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THE PROFESSIONAL GEOLOGIST

VOLUME 61 NUMBER 4 OCT.NOV.DEC 2024

Honoring Excellence in the Profession

Understanding and Addressing Vapor Intrusion

Mineral & Rock Resources of the Levant

Peer reviewed

Brine and Mineral Evolution of the Railroad Valley Evaporite Deposits

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The Professional Geologist

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Description: ***Iguazu Falls: Devil's Throat*** – Iguazu Falls, one of the largest falls in the world, is located on the Iguazu River along the border between Argentina and Brazil. Iguazu Falls is spectacular and composed of over 200 individual falls. It should be viewed from both sides of the river as each side has unique vantage points. The falls are due to the presence of Lower Cretaceous basaltic lava flows, 125-100 million years ago, which spread over more than one million square kilometers with a thickness of up to 1,500 meters. More recent river erosion along structural features in the basalt have created the falls and cut the narrow canyon called Devil's Throat.

*Photograph by **Guy A. Swenson, III, CPG-7574**, AIPG Northeast Section, 2024.*
2024 Photo Contest: Scenic Wonder - Grand Scale Landscape. Runner Up on page 50.

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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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Progress is being made…

Adam W. Heft, CPG-10265

Greetings once again! I can't believe how fast this year is disappearing. The National Conference in Durango has come and gone, and the holidays are right around the corner. This edition of *The Professional Geologist* represents my sixteenth, and the last of my second elected term. You will see a variety of content, including a peer review article on the Railroad Valley Evaporite Deposits, information on the National Conference and our annual award winners, an ECP spotlight, an article on the geologic influences on natural resources in the Levant, and more. Be sure to check out the photos from the National Conference and read the award acceptance text to get a feel for who our organization is honoring and what they have been doing.

The theme of my most recent column was "To Err is Human…" and to follow up on that, I'll share a discovery I made early this year regarding our annual elections. As I said, this has been my second year of my second term, and there was supposed to be an election for the Editor for the next two-year term. But during a review of our National Bylaws, I made a discovery that the Editor position was to be elected during the odd numbered years, not the even. Looking into why we were off schedule, I found that the issue stemmed from when one of our previous Editors had stepped down from the position in the middle of the term. Consequently, the Executive Committee at the time decided to have an election the following year, and this put us off schedule. I brought this to the attention of our President, **Shanna Schmitt**, and pointed out that we were technically in violation of the Bylaws. So, to correct the problem, I was appointed to serve one additional year (2025) to put us back on the correct schedule for elections. So, I will continue to have the privilege to serve on the Executive Committee as your Editor for another year.

I have been working diligently to bring improvements to our publication. One thing you will notice is that there have been more ads in the recent editions. This is because I've been actively seeking out potential advertisers with a goal to make *TPG* cost neutral. Since the cost of these ads have been substantially reduced, we have been having more success in securing them. If you know of a company that might be interested or would benefit from placing an ad in *TPG*, please put them in contact with me to discuss options. Another thing you will notice is the promotion of AIPG as "The Gold Standard in Geoscience Professionalism". The credit for this promotion belongs to **Sara Pearson**, our 2025 President. I think with her vision and dedication to AIPG, we can expect great things to happen under her leadership.

Something you won't have noticed by perusing *TPG* is that as a result of the recent call for volunteers to serve as Associate Editors, we have had an unprecedented positive response. People were coming out of the woodwork for several days after that email went out. We now have more than 20 individuals with a wide range of specialty fields of practice to help with peer reviews of technical articles. My sincere thanks to all who stepped up and volunteered their time to help. The first request I had of them was to ask that they help by contacting people in their networks to consider submitting articles for publication. This is needed to help fill our pipeline of articles with the goal of increasing the number of submissions for peer review. As a result of that request, I had several individuals say they would do so (and had possible leads), and one who would submit an article himself! That article will appear in the next edition.

Remember that the next issue of *TPG* will be our annual Student Edition. As always, we are in need of articles, opinion pieces, and Tales from the Field; anything geared towards students or that may help our students finish their academic careers or enter the profession. Of course, we would like to see more writing from students. Additionally, articles for this edition are not required to be student-focused. The deadline for the student edition articles is November 1st; please consider submitting something!

Having been a CPG for 25 years, I occasionally look back at our organization and see some of the things we have done in the past. This looking back has prompted me to bring back the practice of publishing the names of new members and applicants for membership. Receiving the Certified Professional Geologist (CPG) credential is a significant and prestigious accomplishment in our profession. We believe it's important to welcome and celebrate these achievements, sharing them with colleagues across the organization. By doing so, we recognize the hard work and dedication of our members, while also striving to foster a strong sense of community and professional pride within AIPG.

In this same vein, I realized that it has been many years since we last published a membership directory. Yes, we have an online directory, but it is not always easy to find someone you may be looking for. Also, it is not conducive to scanning the membership to see who you know. To this end, I've decided to include in the upcoming Student Edition (and each Student Edition going forward) a listing of all members. This will be a list by Section and will include only an individual's name and member number. No contact information will be included. The list must also be subject to a specific "Opt-in" by members. By the time you read this, an email will have been sent out requesting you to respond and give your permission to be included on this list. I encourage you to participate in this effort to show that YOU are a part of the gold standard of geoscience professionalism!

Dear Editor,

I read Isaac Pope's article in the April, May, June issue of *TPG*. I called Cristie Valero to make some comments, and she suggested that I should contact you.

Isaacs' article was interesting, but he has confused petrology with petrography. He is describing petrography, which is the systematic identification of the minerals that make up a rock sample and identifying the rock. This is mostly done with transmitted light through the thin section, viewed with the optical or petrographic microscope.

The other technique used by petrographers is reflected light microscopy. This is done by making polished sections and identifying the minerals that are present by their light reflectance and habit and classifying the sample. This is mostly done on metallic minerals, determining the composition on multi metal ore samples. It is also used to determine coal macerals, mostly on anthracite coals.

Petrology on the other hand is to use the petrographic, chemical, and stratigraphic relationships to the study of how a rock complex is related to each other within a geologic province, and the attempt to understand its origin, place, and relationship to the province.

This is not meant as a criticism, only a slight clarification.

Best regards,

Harald Hoegberg, CPG-08263

Editor

The Professional Geologist

Comment regarding "Some Common Misconceptions About Groundwater" by Barney Popkin, *TPG* Jul-Sep 2024

Upon reading Barney Popkin's list of misconceptions, I initially thought it might be prefaced with "Which one of these is not like the others?" The first misconception stands out in particular, as it appears reversed in meaning. I'll address this misconception below.

However, a couple of terminology clarifications are needed: The term "transmissibility" has largely been replaced by the more precise "transmissivity" (see Lohman, 1972a). Additionally, "isometric" (Misconception 5) refers to a type of exercise, whereas the correct term in this context is "isotropic," a condition where aquifer properties are independent of measurement direction.

Regarding Popkin's Misconception 1:

He challenges the common assumption that hydraulic parameters and conditions are good predictors of groundwater availability, suggesting instead that safe yield, storage capacity, and saturated aquifer volume are better predictors. Assuming this, as written, is what was intended, I offer the following critique.

First, hydraulic conductivity, transmissivity, and storage are indeed the fundamental parameters for understanding groundwater flow and availability. These physical properties, susceptible to measurement through tools of our profession (i.e., mapping, logging, testing), are incorporated into conceptual and mathematical models of groundwater flow, an essential process for predicting (more accurately, estimating) groundwater availability.

Second, while concepts like safe yield, storage capacity, and saturated aquifer volume can provide some insight, they are only marginally physical properties susceptible to direct measurement. Moreover, these concepts, particularly "safe yield," are ill-defined and therefore problematic. The notion that safe yield, for example, is equated to aquifer recharge is a myth that has been repeatedly debunked (see e.g., Bredehoeft, 1997; Sophocleous, 1998), yet, like a whack-a-mole, this myth continues to pop up in defiance of rational analysis.

Theis' seminal 1940 paper, "The Source of Water Derived From Wells", articulated the basic principles necessary for determining the sustainability of groundwater pumping. Konikow and Leake (2014) opined that Theis' paper should be mandatory reading for all groundwater professionals, to which I add, especially for those who still cling to the outdated concept of safe yield.

Lohman (1972b) stated that safe yield should be redefined as the amount of groundwater withdrawals that can be sustained without getting into trouble. Lohman's simple construct emphasizes the complexity of system understanding required, including hydraulic parameters and aquifer conditions, and also economics, water quality, water rights, competing uses, and the environment.

Sincerely,

John J. Ward, RG, CPG-06729

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Honoring Excellence in Geoscience 2024

The American Institute of Professional Geologists (AIPG) has a long-standing tradition of excellence and dedication to the geosciences. Since its inception in 1963, AIPG has championed the crucial role that professional geologists play in navigating the complexities of our ever-evolving world. From resource exploration, development, and management to public health and environmental protection, geoscientists are at the forefront of addressing the challenges of today and tomorrow.

In an organization as dynamic as AIPG, identifying a select few for special recognition is no small feat. The Honors and Awards Program seeks to acknowledge those who have gone above and beyond in their contributions to the profession, the Institute, and society at large. This responsibility lies with the Honors and Awards Committee, who ensure the process remains accessible and thorough, making sure that the most deserving individuals are recognized.

Currently, AIPG bestows seven prestigious honors:

- **Ben H. Parker Memorial Distinguished Service Medal**
- **Martin Van Couvering Memorial Service to the Institute Award**
- **John T. Galey, Sr. Memorial Public Service Medal**
- **Award of Honorary Membership**
- **Outstanding Achievement Award**
- **John Stewart Memorial Early Career Professional Award**
- **Presidential Certificate of Merit**

Each award reflects the diverse ways in which geoscientists contribute to their field, whether through service to the Institute, public outreach, early career achievements, or outstanding professional accomplishments. Descriptions of these awards, along with past recipients and nomination forms, can be found on the AIPG National website. Alternatively, you can contact the AIPG National Headquarters for more information.

This year, the Honors and Awards Committee led by National Vice President, **Todd McFarland**, CPG-11348 has selected a group of remarkable leaders who have shown unwavering commitment to advancing the geosciences and supporting the AIPG mission. We extend our heartfelt congratulations to all the honorees featured on the following pages.

Looking ahead to 2025, nominations are now open online and by mail through January 15, 2025. Detailed instructions for submitting nominations for both national and section leadership awards can be found on pages 32 and 33 of this edition of *The Professional Geologist.*

As you renew your dues this year, please take a moment to reflect on the colleagues who have made a significant impact on our profession. Consider nominating them for one of these prestigious awards. Geoscientists are making a difference every day—advancing our understanding of the earth, protecting the environment, and finding innovative solutions to global challenges. We look forward to celebrating their achievements in 2025, as these members exemplify the gold standard of professionalism that AIPG represents.

Let's continue to honor those who are driving our profession forward.

Thank you to our Awards Committee members: Todd McFarland, David M. Abbott, Jr, CPG-04570, Amy Hoeksema, CPG-08902, Anne Murray, CPG-11645, and Matt Rhoades, CPG-07837.



BEN H. PARKER MEMORIAL DISTINGUISHED SERVICE MEDAL

Lawrence M. Austin

CPG-5181

Michigan Section



The Ben H. Parker Memorial Distinguished Service Medal is the Institute's most distinguished award. It was established by the Executive Committee in 1969 in posthumous honor of a truly great leader, who devoted much of his life to improve the quality of geology and geologists and the services they provide. The medal is awarded to individuals who have long records of distinguished and outstanding service to the profession.

Stunned, absolutely stunned by this award. I've always thought what I was doing was simply a task that needed to be done, and I was pleased to be of service to the Institute. So yes, I am stunned by this award.

That being the case, there are a couple of people I need to thank for all they've done that has pushed me to this podium. Let's see here, where do we start. Ok, I've only got 5 minutes so let me summarize. I have to thank my wife Mary for 44 years of marriage plus another 5, in all 49 years, putting up with my shenanigans. I have to thank my daughter and son and their respective better halves and I imagine it won't be long before my granddaughter will also be rolling her eyes. Heaven knows I've dragged them into enough caves, quarries, mines, road cuts, lakes, reefs, streams and wetlands over the years.

I also have to thank more than a few people at AIPG. Wendy Davidson, Bill Siok, Aaron Johnson, Barb Murphy, David Abbott, Ron Wallace, Charles Dimmick, Cathy Duran and Dorothy Combs. I've had the pleasure of working with Wendy since I began coming to National meetings about 35 years ago and Bill, Aaron, David, Charles, Ron and Barb have been of immense counsel over the years. Cathy and more recently Dorothy have also done their best to keep me out of trouble. Considering that I'm still above ground, outside the gray bars, and my name wasn't in the obituaries this morning means two things. It's been a great day and these wonderful people must be succeeding in that endeavor. Further, all the members, past and present, of the Section and National Screening Committees. These people have been both the gatekeepers and the driving force that brings in new members. And, realistically, that means all of Institute's members who have worked with me and encouraged me. So perhaps this scroll should be another 10 feet longer.

In the process, I've had the pleasure to meet and work with a lot more people in the Institute and industry than I ever expected and have come to appreciate them for their individual viewpoints and counsel. I know it made a better person of me and I hope my contributions have helped others as well. So in that same vein, let me try to pay this forward with a few words of encouragement of my own for those present and those reading these comments.

Talk with the people around you, in the office at AIPG, or within your Section. See if there's a niche you can fill, be it leadership, editing, coordinating, reviewing, screening, whatever. We all have areas within which we personally excel yet require little effort on our part. Can you help a student chapter get organized or maintain its momentum? Would you like to screen applications? Organize a field trip? Arrange a meeting? Write for *TPG*? Create a webinar? Edit a newsletter? There are endless ways in which you can be of assistance and the Sections and National will certainly appreciate the help.

In closing, if you will allow me to further mutilate an oft quoted statement from President John F. Kennedy, "Ask not what your Institute can do for you, rather ask what you can do for your Institute." You'll be eternally glad you did.

Thank you all most sincerely.



From left: Bill Mitchell, CPG-10486; Larry Austin, CPG- 5181; Sara Pearson, CPG-10650; Donovan Vitale, SA-11158; Stephanie Austin Redding, Mary Austin, Evie Redding, Dan Redding, and Adam Heft, CPG-10265.



Sara K. Pearson
CPG-10650
Michigan Section

The Martin Van Couvering Memorial Service to the Institute Award was established by the Executive Committee in 1979 in posthumous honor of the first president of the Institute. Martin Van Couvering made the presidency a full-time occupation for the first two years of the Institute's history. His dynamic leadership, diplomacy, and organizational abilities established the solid foundation from which the Institute has grown. Few, if any, have given so much to the Institute.

I am deeply honored and humbled to receive the Martin Van Couvering Award for service to the American Institute of Professional Geologists (AIPG). To be recognized in this way by my peers and an organization I hold in such high esteem is truly an honor. As I reflect on my journey in the geosciences, I am reminded of our profession's profound impact on the world around us and the critical role that each of us plays in advancing knowledge, protecting the environment, and safeguarding human health.

Throughout my 30+ years as a hydrogeologist, I have seen firsthand the importance and value of the work that geoscientists do. We are the stewards of the Earth's resources, the protectors of public health, and the educators who help the public understand the complex and dynamic processes that shape our world. From identifying critical water resources to mitigating the impacts of natural disasters, our work is essential to the well-being of society and the sustainability of the planet.

However, we must also acknowledge the challenges that our profession faces. We have all seen the statistics—fewer students are choosing to study geosciences, and programs across the globe are being shuttered. This decline comes at a time when the need for geoscientific expertise has never been greater. Society's rejection of science in favor of misinformation and skepticism is a troubling trend, particularly when we have made so many advances in technology that allow us to gain a greater understanding of the Earth, its processes, and the intersection of those processes with human activities.

Remediation and management of risks to prevent exposure to hazardous substances released to the environment like per- and polyfluoroalkyl substances (PFAS) are an example. Additionally, geoscientists play a vital role in the mitigation of impacts from geohazards including identifying early warning signs and preventive measures, yet our expertise is often undervalued or overlooked. We must continue to advocate for the importance of our work and educate the public about the vital contributions that geoscientists make to society. This is one of the many reasons why I am so passionate about serving AIPG and why I have been a dedicated member for 25 years to this organization.

AIPG is an institution that embodies the values of competence, integrity, and ethics—values that align closely with my own personal and professional beliefs. AIPG's work to promote and advocate for geosciences is critical, and I am proud to be part of this mission. My goals have always been to promote the geosciences, educate the public, protect public health, and understand our Earth, its processes, and how we can manage our resources responsibly and sustainably. It is through AIPG that we can continue to advance these goals and ensure that geosciences remain a vibrant and respected field.

As I accept this award, I am reminded of the many Certified Professional Geologists (CPGs) who have received this honor before me, including my husband, Adam Heft. The legacy of service and dedication that this award represents is deeply meaningful to me, and I am proud to stand amongst those who have contributed so much to our profession. Martin Van Couvering, the first president of AIPG, had a vision for an organization that would promote the highest standards of professionalism in the geosciences. His vision became a reality in 1963, and it is an honor to carry forward his legacy.

My service to AIPG has spanned many roles, from my involvement in the Michigan Section to my work at the national level. Each of these roles has allowed me to contribute to the promotion of our science, build partnerships, and enhance the knowledge and expertise of professionals in our field. As the current national president-elect, I am excited to continue this work and serve the Institute in its highest leadership position as president next year. I look forward to focusing on promoting our members, the profession and the Institute, ensuring that AIPG remains a strong and influential voice in the geosciences community. Together, we can continue to advance the geosciences, protect public health and our environment, and inspire the next generation of geoscientists.

Let us go forward with determination and optimism, knowing that the work we do makes a difference and that the future of the geosciences is bright.

John T. Galey, Sr. Memorial Public Service Award

John D. Sorrell
CPG-11366
New Mexico Section



The American Institute of Professional Geologists' Public Service Award was established by the Executive Committee in 1982 in recognition of one of its primary purposes: service to the public. In 1992, it was renamed the John T. Galey, Sr., Memorial Public Service Award, in posthumous honor of our fourth President, whose long professional career was a continuum of service to both the geological and the general public.

I am a geologist working in the Land of Enchantment and have been doing so since graduating from New Mexico Institute of Mining and Technology in the fall of 1978.

In 1980, I was thrilled to go to work for a Certified Professional Geologist, Mr. Glenn Hammock, with a notable engineering company here in Albuquerque, New Mexico. In the nearly four years I spent under his mentorship, I was blessed with great field experiences and established relationships with many geologists, earth scientists, and public representatives. I became aware of his association with the American Institute of Professional Geologists, as he was involved with the New Mexico Section at that time.

Employed by architectural and engineering firms in my early days taught me to focus on fiscal responsibility and the importance of promoting safety in the field. Water resource development was my primary responsibility while working on large-diameter, deep-water well drilling and completion projects for the City of Albuquerque and Los Alamos. My mentors at that time also began to educate me about the importance of professionalism, education, and how to define and maintain ethical conduct.

As I continued my career with the Department of Interior, Bureau of Indian Affairs in 1989, I was tasked with conducting geologic interpretations of groundwater characterizations for Native American Water Rights litigation. In 1998, I was asked to work with the Pueblo of Isleta to develop a water resource development and protection program. During these twenty years of integrating several different tribal initiatives and goals, I was rewarded with many wonderful interpersonal relationships with native American ranchers, farmers, and tradesfolk.

Through these years, fellow scientists repeatedly encouraged me to apply for membership in AIPG. Although I had been interested in becoming a member for many years, I did not apply until 2010.

For me personally, the value of membership was about building confidence. Slowly I got involved with the NM Section and was gratified that my contributions were welcome. This gave me incentive to continue and start developing rewarding relationships and opportunities to participate with others interested in geology and those folks in my discipline that were not directly related to work, which I found extremely fulfilling!

> ***During these twenty years of integrating several different tribal initiatives and goals, I was rewarded with many wonderful interpersonal relationships with native American ranchers, farmers, and tradesfolk.***



President Shanna Schmitt and John Sorrell at the National Conference Honors and Awards Banquet.

Outstanding Achievement Award

MAJOR CONTRIBUTION TO THE PROFESSION



Nicolaus Zentner

Professor teaching geology at Central Washington University.

The Outstanding Achievement Award Major Contribution to the Profession was established by the 1989 Executive Committee to honor a non-member of AIPG who is widely recognized as a major contributor to the profession of geology. The award is not necessarily given annually, but only when the Awards Committee recommends an outstanding candidate to the Executive Committee for their consideration.

Since 2020, I have been making geology videos on YouTube – and I have broken through to a wide audience worldwide. At first, I thought the popularity of the field trips, interviews, and classroom discussions were due primarily to the unusual circumstances of the worldwide pandemic. But the restrictions have lifted, and yet the geology videos continue to be wildly popular. And so…. I am proud to report that a diverse audience is willing and able to participate as an online community as we learn new things together. It is fun, uplifting, and energizing. Geologists and non-geologists are all watching and contributing together – it is a beautiful thing.

This award is meaningful – thank you.

SECTION LEADERSHIP

The AIPG Section Leadership Award was established by the Executive Committee in 2013 to recognize one or more of our members who have demonstrated a long-term commitment and have been long-term contributors to AIPG at the section level.



William C. Aley, IV, PG, MEM-2855, *Florida Section*

Since 2017, Bill has been a key member and leader of FAPG (Florida Section of AIPG). For the past several years, Bill has been a Board Member providing valued leadership on legislative matters, public outreach, and newsletter material. As Editor, Bill has revived our newsletters to membership with excellent material and it has proven to be a catalyst for positive momentum in outreach, in particular with legislative matters.

Bill has been the Editor of FAPG since 2019 and propelled the group forward with heightened visibility through the newsletters which have reached thousands of readers. Previously, the newsletter effort had stagnated. Bill single-handedly revived it, gathering great material giving FAPG something great to talk about to all. Critical to our legislative agenda as we have handed them out to lawmakers and fellow technical organizations garnering support. Bill is an excellent writer and accomplished Geologist in Florida, and it shows in his work.

FAPG would NOT be where it is without Bill. Besides the Editor work described above, Bill is an outstanding Geologist (PG) and member of AIPG. His specialty is Marine/Coastal Geology providing valuable technical support on dredging and sediment management projects across the State. He now an established leader in the USACE Geosystems Branch in Jacksonville and Co-Chair of the Groundwater Working Committee.

Nominated by: Clint Noble, MEM-1938

Jessica Davey-Cutter, MEM-3242, *Colorado Section*



Jessica has single-handedly kept the Colorado section alive and thriving. Her dedication to the Chapter, and AIPG as a whole, is both impressive and encouraging. We would not be where we are without her.

Nominated by: Andrew T. Jones, MEM-3347

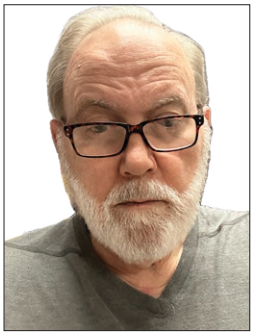


David M. Follett, CPG-12034, *Ohio Section*

Dave Follett became a member of AIPG in 2018. In 2019, he began serving on the Ohio Section's Executive Committee in the elected position of a Member-At-Large. He then moved into the elected positions of Treasurer followed by President-Elect and President of the Section. Currently, Dave serves as both Past-President and President-Elect for 2024. As Treasurer, Dave managed the finances for the Section as well as the registration for all of our quarterly events and our charity golf scramble. In addition, as Treasurer Dave has led the Section's annual advertising/sponsorship campaign and sponsor campaign for our annual charity golf scramble, which raises money for our Student Chapters. Under his leadership, the Section regularly increased the monies raised during both of these campaigns. During Dave's leadership as President, the Section successfully migrated from our existing website to StarChapter. Dave has also agreed to serve as President in 2025 after serving in the same position in 2023. All of these are demonstrated leadership qualities. Further, during Dave's tenure on the Executive Committee, he has continued to demonstrate his experience and leadership capabilities in his career as a geologist. Between 2018 and 2022, Dave grew as a leader in the Columbus Office of Civil & Environmental Consultants, Inc. through taking over Leadership of the Waste Management Practice and serving as the Office Safety Leader. In 2023, Dave accepted a position with WIN Waste Innovations as an Environmental Compliance Manager, where he provides oversight for all their Ohio operations. For his demonstrated leadership to the Ohio Section and leadership in his career as a geologist, we recommend Dave Follett for a 2024 AIPG Section Leadership Award.

Nominated by: Robert Andrews, CPG-11975 and Brent Smith, CPG-11130

Thomas A. Herbert, PhD, PG, CPG-2551, *Florida Section*



Dr. Herbert has been a leader of the geologic profession in Florida for several decades. He is a licensed professional geologist in Florida (PG # 5) and eight other states. Tom has more than 50 years of field experience in all phases of geology.

Many consider Tom to be the father of geologic licensure in Florida. There was a clear need for licensure and Tom's efforts resulted in a draft bill and final approval by the Florida legislature. Licensure has contributed to improving the stature of the geologic profession and advanced the quality of geologic practice in Florida. Tom was appointed to the first Board of Professional Geology by Governor Bob Martinez. He became the first chair in 1987 and remained an influential member of the Florida Board of Professional Geologists through 1995. His leadership was instrumental in establishing the rigor of our profession and our professional culture in Florida.

Tom's professional affiliations and assignments include: Member of the AIPG and Certified Professional Geologist for over 50 years Member European Federation of Geologists President: Florida Chapter, AIPG (1984-1986) Founding Member and first President of the FAPG (1996-1998) Member, Geological Society of America Member, Society of Mining, Metallurgy, and Exploration, Galey Award in 2018 for National Public Service Award from the AIPG

Nominated by: Wllliam C. Aley, IV, PG, MEM-2855

SECTION LEADERSHIP



Donald K. Lumm, CPG-8987, *Kentucky Section*

Donald "Donnie" K. Lumm (CPG-08987) is a dedicated leader of the Kentucky Section, having just finished serving as President, for his 4th term since 2005. In past years he has served as Vice President, Treasurer, and Secretary, and is the main driving force for visiting geoscience departments in Kentucky both to recruit student members and to share the AIPG story and purpose. He is a leader who insists on accountability for himself and for others. No doubt the National office is aware of Donnie's involvement in the organization of the 2023 annual meeting in Covington, both his representation of the Kentucky Section as well as his determination in co-leading two field trips. He has an uncompromising interest in the success of AIPG.

Nominated by: John T. Popp, CPG-6724

Presidential Certificates of Merit



R. Douglas Bartlett, CPG-8433
Arizona Section

Recognized for his dedication and persistence in chairing the 2024 annual AIPG conference.

Douglas C. Peters, CPG-8274
Colorado Section



Recognized for his dedication, time, and energy in planning the 2024 Annual AIPG Conference.



Brigitte M. Petras, ECP-0851
Ohio Section

*Recognized for her outstanding work in creating many webinars with great content for early career professionals and students, her insightful contributions to the Executive Committee, and her consistently interesting **TPG** columns.*

Anna Sutton, MEM-2528
Illinois/Indiana Section



Recognized for her dedication and continued leadership of the AIPG ad hoc Diversity, Equity, and Inclusion Committee.



Donovan Vitale, SA-11158, Chapter President
(pictured front, left with chapter members on a cave field trip)



WMU Student Chapter at The Cliffs of Moher, Ireland.

Congratulations to Western Michigan University's (WMU) AIPG Student Chapter on being awarded the prestigious Student Chapter of the Year for the second year in a row! They along with the support of their outstanding WMU staff advisor, Tom Howe, SA-5050 have demonstrated dedication to growing geoscience education and engagement. From the weekly meetings and innovative committee work to successful outreach efforts like Bronco Bash and Waldo Fest, it's clear that the student's passion for geology is making a meaningful impact both on campus and beyond.

The following paragraphs are excerpts from WMU's report.

Interactions with Professional Geologists and AIPG

At the beginning of the year, we were fortunate enough to have AIPG's support in sending Gabe Fox (Vice President) to the 2023 AIPG 60th Anniversary National Conference. The conference was a great opportunity for Gabe to network with AIPG members, learn about the geologic industry outside of academia, and attend various conference field trips.

In February, two club members and our club advisor went to the Tucson Rock and Gem Show. This endeavor served two valuable purposes. First, it was a great opportunity to interface and network with other geologic professionals that attended the show. Second, it was an opportunity to invest some of the funds we had acquired in the first semester in new materials that could be sold for a profit.

The AIPG ECP meetings have also served as an invaluable opportunity for gaining insight into the professional community and networking with other student chapters. We have attended all the AIPG Michigan Section ECP meetings this year and we greatly value the time and effort that Sienna Meekhof puts into organizing meetings, conveying upcoming opportunities, and her general support. From networking with other student chapters, we had the chance to meet up with the Eastern Michigan University Chapter. During our meet up, we toured Rood Hall and discussed our successes and struggles in effectively operating AIPG student chapters.

To further gain industry insights and enhance networking, we have hosted three speakers from a variety of fields. Sienna Meekhof from Soil and Materials Engineers, Inc. talked to us about engineering geology, Pablo Mora from EGLE talked about the environmental engineering field, and Matt Kirby from California State talked about Paleolimnology and climate change during WMU's Climate Change- Spring into Action Week. Each speaker serves as an opportunity to build valuable, professional connections and gain a better understanding of what a career in the geologic industry may look like.

Activities in Our Community

This year, the AIPG Student Chapter of Western Michigan University has continued to build upon our educational outreach program. Knowing geology is heavily based on experiential learning and collaboration, we believe educational outreach serves to introduce and inspire a new and diverse generation of future geologists.

So far, we have done events with the Children's Nature Playscape, Potage Northern Middle School, Portage West Middle School, and the Air Zoo. Our educational efforts have reached over 400 K-12 students this academic year alone, with several more events on the books.

In early November 2023, 200+ middle school students came to WMU for a STEM Day field trip. When students arrive at the geology department, we ask them questions to see what they already know about geology and what they think geology is. Students are also asked about their

desired career paths and explained how geology may play a role. Many students are surprised to learn geology plays an influential role in the cosmetics, construction, and technology industries. We show a slideshow presentation intermingled with hands-on activities pertaining to Michigan's unique geology, the three rock types, and hydrogeology. We allow the students to dig for rocks and fossils in a sandbox and use magnifying glasses and their newly acquired geologic knowledge to figure out what type of specimen they have. The WMU AIPG Student Chapter aims to spark scientific intrigue and give students the basic knowledge and materials to become future geologists when they leave.

Upcoming educational outreach events include Dino World Live and STEM Day for the Boys Scouts of America. Set in mid-April, Dino World Live is performing a show on WMU's campus. The event is a massive puppet/animatronic show that brings dinosaurs to life. We will be attending the event and hosting a fossils education session before the event begins. Attendees will have the opportunity to get hands-on experience with fossil identification as well as the opportunity to interact with our student members and ask any dinosaur or geology related questions. In fall of 2024, the WMU AIPG Student Chapter will be participating in WMU's Boy Scouts of America STEM Day. The Student Chapter will be formulating the events and resources needed for scouts to obtain their Geology Merit Badges!

Another successful community outreach event that the Student Chapter participated in was supervising the Geologic Mapping, Fossils, and Dynamic Earth events for the Regional Science Olympiad Competition. The Geologic Mapping event tested the students' ability to interpret geologic maps meaningfully and accurately. The Fossils event tested the students' ability to identify various fossilized organisms and their methods of fossilization. The Dynamic Earth event tested students' understanding of geologic processes. Our chapter member volunteers proctored and scored the event. This event took place on March 16th on WMU's main campus and included more than 45 middle schools and high schools in the region. The chapter will also be hosting the Statewide finals event in May of 2024.

Unrelated to our efforts of expanding geologic intrigue in K-12 students, the WMU Student Chapter has made quite a splash in the Kalamazoo Trivia community. In the spring semester, we started attending weekly trivia at Shakespeare's Pub as a team bonding activity. As The Geolofreaks (our trivia alias) we have won first place five times! Trivia has served as a fun bonding event that members look forward to each week!

Congratulations to Student Chapter of the Year Runners Up!

Eastern Michigan University

Wayne State University



Brine and Mineral Evolution of the Railroad Valley Evaporite Deposits

Curtis P. Kortemeier, CPG-12180 and Vincent R. Ramirez

Abstract

Sedimentary rocks of the Crows Nest Sequences in Railroad Valley, eastern Nevada, host a zoned series of playa evaporites. The chemical-sedimentary zoning comprises Carbonate Bank, Mud Flat and Salt Pan facies. Evaporation is the driving process precipitating early, distal dolomite and calcite forming the Carbonate Bank. The Mud Flat is dominated by sedimentation of clays (both authigenic and clastic) with pirssonite and accessory northupite and tychite. Textures suggest that these species form as bottom growths with concurrent sedimentation and precipitation. The Mud Flat facies grades into the Salt Pan facies with an increase in salt deposition. Continued evaporation leads to the deposition of trona ($Na_2CO_3 \cdot NaHCO_3 \cdot 2H_2O$) in the Salt Pan facies as the system is depleted in calcium and magnesium ions and simultaneously enriched in sodium. Burkeite and thenardite are precipitated as the system becomes depleted in carbonate ions. Trona, sodium sulfates, borates, and lithium are present in potentially economic quantities. Residual brines are not enriched in potassium, possibly due to microbially aided illitization of smectite. Salts of the Middle Zone Crows Nest -Sequences are cyclic, showing evidence of alternating evaporation and fresh(er) water inputs. Over time the system continued to evolve with the conservation of sulfate (and chloride) as the sodium salts of these anions are the most soluble. The stratigraphically upper salts are characterized by the highest sulfate values, as thenardite.

Introduction

3PL Operating Inc.'s (3PL) Railroad Valley Project is in Northern Nye County approximately 60 miles southwest of Ely, Nevada and 100 miles east of Tonopah, Nevada (Figure 1). The approximately 2,000-foot-thick sequence of Playa sediments contain substantial amounts of evaporites with economic potential.

Railroad Valley is well-known as home to Nevada's largest producing oil fields. Oil was discovered in 1954 and 46 million barrels have been produced, primarily from three fields. There are 293 total oil wells, of which 100 have been producers. Oil accumulations on the east side of the valley are in faulted slivers along the along the range front, in Paleozoic and Eocene strata at 6,000-foot depths. A single well in the Grant Canyon field has produced 9.5 million barrels of oil, at sustained rates of 4,100 barrels per day (Hess and others. 2011). Oil accumulated on the west side of the valley is trapped stratigraphically in porous facies of volcanic air fall tuffs at 2,000-foot depths. A prominent anticline in the center of the valley yields small production from a single well. The source of the oil is from Eocene and Mississippian shales, and the oil produced is 30 gravity API, though 50% waxy, and solid at room temperature. Connate water in the producing zones is very fresh, and unrelated to the brine deposits in the Pliocene sequences.

The informally named Crows Nest Sequences have been divided into 22 members (Personal Communication, Loomis, 2023). Four of those members host bedded salt deposits which are the focus of this paper.

Since 2017 3PL has drilled three wells comprising over 6,000

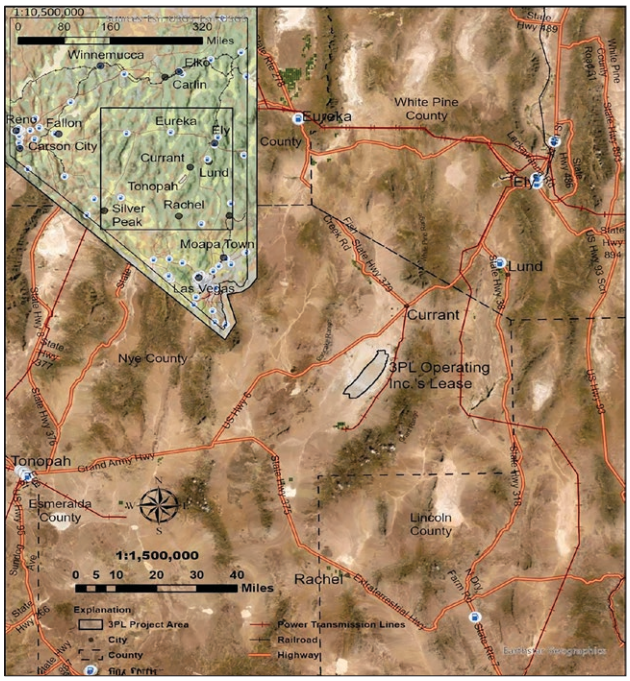


Figure 1. Location of the Railroad Valley Playa showing 3PL Operating Inc.'s approximate claim boundary.

feet of core and cuttings. Physical rock samples have been augmented by extensive down-hole geophysical logs. Seventy -eight sidewall percussion cores were obtained in areas of core-loss. The sidewall cores have been analyzed by X-ray diffraction and a second split was analyzed by ICP-MS for multiple elements. Figure 2 is a simplified block diagram of the Railroad Valley Playa It illustrates the geologic setting and shows the locations of two of 3PL's wells.

Evaporite Beds

Formation of evaporitic deposits within the Crows Nest Sequences in Railroad Valley is the result of the cyclic alternation of clastic input carried by chemically dilute meteoric water followed by evaporation. During wet periods the influx of water carrying a load of fine-grained clastic material exceeds evaporation and recharges the system. During dry periods, mass loss of water is greater than inflows. The liquids of the playa evolve and meet chemical divides (Olson and Lowenstein, 2021; Hardie and Eugster,1970). This evolution has led to the development of three chemical-sedimentary facies recognized at Railroad Valley: Carbonate Bank, Mud Flat, and Salt Pan (Figure 2). These are loosely correlative to the Carbonate, Transition Zone, and Nucleus of Munk (2021).

Within the playa, over 20 minerals have been recognized by X-ray diffraction analyses. Their distributions are intimately related to playa recharge and evaporation. Their genesis may be clastic in-wash, evaporative, or through diagenetic alteration of precursor minerals as fluid chemistry changes due to evaporation (Table 1).

Four members in the Middle Zone of the Crows Nest Sequences (Crows Nest) host salting-upward evaporitic sequences of economic interest at Railroad Valley (Figure 3).

Member C Salts

From 1,890 feet below surface to 1,770 feet below surface Member C of the Crows Nest exhibits five salting-upward evaporitic sequences containing up to 81% trona (based on X-ray diffraction analyses). This sequence is known from cuttings, sidewall percussion cores, and from its unique electric log signature.

Member E Salts

From 1,630 to 1,605 feet below surface, Member E of the Crows Nest exhibits a partial retrogradational cycle (increasing freshwater component) followed by a partial progradational or evaporitic cycle. These cycles (where intercepted in well Li 10-28) did not reach the point at which significant trona was deposited but are much richer in

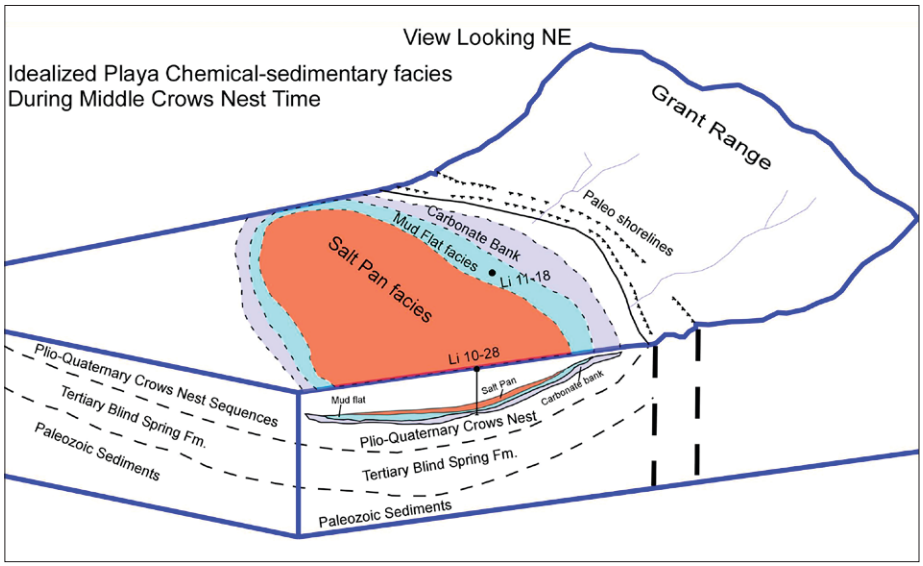


Figure 2. Schematic block diagram of Railroad Valley showing stylized facies for the Middle Zone of the Crows Nest Sequences.

Table 1 - Evaporite and Associated Minerals of the Middle Zone Crows Nest Sequences

Mineral Name	Chemical Formula	Probable Origin
Calcite	$CaCO_3$	Evaporite
Dolomite	$CaMg(CO_3)_2$	Evaporite
Magnesite	$MgCO_3$	Diagenetic/Alteration
Pirssonite	$Na_2Ca(CO_3)_2 \bullet 2H_2O$	Evaporite
Gaylussite	$Na_2Ca(CO_3)_2 \bullet 5H_2O$	Evaporite
Northupite	$Na_3Mg(CO_3)_2Cl$	Authigenic
Tychite	$Na_6Mg_2(SO_4)(CO_3)_4$	Authigenic
Trona	$Na_3(CO_3)(HCO_3) \bullet 2H_2O$	Evaporite
Nahcolite	$NaHCO_3$	Evaporite
Natron	$Na_2CO_3 \bullet 10H_2O$	Diagenetic/Alteration
Thermonatrite	$Na_2CO_3 \bullet H_2O$	Diagenetic/Alteration
Burkeite	$Na_4(SO_4)(CO_3)$	Evaporite
Thenardite	Na_4SO_4	Evaporite
Halite	NaCl	Evaporite
Searlesite	$NaBSi_2O_5(OH)_2$	Evaporite
Ulexite	$NaCa[B_5O_6(OH)_6] \bullet 5H_2O$	Evaporite
Smectite	$X_{.3} \cdot nH_2O\ [(Al_{1.5}Fe^{3+}{}_{.2}Mg_{.3})Si_4O_{10}(OH)_2]^{-.3}$	Clastic/Diagenetic
Mixed Layer Illite-Smectite		Diagenetic/Alteration
Mixed Layer Illite-Vermiculite		Diagenetic/Alteration
Illite	$K_{0.6\text{-}0.85}(Al,Mg)_2(Si,Al)_4O_{10}(OH)_2$	Diagenetic/Alteration
Analcime	$NaAlSi_2O_6 \cdot H_2O$	Diagenetic/Alteration

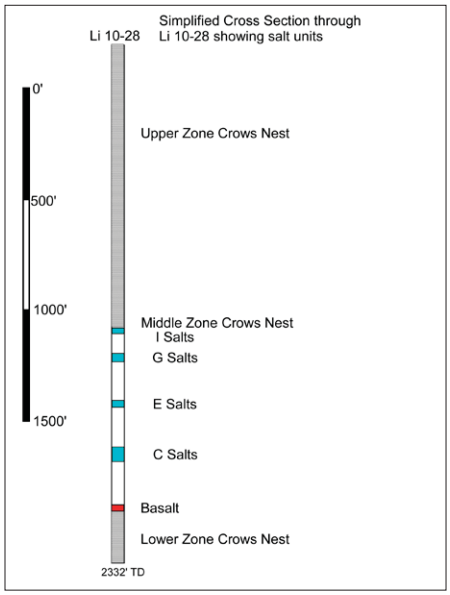


Figure 3. Simplified cross section through Li 10-28 showing zones of Crows Nest Sequences and salt beds.

pirssonite than the typical mud flat facies rocks.

Member G Salts

From approximately 1,545 feet to 1,390 feet below surface, Member G of the Crows Nest records four salting-upward evaporative cycles culminating in evaporites that grade from 55% trona upward into beds that are 96% thenardite.

Member I Salts

From 1,360 to approximately 1,274 feet below surface Member I of the Crows Nest exhibits one retrogradational cycle and one long multi pulse progradational evaporative cycle. This progradational cycle culminates with the precipitation of 90% pure bedded trona.

Chemical Facies

The playa has been subdivided into three lateral facies based on degree of evaporation, style of deposition (precipitation), and characteristic mineralogy.

Carbonate Bank

The distal zone of the playa is the Carbonate Bank. This is the area in which the evaporation/inflow balance only precipitates the least soluble species. At Railroad Valley rocks of this zone are dominated by clays, clastic materials and evaporative dolomite and calcite. This is analogous to the Carbonate zone of salars as described by Munk and others (2021) or the "early" insoluble carbonates at Searles Lake (Olson and Lowenstein 2021).

Mud Flat

Basinward of the Carbonate Bank is the Mud flat. Rocks of this zone are characterized by black, anoxic, organic rich clay minerals with coarse clear euhedral pirssonite (Figure 4). The field term for these rocks is "snow-flake clays" due to the bright white or clear pirssonite crystals in a black matrix. Pirssonite can form crystal aggregates but aggregates and single crystals are matrix supported and do not show any preferred orientation. They are not abraded, nor sorted. Pirssonite can be accompanied by subordinate amounts of northupite and tychite. Rocks of this facies are interpreted to form from a relatively high-density brine during deposition of clays. Pirssonite crystals are either water column precipitates that accumulated at the same rate as the clays or the pirssonite crystals grew at the interface between the sediment and the water column in a sabkha-like environment. Probable northupite has been observed (by optical microscopy only) in close association with pirssonite as <0.1mm euhedral octahedra. It may be the result of trapped (non-equilibrium) pore fluid diagenetic precipitation.

Salt Pan Facies

Representing the core of the playa, or nucleus (Munk, 2021) is the salt pan. This represents a local evaporative maxima or low water stand. Whether or not evaporative maxima resulted in sub-aerial exposure of salt-beds is an active area of study for 3PL staff.

Salt Pan facies rocks are typified by massive beds of coarsely crystalline soluble Na-species. Most common in well Li 10-28 is trona. Significant concentrations (11 to 96% by weight) of thenardite are known locally, especially in the member G salt beds. Trona crystals are typically elongate, lath shaped, and show a preferred orientation. Due to core loss, these beds are primarily known from side wall percussion cores. The percussion cores are not oriented, but crystallization is presumed to be parallel to playa bottom. The trona is inferred to be a bottom growth cumulate or may have first formed as surface rafts which sank or otherwise accumulated (McNulty 2018). See Figure 5.

Each salt bed features a rapid upward increase in the abundance of soluble sodium species with very little clay deposition. The most soluble salts are found at the top of the sequence. This is followed by a gradational, transgressive, progressively wetter cycle. The input of more Ca^{2+} ions leads to a return of pirssonite deposition (Figure 6). The net effect is that the trona-rich salt pan facies beds are bounded above and below by pirssonite-containing

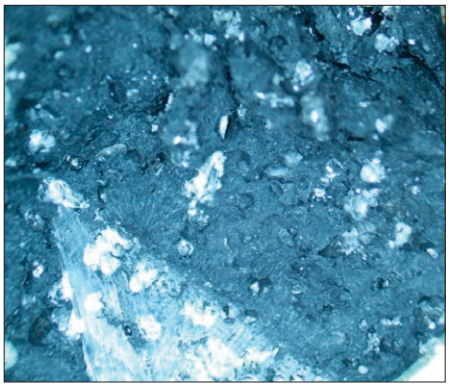


Figure 4. Sidewall core micro photograph from 1,305' showing black snowflake clay with 28% pirssonite, representing the mudflat facies within Member I. Field of view is approximately 0.75 inches. 7x binocular microscope.

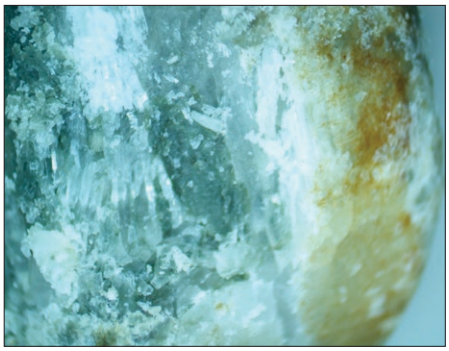


Figure 5. Lath shaped trona crystals from C salt sidewall core at 1,866 feet representing the Salt Pan facies. Field of view is approximately 0.5 inches Binocular microscope. Sample is 90% trona, with minor pirssonite and both smectite and mixed layer clays.

beds. Additional work will be required to determine if the pirssonite is deposited by back reaction with previous trona, or if the trona sequences remain geochemically isolated and the pirssonite deposition occurs without recycling of previously precipitated sodium.

Observed mineralogic zoning at Railroad Valley can be understood in terms of chemical divides (Hardie and Eugster, 1970, Olson and Lowenstein, 2021). Precipitation of an evaporite mineral will drive the brine composition away from the components of that precipitate and towards more soluble species (Figure 7). In the case of Railroad Valley, HCO3- (and ultimately CO32-) were much more abundant than calcium and magnesium. The precipitation of dolomite and calcite leads to the depletion of calcium and magnesium and enrichment in the alkali metals in the remaining brine.

Potassium does not show significant enrichment in the brines of Railroad Valley.

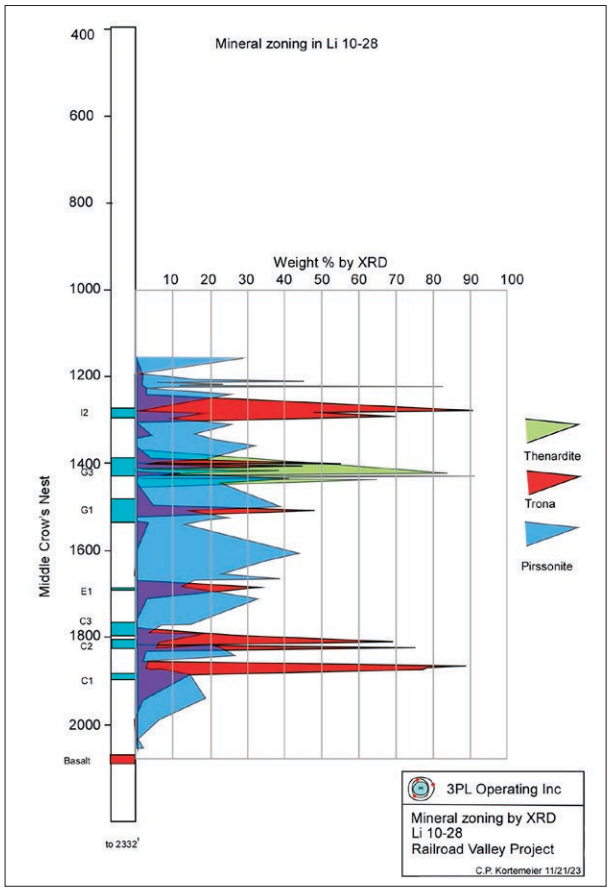


Figure 6. Graph of X-ray diffraction mineralogy of sidewall cores in the Middle Zone of Crows Nest Sequence. Note the pirssonite-rich halos bound trona beds.

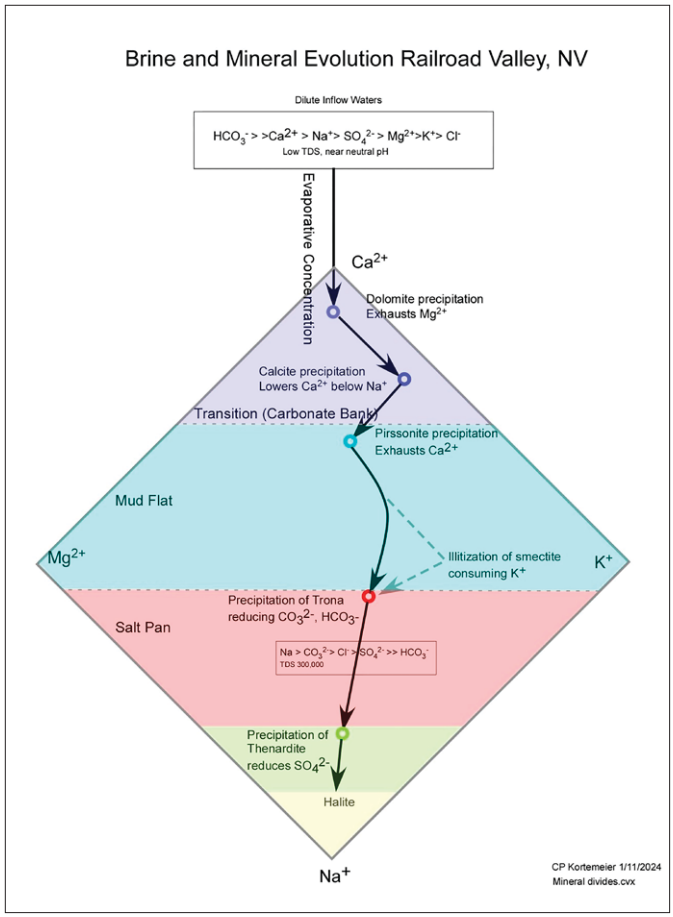


Figure 7. Brine Evolution of Railroad Valley Playa showing important mineral divides.

The sodium/potassium ratio in model inflow water is 5:1. In brine it is over 100:1 (average of the three densest brine samples).. Some process must be consuming potassium; however, potassium evaporite species are notably lacking in Table 1.

The presence of filamentous evaporite textures, laminar structures, and the generally high volatile organic content (hydrocarbons) of the black claystones (Figure 8, also Figure 4) raise the possibility of microbially mediated crystallization as an important process at Railroad Valley. It is possible (Aubineau and others, 2019; Cifuentes and others, 2021) that microbes facilitated the illitization of early formed smectite. Authigenic alteration of smectite to illite may have prevented evaporitic concentration of potassium by the reaction: smectite + K^+ ↓ illite + Si^{4+} + Fe^{2+} + Na^+ + Mg^{2+} (Huggett, 2005; see also Figure 7).

Filamentous and mat-like structures have been associated with microbial mats and stromatolites (Abineau and others, 2019, Shapiro 2005, 2007). The filaments of Figure 8 show some of the same morphologies illustrated in Figure 9 (modified from Shapiro 2007).

Brine Evolution and Geochemical Conditions

To test whether the cyclic evaporation and inflow cycles in a closed evaporitic basin (CHSD of Castor and Henry, 2020) could produce the observed mineral zoning a series of mineral saturation diagrams were prepared using Geochemist's Workbench.

The three densest samples of brine from well Li 10-28 (see Figure 2) were averaged to create a model brine (Table 2) in Geochemist's Workbench program. The model brine was diluted mathematically in a series of six steps as shown as sample numbers on Figure 10: The most dilute sample is closest to possible inflow waters to the playa. The non-diluted sample represents today's brine in equilibrium with the salt deposits. Mineral saturations were created for each model brine concentration to test if simple evaporation (concentration) could generate the observed mineral sequences. The mineral saturation diagram (Figure 10) was inverted on the Y axis to provide a 'bottom up' view that might mimic a geologic column or timeline. In this perspective supersaturation lies at the bottom of the diagram below the Q=K line (Q/K = 1).

Examination of Figure 10 shows good agreement with the observed mineralogical zoning. At about 10 % of today's brine strength, dolomite is the first species to saturate. Kim (2023) proposes that oscillating conditions at the saturation point promote crystallization of dolomite at ambient conditions.

As evaporation progresses the next mineral to reach saturation is calcite. At about 50% of brine strength, pirssonite becomes saturated. At essentially 100% of brine strength, trona is saturated and thenardite is marginally undersaturated. This method does not account for the Ca^{2+} and Mg^{2+} content that would increase in the brine from 'undissolving" the early formed carbonates. Increasing Ca^{2+} and Mg^{2+} would push back the saturation point requiring less evaporation for precipitation. The simple evaporative path moves us from left to right across Figure 10 and reproduces the observed mineralogic zoning.

Some species (gaylussite, natron) were suppressed to increase legibility of Figure

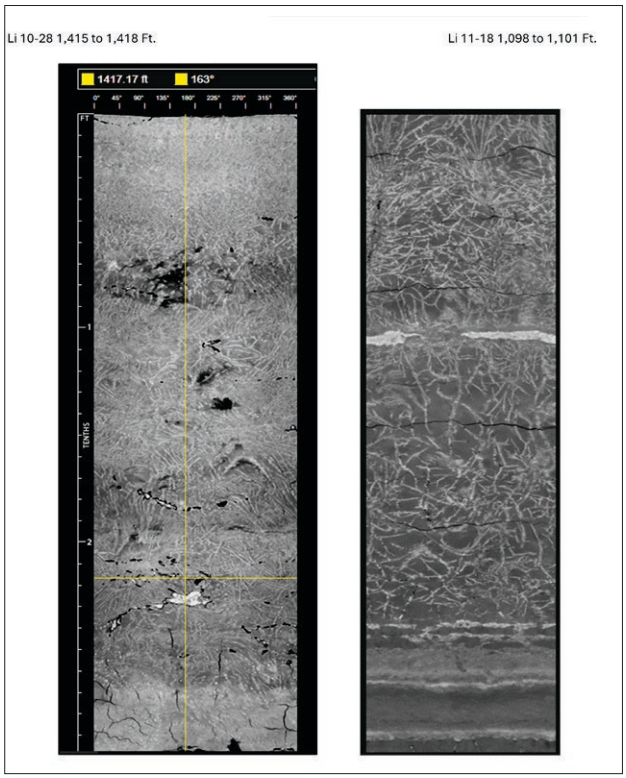


Figure 8. CAT scans of core from well Li 10-28 and well Li 11-18 showing filamentous (microbial?) evaporites.
Cores are three feet long.

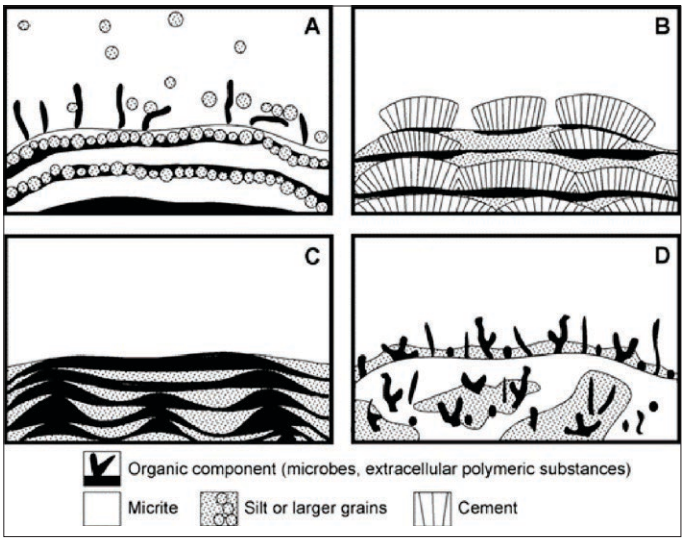


Figure 9. From Shapiro 2007, and 2005. Schematic stromatolite textures. These textures would potentially be present at all scales from outcrop to thin section. Compare to Figure 8.

10. Only pirssonite is observed in well Li 10-28, (Figure 2) although gaylussite has been noted elsewhere in the property. Given average brine compositions, the gaylussite/pirssonite transition constrains the activity of water to a = 0.8 or lower (Figure 11A).

Figure 11 A is a much better match for the observed mineralogy and mineral zoning observed in the salt pan facies as typified by well Li 10-28. However, the predominant sodium carbonate phase is trona rather than natron, and burkeite has only been recognized in minor amounts in Li 10-28. Trona could be precipitated over natron because it has fewer waters of hydration. Lower waters of hydration would be favored by the extreme evaporative concentration. Gaylussite is known from well Li 11-18 (Figure 2) in a section that is interpreted as distal Mud Flat facies, both laterally and vertically displaced from the main accumulations of trona. The distal zones are characterized by a higher activity of water and lower evaporitic concentration (Figure 11B).

Conclusions

The Crows Nest Sequences host significant evaporitic concentration of trona and associated salts. The middle zone of the Crows Nest records four cycles of salting upward evaporative deposition within the salt-pan facies. As shown in Figure 12, each cycle begins with influx of relatively dilute water which is acted upon by evaporation. As the fluid evaporates it first deposits dolomite and calcite in the or Carbonate Bank. Further evaporation causes the saturation and deposition of pirssonite of the Mud Flat facies. Continued evaporation causes the precipitation of trona, minor burkeite, and local thenardite comprising the Salt Pan facies.

Member E salts in the location of Li 10-28 failed to reach the full Salt Pan facies. This may represent a partial evaporative cycle, or the heart of the Salt Pan facies has simply not yet been intercepted. This is thus an active exploration target.

Member G salts have more sulfate than the other salts. This may indicate a higher degree of concentration was reached in G or it may suggest an overall playa evolution with an increase in residual sulfate content. Or again it may simply mean the evaporative maxima for the other salts has not yet been intercepted in drilling. At this point other sources of sulfate cannot be ruled out, including geothermal/hydrothermal fluids.

3PL Operating Inc is actively exploring and are hopeful to begin pre-feasibility studies on this major trona -rich playa sequence in the next phase.

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Table 2 - Model brines input for saturation diagram. Concentrations range from 1 percent to full strength brine.

		Fractional concentration of original						Model MZ Brine 1.0
Sample ID	Unit	0.01	0.1	0.25	0.5	0.75	0.9	
Ca++	mg/l	0.2	1.8	4.5	9.0	13.4	16.1	17.9
Mg++	mg/l	0.2	2.3	5.6	11.3	16.9	20.3	22.6
Na+	mg/l	1,242	12,417	31,042	62,083	93,125	111,750	124,167
K+	mg/l	11	114	286	571	857	1,028	1,142
CO_3--	mg/l	577	5,768	14,421	28,842	43,264	51,917	57,685
SO_4--	mg/l	663	6,625	16,563	33,125	49,688	59,625	66,250
CL-	mg/l	867	8,670	21,675	43,350	65,025	78,030	86,700
pH		8.00	8.50	9.00	10.50	10.25	9.90	9.65

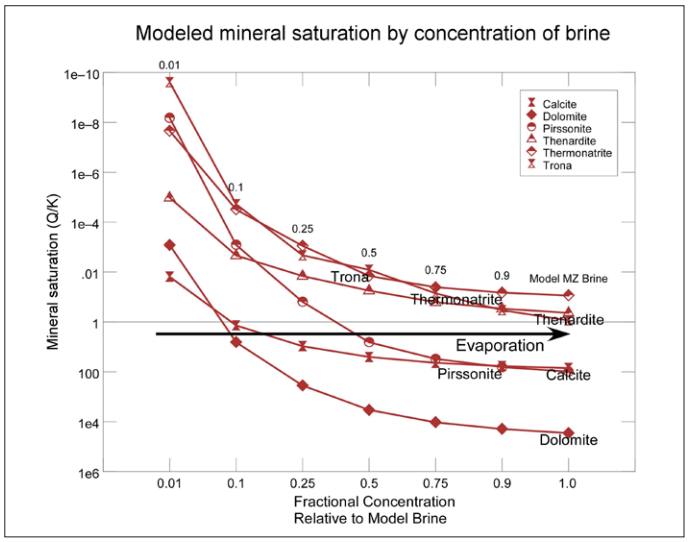


Figure 10. Inverted Mineral Saturation diagram showing average mineral evolution from 0.01 concentration relative to brine to 1.0 or full-strength brine.

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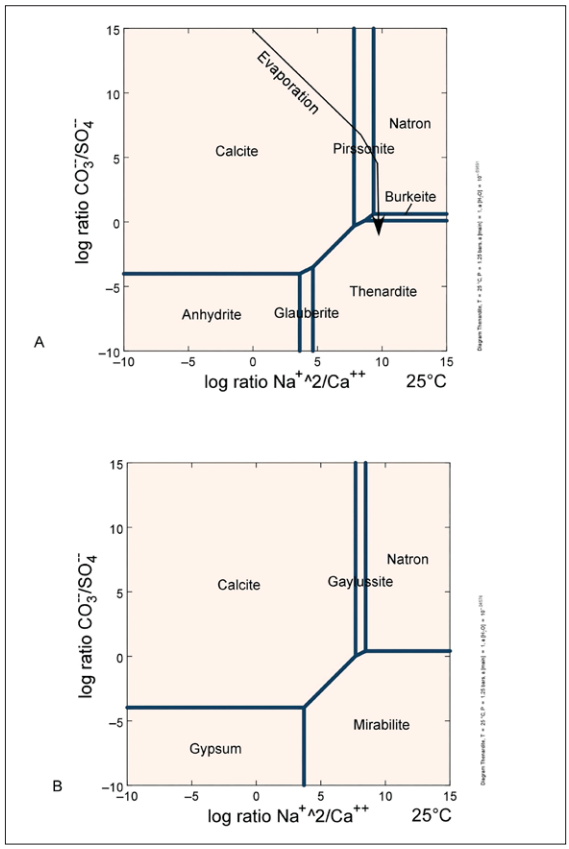


Figure 11. A: Evaporite phases at low activity of water (0.8) i.e. High evaporitic concentration. B: Evaporite phases at high activity of water (1.0) i.e. Lower evaporitic concentration.

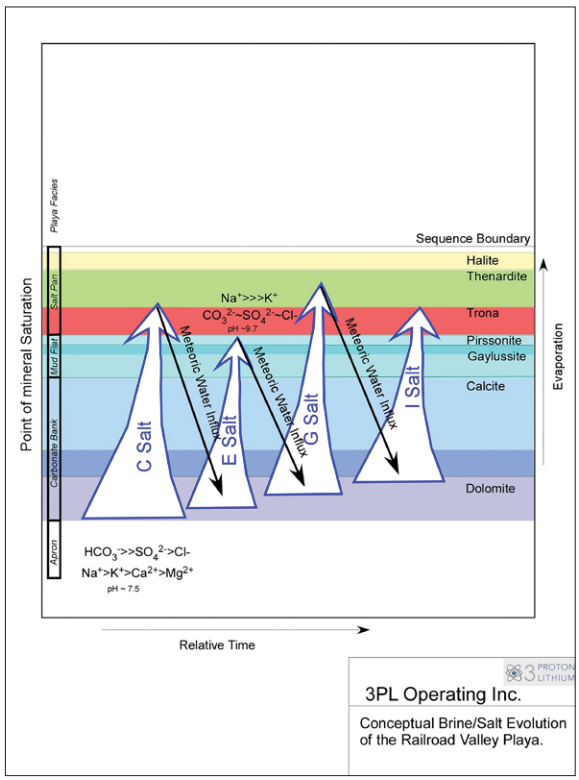


Figure 12. Conceptual Diagram for brine evolution and salt deposition at Railroad Valley.

Understanding and Addressing Vapor Intrusion:
Protecting Indoor Environments

Robert C. Carvalho, P.G., CPG-10588, CEO/President at EAI, Inc., Jersey City, NJ
www.eaienviro.com

Protecting buildings from the threats lurking underground is crucial in today's construction and environmental era. Vapor intrusion poses significant risks to indoor air quality and the health of occupants. Vapor barriers and remediation strategies are innovative solutions that help safeguard indoor environments and maintain structural integrity. Here we'll explore what vapor intrusion is and what types can create harmful effects when not properly addressed.

What is Vapor Intrusion?

Vapor intrusion occurs when volatile chemicals from contaminated soil or groundwater migrate into the indoor air of overlying buildings. These contaminants, often originating from industrial activities, landfills, or leaking underground storage tanks, include volatile organic compounds (VOCs), semi-volatile organic compounds, and inorganic substances like mercury or hydrogen sulfide. Methane and radon, naturally occurring gases, can also pose significant health risks if they accumulate indoors.

The U.S. Environmental Protection Agency (EPA) provides a comprehensive overview of vapor-forming chemicals, including:

- VOCs, such as trichloroethylene and benzene
- Select semi-volatile organic compounds, such as naphthalene
- Elemental mercury
- Some polychlorinated biphenyls and pesticides

The Importance of Protecting Against Vapor Intrusion

The intrusion of these vapors into indoor spaces can lead to serious health issues, including respiratory problems, neurological effects, and even cancer. Therefore, it is essential to implement effective barriers and mitigation strategies to prevent these harmful substances from compromising indoor air quality and endangering occupants. The Centers for Disease Control and Prevention (CDC) and their Agency for Toxic Substances and Disease Registry (ATSDR) offer detailed insights and factsheets on the health impacts of vapor intrusion in their online fact sheet. [https://www.atsdr.cdc.gov/vapor-investigation.html]

Technical Aspects of Vapor Barriers

Vapor barriers are designed to prevent the migration of harmful gases and vapors from the subsurface into buildings. These barriers are typically composed of impervious materials that block or redirect the flow of contaminants. Various types of vapor barriers exist, with spray-applied membranes being among the most effective due to their seamless application and adaptability to complex building geometries.

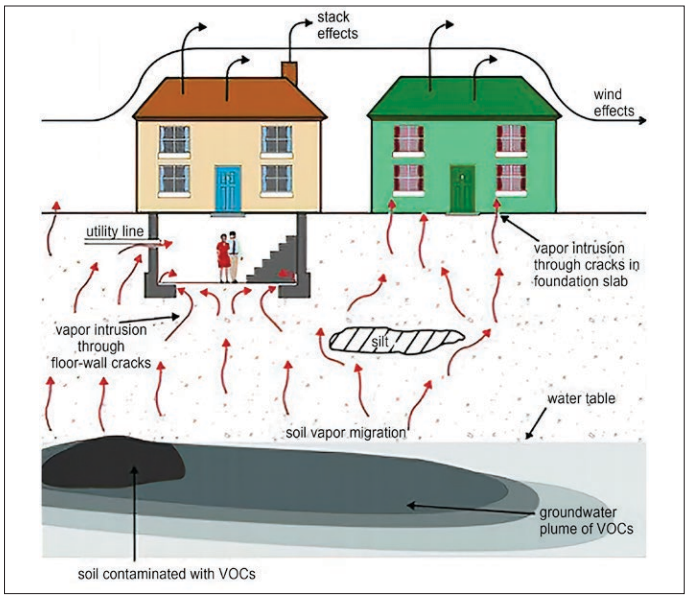


Figure 1. Migration of Soil Vapors to Indoor Air.

This figure depicts the migration of vapors in soil gas from contaminated soil and groundwater into buildings. Vapors in soil gas can enter buildings through foundation cracks and utility line openings. Atmospheric conditions and building ventilation are shown to influence soil gas intrusion.
[source: https://www.epa.gov/vaporintrusion].

The installation of vapor barriers involves several critical steps to ensure their effectiveness:

1. **Site Preparation:** The area where the barrier will be applied must be properly prepared, often involving the removal of debris and smoothing surfaces to ensure a good bond.
2. **Application of Membrane:** Spray-applied membranes are popular due to their ease of application and ability to create a continuous, seamless barrier. This method involves spraying a liquid material that cures to form an impermeable layer. Additionally, sheet membranes can be taped or welded together to form an impermeable barrier.
3. **Integration with Venting Systems:** Effective vapor intrusion mitigation often includes venting systems that manage volatile gases beneath structures. These systems, such as low-profile pressure relief systems, work in conjunction with vapor barriers to prevent vapor accumulation and ensure safe venting by moving any residual vapor-forming

chemicals out from the foundation to open air, eliminating their volatility.

4. **Quality Assurance:** Post-installation, the barrier's integrity is typically tested to confirm its effectiveness. This can involve various testing methods, including smoke and tracer gas testing.

Ensuring Safe Indoor Environments

Addressing vapor intrusion is essential for ensuring safe and healthy indoor environments. By understanding the sources and risks associated with vapor intrusion and implementing robust vapor barrier systems, we can significantly reduce the health hazards posed by subsurface contaminants. Professionals in construction, engineering, and geology must prioritize using these advanced technologies to create resilient structures that protect both the integrity of the buildings and the well-being of their occupants.

By prioritizing the protection of indoor air quality and structural integrity, we can create built environments that last for generations while ensuring the health and well-being of occupants.

About the Author

Robert Carvalho holds a Bachelor of Sciences in Geology from Hofstra University and is a Certified Professional Geologist (CPG). He has over 30 years of experience managing and directing a wide range of environmental projects as the President and CEO of EAI, Inc.



Photo. A spray-applied vapor barrier is being installed onto a base fabric that strengthens the sub-slab membrane and provides a uniform substrate to receive the barrier application. Spray-applied vapor barriers more easily form along conduits and other protrusions on the foundation. The concrete foundation will be poured after this has been quality-controlled and approved.

Exploring Arizona:

AIPG & EEGS Join Forces for a Geology Field Adventure

Article reprinted from the AIPG Arizona Section May 2024 Newsletter.

Dawn H. Garcia, CPG-08313

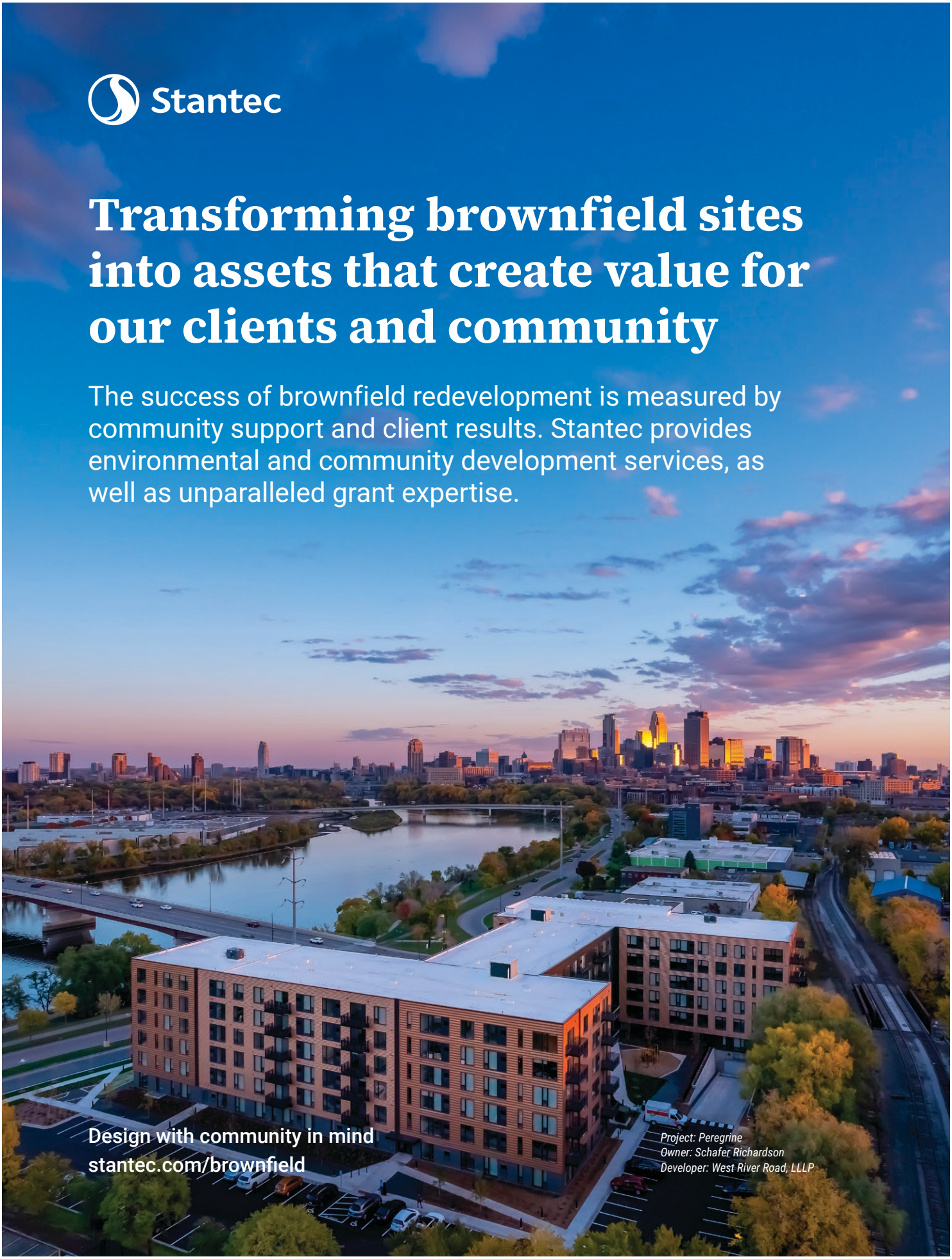
The AIPG AZ Section collaborated with the Engineering and Environmental Geophysical Society (EEGS) to develop a joint one-day field trip as part of the EEGS international conference in March 2024. The field trip was to two exploration projects near Casa Grande, Arizona. AIPG was also provided with a free booth for the conference. AIPG members Ann Pattison and Paul Warren, plus an emeritus geophysicist friend, helped Dawn Garcia with the AIPG information booth.

There were about 30 participants who attended the joint AIPG/EEGS field trip to the Arizona Sonoran Cactus Mine and Ivanhoe Electric's Santa Cruz project. EEGS past president Janet Simms remarked how pleased she was that through an AGI Member Society Council Meeting there arose a collaboration between AIPG and EEGS. The weather was lovely and the logistics went relatively smoothly. Both sites were prepared with presentations to give an overview at the start of the visit. Arizona Sonoran has more to see on the ground because of the historic mining operations (open pit, stockpile, tailings), whereas the Santa Cruz project is greenfields exploration. Both sites have large, well-organized core shacks, and it was quite fun to see the formation breaks and to contrast the two sites, which are spatially close and geologically related. There was very good feedback from the out-of-town EEGS participants. Most had never been to Tucson or to a mine site, so the field trip was quite a learning curve for them!

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Mineral and Rock Resources of the Levant

Barney Paul Popkin

Geology contributes to, and with climate, determines a region's terrain. The Levant, the dominant region of the Eastern Mediterranean in West Asia, is largely devoid of valuable mineral resources. This 250,000 sq. mi. (640,000 km^2) area stretching from southeastern Turkey to northeastern Egypt, consists mainly of thin, calcareous, carbon-deficient, alkaline, and sodic desert soils, rocks, and minerals.

Limestone, marble, sand and gravel, and clay provide building and facing stones, sculpture material, mosaics, underground shelters and subway train networks, construction materials, pottery and ceramic glazes, cosmetics, and health treatment materials. Fossil resin amber, and precious stones (lapis lazuli, carnelian, turquoise), salt, phosphides, and natron (sodium-rich) glass are valuable mineral-, rock-, gem-, or special soil- derived exports. Oil and natural gas are present offshore.

Several of these resources are important to industry, food supply, and even warfare. Levant salt was used as primitive currency as well as for salting soil and wells during warfare in the ancient world, preserving meat, fish, vegetables, and fruit, processing leather, glazing ceramics, dyeing textiles, separating gold from silver, and making cheese, medicines, and cosmetics.

Keywords: geology, Levant, Eastern Mediterranean, Rocks, Minerals, Mineral Resources, Oil and Gas Resources

Introduction

The Levant is a large and ancient historic region in the Eastern Mediterranean of Western Asia. It links Europe, Asia, and Africa by land and by sea. Its sea and land routes have been trading routes throughout recorded history. The Mediterranean Sea lies to its west. The Fertile Crescent lies to its east. The Eastern Mediterranean Sea covers about 40,000 square miles, about 1.9 times larger than the Western Mediterranean. Its shoreline is suitable for seaports and harbors.

The Levant includes parts of southeastern Turkey (coastal Anatolia and Hatay), Greek Dodecanese Islands, Cyprus, all of Lebanon, Israel, Gaza, and much of Syria and Jordan. Some authorities consider coastal Sinai and northeastern Egypt as within the Levant. The Levant's seacoast is over 5,000 miles long. It enjoys a Mediterranean climate of limited winter rains, high summer evaporation and plant transpiration rates, low humidity, and strong winds along the coast. These winter rains and desiccating summer winds have, acting on their rocks through the millennia, produced thin, calcareous, carbon-deficient, alkaline, and sodic desert soils, rocks, and minerals.

Mineral Resources

For a desert, it is surprising that the Levant has only limited mineral resources. Limestone, marble, sand and gravel, and clay provide building and facing stones, construction materials and raw materials for sculptural mosaics, pottery and ceramic glazes, and cosmetics and health treatment materials. The same rock types have been excavated to provide underground shelters and subway train networks. Fossil resin amber, precious stones (lapis lazuli, carnelian, turquoise), salt, phosphides, and natron (sodium-rich) glass are valuable exports. Oil and natural gas are present offshore.

The Levant has limited arable land which needs irrigation and fertilization to be productive. The region consists of outcrops of fresh or weathered limestone covered by a thin veneer of calcareous soil. Rainfall and snow melt in its inland mountain ranges feed intermittent freshwater rivers, underground springs, and perennial groundwater.

Geology

Figure 1 is a simplified geologic map of the Levant. According to Avni (2017), the main physiographic features are the Lebanon Mountains to the east. The region is situated at the junction between the northeastern African and northwestern Arabian Plates. It borders the eastern Mediterranean

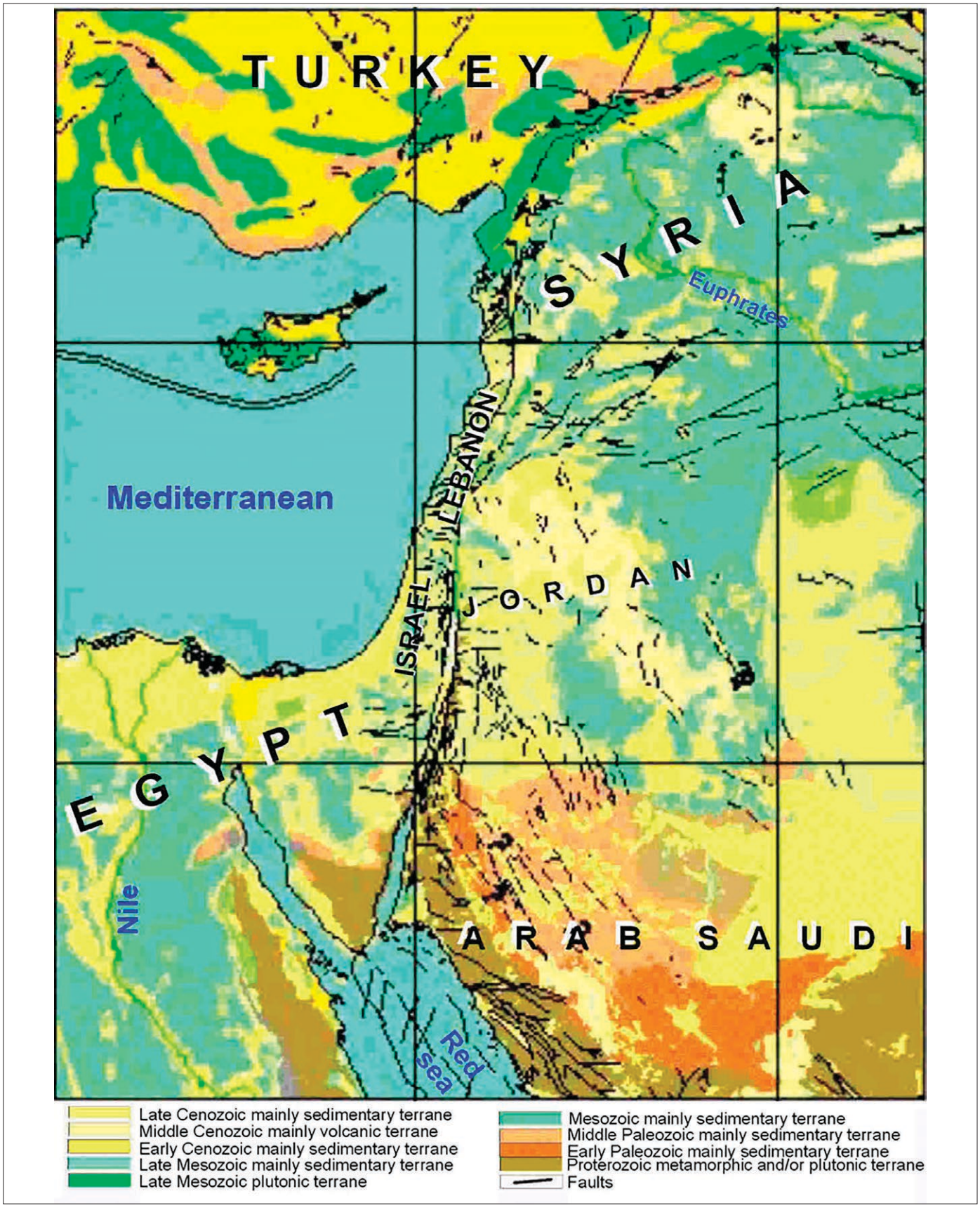


Figure 1. Geologic Map of The Levant Showing Major Terranes Including Major Fault Zones (Cornell University).

Levantine Basin. In the last 40 million years, the Levant plate dissected the Levant along the Dead Sea Transform. The Levant includes 3,000-meter-high mountain ranges and deep structural depressions that reflect the area's Miocene history about 23 to 5.3 million years ago.

According to Ghalayini et al (2018), the Lebanon Basin of the Eastern Mediterranean Sea consists of four domains: 1. The distal Levant Basin; 2. The Lattakia Ridge; 3. The Levant Margin; and 4. The Onshore. Each domain is characterized by a particular structural style and stratigraphic architecture, resulting in different source-reservoir traps.

Figure 2 shows simplified geologic structures of the Eastern Levantine Margin, important for its petroleum reserves. Oil and natural gas traps in the offshore Levantine are both structural and stratigraphic (Marlow et al, 2011). The "white" designation on the map indicates undifferentiated Neogene continental to lacustrine/shallow marine and volcanics and Cenozoic limestones, sandstones, and conglomerates.

Figure 3 illustrates geologic simplified relief features of the Levant, showing locations 1-5: sediment cores 1,2,4; 3. Soreq (Avshalom) Stalactites Cave; and 5 The Cairo Nilometer. Note the dark shading indicating mountains. The Nilometer consisted of steps located within three reaches of the Nile River where the ancient Egyptian administers would yearly gage the height of the River and adjust taxes based on their assessment of a prosperous or paltry agricultural economy.

Petroleum Resources

The U.S. Geological Survey (2010) estimates that Levantine Basin (Figure 3) reserves include about 1.7 billion barrels of oil, and 3.5 trillion cubic meters of natural gas. Geologic elements that define the assessment include "limits of reservoir rock, geologic structures, source rock, and seal lithologies (USGS, 2024)."

The Levant Basin covers 83,000 square kilometers of the Eastern Mediterranean, bounded on the north by the Tartus Fault, to the northwest by the by the Eratosthenes Seamount, to the east the Levant Transform Zone, to the south by compressional structures in the Sinai, to the west by and southwest by the Nile Delta Cone Province (USGS, 2010). The Levant Basin Province, Mesozoic-Cenozoic Total Petroleum System consists of three oil and gas reservoirs: Levant Margin, Levant Sub-Salt, and Plio-Pleistocene (Figure 4).

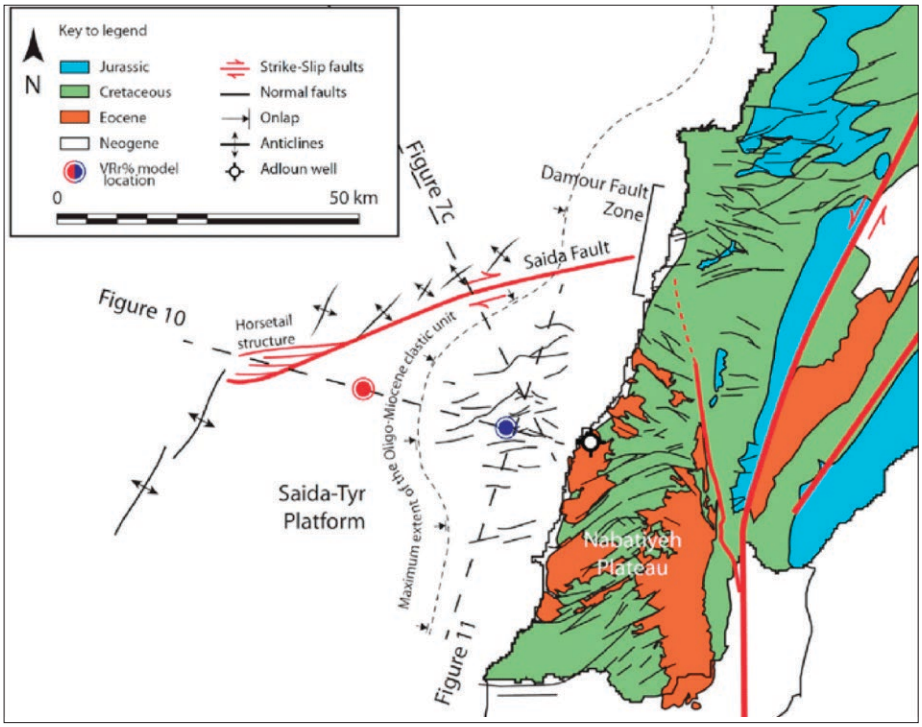


Figure 2. Geologic Structures of the Eastern Levantine Margin (Ghalayini, 2018).



Figure 3. Geologic Relief Features of the Levant (Kushner and Stein, 2019).

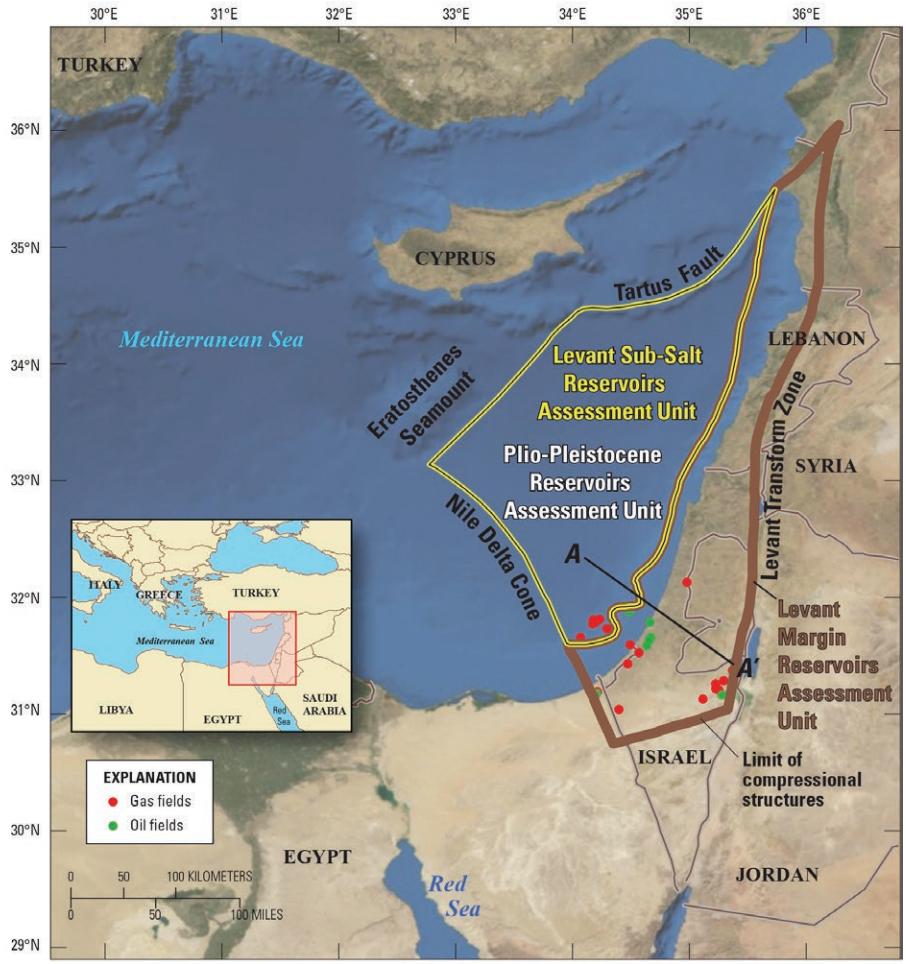


Figure 4. Location of Three Oil and Gas Non-Dimensional Geographic Assessment Units in the Levant Basin, Eastern Mediterranean (USGS, 2010).

According to Offshore Technology (2023), the Leviathan natural gas field, within the Levantine Basin, "was formed in several main tectonic stages, and early Mesozoic rifting led to the shaping of a large graben and horst system, stretching across the onshore and offshore Levant Basin. The Basin is infilled by post-rift tertiary sedimentation."

Figures 4 and 5 show the locations of the Levant oil and gas assessment areas as well as a representative geologic cross-section, respectively. Note the fields are within or offshore of Lebanon and Israel. The cross-section of the southern Levant Basin reflects its complex faulting, folding, and uplift.

Springs and Dead Sea

The ancient Phoenicians built an offshore freshwater reservoir within the coastal Mediterranean Sea constructing a rock barrage (dam). The barrage was updated by Colonial France with modern materials. A concrete "spring house" was constructed over the spring near the outfall to provide filtration for clarification and chlorination for disinfection.

Figure 7 shows friends enjoying clay body treatment at the famous Dead Sea. They are a Dutch nurse from Damascus and an American entomologist from DC on holiday.

Discussion and Conclusion

The Levant's mineral resources are limited. They provide a small contribution to national gross domestic products in the Levant. Even the recent exploration and development of offshore oil and gas in the

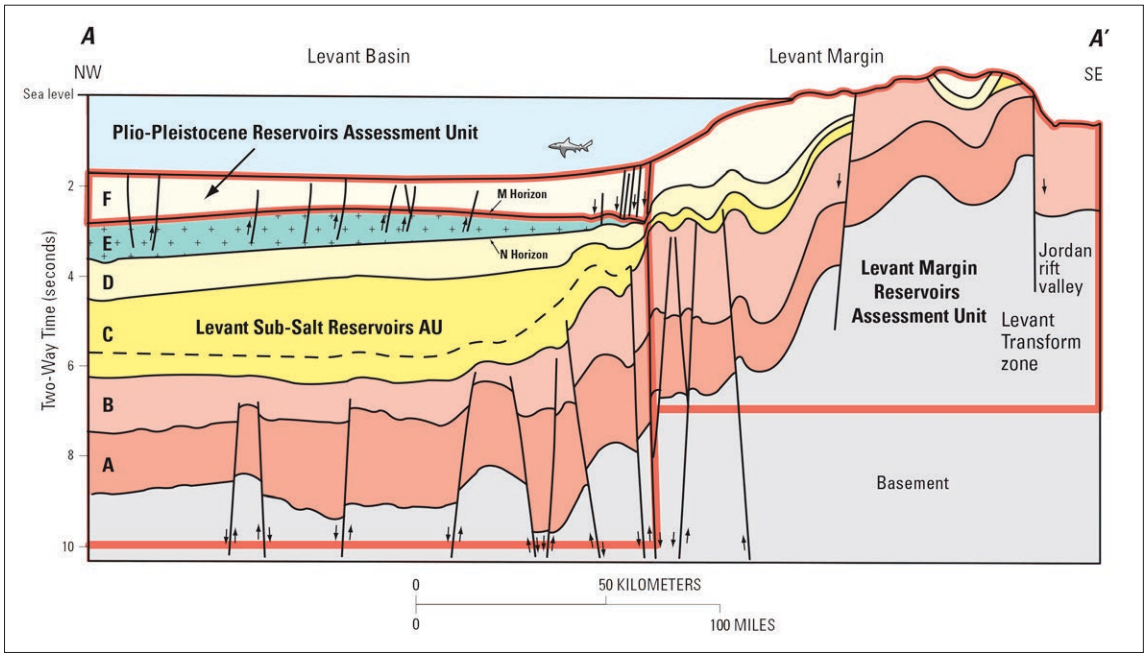


Figure 5. Geologic Cross-Section of Southern Levant Basin Showing Three Oil and Gas Non-Dimensional Geographic Assessment Units in the Levant Basin, Eastern Mediterranean (USGS, 2010) .

Eastern Mediterranean Sea are unlikely to make the Levant a mineral resource based economic giant.

Nonetheless, the region's diversity would make it a popular tourist and retirement destiny for its rich history, culture, beauty, and diversity, and its role in establishment of the major western religions. As an American who has worked in the Levant for several decades, I can attest to family, friends, neighbors, and colleagues who have been Levant tourists and became residents, despite conflict and wars.

Some of this natural Levantine landscape and resources diversity include topographic contrasts from coastal to inland snow-capped mountains, charming limestone grottos and perennial fresh-water carbonate-rich springs, and interesting sites. There are marketable rocks and minerals including cosmetic materials, and touristic gentle, flat, and polished to rough and rugged, and raw landscapes.

Author comments. Barney Paul Popkin is an American geologist and hydrologist. A former U.S. Agency for International Development Advisor and U.S. Geological Survey Hydrologist, he has over 50 years of international experience including the Levant from Syria to Egypt. Mr. Popkin is grateful for conversations with Amin Shaban of the Lebanon National Council for Research, Ronald Lubke and Dick Sherman of Metcalf & Eddy Engineers, David Brooks of Friends of the Earth/ Middle East, Carl Hodges of the University of Arizona Environmental Research Laboratory and Seawater Foundation, Sol Resnick of the Arizona Water Resources Research Center, Digger Jones of the USGS, Dan Deely of USAID, and publications from those organizations as well as the Central Intelligence Agency.



Figure 6. "Spring house" from a Large Natural Fresh-Water Spring from Inland Limestone Grotto (cave), Tripoli, Lebanon (Popkin, February 7, 2011).



Figure 7. Dutch female and American male tourists treating themselves to medicinal clay body treatment at the Dead Sea, Jordan (Popkin, September 23, 2005).

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NEW LOBBYIST, OLD CHALLENGES:
NYSCPG's Push for a State Geologist and Legislative Advocacy

Article excerpt reprinted from the AIPG Northeast Section Spring 2024 Newsletter.

John M. Nadeau, CPG-11181, NYSCPG Executive Director

We are working on plenty of informative and exciting things for those interested in networking, PDH credits, or educational events. In one of the most exciting pieces of news so far this year, NYSCPG has contracted with a new lobbyist. The organization was represented by Peter O'Connell from 2011 until his retirement. Peter helped NYSCPG with a list of potential firms to represent us going forward, and the Board of Directors unanimously approved retaining Campbell H. Wallace, Esq for legislative and regulatory representation. Campbell, an attorney, is a partner at Pastel Rosen & Wallace LLP, an Albany-based law and lobbying firm. Campbell comes to the Council with considerable professional design industry experience having served as the director of government relations for ACEC New York for eight years, where he successfully lobbied on behalf of the consulting engineering community. I look forward to working with Campbell on legislative and regulatory matters for NYSCPG.

I mentioned the position of the State Geologist in the last NYSCPG newsletter and wanted to share the same information with NEAIPG members. I attended a recent dinner presentation by Andrew Koslowski and was reminded that New York no longer has a State Geologist. It has been over 10 years since the last person held the official title as part of the State Geologic Survey. Since the standard of the profession of geology has been elevated since that time, why would the state not appoint a person to this important role? The state has also seen varying effects of climate change, and federal grants for studying these changes require the participation of a state geologist. NYSCPG believes that role of the State Geologist and the State Geologic Survey are crucial for the protection of the public and the resources of New York. As professional geologists, we should all be requesting our elected representatives to support this effort.

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AIPG Member Photo Challenge

Awards:

First place in each category:

Image published on the cover of *TPG* in 2025. 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 categories:

1. **Off the Beaten Path - Unique feature/ formation.**
2. **Ancient Life - Fossil hunting finds.**
3. **Geologists in the Field - People at work/field trips.**
4. **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.

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, 2024**.









Building the Future of Geology

Support the Foundation of the AIPG

Many thanks to all those who participated in the Foundation of the AIPG's activities at the National Conference in Durango! We raised over $4,500 between the silent auction and river rafting trip. We could not have done it without our donors, bidders, and rafters! These and other fundraising activities support our grant programs including student scholarships, student and young professional workshops, educational programs aimed at practitioners, the public, and policy makers, and some special needs requested by AIPG or other professional organizations. The Foundation is proud to be able to serve AIPG and the geosciences by providing financial support for these programs. These grants are only possible through your generous donations. Every donation helps the Foundation to contribute toward building the future of geology. If you have any questions or comments about the Foundation, please contact me or any of the other Trustees of the Foundation for additional details and check the AIPG website for more information about the Foundation. Your continued support is greatly appreciated. Stay tuned for information on 2025 fundraising activities. Thank you.

Mike Lawless

Michael D. Lawless, CPG, PG
Chairperson, Foundation of the AIPG
540-557-1319 office phone

The Foundation of the American Institute of Professional Geologists is a 501(c)(3) organization. Contributions are tax deductible. EIN 45-2870397

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Above and beyond...

2025 Call for Nominations

The 2025 AIPG Awards Committee is seeking nominations for future honorees who exemplify the qualities of leadership and dedication to service upheld as the highest standards and values of the Institute. The qualifications for these awards can be found below. Nominations are due January 15, 2025. Submit online at https://aipg.org/page/Awards or scan the QR code on page 33.

Leadership

Ben H. Parker Memorial Medal

The Institute's most distinguished award was established by the Executive Committee in 1969 in posthumous honor of a truly great leader, who devoted much of his life to improve the quality of geology and geologists and the services they provide. The medal is awarded to individuals who have long records of distinguished and outstanding service to the profession.

The most important criterion is a continual record of contribution to the profession of geology. A wide variety of contributions can be considered, such as (a) the education and training of geologists, (b) professional development of geologists, (c) services to the Institute, (d) leadership in the surveillance of laws, rules, and regulations affecting geology, geologists, and the public, and (e) activity in local and regional affairs of geologists.

Service to the Institute

Martin Van Couvering Memorial Award

Established in 1979 by the Executive Committee in posthumous honor of the first president of the Institute. Martin Van Couvering made the presidency a full-time occupation for the first two years of the Institute's history. His dynamic leadership, diplomacy, and organizational abilities established the solid foundation from which the Institute has grown. Few, if any, have given so much to the Institute.

The most important criterion for the Martin Van Couvering Memorial Award is service to the Institute. A wide-variety of contributions to the Institute may be considered. By far the most important contribution a geologist can make to the Institute is that of time. It is the contributions by individuals to the Section, the committees, and special projects that enable the Institute to enhance the practice of geology.

Service to the Public

John T. Galey, Sr. Memorial Public Service Award

AIPG's Public Service Award was established in 1982 in recognition of one of its primary purposes: service to the public. In 1992, it was renamed after John T. Galey, Sr., in posthumous honor of our fourth President, whose long professional career was a continuum of service to both the geological profession and the general public.

Recognition of public service is important because so many Members have distinguished themselves as experts in the field to governmental agencies and serving the needs of the public.

The application of geology to the needs of the general public may be in many different forms. Recipients of this award have outstanding records of public service.

Honorary Membership

Honorary Membership

Since 1984, AIPG has conferred Honorary Membership to those who have an exemplary record of distinguished service to the profession and to the Institute.

John Stewart Memorial Early Career Professional Award

The John Stewart Memorial Early Career Professional Award was established by the Executive Committee in 2019 in posthumous honor of John Stewart, who graciously gave his time and experience to AIPG and in encouraging geologists in their early careers and professional growth. This award is to honor an Early Career Professional member who has demonstrated an ongoing commitment to the geologic profession and AIPG at the section and/or national level, and in particular, to mentoring and aiding in the advancement of Early Career Professional members in their early careers and within AIPG.

This award is to assure that active and ambitious Early Career Professional member geologists are honored as the future of AIPG.

Emerging Leaders

Advancing Geosciences

Outstanding Achievement Award Major Contribution to the Profession

The Outstanding Achievement Award Major Contribution to the Profession was established by the 1989 Executive Committee to honor a non-member of AIPG who is widely recognized as a major contributor to the profession of geology. The award is not necessarily given annually, but only when the Awards Committee recommends an outstanding candidate to the Executive Committee for their consideration.

In 2013, the Executive Committee voted to expand the scope of the award to include candidates engaged in all types of media that inform or enlighten the public on the roles of professional geologists and the geosciences in society. This award may be for work in any media that inform or enlighten the public on the roles of professional geologists and geosciences in society. This award may be for work in any media such as visual (television, film, webcasts), auditory (radio, pod casts) or printed (books, articles, websites). The work must have been completed within five years preceding the award nomination and the nominee may be an individual, a group, or a company.

AIPG Section Leadership Award

The AIPG Section Leadership Award was established by the Executive Committee in 2013 to recognize one or more of our members who have demonstrated a long-term commitment and have been long-term contributors to AIPG at the section level. AIPG has many sections where one or more individuals have demonstrated exceptional leadership for their section and in many instances kept the section together and moving forward. These individuals are commonly not known at the National level or by AIPG members outside of their sections; however, their contributions have been vital to their sections and they perform this work because of their commitment to our profession and AIPG. All active section members are eligible. It is not required to be a current or past section officer. The award will consist of a plaque (or similar) that will be presented to the awardees at the annual meeting of AIPG.

Based on the above criteria the Awards Committee may select multiple nominees for the award.

Section Leaders

Nominations due January 15, 2025

https://aipg.org/page/Awards

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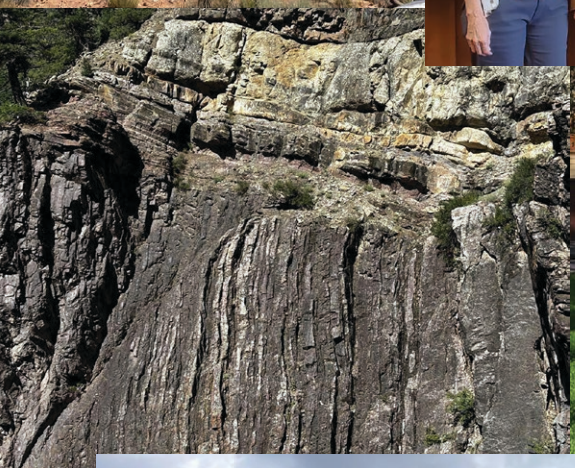








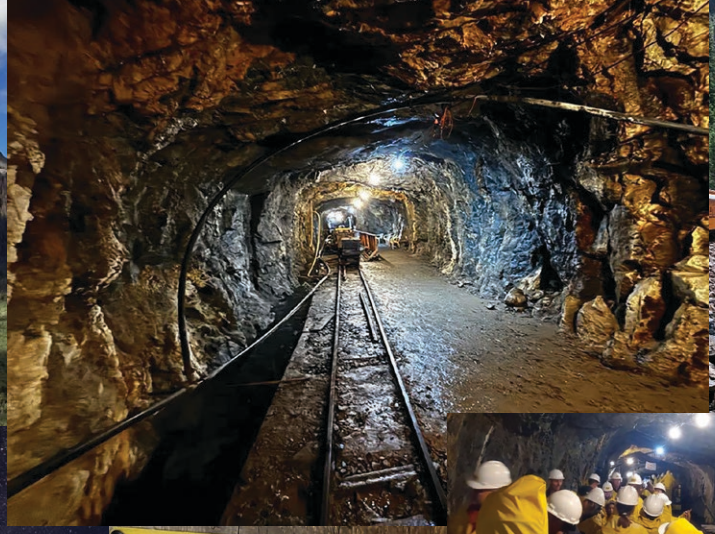








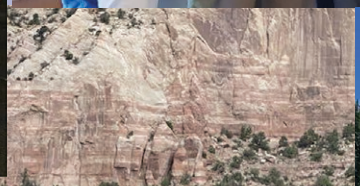





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How Earning My CPG Transformed My Career Perspective

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

> *I believe that knowing you've been admitted to this select group that represents the gold standard of the geoscience profession based on your education, experience, and professionalism, as reviewed by your peers, DOES change how you view your career.*

As you already know, if you are a regular reader of the Director's Column, my first ever 'geology job' was as a field remediation specialist when I was still an undergraduate student at Missouri State University. Since then, I've done a little consulting on gold and zinc-lead deposits, worked as a college and university professor, and created and led field trips to locations of geologic interest. One of the things that all these jobs have in common is that there was no requirement that I be a licensed or certified professional geologist to do that work. As a field remediation specialist, I worked under the supervision of a PG. In the states where I worked, academic geologists weren't required to be licensed or certified by an external professional organization. With a young family and an academic salary, I made the decision not to pursue any kind of registration or certification, and for the next 20 years or so, I pursued my career without really thinking about what it means to have your state license or a professional certification.

Last year, we (AIPG) were finally able to complete our electronic CPG application process. Because so many of you had encouraged me to apply for my CPG, I volunteered to be the first person to try out the new electronic CPG application. We hoped that if we found glitches or if we had data processing or security errors, it would be my application that was delayed or compromised. As with any new procedure, we did find our fair share of glitches, from text boxes that were too small, to applications that didn't get auto saved to the correct locations, but we were able to quickly correct those issues. We saw a dramatic increase in the number of CPG applications, and I again volunteered to have my application placed on hold so our staff and our excellent Section and National Screening Committee members could focus on these new applications. In all honesty, I also took a bit of extra time to resubmit documentation as we corrected glitches in the process or where screeners asked for more detail.

Earlier this year, after two decades of service as the National Screening Committee Chair, Larry Austin decided it was time to retire. Larry's work has been exemplary, and he left big shoes to fill. But we were fortunate to have past AIPG President Barb Murphy step in as the new National Screening Committee Chair. Under Barb's leadership, the AIPG CPG application process continues to run smoothly, and we can properly vet and approve new CPG applicants more quickly than ever before, without compromising the quality of our review process. I cannot thank Barb, Larry, Dorothy Combs in Membership Services, and all our Section and National Screening Committee members enough for their hard work and attention to detail that holds applicants for the AIPG CPG credential to the highest standards.

The combination of being the first applicant under the new electronic system, changes in the National Screening Committee Chairperson, and my own work schedule, meant that my application was delayed. I wasn't too concerned about the delay because I thought that getting my CPG would be a good thing, but that in the grander scheme of things it (getting my CPG) wasn't going to change the way I viewed my job and career.

I could not have been more wrong. When Dorothy sent the email letting me know that I had received my CPG (#12229), I started to really think about what that meant. It meant that my peers had reviewed my work history, and education, and assessed my letters of support from colleagues. It meant that I was one of a select few who had passed muster and could now call myself 'Certified Professional Geologist.' Over the next few days as I really thought about what getting my CPG meant to me, I came to realize just what a high honor it is. I place it on a par with getting my bachelor's degree. For me, the recognition from my peers and colleagues holds tremendous value, a value that I didn't fully understand until now.

I know that for many AIPG members, the CPG is not required for work in your state. I know that state licensure is the requirement you must meet to be a project manager and to have full upward and lateral mobility in your career. Still, I encourage you to apply for your CPG when you become eligible. I believe that knowing you've been admitted to this select group that represents the gold standard of the geoscience profession based on your education, experience, and professionalism, as reviewed by your peers, DOES change how you view your career. It certainly did for me.

I wish all of you a wonderful fall.

Aaron W. Johnson, CPG-12229



From Rainforests to Public Safety: The Role of Geosciences in Shaping Our Future

Shanna Schmitt, CPG-11781
shanna.schmitt@state.mn.us

Thanks so much to everyone who attended the annual conference in Durango, Colorado. It was great meeting new people and catching up with friends and colleagues. As this final 2024 issue of TPG hits your inbox or mailbox, it's a reminder to renew your AIPG membership! Thank you to our current members; we appreciate your involvement in AIPG that helps us be the gold standard in geoscience professionalism.

Advocating for a circular economy

In seventh grade, I wanted to save the rainforests and started our household recycling program. "Environmentalist" was a big, popular term when I was in high school. Geology connects everything, so that became my major in college. Now, I'm a geologist that works primarily on investigating and remediating soil, groundwater, and soil vapor at Brownfield and Superfund sites. I think of this as recycling on steroids. And I still recycle – a lot – but I also try to reduce and reuse. Not just to save the rainforests, but because I don't want to waste resources. As a geologist, my education and experience has shown that it takes a tremendous amount of time, money, and effort to research, locate, develop, extract, produce, and distribute the materials that we use every second of our lives. Geologists and geoscientists are in a unique position to see the interconnections between our resource pipelines and our economies. The Reduce, Reuse, Recycle program still exists, but now there is a push for a circular economy. The circular economy model is more robust than the "reduce, reuse, recycle" I learned back in seventh grade, and includes things like reusing critical minerals. So, when interacting with our professional networks and our personal networks of political representatives, family, friends, and acquaintances, I think we make excellent advocates of the need for a circular economy.

A sidenote about rainforests, penguins, and geology…I have a newfound love of temperate rainforests because of my love of penguins. In 2022, my husband and I watched a documentary on the penguin species of the world. We learned about the Fjordland Crested Penguin (aka Tawaki) that lives in south-western New Zealand. A very rare, small, and shy penguin that nests in the temperate rainforests on the western coast of the South Island (and a few even more remote areas). So, we decided to make our Women's World Cup trip to New Zealand and Australia in 2023 a penguin [photo] hunting expedition; the geology stops were already planned. In addition to boiling mud, geysers, volcanoes, mountains, glaciers, spherical boulders, limestone pillars, and living stromatolites (we only have fossils in Minnesota) and thrombolites, we saw a single Tawaki in the wild. It was magical.

Geology is everywhere

A fun story that shows, once again, that geology is everywhere. While browsing the web late one evening and going down various odd paths, as one does, I decided to search for "earth systems science," the name of a course that I took during one of my last semesters at university. To my surprise, the first result was from the U.S. Department of Homeland Security (DHS). I clicked on the link and started reading. The website has a nice graphic that shows the geosphere, hydrosphere, atmosphere, cryosphere, and biosphere all connecting at "public safety and security." A slightly different angle than my 2002 course, but it makes sense as natural disasters, with their many forms and causes, are a threat to public safety and security. I internally catalogued how our varied geoscience careers have parts to play in the research, policy, identification, and cleanup of natural disasters. When we talk about public health, safety, and security, we have very good arguments for licensure, which AIPG fully supports. However, the AIPG voluntary certification, via our Certified Professional Geologist membership category, provides recognition and the expectation that the work we do as geoscientists - everything from research, exploration, sample collection, data interpretation, conclusions, and providing recommendations - is done with the highest level of competency, integrity, and ethics.

Geology connects the sciences, the materials of our lives, and our public safety and security. And perhaps there are a few geoscience jobs at DHS. Who knew?!

Thank you to everyone I've worked with this year. I have enjoyed getting to know more AIPG members and representing AIPG at a variety of conferences, meetings, and events, both in-person and online, that I've attended. Thank you for being involved and/or volunteering for national roles! I have truly appreciated the opportunity to serve and give back. Please continue to reach out if you have questions or comments!

> …AIPG voluntary certification, via our Certified Professional Geologist membership category, provides recognition and the expectation that the work we do as geoscientists - everything from research, exploration, sample collection, data interpretation, conclusions, and providing recommendations - is done with the highest level of competency, integrity, and ethics.

Answers on Page 44



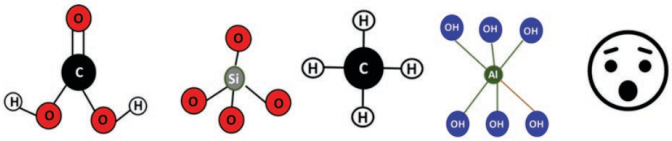
Robert G. Font, CPG-03953
robertfontphd@gmail.com



1. The coastline at Cabo da Roca in Portugal illustrates all but one of the choices below:

a) Sea arch.
b) Sea stack.
c) Tombolo.
d) Headland.
e) Dude, I think that there are sharks along this coast. Did you ever watch "Jaws"? Man, I don't go in the ocean; I only swim in man-made, heated swimming pools with adjacent wet bars.

2. In reference to the diagrams presented here, which choice would you relate to the chemical weathering of limestone?



3. The percentage of clay particles in typical loess deposits is approximately:

a) ≥50%.
b) ≥75%.
c) ≤20%.
d) 60% to 65%.
e) 0% to 100%, moore or loess.

4. Which of these became extinct at the end or Cambrian time?

a) Trinucleids.
b) Olenellids.
c) Acanthodians.
d) Inoceramids.
e) This is a mean one, man! This is what I'd call ESOTERIC!!!!!



5. When mapped with respect to a reference datum, two fractures are defined by the equations $y_1 = 2x + 2$ and $y_2 = -x + 5$, respectively. What would be an angle of intersection for these two joints?

a) 83.29^{o}.
b) 43.67^{o}.
c) 71.56^{o}.
d) 15.03^{o}.
e) You expect ***me*** to calculate this? Ha, ha, ha, ha, ha, ha!!!!!!!!!!!!!!!







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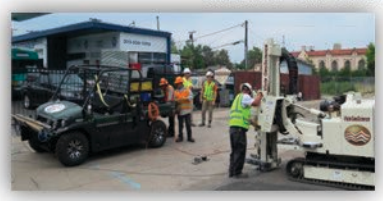
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Topical Index-Table of Contents to the Professional Ethics and Practices Columns

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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How will AI and machine learning impact your career?

Marc Herpfer, 2024 SME President, in his President's Letter in the May '24 *Mining Engineering*, asks, "How will AI and machine learning impact your career?". Herpfer believes that "we are on the cusp of a tremendous transition for humanity driven by science and technology. … Machine learning and artificial intelligence (AI) will enable more change during the next decade than the computer revolution empowered us to accomplish during the last half-century." I've been a member of SME for over 50 years starting as a student. When I was a student, papers were prepared on a typewriter using Courier or Elite fonts, final drawings and maps were hand-drawn in India ink and colored with pencils, and multiple copies were made by mimeograph or blue-line printers for big maps. I was able to run simple computer programs using a teletype and Basic while most folks had to use Fortran and computer cards. Now we have personal computers and laptops, scanners, laser printers, large-format plotters, and graphics programs. In the late '60s, cameras used film and you selected black and white or color prints, or color slides. Today's electronic cameras are smaller, often with greater resolution, you can select for a print or a slide as needed and can easily add annotations to the picture. We are just beginning to explore the many things that AI can do to improve our work. I agree with Herpfer that the next decade will bring tremendous changes in how geoscience is done. But geoscience will still involve looking at and through rocks and their chemistry and physics and humans will have to figure out what it all means. RMAG President Mike Tischer reprints this interesting question, "AI won't replace humans—but humans with AI will replace humans without AI."[1] What do you think?

An article, "How critical minerals tie to the AI boom," in the July 9, 2024 AIPG *eNews* focused on the demand for high-purity alumina, a critical component of semiconductors and as a separator dividing positive and negative electrodes in EV batteries that prevent short circuits and spontaneous explosions. The electrification of vehicles will require 55% more new copper mines by 2050 according to the International Energy Forum.[2] The report added that even factoring out energy transition, the world will need to mine at least 115% more copper than has been mined in human history pre-2018 just to meet business-as-usual trends.

Another aspect of the increasing use of AI is the geometrically increasing data storage requirements for all the data being collected to improve and for use in AI programs. Data storage facilities require lots of electricity. Increasingly sophisticated AI programs will require increasing computing power in chips (AI+ compatible chips will process trillions of operations per second). Wind farms of the size necessary for small cities are needed for a single large data center. "Training a large language model like GPT-3, for example, is estimated to use just under 1,300 megawatt hours (MWh) of electricity; about as much power as consumed annually by 130 US homes."[3] Tech giants Google and Microsoft have each consumed 24 TWh of electricity in 2003, equaling the power consumption of Azerbaijan (10.1 million people).[4] Google and others have issued press releases about AI's inability to become net-zero emitters as soon as previously projected.[5] Finally, AI isn't always correct: ask ChatGPT, CoPilot, Google Gemini, and Meta AI "How many 'r's occur in the word 'strawberry'? The AI programs' answer is 2 which your eyes tell should be 3.

Regaining use of old project data

An article, "Rescuing geologic 'dark data' from the dustbin," appeared in the *AAPG Explorer* for July 2024. 'Dark data' consists of the old maps, handwritten field notes, photos, drill logs, reports, etc. that sit forgotten in a company's files and are no longer being used. In fact, due to retirements and the like, the geoscientists who worked on these projects are no longer with the company. The article notes that the USGS has over a century's worth of dark data. Assembling this dark data, indexing the site and data location, and updating it to digital form would be of tremendous help to those reexamining the area. Similar 'darkening data' sites are in the old files of many consultants who might be willing to donate this data to a university depository or similar institution. As I pointed out in "Confidential information about a property—who owns it?" in column 175 (Jul '20) disclosure of such confidential information without the owner's permission can constitute an ethically impermissible conflict of interest. My discussion points out various potential problems with identifying the current data owner. The *AAPG Explorer* article describes

1. Mike Tischer, "Deus Ex Machina," RMAG Outcrop, July '24 President's letter from the *Harvard Business Review*, August 2023.
2. https://www.mining.com/vehicle-electrification-requires-55-more-copper-mines-by-2050-report/.
3. How much electricity does AI Consume?: https://www.theverge.com/24066646/ai-electricity-energy-watts-generative-consumption.
4. *This Week*, 7/24/2024, p. 32.
5. Google's carbon emissions surge nearly 50% due to AI energy demand: https://www.cnbc.com/2024/07/02/googles-carbon-emissions-surge-nearly-50percent-due-to-ai-energy-demand.html; Will AI accelerate or delay the race to net-zero emissions?: https://www.nature.com/articles/d41586-024-01137-x.

a firm, Sabata Energy Consultants, that is contacting companies for permission to gain access to this data and make it digitally available thus resolving the potential conflict of interest problem. Perhaps similar firms might be able to compile, digitize, and sell similar accumulations of dark data from other geoscience specialty areas.

Oklahoma's 10 Commandments teaching requirement—my lesson plan

Oklahoma Superintendent of Public Instruction Ryan Walters released guidelines for integrating the Bible into classrooms.[6] If I were teaching Earth History or evolution in Oklahoma, my assigned Bible reading would be Genesis 1.1—1.31 and 2.4b—8. The first chapter of Genesis recounts the familiar story of the six days of creation while the verses from the second chapter provide an alternative account of the order of creation. Both stories cannot be literally true. As with the creation stories of other cultures, these two alternative Abrahamic creation stories are not about science but are about the higher power's relationship with the culture. The blessing and hallowing of the seventh day (Genesis 2.3) is Judaism's greatest gift to the world, the recognition of the need for a day of rest each week.

Avi Steinberg observes in *The Lost Book of Mormon: A Quest for the Book That Just Might Be the Great American Novel* that scriptures are a subgenre of nonfiction in which stories are told along with the proviso that the stories are absolutely true. This raises the question of what is the meaning of *true*. *The Lost Book of Mormon* is an excellent review of how the book came to be written without any effort to convert you. I recommend it.

Will silica dust become the new asbestos?

Researchers in the UK are recommending new limits to a person's daily limit to silica dust from 0.1 mg/m^3 to 0.05 mg/m^3 over the working day. The study does note that more study is needed.[7] What is not included in the summary is the size of the hazardous silica particles, a critical parameter. Dust can be a problem. But humans have lived in dusty environments since the beginning. As the asbestos scare has demonstrated, uncritical declaration of a hazard can have serious and unnecessary economic consequences. Unless it is in dust form, it isn't a problem. The asbestos in the pipe insulation in a former home was not a problem because the pipes were regularly painted to prevent release of asbestos dust. My asbestos samples from Thetford Mines, QC are bigger than an elephant can snort.

Pooping in the field

This is a continuation of the discussion of this topic that began in the last column (190 Jul '24). I recently became aware of a product kit that consists of a shovel, compact expandable wipes, tabs to help dissolve the poop, and a carry case that is available from www.pactoutdoors.com. While you may be interested in obtaining a Pact kit, I want to pass along the following practice standard from the Pact website, "You should pack out your waste when in any of the following types of areas: arid deserts, the alpine (places where trees do not grow), anywhere that doesn't allow you to get 200' from water sources (e.g. narrow canyons), and anywhere that local regulations mandate pack out methods. When a mandate is in place it is generally because the area receives so much traffic that the soil couldn't handle the volume of buried waste even with our Pact Mycelium Tabs. Generally, most other areas should be okay to bury. But it's always a good idea to research this in advance."

Replacing equality with equity

Christine Lilek's "Replacing equality with equity: an equity road map" in column 190 (Jul/Aug/Sep '24) and a note on Darrun M. McMahon's *Equality: the history of an elusive idea* (2023) stating that: "Equality is in crisis. Our world is filled with soaring inequalities, spanning wealth, race, identity, and nationality. Yet how can we strive for equality if we don't understand it? As much as we've struggled for equality, we have always been skeptical about it. How much do we want, and for whom?" prompted me to reflect on the topic "Equal pay for equal work" presented in columns 163 (Jul/Aug/Sep '17) and 165 (Jan/Feb/Mar '18). As pointed out in column 163, "'Equal pay for equal work' is a worthwhile goal. It sounds great until one digs into it a bit. What constitutes 'equal work'? Are all similarly qualified geoscientists paid the same? No, they are not." Data from a 2016 AGI study found that "Clearly geoscience salaries depend on both degree and area of practice. Oil and gas pays the most [in this 2016 study]. The area of practice also varies by degree. Is the work done by an environmental geoscientist equal to that of an oil and gas geoscientist? Generally not, at least as measured by salary."

In column 165, **Guy Swenson** (CPG-07574) noted that "'Equal Pay for Equal Work' is fundamentally about accepting and encouraging diversity by treating employees equally. This is not an issue of whether environmental geologists are worth more or less than petroleum geologists or whether a part-time employee is equal to a full-time employee. This is about whether employers treat employees equally without regards to gender, race, national origin, or personal values. Equal treatment includes equal pay for the same work." I concur with Mr. Swenson's comments as they apply to individual employers. However, when the topic appears in the news, the observation, "On a percentage basis, the average woman earns only 79% of what a man earns"[8] is frequently made. This statistic is not employer-based; it compares all employed women with all employed men. This statistic hides a wide range of complexities including such things as job type, the female-to-male ratio in that job type, educational level, experience, etc.

Market factors explain much of the differences between the pay levels of different geoscience specialties. Petroleum geoscientists work to find oil and gas, products in demand, and their pricing affects the amount petroleum geoscientists are paid. Mining is similar; however, because more people involved in successful exploration programs, a far greater number of prospects examined, and far greater amounts of money are required to bring a mine into production, there is less room for individual mining professionals to make a lot of money. As the saying goes, "In order to make a small fortune in mining, start with a large fortune." Other areas of geoscience practice are more directly dependent on what taxpayers will support. Many work directly for governmental agencies or in areas that depend on governmental expenditures or grants. Improving water quality or quanti-

6. 'The woke radicals will not like it': Oklahoma releases schools' Bible guidelines (thehill.com).
7. www.dw.com/en/why-silica-dust-could-become-the-new-asbestos-health-risk/a-69875518?maca=en-rss-en-all-1573-rdf./.
8. https://www.forbes.com/sites/clareoconnor/2016/04/12/equal-pay-for-equal-work-the-gender-wage-gap-by-thenumbers/#22b384351454. Accessed 11/4/17.

ties does not generally increase the price of water. Environmental quality is similar. Engineering geology is also frequently dependent on the tax dollars required to build roads, dams, or other structures.

Sara Pearson, CPG-10650, commented, "Not all degrees are equal. There is significant disparity in what is being taught and the quality of instruction [between schools]. This is part of the complications that you mentioned." Pearson also noted that the skills and tasks required for each job can very dramatically between and even within firms. While the local, state, and federal civil service rules for government jobs attempt to even things out, there still can be variations.

I watched some of the Paralympic competitions. The various disability classes are attempts to provide equitable competition within each category. Some Paralympians are competing in different categories this year than they did in Tokyo as efforts to achieve equitable competition continue. Of course one of the reasons for classification change are the result of the progression of disabling diseases like multiple sclerosis over a person's lifetime.

Unfortunately, while recognizing the inequalities between geoscience practice area salaries, I do not see an equity solution. 'Equality' means the same while 'equity' means being treated with the same respect and care even when the treatment is unequal for a legitimate reason. Lilek's article points to equity examples like automatic doors to many buildings, which can provide benefits to all regardless of physical limitations. Do you have any ideas?

I recently watched a rerun of *Grey's Anatomy* that pointed out that different ethnicities can respond differently to "standard" medical treatments. For example, commonly East Asians have a condition, "the Asian flushing syndrome" that causes flushing following the consumption of minor amount of alcohol. The fisherfolk among Southeastern Asia peoples have evolved the ability to hold their breath for long periods.[9] Aside from ethnic distinctions, an individual's medical condition, such as an addiction or allergy, can affect particular treatments. These differences in treatment are unequal in terms of being exactly the same but are equitable because individuals are given the best possible treatment (we hope) given their characteristics. Is the pay disparity between differing geoscience specialties analogous to these medical situations? Let me know what you think.

9. Edward Slingerland, 2021, Drunk: how we sipped, danced, and stumbled our way to civilization.

Welcome

New Certified Professional Geologists!

May 1, 2024 - August 31, 2024

Section	Name	AIPG Member Number
Colorado	Aaron Johnson, PhD	CPG-12229
Colorado	Patrick C. Loury	CPG-12224
Colorado	Mark E. Stacy	CPG-12217
Idaho	Tyson J. Forbush	CPG-12230
Idaho	Nathaniel R. Swanson	CPG-12227
Illinois-Indiana	Michael J. Cook	CPG-12231
International	Karla M. Calderon Guevara	CPG-12220
International	Carlos A. Zamora	CPG-12225
Minnesota	Edward W. Gazzetti	CPG-12215
Minnesota	Matthew J. Robey	CPG-12223
Northeast	Brian R. Mocci	CPG-12216
Oklahoma	Bay R. Woods	CPG-12228
Oregon-Washington	John S. Oldow, PhD	CPG-12222
Tennessee	Jason T. McCuistion	CPG-12218
Texas	Russell T. Winn	CPG-12219
Virginias	William T. Cooper	CPG-12226

The Gold Standard in Geoscience Professionalism.

Early Career Professional Spotlight: Patrick Szopinski

Brigitte Petras, ECP-0851

I would like to recognize Patrick Szopinski, ECP-1015 from the AIPG Missouri Section in the ECP Spotlight this quarter. He was selected for this honor because of his enthusiasm for geology and his stewardship within his career. Additionally, his actions energetically align with the mission of AIPG – to advocate for our profession and serve its members. His write-up below showcases his experience, energy, and dedication towards AIPG.

I first got acquainted with him as he answered our Call for ECPs to become more involved in AIPG's events. Since then, he has moderated and served as a panelist for webinars in our Student ECP Webinar Series, volunteered as a technical a session chair, and facilitated part of the Annual Student ECP Professional Development Workshop. I interviewed Patrick and he provided his own words of the responses he gave. The answers below are in Patrick's voice.

As always, I hope this spotlight series provides a platform to recognize outstanding early career professionals, inspires students and other new professionals to find their own path to success by learning from others, and that other professions gain more insight on the talent and the ideas of early career professionals.

Tell us about yourself.

Since I was a toddler, I knew I wanted to be a scientist. I started with having crates of dinosaur toys in my bedroom, then I had books about fossils and volcanoes on my bookshelf. Now I have too many mineral specimens on my mantel, a shortcut to ArcGIS on my laptop, a travel bag filled with Estwing hammers and duct tape, and a degree that says "Bachelors of Science in Geology." If five-year-old me could see who I've become, I think he'd be most pleased!

I've been with AIPG for almost seven years, having joined when I was an undergrad student at the University of Nebraska-Lincoln. Since I moved to St. Louis and joined the Missouri Chapter, I've upgraded to an ECP, and am much more involved with AIPG overall.

I've been working in the geosciences for over five years. Since graduating, I've worked for multiple engineering and consulting firms in both Illinois and Missouri. My current role is an Advanced Lab Technician and Lab Supervisor for SCI Engineering, Inc. in the St. Louis metro area. At a given time, I manage five to 20 people at the lab, and even had to teach and guide five interns this summer alone. In the near future, I plan on attending grad school in Missouri for my Master's in Geological Engineering/Geophysics, as well as earn my PG license in Missouri. After that I'm not sure where I'll go. Perhaps I'll have to write another one of these spotlights in 2030 to keep everyone up-to-date!

Do you have any professional achievements/awards?



Patrick next to the sign for SCI Engineering, Inc.'s headquarters in St. Charles, MO proudly wearing his AIPG cap from the 60th Anniversary National Conference in Covington, Kentucky.

My involvement with AIPG started as a student member back during my undergrad (which was free). Since then, I've been trying to deepen my involvement, not just with the Missouri chapter, but at the broader level too. I've written an article for the student and ECP edition of *TPG*. I regularly attend the webinars hosted each month, and I even served as a panelist on the "Launching Your Career in the Geosciences" series earlier this year. One thing that I'm proud of was attending the 60th Anniversary National Conference back in 2023. In fact, this was my first time attending any national AIPG event at all. It did not disappoint! I was lucky enough to serve as a technical session chair for multiple presenters, an opportunity I did not expect. One of my favorite experiences was helping officiate events on the Student and ECP Day, which was a full day of activities and presentations geared towards students and others who were looking for guidance on their own careers. These included mock interviews, ASBOG exam advice, presentations from people on different career trajectories, and plenty of great chances to network.

As for professional development within my career, I secured my Geologist Registrant-in-Training (GRIT) certification from the State Board of Geologists in Missouri (No. 2022032986). But not only did I have to pass the FG exam to qualify – no small feat thanks to pandemic-related delays – but I had to change employers to

Continued on p. 45

Answers:

1. The answer is choice "c" or "tombolo." The beautiful Portuguese coastline at Cabo da Roca has visible sea stacks, sea arches, headlands, and bays. By definition, a "tombolo" is a sedimentary bar which connects an island to the mainland. This depositional coastline feature is not present here.

2. The answer is choice "a" as it illustrates carbonic acid H_2CO_3 or $H^+ + HCO_3^{-1}$. Calcite in limestone is acted upon by carbonic acid and breaks down into soluble calcium cations and bicarbonate anions [$CaCO_3 + H^+ \rightarrow Ca^{++} + 2HCO_3^-$].

Choice (b) is the silicon tetrahedron $(SiO_4)^{-4}$.

Choice(c) illustrates methane or CH_4.

Choice (d) is the aluminum octahedron. Each hydroxyl anion OH^{-1} divides its charge with two other units so that the net charge of an octahedral unit with an aluminum cation Al^{+3} at its center is +1.

3. The answer is choice "c" or "≤20%."

Loess is a clastic sedimentary deposit formed from the accumulation of wind-blown dust. It has the following characteristics:

- It is mainly composed of silt-size particles with a predominant grain size ranging from 0.02 to 0.05 millimeters. Clay fraction is generally ≤20% clay. Silt and sand make up the rest.
- It is often loosely cemented by $CaCO_3$.
- It tends to be highly porous.
- It contains vertical capillaries that allow fracturing and the formation of near-vertical bluffs.
- It may be derived from periglacial ground (Mississippi River alluvial valley), desert terrain (China), volcanic material (Argentina and Ecuador), and evaporitic deposits (Spain).

4. The answer is choice "b" or "olenellids."

Olenellids are trilobites (arthropods) found only in the Cambrian strata.

Trinucleids are also trilobites, but these lived only in the Ordovician Period.

Acanthodians were a class of jawless fish that became extinct at the end of Permian time.

Inoceramids were marine bivalves that became extinct at the end of the Cretaceous.

Well, you can make the case for "esoteric" information, but it is still part of geology….

5. The answer is choice "c" or "71.56°."

Given:

$y_1 = 2x + 2$ (1)

$y_2 = -x + 5$ (2)

Taking derivatives:

$y_1' = m_1 = 2$ (3)

$y_2' = m_2 = -1$ (4)

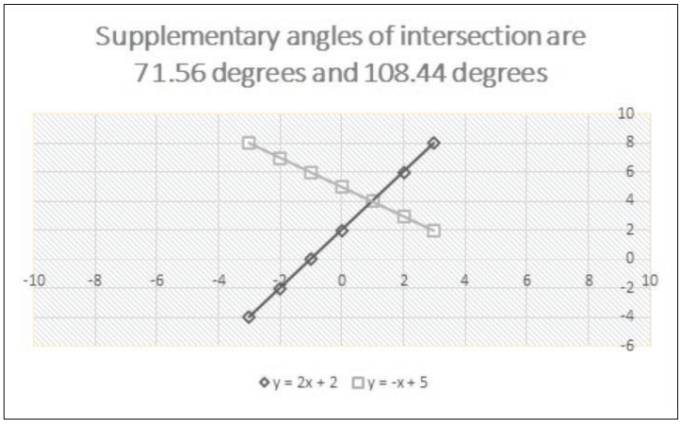
Recall:

$\tan \Theta = (m_2 - m_1) / (1 + m_1 m_2)$ (5)

$\tan \Theta = [(-1) - 2] / [1 + (2) * (-1)] = 3$ (6)

$\tan^{-1} \Theta = \tan^{-1} (3) = 71.56^o$ (7)

Please see the diagram to the right.



ECP Spotlight, continued from p. 43

find one where my certification could be cosigned by an already-licensed geologist. If anyone wants to read that full story, I've written about it in the April/May/June 2023 edition of the *TPG*.

> *And with geology being more interdisciplinary than ever, I feel especially grateful to my professors and faculty for encouraging me to examine other fields within geoscience.*

How did your education and student opportunities help you in your career?

While I always knew that geology was what I wanted to study as a college student, I didn't know how that course of study would look. If you'd asked me what my dream job was as an 18-year-old, I would've said "paleontologist," but that changed during my undergraduate career. I owe a lot of thanks to the faculty at the University of Nebraska-Lincoln's Earth and Atmospheric Sciences Department. Not only were they great teachers, but they offered a lot of guidance with how to make a career out of geology, especially in two key categories: what are the skills you need to get started in a particular field; and what is the demand, availability, and volatility of that particular field?

Paleontology was my first fascination in the geosciences, and naturally I filled my freshman schedule with any class related to it. I was able to help with fossil-hunting fieldwork in New Mexico for a summer, and volunteer at the state's natural history museum. But I learned early on that paleontology is a highly competitive field with limited positions which require a substantial academic investment. It was sobering to learn, but I'm grateful that my faculty explained this early on, so I had time to find another field of interest.

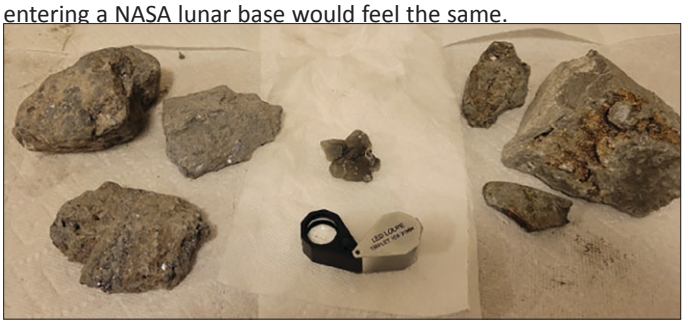
During my sophomore year, the university hired a professor of geophysics, and I quickly learned how much I enjoyed that. I took as many geophysics classes as I could, and I even helped teach one class as a teaching assistant. I ultimately asked that professor to serve as my advisor for my undergraduate thesis, which focused on using geophysical field instruments to determine the boundary of the Midcontinent Rift System in Nebraska. Although it was a challenge, I am delighted that I found another area within geology to capture my interest and that I was able to begin accumulating skills that could benefit my career as a geophysicist.

At the same time, I began hearing about the geotechnical engineering field. This piqued my interest since it combined studying and understanding the earth with practical knowledge about how to use it for human needs, like infrastructure. I learned that there were lots of job opportunities for early graduates within this field, so I began looking for ways to improve my skillset to fit with this discipline (many of those skills overlap with geophysics). With some guidance from faculty, I took additional courses in engineering statics, material science, and construction materials testing. These classes were pivotal in securing my first job at a geotechnical engineering firm.

Not only were there career-related gains from focusing on the job-related side of my degree, but it also helped broaden my scope of knowledge. I have a deeper understanding of how geology relates to the rest of society, and how I could put my expertise into action to help build and understand the world in which we live. And with geology being more interdisciplinary than ever, I feel especially grateful to my professors and faculty for encouraging me to examine other fields within geoscience. My sedimentology professor, Dr. David Loope, said it best, "Any fool can know, but it takes a genius to understand."

What's one of your favorite AIPG experiences?

In November 2023, I and several members of the AIPG Executive Board and Missouri Chapter went on a tour of the Fletcher Mine. This is a working lead and zinc mine in southeastern Missouri, part of the Doe Run Mining company that produces the most lead and zinc in North America. As someone living in St. Louis, it was quite the treat to explore this area of my state and see some of Missouri's geology up close and personal. We met several of the miners and geologists who work at the company, and we descended over 900 ft into the working zones. Fletcher Mine is a wet mine, since it's below the water table, and water and oxygen are continually pumped throughout the working areas so that the staff have clean breathable air. The air in the mine was deliciously pure, as it smelled to be free of pollen or pollutants. Any dust generated by the work was captured by water instead of going airborne. I imagine that entering a NASA lunar base would feel the same.



Specimens of minerals in limestone collected from Fletcher Mine in Viburnum, MO: galena on the left, raw calcite crystals in the center, pyrite on the right. Hand lens for scale.

The Fletcher Mine is primarily housed in Cambrian- to Ordovician-aged limestone and dolostone, where galena, chalcopyrite, and sphalerite are the minerals primarily mined for ore. As we toured the insides of the mine, the guides took us to various locales where the mining was taking place, and we were allowed to collect our own samples from the host rock. I personally left with a bag weighing over 30 pounds!

Once we were above-ground, we visited the processing facility on the mine site, where lead, zinc, and copper are extracted from the ore. Viewing the processing helped me contextualize the role of raw geological materials in the nation's supply chain. I left that trip with a profound respect for all the people involved in the mining and processing industry.



Geoscience Education and Workforce Development in Universities: **Progress, Problems, and Prospects**

Rasoul Sorkhabi, Ph.D., CPG-11981

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Since the emergence of geology as an independent modern science in the early 19th century, geology education has been part of higher education, first in Europe and North America and later in other parts of the world. Currently in the USA, about 2,000 (out of 2,832) universities and colleges offer earth science and geology programs at various levels. In addition, there are 1,105 community colleges, most of which offer earth science and geology courses. Nevertheless, in the past decade there has been a serious decline in geology education, especially in terms of program shutdown and student enrollment at universities. In an editorial in 2021, *Nature Reviews Earth and Environment* observed that "Universities are ruthlessly cutting geoscience departments, funds and staff, brining a terrible blow to Earth science research worldwide."[1] For instance, Macquarie University in Australia and Laurentine University in Canada axed their entire Earth science departments. Royal Holloway, University of London, cut down jobs in "less popular disciplines" including geology. University of Vermont in the USA merged geology and geography departments into one. This article analyzes the root causes of this decline in geoscience education and offers some suggestions based on a multi-approach study.

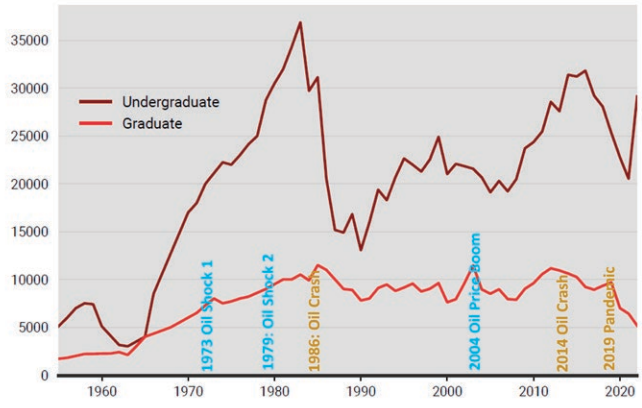


Figure 1. Undergraduate and graduate geology enrollments in the USA 1955-2022 (source: AGI, 2023).

Let's, however, start with good news and bad news. The good news is that post-pandemic enrollments in geology and earth science programs for undergraduate students have drastically increased and the bad news is that the enrollment for master's students has continued its decade-long decline[2] (Figure 1).

Decline in Oil and Gas Employment

Since the 1910s, the petroleum industry has increasingly hired geology graduates. This accelerated after World War II when demand for oil and gas rapidly increased because of post-war reconstruction, economic development, population growth, as well as modernization programs in the Global South. In the USA, enrollments in geology for both undergraduate and graduate students increased steadily throughout the 1970s and peaked in the early 1980s, partly because oil price increases by the First (1973) and Second (1979) Oil Shocks motivated the oil industry to explore new oil reserves and hire many geologists and geophysicists. Then came the oil market crash of the mid-80s which eliminated many jobs in the oil industry and caused a rapid decline in geology enrollments as well. During 1995-2008 the oil industry boomed again as global demand for oil (especially from China and India) combined with violent conflicts in the Middle East pushed oil prices higher. In 2014 OPEC, in their attempt to defeat the US oil and gas shale revolution, crashed oil prices by flooding the world market with their less expensive oil. The 2019 Coronavirus pandemic reduced demand for oil gave another blow to the oil and gas market.

The oil market crashes of the past decade have adversely affected both geoscience enrollments and petroleum geoscience and engineering programs. The petroleum industry's employment of students fell from 35% for BS graduates and 70% for MS graduates in 2013 to about 7% for both graduates in 2020 (Figures 2A, 2B).[3] During the same period, undergraduate enrollment in petroleum geology and engineering programs in the USA fell by 75%.[4] Many universities, including Imperial College, University of Calgary, and

1. "Geoscience on the chopping blocks," *Nature Reviews Earth and Environment*, 2: 587, https://www.nature.com/articles/s43017-021-00216-1
2. Mosher, S, Ryan, J., and Kane, C. (2023) *Vision and Change in the Geoscience: Shaping the Future Graduate Geoscience Education.* American Geoscience Institute, Alexandria, VA..
3. Keane, C., Gonzales, L., and Robinson, D. (2022) *Status of Recent Geoscience Graduates 2021.* American Geosciences Institute, Alexandria, VA.
4. "Big oil's talent crisis: high salaries are not enough," *Wall Street Journal,* August 6, 2023.

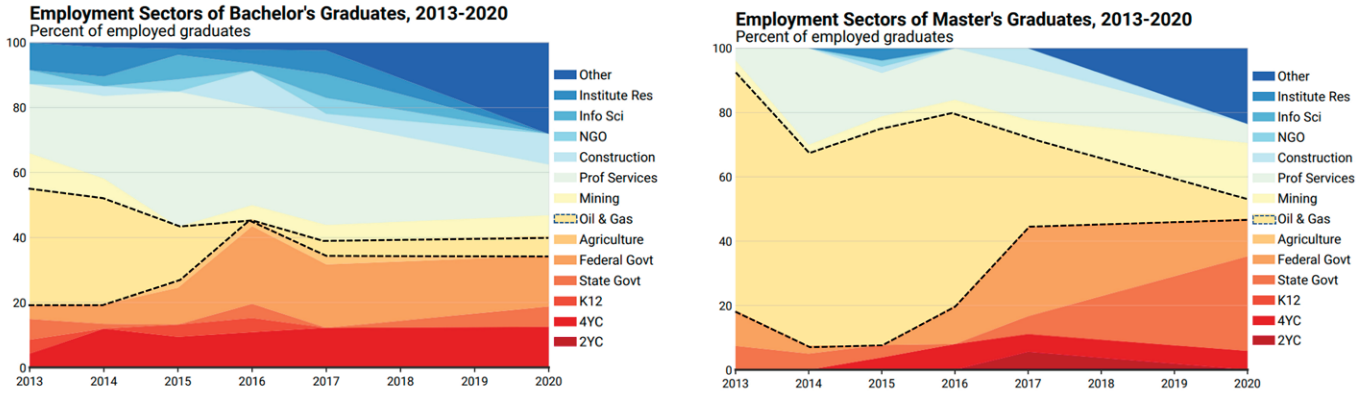


Figure 2. Employment sectors for BS in geology graduates in the USA, 2013-2020 (2A) and for MS graduates (2B) (source: AGI, 2022). Note that employment by the petroleum industry for both BS and MS geology graduates drastically decreased during this period.

University of Utah have thus terminated their petroleum geology or engineering degrees.

The recent changes in the oil and gas industry impacts geoscience education in three ways:

1. Due to market volatility, the oil and gas companies have reduced their new hires and their funding of geoscience and engineering projects in universities.
2. The largest growth in the US oil and gas production over the past decade has been in shale plays, which require less exploration geoscience as these formations have already been identified.
3. Massive growth in automation, data digitization, artificial intelligence tools, machine learning models, geoscreening (interactive streamline generation and visualization of data), and remote monitoring of operations have reduced (and will increasingly reduce) man-hour and manpower.

Conversely, many young people do not want to work in fossil fuels because of their concerns over global warming and environmental problems caused by fossil fuels. Indeed, some universities have divested from fossil fuels, often as a symbolic act to show their concerns.

It is not clear how far the oil and gas industry can afford to continue without new investments in human resources, and research and development. Currently, oil and gas account for 62% of energy consumption. Replacing this huge portion with renewable energies will be unlikely to happen at a quick pace. As the global demand for energy resources increases, the oil and gas companies will have to explore and find new reserves to meet the market demands. And this will require a new workforce for exploration and production. Interestingly, there are already reports of "talent shortage" in the oil and gas industry.[5] This implies that the in coming years, the oil and gas companies may again hire geology and geophysics graduates in huge numbers. But if the Western universities cannot supply this workforce, the oil and gas companies will rely more on the trained workforce from non-Western countries.

Geoscience for the Energy Transition

Even without job growth in the oil and gas industry, it is important to note that development of renewable energy resources on a massive scale and the energy transition toward low-carbon technologies and economies will all require geoscience knowledge and skills in myriad ways.[6] In fact, many of the skillsets in petroleum geoscience and engineering can be transferred to other fields in the energy transition. The petroleum industry, over more than a century, has developed highly sophisticated science and engineering for characterization, imaging, drilling and production from subsurface prospects. Geoscience departments can repackage and customize these skillsets for training, research, and workforce development in fields (Figure 3) such as (1) enhanced geothermal systems (which require hydraulic fracturing of deep rocks), (2) carbon sequestra-

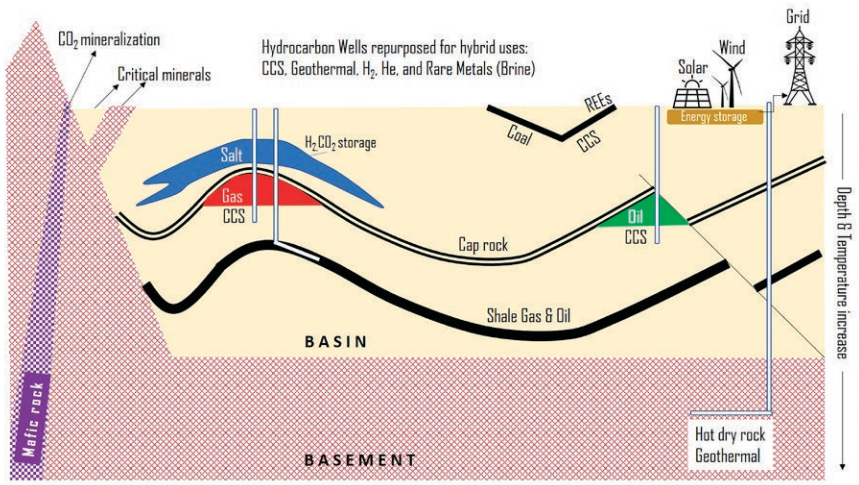


Figure 3. Various ways the subsurface petroleum geoscience can be applied to the energy transition technologies (source: Sorkhabi, 2023).

5. "The real shortage facing the oil and gas industry? Talent," *Hart Energy*, January 8, 2023.
"Big oil's talent crisis: high salaries are not enough," *Wall Street Journal*, August 6, 2023.
"Talent is the next energy crisis. Here's what we can do about it." *World Economic Forum*, April 21, 2023.
6. Sorkhabi, R. (2023) Geoscience education and workforce development for the energy transition. *First Break*, 41 (10): 83-86.

tion projects (which require detailed reservoir, fluid-rock interaction, and sealing analyses), (3) mapping and production of critical minerals, rare-earth elements, and battery-grade substances, (4) geologic (natural) hydrogen; (5) environmental assessment studies of the energy transition technologies, and so forth.

New Image and Content

We live in the Age of Image. And geology does not appeal to a large section of the young population because they often see our field as dirty or dangerous. People think of geologists as people digging into the ground for coal or crude oil, or chasing earthquakes, volcanic eruptions and other hazards. This image problem is highly amplified when we consider that the geoscience field and community also face formidable competition for students from other fields, especially bioscience, nanoscience, chemistry, chemical engineering, computer science and information technology, and business. Image, of course, should not be deceptive; it should reflect and be supported by a strong content. We can address the image problem in various ways, including new content designs, improving public (and students') perception about the significance of geoscience for science as well as society, showcasing variety in geoscience jobs and multitude of career opportunities, and implementing diversity in geoscience education and workplace.

New Narratives for Research

Graduate students will devote themselves to research if they find their research problem to be interesting, meaningful and impactful. This is how the plate tectonic revolution during the 1960s to 1970s attracted large numbers of students to various disciplines in geology. It is thus important to articulate new "narratives" for geoscience research. In 2020 the US National Academies of Sciences, Engineering, and Medicine published *A Vision for NSF Earth Sciences 2020-2030: Earth in Time*.[7] The report identified 12 key problems as the focus of geoscience research. These include Earth's magnetic field, the birth of plate tectonics, critical minerals, earthquakes, volcanoes, topographic changes, soil as critical zone, climate dynamics, water cycle, biogeochemical cycles of elements, biodiversity, and geohazards.

Critical Needs for Applied Geoscience

In 2020 the American Geoscience Institute published *Geosciences Supporting a Thriving Society in a Changing World* with a focus on the practical aspects of geoscience.[8] The report identified the following critical fields: climate change, water, energy resources, natural hazards, geospatial data, soils, mineral resources, oceans and coasts, waste disposal, and workforce development.

Global Sustainability and Development

In 2023, UNESCO and the American Geophysical Union published *Geoscience in Action: Advancing Sustainable Development*.[9] The report sponsored by 24 professional societies suggested that geoscience community should engage in 17 Sustainable Development Goals formulated by the United Nations. These include End poverty; Zero hunger; Health and wellbeing; Education; Gender equality; Clean water; Affordable and clean energy; Work force and economic growth; Reduced inequalities; Sustainable cities and communities; Responsible consumption and production; Climate action; Marine conservation; Terrestrial ecosystems; Peace and justice; and Global Partnerships.

Geoscience Skillsets

In 2021, the American Geoscience Institute published *Vision and Change in the Geosciences: The Future of Undergraduate Geoscience Education*.[10] The Report prepared by 10 geoscientists from various universities was supported by a five-year NSF research grant (2014-2019, "Future of Undergraduate Geoscience Education"). The report suggested the skillsets needed for the modern geoscience training. These include critical thinking and problem solving; effective communication; research encompassing observational, experimental work and modeling; field work experience; data integration and synthesis; big data science; scientific research methods; self-motivated and continuing education; and digital technologies such as GIS, Google Earth, etc.

Diversity, Equity, and Inclusion (DEI)

Geoscience departments should pay special attention to DEI in their organizational framework. Geology and geophysics have largely been male-dominated disciplines (even though many female geoscientists have contributed to this science and the female geoscientist population has steadily increased). There are now large numbers of female and minority students who strive to acquire higher education and pursue high-paying professional careers. Geoscience departments need to diversify their staff, faculty, and students, expand their courses and training, and appeal to the needs of a diverse population.

Generation Z and Geoscience Education

Decline in geoscience education is also part of a general decline in university and college education in the recent decade.

According to the National Centers for Education Statistics (NCES), undergraduate college enrollment in the USA increased at a rate of 2.2% annually from 1985-2010. The enrollment peaked in 2010 at about 18.1 million students; since then, however, it has decreased at a rate of about 1.5% annually and stood at 15.9 million in 2023.[11]

7. National Academies of Sciences, Engineering, and Medicine (2020) *A Vision for NSF Earth Sciences 2020-2030: Earth in Time*. The National Academies Press, Washington, DC. https://doi.org/10.17226/25761.
8. AGI (2021) Geosciences Supporting a Thriving Society in a Changing World. American Geosciences Institute, Alexandria, VA. https://www.grow-geocareers.com/assets/files/CriticalNeeds2020.pdf.
9. Maria Angela Capello, Emer Caslin, Iain S. Stewart, Denise M. Cox, Anna C. Shaughnessy, Estella A. Atekwana, Heather K. Handley, Ted Bakamjian, Ludivine Wouters, Miriam S. Winsten, Vimal Singh and Kombada Mhopjeni (2023) *Geoscience in Action: Advancing Sustainable Development*. UNESCO, Paris; AGU, Washington DC. https://geoscienceinaction.org/.
10. Mosher, S and Keane, C. (Eds) (2021) *Vision and Change in the Geosciences: The Future of Undergraduate Geoscience Education*. American Geosciences Institute, Alexandria, VA. https://www.americangeosciences.org/change/print-edition/.
11. https://nces.ed.gov/programs/digest/d22/tables/dt22_303.70.asp.

This decrease is in the face of the fact that US population grew 7.7% from 309.3 million in 2010 to 333.3 million in 2022.

College students currently belong to "Zoomers" or Generation Z, born between 1997 and 2012. Like the previous generations, Generation Z have their own pathways and priorities. It appears that many young people today are not interested in a four-year college degree for several reasons.[12] College education has become expensive, and many do not want to take loans and invest their future in a college degree. Moreover, some in Generation Z take more time to figure out what career they want to pursue, and they do not want to do this "soul searching" while spending money and time in colleges. Finally, many in Generation Z do not see much value in committing four years of their youth to getting a BA or BS; they prefer to focus directly on a career and professional field of their own interest.

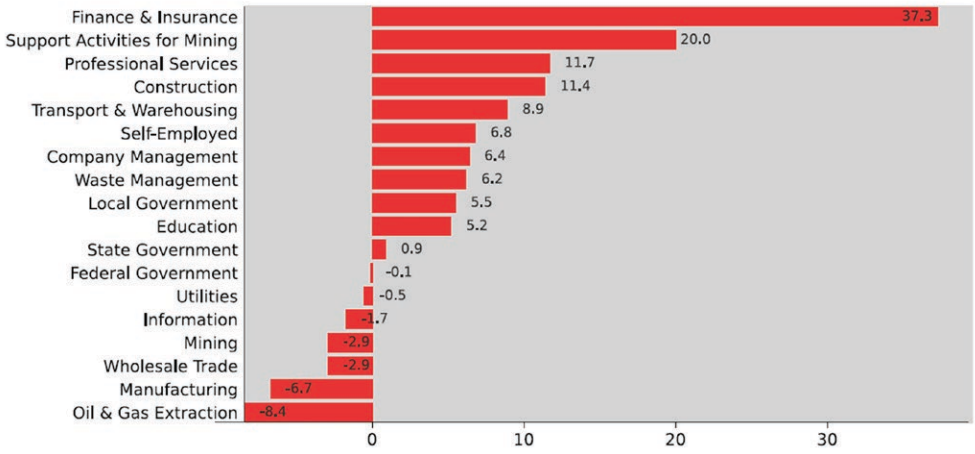


Figure 4. Projected changes in geoscience labor demand by sector between 2018 and 2028 (percent change from 2018 levels) (source: AGI, 2023).

Geoscience, being an applied science, has some advantages to attract Generation Z. This, however, will require designing applied courses and professional degrees such as those related to hydrology, environmental chemistry, mineral technology, construction geo-engineering, and so forth.

It is also important to reach out to the comfort zone of Generation Z. This generation was brought up in the era of digital technologies and social media. They prefer mobile, digital, helpful, and frictionless engagements. They want a community which includes their voice. They want to be engaged in purpose-driven tasks that matter to them. New geoscience education courses, programs, and platforms must adapt to these new circumstances.

It is worth mentioning here an interesting recent project titled "Rocks Really Rock" that promoted geology to young people. Conducted by Carolina Ortiz-Guerrero, then a doctoral student at the University of Florida, this free, informal, and publicly available program was taught to 120 middle school students in 2022.[13] It involved creating virtual field trips via audiovisual recordings of several locations in Idaho based on several "big ideas" related to Earth's age, interacting systems, and life evolution. The virtual field trips were mounted onto Google Earth and were shown to students. Results of assessment surveys given to students indicated that the electronic field trips on Google Earth positively impacted students' attitude toward geology and geology careers. The project had positive impacts because it integrated videos and maps and used stories to describe the content.

Earth Science in High Schools

University education cannot be decoupled from K12 education. If a teenager becomes keenly interested in a discipline, he or she will probably follow that as a career. Many children love fossils, minerals and rocks. Stephen Jay Gould (1941-2020) famously said that he wanted to become a paleontologist because when he was five years old his father took him to see the Natural History Museum in New York. Of course, not every child who visits a natural history museum becomes (or should become) a geologist. However, it seems that many students lose their interest in Earth Science in high school. This may also be a normal thing as students become interested in various fields. However, the quality (or the lack of) science education, and earth science in particular, in many public schools may also play a huge role in the decline of students' interests in sciences.

According to a 2015 report by the American Geoscience Institute, only two states *require* and only 22 states *accept* Earth and Space Science courses for high school graduation. In other words, 28 states *do not accept* Earth and Space Science courses for high school graduation.[14] There are 26,727 high schools (both public and private) in the USA. Professional societies such as AIPG, American Geophysical Union, Geological Society of America, National Geographic Society, National Association of Geoscience Teachers, and others can play a transformative role in promoting Earth science education in high schools and persuading high schools across the country to offer and improve Earth Science courses. Geoscientists can actively engage as volunteers and take interesting geology stories, specimens, and experiments to classes and share with students. The cumulative impact of these small steps can be tremendous.

12. "The future costs of declining college enrollment rates," *Michigan Journal of Economics*, April 19, 2022, https://sites.lsa.umich.edu/mje/2022/04/19/the-future-costs-of-declining-college-enrollment-rates/.

    "US college enrollment decline – 2024 facts & figures." April 22, 2024. https://www.collegetransitions.com/blog/college-enrollment-decline/.

13. Ortiz-Guerrero, C., & Loizzo, J. (2024). Rocks Really Rock: electronic field trips via Web Google Earth can generate positive impacts in attitudes toward Earth sciences in middle-and high-school students. *Geoscience Communication*, 7(2): 101-119.

14. *Earth and Space Sciences Education in US Secondary Schools: Key Indicators and Trends.* Earth and Space Science Report, Number 2.1, July 2015. American Geosciences Institute, Alexandria, VA.

Earth Science Literary

As geoscientists we should not limit our attention to universities, colleges and schools only. Earth science literacy for the public at large is equally important, especially since we also need public support for education and research in Earth science. Popular books, magazine articles, and documentary films about Earth, enriching Earth science exhibits in natural history and science museums, and visits to national parks and monuments all help promote the value and joy of Earth science among people.

Job Market

According to the US Bureau of Labor Statistic, there were 26,300 geoscientists, 6,600 hydrologists, 10,500 atmospheric scientists, and 80,500 environmental scientists in 2022. Job growth for geoscientists is projected to be 5% by 2032. The job growth will be different in various sectors for geoscientists, with the largest being in finance and mining (Figure 4).

Acknowledgements

This article is based on the author's presentation at the AIPG's Annual Convention in Durango, Colorado, August 10-13, 2024. I thank Shanna Schmitt (AIPG President 2024) for chairing the session in which this presentation was made, and for permitting an engaging Q&A time.

In Memoriam

Robert (Rob) White, CPG-11019

Decatur, Georgia

July 28, 2024

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Obituary and photograph taken from the Georgia Funeral Care website.

Robert Anderson White passed away late Sunday, July 28, 2024, after an acquired illness ended his courageous lifelong struggle with kidney disease. He was 58 years old.

Born in Lynchburg, Virginia, Rob later lived in Miami, Florida, then High Point and Greenville, North Carolina, and Lynchburg again before settling in Atlanta, Georgia. He invariably made hosts of friends. A Guilford College graduate, he earned an M.S. in Geology from Georgia State and headed, as Professional Geologist, his own environmental consulting firm until dialysis precluded full-time work. He was a former officer of the Atlanta Geological Society and member of several dog-training organizations. Rob was a seasoned outdoorsman whose greatest joy was training his own dogs both as hunting dogs and service dogs. As often as possible, he enjoyed helping to organize dog handling with cherished friends at Franklin County's South Fork Hunting Preserve. Those who knew him particularly remember Rob's intelligence, kindness, generosity, compassion, and determination to find fun in every day.

2024 Photo Contest Runner Scenic Wonder - Grand Scale Landscape.

Description:

"Yosemite's Half Dome – a wonder of glacial forces"

The Half Dome in Yosemite National Park is a wonder of glacial forces! The sheer granite face and distinctive curved shape of Half Dome were carved and polished over 10 million years ago by the movement of massive glaciers flowing through the Yosemite Valley. These glaciers slowly cut deeper into the valley, sculpting the surrounding rock. Without the erosive power of the ice sheets flowing through the valley, Half Dome would not exist in its present form. The handiwork of the glaciers is unmistakable.

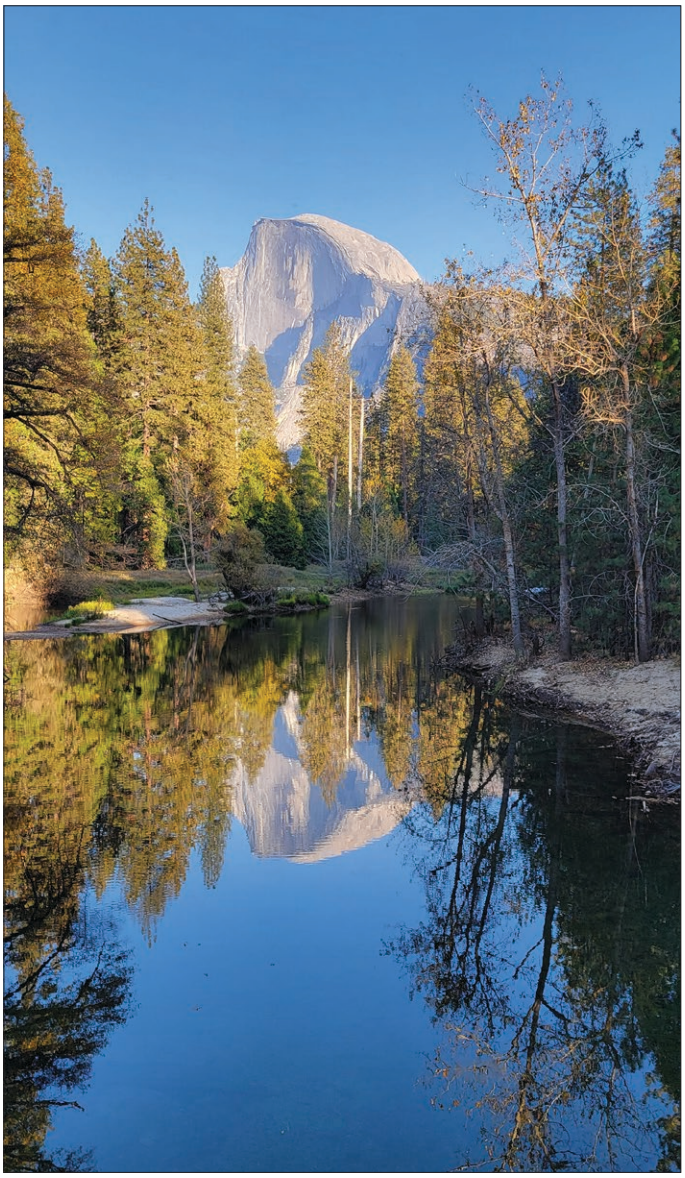


Photo taken in 2023 by **Poonam Rameshbabu***, CPG-11860 - California Section.*

FAPG's Advocacy and Influence in Florida Legislation

Championing Geoscience

Article excerpt reprinted from the AIPG Florida Section/FAPG Spring 2024 Newsletter.

Clint C. Noble, MEM-1938

On the State level, personally, myself and a few FAPG Board Members are very active in our work at the Capitol working with our lobbyist Natalie Kato spreading the word about what we do, ensuring Geologists are included in the appropriate legislation (carbon sequestration in Florida anyone?) and our license is promoted and protected for the benefit of technical Clint Noble, P.G., FAPG President. excellence, service to clients, safeguarding natural resources, and to the best interest to the ever-growing Floridian population. It was refreshing to have significant discussions with lawmakers forming partnerships, especially Senate Majority Leader Albritton, framing an understanding of what we do and why it matters to their constituents including the cutting-edge work Florida Geologists are doing to characterize the nature of PFAS contamination in our water supply.

Advancing our message and credibility via CEUs is vital to our profession and we have political supporters. We have an established Florida Geologists Political Action Committee (PAC) to enable positive change in that regard. We have sponsored and supplied geologic presentations to key Florida conferences including Florida Remediation Conference, Florida Mining Conference (SME Chapter), Florida Water Resources Conference, and the Florida Association of Environmental Professionals.



Clint Noble and Scott Sigler of FAPG with Senate Majority Leader Albritton.



FAPG Leaders McKinnon and Noble with Senator Polsky.

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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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