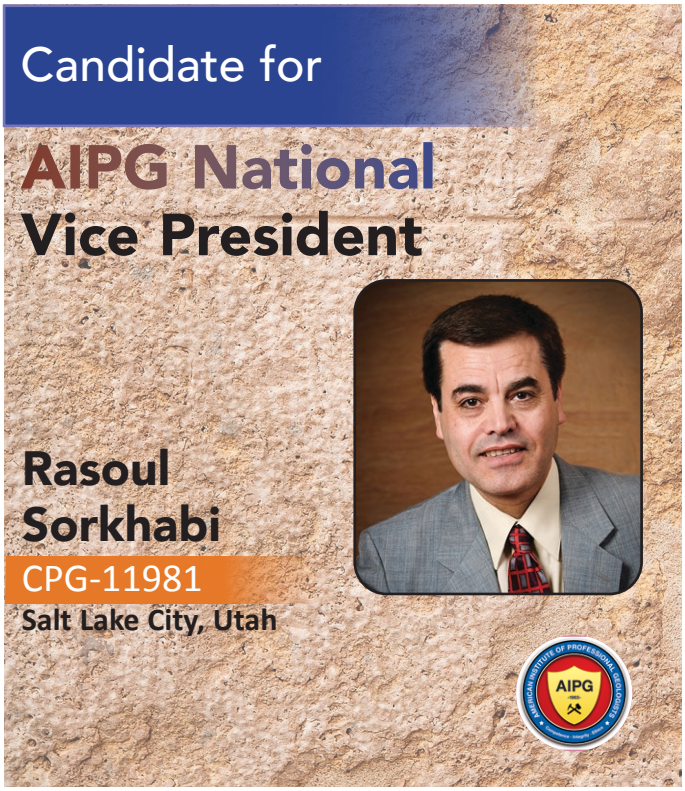
As a longstanding member of AIPG, I now feel called to serve at the National level. If elected, I will uphold AIPG's core values of professionalism, ethics, and service. I am deeply committed to strengthening connections between National leadership and our Sections, improving communication across the organization, and ensuring that members at every stage of their careers feel supported and engaged. Over the past several years, I have delivered career-focused presentations to colleges, universities, and professional geoscience organizations, including the Geological Society of America. Guiding young geologists and encouraging undecided students to consider our profession is both integral to AIPG's mission and a personal priority of mine. The long-term strength of our profession depends on our commitment to mentoring, supporting, and actively welcoming the next generation.

While living and working in Kentucky, I was honored to serve on the Kentucky Board of Registration for Professional Geologists, where I gained firsthand insight into the importance of licensure and the financial and membership challenges many state boards face. Professional licensure standards must remain rigorous and meet or exceed those of other licensed professions. Maintaining these standards protects the public, strengthens our credibility, and ensures geologists retain authority within their areas of expertise.

My vision for AIPG is rooted in connection, advocacy, and sustained excellence. National leadership must actively support our Sections, champion licensure and professional standards, and remain responsive to the evolving needs of our members and the communities we serve. We must continue to invest in meaningful outreach, strengthen collaboration among Sections, and ensure that AIPG remains a visible and respected voice for geoscience professionals. AIPG has given so much to me professionally, and I am committed to helping ensure it remains strong, relevant, and impactful for those who come after us.

This same commitment guides my professional work and leadership. As a professional geologist in the assessment and remediation field, I navigate the intersection of science, regulation, and public health daily. The work is demanding and deeply rewarding. Each day reinforces why I chose this profession: to apply sound science in ways that protect human health and the environment. If elected Vice President, I will serve with professionalism, collaboration, and a steady commitment to advancing AIPG's mission and supporting the geologists who uphold it.

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A Big Thank You to the AIPG National Executive Committee for accepting my nomination for the 2027 AIPG Vice President. I am honored by their endorsement and excited for this community service. Doug Peters will serve as the 2027 AIPG President and it will be an honor to work with him.

All my education and training – BSc, MSc, PhD and Post-Doc, have been in geology, and in a global sense – spanning several countries, India, Japan, and USA. Geology has been my profession and passion – as it is also true for my colleagues at the AIPG. It is indeed a privilege and gratifying to wake up every morning and know that you are going to work with data, maps, places, rocks, and fellow humans – related to the science of our one and only home planet.

I became a geologist because as a young boy I happened to visit the Himalayas; I was hooked by the majesty, serenity and mystery of the mountains. I know every geologist has a favorite mountain.

My first article in *The Professional Geologist* was titled "Active Geology of the Himalaya and Its Environmental Impact." It was published in December 1994. I was then a young geologist at Arizona State University. Years later, in 2018 when I was joining the AIPG, I requested a friend – Stephen Testa – to be a sponsor! I knew Stephen through our common activities at the AAPG and Petroleum History Institute. Stephen had served as a past AIPG President. When I mentioned my *TPG* article of 1994 to Stephen, he said, "Oh, that year, I was the AIPG Vice President." A small round world, indeed! This is the beauty of professional societies that connect us in some interesting ways through the years and across different places.

After my ASU years, I worked for the oil industry for several years, and then in 2003, I joined the University of Utah's Energy & Geoscience Institute, where I have been a research professor. My field of research has varied according to the needs of time – structural geology and tectonics, geochronology, petroleum geology, basin analysis, and history of geology.

After I joined AIPG, I wrote a *TPG* article on career tips for young geologists. John Barry was the Editor then. He kindly suggested that I write a regular "Educator's Corner," which I have done for the past seven years. All through these years, it has been a delight for me to work with first John Barry, and then with Adam Heft, who succeeded John as the Editor, and Sara Pearson, past AIPG President and to whom we owe all the artistic design of the magazine. I am grateful for their fellowship.

I mentioned geoscience education because this is something very close to my heart. Being an academic, I am biased toward education, but I firmly believe that the wellbeing of professional societies such as AIPG depends on students, universities, mentoring, and workforce training. I am sure each of you would testify to this from your own life experience of how a caring and enthusiastic teacher gave you a helping hand on your career path.

If elected as the AIPG Vice President, I will focus on the following objectives:

First, continue the great work that past presidents, vice-presidents and other volunteer officers have performed. For this, I will work closely with the AIPG Staff and Executive Committee – to assist them, to exchange thoughts, and to implement tools and tactics that ensure AIPG accomplishments and services continue to flourish.

Second, promote the AIPG – as much as possible in my capacity, both in the USA and overseas. People are the real constituents of any professional society; otherwise, societies are just buildings and names. We must introduce the services and contributions of the AIPG to the communities and show how professional geologists can benefit from and contribute to the AIPG.

Third, explore ways to expand the AIPG bases in colleges and universities. Membership expansion is the key. How can we create synergetic activities between AIPG and universities (faculty, researchers, and students)?

Finally, create alliances between AIPG and state-level geological societies. Again, synergy and fellowship are the key here.

Small actions in the right direction go a long way and yield positive results. I was a member of the GSA Academic & Applied Geoscience Relations Committee from 2013-2016. In our first meeting, we discussed why and how the GSA Coal Geology Division should be expanded and converted to Energy Geology Division. It was implemented; GSA Energy Geology Division is now a more inclusive and vibrant section among the GSA membership.

Thank you for your attention and for the opportunity to serve the AIPG and community.

> **People are the real constituents of any professional society; otherwise, societies are just buildings and names. We must introduce the services and contributions of the AIPG to the communities and show how professional geologists can benefit from and contribute to the AIPG.**



When I contemplate my vision as an AIPG national officer, I think first about community. Throughout my career, I have learned that professional growth does not happen in isolation. It happens when someone takes the time to answer a question, to offer perspective, or to say, "You're capable of more than you think." Those moments shape careers, and they have shaped mine.

One of the most impactful mentors in my life and career is only two years older than me. She was not decades ahead in experience, yet she gave me advice that I deeply needed at a pivotal point in my development. Her honesty, encouragement, and example challenged me to step forward rather than wait until I felt "ready." That experience reshaped how I think about leadership. Through the mentors I have been fortunate to learn from, I have come to understand that meaningful influence comes from intention, engagement, and a willingness to serve, not necessarily age or seniority.

My vision for AIPG is rooted in that understanding. I believe AIPG already provides tremendous value to early-career professionals through mentorship programs, professional development webinars, and national engagement opportunities. My goal is not to reinvent these efforts, but to help refine and expand them so they become even more impactful.

As an Early Career Professional representative, I would focus on three primary areas: strengthening mentorship, expanding practical development opportunities, and increasing intentional engagement.

First, mentorship. AIPG's existing mentorship program provides an important foundation, but I believe there is opportunity to enhance its structure and visibility. In my own experience, some of the most impactful mentorship has occurred within programs that intentionally recognize and match committed mentors and mentees. I would advocate for refining the mentorship framework to encourage defined goals, clearer expectations, and possibly recognition of mentor involvement, so that participation feels purposeful and meaningful on both sides. Even a small improvement in structure can significantly increase impact.

Second, professional development. AIPG has already demonstrated leadership by offering webinars and resources on licensure and professional practice. I would like to build upon that momentum by creating more opportunities for early-career professionals not only to attend, but to contribute. Exposure through participation, by presenting case studies, sharing project experiences, or leading discussions, can be far more transformative than passive observation. Providing structured platforms for early-career members to present webinars or participate in panel discussions would foster confidence, visibility, and ownership within the profession.

Finally, intentional engagement. Early career members are more likely to remain active when they feel heard and included in shaping the organization's direction. As the official representative for student and early-career members, I would prioritize clear communication between chapters, state sections, and the National Executive Committee to document and convey concerns, ideas, and initiatives flow effectively in both directions. I would support regular feedback channels, such as surveys or listening sessions, to better understand the needs and perspectives of emerging professionals. Representation strengthens decision-making and allows AIPG to continue to evolve alongside the profession it represents.

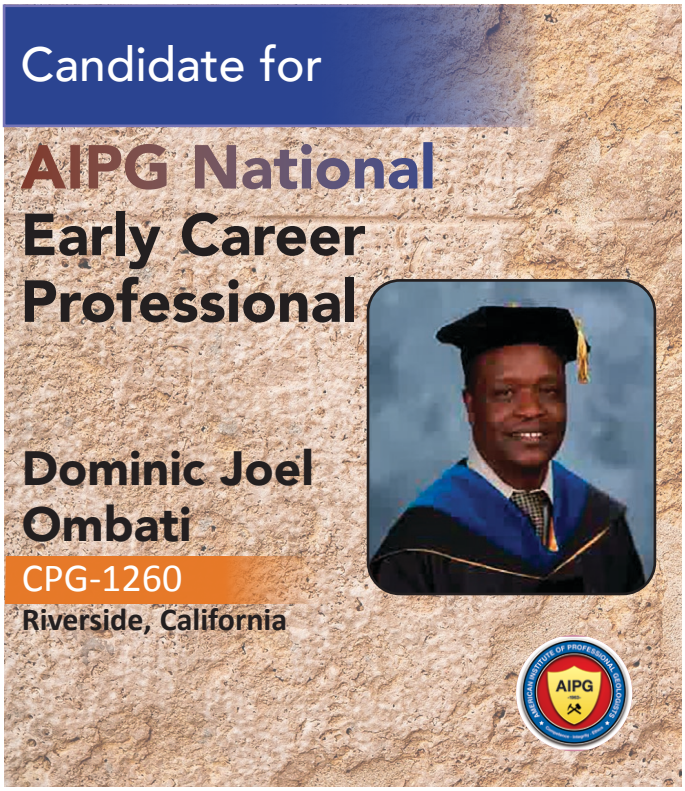
At its core, my vision is simple: I want AIPG to be an organization where early-career professionals feel both supported and challenged. Supported in their development and challenged to step into leadership earlier than they might otherwise believe possible. I want young members to see a clear pathway from student to licensed professional, and from member to leader, understanding that leadership begins with engagement, not title.

> **My vision is not about dramatic change, but about intentional growth by strengthening mentorship, expanding participation, and cultivating a more engaged community of professionals who are proud to represent geology and AIPG.**

I have always been drawn to opportunities where I can build community, whether through student organizations, professional groups, or collaborative project teams. Serving as an Early Career Professional representative would allow me to extend that commitment at a national level. I am motivated not by recognition, but by the belief that professional organizations matter when they are active, responsive, and forward-looking.

AIPG plays an essential role in upholding professional standards, promoting ethical practice, and strengthening public trust in geoscience. My goal is to help ensure that early-career professionals see themselves as contributors to that mission from the very beginning of their careers. When young geoscientists feel connected to the profession, they pursue licensure, engage meaningfully, and step confidently into future leadership roles.

If elected, I would approach this position with energy, humility, and a willingness to listen. My vision is not about dramatic change, but about intentional growth by strengthening mentorship, expanding participation, and cultivating a more engaged community of professionals who are proud to represent geology and AIPG.



I am excited to accept my nomination as the Early Career Professional (ECP) representative to the executive committee for 2027. During my graduate studies in geology, I had the privilege of serving on two AIPG committees as a student, which gave me valuable insights into the importance of active engagement and service within the AIPG community.

My experiences have reinforced my belief that AIPG stands out as one of the best organizations offering inclusive networking and service opportunities for both students and early-career professionals. I am eager to work collaboratively to enhance AIPG's outreach and membership initiatives, particularly among these groups. It is my goal to ensure that others can also experience the benefits that I have gained through my involvement in AIPG.

My background is in environmental geology and sedimentology, with a passion for sustainability and science communication with the public. Originally from Kenya, I moved to the U.S. to pursue my graduate studies in geology, driven by a desire to deepen my understanding of Earth's processes and contribute to environmental stewardship. My training has allowed me to work on both local and international projects focused on environmental geology and sustainability. Through these efforts, I aim to address ecological challenges, promote sustainable practices, and foster a better understanding of the link between geology and environmental health.

Navigating the transition from international student to a working professional posed its challenges, but I found that the networking and service opportunities available greatly eased the process. Engaging with organizations like the AIPG has been especially helpful, offering valuable service opportunities that enriched my resume.

I am committed to building on AIPG's achievements over the years, focusing on a collaborative, inclusive approach that involves all stakeholders. I will specifically prioritize initiatives that promote AIPG membership among geology students and early-career professionals, promoting the existing AIPG mentorship programs, networking opportunities, and resources that empower the next generation of geologists.

If elected, I will focus on the following objectives:

Increasing AIPG membership among students and early career professionals.

Engaging geology students and early career professionals who are not presently members of the AIPG by utilizing a comprehensive approach that includes data analysis, stakeholder consultation, and the development of innovative outreach strategies.

> **My ultimate goal is to empower geology students and early-career professionals by providing the support they need to succeed in their fields, in line with AIPG's mission to advance the geosciences and promote professional growth.**

First, by conducting a thorough analysis of existing data to identify demographics and regions where geology students and early career professionals remain unengaged. This will help pinpoint specific groups that may benefit from AIPG's resources and community.

Second, consulting with all stakeholders to gather insights into the barriers that these potential members face. This collaborative effort will ensure outreach strategies are informed by the experiences and needs of both prospective members and existing members.

Finally, designing and implementing targeted outreach initiatives that resonate with these audiences. Leveraging innovative communication methods and tailored engagement activities to enhance recruitment efforts and foster a sense of belonging among geology students and early career professionals, encouraging them to join and actively participate in AIPG.

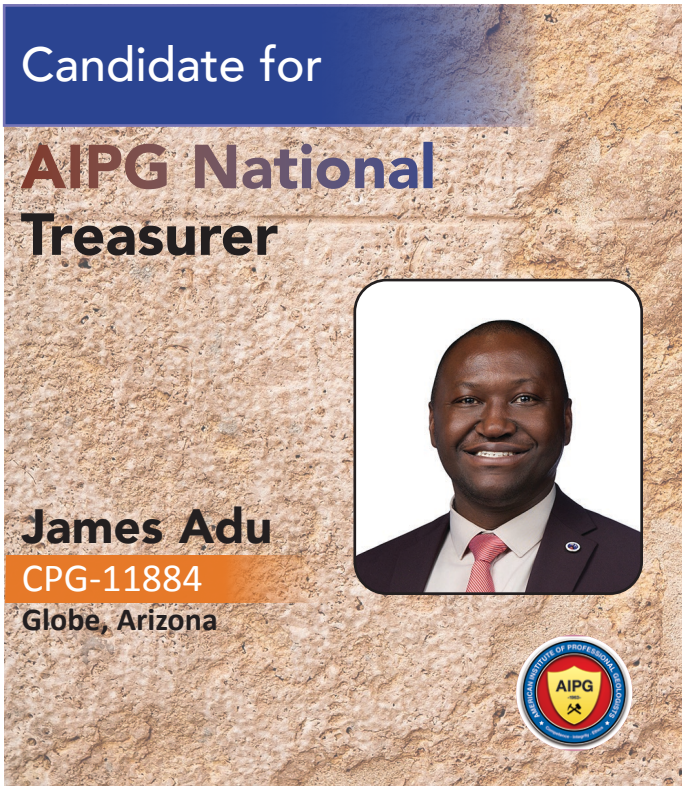
Promoting personalized engagement for students and early career professionals.

Fostering a deep understanding of the unique needs and expectations of geology students and early career professionals. By actively seeking and valuing their input through surveys, focus groups, and open forums, to gain comprehensive insights into their experiences, challenges, and aspirations.

Tailoring strategies to support these individuals effectively and ensuring that AIPG initiatives resonate with their specific circumstances. Using the insights gathered to update the existing AIPG services, networking opportunities, and mentorship programs to truly reflect the priorities of this demographic.

My ultimate goal is to empower geology students and early-career professionals by providing the support they need to succeed in their fields, in line with AIPG's mission to advance the geosciences and promote professional growth.

Thank you for the nomination. I am prepared to work collaboratively in advancing the mission of AIPG.



> I value the role AIPG plays in supporting ethical practice, professional recognition, and community among geologists. I also believe our Institute has meaningful opportunities ahead: strengthening support for members, growing engagement among early-career professionals, and continuing to demonstrate the value of geology to society.

I am honored to be nominated for the office of AIPG National Treasurer for 2027 and 2028. My vision is straightforward: to work closely with the Executive Committee as a careful steward of AIPG's finances so that our organization remains strong, relevant, and positioned to advance the profession of geology for the benefit of all members.

Throughout my career, I have learned that good stewardship is about more than balancing accounts. It is about aligning resources with purpose. In geology, whether in mining, environmental work, hydrogeology, engineering geology, energy, or academia, our decisions must be grounded in sound data, sound judgment, and long-term responsibility. The same is true for an organization like AIPG. Strong financial management creates the stability needed to support member services, professional certification, student and early-career engagement, section activities, publications, outreach, and the broader voice of professional geologists.

I bring to this role a combination of technical, leadership, and financial experience. As a Certified Professional Geologist with more than 20 years of global experience across geology, exploration, mine operations, and resource evaluation, I have spent my career making disciplined decisions under uncertainty. In parallel, my Executive MBA with a finance concentration strengthened my understanding of budgeting, capital allocation, financial modeling, and strategic planning. In both industry and volunteer leadership, I have seen how thoughtful financial oversight can enable innovation, create resilience, and help organizations invest in the areas that matter most.

If elected, I will focus on three priorities.

First, I will support transparent, disciplined, and mission-focused financial stewardship. AIPG's finances should continue to be managed with integrity, clarity, and accountability. Members should have confidence that resources are being used wisely to strengthen the Institute, support its programs, and preserve its long-term health. As Treasurer, I would work with the Executive Committee to help ensure that our budgeting and financial decisions reflect both present needs and future opportunities.

Second, I want to help expand the value AIPG provides to members at every career stage. One area I am particularly passionate about is financial education for geoscientists, especially students and young professionals. Our members are highly trained in geology, but many receive little practical guidance on personal finance, retirement planning, tax awareness, or building financial resilience over the course of a career. This need also extends to members who operate as consultants, independent practitioners, or small business owners. I believe AIPG can play a constructive role by offering educational programming that helps members better understand topics such as retirement investing, tax-efficient planning, and broader financial literacy relevant to geoscience careers. This would not replace professional financial advice, but it could provide valuable awareness and practical tools that many members would appreciate.

Third, I want to contribute to building a stronger bridge between professional excellence and professional sustainability. AIPG has long stood for competence, ethics, and service. I believe financial wellness is also part of sustaining a strong profession. When geologists are better equipped to manage their careers, plan for retirement, evaluate opportunities, and understand the business side of their work, they are better positioned to lead, to serve the public, and to remain active contributors to the profession over the long term.

My service to AIPG has reinforced these convictions. As 2024 President of the AIPG Arizona Section and a 2025 AIPG national board leader, I have seen firsthand the importance of collaboration, member engagement, and practical leadership. I value the role AIPG plays in supporting ethical practice, professional recognition, and community among geologists. I also believe our Institute has meaningful opportunities ahead: strengthening support for members, growing engagement among early-career professionals, and continuing to demonstrate the value of geology to society.

If given the opportunity to serve as National Treasurer, I will bring energy, integrity, financial discipline, and a member-centered mindset to the role. My goal is to help safeguard AIPG's financial strength while also supporting ideas and programs that advance both the organization and the profession.

I would be honored to earn your support.

CANDIDATE FOR AIPG NATIONAL 2027 PRESIDENT-ELECT



Chris Hogan

CPG-11960
Salem, Missouri

Statement of Purpose or Goals you have for AIPG: If chosen as President-Elect, I plan to advocate for our profession in all facets that geologists serve. These include elements of professional development, key members of projects, and growth in our knowledge of the science. In addition, the continuing support of initiatives already in process will be a cornerstone of my plans; to include growth of the ECP, Student chapters, as well as the state membership level.

Universities Attended	Degrees Granted	Dates
University of Tennessee - Knoxville	B.S. Geological Sciences	1999

Company	Title	Dates
The Doe Run Company	Sr. Mine Geologist/ Geology Superintendant	2014-present
Freeport-McMoRan-Climax Molybdenum	Geology Modeler II	2012-2013
The Doe Run Company	Mine Geologist I, II, Mine Geology Supervisor	2006-2012
Walmart, Inc.	Area Manager, distribution	2000-2006
ASARCO, Inc.	Geology Intern, Mine Geologist	1995-2000

AIPG Activities	Dates
AIPG Vice President	2025
Field Trip Coordinator - National Conference, St. Louis, Missouri	2025
Member of NSC-West review board for CPG applicants	2024-present
ECP - GeoCareers panel member, hosted by Brigitte Petras	2023
Webinar Host - Lunch and Earn - The Economics of Mine Geology	2022
Keynote Speaker - National Conference, Nashville, Tennessee- Tennessee Sphalerite Deposits	2023-Present

CANDIDATE FOR AIPG NATIONAL 2027 VICE PRESIDENT



Megan Cleinmark

CPG-12111
Charlottesville, Virginia

Statement of Purpose or Goals you have for AIPG: My goal is to promote strong communication, Section support, and national advocacy within AIPG. I am passionate about protecting professional licensure, investing in meaningful outreach, and ensuring geologists at every stage of their careers feel supported and valued. I will work to help keep AIPG relevant and positioned for long-term success.

Universities Attended	Degrees Granted	Dates
University of Montana	M.S. Geosciences	2007-2010
College of Charleston	B.S. Geology & Environmental Geosciences B.S. Anthropology	2002-2006

Company	Title	Dates
ECS Mid-Atlantic	Environmental Senior Project Geologist	2025-present
TRC	Senior Geologist	2023-2025
CSI, Inc.	Senior Geologist	2022-2023
L.E. Gregg Associates	Senior Geologist	2013-2022
BCTC	Adjunct Geology Instructor	2013-2018
Holman Consulting Engineers	Geologist	2010-2012

AIPG Activities	Dates
AIPG National Membership Committee Member	2025
Kentucky Section Vice President	2023
Kentucky Section Past President	2022
Kentucky Section President	2021
Kentucky Section President-Elect	2020

CANDIDATE FOR AIPG NATIONAL 2027-2028 TREASURER



James Adu

CPG-11884
Globe, Arizona

Statement of Purpose or Goals you have for AIPG: My vision as an AIPG National Officer is to work with the Executive Committee as a responsible steward of the organization's finances, ensuring that AIPG remains strong, sustainable, and well positioned to advance the profession of geology for the benefit of its members. I also want to expand member value by promoting financial education, especially for students and young professionals, in areas such as retirement planning, alternative investments, and practical tax strategies for employees, consultants, and business owners. Through sound financial leadership and member-focused initiatives, I hope to help strengthen both AIPG and the long-term success of geologists across all career stages.

Universities Attended	Degrees Granted	Dates
Quantic School of Business & Technology	Executive MBA	2022
New Mexico Institute of Mining & Technology	M.S. Mineral Engineering	2012
Kwame Nkrumah Universitty of Science & Technology - School of Mines	B.S Geological Engineering	2004

Company	Title	Dates
Airth.io	Technical & Commercial Advisor	2026-present
Caspstone Copper	Chief Geologist	2023-2026
ASARCO	Senior Geologist	2021-2023
Kinross Gold Corporation	Senior Geologist	2017-2021
Freeport-McMoRan	Resource & Mining Geologist II	2012-2017
Newmont Corporation	Resource Geology	2012
Barrick Gold Corporation	Exploration Geologist	2011
Rudnic Company	Senior Exploration Geologist	2010-2011
Moydow Mines Int./Shankill Resources	Resident Geologist (Exploration)	2004-2010
Blue Cross Exploration	Exploration Geologist	2004
AngloGold Ashanti	Mine Geologist	2002

AIPG Activities	Dates
National Executive Advisory Board	2025
Arizona Section President	2024
Arizona Section President-Elect	2023
Arizona Section Secretary	2014, 2015, 2017

CANDIDATE FOR AIPG NATIONAL 2027 VICE PRESIDENT



Rasoul Sorkhabi

CPG-11981
Salt Lake City, Utah

Statement of Purpose or Goals you have for AIPG: To help the AIPG Staff and Executive Committee with AIPG-academic alliances, expansion of membership, and promotion of AIPG both in the USA and overseas.

Universities Attended	Degrees Granted	Dates
Kyoto University, Japan	Ph.D.	1986-1991
Jammu University, India	M.S.	1983-1985
Jammu University, India	B.S.	1980-1983

Company	Title	Dates
University of Utah	Research Professor	2003-present
Japan National Oil Corp, Japan	Senior Geologist	1997-2003
Arizona State University	Research Professor	1991-1997

AIPG Activities	Dates
Educator Corner articles	2020-present

CANDIDATE FOR AIPG NATIONAL 2027
EARLY CAREER PROFESSIONAL



Becca May

ECP-1250
St. Louis, Missouri

Statement of Purpose or Goals you have for AIPG: My goal for AIPG is to strengthen meaningful engagement and participation from early-career geoscientists by expanding mentorship, increasing access to practical professional development, and ensuring early-career perspectives are actively represented at the National Level. I would work toward this by advocating for structured, short-term mentorship pairings, helping organize the already practical webinars focused on licensure and early-career challenges, and creating regular feedback channels so emerging professionals feel heard and supported. Having personally benefited from mentorship early in my career, I am committed to building those same intentional opportunities for others within AIPG.

Universities Attended	Degrees Granted	Dates
University of Missouri	M.S. Geology	2022-2024
University of North Dakota	B.S. Geology	2018-2022
University of North Dakota	B.S. Environmental Studies	2018-2022

Company	Title	Dates
Stantec	Geologist - GIT	2024-Present
Barr Engineering Co.	Assessment & Remediation Intern	2023
Institute for Energy Studies (UND)	Research Assistant	2021-2022
North Dakota DEQ	Watershed Management Intern	2021
Energy & Environmental Research Center	Geophysical Research Intern/ Research Assistant	2020-2021
University of Missouri	Research Lab Technician/ Graduate Teaching Assistant	2022-2024
University of North Dakota	US MASTER Program Research Assistant/ College of Engineering & Mines Outreach Ambassador	2022 2020-2022
Allen Angel Capital Education	Managing Director / Investment Analyst	2023-2024
MaxFi Surgical Simulations	Marketing Specialist	2025

CANDIDATE FOR AIPG NATIONAL 2027
EARLY CAREER PROFESSIONAL



Dominic Joel Ombati

ECP-1260
Riverside, California

Statement of Purpose or Goals you have for AIPG: I am dedicated to serving as the Early Career Professional (ECP) representative for AIPG, 2027. I will build on past achievements while engaging all stakeholders inclusively and work collaboratively to increase AIPG membership among students and Early Career Professionals.

Universities Attended	Degrees Granted	Dates
Loma Linda University	Ph.D. Earth Science	2024
Loma Linda University	M.S. Geology	2016
Bugema University, Uganda	B.S. Biology	2010

Company	Title	Dates
La Sierra University, California	Assistant Professor Sustainability studies	2024-Present
Loma Linda University	Graduate Student Assistant	2012-2014

AIPG Activities	Dates
AIPG National Diversity & Inclusion Committee Member	2022
AIPG National Membership Committee Member	2024-2026

Watch for your e-mail ballot in April from AIPG Headquarters. Alternatively, eligible voting members may also mail the ballot below to headquarters at the following address:

10701 Melody Drive, Suite 630
Northglenn, CO 80234

Official AIPG 2026 Ballot National Officer Election

President-Elect
President in 2027

☐ **Chris Hogan, CPG-11960**

Treasurer
Term of office 2027-2028

☐ **James Adu, CPG-11884**

Name

_____

AIPG Member Number

_____

Vice-President
Term of office 2027

☐ **Megan Cleinmark, CPG-12111**

☐ **Rasoul Sorkhabi, CPG-11981**

Early Career Professional
Term of office 2027

☐ **Becca May, ECP-1250**

☐ **Dominic Joel Ombati, ECP-1260**

Vote online or mail in this ballot



Mapping at East Canyon U-V Project in Utah, USA

A Source of Carbon Free Energy Sitting in the Ground

Regina Molloy, CPG-12345

Introduction

This article is written by an exploration geologist that has explored critical minerals in several significantly endowed sedimentary basins for iron ore, potash, coal, lead-zinc and uranium. Recent field mapping at East Canyon on a Uranium-Vanadium (U-V) project in Utah motivated writing this article to share with other geoscientists the potential these rocks have in unlocking energy in the USA. The Colorado Plateau uranium deposits, including the Uravan Belt Arc deposits, are comparable in terms of mineral endowment to those basins and commodities previously mentioned. In addition, this article is written to ignite conversation from those who have an interest in the development of the uranium industry and the Uravan Belt Arc of high-grade U-V deposits. Both uranium and vanadium are classified critical minerals by the United States Geological Survey (USAGS) and therefore have strategic national importance to the USA.

Significant zero carbon energy could be produced in Utah and Colorado by adopting a vision of locally extracted and locally consumed therefore adopting a safe localized transport model. Uranium products could be processed by small uranium reactors to provide the energy needs of growing cities such as Salt Lake City and Denver. Small modern micro reactors present far less danger than the historical larger ones which caused devastation in Japan. The vision is how to harness the most efficient natural energy cheaply from the ground to the grid, as it was hand mined in the past to help the USA. Once optimized, energy capacity could be used for digital data storage and support local manufacturing businesses by competing in electricity price in a globally competitive market. Low-cost energy boosts economic output and attracts companies to manufacture in the USA. Put another way, create a low-cost energy environment and manufacturing will follow. In-situ uranium leaching has been pioneered in Wyoming, and the USA already has developed extraction knowledge and skills without digging up the ground, this is particularly relevant when evaluating narrow high-grade U-V seams. The USA government invests in geothermal and could invest further in methodologies to extract uranium from the ground. USA also produces small uranium reactors and has the technical capability and know-how to produce electricity from mined uranium.

This article is written by Regina Molloy (CPG-12345) on a Utah mapping project she mapped called East Canyon, the project is highly prospective for U-V and is part of the Uravan Belt Arc of deposits straddling Utah and Colorado. The Uravan belt is part of the prolific and world-renowned Colorado Plateau which extends from Utah and Colorado into Arizona and New Mexico. This article presents the field mapping in terms of the observed stratigraphy, field photo observations, U-V mineralized horizon and airborne radiometric processed imagery which identifies the

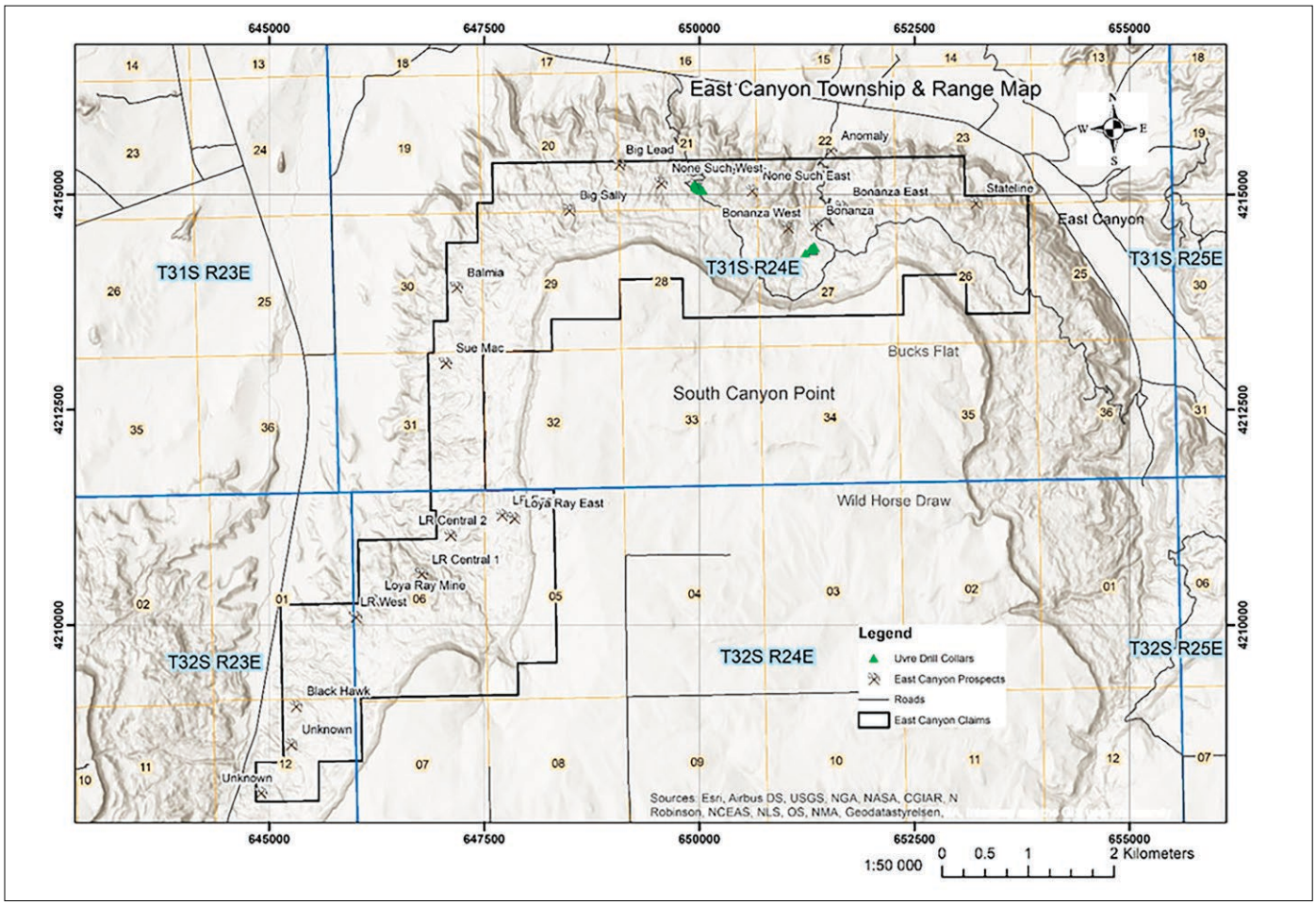


Figure 1. Digital elevation model showing the escarpment of the East Canyon mapping project on the western and northern side of South Canyon Point 10 miles north of Monticello, Utah. U-V mineral occurrences and historical mines are shown and labelled. The East Canyon prospect claims package is shown.

surface exposed uranium in stratigraphy and from historical mine dumps.

The mapping project is located on the western and northern margins of South Canyon Point ten miles north of Monticello in Utah, USA (Figure 1). It is an exploration project owned by Minerals Exploration Ltd and they have given consent to publish this article in the AIPG newsletter.

The East Canyon stratigraphic sequence is impressively unique in terms of a relatively undisturbed gentle dipping sequence of fluviatile sedimentary rocks of Jurassic-Cretaceous age where the full sequence of Brushy Basin and Saltwash Members are exposed along the entire South Canyon Point plateau. The top of sequence extends from Dakota Sandstone and Burro Canyon Formation at the top of the plateau, down to the Entrada sandstone - Slickrock Member and potentially Camel Fm at the base planar level below Loya Ray prospect in the west. The project also has significant historical reference to past mining activities for uranium which was funded by the Department of Energy during its nuclear program in the 1950-1970's.

Uranium is an exciting commodity that can produce carbon free energy in abundance relative to renewal minerals. The challenge for the extractive minerals industry is to learn how to harness the energy in an investible and sustainable way, and convince the public that uranium can produce safe, zero harm and carbon clean energy when mined and consumed locally.

The East Canyon Uranium-Vanadium (U-V) project has a long history; it was first explored for radium in 1910, then vanadium, followed by uranium and has been left underexplored since 1979. The East Canyon stratigraphic succession hosts a continuous horizon containing high-grade U-V mineralization which given its age is remarkably intact and with limited disruptive faulting, this makes the sedimentary sequence relatively unique. The mineralized horizon was intermittently mapped along two trends being the 3-mile (5km) East-West Trend, and the 1.5-mile (2.4km) Loya Ray Trend and a further 0.7 miles (1.2km) for a total length of 2.2 miles (3.6km). Figure 2 depicts the trends and uranium prospects where uraninite (±coffinite (further confirmation required), ±carnotite, ±green vanadium) was observed in outcrop within the Saltwash Member and is shown as green along the length of the plateau in figure 2. The mineralization style is tabular sandstone hosted and could potentially host roll front U-V deposits where bedding warps within basal fluviatile channels where entrapment enables precipitation and preservation. The grades of uranium are exceptionally high with best rock chip laboratory analysis returning up to 1.64% U_3O_8 and 6.72% V_2O_5 and given the strike length of the plateau there is a lot of uranium and vanadium within the sandstone host at East Canyon.

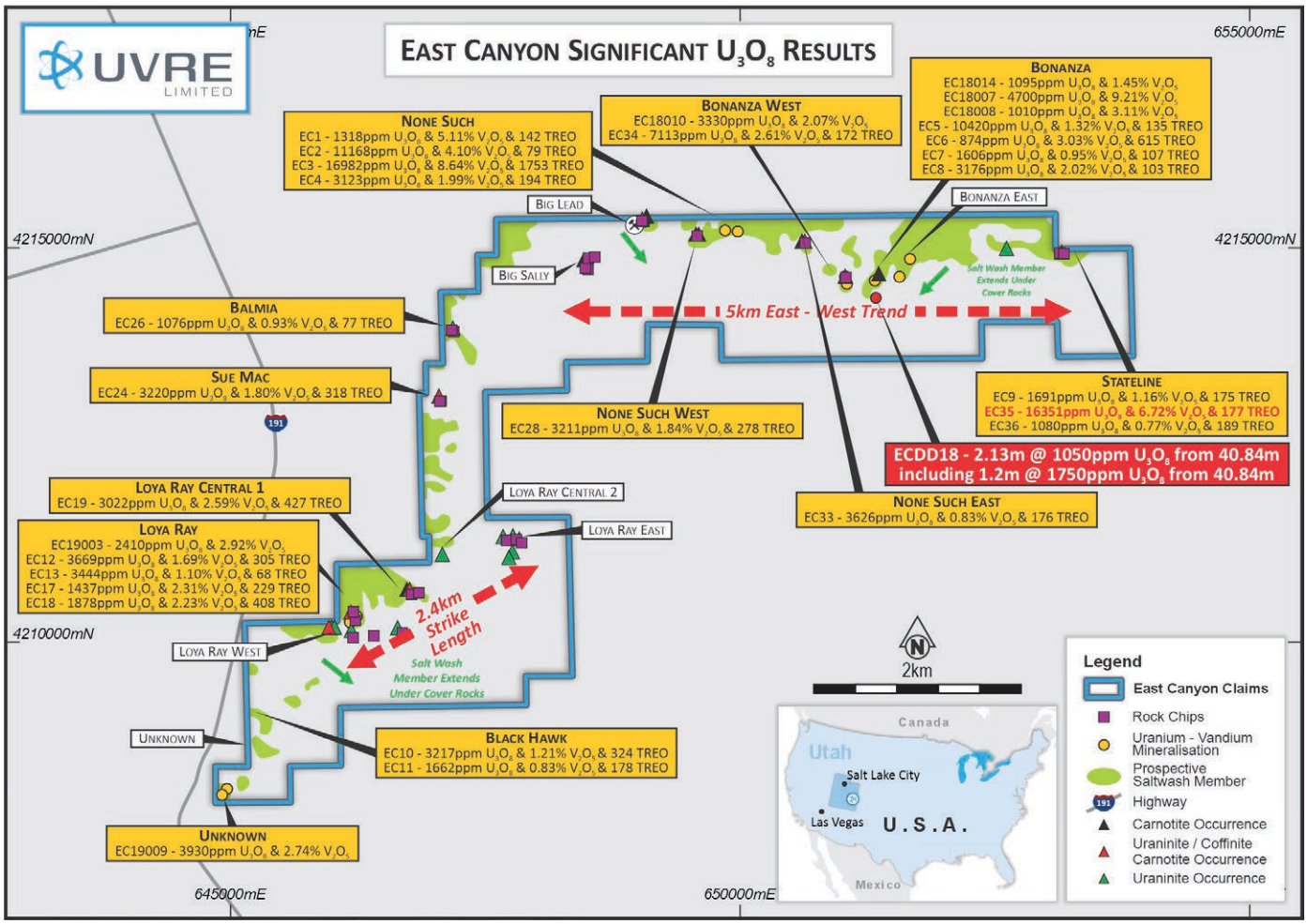


Figure 2. East Canyon map showing the prospective Saltwash Member in green and the mapping rock chip laboratory analysis for uranium, vanadium and Trace Rare Earth Element Oxides (TREO. Nineteen prospects are shown where uraninite, (±coffinite to be confirmed), carnotite minerals were observed. Some green and orange vanadium was observed at Bonanza and None Such prospects.

The sedimentary succession is an impressive package of well-preserved fluviatile sedimentary successions with a remarkable coarsening upward sequence with interstitial matrix carbonate. The sheet wash is relatively unconsolidated and is very well preserved given the Jurassic-Cretaceous age of the formations. Of note is the consistent exposure of the U-V mineralized horizon along the length of the western and northern plateau margins in which the two trends were identified. Some prospects have historical hand mined pits and adits which are remarkably well preserved, and which provided the uranium during 1948-1978 mining period.

2. District Scale Key Considerations

Below is a list of considerations relevant to field mapping in association with the U-V mineralized district.

a. Interesting fact: The Colorado Plateau has 4,000 sandstone-hosted uranium occurrences and hosts over 1.2 billion pounds of mined U3O8 mined from the Chinle and Morrison Formations (Hall, S.M et al 2023). On a global scale, this is a globally significant endowed terrain.

b. The Morrison Formation is best endowed in U-V and includes the Brushy Basin, Saltwash and Tidwell Members. Outcropping horizons are high grade and range from 0.3 ft (1m) to 32 feet (10m) in thickness and some prospects having disseminated uraninite haloes up to ten feet either side of the mineralized horizon. Mineralized horizons are narrow and high grade, and the stratigraphy is laterally extensive. Only the outcropping exposures were previously explored and mined. U-V is likely to exist under the South Canyon plateau and are potentially concentrated within basal channels.

c. Deposits are stratigraphically controlled and located within permeable channels and sub basins which became disconnected from a larger basin during uplift and erosion. The depositional environment is important for the localized concentration of U-V in the central and deepest portions of the fluviatile channel.

d. Morrison Formation U-V deposits are characteristically several thousand meters long and several hundred meters wide and comprise tabular, stacked high grade mineralized layers that are 10-16 feet (3-5m) thick with grey, bleached sandstone (Hall, S.M. et al 2023). District scale ore minerals referenced in Hall, S.M et al 2023 include coffinite, uraninite, amorphous uranium oxide, organo-uranium complexes, montroseite, roscoelite, vanadium illite/smectite, vanadium-bearing chlorite, tyuyamunite, carnotite, paramontroseite, corvusite-group minerals and

hewettite. Associated minerals include calcite, pyrite, chalcopyrite, galena, sphalerite, ferroselite, claustalite, wurzite, cobaltite and naumannite (near carbonaceous plant material) (Hall, S.M. et al 2023).

e. Distinct pulses of uranium mineralization and/or redistribution occurred from 259 Ma to 12 Ma during the Chinle Formation (245-208 Ma), Morrison Formation (134-157 Ma) and Colorado Plateau uplift (66-36 Ma) (Hall, S.M et al 2023).

f. Hundreds of publications exist on the Colorado Plateau which discuss geology, geochronology and metallogeny regarding the U-V deposits; however, there isn't an exploration model for the precipitation of uranium with vanadium where vanadium is commonly higher in grade in the Uravan belt. More research is required to better understand the ore genesis of vanadium and its distribution relative to uranium.

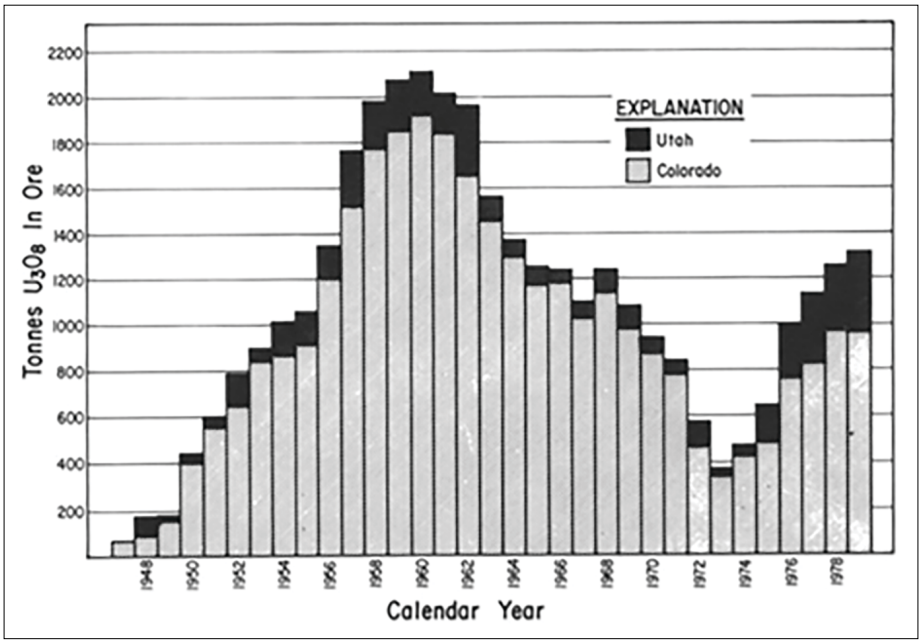


Figure 3. Uranium production of the Uravan mineral belt in Colorado and Utah and adjacent areas from 1947-1979. Source Chenoweth 1981.

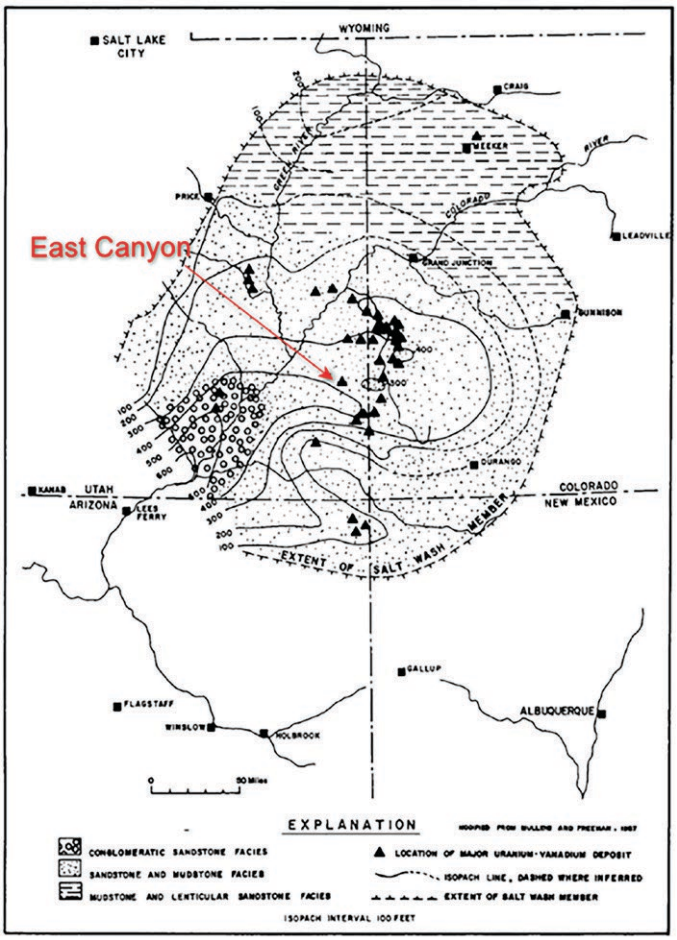


Figure 4. Historical map by Thamm et al 1981 showing the uranium isopach facies map of locations of the major historical Salt Wash U-V producing areas. East Canyon is an extension of the Uravan Mineral Belt Arc to the west (as shown).

g. The USA government sponsored uranium exploration drill programs that took place between 1948 and 1956 and sponsored buying mining products with fixed price purchases. Additional subsidies for transport haulage were also paid where product was hauled to centralized mills including the former mill in nearby Monticello. This mill has since been decommissioned as a superfund project and was initially constructed for vanadium processing and later altered to process uranium (Thamm et al 1981). The USA government subsidies stopped in the 1970's.

h. Salt Wash sandstone deposits were mined between 1947 and 1979, mining 17,645,000t @ 0.24% U_3O_8 and 1.25-1.50%V_2O_5 (Thamm et al 1981). U_3O_8 mined grades were the same across the Colorado Plateau of deposits due to the government subsidizing mining, and grades were designed according to the centralized processing facilities requirements. The historical deposit mined grade is therefore not a reliable predictor reflective of mineral resource grade due to the government subsidies provided.

i. Deposits were mined for radium in 1910-1923, for vanadium in 1930 where mines opened by 1935 and the Metals Reserve Program 1942-1944, all were sponsored by the USA government. Then in 1943-1946 the Manhattan Engineer District Studies focused on the Salt Wash Member for uranium. The Atomic Energy Commission Program commenced in 1947 and during this program uranium production peaked in 1960 and again in 1978 and then the program ceased a year later in 1979 (Chenoweth 1981).

3. Uravan Belt

Figure 4 shows the distribution of uranium deposits within the Uravan Belt Arc and the associated uranium hosting sedimentary units; these include conglomerate sandstone facies, sandstone and mudstone facies, and a mudstone and lenticular sandstone facies at Grand Junction. This map was produced by Thamm et al 1981. Note

the location of East Canyon where U-V mineralization was mined within the sandstone and mudstone (shale) facies.

Figure 1 and Figure 2 are maps of the East Canyon Project showing U-V prospects along the down slope exposure of the Saltwash and Brushy Basin member stratigraphy and the top plateau sandstone cliffs comprising Dakota Sandstone and Burro Canyon Formation (Fm). In terms of U-V mapped mineralized exposures, the two identified trends are shown being the East-West Trend and the Loya Ray Trend. There are nineteen locations in which the U-V mineralized horizon was identified around the 6,465 feet (1,970 m elevation) contour, of which some were historically hand mined by adits and small pits. The exposures of U-V mineralization along a consistent elevation were reliable given the age of the sedimentary package. The U-V mineralized horizon prediction improves the level of prospectivity confirming a large volume of U-V given the mineralization is stratigraphically extensive in outcrop where exposed and laterally dipping into the plateau.

4. Mapping Project Uranium - Vanadium Summary

The East Canyon project area comprises 19 prospects which are listed in Table 1 and mapped in Figure 1 and Figure 2. In terms of historical mine hubs, the Bonanza mine hub was the largest observed where uranium was sourced from six (6) mines and hand sorted and transported down the steep drainage escarpment in the north. The mines are located within the Upper Sandstone of the Saltwash Member, and the mineralized horizons are stratigraphically bound measuring on average 10-40 inches (0.2-1m). Disseminated uraninite in sandstone intermittently envelopes the mineralized horizon extending 10-13ft (3-4m). None Such was the second largest historical mining hub where uranium was sourced from three (3) mines including an area that had been excavated by a dozer via contour mining. The None Such product was centralized, hand sorted and transported down the steep hill. The third largest historical mine hub was the Black Hawk, Unknown South and Unknown North locations where underground mine adits were observed, and these were closer to the former Monticello processing facility so would have had less transport cost.

The Loya Ray mine comprised a small adit with air ventilation. Big Lead was a small area of open cut excavation and likely part of the None Such mining hub. Big Sally was a large area of exposed geochemically leached limestone which appears to have scavenged uranium over the outcrop. Some impressively large radiating calcite crystals with pink hues were observed in this location.

Sue Mac and Balmia were small outcrops of uraninite sandstone within the upper sandstone unit of the Saltwash Member, and this horizon could be intermittently traced walking southward towards Loya Ray over a 1.8-mile (3 km) distance.

The best exposures of the U-V mineralization are within the 3-mile (5km) East-West Trend as the sandstones are well exposed due to a large circular failure and the dip of the stratigraphy relative to the circular failure exposes a thicker sequence of sandstone in this area. Along the East-West Trend from Big Lead in the west to Stateline in the east, the upper sandstone of the Saltwash Member is well exposed, and the best outcrops were historically selectively mined.

Below is a summary table of the field observations made at each of the prospects at East Canyon, those with historical hand mining are noted.

5. Mapping of Radiometric Airborne Survey

An airborne radiometric survey was flown in 2023 to determine surface uranium distribution at East Canyon. The results facilitated the identification of specific stratigraphic locations where uranium

Table 1. East Canyon prospects identified by historical mining and U^2/Th ratios of processed radiometric survey

#	Name	Historical Mine	Comment
1	Loya Ray Mine	Small historical underground working, some open dozer cuts observed.	Single small adit and bull-dozer tracks.
2	Loya Ray Central 1	none	Area of exposed rock with uraninite. Tracks evidence of prior drilling noted however no drill holes could be found.
3	Loya Ray Central 2	none	Single small area. In the approximate location of South Shay Fault. Below green-red clays.
4	Loya Ray East	none	Large area of Brushy Basin and Salt Wash Member Sheetwash Conglomerate running 200 counts per sec-ond (cps). This area is not historically mined, outcrop exists but comprises rounded hill tops, further trenching or drill testing could be con-ducted.
5	Loya Ray West	none	
6	Sue Mac	none	Uraninite sandstone exposed
7	Balmia	none	Uraninite sandstone exposed
8	Big Sally	none	Limestone, calcite, scavenging uranium?
9	Big Lead	Small bulldozer excavated pit, pos-sibly part of None Such mine hub	
10	None Such	None Such mine hub	Eleven drill core holes drilled by Uvre in 2022
11	None Such West	None Such mine hub	
12	None Such East	None Such mine hub	
13	Bonanza	Bonanza is an his-torical mine hub	Five drill core holes drilled by Uvre in 2022
14	Bonanza East	Bonanza mine hub	
15	Bonanza West	Bonanza mine hub	
16	Stateline	Bonanza mine hub	
17	Black Hawk	None found	
18	Unknown 1	None found	Dozer work that appeared to look like a drill pattern, may have previously been drilled.
19	Unknown 2	Historical mine adit, likely part of the old Happy Jack mine hub	One exposed historical drill hole observed.

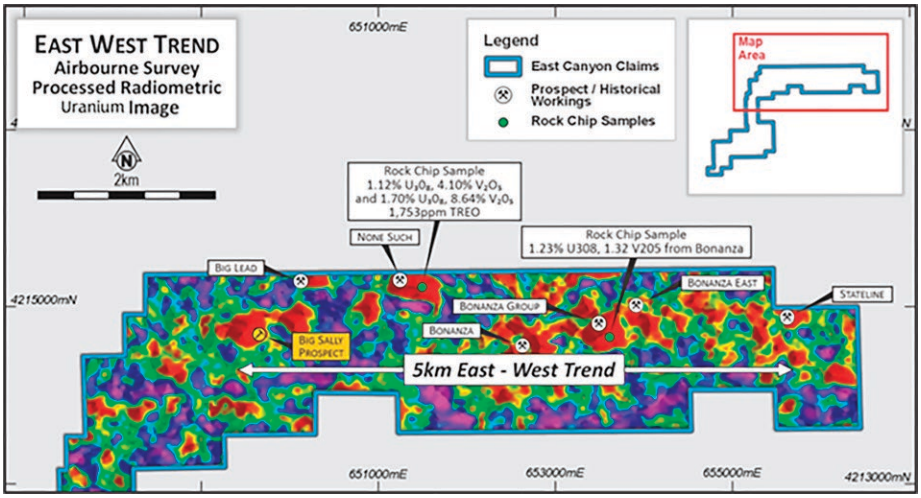


Figure 5. Airborne radiometric image of the East-West Trend showing the distribution of uranium at surface along the 3-mile (5km) East-West Trend at East Canyon.

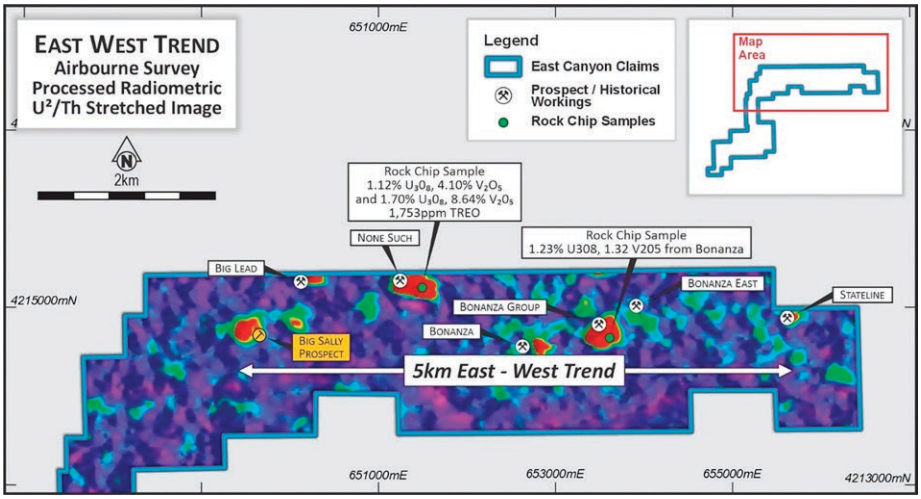


Figure 6. Airborne radiometric image of U^2/Th which highlights the most significant relative distribution of uranium at surface.

is present. Figure 5 shows uranium distribution without filtering along the 3-mile (5km) East-West Trend, and Figure 6 shows the U^2/Th ratio which identifies the most prospective relative uranium anomalism. Radiometric surveys reflect materials at the surface only and are not a ground penetrating technique so only uranium within the top 8-12 inches (20-30cm) can be detected. Buried and concealed uranium cannot be detected by radiometric surveys.

At Loya Ray, the Saltwash Member is faulted along the northeast striking South Shay fault with the north side block down faulted. The fault has created a hummocky terrain of tilted Saltwash Member stratigraphy with deeply incised drainages and classic circular failure along the escarpment where the fault cuts the plateau at an acute angle. The circular failure can be observed in Photo 1 which shows the escarpment and the fault runs roughly parallel to the photo. Consistent elevated counts per second (cps) were detected by the scintillometer over the 1.5-mile (2.4kms) length.

The Loya Ray Trend is well defined by the U2/Th image shown in Figure 7, where to the west is the Loya Ray mine, and the northeast portion of the trend has had limited prior exploration with anomalous cps sheetwash conglomerate. The Saltwash member continues along the southern plateau escarpment where uranium in Saltwash is anomalous. Figure 8 shows U^2/Th anomalism extending for a further 0.7-mile (1.2km) southwest of Loya Ray, creating a total strike length of 2.2 miles (3.6km) of Saltwash Member uranium anomalism. An oblique view of the plateau can be observed in Figure 9 facing southwest where the U^2/Th image is draped on a digital terrain model, each of the Loya Ray mine anomalisms to the east and west are clearly visible. Figure 10 shows the same oblique view but with total uranium imagery which reflects the distribution of uranium within the Saltwash Member stratigraphy.

6. Project Stratigraphy

The East Canyon stratigraphy ranges in age from Middle Jurassic Entrada Sandstone which is part of the San Rafael Group up to the Lower Cretaceous Dakota Sandstone unit, as shown in the Figure 11 stratigraphic section. The full sequence is intermittently exposed along the plateau margins, and the circular failure further exposes the U-V mineralization along the Loya Ray Trend in the west and along the East-West Trend to the north. Given the age of the well-preserved sedimentary succession, the stratigraphic sequence is uniform and consistent throughout the plateau.

The East Canyon stratigraphy is gently easterly dipping, and the stratigraphic succession is well exposed along a terraced eroded plateau. The angle of terraced exposure from top to bottom is 45-55 degrees. The top of the plateau comprises a steep cliff of cross bedded Dakota Sandstone remotely interpreted as underlain by ±Burro Canyon Formation which from a distance is estimated to measure 65-100 feet (20-30m) with high cliffs forming steep sub vertical buttresses at the top of the plateau.

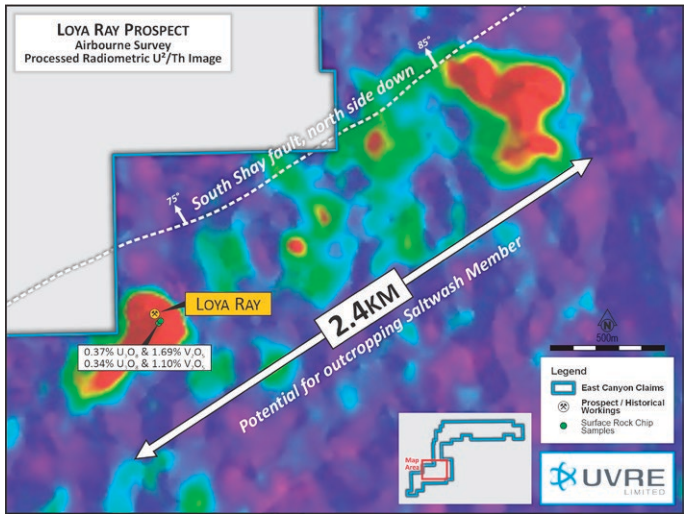


Figure 7. Loya Ray trend showing U^2/Th ratio over a 1.5-mile (2.4km) trend of Saltwash Member stratigraphy, the best Loya Ray rock chip analysis returned 0.37% U_3O_8 and 1.69% V_2O_5.

Due to the gentle easterly dip, the Dakota Sandstone is much closer to planar ground level on the eastern side of the plateau where spectacular high angle cross bedding within the thick sandstone buttresses can be observed.

Below the Dakota sandstone and Burro Canyon Formation is a magnificent thick sequence of Sheetwash Conglomerate which is largely unconsolidated and creates a sharp contact with the overlying sandstone. The Sheetwash Conglomerate is interpreted as the Brushy Basin Member. Due to the unconsolidated state of the Sheetwash Conglomerate unit, which may be unconsolidated due to carbonate matrix leaching, the well-rounded pebbles are scattered downslope, and in areas completely obscure the underlying sandstone-conglomerate bedded strata, especially in areas of deeply incised drainage ±circular failures.

The Sheetwash Conglomerate is a coarsening upward sequence where the smoothed pebbles in the upper contact with the Burro Canyon Formation are very coarse with well-rounded sheetwash pebbles which are up to 4-6 inches (10-15cm) in diameter. The conglomerate clasts and bedding thickness sequence fines downward, into laminated sandstone and conglomerate. At East Canyon this is interpreted to be part of the Brushy Basin member transitioning into the Salt Wash Member upper contact where the conglomerate beds decrease in thickness and transition to smaller pebble layers within the laminated cross bedded sandstone. The rounded pebble diameter decreases from top to bottom and at the base of sequence to 0.3-0.8 inches (1-2cm) in diameter. The sequence sharply transitions from overlying sandstone to the fining downward sequence of pebble conglomerate and sandstone. The sequence is an impressive preservation of fluviatile cyclic high energy to lower energy sedimentary deposition and well preserved along the plateau given the Jurassic-Cretaceous age.

The Sheet Wash Conglomerate contains radioactive minerals and runs 5,000cps with a scintillometer when traversing the sequence and notable high readings were recorded along the Loya Ray Trend and above the Bonanza and None Such prospects. In places the Sheetwash Conglomerate was observed to have carbonate within the matrix (especially at Bonanza prospect) and upon exposure to surface weathering processes, the carbonate matrix appears to be chemically leached from the conglomerate leaving masses of unconsolidated sheet wash pebbles.

The top of the Salt Wash Member is a massive white-grey reduced 33 foot (10m) thick sandstone unit which hosts the U-V mineralized horizon at East Canyon at approximately 6,465 feet (1,970 m elevation). This Upper Sandstone unit appears white and bleached and can include modern organic material and occasional black chert. The black chert is not specifically noted in historical literature; however, it was found within the mineralized horizon and intermittently above the overlying stratigraphy.

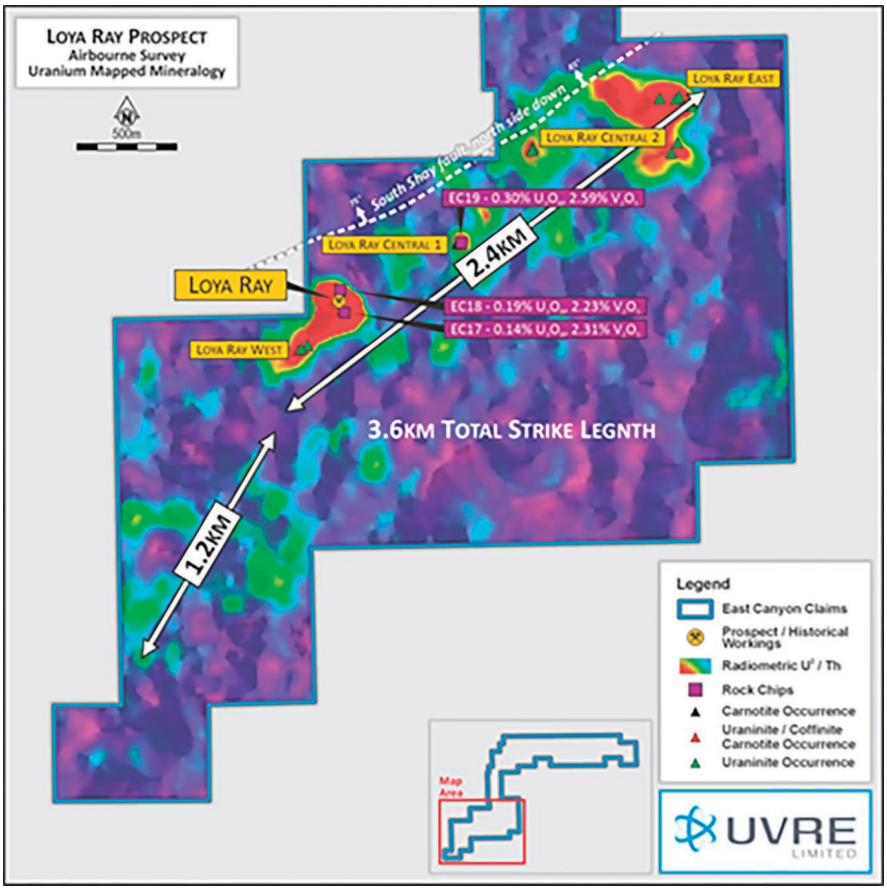


Figure 8. The Loya Ray trend showing U^2/Th ratio and the extension of the Saltwash Member uranium for a further 0.7 mile (1.2km) to the southwest. The image shows a total strike length of 2.2 miles (3.6km) of anomalous Saltwash Member stratigraphy.

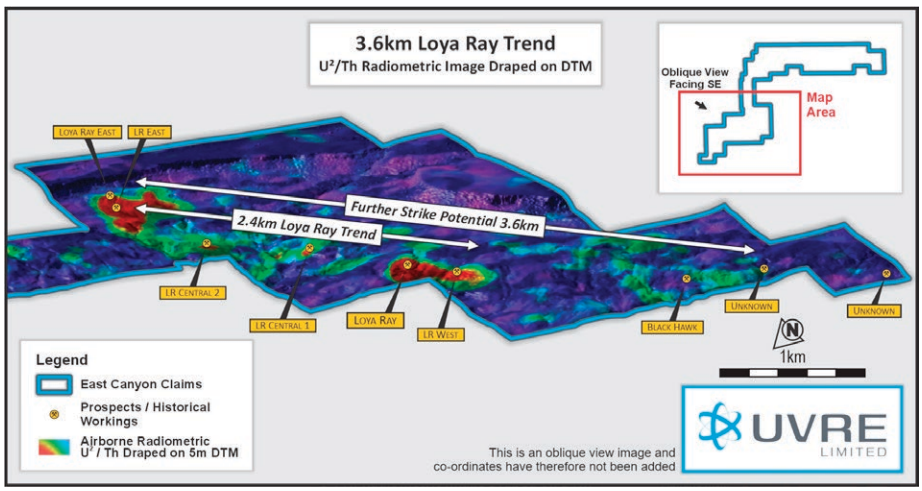


Figure 9. An oblique cross section view where U^2/Th ratio is draped on a digital terrain model. The image depicts the uranium prospective portions of the Saltwash member along the margin of the plateau where the Saltwash member outcrops over 2.2 miles (3.6km).

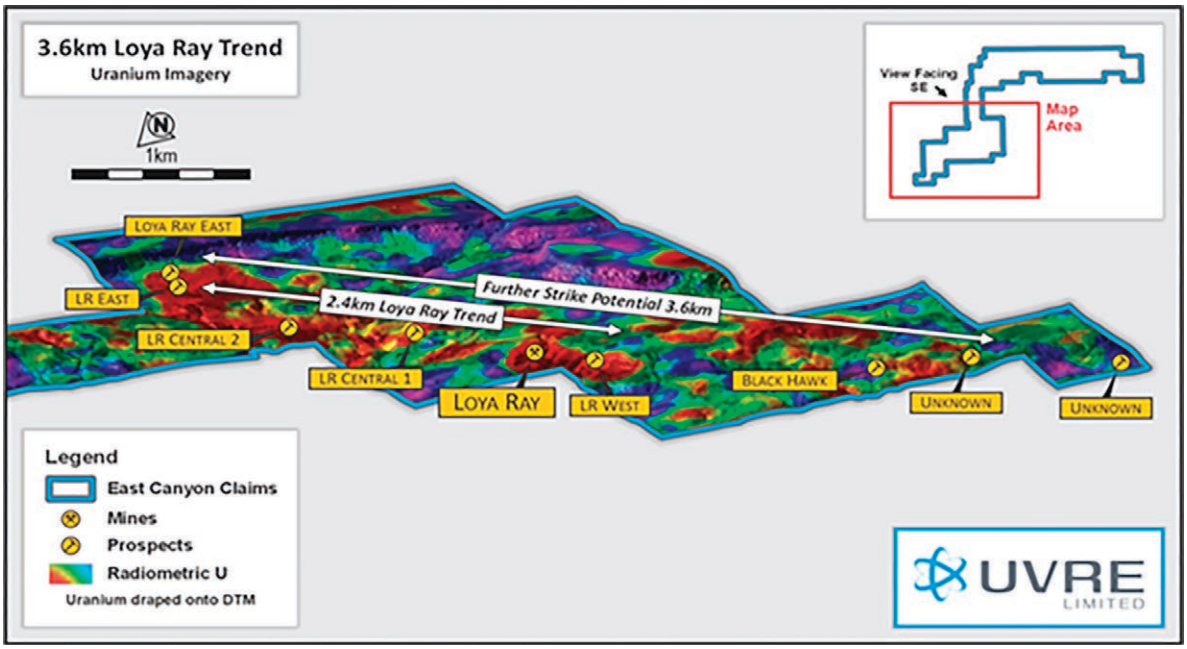


Figure 10. Total uranium image shown over the southern mapping area, note how the distribution of uranium is extensive and how it compares to Figure 9 with U^2/Th ratio. Uranium prospects are labeled. The Saltwash member is consistently anomalous for uranium as a stratigraphic horizon.

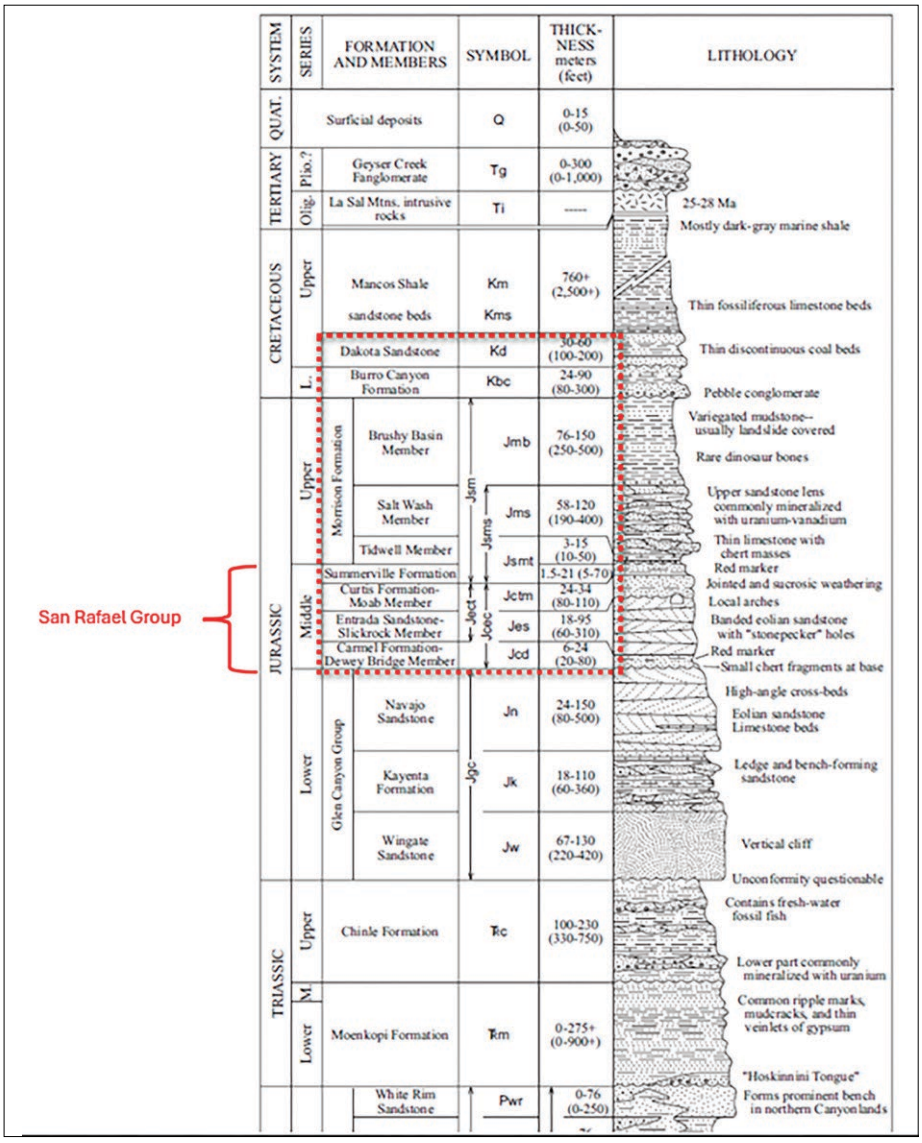


Figure 11. The East Canyon plateau exposed stratigraphy is highlighted in red broken line and ranges in age from Middle Jurassic to Lower Cretaceous. The Morrison Formation hosting the East Canyon U-V mineralization within the Salt Wash Member. The regional stratigraphic section is sourced from Doelling, Hellmut, H. 2004, the Geological Map of the La Sal La Sal 30x60" Quadrangle, Utah Geological Survey Map 25. Plate 2 of 2 notes.

Discontinuous coal beds were noted in the Dakota Sandstone stratigraphic column in Figure 11. Fine grained disseminated black uraninite occurs as disseminations within the surrounding U-V sandstone which is easily detected by the scintillometer. At None Such and Bonanza the mineralized horizon includes a thicker green reducing shale band adjacent to a red oxidized shale band. Organic tree roots were observed to grow along this horizon likely due to water channeling associated with the shales. The shales appear thin and squashed due to subsidence and the uraniferous fluids appear to be constrained within the shales by the surrounding massive sandstone unit. The presence of white illite clay and carbonate is consistent with the uranium and vanadium mineralized horizon observed at East Canyon.

The U-V mineralized horizon is located at the base of the upper sandstone unit of the Saltwash Member. Below the upper sandstone unit is a series of four to five sandstone units interbedded with maroon, red, green, orange and grey shales appear

as clay. The shale-clay sequence becomes progressively thicker between the sandstone units until the underlying red bed shale units are well exposed and are thicker towards the underlying Tidwell Member and Summerville Formation. A thin limestone unit that appeared cherty was observed below the Loya Ray mine and thicker red shale-clay beds where distinct grey cherty limestone was observed and interpreted as the Tidwell Member. This was the only observed location on the eastern plateau below Loya Ray historical mine. Underlying the Tidwell Member is a yellow sandstone which appears beige to dirty brown and with spectacular cross bedding which is interpreted as the Entrada Sandstone. Stratigraphically the Todilto Formation underlies the Entrada Sandstone and is also prospective for uranium mineralization. This could be an exploration target below Loya Ray where the full sequence of stratigraphy is exposed to planar ground level.

Below are a series of photographs taken during the field mapping which present the stratigraphic sequence, historical mine exposures and U-V mineralized horizon.

The stratigraphic field observation photos show the full sequence of East Canyon stratigraphy from lower Cretaceous Dakota Sandstone- Burro Canyon Formation down through the Brushy Basin and Saltwash Member stratigraphy down to the Entrada Sandstone Member.

The East Canyon western escarpment is shown in Photo 1, Photo 2, and Photo 3. The Loya Ray Trend sequence is shown in Photo 1, the eastern escarpment near Balmia and Sue Mac prospects in Photo 2, and the East-West Trend where the Bonanza and None Such historical mines are located in Photo 3.

The delineation of the U-V horizon along the escarpment strike is particularly useful for modelling a potential channel and the rolling and warping character of the mineralized horizon is shown in Photo 5 facing eastward towards Balmia and Sue Mac Prospects. The Plateau escarpment digital elevation model provides excellent exposures in which to potentially conduct 3D detailed modelling to try and define the axis of the channel over the entire project area. Detailed stratigraphy surrounding the mineralized U-V horizon at Loya Ray is shown in Photo 6 and Photo 7 where the

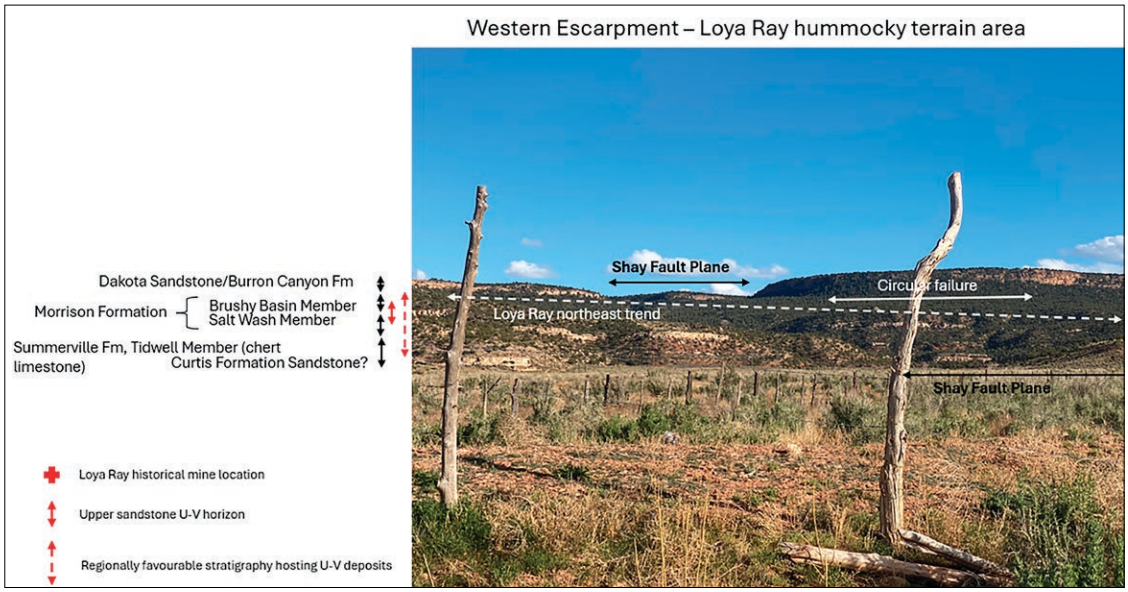


Photo 1. Loya Ray escarpment, facing west and showing the full stratigraphy and Loya Ray U-V trend. The Shay Fault plane is shown as well as the circular failure which exposed the Loya Ray prospect and was historically mined. The top of the plateau sequence is Dakota Sandstone-Burrow Canyon Formation with underlying Morrison Formation comprising Brushy Basin and Salt Wash Members and the Tidwell Member chert-limestone horizon and possibly the Curtis Formation yellow sandstone (not labelled in photo).

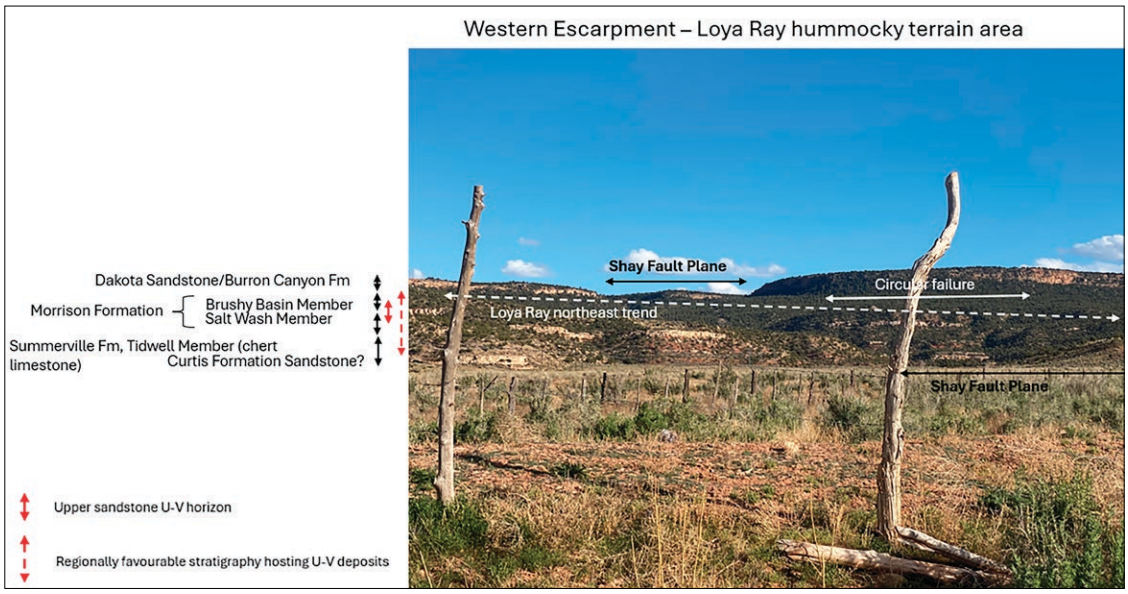


Photo 2. East Canyon stratigraphy eastward facing, view looking up the escarpment towards Balmia and Sue Mac prospects where the full stratigraphy is well exposed and easily viewed from a distance. The northern western plateau in this area does not have the escarpment circular failures as observed along the East West Trend and Loya Ray Trend evidence of less faulting at an acute angle to the escarpment. The location of the Upper Sandstone U-V horizon is shown in bold red left arrow and the favorable stratigraphy hosting U-V deposits by the broken line red arrow.

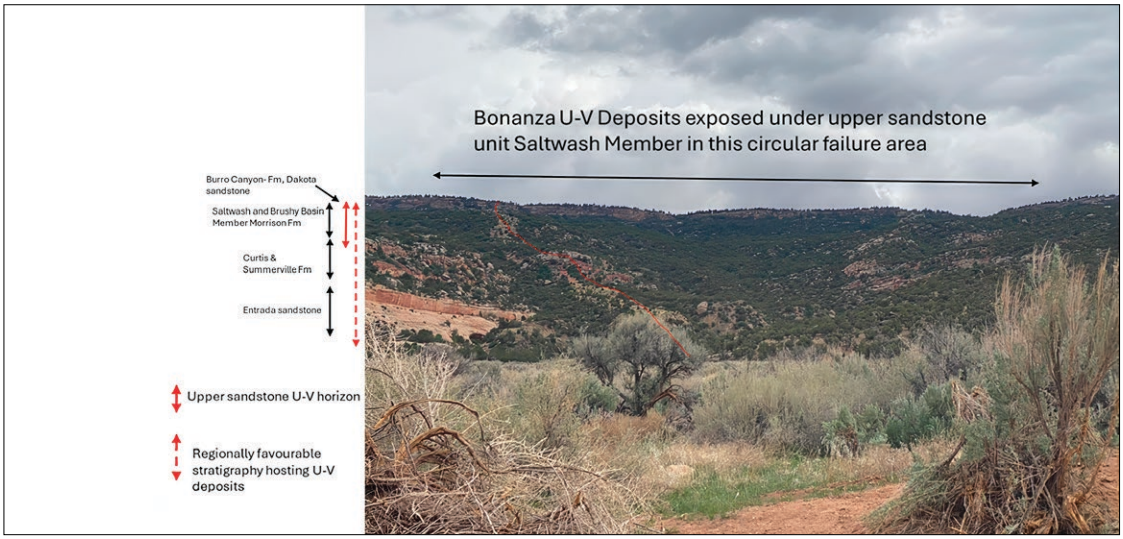


Photo 3. View of escarpment (southward facing) of the East-West Trend where the Bonanza deposits are well exposed within the Saltwash Member. Pipeline infrastructure is shown by the red line on the left-hand side.

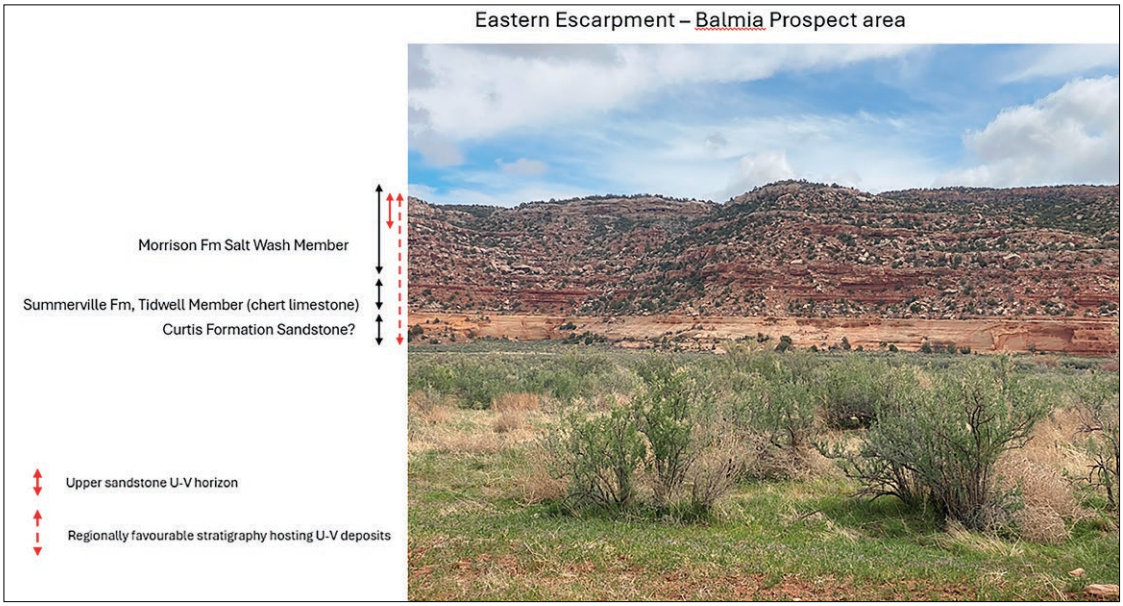


Photo 4. Photo of the four to five terraced sandstone units along the eastern plateau escarpment in the Balmia Prospect area. Photo shows the exposed lower stratigraphy including the thicker basal red beds. The Salt Wash Member down to the Curtis Formation sandstone is exposed in this photo. The overlying Brushy Basin to Dakota Sandstone is not visible in the photo and is located above the upper Sandstone shown at the top of the photo on another terraced ledge.

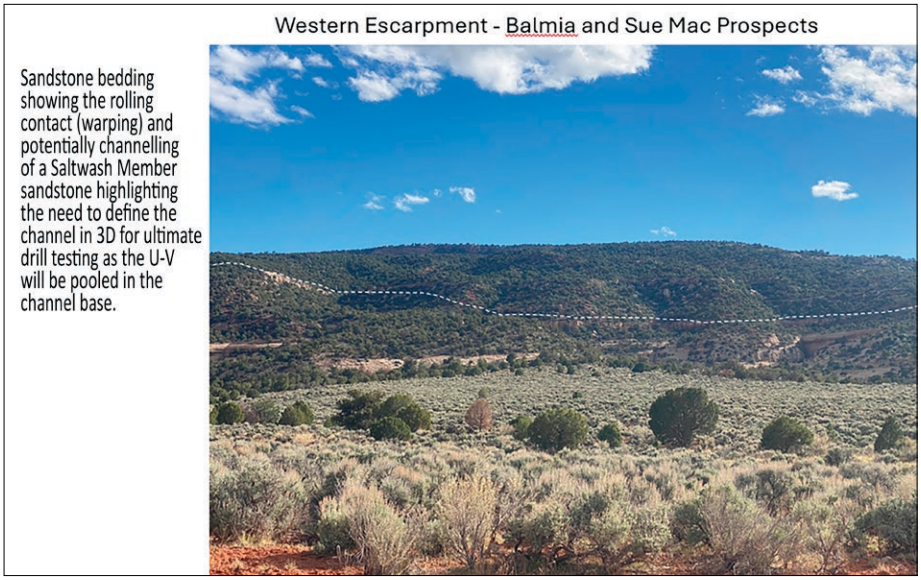


Photo 5. Photo of the western escarpment showing the undulating warping of a sandstone unit, each of these units could be further modelled in 3D utilizing a digital elevation model, the U-V horizon can then be modelled.

U-V mineralized horizon is associated with a limonite hanging wall transitioning upwards to green reducing clay, red bed shale and further massive sandstone and intermittent clay-shale banding within the sandstone unit. A similar sequence of stratigraphy was also observed at the Big Lead pit as shown in Photo 8 where fine grained oxidized sulfides were observed along the mineralized contact. Diagenetic sulfides, likely pyrite, were observed within the sandstone sequence along with liesegang banding.

The outcrops at None Such show the same localized stratigraphy with overlying green reducing clay surrounded by bleached sandstone with surficial iron oxide coating on the sandstone, as shown on Photo 9 and Photo 10.

The Bonanza East U-V mineralized horizon is associated with a green clay illite horizon within a massive sandstone unit



Photo 6. Mineralized U-V seam at the Loya Ray mine where mineralization is exposed along an oxidized sandstone limonitic horizon.



Photo 7. Photo of Loya Ray mine cutting showing a more detailed view of the U-V mineralized horizon shown in Photo 6.

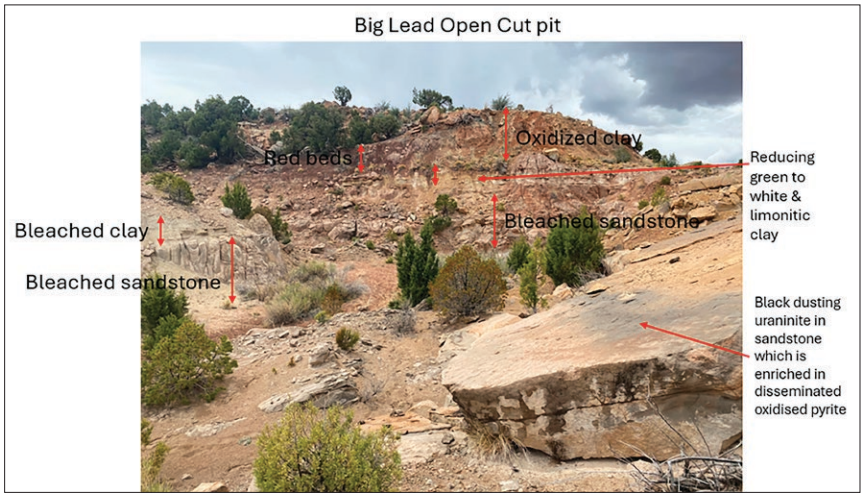


Photo 8. Cutting exposure of the Big Lead mine with uraninite in sandstone in the foreground and overlying the hanging wall is a red clay sequence. The U-V mineralized horizon occurs at the intersection of footwall limonitic sandstone and hanging wall bleached sandstone with clay/shale or illite enriched.

Below: Photo 9. Photo of None Such adit showing flat lying reducing clay-shale horizon above the adit with surrounding, bleached sandstone with surface iron coating.



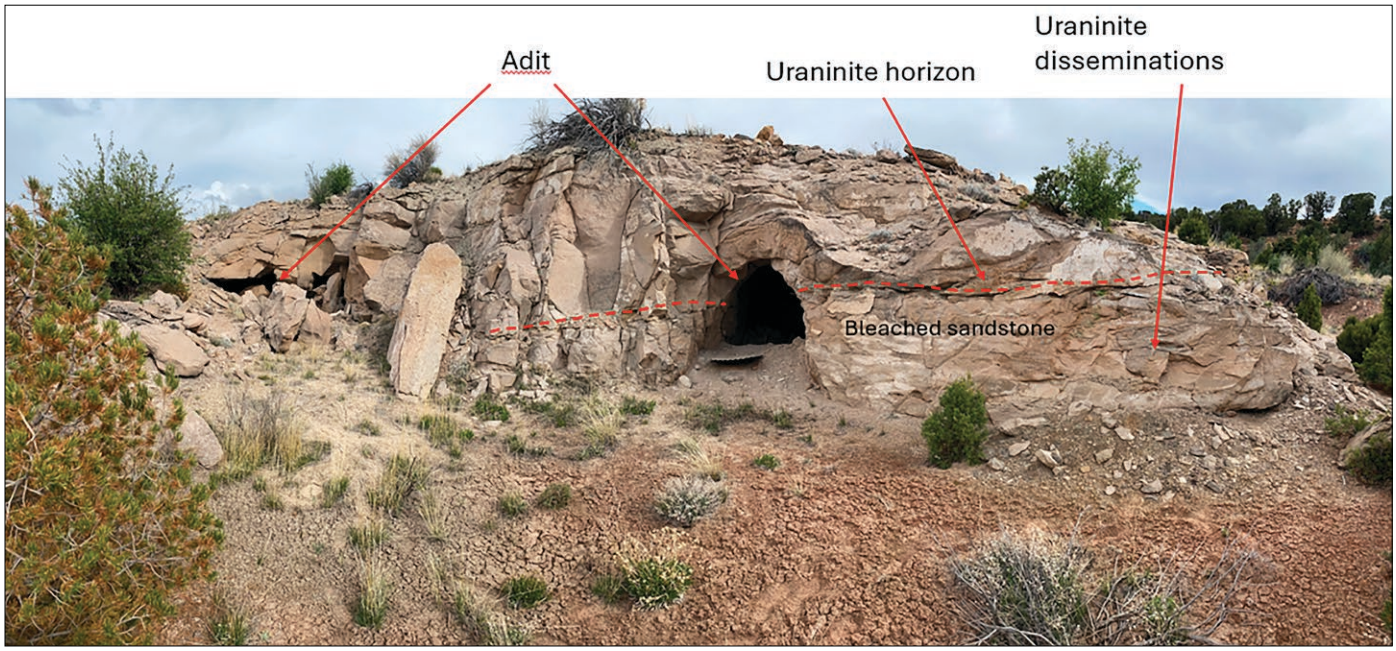


Photo 10. One of the None Such adits showing a mined seam of flat lying sandstone enriched in uraninite.

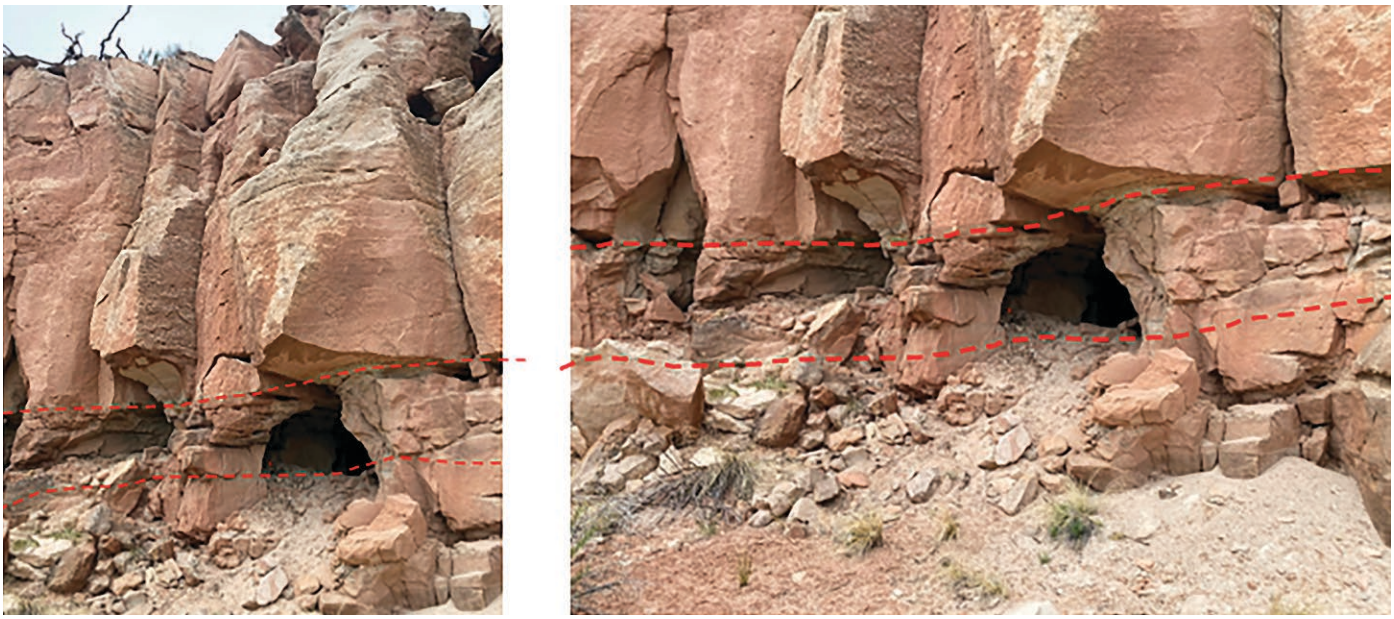


Photo 11. Bonanza Eastern mine adit with flat lying mineralized U-V horizon marked in red broken line within bleached sandstone with oxide staining on surface.

and the green reducing clay is present but limited, also observed occurrences of black chert within the U-V horizon.

In the southern mapping area near Loya Ray West, localized surficial black coatings which resembled oil slicks and an impressive black carbon lichen were observed.

7. Conclusion

The East Canyon Morrison Formation stratigraphy which is prospective for U-V mineralization and Trace Rare Earth Element Oxides (TREO) is well preserved along the South Canyon Point plateau where sandstone exposures are terraced. The top of the plateau was interpreted as Lower Cretaceous Dakota Sandstone to Burro Canyon Formation and the stratigraphy down sequence is well exposed for the Brushy Basin and Salt Wash Members and down to the Entrada Sandstone and potentially the Camel Formation – Dewey Bridge Member which is Middle Jurassic.

There are nineteen prospects at the East Canyon project some of which are defined by historical adits and pits where clusters of mines accumulated hand mine product and transported it to the Monticello facility. Some of the nineteen prospects are defined by U^2/Th ratios.

An airborne radiometric survey flown in 2023 processed for uranium and thorium highlights the distribution of uranium within the Saltwash Member and portions of the Brushy Basin Member and U^2/Th ratio depicts the highest relative uranium anomalism. The prospects occur along a U-V mineralized horizon which was mapped by the airborne radiometric survey at 6,465 feet (1,970m



Photo 12. Bonanza East flat lying U-V mineralized horizon within massive, bedded sandstone unit with U-V associated with light green clay illite horizon. The sandstone units are white bleached with surficial iron oxide staining along joint planes.





Photo 13. Bonanza East showing; left hand side mineralized horizon with black chert adjacent to the adit.
Right-hand side; 6-10 feet (2-3m) wide disseminated uraninite in sandstone in the hanging wall of the U-V mineralized horizon.





Photo 14. Photo of Big Sally leached limestone outcrop, the carbonate appears to have scavenged uranium resulting in a large U^2/Th ratio anomalism. The underlying sandstone below the limestone may be mineralized.





Photo 15. Carbon rich surficial coating was observed on sandstone; it appeared as a surficial coating and common in the southern map area of the Saltwash Member from the Loya Ray West area. The carbon lichen was a thrill to find; it made my day, a gift from mother nature.

elevation). The U-V horizon could be further modelled in 3D utilizing a digital terrain model to better define a potential channel for further U-V mineralization discovery via drilling. Identification of a basal channel within the upper sandstone unit of the Saltwash could provide further economic upside for U-V mineralization. The underlying sandstone units could also be tested for further U-V mineralized horizons.

The mapping observed U-V minerals included uraninite ±coffinite (to be tested), carnotite, green oxide vanadium and orange vanadium. Further testing for coffinite is required to confirm this mineral relative to uraninite.

Historical mining focused on the exposed uraninite horizon in the Salt Wash upper sandstone unit and given the tabular nature of these deposits, it is highly likely there is significantly more U-V mineralization extending laterally from the outcropping and historically mined ore horizons which are not exposed. The mineralized horizons have had limited drill testing given the strike length of exposures.

The uranium is high grade with rock chip samples returning >1% U3O8, the vanadium is also high grade, up to 6.72% V_2O_5 and TREO returned up to 439 ppm.

No modern exploration work had been conducted at East Canyon prior to the recent work with an airborne survey flown, mapping and drilling conducted by Minerals Exploration (formerly Uvre) from 2023 to 2025.

In consideration of the laterally extensive U-V horizon mapped along the stratigraphic sequence at 6,465 feet (1,970 m elevation) and the high grade U-V returned from surface rock chip laboratory analysis, there remains substantial pounds of mineralization at East Canyon. The vision for East Canyon and other Uravan deposits is to locally extract, locally transport and process U-(V) to create substantial carbon free energy. The energy could then be utilized by the States of Colorado and Utah for small scale uranium energy reactors to power growing cities such as Salt Lake City and Denver. When optimized, excess power could then be utilized to power digital server banks and assist the USA manufacturing industry by creating globally competitive energy. With globally competitive energy prices, local industries can expand and the states will attract industries seeking the global lower cost quartile pricing to come invest in USA.

Anyone interested in additional information regarding this project may contact Brett Mitchell at bmitchell@mineralsexploration.com.au.

For details on project mapping and technical information contact Regina Molloy at regina@nvresources.com

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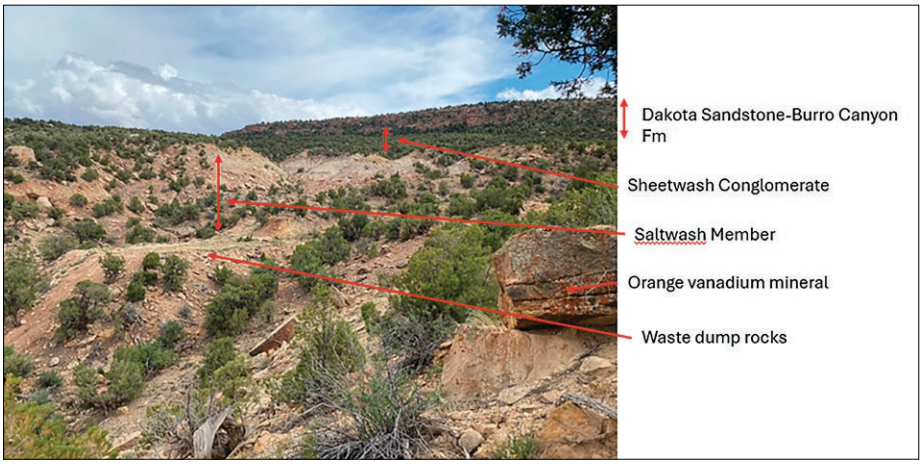


Photo 16. View of None Such with top of sequence Dakota Sandstone and Burro Canyon Formation with underlying Sheetwash Conglomerate and Saltwash Member. Waste dump rock shown and orange vanadium mineral.

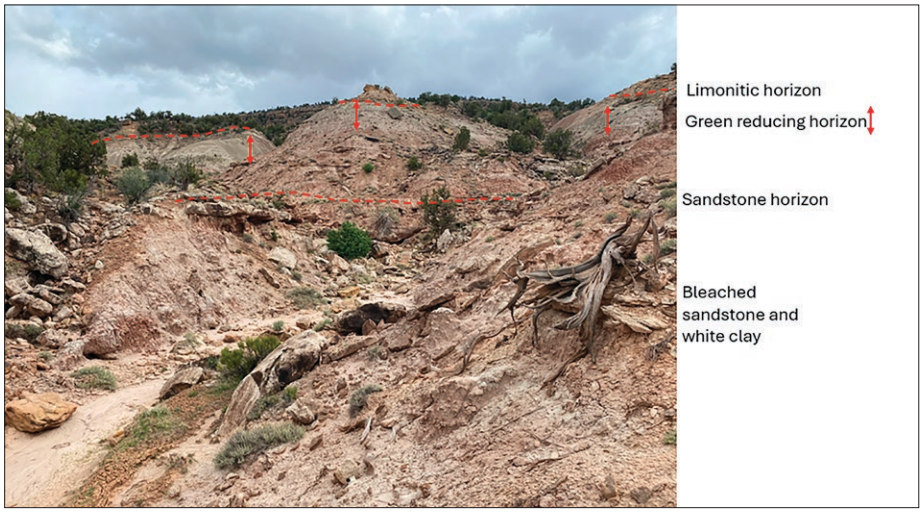


Photo 17. None Such West with limonitic hanging wall sandstone on hilltop above mineralized horizon, reduced white mineralized sandstone horizon and red bed footwall. The mine was bulldozed and ore appears to have been carved out of the escarpment.



Right: Photo 18. Black disseminated uraninite in oxidized sandstone west of Big Lead prospect.



Far Right: Photo 19. Black layer of uraninite-carnotite in sandstone at None Such deposit.



Photo 20. Historical mine stockpile of uraninite-carnotite in sandstone at None Such West.



Photo 21. Green vanadium at East Bonanza adit. Friable when touched, textures looked fibrous and looked like wood replacement.



Photo 22. Radiating calcite from Big Sally altered limestone outcrop.

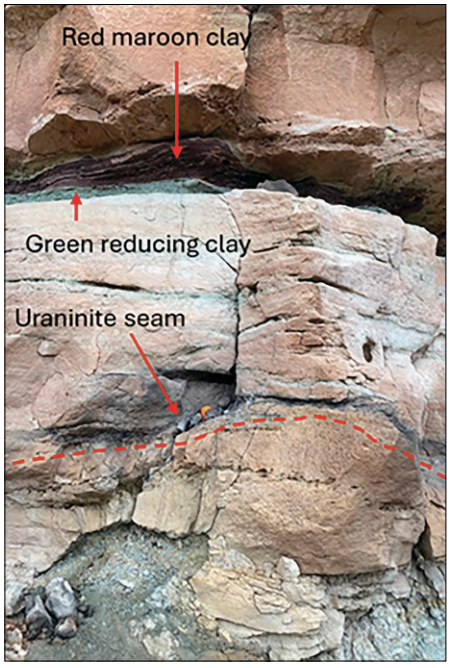


Photo 23. Mineralized horizon at Sue Mac Prospect with overlying uraninite sandstone and underlying thin green clay and thicker underlying oxidized maroon clay contact.



Photo 24. Close up view of the mineralized horizon at Balmia prospect with red oxidized maroon and green shale band, laminated with sandstone. A thin band of uraninite is located above the red broken line.

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Important News from the American Geosciences Institute

Doug Barlett, CPG-08433

Most AIPG members may not be aware that one of the benefits of AIPG membership is that you are affiliated with the American Geosciences Institute (AGI). As an AGI Member Society, AIPG has representation on the AGI Council, which advises the Institute. AIPG is a dues-paying member of AGI so I thought I would take a minute to reintroduce you to AGI. I am the current President-elect of AGI and am a past President and Treasurer of AIPG. Both organizations have greatly benefited my career and introduced me to exceptional geologists across the country, some of whom I have become close friends with over the years. Some questions you may have about AGI are listed below along with an answer.

What is AGI and when was it formed?

AGI was established in 1948 under a directive of the National Academy of Sciences to support the collaboration and common issues of geological societies and sciences. Today, AGI is a consortium of about 46 Member Societies involved in geoscience fields ranging from oil and gas development to engineering geology, mining support, geophysics, vertebrate paleontology, and geoscience education (and many others). AGI represents the interest of over 250,000 geoscientists and has a staff of about 50 principally based at their Alexandria, Virginia headquarters. Jon Arthur, a fellow AIPG member, is the executive director and the former state geologist of Florida. The institute has several departments including the Department of Geoscience Profession and Higher Education headed by Chris Keane, the Department of Education and Outreach headed by Ed Robeck; and the Department of Scholarly Information headed by Tia Colvin. Geoff Camphire heads the communications department which is responsible for maintaining the AGI website (https://www.americangeosciences.org) and creating news releases to various social media outlets.

What does AGI do?

AGI provides information services to its member societies, plays a role in strengthening geoscience education, and increases public awareness of the role of geoscience in society with regard to natural resources, geologic hazards, and the general health of the planet. AGI generates several key publications including:

- Critical Needs Document: a six-part series that applies geoscience to policy issues; targeted for legislatures and elected representatives.
  - https://www.criticalneeds.org/
- Glossary of Geology: a searchable glossary with nearly 58,000 terms.
  - https://information.americangeosciences.org/glossary [requires subscription]
- GeoRef Database: includes more than 4.8M references to published geoscience articles.
  - https://information.americangeosciences.org/georef/
- Workforce and economic data and reports.
  - https://profession.americangeosciences.org/research/data
- Earth Science Week educational packets for schools
  - https://www.earthsciweek.org/toolkit/
- Directory of Geoscience Departments: a Webapp
  - https://www.americangeosciences.org/products/dgd/

AGI manages the Geoscience Online Learning Initiative (GOLI), which is a collaborative effort with AIPG, ASBOG, and SEPM, that includes many online courses on various geoscience topics. Courses are tailored for specific audiences such as K-12, undergraduate, graduate, and professionals. Key topics include energy, raw materials, water, hazards, and ethics. Also included are courses on various skills needed by the geoscience professional. To view available courses, go to https://learning.americangeosciences.org/courses. AIPG not only has authored numerous GOLI courses but also provides CEUs for successful completion of most GOLI courses.

Jon Price, Former President of AGI and AIPG, had this to convey about the Critical Needs Document and Earth Science Week:

> *The AGI Critical Needs documents, developed as a consensus of our profession, highlight geoscience contributions to areas of interest to policy makers: economy, national security, public safety, infrastructure, innovation, and diplomacy. These are concise documents to give to policy makers and their staff. Earth Science Week, a national and global celebration of geological contributions to the public, was the brainchild of Susan Landon (1990 AIPG President & 1994 AGI President). In Nevada, we have led field trips for the public on one of the weekends of Earth Science Week, the second full week of October.*
>
> *Jon Price, CPG 7814*
>
> *Nevada State Geologist Emeritus, 1993-96 Member of the AGI 50th Anniversary Committee; 1997 AIPG President; 2016 Member of the AGI Working on Critical Needs; 2022-23 AGI President*

What benefits does AGI affiliation provide?

The geosciences cover a wide spectrum of topics. Most of us focus only on a narrow area and have little interaction with the myriad of other geoscience disciplines. AGI encompasses all

geoscience fields and facilitates its member societies to interact with other disciplines, share experiences and information, and learn how other societies address the issues involved in running a professional society in today's world. To promote this interaction, AGI hosts a Leadership Forum to convene leading organizations and allow them to share priorities, voice concerns, and strategize solutions to the issues facing geosciences organizations. In addition, AGI convenes a Geoscience Caucus on a regular basis in which topics of mutual interest are discussed. For example, the most recent three caucuses held in 2025 addressed the issue of Artificial Intelligence (AI) and reviewed its benefits and drawbacks and how to best implement AI in societies.

Ron Wallace, former Treasurer of AGI and Past President of AIPG and a recipient of numerous AIPG awards, provided the following paragraph regarding the AGI Leadership Forum:

> *The Leadership Forum is a great opportunity to hear from other professional societies that may be unfamiliar with most geologists. It is a great gathering to hear different views on current events and to collaborate with geologists in different fields of employment. New ideas are generated and even committees may be formed to tackle an issue. It builds trust between societies that all have common issues.*

AGI offers an opportunity for societies to nominate officers to lead AGI. AIPG has almost continuously had members participate as officers in AGI. Currently, AIPG is represented by myself, Matt Rhoades, Dawn Garcia, and Keri Nutter in board positions. Many past board members have originated from AIPG. Clearly, AIPG is a key contributor to AGI in many ways.

AGI programs serve the geosciences - whether in monitoring and developing the geoscience workforce across the discipline, supporting K-12 educators and the promotion of quality geoscience to students and the public, or the numerous pan-geoscience products that form cornerstones of the discipline, including the Glossary of Geology, the Geoscience Handbook, and GeoRef - the most comprehensive global bibliographic system of geoscience literature.

Does AGI offer awards to deserving geoscientists?

Absolutely! In cooperation with its member societies, AGI makes a number of awards each year. These include:

- Ian Campbell Medal for Superlative Service to the Geosciences; AGI's most distinguished award
- Marcus Milling Legendary Geoscientist Medal – for lifetime contribution of high-impact scientific achievement
- Edward C. Roy, Jr. Award: for excellence in K-8 Earth Science Teaching – this award includes a $2,500 prize
- William L. Fisher Congressional Geoscience Fellowship Award: Places a geoscientist to work within congress; a one-year fellowship carries a stipend of $78,000
- Public Understanding Award: for outstanding contributions to Public Understanding of the geosciences
- William B. Heroy, Jr. Award: For Distinguished Service to AGI
- Next Horizons Scholarship: for first-generation student geoscience scholarship; a one-time $5,000 award

AGI provides these awards at the annual meeting that occurs in conjunction with the Geological Society of America (GSA) conference held in the fall of each year. This year, the 2026 GSA conference is scheduled to be held in Denver from October 11-14.

If you know of someone who should be recognized by any of these awards, please visit AGI's website to get instructions on how to nominate a candidate. Also, if you or someone you know would be interested in becoming a member of the board for AGI, please let me know!

Finally, AGI is a great organization with a talented, dedicated staff that has your interests in mind. Please try to support AGI by letting us know if there are things you think AGI can do for the geoscience profession that it is not doing today. We greatly appreciate your insights and suggestions!

AIPG Member Photo Challenge

Challenge categories:

- **Off the Beaten Path - Unique feature/formation.**
- **The Best Part - Capturing the Spirit of the AIPG National Conference.**
- **My Favorite Outcrop or Rock, Fossil or Mineral Sample.**
- **Micro-Geology - Under the microscope.**

Entries must be original and taken by a member. Entry authorizes publication of the image in *The Professional Geologist* by AIPG with credit given to the photographer.

Awards:

First place in each category:

Image published on the cover of *TPG* in 2027. Winners will receive a personalized Estwing rock hammer engraved with their name and member number or AIPG Gear of choice up to $50.

Runners Up in each category:

Images will be published inside the *TPG*. Runners up will receive AIPG gear of choice up to $30.

Challenge Rules:

Image requirements: digital, 300 dpi, 8.5"x11," **portrait orientation** full color.
Members are allowed one entry per category with up to four submissions (one per category).
All images must be original and taken by the member.
Submit entries via email to aipg@aipg.org.
Entries must include:

- Name
- Member number
- Section
- Title of image
- Less than 200 word description of the image
- Names of any identifiable persons in the image and permission to publish their photo
- Year photo taken

Entry deadline: **November 1, 2026**.





The Geology of the Commons:

Balancing Education, Recreation, & Preservation

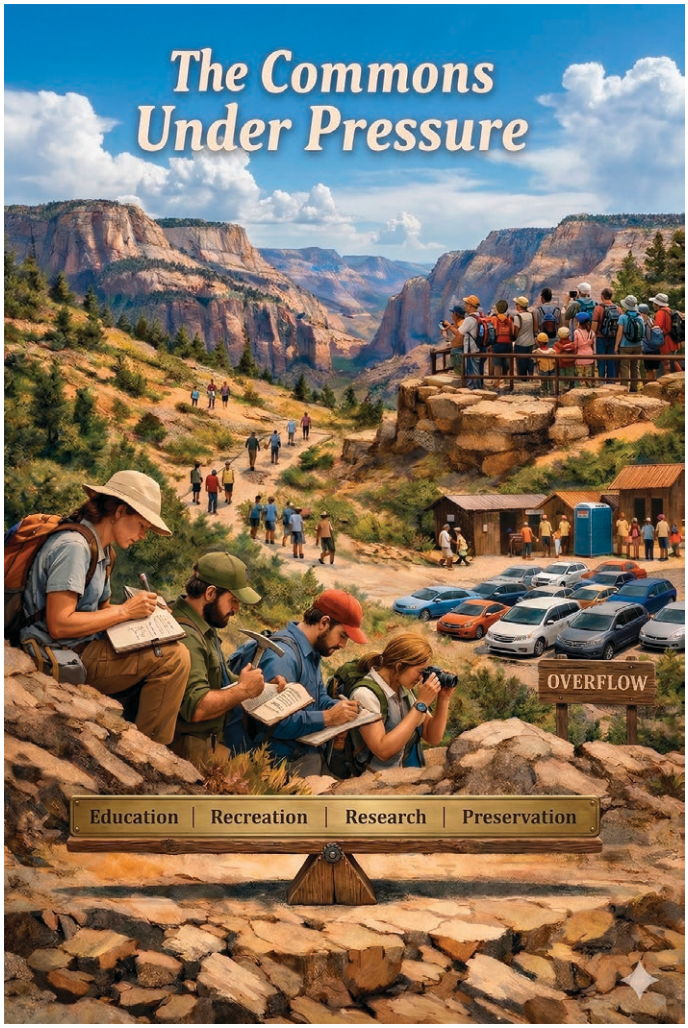
Aaron W. Johnson, CPG-12229
awj@aipg.org

On January 1, 2026, the National Park Service implemented a new "America First" fee structure, which significantly raised prices for non-residents who wish to purchase an annual pass to America's national parks. This new pricing system requires that non-residents pay a $250 fee for an annual parks pass, up significantly from the $80 assessed for the "America the Beautiful" pass, which was offered to residents and non-residents alike. In addition, for the 11 most visited parks (Acadia, Bryce Canyon, Everglades, Glacier, Grand Canyon, Grand Teton, Rocky Mountain, Sequoia, and Kings Canyon), non-residents will be charged an additional $100 per person fee for everyone aged 16 and over. This fee increase stems from an executive order that directed the Secretary of the interior to "[develop] a strategy to increase revenue and improve the recreational experience at national parks by appropriately increasing entrance fees and recreation pass fees for nonresidents in areas of the National Park System that charge entrance fees." The order directs that these fees be used to "to improve the infrastructure of, or otherwise enhance enjoyment of or access to, America's Federal recreational areas."

Regardless of your opinion regarding this change to the fee structure, the need to address overuse of our National Parks (and state parks) is an overarching concern for resource managers at the national, state, and even local levels. In his classic essay, "The Tragedy of the Commons" Garrett Hardin used the example of an unregulated pasture to illustrate that overuse of a common good (overgrazing a pasture) benefits the individual (the owner of the livestock) engaging in the use, but the degradation to that good (the overgrazed pasture) is shared by all who use the good. Hardin's thesis is being played out on public lands today.

In a 2021 article, Brennan Kaylor of Colorado State University noted that the paradox of the park system is that overuse often hinders preservation of the very features that bring visitors to our public lands. Kaylor pointed out Zion National Park in southern Utah as a prime example of the challenges between balancing recreational use of the park while minimizing ecological impacts and maintaining trails and other infrastructure. Of particular interest in Kaylor's article was the statement that "Zion struggles to dispose of human waste." Basic sanitation, which most Americans take for granted, is a daily battle in Zion with failures in sanitation threatening to contaminate delicate hydrologic systems in an area in which water is already scarce.

These threats to our public lands are particularly relevant to our profession. Many of us had our first true geological experiences on public lands. I went on a weekend field trip to the St. Francios Mountains in southeastern Missouri. Our stops included both state lands (Johnson's Shut-ins and Elephant Rocks State Parks and the Hughes Mountain Conservation Area) as well as federal land (Silvermines National Forest Service Campground). As with so many budding geologists, this field experience cemented my desire to become a geologist. Since then, I've been on geology field trips



across the United States, the vast majority of which depend on access to federal and state lands to help train the next generation of geoscientists.

Geology field camps, many of which take place in the mountain west where vegetation is scarce and exposures are more readily observed, also face challenges to access. One field camp director to whom I recently spoke and who asked to remain anonymous told me that they are facing restricted access to classic locations as local recreational groups utilize more of the public lands. This places educational uses of public lands at odds with recreational uses, set-

Continued on p. 42



Geology: The Science of Everything

Chuck Drake, CPG-11179
Chuck@Bio-Techconsulting.com

I hope that everyone has had a great start to 2026, professionally and personally!

I have been reading many LinkedIn posts discussing geoscience education, critical minerals, energy, etc., and I began developing some ideas for this President's Message, which then reminded me of a letter that our Executive Director Aaron Johnson wrote last year to the University of Nebraska at Lincoln, imploring them to not shutter their Earth and Atmospheric Sciences department. Unfortunately, the department was closed, which further emphasizes the need for improving our communication with grade schools, universities, and elected officials, not to mention the general public.

I don't know if it was closed due to fiscal constraints, but it was apparent that the importance of the geosciences in everything we do isn't understood or appreciated. Prior to Aaron writing the letter, it was discussed with the Executive Committee and Aaron was eloquent in describing what he would write in the letter about the contributions that the geosciences make to the world… everything we use in our day to day lives starts with geosciences and geoscientists… everything.

I excerpted two paragraphs from Aaron's letter:

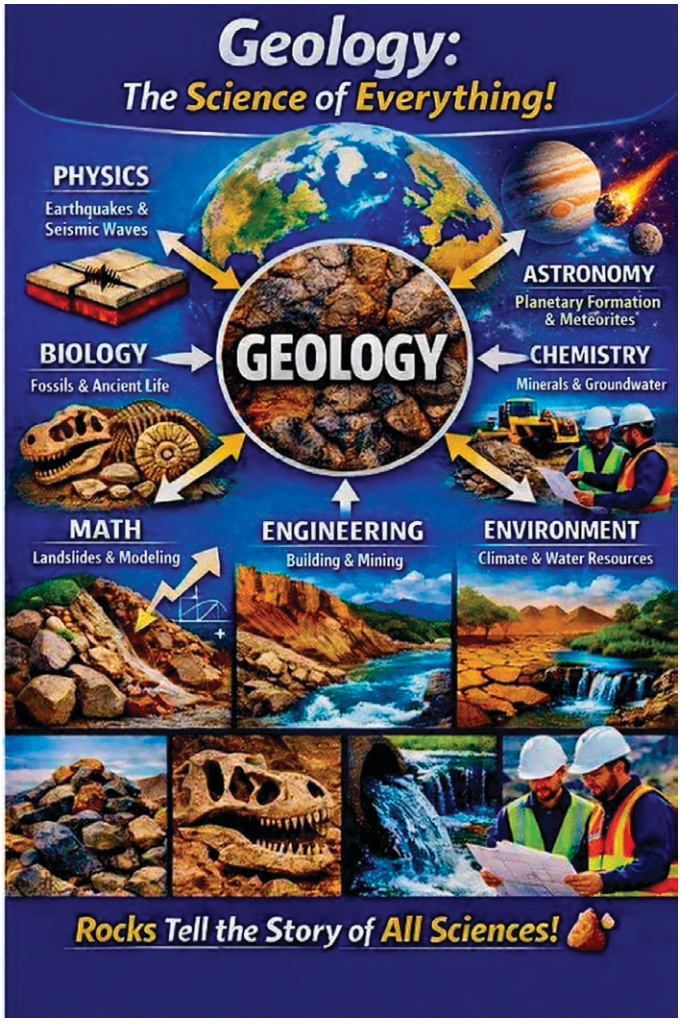
"Nebraska's recently identified and potentially world-class rare- earth mineral deposit south and east of Lincoln is a case in point: its evaluation and future development will require highly trained geoscientists intimately familiar with local stratigraphy, structural history, and mineral systems. …groundwater assessment, geologic mapping, and natural-resource management.

"The scientific discoveries emerging from geoscience—such as stable isotope geochemistry, sedimentological analysis, and hydroclimate modeling—feed directly into advancements in agriculture, water management, environmental remediation, and mineral exploration."

Aaron further references information from the American Geosciences Institute:

"The AGI projects a shortfall of 130,000 geoscientists by 2030, driven by retirement of the baby boomers and early Gen-X populations and declining enrollment in geoscience degree programs nationwide. The unemployment rate for geoscience degree holders stands at 1.4%, reflecting sustained and growing demand. Eliminating EAS would not only deepen this shortage but would constrain Nebraska's ability to meet its own workforce needs in groundwater protection, agriculture, environmental compliance, hazard mitigation, and mineral development."

I'm not using excerpts from Aaron's letter to cut down on content I need to write, although it does help! I'm using it because I was recently sent the "Geology: The Science of Everything" poster from a colleague and friend, which she came across on LinkedIn. I read the post from Akshay Raut, a hydrogeologist in India, and in his post he stated in a different way what Aaron had written. By the way, I invited Akshay to look into becoming an AIPG member!



After seeing the poster and reading Akshay's summary, I dug deeper into the information on LinkedIn from our fellow professionals on interesting projects, education, developments in the geosciences; all of these from those in consulting, those working in mining and minerals and education. The posts from each of these and many others sheds a lot of light, at least for me, on the depth and breadth of how the geosciences touches us.

The general public, especially those not involved with the water supply/ water treatment/ water utility business, have no idea what it takes to inexpensively deliver drinking water to their homes.

We as a profession, including engineers and water supply utilities, are doing a much better job of informing the public of the exploration for our water supplies and water resource development projects as they are designed and implemented. Public workshops, websites, LinkedIn, other social media are being used. These resources, along with the "Geology: The Science of Everything" must continue to be used every chance we get.

Contact your state representatives and senators, set up a meeting to introduce yourself and use the poster as an introduction and talking point!



Another effort to undertake is to give a presentation to your children's, or grand-children's, as the case may be, grade school or high school science classes. A few weeks ago, I gave a presentation to a class at the University of Florida Geological Sciences department, discussing the many career opportunities in the geosciences and the importance of obtaining licensure and becoming a member of the AIPG and ultimately getting the CPG credential. Both of those, I told them, will enhance their careers and expand their network of professional friends, many of whom will become personal friends.

Lastly, the satisfaction you get from showing the youngest generation the wonders of geosciences and the world around them is immense. Here are two photos of a demonstration of permeability to my grand-nieces' 4th grade class in Colorado using a core sample of limestone from Florida and a piece of basalt that I picked up out there. The look on their faces when the water went through and out of the limestone was priceless! It would be great if that presentation sparked something in even one or two of them to learn more about the geosciences.



The Executive Committee partners with many other geoscience organizations, and for many of them, education of elected officials and the general public is high on their list of duties. The AGI, led by Dr. Jon Arthur, is a wealth of information on virtually every aspect of the geosciences, so please take the opportunity to go to their website www.americangeosciences.org and explore their resources. The opening page grabbed my attention and is "Uniting the Geosciences."

Each of us has a responsibility to inform the public of our value to their everyday lives. Remember, we are the gold standard in our profession, and it is up to us to maintain that standard.

Executive Director's Message, Continued from p. 40

ting up conflict between local groups and educational institutions, some of which have been returning to these classic localities for a half-century or longer. However, the camps themselves also have a large impact on these public lands. Imagine 45 students and faculty, each with a rock hammer, sample bags, and a hand lens, collecting samples and mapping their field area. The impacts are large, with some camps utilizing upwards of a dozen individual mapping areas for a five-week camp, so that each area is only utilized once every two or three years. Having taught field camp for nearly a decade earlier in my career, I can attest to the impact of a 45-person field camp on a field mapping area. After a four-day mapping project, splintered rocks abound and trampled vegetation is all too common.

Unfortunately, there is no easy solution. Will increased fees decrease visitation and stress on public lands? The short answer is ultimately yes. However, it remains to be seen if the increase put into place on January 1 will have a significant impact on visitor numbers. The National Park Service may well find that the $250 fee is too low. Ultimately, it is up to us (citizens, scientists, decision-makers, resource managers) to determine where the balance lies between using the commons and preserving it for others. Educational, recreational, research, and, in the case of BLM land commercial uses, will continue to compete for use of our public lands. As geologists, it is tempting to fall into the arrogance of geologic time, where we note that Earth has existed for 4.6 billion years and will continue to exist long after our petty squabbles over public lands have ceased. I would argue that we should steer far clear of that argument and instead focus on using our knowledge and training to inform decision-makers, citizens, and corporations of the often delicate geological heritage of these spaces. What an irony it would be if by choosing to invoke the geological time argument, we were to lose access to the very sites that are critical for training the next generation of geologists.

With warmest wishes for spring,

Aaron W. Johnson, CPG-12229

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Kaylor, B., 2021, Overuse in National Parks: Fewer Visitors or More Parks, Colorado State University Public and Environmental History Center, Online, https://pehc.colostate.edu/2021/09/overuse-in-national-parks-fewer-visitors-or-more-parks/.

Presidential Executive Order 14314, 2025, Making America Beautiful Again by Improving our National Parks, available at: https://www.whitehouse.gov/presidential-actions/2025/07/making-america-beautiful-again-by-improving-our-national-parks/.



Degrees of Separation in a Small Profession

Skylar Vertes, ECP-1122

Over the past few years working alongside geoscientists and technical teams, I've spent a lot of time thinking about what it truly means to build a sustainable and fulfilling career in this profession. Early career geoscientists today are balancing on the job learning, licensure paths, evolving expectations, and challenge of establishing themselves in a field that is both rigorous and deeply impactful.

What became clear to me fairly quickly is how interconnected the geoscience community is. From the outside it can look like a large and scattered profession, but once you begin working within it and alongside it, the network starts to feel much smaller and more connected.

When I first started working on projects involving geoscience teams, I expected the industry to be difficult to navigate. Instead, I repeatedly encountered shared professional contacts and overlapping networks, with individuals on one project having previously worked with colleagues from another. Conversations often revealed mutual colleagues, shared academic ties, or prior project connections. Seeing that pattern repeat over time changed how I understood the professional landscape.

In geoscience, degrees of separation are often just one or two.

Geoscience is not just technical work. It is also a relationship driven professional community built on trust and shared responsibility. The work geoscientists do informs decisions that affect infrastructure, resources, communities, and the environment, and that level of responsibility naturally creates strong professional ties.

Why Degrees of Separation Matter

For early career professionals, whether they are geologists, scientists, engineers, or working in supporting technical roles, it is easy to feel like they are figuring everything out alone. Recognizing how connected this profession is can shift that experience in a meaningful way.

Mentorship is often closer than it appears. Much of the most useful guidance shared with early career professionals happens through informal conversations and introductions. Someone takes the time to explain how they approached a decision, how they communicated uncertainty, or how they handled an early mistake. Those conversations often shape professional judgment far more than formal training sessions.

Connection also reinforces accountability and professionalism. In a closely connected professional community, how you communicate, collaborate, and follow through matters. Reputations are built over time through reliability, integrity, and respect for both the science and the people involved in the work.

Career paths are also more flexible than many people expect at the beginning. The distance between consulting, mining, environmental work, engineering, research, and regulatory roles is often smaller than it looks. Shared networks and shared professional standards make it easier for people to move between specialties while remaining connected to the broader geoscience community.

Perhaps most importantly, understanding these connections helps replace isolation with a sense of belonging.

Where AIPG Fits In

AIPG plays an important role in strengthening and formalizing these professional connections. Through chapters, publications, events, and ethical standards, the Institute brings together geoscientists across specialties and across career stages.

From my perspective, AIPG gives structure to the connectivity that already exists within the geoscience profession. It creates a place where early career professionals can engage, learn, and build relationships intentionally rather than by chance.

What This Means for Early Career Professionals

Early career professionals across geoscience and related technical fields are already contributing to meaningful work while still developing confidence, communication skills, and professional judgment.

My focus in the ECP role is to help strengthen the connections that support that growth. That includes encouraging approachable mentorship, supporting honest conversations about career development, helping students and early career professionals feel welcomed, and making sure early career perspectives are part of the conversation within AIPG.

Looking Ahead

Working alongside geoscientists has shown me how generous this professional community can be with knowledge, perspective, and support. Many people take time to guide newer professionals without realizing how much impact those conversations have.

If you are early in your career, I would encourage you to reach out. Talk with a coworker about how they built their path. Connect with someone through your AIPG chapter. Ask questions, follow up, and stay engaged. Most people in this profession are more willing to share their experience than you might expect.

Geoscience is ultimately a collaborative profession. When its natural connectivity is recognized and supported, it becomes one of its greatest strengths for the next generation.

Answers on Page 47



Robert G. Font, CPG-03953
robertfontphd@gmail.com

1. Volcanism associated with the Lesser Antilles began about this time in the geologic record:



a) The Cambrian Period.
b) The Kimmeridgian Age of the Late Jurassic Epoch.
c) The Paleozoic Era.
d) The Eocene Epoch.
e) Graduate from D.U.M.B. University with a PhDUD and NAVEL prize winner in science conclusively states: "The term 'Lesser Antilles' refer to little Caribbean ants. Volcanic activity perturbs and irritates these little ants, making them very aggressive. Little and big ants appeared in the geologic record at about the same time mortifying terrigenous trilobites, aquatic rodents…"

2. "When the "water plasticity ratio" is greater than 1, we may say that:



"It is important to note that if the "water plasticity ratio" is greater than one, it is also greater than zero!"

a) The soil or sediment is within the plastic range.
b) The soil or sediment is in a liquid state.
c) The soil or sediment is below sea level.
d) The soil or sediment can be classified in the Unified Soil Classification System as an "ML."
e) Deep thinker, genius engineering geologist states: "It is important to note that if the 'water-plasticity' is greater than one, it is also greater than zero!"

3. In geoscience, the term "albedo" refers to:
a) A subsurface soil horizon where clay and iron oxides have been removed so that its color is determined by the sand and silt particles and not by their coatings.
b) Porphyritic igneous rocks consisting of phenocrysts of albite in a groundmass of mainly albite, where muscovite, garnet, quartz, and apatite occur as secondary minerals.
c) The youngest Epoch of the Permian Period.
d) The fraction of light that is reflected by a body or surface.
e) The nickname of an Italian albino dude named Edoardo.

4. This gemstone has a hardness of 6.5 to 7.5 with the chemical formula $Ca_3Al_2(SiO_4)_3$:
a) Topaz.
b) Peridot.
c) Grossular garnet.
d) Zircon.
e) It doesn't matter, dude. For me is diamond or nothing! And I'm broke! Can't buy diddly squats!

5. This geologist was the first to publish quantitative analysis of pollen and is considered as one of the founders of palynology.
a) Christian Gottfried Ehrenberg.
b) Carl von Linné (Carl Linnaeus).
c) Mary Anning.
d) Ernst Jakob Lennart von Post.
e) Edwin Donald Snider.



Topical Index-Table of Contents to the Professional Ethics and Practices Columns

A topically based Index-Table of Contents, "pe&p index.xls" covering columns, articles, and letters to the editor that have been referred to in the PE&P columns in Excel format is on the AIPG web site in the Ethics section. This Index-Table of Contents is updated as each issue of the TPG is published. You can use it to find those items addressing a particular area of concern. Suggestions for improvements should be sent to David Abbott, dmageol@msn.com

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LA Abrasion versus Micro-Deval testing for aggregates

In my presentation, *Towards the resolution of geoscientific issues or problems* at the 2025 AIPG Annual Meeting, I illustrated a problem in quality assurance/quality control programs between the results of using the LA Abrasion compared with the Micro-Deval methods for testing aggregate degradation. I stated that the Micro-Deval method provided a more accurate test than the LA Abrasion method and that the repeatability of the LA Abrasion tests was a problem. I based this observation on my paper, *Assuring the reliability of your sampling results* (*TPG*, Nov/Dec 2007, p. 33-38). Following my presentation, **Stephen Stokowski**, CPG-6607, commented that the LA Abrasion Test, when properly conducted remained a valid and important method for testing aggregate. Stokowski's comment prompted me to investigate more recent papers on the topic. A 2024 paper, *Improving aggregate abrasion resistance prediction via Micro-Deval test using ensemble machine learning techniques,*[1] states, "The Micro-Deval abrasion test (MD) is one of the most important tests that provides characteristics of crushed aggregates that show their resistance against mechanical abrasive factors such as repeated impact loading." The article describes various machine learning (ML) methods to predict MD abrasion values. The article also suggests that using multiple test methods "could yield a more dependable assessment of aggregate durability." **W.H. "Bill" Langer**, CPG-11528, the aggregate expert for the USGS for many years, has noted that the various aggregate testing procedures "do not always ensure that the aggregate will perform well in service. The influence of geologic factors on rock properties and their suitability for use as aggregate has been recognized, but geologic factors have not received the same emphasis in the literature as engineering aspects."[2] Langer's paper describes the mineralogic, petrologic, weathering and alteration, and other geologic factors that affect the performance of a particular rock for aggregate. "Petrographic examination of the rocks to be used as aggregate can yield important information about the type, size, shape, and proportions of mineral grains, their interlocking nature, and the amount and interconnectedness of pores and fractures in the rocks. Knowledge of these characteristics and how they interact is critical in determining the suitability of any material for use as aggregate."

Sustainability and resource extraction—a geoethical dilemma

According to a Copilot search, sustainability means:

- The ability to be maintained at a certain rate or level.
- Avoidance of the depletion of natural resources in order to maintain an ecological balance.

The Oxford Dictionary of English (2010) defines sustainability as: "the property of being environmentally sustainable; the degree to which a process or enterprise is able to be maintained or continued while avoiding the long-term depletion of natural resources." "Avoidance of the depletion of natural resources" is a key part of these definitions and is part of achieving a long-term geoethical goal of allowing future generations' access to those resources.[3] The fundamental problem is that individual natural resources occurrences or deposits are finite in size. Extraction thereof makes them depletable. Recycling of already extracted natural resources is desirable but does not provide enough mineral products for current or future demands.

For example, both the demand for the increased number and sizes of AI data centers and electric vehicles requires an increased demand for copper that exceeds the production capacity of current copper mines. According to a Forbes article, A conventional data center uses between 5,000 and 15,000 tons of copper. A *hyperscale* data center, on the other hand—the kind being built to run artificial intelligence (AI) data centers—can require up to *50,000 tons of copper per facility*, according to the Copper Development Association.[4]

The amount of copper in standard cars and EVs varies significantly:

- Standard Internal Combustion Engine (ICE) Cars: Typically use 20-49 kg of copper.
- Hybrid Electric Vehicles (HEVs): Require about 40 kg of copper.
- Plug-in Hybrid Electric Vehicles (PHEVs): Use around 60 kg of copper.

1. Alireza Roshan & Magdy Abdelrahman, *Engineering Journal*. V. 28, I 3, DOI:10:4146/ej.2024.28.3.15. The authors are both at the Missouri University of Science and Technology, Rolla, MO.
2. Langer, W.H., 2001, Geological considerations affecting aggregate specifications *in* Proceedings, 9th Annual Symposium, International Center for Aggregates Research: International Center for Aggregates Research, Austin, Texas, 16 p.
3. IAPG Cape Town Statement on Geoethics, 2016, http://www.geoethics.org/ctsg.
4. www.forbes.com/sites/greatspeculations/2025/12/08/data-centers-could-gobble-half-a-million-tons-of-copper-a-year-by-2030/.

> *How these societal demands for natural resources are squared with sustainability demands will continue to be a great dilemma and a professional ethical conundrum.*

- Battery Electric Vehicles (BEVs): Can require up to 83 kg of copper.
- Fully Electric Cars: Often use as much as 80 kg of copper.

In summary, EVs generally use more copper than traditional gasoline-powered vehicles, with BEVs having the highest copper content.[5] Where is the needed copper going to come from? New mines.

Turning to another mineral product, aggregate production represents the largest mined mineral product in the US. Aggregate is used for roads, road base, concrete, asphalt, decorative stone, etc. Every town and county has aggregate pits. The USGS reported that total 2024 US aggregate production as 2.38 billion tonnes (crushed stone 1.55 billion tonnes and sand and gravel 900 million tonnes)[6, 7]. Given the estimated US population in 2024 of 340.1 million people,[8] this equals 7 tonnes or 7.7 short tons per person per year for the 2024 estimates—this amount varies between years depending on various economic factors. In the Denver area, the amount of aggregate use has been as high as 9 tonnes (10 short tons) per year.

The identification and delineation of natural resources deposits have been a major employer of geoscientists over the decades and will continue to be in the future, although the quantity of a particular mineral resource will vary, a fact with which mining geologists are very familiar. Finding economically viable rare earth mineral deposits are currently a hot commodity. Ever since the beginning of the industrial revolution in the early nineteenth century, society's demand for ever increasing amounts and varieties of natural resources has steadily increased. Even if we stop using oil, natural gas, and coal for fuel, we will still need to extract some of these mineral resources because they are important chemical feedstocks. How these societal demands for natural resources are squared with sustainability demands will continue to be a great dilemma and a professional ethical conundrum. The existence of this geoethical conundrum should not be ignored and should be discussed with geoscience students if we are to be ethically honest.

Carnal embraces between professors and students

Carnal embraces are among the romantically related activities falling within the generally agreed-on rule proscribing this and related activities between professors and students.[9] The question is, is/are there (a) generally recognized exceptions to this rule? I would like to receive your emailed responses to this question, which will be addressed in the next *TPG*. Please consider your response and write me.

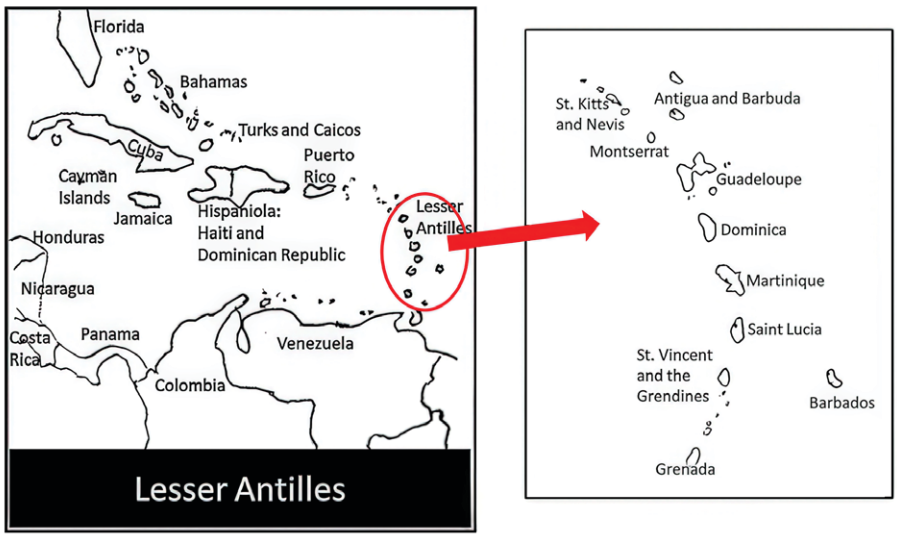
5. https://carsbibles.com/how-much-copper-is-in-an-electric-car/.
6. www.usgs.gov/centers/national-minerals-information-center/natural-aggregates-statistics-and-information.
7. I always use "tonnes" for "metric tons" to make the units clear.
8. www.census.gov/library/stories/2024/12/population-estimates.html.
9. The first line in Tom Stoppard's *Arcadia* (1993) "What is a carnal embrace?" is asked by a 13-year-old heiress of her tutor in 1809 at an English country house. She has heard the term used by servants gossiping about what they saw outside the house. The tutor doesn't really want to provide the correct answer and instead observes that the heiress was to be studying Fermat's last theorem (there is not a solution to $a^x + b^x = c^x$ where x is a whole number greater than 2). *Arcadia* continues with exploration of the space-time continuum and other topics and is very much worth reading.



Answers:

1. The answer is choice "d" or "The Eocene Epoch." The Lesser Antilles are found along the eastern boundary of the Caribbean Tectonic Plate, a convergent boundary with related subduction and volcanism. The sequence of events in the historical geology of the Caribbean region is summarized below, as adapted from Sealey (1992; Caribbean World, A Complete Geography).

Geologic Time Unit	Geological Events
Pleistocene to Holocene	The islands of the Bahamas were formed, while Barbados and the limestone bank islands took their current configuration.
Pliocene	The margins of the Caribbean Plate were underthrusted and uplifted. The western leeward islands of the Lesser Antilles were formed via volcanism.
Miocene	Jamaica and Trinidad rose above sea level.
Oligocene	The Bahamas, Belize, and much of the Greater Antilles became shallow-water banks fringed by coral reefs.
Eocene	Subduction and its related volcanism came to an end in the Greater Antilles and began along the western belt of the Lesser Antilles and Windward islands. Jamaica was submerged.
Paleocene	The Caribbean Plate started to move eastward resulting in orogenic activity in the Greater Antilles, Trinidad, and Venezuela.
Cretaceous	The Caribbean Plate broke away from the Pacific Plate. The islands of the Greater Antilles formed as a volcanic chain resulting from lithospheric subduction.



2. The answer is choice "b" or "The soil or sediment is in a liquid state." The water plasticity ratio is also known as the liquidity index (LI), where:

$LI = (W_n - PL) / (LL - PL)$ (1)

$LI = (W_n - PL) / PI$ (2)

In equations (1) and (2):

- W_n = natural water content
- LL = liquid limit
- PL = plastic limit
- PI = plasticity index

Thus, if LI > 1 then, W_n > LL and the soil or sediment is in a liquid state and behaves as a liquid.

Choice "a" does not apply here. Soils with LI > 1 can found above sea level, so choice "c" is not our answer. In choice "d" the "ML" classification defines a silt of low compressibility.

3. The answer is choice “d” or “The fraction of light that is reflected by a body or surface.” The Earth’s albedo is about 31%, signifying that about one-third of the solar energy that gets to Earth is reflected out to space.

   Choice “a” is known as an “albic horizon.” Choice “b” describes “albitite.” Choice “c” is the Lopingian Epoch (~260 to 251 Mya).



Grossular garnet
$Ca_3Al_2(SiO_4)_3$

4. The answer is “c” or “Grossular garnet.”

Topaz has a hardness of 8 and a chemical composition described by the formula $Al_2(SiO_4)(OH,F)_2$. Peridot is olivine with a hardness of 6.5 to 7.5 and formula $(Mg,Fe)_2SiO_4$. Zircon has a hardness of 6.5 to 7.5 and formula $ZrSiO_4$.

5. The answer is choice “d” or “Ernst Jakob Lennart von Post.” Ernst Jakob Lennart von Post (1884-1951) was a Swedish naturalist and geologist and a founder of palynology.

Christian Gottfried Ehrenberg (1795-1876) was a German naturalist, geologist, anatomist, and microscopist. He is considered to be the founder of micropaleontology.

Carl von Linné (1707-1778), also known as or Carl Linnaeus, was a Swedish botanist, zoologist, physician, and taxonomist who formalized binomial nomenclature and is known as the father of modern taxonomy.

Mary Anning (1799-1847) was an English paleontologist and fossil collector who became world renowned for the discoveries that she made in Jurassic marine fossil beds in the cliffs along the English Channel in southwest England. She recovered the remains of *ichthyosaur* and *plesiosaur*, as well as the first *pterosaur* ever found outside of Germany. By the time that she died in 1847, Anning had received a lifetime annuity from the British Association for the Advancement of Science.



Edwin Donald Snider, or Duke Snider (1926-2011) was not a geoscientist, but an outstanding baseball player. The “Silver Fox” played outfield, mainly for the Brooklyn/LA Dodgers, with a lifetime batting average of 295 and 407 home runs.



Here comes AOM
(Anaerobic Oxidation of Methane)

Terry Gulliver, CPG-06569

Here is a tale of a biogeochemical phenomenon in five parts. It is posed in a classic problem in Texas salt dome origins (1), resolved by German geologists commandeering a Russian submersible (2), the solution being used to elucidate a deep groundwater puzzle in Colorado oil shale (3), and to edit a Wikipedia article about coal balls (4); but it is still not fully grasped by a 2025 USGS paper on uranium bearing collapse breccia pipes (5).

The problem (1)

Extensive description of salt domes in the Texas Gulf coast by Posey and Kyle (1987-1988) describes salt diapirs having risen thousands of feet through unconsolidated sediments, with anhydrite and calcite caps, native sulfur bodies on the flanks, and some metal sulfides beneath. Sulfur was mined for decades by the Frasch process, gas has been recovered in sands tilted by the diapirs, and the sulfides have been of interest. Posey and Kyle concluded, in agreement with earlier authors, that hydrocarbons including methane and some metals expelled by sediment compaction and rising along the edges of the diapirs meet sulfate from the salt, and seem somehow to react to form cap carbonate, sulfur and deeper sulfides. A problem was that the apparent reaction energies were so low that the mechanisms seemed infeasible, and similar looking $\{CH_4 + SO_4^- => HCO_3^- + HS^- + H_2O\}$ suspects in various environments which were obviously redox processes could not be spoken as such. A mumble ("somehow") stood in for a catalyst. Even though some previous authors such as Reesburg et al (1982) had strongly implied such was occurring as methane was disappearing from deep sea sediments.

Some of those other environments were anaerobic playa sediments with algal content, and oceanic trenches with evaporites and organic detritus and gases, some from smoker vents, and coal seams disappearing into a stratum of calcareous concretions or "coal balls" (miner surprise!).

The Eureka (2)

It was once thought that the Black Sea basin had been below the sea level of the Aegean Sea, and that a breakthrough in the Bosporus sometime between 10,000 and 5,000 BCE would have been a deluge and possible origin of the Great Flood myth. Archeologists scouring the now-flooded offshore of the Black Sea for signs of habitation did not find unambiguous evidence for that, but did find methane vents and carbonate mats, in anoxic zones. A German-Russian-Ukrainian mission with a manned Russian submersible explored the vents, documented carbonate spires growing on vents in a "microbial reef" and recovered samples which were cultured in a lab and shown to exhibit sulfate-methane metabolism by cooperative methanotrophic Archaea and sulfate reducing bacteria (Michaelis et al, 2002). Those microbes were the "somehow" catalyst. The process has since been typically referred to as AOM, for anaerobic oxidation of methane (although it also is used for nitrate and metal reduction in more limited situations).

One of the findings of the Hamburg investigators was that isotopes of S and C showed some fractionation in AOM, microbes having a slight "preference" for lighter isotopes, so that carbonate precipitates had lighter (smaller C^{13}/C^{12}) ratios than source methane, and sulfides had lighter S than the salt sulphate. This is now an AOM routine diagnostic.

Kyle, one of the authors describing Texas salt domes before the recognition of AOM viability cowrote a paper in 2019 acknowledging it as the key dynamic in production of carbonate caps. The abstract reads:

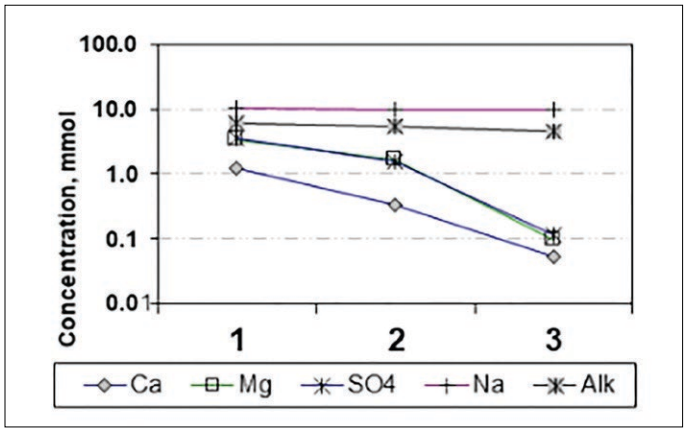
> *Major hydrocarbon accumulations occur in traps associated with salt domes. Whereas some of these hydrocarbons remain to be extracted for economic use, significant amounts have degraded in the subsurface, yielding mineral precipitates as byproducts. Salt domes of the Gulf of Mexico Basin typically exhibit extensive deposits of carbonate that form as cap rock atop salt structures. Despite previous efforts to model cap rock formation, the details of subsurface reactions (including the role of microorganisms) remain largely unknown. Here we show that cap rock mineral precipitation occurred via closed-system sulfate reduction, as indicated by new sulfur isotope data. 13C-depleted carbonate carbon isotope compositions and low clumped isotope-derived carbonate formation temperatures indicate that microbial, sulfate-dependent, anaerobic oxidation of methane (AOM) contributed to carbonate formation. These findings suggest that AOM serves as an unrecognized methane sink that reduces methane emissions in salt dome settings, perhaps associated with an extensive, deep subsurface biosphere.*

AOM in Colorado oil shale (3)

In the early 2000s, I was working with a contractor for Shell on its oil shale property in Colorado's Piceance Basin. We performed fairly sophisticated testing of low permeabilities and water chemistry, the latter including major ions, trace elements, and stable isotopes of H, O, C and S. Drillers had encountered pockets of hydrogen sulfide in some more permeable horizons (as had been reported in the past), indicating reducing conditions. What we found in a roughly 5-mile square was a plume of dissolved methane and hydrogen sulfide, with clear concentration gradients in those gases, in carbonates, and in some trace elements. This plume appeared to originate from a set of normal faults which we called the "C-a faults", since they were on the former federal oil shale lease tract C-a.

What we found was that methane concentrations decreased down the regional groundwater flowpath, along with Ca, Mg, sulfate, and total dissolved solids, as shown below. The X-axis represents three wells, each roughly a mile apart, in roughly the direction of the hydraulic gradient in the one of the silty, low-kerogen water bearing intervals. Sodium concentrations are steady, showing no dilution by dispersion or reaction, while calcium and magnesium

decrease along with sulfate. The C-a faults would be located near the left axis in this schematic.



This data pattern is duplicated over 21 monitoring well clusters installed by Shell in the 2000s and completed in seven water bearing intervals, and a dozen older wells in the area. What might have seemed to be a plume emanating from the former C-a in situ pyrolysis testing (~ early 1980s) was puzzling and potentially a liability. When I discovered the article in Science magazine describing the Black Sea AOM in seafloor carbonates and confirmed in the laboratory, a light went on. A whole lot of spreadsheet exploration of a great deal of water quality data, buttressed by some stable isotope analyses, showed that, indeed, sulfate was being consumed along the groundwater flowpath and Ca and Mg carbonates were being precipitated. Methane tends to off-gas (effervesce) from samples collected at surface and meaningful analyses for it would have required flasks sealed at depth.

When I presented this data to the client water chemist Dr. Posey, he was dubious, even after having shared the Science paper. Then I discovered that he was an author of many of the 1980s papers on Texas salt domes, wherein sulfate reduction of methane was the unmentionable, infeasible key to metal sulfides, native sulfur and calcite-anhydrite caps on flanks and caps of those salt domes. Here Sir are your catalysts! Bugs!

Two interesting codas on the oil shale: Firstly, the water bearing intervals, siltier horizons without kerogen, and with permeabilities on the order of one millidarcy, and minute pore throat size, could not transmit microbes, so the AOM bugs likely were there at the time of deposition (Eocene, ~ 49 ma). Mind boggling.

Second coda: In 1973 the Atomic Energy Commission and Continental Oil (now Conoco) detonated a string of three nuclear devices at a depth of 5,480 – 6,690 feet, in the Fort Union – Mesaverde Formations, to see if it could liberate gas from tight sands. The Rio Blanco project was part of Operation Ploughshare, an Eisenhower era gesture to "turn swords into ploughshares". The location of this was about four miles east of the future C-a tract. Could this have jiggled the area enough to open the C-a faults and make a methane pathway from the deeper oil shale? A groundwater solute travel time from C-a faults to the 2003 tip of the plume we described, is about four miles, in a horizon with gradient approximately 0.03, and porosity 0.1, would require a hydraulic conductivity of ~ 0.6 ft/day, or 2 millidarcy (K = v.n/i), close enough to not refute this possibility. A friend who stopped on the side of the road near Parachute, 30 miles from the blast, to see if he could feel the expected earthquake, said he had not felt a thing, but he noticed his car was bouncing up and down on its springs. The result of the test was vitrified cavity walls and radioactive gas (who would have guessed!).

A profusion of literature on AOM in varied niches began after the 2002 Michaelis et al Science article. ChatGPT is ahead of Wikipedia:

> *"AOM is a global process that occurs in a wide range of anoxic environments, including seafloor methane seeps, coastal wetlands, freshwater lakes, landfills, and even deep-sea hydrothermal vents."* November 2025.

I co-authored a paper on the Shell project groundwater quality for an Oil Shale Symposium. When the Cloud lost a lot of my files, I went to the Colorado School of Mines library to find a copy and found the Oil Shale Symposia Proceedings had been taken off the shelves. Retired!

Coal balls (4)

I was a little obsessed with AOM. An article about coal balls took my attention, and when I heard about a longwall in an eastern coal mine having its seam disappear into a field of calcite concretions, I said, I know how that could happen: invasion of seawater with sulfate of a shallow peat deposit in a rising sea margin would allow sulfate + humic acids and methane = AOM calcite + sulfide. And in Wikipedia the Coal Balls entry needed some tactful editing regarding mechanisms in the new literature, by me and others subsequently. However, the owner of the article is a Victorian-museum-oddities-showcase sort of person, who deleted all those edits, so that what remains is *"...peat was prevented from being turned into coal by the high amount of calcite surrounding the peat; the calcite caused it to be turned into stone instead*." And, "*...drift theory holds that the organic material did not form in or near its present location. Rather, it asserts that the material that would become a coal ball was transported from another location by means of a flood or a storm.*"

Oddly, when I was once a geology department curator, I cut a spherical calcite concretion on a diamond saw and polished the surface to show the layering and radial veining for display in a showcase of local oddities in a small-town museum. No coal nearby: not all spherical concretions are coal balls. But Wikipedia now has (November 2025) under Concretions, "…carbonate concretions, which form in response to the reduction of sulfates by bacteria…".

Breccia pipes (5)

In 2025 the USGS published Van Gosen et al on solution collapse breccia pipes mineralized by uranium and various metal sulfides in the Grand Canyon area. These have been known and mined for a long time, the most famous mine perhaps being the Orphan, just below the visitors' center on the South Rim. The pipes originated in the karstic Redwall Limestone and reached up to the present surface by stoping as overlying strata were deposited. Many pipes are mineralized in the Hermit Shale interval. Van Gosen et al describe the pipes and mineralization, and propose that the sulfide-S originated as sulfate from near surface evaporites, and suggest the reduction might have been due to "BSR" (biological sulfate reduction), but do not venture what might have been the oxidation part of this redox. Redox is a 2-part electron shuffle, it must have a donor (reductant) and acceptor (oxidant, here SO_4). To not even speculate on the reductant is like stepping around AOM before it was acceptable.

Does the Hermit Shale have pyrite and organic matter where it is not weathered, that might have allowed Fe(II-III) and hydrocarbons to form a reducing fringe on the pipe walls in the Hermit? And would such a precursor promote an AOM zone when methane began to off-gas from minor coals in the Surprise Canyon Formation directly above the Redwall under increasing overburden? Van Gosen et al state that mineralization happened in two phases: one precipitating carbonates and metal sulfides, and the later uranyl U coming around and between those. Wild speculation by me with AOM

colored glasses, in the gaps. But one cannot have *red-* without the *-ox. If you grab a hot wire (electron donor) and become an electron acceptor (oxidizer) you may be somewhat reduced*, a high school chemistry teacher said, somewhere back in the days of JFK. No acceptor, no reaction boys.

A thing about methane is, it is not ubiquitous, but it pops up wherever organic material degrades (by methanogens or thermal cracking) and persists where there are no electron acceptors such as oxygen, or nitrates, iron or other oxidized metals. Or sulfate, which is everywhere in oceans and evaporites, and places where sulfides are exposed to air. Where they come together and a community of methanotrophs and sulfate reducers can hang out, despite the miniscule energy they get from it, AOM can happen. People estimate most (>80%?) methane rising from sea floors nowadays does not reach the surface. And it has been suggested that AOM was implicated in Paleozoic iron formations. Not quite everywhere then, and only for half the age of the planet.

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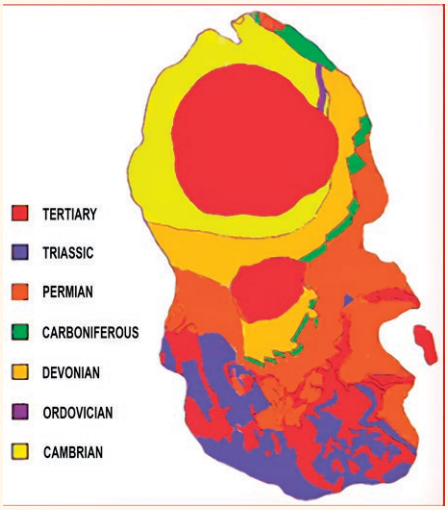
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Field Trip to the Isle of Arran

March 31-April 7, 2027



Registration for AIPG's 2027 field trip to the Isle of Arran is now open. The last issue of The Professional Geologist announced the field trip and presented a brief outline of this UNESCO Global Geopark island known as "Scotland in Miniature". A glance at the simplified geological map shows just why geologists have made a beeline for Arran for so long. Even the 'father of modern geology' James Hutton, came here and at Lochranza found one of his famous unconformities.

It's not just the timespan of rocks on the island, from Cambrian to Tertiary and most of the periods between, it's the fact that there are sedimentary, igneous and metamorphic rock types in profusion. There are Quaternary landforms that bear witness to changes in sea level and glaciation and much more besides. In short, this is a geologist's paradise!

A general outline of the field activities includes fabulously varied rock of the Brodick area; dikes, red rocks and conglomerates of the coast of Brodick to Lamlash; rocks around Lochranza, including Hutton's Unconformity; rock of the Tertiary igneous center and granite contacts at Glen Sannox; Quaternary geology of Arran; coastal geology of Corrie, Old Red Sandstone, Carboniferous and Permian; shore sections in south Arran; and Dalradian metasediments of the Mull of Kintyre.

We'll be staying at the Kinloch Hotel for seven nights and making day trips. The costs of main meals (breakfast and dinner) at the hotel are included in the field trip price, plus the packed lunches that will be provided daily.

The cost per person is US$2,700 for a shared double bed or room with two twin beds. A single room is US$3,100/person. The field trip cost includes the two field trip leaders, accommodation and meals as indicated above, travel during the field trip (we will have a tour bus), and admission to any museum or attraction visited by the group.

The field trip will run subject to a minimum of 15 participants signing up by June 30, 2026, with a downpayment of US$750/person. AIPG members and their guests are welcome. The balance is due no later than December 31, 2026. Payments should be made via check to AIPG. If you desire to pay via credit card, an additional 5% will be charged to cover processing fees.

The field trip brochure and a registration form are available on the AIPG website: The brochure describes more details about the field trip and information on how to reach Arran and the hotel (note: the field trip doesn't include travel costs to Scotland).

Mail checks to: AIPG, 10701 Melody Drive, Suite 630; Northglenn, CO 80234. For questions, please contact the national office at 303-412-6205 or send an email to aipg@aipg.org.

LANDFILL HYDROGEOLOGY AND THE LAW OF UNINTENDED CONSEQUENCES

Peter H. Dohms, CPG-07141

This article is intended to illustrate how the Law of Unintended Consequences can take effect during attempts to enhance environmental protection. Two case histories are provided, each of which falls under the heading of landfill hydrogeology. The name(s) of the state(s) in which these examples occurred have been deliberately omitted since, while many years have passed, some of the regulatory individuals associated with decisions that are described may still be active in the profession.

First, to define The Law of Unintended Consequences: "Outcomes of a purposeful action that are not intended or foreseen." (attributed to the 20th century American sociologist Thomas K. Merton.) Consequences may include an unexpected benefit, an unexpected drawback (a detriment in addition to the desired effect), or a perverse result (i.e., a precise opposite of the desired effect). In the following two case histories, the unintended consequence would have fallen into the category of an "unexpected drawback."

Case History 1 – Containment of Landfill Gas

At the municipal solid waste landfill in question, the original landfill cells had been built upon a clay horizon that was "compacted in place." Artificial liners had not yet been required at all landfills. When those cells were closed in the late 1980s to early 1990s, the "final cover" was borrowed from a nearby pit and was graded and re-vegetated. My firm's assignment, which began after that closure had been completed, was to design and install a more-complete ground water monitoring array around the entire facility, which had expanded significantly beyond the original footprint. Incorporated into that array was an existing monitor well on the south side of the facility that was completed with its screen bridging the water table in the unconfined aquifer underlying the "compacted in place" clay base of the cells.

As the new monitoring array was being commissioned, the state regulatory agency ordered the landfill operator to install an impervious cap over the closed cells with the intent to prevent continuation of the release of landfill-derived methane to the atmosphere. That action was completed and a flexible membrane was installed covering the entire area of the closed cells (and then covered with new soil and vegetated). About six months later, during a quarterly ground water sampling event, it was noticed that the "older" monitor well along the south boundary had begun discharging smelly gas. That sampling event revealed the presence of an array of volatile chlorinated and non-chlorinated organic compounds in the ground water at the well. The quarterly monitoring report to the state agency raised major concerns and further investigation was ordered. My firm was assigned to undertake the follow-up.

Step 1 was to test the gas discharging from the monitor well. The gas sample collection was undertaken in Level B PPE with great care employed. Test results indicated methane and carbon dioxide as the two major components of the gas, with the same mix of chlorinated and non-chlorinated volatile organic compounds. Since impacts had already been found in the aquifer at that well, a wider assessment was undertaken.

When "step-out" test wells were installed and tested, we discovered to our alarm that the contaminant front was migrating much more quickly than could be explained by advection and dispersion alone. Upon consideration I hypothesized that the landfill gas was spreading through the vadose zone above the water table-type aquifer (capped by the clay) and that it was likely that the volatile contaminants were partitioning into the ground water from the gas. So, I did some research on Henry's Law and, since the vadose zone and the aquifer were under ambient temperature and pressure, I was able to demonstrate that this hypothesis was the most likely explanation for the observed rapidly moving contamination front.

Less than a year after the gas discharge from the monitor well was first observed, an array of three recovery wells (and several observation wells) was put in place a full half-mile down gradient of the boundary of the closed landfill cells. (Simultaneously, an array of landfill gas recovery wells was installed into the closed cells, and gas recovery and flaring was begun to relieve the pressure at its source.) A pipeline was installed from the recovery wells back onto the landfill property, where a low-profile air stripper was installed to remove the VOCs from the affected ground water. Cleaned ground water was discharged to a constructed wetlands that was already present on the landfill property. After about three years, the remediation system was shut down and the project concluded.

Desired Benefit: Shutting off the uncontrolled emission of landfill gas to the atmosphere through the original landfill cover. That benefit was achieved.

Unintended Consequence: Significant contamination of the underlying aquifer with volatile organic compounds and the necessity for installation of a complex remediation facility.

Epilogue: Several years later a new, deeper landfill cell was being excavated in a nearby area of the landfill site and the excavation penetrated the clay horizon that had been "compacted in place." One day, one of my senior geologists brought an unusual specimen to the office from the work site; it resembled a pipe, about three feet long and four inches inner diameter, with the pipe "wall" comprised of iron oxide minerals cementing quartz grains. The "pipe" was filled with fine sand. It didn't take us long to figure out what it meant. A pine tree had sent its tap root down through the clay horizon. The tree died and the tap root decayed; perched ground water began migrating downward through the void, bringing fine sand and depositing iron oxide at the reaction front at the perimeter of the root hole. Parenthetically, pine forests in that part of the world typically have over 100 trees per acre. When the clay was later "compacted in place," the root hole voids remained, and became robust conduits for the pressurized landfill gas to begin migrating after the impervious cap was installed.

Conclusion: In hindsight, even with the benefit of nearly 30 years since this project occurred, it is doubtful that this "unintended consequence" could have been prevented or foreseen.

Case History 2 – Evolution of the C&D Landfill Industry

For many years, the operation of construction and demolition debris (C&D) landfills was unregulated in the state. In the mid-1990s I learned that the state's environmental agency had proposed rules to impose regulation, and a review indicated that the principal changes were going to include formalized permitting and permit renewal; tighter control on materials being disposed; placement of interim cover on debris; prohibition of scavenging; installation of monitor wells and quarterly water quality sampling, testing and reporting; financial assurance; and formalized closure and post-closure care. No liners were to be required. Previous regulation had been limited to written notification of the facility's existence to the agency. A marketing opportunity was recognized, so the list of registered facilities was obtained, and periodic newsletters were mailed to the operator of each facility. There were about 110 in the "region" of the state where my firm's office was located.

The new regulations included what I termed a "Get out of Jail Free card," a stipulation that if an operator decided that these regulations might be burdensome they could file a notice of closure, cover the debris that was in place, and lock the gate. About one-third of the existing facilities took advantage of this option immediately. By the time the new regulations went fully into effect, the "universe" of C&D landfills had dwindled to about half of its pre-regulatory numbers.

I mentally divided the existing facilities that were operating prior to the regulations into a number of categories. There were the "sideline" and "hobby" operators, who had an exhausted borrow pit where they could "sell airspace" to make a few dollars. There were the "mom and pop" operators, who typically had a larger facility that was their principal business. The next category was comprised of small, under-capitalized firms. As the C&D disposal business evolved, fewer and fewer small firms survived and some large, professional firms entered the market.

The "hobby" and most of the "sideline" operators were all too happy to take advantage of the state's offer to close without liability, especially when they learned the projected costs associated with monitoring & reporting, paperwork, closure and post-closure care, and liability in the event of adverse monitoring results. My office began consulting for C&D landfills, with up to 10 facilities at a time under our care.

As the years passed, consolidation began. First, the last few sideline and mom & pop operators sold out to investors, who established their own C&D landfill management firms. In a couple of cases, such firms acquired two or three facilities to increase revenue and spread overhead costs. There were several weather-related disasters that resulted in greatly-expanded, short-term increases in gate receipts. The fewer individual facilities increased in size, bringing in larger and a few "major" solid waste management operators. As facility sizes continued to increase, environmental difficulties started to crop up.

Any landfill, once it surpasses a threshold tonnage of debris across a thick-enough depth, with routine cover being applied, undergoes a change in its internal chemistry. At first the debris oxidizes, but as oxygen is consumed and not replaced, the chemistry becomes reducing. Effects are seen in ground water; dissolved oxygen decreases and eventually disappears. This can cause profound changes in distribution of major cations and anions. Prominent among those is the appearance of inorganic iron. It was discovered that naturally occurring ferric iron in the underlying unconsolidated sand aquifer was reduced to soluble ferrous iron, which would migrate to my monitor wells. The state regulated the secondary drinking water standard for iron (0.3 mg/l, established to guard against taste and odor) as an enforceable standard. I had to argue often and intensely with the regulatory scientists about this until their own highly paid university-based consultant came to the same conclusion.

Another geochemical difficulty began to surface, based on large quantities of sheetrock in the C&D waste stream, particularly following weather-related disasters. The principal component of sheetrock is gypsum, calcium sulfate (sulfur strongly oxidized). In the thicker columns of C&D debris, anaerobic bacteria attacked the sheetrock, yielding a byproduct of hydrogen sulfide gas. Add the proximity of some C&D landfills to residential areas, and the "rotten egg" odor created a public uproar. The regulatory agency was not pleased. While investigating two sites I was able to observe some locations where hydrogen sulfide slowly venting through the daily cover allowed hydrogen sulfide oxidation, depositing elemental sulfur.

Desired Benefit: Regulation of a previously unregulated category of landfill operations. That was accomplished.

Unintended Consequence: Prior to regulation, the large number of small C&D disposal facilities was so large that it was nearly impossible for any single site to create significant environmental problems. As industry consolidation proceeded, the number of sites decreased and their size dramatically increased, crossing the threshold for the initiation of environmental harm. Certainly, a detriment to the desired effect.

Conclusion: I have to believe that careful forethought could have predicted this outcome. Simple economics dictates that when costs are increased, companies seek the economic benefits of increased size. Mix in the economic disincentives of maintaining compliance at many small operations, and the outcome becomes more obvious.

Final Thoughts

With respect to the C&D industry evolution, my day-to-day work of overseeing permitting, re-permitting, monitoring, reporting, and responding to agency demands made me too busy to recognize the implications of the evolution of the business and the adverse environmental effects that were developing. I was stuck in reaction mode. It was only in hindsight that I was able to make these connections. At the municipal landfill with the landfill gas migration issue, my reaction time was shorter, given the ongoing focus on monitoring and reporting.

These two case histories do not, by any stretch of the imagination, represent the entire universe of "unintended consequences" with respect to environmental oversight and response. It is hoped, however, that they will shine some light on how such circumstances can arise.

So, what are my recommendations? If you have the luxury of time, try to think ahead using the meme, "*What can possibly go wrong?*" Then combine your thoughts and considerations with Murphy's Law, "*If it can go wrong, it will go wrong.*" As an environmental regulator, facility operator, or third-party consultant, you must pay attention to all of these factors and attempt to be proactive instead of reactive as developments occur.

Juanita's Pezón

William J. Elliott, CPG-04194

The summer of 1963 was spent by several San Diego State College and Autonomous University of Baja California, Ensenada, BC, students mapping geology and conducting geophysical surveys. This project was funded by Dr. Gordon Gastil's NSF grant. Working together, we had a wonderful opportunity to learn about each other's culture and share our collective experiences, hopes and dreams for the future.

Crisscrossing the Peninsular Ranges, from the Pacific Ocean to the Gulf of California, on washboard dirt roads and windy cow-paths, we encountered numerous cone-shaped mountains and hills, to which the Mexican students would gleefully point out to us, and say, "that's Juanita's Pezón". Of course, we all knew the simple translation to English was Molly's Nipple.

During my travels in the many years since, I have often chuckled to myself when noting yet another example of Juanita's Pezón.

JUANITA'S PEZÓN ON THE EAST SIDE OF US-395. That said, there is a Juanita's Pezón that most folks miss on the north side of Mono Lake, driving between Conway Summit and Lee Vining. It is a little patch of dark-colored mid-Miocene to Pliocene andesitic volcanic rock (Bailey, 1089; Koeing, 1963) capping a cone-shaped knob of light-colored Cretaceous granodiorite (Bailey, 1989; Koeing, 1963) about 0.8-mile northeast of the pronounced hairpin curve in US-395. It is a perfect "tit" or pezón in Spanish – a dark-colored nipple sitting on a light-colored granodiorite cone (Figure 1). Our little pezón, therefore, is apparently an isolated eroded remnant, or orphan, of what was likely a much wider-spread mass of volcanic rock (Figure 2).



Figure 1. Juanita's Pezón, located 0.8-mile northeast of the sharp hairpin curve in US-395 below Conway Summit.

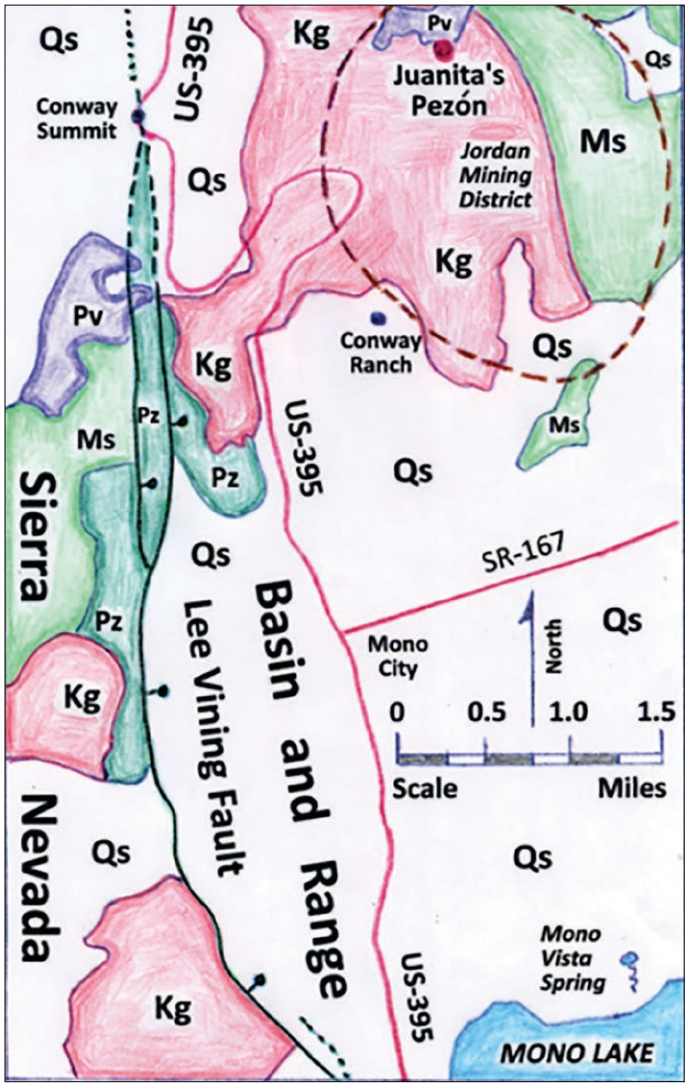


Figure 2. Simplified geologic map showing the location of Juanita's Pezón relative to Mono Lake and Conway Summit. Qs = undifferentiated Quaternary sediments, Pv = Middle Miocene to Pliocene volcanics, Kg = Cretaceous granodiorite, Ms = pre-Cretaceous metasedimentary rocks, Pz = Paleozoic metasedimentary rocks. The ball is on the down-thrown side of the Lee Vining fault. Modified and simplified after Bailey, 1989).

The next time you drive US-395 between Mono Lake and Conway Summit, keep an eye out for this little bit of levity in the topography and underlying geology. It is not big, but it sure fits the description we learned from our Mexican friends in 1963.

GEOLOGY. This tiny outcrop represents a nonconformity, of younger volcanic rock resting on older granitic rock. In this case the older, Cretaceous granodiorite, must have first cooled and congealed, and then been uplifted to the point that it was exposed to atmospheric elements and gradually worn down to an erosion surface. Finally, this old surface was covered by mid-Miocene to Pliocene volcanic rocks, which are exposed at the surface today.

How much time is represented by this thin contact? In round numbers it is about 50 million years, or so, from approximately the end of Cretaceous to mid-Miocene, that is, Paleocene, Eocene, Oligocene, and early Miocene. It likely represents the old Eocene erosion surface.

During this time, the Nevadaplano was eroding and shedding debris in all directions, including westward over the Sierra Nevada and down into the Central Valley of California. Located near the western boundary of the Basin and Range province, just east of the Lee Vining Fault, it is likely that this tiny outcrop represents a very small piece of that long ago tectonic and erosional event. (Bailey, 1989; Elliott, 2025a; Elliott, 2025b; Elliott, 2025c; Elliott, 2025d; and references contained therein),

MINING. The old Jordan Mining District is located between the hairpin turn in US-395 and Molly's Nipple (dashed brown circle, Figure 2). Lode and placer gold old was mined during the 1870s and 1880s. Several quartz veins contained abundant sulfides with copper, silver, and some manganese. Total district output is unknown, but is estimated to have been several million dollars (Clark, 1970, p. 83).

Before running off thinking Juanita's Pezón is just a simple mundane geological outcrop, remember that there is usually more there than initially meets the eye.

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Best Practices for Writing and Publishing Your Research Work

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It is fair to say that without writing and publishing there would not be any science as we know it today. In fact, modern science began in the 17th century with professional societies, meetings, presentations, and journals including the *Journal des Sçavans* in Paris and the *Transactions of the Royal Society of London*, both published in 1665.

Scientific writing may be categorized into five types: (1) Popular science articles and books, (2) textbooks, (3) research proposals and grants, (4) project reports for funding agencies, internal reports for corporations or white papers for the public and publicity, and (5) research papers for technical journals. This fifth category is the focus of this article which discusses some tips, procedures, and challenges for writing and publishing geoscience papers. I used "best practices" in the title of this article to imply some well-known skillsets; obviously, best practices in any field may differ from one practitioner to another. Choose or create what works best for you.

Who Writes Research Papers?

Let's start with authors. Those who create scientific papers fall under one of the following four groups: (1) Academic professors, researchers, scholars, and graduate students; (2) corporate and industrial scientists and engineers, (3) researchers working for government agencies, and (4) experts working for non-governmental organizations, foundations, and research institutions. Each group of these authors have their own motivations, priorities, career paths, restrictions, and latitudes.

Academic researchers have the most incentive to write and publish research papers because their job performance, research funding, and student training depend on "publish or perish" strategy. However, professional scientists and engineers working for corporations and non-academic institutions also conduct valuable research and their research results equally benefit the scientific community and society.

Corporate Knowledge and Public Knowledge

Some research work must understandably remain confidential because of national security, trade secrets or technological advantages for its financer or producer. Therefore, professional geoscientists working for corporations face an important barrier: Their work and data are usually confidential, and they need to obtain permission from their employers to publish any research results. Sometimes, it may not be possible to publish these results. However, it is often possible to obtain permission to publish non-sensitive parts of research or publish results after an elapse of confidentiality period. Research work eventually deserves to be published as a contribution to science and technology. Industries and professional scientists for their work and profits rely on research results of countless other researchers who shared their research work with the public. In the same spirit, corporations also need to return the favor and publish new research works in order to advance humanity's intellectual horizons, life standards, and civilization.

Many great contributions to geoscience have been made by research teams working for petroleum, mining, engineering, and geoscience service companies. William Smith, one of the founding fathers of modern geology, whose 1815 geological map of Britain (according to Simon Winchester[1]) "changed the world," conducted field work for coal mapping. In our own time, well logging and geophysical surveys were advanced by the petroleum industry. Seismic and sequence stratigraphy came out of research conducted at Exxon in the 1970s. In the same decade, geophysicists at Shell pioneered the development of direct hydrocarbon indicators from seismic attributes and images. Without the oil industry's support of geoscience and engineering we would have had very little knowledge of subsurface Earth and sedimentary basins.

Reading is Writing

Almost every writer who has suggested tips for successful writing – from Ralph Emerson and William Faulkner to Stephen King and Joanne Rowling – has said that to write well you need to read well and read a lot. There is no other substitute. If you want to write a science fiction book, you need to read a lot of science fiction books. If you want to publish an article in *Science* or *Nature*, you must read articles (at least in your own field) published in *Science* and *Nature*.

There is a famous quote from Emerson's 1837 essay "The American Scholar": "First we read, then we write," which is the title of an insightful book[2] by Robert Richardson on creative and writing process. Emerson's phrase does not mean that we read to copy and plagiarize and not be original. It means that we read

1. Simon Winchester, *The Map that Changed the World: The Tale of William Smith and the Birth of a Science* (HaperCollins, New York, 2001).
2. Robert Richardson, *First We Read, Then We Write: Emerson on the Creative Process* (University of Iowa Press, 2009).

creatively to learn the craft and then we write to build upon what has been done, and only then can we be original.

Reading even casually and unconsciously is still a learning and an encouraging process. However, reading a book or an article as a writer requires reading carefully, analytically, and even critically. Here is a testimony from William Faulkner: "Read everything — trash, classics, good and bad, and see how they do it. Just like a carpenter who works as an apprentice and studies the master. Read! You'll absorb it. Then write. If it is good, you'll find out."[3]

This is true for any kind of writing – from poetry to petrology. That is why it is important that students are given assignments to read important papers in their fields of research and discuss them in the class (sometimes called seminar classes).

Organization of Research Papers

In *The Chicago Guide to Communicating Science*[4], Scott Montgomery states that a research paper must answer five fundamental questions:

(1) *What* did you do? (2) *Why* did you do it? (3) *How* did you do it? (4) What did you *find*? And (5) What do you *mean*?

These questions are built into the structure of modern research papers, which include the following sections: (1) Title and authors; (2) Abstract; (3) Introduction; (4) Methods and Samples; (5) Data and Results, (6) Discussion and Interpretations; (7) Conclusions; (8) Acknowledgements; (9) References cited.

This structure is an established standard for almost all sciences, all technical journals, and even for various research methodologies – whether our research is empirical (field mapping, measurements, sample analysis, geophysical imaging, and so forth), experimental (controlled laboratory or physical analog experiments), numerical modeling and computer simulation, theoretical synthesis or mathematical solutions.

It should also be noted that each journal may have a different "style" of presenting research results. For example, research articles in *Science* and *Nature* usually adopt an "essay" style and give topical titles for sections rather than structural headings listed above. Also, formats for references and citations differ from one journal to another. It is best to consult current editions of the journal you intend to submit your paper to.

Data tables and "figures" (a general term to include all graphics such as maps, photographs, diagrams, and illustrations) are essential parts of a research paper and should be made carefully to enhance the text and to demonstrate the research conducted. I usually make tables and graphics first (because they contain and depict the research results), then write the text accordingly, and revise and add to the graphics as needed during the process of writing.

What is the Question?

A research paper, like the scientific method, should aim to solve a specific problem. Therefore, the objectives of the study should be articulated in the introduction part of the paper. In fact, the question a scientist formulates not only guides the methodology and research procedure but also determines the significance and scope of the research. When I was a PhD student, one of my peers used to say, "A good scientific question is half of the research work; the rest are data collection and interpretation." I still remember this wise advice.

Research is Fun; Writing is Hard

Research work is full of curiosity and discovery; it includes field work, group work, data collection, novel experimentation, predictive model designs, and so forth. To a scientist, these are all fun and joyful experiences. However, writing about research work can be hard. Even the most seasoned writers often find writing to be challenging and demanding. "If you find that writing is hard," says William Zinsser in his bestseller *On Writing Well*, "it's because it *is* hard."[5]

Why is writing (I mean good writing) so hard? For one thing, writing is a lonely job. Unlike film actors, concert musicians or circus clowns, you do not write in front of an audience; you sit alone in a room, dig into your mind, and produce words that make most sense and convey your message accurately and pleasantly. This is all an introverted process – an inward journey, being away from entertainment, and requiring concentration.

I usually characterize writing a good article like giving birth to a child; the entire process has three stages. In Stage One, you have brilliant ideas, hard-earned data, passion, and inspired images for your article; this is like a honeymoon. Stage Two is the real labor – a tormented process of actualizing your inspired ideas and images into a literary product that is alive, meaningful and powerful. Stage Three is once again all joy; you are gratified by your product completed and published – the child is healthy and smiling.

How can we overcome the hardship of writing and become productive? Let me offer two simple solutions.

(1) Perspective shift. If we know (from experience) that writing itself is full of creativity and has its own joy, and that publishing is the extension and conclusion of our research work, we gain a positive perspective toward writing and publishing. You may have read this quote from *Virginia Woolf*: "Nothing has really happened until it has been recorded."[6]

(2) Time management. Despite what we may say, it is impossible to "kill" time or "find" time. All of us are given 24 hours a day (call it Mother Nature's justice); the only thing we can do about time is to plan and schedule it. If we are truly willing to publish a paper, we will devote proper time to writing it. This scheduling may be a couple of hours a day, a week or a month depending on each person's situation. But not "finding" time is often an excuse to deny or delay. In his book *How to Write a Lot*, psychologist Paul Silvia emphasizes that it is essential to set a goal for writing in terms of timing and product, plan a sufficient and practical schedule, and stick to the work schedule.

Writing is Thinking

No matter how much data we have collected, analyzed and interpreted, research work is incomplete without documenting it.

3. William Faulkner, interviewed by Lavon Rascoe for *The Western Review*, Summer 1951, pp. 300-304.
4. Scott Montgomery, *The Chicago Guide to Communicating Science* (University of Chicago Press, 2017), p. 22.
5. William Zinseer, *On Writing Well: The Classic Guide to Writing Nonfiction* (Harper Perennial, 2006), p. 9.
6. This famous quote is given in Nigel Nicholson's biography of *Virginia Woolf* (Penguin, 2000).

In fact, writing itself is an important part of research and has its own benefits, including the following:

1. We realize how much we know about the field and what our blind spots are.
2. We research and acknowledge the previous works in our field.
3. Through explaining our results, we sharpen our language and fine-tune our interpretations.
4. We appreciate the merits and contributions of our research.
5. We recognize and suggest remaining problems for further research.

Writing is not a passive activity of simply recording data in words; writing is an active process of thinking, learning, and creating.

Writing is Rewriting

It is important not to submit a pre-mature paper because it would be a waste of time for yourself, editors and reviewers. Writing requires revising and polishing, which also means that it is time consuming and tedious. The paper should be complete, accurate and clear.

By "complete" I do not mean to be obsessed with perfection (there is no such thing as final research work). Simply make sure that your text, data, and figures – whatever is necessary to present your research to the scientific community – are all in place.

Accuracy means that the language and graphics of our paper are correct. Check and cross-check for errors before submitting the paper.

The third component – clarity – needs some elaboration. In *The Summing Up*, which is Somerset Maugham's account of how he learned his craft of writing, he says, "I have never had much patience with the writers who claim from the reader an effort to understand their meaning. You have only to go to the great philosophers to see that it is possible to express with lucidity the most subtle reflections."[7] Maugham goes on to say that when someone writes obscurely, either he or she does not know how to write clearly (Maugham calls it "negligence") or the writer is not sure about the meaning of what he or she is writing (obscurity out of "willfulness"). When we spend so much time at work, our language, terms and thoughts may become too close and too obvious for us. But when we write to others, we must ensure that they can understand our work. That is clarity.

Selecting the Right Journal

Should we choose a journal before or after writing our paper? Opinions will vary. Some experienced researchers may have a clear idea of their paper and the journal to which they are planning to submit. Alternatively, you can prepare the first draft of your paper and then revise, format and fine tune it for a specific journal. Writing the first draft will also help you select an appropriate journal.

Selecting the right journal for your paper requires some homework. Before you submit your paper, study the scope of the journal and compare it with the content of your paper: Have they published similar papers? Choose the journal based on the scope and relevance of your research results. Perhaps, geoscience journals can be categorized into six groups:

1. General science journals such as *Science*, *Nature*, and the *American Journal of Science* publish papers that contribute to a scientific field in a fundamental way and have broad, cross-disciplinary, and global significance.
2. Some journals such as *Geology*, *Journal of Geology* or *Journal of Geophysical Research* publish papers that contribute to geology in a significant and broad manner.
3. Disciplinary journals such as *Journal of Structural Geology*, *Journal of Metamorphic Geology*, *Sedimentology*, and *Economic Geology*, and so forth deal with important contributions to a particular discipline within geosciences.
4. Regional journals published by geological societies in various countries such as Australia, Canada, India, Japan and so forth.
5. Institutional journals published by universities, departments, research institutes, and surveys.
6. Conference proceedings on a particular topic.

Some papers may be qualified for any of the above-mentioned journal categories. Selecting a journal mainly depends on not only the nature and volume of your data but also how significant your interpretations are and how you articulate and present your results. In any case, it is important to submit your research work to an established, reputable and peer-reviewed journal.

Peer Review Process

Peer review is an essential part of scientific publishing. Papers submitted to research journals must be reviewed by two or three researchers in that field. No scientific paper should go unchallenged without an external assessment. This is increasingly becoming important in our age of uncontrolled social media and online sources. Moreover, peer review usually improves the quality and presentation of published papers.

Peer review, like any other human activity, is not perfect. Professional rivalry and jealousy or careless and poor reviews may result in unfair reviews and publication delays. But there are ways to minimize these issues: Authors can respond to reviews; editors can supervise the review process in a professional manner; some journals allow authors to recommend or not-recommend possible reviewers; some journals send submitted papers for double-blind reviews (where authors and reviewers remain anonymous to each other); and finally, there is no shortage of journals today and one can always revise and resubmit a paper to another journal. The important thing is that peer review process by non-paid external reviewers is necessary and it has traditionally been a metric for modern science and research work. As editors, reviewers, and authors we can only improve the quality and mechanism of peer review.

After a paper is reviewed, the journal's decision may be Reject, Major Revision, Minor Revision, or Accept (as is). Papers often receive outright rejections if their topics or presentation styles do not fit the journal or data and interpretations are of poor quality. Very few papers are accepted as submitted. For the vast majority of papers, the authors are recommended to revise the paper in a major or minor way based on the reviewer's comments and resubmit their

7. W. Somerset Maugham, *The Summing Up* (William Heinemann, 1938; Penguin, 1963), p. 24.

papers. In any case, it is important to carefully consider comments from reviewers and editors, then revise the paper, and submit it to the same journal or to a more appropriate journal. Be positive: Use feedback from reviewers and editors to strengthen your paper.

Craft of Writing

Writing and publishing require skillsets. As scientists and engineers, we usually learn how to write and publish research papers from our advisors and peers while we are students. We rarely take a course on the craft of scientific or technical writing. I know a professor who took a course on nonfiction writing after he retired because he wanted to write a popular geology book, although he had already published more than a hundred research papers. It is perhaps imperative that science and engineering departments include a technical writing course as part of graduation requirements for their students.

There are also some helpful books on this topic. Some of them (those I have myself read) are introduced here:

The Chicago Guide to Communicating Science, by Scott Montgomery (The University of Chicago Press, 2017, second edition) from the pen of someone who preaches what he has practiced.

How to Write a Lot: A Practical Guide to Productive Academic Writing, by Paul Silvia (American Psychological Association, Washington DC, 2018).

On Writing Well: The Classic Guide to Writing Nonfiction, by William Zinsser (Harper Perennial, New York, 2006, ninth edition, but even an earlier edition will do).

They Say, I Say: The Moves That Matter in Academic Writing, by Gerlad Graff and Cathy Birkenstein (W. W. Norton, New York, 2010, second edition).

And last but not least:

The Elements of Style, by William Strunk and E.B, White (McMillan Publishing, third edition, 1979; Longman, fourth edition, 2000).

Happy reading and writing!







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In Memoriam

Richard E. Gray, CPG-01257

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Photo and obituary obtained from the Pittsburgh Post-Gazette website.

Richard E. "Dick" Gray, age 90, of Salem Twp., Westmoreland County, passed away on Wednesday, June 25, 2025, at UPMC Shadyside in Pittsburgh.

Richard was born December 12, 1934, in North Braddock to the late Paul and late Theresa (O'Hara) Gray.

Richard "Dick" Gray, P.G., Dist.M.SME, Hon.M.AEG, Hon.BC.GE, Dist.M.ASCE graduated from St. Thomas High School in Braddock, PA. He received an undergraduate degree in 1956 from Carnegie Mellon University in Pittsburgh (then called "Carnegie Tech"). Dick Gray along with classmate, Tony DiGioia were chosen by their CMU professor, Elio D'Appolonia, to join his firm after graduation. In April 1957, Dick began a six-month assignment as a Lieutenant in the U.S. Army Corps of Engineers. He then went on to take courses at MIT in Boston during the summers of 1958 and 1959. While at MIT, Dick was fortunate to be exposed to the world's leading practitioners in soil mechanics and foundation engineers (Professors Terzaghi, Casagrande, Peck among others).

Dick with his classmate, CMU Lab partner and friend, Dr. Anthony DiGioia, Jr. went on to co-found the firm of General Analytics, which later became GAI Consultants. Dick retired from GAI at the age of 70, after the firm had grown to over 600 employees where he and Tony earned a reputation as BRILLIANT ENGINEERS, excellent leaders and generous employers.

Dick and Tony felt they still had so much to contribute to the Engineering world. They decided to "consult" joining together once again to establish DiGioia Gray and Associates, an engineering firm that grew to more than 125 employees before recently, becoming part of the larger firm, Gannett Fleming. Dick and Tony firmly believed in encouraging and supporting the next generation of engineers, so they established the DiGioia Gray Scholarship at Carnegie Mellon University.

In his firms, he cared deeply about the many people that he interacted with and the younger people that he mentored. His services to the professions of engineering geology, geotechnical engineering and mine subsidence detection and control were world renowned. Those professionals that he trained and had an impact on will certainly carry Dick's legacy forward. Clearly the next generation will benefit from Richard E. Gray's countless contributions.

Dick was predeceased by his beloved wife and best friend, Audrey Gray, and shared a wonderful life together of 47 years. Dick met Audrey at the Pittsburgh firm of GAI Consultants. Over their many years together, Dick and Audrey were able to travel extensively, exploring 47 different countries on personal and Dick's professional trips. In the professional society, functions held all over the country and worldwide, where one saw Dick, Audrey was almost always by his side.

Dick was the recipient of countless awards, too numerous to list. Two awards that were close to his heart were receiving the Alumni Achievement Award (2010), Carnegie Mellon University and the Distinguished Alumnus Award, Carnegie Mellon University Civil and Environmental Engineering Department (2016). Dick was a prolific and distinguished writer, contributing over 95 publications in print. His efforts include leading the writing team in producing "The Geology of Pittsburgh" for AEG Cities of the world series, the Association of Environmental and Engineering Geologists of which Dick was a past president and member for over 50 years. Dick never met a rock he didn't like.

In collaboration with his close friend and colleague, Terry R. West, the two established the West–Gray Scholarship, that provides funding for students in the environmental and engineering geology fields in the eastern portion of the United States to further their studies. Both Terry and Dick Gray have sustained this important AEG Foundation Scholarship for many years and numerous college and university students have benefitted from it.

Donald B. Basko, CPG-01356

Rapid City, South Dakota

Passed on January 26, 2026

Member Since 1966



Photo and obituary obtained from the Oil City News website.

Donald (Don) Basko, 95, passed away peacefully in his sleep on January 26, 2026, surrounded by the love of family.

Don enjoyed the last year and a half of his long and amazing life at his daughter's home in Rapid City, South Dakota. There he enjoyed the adventures with grandkids and great-grandkids, looking for rocks and sharing stories.

Don was the youngest of six boys born to Frank Philip and Mary Ryan Basko in Chicago, Illinois. Don received a BS in Geology, and completed his Master's Degree from the University of Wyoming.

After serving two years in the Army during the Korean Conflict, Don went to work as a geologist for Sinclair Oil and Gas Company in Casper in 1956.

On January 3, 1958, Don married Judee M. Carter, who was a Casper native. The couple had two children, Daniel (Julie) of Conroe, Texas and Catherine (Randy) of Rapid City, South Dakota. Don and Judee's union lasted almost 50 years until Judee's passing on October 20, 2006. They traveled extensively in Europe and the United Kingdom.

On December 29, 2007, Don married longtime friend and acquaintance, Mary L. Harris. Golf, fly fishing, and woodworking were just a few of Don's many hobbies.

After four years with Sinclair, Don went to work for the Wyoming Oil and Gas Conservation Commission as a field inspector/technician in 1960. Don moved up in the agency holding various positions of increasing responsibilities, and in 1968, Governor Stan Hathaway appointed Don as the State Oil and Gas Supervisor for the Wyoming Oil and Gas Conservation Commission. A position he held until retirement in 1997, making him one of the longest-serving state oil and gas officials in the nation. In 1997, the first building designed for the oil and gas commission operations, records, and regulatory hearings was dedicated as the "Basko Building". In 2004, a new

and much larger Wyoming Oil and Gas Conservation Commission building was built and for the second time, was named the "Basko Building" in recognition and appreciation of Don's many years of devoted service to the people of the State of Wyoming and to the oil and gas industry.

His leadership, integrity, and professionalism greatly enhanced the orderly development and conservation of Wyoming's mineral resources. After retiring, Governor Freudenthal appointed Don to be one of the five oil and gas commissioners that oversaw hearings and various oil and gas regulatory matters. In total, Don led and was associated with the Wyoming Oil and Gas Conservation Commission for 48 years.

Don started and facilitated the Wyoming Natural Gas Fair in 1997, for 19 years.The family wishes to thank the doctors and nurses at Davita Hioaks Dialysis Clinic, Bon Secours Cancer Institute at St. Francis, caregivers from Care Advantage, and the staff of Ascend Hospice for their love and care of Ed during his long illness. We are also thankful to our dear family members, neighbors, church family, and friends for their prayers, help, and support during these past months.

Memorial gifts may be made to the following: The Doster-Via Family Scholarship, Brightpoint Community College Foundation, 800 Charter Colony Parkway, Midlothian VA 23114; Central Baptist Church (see address above); Virginia Tech, Blacksburg, VA specifically for student financial assistance in the Geology Department.

John W. Knox II, CPG-02911

Dallas, Texas

Passed on September 13, 2025

Member Since 1975



Photo obtained from the Dignity Memorial website.

John W. Knox was an AIPG member for over 50 years.

Perry H. Rahn, CPG-03724

Hill City, South Dakota

October 27, 1936 - January 15, 2026

Member Since 1977



Memorial provided by J. Foster Sawyer, CPG-10,000.

Perry Hendricks Rahn, 89, passed away on January 15, 2026, at Westhills Village in Rapid City, SD. Perry was born on October 27, 1936, in Allentown, PA, the son of Douglas A. Rahn and Frances E. Weisel Rahn.

It is with sadness and great appreciation for his many contributions and a truly amazing life that we say goodbye to our mentor, former professor, colleague, and friend, Dr. Perry H. Rahn, who passed away peacefully in Rapid City, South Dakota, on January 15, 2026. Rather than print his obituary, I thought it might be more appropriate to share the nomination letter (presented below) for the Lifetime Achievement Award that Dr. Rahn received from the AIPG South Dakota Section following the 2025 Section field trip which he led in the central Black Hills on September 27, 2025. Additional photos from the 2025 field trip, previous field trips led by Dr. Rahn, and information about his *J. Paul Gries Geologist of the Year Award* in 2010 also are available at the AIPG South Dakota Section website at https://sd-aipg.org

The American Institute of Professional Geologists, South Dakota Section

Awards

The AIPG South Dakota Section Lifetime Achievement Award

To

Dr. Perry H. Rahn, CPG-3724

It is my great pleasure and utmost honor to nominate Dr. Perry H. Rahn, CPG-3724, for the inaugural presentation of the AIPG South Dakota Section Lifetime Achievement Award. Since becoming a member of the South Dakota Section in 1977, Dr. Rahn has supported AIPG through outstanding field trips, publications and contributions to The Professional Geologist, and mentorship for many current members of AIPG in South Dakota as well as other sections across the nation. Dr. Rahn influenced thousands of students as a professor at the South Dakota School of Mines & Technology, and he is the author of the classic geological engineering textbook Engineering Geology, an Environmental Approach. His research and publications pertain to engineering geology, hydrogeology, and geomorphology, and he is particularly well respected for his research and conservation efforts for the Madison Aquifer, western South Dakota's most valuable and prolific source of groundwater. Dr. Rahn experienced the tragic flood of 1972 in Rapid City, SD, and he remains a strong advocate and supporter of efforts to alert the general public to the dangers of building on floodplains.

- Below are some of the highlights of Dr. Rahn's contributions to AIPG throughout his career.
- Led the AIPG South Dakota Section 2003 field trip to pegmatite mines and exposures in the central Black Hills
- Published *The Last Glacier in the Bighorns* (Rahn, P.H., C.M. Ray, and M.W. Rahn, 2006) in The Professional Geologist
- Led the AIPG South Dakota Section 2007 field trip to pegmatite mines and exposures in the central Black Hills
- Co-led the AIPG South Dakota Section 2009 field trip focused on the hydrogeology of the east-central Black Hills
- Was awarded the AIPG South Dakota Section 2010 *J. P. Gries Geologist of the Year Award*
- Led a field trip during the 2012 National AIPG meeting in Rapid City, SD, titled *Paleofloods and Hydrogeology of the Black Hills: 40th Anniversary of the 1972 Rapid City Flood*

- Led the AIPG South Dakota Section 2025 field trip to Gold Mountain in the central Black Hills

It is with the greatest appreciation of Dr. Rahn's longtime support for AIPG, his impact on countless geology and geological engineering students, and his outstanding contributions in geological engineering, hydrogeology, and geomorphology that I am honored to nominate and present him with the AIPG South Dakota Section Lifetime Achievement Award.



Left: Gathering for the AIPG South Dakota Section 2025 field trip to Gold Mountain in the central Black Hills. Right: Dr. Perry Rahn (CPG – 3724) and Dr. Nuri Uzunlar discuss the geology of Gold Mountain (photographs by J. Foster Sawyer CPG – 10,000).



Left: Dr. Perry Rahn receiving his Lifetime Achievement Award from the AIPG South Dakota Section (photograph by J. Foster Sawyer CPG – 10,000). Right: Field trip participants at Dr. Rahn's cabin overlooking Slate Creek in the central Black Hills (photograph by Nuri Uzunlar). .

Colleagues:

Have you wondered what to do about all those geology books that you've been collecting but no longer need? AIPG has a book donation program with several universities in Mexico that would greatly appreciate books to build their technical libraries. Book donations would need to be shipped or dropped off in Tucson, Arizona, and then we'll coordinate to get the books to Mexico.

If you would like to make a donation, please contact the AIPG national office for instructions!

Roger B. Stickney, CPG-05155

Anchorage, Alaska

Passed on August 1, 2025

Member Since 1982



Obituary and photo obtained from the Alaskan Funerals website.

Roger Barton Stickney, the guy with the big, ready smile, was born in Mt. Vernon, WA, and died in Anchorage, AK, after a short hospice stay.

Roger is survived by Michele, the love of his life, buddy and wife of over 53 yrs. He was a beloved son of Donald and M Ruth Stickney and brother to Ben Stickney (deceased), and two nephews Bart and Bing Stickney.

In 1962 Roger graduated from David Douglas H.S in Portland, OR. He then completed his BS degree in Geology at Oregon State Univ. in 1966 and was immediately drafted into the Army. He became a helicopter pilot and served in Viet Nam. After his tour, returned to the U.S.A. serving as an Army instructor pilot.

After marrying in 1972, and exploring employment options, Roger decided in 1973 to begin work on a MS degree at OSU in Geology, which he completed in 1976. He was hired by UNOCAL as an exploration geologist and relocated to Anchorage.

After the move north, Roger still had the bug to fly helicopters so joined the AK Army Nat'l Guard as a pilot. He flew Hueys, Sky Cranes, and Black Hawks. He served as an instructor and mentor over many years to eager, new pilots.

During the last years of his Guard career, he was chosen to be Alaska's first Command Chief Warrant Officer 5 (CW5). An honor earned, deserved and executed with excellence.

After many years with UNOCAL, Roger became an Aviation & Ground Safety Specialist on Joint Base Elmendorf Richardson.

In 1994 he (and Michele) joined the world of motorcycling when they took lessons, bought matching white Goldwings and drove them back to Alaska from Maine. In 1996 they made a big "bike" trip to and from AK covering all Canadian provinces and territories including Newfoundland.

As a very strong advocate for gun safety, Roger volunteered many years at the Mat Valley Sportsman's Range as an Instructor and Range Safety Officer plus served on their Board of Directors.

To help in the community, Roger, donated over 12 gallons of blood for the health of others. He was a life member of the Viet Nam Helicopter Pilots Assoc. and 191st Assault Helicopter Assoc.

Paul W. Lambert, CPG-06974

Valparaiso, Indiana

August 10, 1953 - January 23, 2026

Member Since 1982

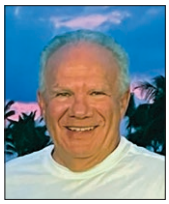


Photo and obituary obtained from the Angelcrest, Inc. website.

Paul W. Lambert, 72 of Valparaiso passed away January 23, 2026 in the arms of his loving wife Patricia Masanz Zappetillo. He was born August 10, 1953 in Lansing, Michigan to C. Wesley and Consuela Ernestine (Reyaud) Lambert who preceded him in death along with his late wife Debra (2011). Paul earned his Bachelor of Science degree from ISU in Geology and a master's degree in Geology from IU. He was a member The American Institute of Professional Geologists. Paul was an Eagle Scout, a recovery diver and an open water recovery diver as well as an advanced open water diver. His hobbies included swimming, scuba diving, biking, traveling and being with his horse and pets. He loved spending time with his family and grandchildren.



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Comments on proposed rule: Modernization of Property Disclosures for Mining Registrants

Comments on the U.S. Security and Exchange Commission's (SEC's) proposal are available at https://www.sec.gov/comments/s7-10-16/s71016.htm

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