

# Summer 2019

**PFAS  
Regulatory  
Update**

**Save  
the date!  
October 23  
Fall Meeting**







## Section President's Message

Craig McCammack - CPG-11731, V3 Companies



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Greetings! We hope you are all enjoying the summer! Perhaps some of you have already taken that vacation you were planning last winter, and others (like my family) are gearing up for a family getaway before school starts. By the way, if your travels take you up close and personal to any noteworthy scenery (especially with rocks!), please email us your photos and a description of the trip, and we'll use them to dress up our next newsletter.

With that, let's look back at the major Section activities in the first half of 2019:

- On Friday, April 12th, 2019, a small but hearty group of AIPG members and guests toured the US Silica operations in Ottawa, IL. This is North America's largest silica sand production facility, mining nearly pure quartz sandstone from the St. Peter sandstone. The tour was followed in the afternoon by lunch and hiking in nearby Starved Rock State Park. Jennifer James' account of the day's activities is presented later in the newsletter.
- The Spring meeting featured two academics from Wheaton College, whose topics were fascinating, unique, quite unrelated, and yet from the same geographic area. Dave Heidlauf's article summarizes their respective presentations on research of the Perry Mastodon, and the chemistry, mineralogy and formation of fulgurites.
- August 3rd Field Trip in Bloomington IN – Todd Thompson (Indiana State Geologist) and Brian Keith (Indiana Geological Survey) led a one-day trip to observe limestone quarries and outcrops in the area.

Looking ahead, there are several events scheduled for the second half of the year:

- October 23rd AIPG IL/IN Section Fall Meeting and Vendor Networking Night – In an evening with the regulators, Greg Dunn and Mike Charles of the Illinois EPA update us on the current IEPA administration, an overview of the Office of Site Evaluation, the future of TACO / CCDD regulations, and other LUST & SRP news you can use.
- In the planning stages is a field trip to Indiana Dunes, we will keep you apprised!

Hope you can make the field trip, and I look forward to seeing you at the Fall Meeting!

Craig

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## NEWS & UPDATES

### Zach Dearmin Voted to Section Board

Zach Dearmin was unanimously accepted to join the board on March 13, 2019. Zach adds to our representation in Indiana where he works as a geologist at ECC Horizon, a full-service environmental consulting firm. Read more about Zach later in the newsletter.

### UIUC Student Chapter in Development

In February, Anna Sutton and Dave Heidlauf, both graduates of the University of Illinois at Urbana-Champaign Department of Geology, met with the current graduate students there. Anna and Dave gave a short presentation regarding the benefits of AIPG membership and the procedure for setting up a student chapter. After the mid-day class, Anna and Dave took four of the interested graduate students to lunch. The students expressed interest in founding a student chapter. The Section is continuing communications with the UIUC Geology Department and its students regarding volunteers to stand as student chapter officers and finding a faculty sponsor.

### Insights and Lessons from Cape Town - Essay Published in Hydrogeology Journal

Board member James Adamson and researchers Thomas LaVanchy, PhD of Oklahoma State and Michael Kerwin, PhD of University of Denver draw attention to the confluence of factors that lead to water security issues in Cape Town, South Africa. The authors hope to provide insights to other global cities at risk of water insecurity, and consider the important role that groundwater resources can play in averting crisis. <https://link.springer.com/article/10.1007/s10040-019-01979-0>

### Shirley Mensah from EIU Receives National Student Scholarship

In April of this year, Shirley Mensah (SA-7566), a geology undergraduate student received the AIPG National Student Scholarship from Dr. Diane Burns, Department Chair and Associate Professor, Geology. Eastern Illinois University is home to the first student chapter established by our section back in 2013.



### Indiana Continuing Education Requirements

Remember that the Professional Geologists of Indiana have submitted a bill to the Indiana legislature requiring continuing education in the geological sciences as a condition of licensure renewal. If the bill passes into law, the Board of Licensure of Geologists in Indiana will have two years to determine how the continuing education program will be implemented. Details can be found at the link: <http://iga.in.gov/legislative/2019/bills/senate/580#document-894f3f46>

# FALL MEETING ANNOUNCEMENT

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Wednesday, October 23, 2019: Morton Arboretum, Lisle, Illinois: 6pm - 9pm

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The Illinois-Indiana Section of AIPG is excited to announce that the Fall Section Meeting and Vendor Technology and Networking Night will be held on October 23, 2019, at the beautiful Morton Arboretum facility in Lisle, Illinois. We invite you to mingle with colleagues, students, and vendors while enjoying a light dinner (included) and drinks from the cash bar.

## An Evening with the Regulators

**Mr. Greg Dunn, PG**

Manager – Illinois EPA Remedial Project Management Section

Greg will bring us up to date on the current administration, the future of TACO / CCDD regulations and other LUST & SRP news you can use

**Mr. Mike Charles**

Illinois EPA Remedial Project Management Section

Mike will present an overview of the IEPA Office of Site Assessment and how Targeted Brownfields Assessments can be used to help communities assess conditions at municipal brownfield sites

**Ms. Lynn Smith, PG**

AIPG Illinois-Indiana Section Board Member

Lynn will provide current information about the newly developing regulations related to Emerging Contaminants, particularly PFAS

You can visit [www.mortonarb.org](http://www.mortonarb.org) for directions. When arriving at the Arboretum, tell the gate attendant you are attending the AIPG meeting and you will not be charged the entrance fee.

This event is free and open to the community practicing in the geological sciences in Illinois and Indiana (non-member donations are requested). A light dinner and cash bar will be provided.

Please RSVP to Craig McCammack at [cmccammack@v3co.com](mailto:cmccammack@v3co.com) or (630) 936-0332

## Introducing Zach Dearmin, Our Newest Section Board Member



Zach attended the University of Tennessee at Chattanooga (UTC) for his freshman and sophomore years in college. He was actively involved in the UTC Geology Club and was the founding president of the UTC AIPG Student Chapter. He transferred to the University of Tennessee at Knoxville (UT) to finish his bachelors program. At UT, Zach completed his core geology classes and took additional elective courses

in petroleum geology, seismology, and oceanography. During his senior year of school, he was a Geological Intern at Aerostar SES LLC, an environmental, construction, and engineering firm in Oak Ridge, Tennessee. The environmental work Zach focused on during his internship was Phase I and II ESAs dealing with emerging contaminants such as PFAS. He finished his senior year by studying abroad for his geology field camp in Sardinia, Italy. Zach has been a member of AIPG since 2014, growing from Student Member to Young Professional Member after graduating. Zach moved to Indianapolis in November of 2018 to start a new position as a Staff Geologist at ECC Horizon, a full-service environmental consulting firm. He has experience in soil, soil gas, groundwater, and indoor air sampling, as well as drafting maps, figures, and vapor mitigation systems in AutoCAD. In his free time Zach enjoys playing disc golf, ultimate Frisbee, board games (lately it has been primarily Terraforming Mars), watching hockey, ice skating, drawing and painting, reading, hiking, and rock climbing.

## Sardinia, A Trip Through Time

-Zach Dearmin

I had the opportunity to attend a geology field camp in Sardinia, Italy, hosted by Boise State University. Sardinia is the second largest island in the Mediterranean Sea, located directly south of Corsica and west of the Italian mainland. During my month of exploring and mapping the different s of the island, I experienced a culture and geologic features completely new to me.

Geologically, the island can be separated into four zones. Starting on a beach northwest of the city of Alghero, we worked our way southeast across the four zones, ending our time in the region's capital of Cagliari. Sardinia has rock formations dating as far back as the Cambrian and as recent as Oligocene-Miocene. The majority of the island consists of high grade metamorphic rocks referred to as the Variscan basement, due to deformation during the Variscan orogeny. Back arc extensioning due to Atlantic

sea floor spreading created extensional tectonic activity, forming some of the youngest rocks on the island. The most extraordinary geologic feature was a distinctive outcrop of a light and dark banded rock, formed due to the partial melting and mixing of igneous and metamorphic rock, better known as a "migmatite". After some sweat and a lot of time, I was able to break free a small piece to take home with me.



The "Elephant Rock" in Sardinia made of trachyte

Culturally, Sardinia had an ancient Nuragic civilization that dated back to around 1500 BC. Village remains of this civilization, called Nuraghe, can still be found all across the Sardinian landscape today. Some were no more than small piles of rock and the size of a small room, while others were still in good shape, and spanned a few thousand square feet. From what I saw and heard about the Nuragic people, they were an intelligent and resourceful civilization whose influence spread well beyond the shores of their island.

An ancient civilization using even more ancient rocks to construct their villages and lives. Thousands of years later I am able to walk that same land, see those same villages, and touch the same rocks, even still not knowing the full story they could tell.



Nuraghe in northwestern Sardinia



## Harvey Pokorny (CPG-7919)

Hi All! For those of you interested in the demise of the dinosaurs, this is the most interesting and significant article of the decade. Take a peek!

The article is interactive, online and free with great visualizations! Follow the PNAS link below.

“A seismically induced onshore surge deposit at the KPg boundary, North Dakota”

**Abstract:** “The Chicxulub impact played a crucial role in the Cretaceous– Paleogene extinction. However the earliest post-impact effects, critical to fully decode the profound influence on Earth’s biota, are poorly understood due to a lack of high-temporal-resolution contemporaneous deposits. The Tanis site, which preserves a rapidly deposited, ejecta-bearing bed in the Hell Creek Formation, helps to resolve that long-standing deficit. Emplaced immediately (minutes to hours) after impact, Tanis provides a post-impact “snapshot,” including ejecta accretion and faunal mass death, advancing our understanding of the immediate effects of the Chicxulub impact. Moreover, we demonstrate that the depositional event, calculated to have coincided with the arrival of seismic waves from Chicxulub, likely resulted from a seismically coupled local seiche.”

Robert A. DePalma, et al., PNAS April 23, 2019, 116 (17) 8190–8199; first published April 1, 2019 <https://doi.org/10.1073/pnas.1817407116>

This is a moment in time memorialized. But more interesting, read how he got to this point. This is the story of Robert DePalma, a life-long geologist immersed in vertebrate paleontology for a long time. Read it if you get a chance: <https://www.newyorker.com/magazine/2019/04/08/the-day-the-dinosaurs-died>

## MEMBERS CORNER

IL/IN section members are invited and encouraged to share stories, photos, updates, and any developments that may be of interest to the section. Submissions will be published in the biannual newsletters. Please send all submissions to James Adamson at the link [Email Members Corner Submission](#)

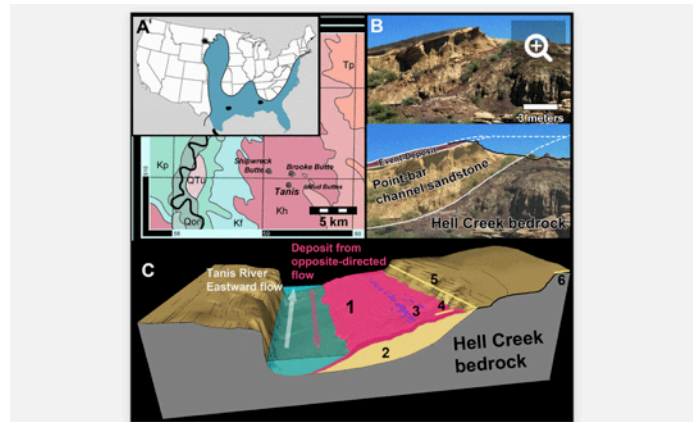


Fig. 1.

Download figure | Open in new tab | Download powerpoint  
Map of the Tanis study locality. (A) Tanis within a regional context (large map) and on a national map (inset). Reprinted with permission from ref. 14; black dots in inset are previously documented KPg tsunami localities; star denotes Tanis. Kf, Fox Hills Formation; Kh, Hell Creek Formation; Kp, Pierre Shale; Qp, Quaternary and Upper Tertiary; Tp, Slope Formation. (B) Photo and interpretive overlay of an oblique cross-section through Tanis, showing the contact between the angled point-bar sandstone and the gray Hell Creek bedrock. (C) Simplified schematic depicting the general contemporaneous depositional setting for the Event Deposit (not to scale). The Event Deposit (1) covers the slope of a prograding point bar of a meander (2), which incised into the Hell Creek bedrock during the late Cretaceous. Location of the densest carcass accumulations (3) along the slope; location of KPg boundary tonstein directly overlying the Event Deposit (4); location of KPg tonstein overlying the adjacent overbank (5); location of Brooke Butte (6), the closest KPg outcrop to Tanis.

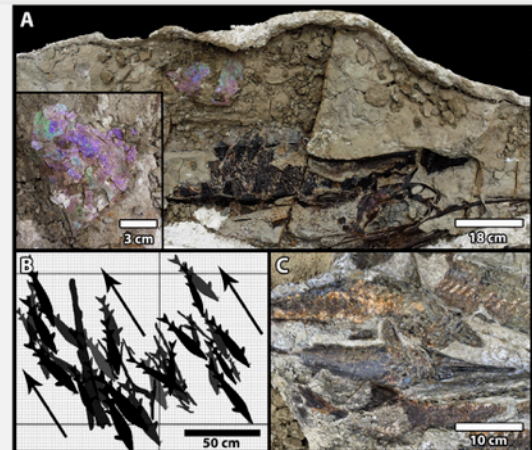


Fig. 7.

Download figure | Open in new tab | Download powerpoint  
The Tanis Konservat-Lagerstätte. (A) Plaster field jacket with partially prepared (freshwater) acipenseriform fish (FAU.DGS.ND.161.116.T) next to a nacreous ammonite shell (inset). (B) Partial site map showing carcasses oriented by flow. (C) Field photo showing mass grave of fish carcasses, aligned by flow.

# REGULATORY UPDATES



## Federal and State Updates - PFAS Contaminant of Emerging Concern

**Lynn P. Smith, P.G. - MEM  
2506**

Per and Polyfluoroalkyl Substances (PFAS) is a chemical category of synthetic compounds formed from carbon chains with fluorine atoms attached. Due to their persistence, bioaccumulation, toxicity, and widespread use, they are of environmental concern. Sources of PFAS include manufacturing use for raw material, industrial chemicals, and consumer products. Examples include Aqueous Film Forming Foam (AFFF) used in fire-fighting and emergency response by Department of Defense, airports and refineries; Consumer Products such as stain-resistant/non-stick products; paints/plastics/adhesives; personal care products; and paper and food packaging. Additional uses include automotive, textiles, carpet/furniture, semiconductor, mining. PFAS impact to drinking water is of immediate concern and actively being addressed on the federal and state level.

As of July 2019, the latest update of an interactive map by Environmental Working Group and the Social Science Environmental Health Research Institute at Northeastern University, documents 712 locations in 49 States are known to have confirmed PFAS contamination in public water systems and military bases, airports, industrial plants and dumps, and firefighting training sites. The Pentagon has identified at least 400 military installations largely caused by a legacy of using PFAS-containing firefighting foam. Reportedly, many of these military sites have PFAS levels greater than 100,000 parts per trillion (ppt). In many cases, these contaminants are migrating into drinking water supplies, ground water and surface water.

PFAS updates on the Federal and State levels are constantly changing. Highlights of latest updates in 2019 are summarized below.

## PFAS FEDERAL UPDATES

### July 2019

- U.S. Military launches PFAS Task Force and will report on its composition and charter within 30 days and provide update within 180 days
- U.S. House of Representatives passes PFAS protections including 2025 ban on military use, Superfund cleanup and clean water safeguards. The U.S. House approved provisions to address drinking water contamination from toxic per- and polyfluoroalkyl substances (PFAS). The annual defense spending bill would phase out the military's use of PFAS-containing firefighting foams by 2025. The bill would also designate all PFAS chemicals as hazardous substances under Superfund and toxic pollutants under the Clean Water Act, spurring cleanup and reducing discharges into waterways, respectively.

### June 2019

- U.S. Senate approves 2023 ban on military's toxic PFAS foams
- PFAS Sampling Update, US EPA releases Update VII to the SW-846 compendium of methods. Phase II – PFAS Methods 8327 and 3512. The public comment period for this method will be open until August 23, 2019. This includes a 30-day extension to the comment period, which originally ended on July 22, 2019.
- U.S. EPA released its Draft Interim Recommendations for Addressing Groundwater Contaminated with Perfluorooctanoic acid (PFOA) and Perfluorooctane sulfonate (PFOS) for public review and comment as part of the Agency's PFAS Action Plan commitments.
- The guidance provided recommendations on:
  - Screening levels, which are used to determine if levels of contamination may warrant further investigation;
  - Preliminary remediation goals (PRGs) to inform site-specific cleanup levels for PFOA and PFOS contamination of groundwater that is a current or potential source of drinking water. PRGs are initial targets for cleanup, which may be adjusted on a

site-specific basis as more information becomes available.

- EPA is seeking comments on all parts of the recommendations, including the use of EPA's Lifetime Drinking Water Health Advisory level of 70 ng/L or parts per trillion as the recommended PRG for groundwater, or whether higher or lower values would be supported.
- The 45-day public comment period closed on June 10, 2019.

#### February 2019

- The U.S. EPA released the PFAS Action Plan

### **PFAS STATE UPDATES**

#### July 2019

- New Hampshire issues final proposal for four PFAS Standards
- Connecticut announces interagency working groups on PFAS

#### June 2019

- Northeastern States recommend PFAS Policy Solutions to Congress, June 2019
- Colorado Issues Ban on Training with PFAS Firefighting foams, June 2019
- Wisconsin Department of Health Services (DHS) submits new groundwater recommendations to DNR including two PFAS substances. Department of Natural Resources (DNR), Department of Agriculture, Trade and Consumer Protection worked collaboratively with DHS and DNR to develop groundwater recommendations.

#### May 2019

- Wisconsin DNR convenes a PFAS Technical Advisory Group
- Michigan reportedly has most known PFAS sites in the U.S. which is attributed to the state's proactive efforts and comprehensive investigations actively looking for PFAS contamination
- New Hampshire files Lawsuits against PFAS manufactures
- Pennsylvania begins statewide sampling for PFAS

#### April 2019

- Illinois EPA Director, John Kim, announces plan to follow USEPAs lead on PFAS and plans to address PFAS in drinking water initially then move on to groundwater and surface water following the Illinois Administrative Procedure Act (IAPA). Published PFAS guidance documents have not been established by the Illinois EPA.

#### March 2019

- Vermont Senate Bill passes and proposes to adopt an MCL for PFAS under the Agency of natural Resources Water Supply Rule
- Wisconsin introduced bills in assembly and senate that would require Department of Health Services to establish a state health-based groundwater quality standard for PFAS
- Minnesota House and Senate each introduced bills to prohibit manufacturing, knowingly selling, offering for sale, distributing for sale, or distributing for use in Minnesota food packaging to which PFAS have been intentionally added in any amount
- Maine to require PFAS Testing for sludge used in land application
- New Jersey issues PFAS order for companies to testing and treatment of PFAS Waters
- California Water Resources Control Board announced that it will not promulgate an MCL for PFAS in the near term and that it will immediately roll out a "PFAS Phased Investigation Plan" to obtain PFAS effluent and drinking water data across the state. Phase I will require source investigation and sampling at airports, landfills, and drinking water. Phase II will cover refineries, bulk terminals, non-airport fire training areas, and 2017-2018 urban wildfire areas. Phase III will cover secondary manufacturers, wastewater treatment plants and pre-treatment plants, and domestic wells.
- New Jersey sets new interim groundwater quality standards for PFOA and PFOS
- New Mexico seeks to compel U.S. Air Force to address PFAS
- Michigan announces results of reportedly unprecedented statewide PFAS Sampling
- Michigan legislature introduced three bills that would regulate PFAS including
- Requiring fire departments to report use of firefighting foam to MDEQ;



- Promulgation of OSHA rules addressing the use of firefighting foam concentrate containing PFAS in training and equipment calibration;
- Best practices for proper use, and handling and storage of such material; and
- Training for firefighters

#### January 2019

- New Hampshire proposes new PFAS Drinking Water Standards, January 2019

## **PFAS ILLINOIS AND INDIANA**

### Illinois

- Illinois is working and communicating with the U.S. EPA as the PFAS issue continues to unfold. No emergency declaration declared and no established State drinking water or groundwater standards to date of this publication.
- According to Great Lakes Now article from August 2018, Illinois has launched programs to determine the scope of the PFAS problem and to plot best courses of action as the contaminant of emerging concern poses a threat to drinking water sources. Illinois has identified three sites of concern.
- Both PFOS and PFOA have “been identified in shallow groundwater, soil, sediment and surface water” at decommissioned Chanute Air Force Base in central Illinois, according to Illinois EPA spokesperson Kim Biggs. Biggs said the chemicals at Chanute were “not found in the deeper drinking water aquifer” and the Department of Defense is conducting investigations at other federal sites. While no longer operational, parts of the base have been repurposed for civilian use.
- The Illinois EPA sampled the communities of Albany and Freeport where the chemical contaminants were suspected and worked with both to manage known or potential problems, according to Biggs. Biggs said “there have been no states of emergency declared in regards to drinking water in Illinois” and like Wisconsin, it is developing a work group “to determine next steps forward.”

### Indiana

- According to the Indiana Environmental Reporter, Indiana environmental laws are tied directly to federal environmental laws set by the U.S. EPA. IDEM cannot immediately enforce any standards that exceed what the U.S. EPA has set. Because Indiana lawmakers have decided to limit their own

ability to set environmental regulations, the state’s environment is at the mercy of U.S. EPA regulations.

- IDEM’s Drinking Water Branch monitors Indiana’s drinking water for compliance with the Safe Drinking Water Act. The branch monitors whether public water systems comply with a list of maximum allowable levels for different types of contaminants.

The [Interstate Regulatory Council \(ITRC\)](#) website and [US EPA website](#) are good sources to keep up to date on the emerging issues with PFAS regulation. The takeaway is that this is an ever-changing emerging issue that is still trying to find its way. Some states and regions are further along than others and with the USEPA ramping up efforts to establish and update regulations and guidelines, this will help pave the way for states like Illinois and Indiana to develop regulations and guidelines.

Stay tuned for more updates from AIPG Illinois -Indiana section at our Fall Meeting!

# 2019 Spring Meeting Recap



*Dave Heidlauf,  
Wheaton College  
Class of 1982*

The Illinois/Indiana AIPG section held our 2019 Spring Meeting at Morton Arboretum on Wednesday April 24th. I had the pleasure of introducing Dr. Steve Moshier and one of his graduating students Mr. Benjamin Hess from Wheaton College as our evening speakers. Steve and Ben spoke on two diverse and interesting local geologic topics in our northern Illinois / Indiana setting where outcrops are few and far between.

Mr. Hess kicked off our evening with his talk on the chemistry and mineralogy of a clay fulgurite that was formed in the backyard of a home in Glen Ellyn by a lightning strike sometime in January 2016. A fulgurite is natural glass formed in rock, sand, or soil by the heat of a lightning strike that imparts contact metamorphism-like changes in the rock, sand, or soil matrix / mineralogy. Glen Ellyn homeowners suspicious of a meteor impact in their back yard, contacted the Wheaton College Geology Department to see if they could send someone to come take a look at the suspected meteor impact site to see if it posed any risks. Dr. Steve Moshier visited the suspected impact site in the spring of 2016 and discovered the presence of an in ground clay fulgurite. The homeowners gave permission for the Wheaton College Geology department to excavate and conduct studies on the fulgurite. At the end of his sophomore year, Benjamin took on a summer geochemical research project on the Glen Ellyn fulgurite specimen which “morphed” into a two-year senior research thesis project on high-temperature, low-pressure metamorphism helping earn him Goldwater Scholar accolades.

The excavated fulgurite is a glass structure that appears to have replaced the root system of a small tree with a 20-cm diameter trunk and several radiating roots of 5-10 cm diameter. The structure extended from the surface to a depth of about 40 cm. Vitrified roots extend some 30-40 cm from the trunk ending as charred wood. A geochemical study of a cross-section of the fulgurite using Raman spectroscopy, Energy Dispersive Spectroscopy (EDS), and Electron Backscatter Diffraction (EBSD) shows the inside of the fulgurite is a mass of amorphous silica glass, amorphous graphitic carbon, and micro-silicon carbide. Within the fulgurite center was a millimeter-sized copper, antimony, and iron spherule as well as other

smaller iron phosphide spherules, suggesting that under the high temperature, reducing conditions, the metals are highly mobilized and concentrate. The outer rim of the fulgurite is marked by a sharp transition to a more vesicular structure with crystalline grains. It contains TiO<sub>2</sub> polymorphs rutile and anatase, feldspar, zircons, and quartz grains. Lining the edges of some of the larger vesicles were spherules of native iron, demonstrating the reducing nature of the formation process. The EBSD data show the quartz grains have been thermally shattered and not shocked, meaning this fulgurite formed under high temperature and low-pressure conditions. One shattered quartz grain shows normal alpha quartz cores surrounded by smaller bits of cristobalite (a high temperature quartz polymorph), capturing both a temperature-driven phase transition and potentially a size-dependent kinetic factor controlling it.



Benjamin Hess in the laboratory

Dr. Moshier spoke on recent site stratigraphy studies that he and his students conducted on glacial and post-glacial depositional environments where a mastodon was discovered on the property of Federal District Court Judge Sam Joseph Perry in October 1963. An earlier generation of Wheaton College faculty and students from the Department of Geology excavated the skeletal remains during a limited 8-day schedule. The excavation yielded 115 bones and fragments representing 41% of the skeletal components of a mature mastodon. During my college years at Wheaton I would walk by the reconstructed skeleton, now known as Perry Mastodon, on my way to geology class at the former Beyer Science building. More recently Wheaton geology faculty and students collected hand and geoprobe cores from the mastodon discovery location along the East Branch Du Page River valley within the Valparaiso Moraine System. The animal was buried in a hydrologically-open depression that possibly formed due to outwash channel abandonment. Cores revealed a sequence of known units that have been mapped in northeastern Illinois, associated with the last glacial advances, including diamicton, loess, marls and peat deposits. Correlations to sites nearby indicate the basal silts date to 16,500-14,500 cal. yr. BP.

The marl that contained the mastodon dates from 14,500-11,000 cal. yr. BP, which compares with dates from bone collagen from the right femur of the mastodon (13,640-13,450 cal yr BP). Steve concluded his talk sharing an anecdote that when “Perry” had to be moved from its former location to its current display in the new Meyer Science building, that it was discovered that the original reconstruction of the mastodon’s knee joint had been originally assembled incorrectly with a backwards articulating knee. This silly anecdote drove home the importance to me of the basic scientific truth that one should not always accept the interpretations of the past as infallible, otherwise we might walk right past them for years unknowingly as the truth when they are not.



The reconstructed Perry Mastodon, on display at Wheaton College



The excavation site in 1963



Geologists and paleontologists in training, 1963



# FIELD TRIP EXPERIENCE - US SILICA SAND MINE, OTTAWA, ILLINOIS

## Jennifer James - Student at Northern Illinois University

I was fortunate enough to participate in the AIPG Illinois/Indiana Section April 2019 field trip to US Silica's Ottawa, Illinois plant, organized by Paul Hohbach and Craig McCammack. Our tour began in the conference room with representatives from US Silica who gave a marvelous and highly informative presentation about the company, its history, products, and community engagement. The Ottawa plant was founded more than 100 years ago during the boom of the glass and sand industry in the late 1800's through early 1900's. The operation was family owned and operated and continued to grow, bought out neighboring competitors, and eventually joined US Silica in the 1980's. The Ottawa operation produces four classes of products: oil and gas proppants, whole grain silica, testing silica and ground silica. All classifications of products manufactured at the Ottawa plant come from the St. Peter sandstone, which was deposited during the lower Ordovician to upper Silurian periods with extensive deposits in and around the Illinois Basin. The St. Peter is ideal for hydraulic fracturing operations due to the high sphericity, low solubility, consistent grain size and low crush resistance.

US silica is a major employer in the Ottawa community and surrounding cities. The Ottawa plant has an excellent reputation for working with the community and hiring local talent. Additionally, the Ottawa plant conducts tours for many local groups, including

elementary schools, colleges and geological professionals.

After the presentation was complete, we donned our personal protective equipment and headed to the quarry for the next portion of the tour. Upon arrival at the pit, we were able to view the operation in full swing. Operators were in the process of hauling the blasted sand out of the pit, which was scheduled to be completely removed by the end of the day. The sand deposits which lay to the west have been estimated to have another 25-30 years' worth of production.

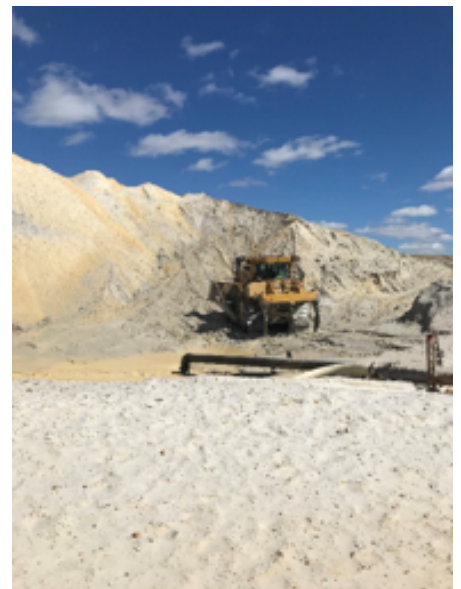
Next, we were transported to the holding area where the sand is transported, stockpiled and subjected to high pressure water stream and heavy equipment to break up the sand further. During this stage, any large rocks or debris are removed. The sand slurry is transported via metal pipelines under the Illinois River to the processing plant. US Silica has several pipelines which run from the sand pit, under the Illinois River, and to the processing plant, which operates 24/7.

After we toured the quarry, we were transported to the processing plant. Inside we were able to observe the full-scale production of sand from when it leaves the pipeline to when it leaves the processing plant for blending and packaging. The sand is washed, shaken, dried and screened on a series of conveyor belts. The hematite staining which is present in several layers of the St. Peter sandstone is easily removed through the washing process. What is produced is an extremely pure, fine grained sand which is free from any debris or discoloration. The sand is then transported to the blending and packaging facility in the next building. While we were not able to tour that facility, Mr. Proctor explained the sand is sorted on mesh screens according to grain diameter in order to be blended. The products used as proppants are assigned a mesh classification, for instance 30/50, indicating the minimum and maximum sizes in the blend. For a 30/50 mesh, the blend contains grain diameters which are small enough to pass through a 30-mesh screen but are large enough to remain on a 50-mesh screen,

with the size of the mesh measured in millimeters.

We concluded our tour in the conference room where we began. We thanked our hosts and commended them for a job well done. They gifted us each with a miniature sand castle which was locally cast by one of their customers using US Silica sand from the Ottawa plant. It was a delightful and thoughtful gift. After the tour was concluded, our group met up at Starved Rock State Park Lodge in Utica for a friendly and fun lunch. The food was excellent, and the company was even better! I learned a great deal in talking with these professionals.

The tour of the Ottawa plant of US Silica was a fascinating look at the mining industry and extraction of Earth's materials. It definitely helped confirm my desire to join the mining industry upon graduation in a couple years. My sincere thanks to Mr. Hohbach and Mr. McCammack for their dedication to providing excellent field trips and experiences for the Illinois/Indiana section, I can't wait for the next one!



## Overview

Lithium is a light, metal element that naturally occurs in economic quantity in (1) granite-related, zoned pegmatites and (2) in volcanic ash-derived minerals within salars / a.k.a. playa lakes. Discovery of new lithium minerals, such as the giant jadarite deposit in Serbia, as well as new deposit finds in the salars of Chile and Argentina may well balance long-term demand – supply. During 2018, three new lithium mines hosted in high-grade pegmatites (up to 2.4% Li<sub>2</sub>O) were commissioned in Australia.

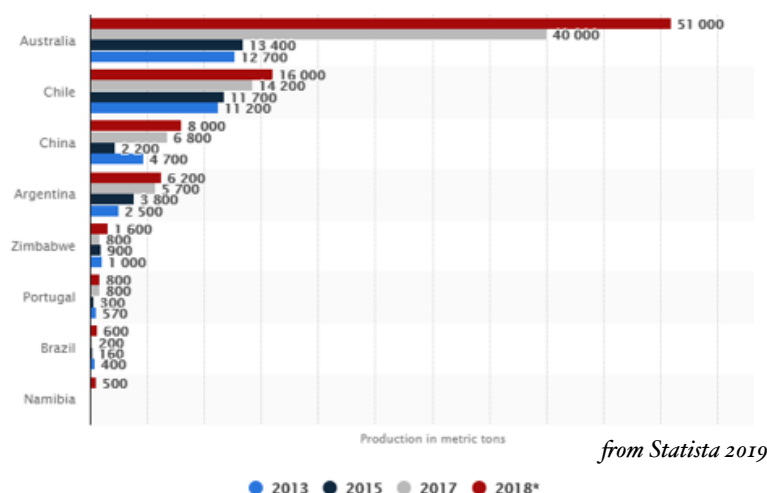
Industrial companies in Asia, Europe and the USA, working to commercialize lithium-ion battery power for electric cars have created great excitement in the lithium sector. Flat demand for lithium use in glass, ceramics, rocket fuel and lasers is dwarfed by rising market demand for combined lithium –copper - cobalt - nickel battery metals. Current prices of \$ 17,000 USD per tonne for battery-grade (99.5%) lithium carbonate reflect perceived future supply shortages (see below). While Chile holds over half of world reserves, it was Australia that produced over 60% of world supply in 2018. Potential new mines in Argentina and China would occur in both pegmatites and salars.

## A Lithium Sector Summary

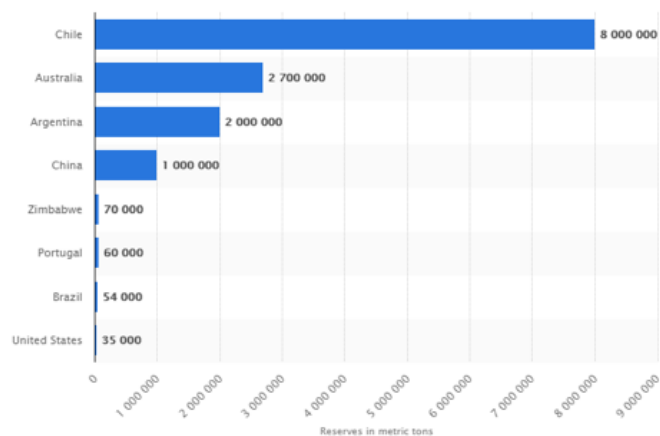
Paul Hohbach, CPG



### WORLDWIDE LITHIUM PRODUCTION in TONNES through 2018



### WORLDWIDE LITHIUM RESERVES by COUNTRY in the year 2018



*Note: lithium carbonate production from the sole active US mine in Clayton Valley, Nevada was not published by Albemarle Corp. It is estimated at < 2000 metric tonnes. Currently the US imports more than 70% of our lithium supply from Australia and Chile. The 2018 supply of 84.7 thousand tonnes is forecast to rise to 509 thousand tonnes of demand by 2025.*

## Current Lithium Advancements in the USA

The USA now has just one operating mine at Silver Peak in Clayton Valley, Nevada. Albemarle Corp. has also partnered with SQM, the giant Chilean State company, to secure additional supply in view of rapidly declining grades (< 200 ppm) at their Silver Peak operation. In Nevada lithium occurs in several volcanic ash beds in playa lakes. These felsic tuffs are likely related to the 767,000 year old (Pleistocene) Bishop Tuff. Lithium carbonate and lithium hydroxide monohydrate are produced via solution mining of lake bed brines. Processing lake brine is normally inexpensive. New deposits have been drilled by junior companies in Clayton Valley playas, but these discoveries are fairly low-grade; their ultimate size is undefined. As long as lithium carbonate prices remain high, some of these finds will eventually achieve active mine status as modest producers. To date no one has found a grand, high-grade lithium prize!

Not all lithium deposits are created equal. Refractory hectorite in clay in a northern Nevada deposit can only be used for automobile grease at this time, so this product commands a low price. Previously-worked pegmatite occurrences, especially in North Carolina, are undergoing re-development. Primary challenges for new US mines in pegmatites are deposit size and relatively high processing costs associated with complicated spodumene amenability. Often large companies, such as Albemarle Corp. and Livent Corp. (an FMC subsidiary) secure quality lithium supplies abroad (Argentina and Chile) and process lithium products in the USA.

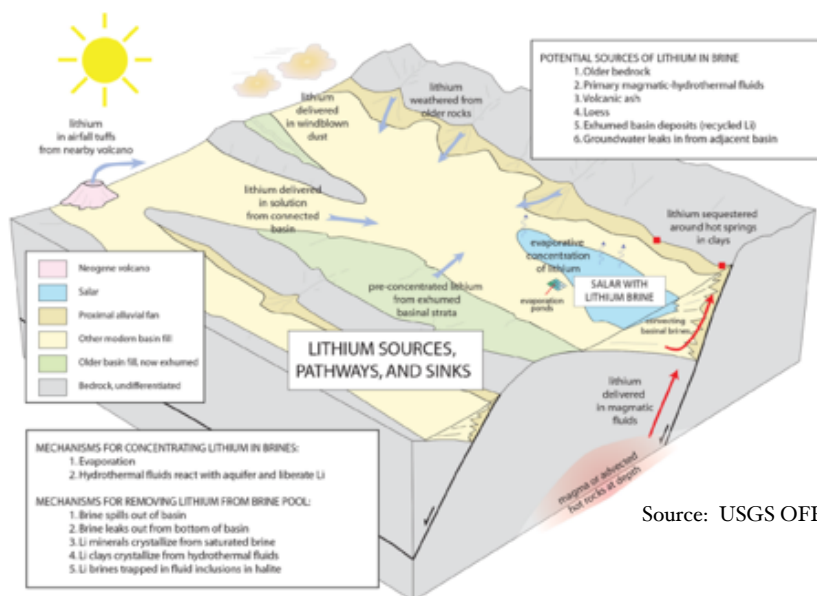
## Current Lithium Sector Challenges

Every discovery of lithium mineralization differs in terms of size, location, grade, type of minerals contained and especially the deposit's metallurgy and amenability to commercial processing. Most large, known deposits occur in some of the earth's most inhospitable regions – the Atacama Desert of Argentina and Chile; the Outback of Australia, and far western China. Lead times to set up mining and modern processing operations in such environments are measured in years or decades.

Processing of lithium minerals that occur in clays (e.g. hectorite) or are combined with undesirable elements such as manganese require unique metallurgical solutions that can cost thousands of dollars per tonne of rock. Essentially such projects become expensive chemistry experiments that often do not succeed! This places lithium deposits on par with rare earth element deposit processing.

Playa lake / salar-hosted deposits most easily yield lithium carbonate stock for lithium ion batteries. As brines are processed in large quantities with little environmental disturbance, these operations can be run at low cost once established (see block diagram below). The biggest challenges to securing more production from salar-hosted reserves in Chile and Argentina (shown above) are (i) salar locations in the remote, hot Atacama Desert of the Andes Mountains and (2) the reluctance of the Chilean government to allow foreign companies to operate independently and quickly establish new

mines in their country. While Chile holds over half of known world reserves, the cost to construct new mines, transport modern equipment and change restrictive Chilean regulations all bode for new medium-term lithium supply to come from Australia or other newly-discovered sources such as Serbian jadarite.



Source: USGS OFR 13\_1006 D. Bradley et al.

**Figure 1.** Schematic deposit model for lithium brines showing part of a closed-basin system consisting of interconnected subbasins. The subbasin containing the salar is the lowest.



## What are we doing this summer?

Our board members are up to some interesting things this summer.

- Section President, Craig McCammack is overseeing the installation of a new patio, deck and outdoor basketball court. He is traveling extensively with his 16-year old son's baseball tournaments.
- Treasurer, Anna Sutton Stinson is busy keeping a new baby human alive. Anna's second daughter was born on March 27!
- Paul Hohbach has been prospecting for gold for a client in Nevada.
- James Adamson has been working on a groundwater model for the largest aquifer in Haiti.
- Harvey Pokorny has been exploring the coastal geology of Lake Michigan from his kayak.

## Become a Member

**Customize your membership level to best fit your needs:**

- Certified Professional Geologist (CPG)
- Professional Member
- Young Professional Member
- Student
- Associate

## TREASURER'S REPORT

ANNA SUTTON STINSON, TREASURER - MEM 2528

**Bank Account Balance: January 1, 2019** **\$13,882**

INCOME	US DOLLARS
None*	\$0
<b>Total In</b>	<b>\$0</b>

EXPENSES	US DOLLARS
2019 Spring Meeting Venue 1/2	\$425
2019 Spring Meeting Venue 2/2**	\$825
2019 Spring Meeting Catering	\$781
<b>Total Expenses</b>	<b>\$2,031</b>
<b>Balance, June 30, 2019</b>	<b>\$11,851</b>

### NOTES:

\*SPRING 2019 MEETING DONATIONS AND 2019 MEMBER DUES TO BE DEPOSITED

\*\* CHARGE WAS AN ERROR AND MORTON ARBORETUM IS REFUNDING \$400

## Illinois-Indiana Section of AIPG

Indiana-Illinois Section:

<http://www.aipg.org/Sections/IL-IN/IL-INaipg.htm>

AIPG National Web Site:

[www.aipg.org](http://www.aipg.org)

Section bylaws were approved by the Executive Committee on October 15, 1991