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On this page...
Welcome to our newest chapter: Iota Gamma! Successful student petitioners pose during a recent SGE site visit to the 216th Chapter of SGE at Sewanee: The University of the South in Sewanee, Tennessee. Back row (left-to-right): Professor Chris Van de Ven, Elsie McCarthy (Chapter President), Matthew “Matt” Thompson, Paul “Rob” Walker, Carlos Madrid Nunan, Leyden Schelke, Brian Gulick, and Professor Eric Ezell; Front row (left-to-right): Aydah Daniels, Eliza “Grace” Scott, Professor Lily Thompson (Faculty Advisor), and Grace Parkhill.
Photo Credit: Diane Burns/SGE

On the cover...
The south face of Mount Rainier, Washington (4,392 m; 14,410 ft) as seen from Ricksecker Point from within Mount Rainier National Park.
Photo Credit: Scott Beason/National Park Service
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About the Society of Sigma Gamma Epsilon

PURPOSE AND OBJECTIVE

The Society of Sigma Gamma Epsilon was founded to recognize scholarship and professionalism in the Earth Sciences. It has for its objectives the scholastic, scientific, and professional advancement of its members and the extension of relations of friendship and assistance among colleges and universities which are devoted to the advancement of the Earth Sciences.

HISTORY AND GOVERNMENT

The Society was established on March 30, 1915, at The University of Kansas. Over 200 chapters throughout the United States have been installed since 1915. Government of the Society is by student members and the ultimate legislative authority is vested in a National Convention held every two years. It is composed of one student delegate from each chapter and the seven national officers who are faculty members. The Constitution and Bylaws of the Society are located at https://www.sgeearth.org/about/.

WHY SHOULD I JOIN?

Membership in Sigma Gamma Epsilon and the listing of it on one’s résumé (or the wearing of a member’s pin) tells a prospective employer or a colleague that you are at least a “B” average student and that in the eyes of your peers you are professionally motivated. Members serve their departments in a number of ways such as organizing field trips, tutoring, arranging displays, and many others. Many chapters have money-raising activities to obtain funds to use for scholarships and awards or to purchase items needed for student use or to assist the department in other ways.

Members of Sigma Gamma Epsilon are encouraged to submit articles to the Society’s professional journal, *The Compass*, as it provides the opportunity to share your research with the Society. *The Compass* contains student papers and articles by practicing earth scientists in addition to news and notes about the Society.

Also, as an associated society of the Geological Society of America, Sigma Gamma Epsilon members are entitled to discounted rates for registration at the annual national meetings.

HOW CAN I JOIN?

Any person in any branch of the Earth Sciences who has completed at least 10 semester hours or 15 quarter hours in Earth Science courses and has maintained a minimum 3.0 G.P.A. (on a 4.0 system) in all Earth Science courses together with an overall G.P.A. of 2.67 in all college courses is qualified for membership. If you qualify and wish to join, you need only inform any officer or the Advisor of your department’s chapter and they can propose you for membership. Initiation of new members is typically held both fall and spring semesters.

FEES AND DUES

A one-time fee of $55.00 provides lifetime membership if initiated after August 1, 2021. If initiated before August 1, 2021, an additional fee of $15.00 is required for lifetime membership.

DOES YOUR SCHOOL HAVE A CHAPTER?

A list of chapters can be found at https://sgeearth.org/chapters/. If you do not now have an active chapter of Sigma Gamma Epsilon at your college or university, the National Office will gladly furnish information and give assistance in reactivating an inactive chapter or chartering a new chapter.

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Stop by and visit us at booth #511 and check out the 36th Annual Undergraduate Research Exhibition poster session (T20) sponsored by SGE (on Monday Afternoon) at the 2024 Annual Meeting of the Geological Society of America in Anaheim, CA, September 22-25, 2024!
Sigma Gamma Epsilon products

Products on this page may be purchased by scanning the QR code to the right or clicking on the following link: https://www.cognitoforms.com/SigmaGammaEpsilon1/OrderForm

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Important upcoming dates

ACADEMIC REGALIA FOR GRADUATION
Please submit your orders for Honor Cord sets or Honor Stoles with 10 business days lead time so we may process the order. Regalia orders for more than one graduate will be shipped to the chapter advisor.

SEPTEMBER 22–25, 2024
GSA Annual Meeting & Exposition
Anaheim, California, USA

NOVEMBER 1, 2024
Deadline for submission of Fall 2024 Chapter Members Form (found at https://sgeearth.org(officer-resources/ > Member Form). Be sure to include returning Life Members even if you only initiate new members in the Spring. This is a prerequisite for applying for the Quality Chapter Award.

Contributing your work to The Compass

RESEARCH ARTICLES
The Compass is continuously looking for research articles submitted by undergraduate and graduate students, as well as their advisors, faculty members, and outside researchers. All work submitted to The Compass undergoes peer review prior to publication. There are no publication fees for The Compass and all final journal articles are Open Access and hosted on the Digital Commons® platform at the College of Saint Benedict and Saint John’s University.

All work submitted for consideration should be original research. Articles should contain appropriate sections such as introduction, background, study area, results, discussion, and/or conclusions. Articles generally contain figures, tables, and/or appendices.

ON THE OUTCROP
Beginning with Volume 84, The Compass will feature a series titled “On the Outcrop.” The purpose of this feature is to highlight an outcrop of geological significance with photos and a brief article. More information about this format can be found here: https://digitalcommons.

APRIL 11–13, 2025
47th Biennial Convention of SGE
Delta Psi (Western Illinois University) will be hosting the next biennial convention at its Quad City campus in Moline, Illinois. More information is upcoming!

OCTOBER 19–22, 2025
GSA Annual Meeting & Exposition
San Antonio, Texas, USA

OCTOBER 11–14, 2026
GSA Annual Meeting & Exposition
Denver, Colorado, USA

OCTOBER 17–20, 2027
GSA Annual Meeting & Exposition
Montreal, Quebec, Canada

CHAPTER NEWS AND NEWS UPDATES
Chapter news and news updates for the society should be sent to the National Editor no later than the dates noted below. Letters to the society may also be submitted in this format.

PUBLICATION SCHEDULE
• Issue 1: January 1 (materials due October 31)
• Issue 2: April 1 (materials due January 31)
• Issue 3: July 1 (materials due April 30)
• Issue 4: October 1 (materials due July 31)

SUBMITTING A MANUSCRIPT
A Manuscript Template (Microsoft Word document) and Digital Repository Material Contribution Form can be found at https://digitalcommons.csbsju.edu/compass/instructions.html. Submit all necessary materials and refer any questions to the National Editor at editor@sgeearth.org. Please utilize the Manuscript Template when submitting articles.
Research Article

Fluvial channel path evolution – Documenting decades of change along the Little Wabash River, East Central Illinois, USA

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ABSTRACT

As highly dynamic landforms, rivers etch their channels into the surrounding and underlying strata over time, continuously reshaping the landscapes they traverse. This study examines geomorphological changes of the Little Wabash River in East Central Illinois between 1938 and 2011. The Little Wabash River is a meandering river sourced in southwestern Coles County, Illinois, and flows southward approximately 390 km to its confluence with the Wabash River. The historical location of the Little Wabash River was delineated to establish a baseline survey using archival aerial photography acquired in 1938. To understand how the channel evolved, investigations were conducted in each county along the Little Wabash River. Among other findings, this work suggests chute cutoffs occur more frequently than neck cutoffs and in smaller amounts of areal extent. Information garnered from these investigations can be used by geomorphologists, engineers, and planners to better understand anthropogenic impacts on riverine systems.

KEYWORDS

Meanders, channel evolution, geomorphology, LiDAR, chute and neck cutoffs

INTRODUCTION

Rivers are one of nature’s most dynamic forces shaping the landscape. Both braided and meandering rivers carve out their flow paths in the underlying strata, leaving definitive geomorphic structures. Over time, rivers will meander and change the course of their active channels. Regionally, individual rivers or stream reaches have been examined in relation to groundwater supply (Van Looy, 2005), endangered species habitat (Greco and Plant, 2003), and channelization processes in agricultural watersheds (Urban and Rhoads, 2003). These changes are created through the development of meander cutoffs in various temporal scales.

Meander cutoffs can form as either chute cutoffs or neck cutoffs, and the mechanisms by which they develop have been examined in past studies (Matthes, 1948; Crickmay, 1960; Winkley, 1977; Ratzlaff, 1981; Gay et al., 1998; Hooke, 2004). The primary difference between these two are chute cutoffs occur over a much larger length of floodplain than neck cutoffs. Neck cutoffs are typically narrower than the channel’s width (Viero et al., 2018). These cutoffs arise from the result of headward erosion of gullies during flooding periods. The gullies form during the initial flooding stage and complete the connection between the two parts of the main channel, creating a pathway through which the stream or river channel will continue to flow (Johnson and Paynter, 1967; Gay et al., 1998).

Numerous studies have been performed to theoretically predict size and shape of meanders in addition to investigating how meanders form (Bagnold, 1960; Leopold and Wolman, 1960; Carlston, 1965; Langbein and Leopold, 1966; Hey,
A large body of work is devoted to determining rates of movement of channels (Micheli and Larsen, 2009; Zhiwei et al., 2017) and delineating approaches and techniques used in meander analysis (Hooke, 1984). Investigations that centered on changes to channel shape over time have been performed, but technology limited these to “snapshots” of a channel with the information then being extrapolated for the entire river’s length (Alexander and Nunnally, 1972; Lewin and Brindle, 1977; Hooke, 1980; Greco and Plant, 2003).

Additionally, many of the temporal changes were derived from maps that were dated from the mid to late 1800s and had many embedded inaccuracies arising from poor mapping skills and lack of cartographic technology. However, with the advent of aerial photography in the early 19th century, chronological snapshots of topography, landscape features and channel locations can be preserved. Decades later – and with the development of remote sensing systems – comparisons to archived photos can be made to delineate the channel path changes that have occurred.

This information is invaluable in understanding fluvial evolution over time, as previous studies have only been able to deal with what was preserved in the rock record, hand drawn maps, field investigations and theoretical constructs of the evolution of river form over time. The research into the physical aspects of meander cutoffs is well advanced; however, there is a need to more accurately document the impact this phenomenon has had on the evolution of the channel’s pathway through time with modern technology. Additionally, little to no research has been focused on inventories of number and sizes of meanders developed. This study addresses both the technology issue and the documentation of cutoff inventory for a single river over 75 years.

As mentioned, there are many variables influencing whether a meander develops, the size of the meander, and other geomorphic features. To minimize external influences and isolate the effects of natural processes, the ideal river for studying evolution using modern technology would have minimal human modifications. A pristine, untouched river would be ideal; however, these are rare. Anthropogenic disturbances like highway and roadway pylons in a river’s active channel are usually inevitable, but using a river that has not been dammed or diverted along its path can provide an acceptable alternative.

**STUDY AREA**

The Little Wabash River in East Central Illinois is part of the larger Mississippi River watershed and is analyzed in this study (Figure 1). This river, with limited research on its history, originates in Coles County, Illinois, and flows south and east approximately 390 kilometers (242 miles) towards a confluence with the Wabash River (Figure 2). Disregarding the two lakes impounded near its headwaters, the rest of the channel’s pathway is undammed and relatively unmodified throughout the remainder of its length (Figure 3).

The Little Wabash watershed flows through agricultural areas, which yields crops like soybeans, corn, winter wheat, and hay (United States Department of Agriculture [USDA], 2020). Earlier research in this multi-year project demonstrated dramatic changes along various stretches of this river’s length as it was investigated county by county (Viertel and Burns, 2012; 2014; LaVeau et al., 2013; Burns and Viertel, 2011; 2014; 2015; Warner et al., 2016; Persico et al., 2018).

All segments of the overall study employed georeferenced historical aerial photos from 1938 to compare to newer Quickbird satellite imagery, Environmental

**Figure 1:** Location map showing Illinois in the United States and the counties in South Central Illinois that are part of the study area.
Systems Research Institute (ESRI) datasets, the Illinois Geospatial Data Clearinghouse (IGDC) and the United States Geological Survey (USGS) National Hydrography Dataset (NHD). Although the individual investigations revealed the expected migration and documented the changes, all of the newer datasets were eventually shown to be less than perfect due to their inability to depict channel banks obscured by tree growth. In an effort to be as accurate as possible for the purposes of this project’s finalization, all of the areas were re-mapped using Light Detection and Ranging (LiDAR) to establish the current pathway of the Little Wabash River. This paper is the culmination of these several years’ worth of investigations along the entire length of the Little Wabash River and provides a summary of the findings of the research for the whole watershed.

**METHODS**

The Little Wabash River has a total flow distance of 390 kilometers (242 miles). Once past the lowest of the two man-made lakes (Lake Mattoon), the river flows through Shelby, Effingham, Clay, Richland, Wayne, Edwards, and White Counties before joining the Wabash River. These counties

![Figure 2: Location of the Little Wabash River Watershed in South Central Illinois (Modified from Tetra Tech, 2008).](image)

![Figure 3: Modern channel pathway of the Little Wabash River, East Central Illinois.](image)
were used as arbitrary divisions of the river into manageable portions to analyze for channel migration changes. Although the portions of the Little Wabash in Richland and Edwards Counties were too small for a complete research project, their data were processed as part of this larger compilation.

Each of the four individual investigations began with retrieving archival aerial photography that was originally acquired between May 1938 and September 1941 by the USDA at a scale of 1:20,000. Archival prints were scanned into a digital format between 2001 and 2008 by the Illinois State Geological Survey (ISGS) and are available via the IGDC. These raster images were imported and manually georeferenced with hundreds of control points using Environment for Visualizing Images (ENVI) or ArcGIS software. Due to slight variances in original scale and the digitization process (e.g., the imagery was digitized over three years using different equipment and personnel), no single resolution holds true in the original archival imagery. Flying height and imagery scale does provide effective discernment of detail at sub-meter resolution. Once adjusted as accurately as possible, these images were imported into ArcGIS to create a photomosaic for the path of the Little Wabash River. The riverbanks were digitized to create a historical baseline map for comparison with current drainage patterns. These channel segments were assigned a red color in all the studies for consistency in differentiating channel alterations through time.

For Effingham County, modern channel location was derived from a dataset obtained by the Quickbird sensor on 28 June 2008, and purchased from the Digital Globe Corporation (now Maxar Technologies, 2021). Once acquired, these data were imported into ArcGIS. As there was not complete coverage for the entire reach of the Little Wabash River in this county, additional data were obtained from co-registered USGS topographic maps (USGS, 1985). These were combined into a single layer and the riverbanks were digitized to define the current channel location for each stretch. For this and subsequent investigations, modern river channels were assigned a green color to help in differentiating between historic and modern channel paths.

For both Clay and Wayne Counties, the current channel location for the area was derived from the ESRI dataset located online in the ArcGIS catalog (now ArcGIS Hub [ESRI, 2021]). These data were imported into ArcGIS and the river banks were digitized to depict the current pathway.

For White County, USGS Digital Raster Graphic (DRG) files were obtained from the Illinois Geospatial Data Clearinghouse database (2015). These digitally scanned images of USGS topographic maps have the image georeferenced to the surface of the Earth, making the dataset more easily managed at the outset. These USGS DRG files do not contain collar information, so the maps were imported and processed in a similar manner to the other counties.

After working with the Quickbird, ESRI, and USGS datasets, it became apparent that tree cover obscured some areas of the river channels throughout the study locale. Because of this fact, some information, such as the bank edge, was unobtainable using these sources. Additionally, the USGS DRG data disagreed with the National Hydrography Dataset in many cases (e.g., the channel location was different between the two datasets), demonstrating a lack of authoritative, accurate data on the river’s present course. This defined the need for a single high-resolution and consistent modern baseline to compare with historical data. With the ability to penetrate tree canopy, generate multiple hits per pulse, and provide precise detail, LiDAR data presented an opportunity to develop a strong baseline for the modern channel. LiDAR data for the counties in question were obtained from the IGDC. This dataset is part of the Illinois Height Modernization Project (ILHMP) and was acquired by the Illinois Department of Transportation in 2011 (except for White County, which was acquired by the Federal Emergency Management Agency [FEMA] for a project in 2011).

The original point cloud data (in a LAS format) was collected with 0.3-meter horizontal accuracy and a nominal point spacing of 1 meter. The LAS data were processed in four segments to render a Bare Earth Model in ArcGIS. This surface, devoid of vegetation or other extraneous detail, produced a detailed map of elevation differences, with vertical accuracy in the <5-centimeter range. The resulting highly detailed terrain raster was up-sampled to avoid loss of horizontal precision. For each segment, a hillshade model was also produced. Hillshade models use an artificially modeled light source to illuminate the surface and assist in discerning fine terrain details. This hillshade model was clipped to a 0.4 km distance from the river centerline (from the USGS NHD). The resulting product gave a very detailed rendition of the Little Wabash River floodplain from its source to its confluence with the Wabash River at the Illinois/Indiana border. This highly accurate and visible model, without interfering vegetation, allowed for accurate digitizing of the banks of the river in 2011.

Once the data for old and new baselines were acquired and
qualified in all the investigations, the two digitized channels – one from 1938 and modern – were then overlain and analyzed for stream centerline and bank path changes. In order to get numeric data for the large changes in the path, polygons were created in the land between the historic and modern channels. Areas of change of half an acre or greater were used in analysis; this equates to ~2,025 m² (21,800 ft²). The extent of these polygons defines the spatial difference between the historic and modern river paths. For each polygon, a center point (centroid) was created to provide a precise spatial location reference for each area of change.

## RESULTS

Every county examined using the outlined method revealed numerous instances of meandering reshaping the landscape, with the severity of alterations varying from minor to substantial. The smallest area affected was 0.5 acres (~2,025 m²). The largest was in Effingham County with over 89 acres (36,0170 m²) now located on the opposite side of the original channel. Several examples of these cutoffs are shown in Figures 4-6.

Altogether, there were 179 cutoffs developed throughout the study area since 1938, totaling 384.6 acres (~1.6 km²) of land. These data were analyzed and grouped into categories based upon size of change (raw data available upon request to authors). These data are summarized in Table 1.

### DISCUSSION

This study has accurately mapped the total area of land impacted by channel migration along the Little Wabash River from 1938 to the present. There is no attempt in the scope of this study to determine the mechanism of change that occurred, although it is important to keep the geomorphic

<table>
<thead>
<tr>
<th>Area of Change (acres)</th>
<th>Area of Change (m²)</th>
<th># of Meanders</th>
<th>% of Total</th>
<th>Total (acres)</th>
<th>Total (m²)</th>
<th>% of Total</th>
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<td>9.29</td>
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<td>37.7</td>
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<td>19.4</td>
<td>78,570</td>
<td>5.2</td>
</tr>
<tr>
<td>10 to 20</td>
<td>40,470 to 80,940</td>
<td>3</td>
<td>1.9</td>
<td>38.7</td>
<td>156,735</td>
<td>10.3</td>
</tr>
<tr>
<td>20 +</td>
<td>80,940 +</td>
<td>2</td>
<td>1.3</td>
<td>109.9</td>
<td>445,095</td>
<td>29.3</td>
</tr>
</tbody>
</table>
Altogether, 179 cutoffs were identified, ranging from as small as 0.5 acres (~2025 m²) to as large as 89 (~36,0170 m²). Graphing the frequency distribution of the sizes of the developed meanders illustrates that the bulk of cutoffs are in the 0.5- to 1.5-acre size (~2,025 to 6,070 m²) (Figure 7), with a mean of 2.15 acres (~8,700 m²). One suggestion of this initial data is that rivers naturally tend to have significantly more small cutoffs that develop over time than large ones. Revisiting the graphical data on the channel pathways and relying on definitions of the difference between different types of cutoffs (Winkley, 1977) reveals that the type of cutoff is directly related to the size and number, with a small transition zone (Figure 8). Chute cutoffs are smaller than 4 acres (~16,185 m²) and more numerous. Neck cutoffs are larger than 6 acres (~24,280 m²) and less frequent, and cutoffs in the 4- to 6-acre (~16,185 to 24,280 m²) size range can be either and seem to trend with neck cutoffs in frequency. It appears that the upper limit of size of neck cutoffs is around 20 acres (~80,940 m²), as no neck cutoffs are found larger than that in the field area.

One cutoff is significantly larger than 20 acres (~80,940 m²) (Figure 6). This cutoff is 89 acres (~36,0170 m²) in extent and bears no resemblance to a typical chute or neck cutoff. Although care was taken to investigate a river that was free of modification from dams and other imposed structures, the change in this section could have been influenced by anthropogenic activity. In this area, the river has been artificially modified by emplacement of concrete pylons to construct an overlying highway. These pylons are meant to have little impact on the river's form and function, but previous studies on hard structures erected in river channels indicate the structures substantially alter flow dynamics and typically result in bridge scour (Huizinga and Rydlund, 2001; Chase and Holnbeck, 2004; Wang et al., 2017; Zaid et al., 2019). Although these studies revolve around the failure of the bridges, the research demonstrates that stream velocities, trajectories, and equilibrium are disturbed by the presence of the pylons and cause increased erosion around the hard structures. Although this phenomenon is known to affect the bridge integrity, additional investigations need to be undertaken to determine how the introduction of these pylons influence the river geomorphology over temporal and geographic scales.

Figure 5: The light colored area marked “1” between the historic river channel (outlined in red) in 1938 and the modern river channel in 2016 (outlined in blue) in Wayne County, IL, is approximately 6 acres in size.

Figure 6: The most significant alteration to the Little Wabash River channel in the study area between 1938 (shown in red) and 2011 (shown in green). The left image is the aerial photo from 2011, while the image on the right shows the same extent’s LiDAR hillshade. The number of acres affected by the shift is approximately 89 acres. Notice that the point at which the channel started altering is coincident with the highway intersection (US 57). It is possible that the construction of the highway altered the river's thalweg and was the primary cause for the deviation in the channel pathway.
CONCLUSION

Documenting changes to the Little Wabash River in Southeastern IL has illustrated the amount of change that can occur as a result of riverine adjustment in approximately 75 years’ time, specifically focusing on an inventory of meander sizes that are created. This study demonstrates that rivers more frequently produce cutoffs in the 0 – 4 acre (0 – 16,185 m²) range all of which appear to be chute cutoffs. Larger cutoffs in the 6 – 20 acre (24,280 to 80,940 m²) range occur much less frequently and are typically defined as neck cutoffs. There appears to be a transition zone in the range of 4 – 6 acre (~16,185 to 24,280 m²) cutoffs, and these can be either chute or neck cutoffs. This linkage of frequency versus size for chute and neck cutoffs is shown clearly in this study and would benefit from similar studies in other geomorphically-similar rivers.

Rarely, there are cutoffs that are anomalous to these sizes; these would be any cutoff that is larger than what appears to be the upper limit of naturally created meanders. These are likely due to anthropogenic alteration of or within the river channel. Although this warrants future research, information garnered from these investigations can be used by geomorphologists, engineers, and planners to better understand anthropogenic impacts on riverine systems.

ACKNOWLEDGEMENTS

This work is the result of a multi-year investigation that incorporated efforts from several outstanding Eastern Illinois University (EIU) students as part of their educational experience. The authors are grateful for the contributions from Jenna Happ, Bill LaVeau, Geno Persico, and Abby Warner. The authors are appreciative of the support provided by the EIU Council on Faculty Research, the Federal Emergency Management Agency, the Illinois State Geological Survey, the Illinois Department of Transportation, and the Illinois Geospatial Data Clearinghouse.

![Figure 7: A representative small cutoff (chute cutoff). The left image is the aerial photo from 2011, while the right image is the LiDAR hillshade for the same extent. This type of cutoff is the dominant type in the study area.](https://www.sgeearth.org)

![Figure 8: Frequency distribution of meanders with respect to cutoff size for the Little Wabash River Watershed study area.](https://www.sgeearth.org)
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Research Article

Overview of the geology, paleontology, and geoscience education opportunities of the University of Tennessee at Martin Coon Creek Science Center for visitors, researchers, and docents

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ABSTRACT

The Coon Creek Formation is an internationally recognized Upper Cretaceous (Campanian, 76 million-years-old) marine clastic lagerstätten deposit with over 500 identified species of nearly perfectly preserved invertebrates, vertebrates, plants, and trace fossils with original shell geochemistry and paleoecological fidelity preserved. The type-locality and type-section, located in rural McNairy County, Tennessee, was preserved for research and education in 1988 when the Memphis Pink Palace Museum constructed a 232-acre geoscience education facility on the site, now run as the University of Tennessee at Martin Coon Creek Science Center. Visitors to the site participate in a wide variety of geoscience education programming and citizen science research that is based upon open-ended inquiry methodology. On the occasion of the 46th Biennial Convention, hosted at the site by the Eta Alpha Chapter of Sigma Gamma Epsilon (SGE), this paper summarizes the overall geologic setting, general paleontology, geoscience education history, and opportunities of the site for SGE field trip participants, potential researchers, visitors, and potential interns. Additionally, this paper highlights some of the numerous geoscience education programs for docents and research opportunities available for geology students who wish to participate in ongoing research at the site.

KEYWORDS

Coon Creek, Lagerstätte, Cretaceous, Campanian, Fossils, SGE, Eta Alpha, Geoscience Education

INTRODUCTION

The Coon Creek Formation is an Upper Cretaceous (76 million-years-old) clastic lithologic unit that is now considered a lagerstätten, or “mother-load” fossil site (Gibson and Dunagan, 2003; Gibson, 2011). The formation’s lagerstätten status was earned due to its remarkable abundance and species diversity of preserved fossils and the exceptional state of mostly unaltered and uncompacted fossil shell preservation (e.g., Adams, 1994; Noble, 1996; Zepp, 1999; Gibson, 2011). The faunal list is growing, but to date over 500 species of fossil taxa have been identified. The biodiversity includes nearly all major phyla of marine invertebrates, numerous vertebrates (especially fish, turtles, swimming reptiles, and one flying reptile), along with rare plant remains (both marine and terrestrial plants). The Coon Creek Science Center, built on the site of the “old Dave Weeks fossil farm,” is a 232-acre facility that is home to the Coon Creek Formation type locality and type measured section. The late Harvard University evolutionary biologist and paleontologist Stephen J. Gould commented to Pink Palace Museum Director

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Doug Noble at the grand opening of the Coon Creek Science Center in 1988 that “...while Coon Creek is not well known, I believe it is one of the ten or twelve most important fossil sites in North America” (Noble, email communication to Ron Brister, December 17, 2002; Brister, 2016). In 1988, the Coon Creek Science Center, opened by the Memphis Family of Museums and Pink Palace Museum so that the fossil riches of the site could be preserved and made available for education as well as scientific research (Brister, 2016). The University of Tennessee at Martin (hereafter, UT Martin) contracted to take control of the 232-acre facility in late 2019, just prior to the COVID-19 pandemic, and the site was renamed the University of Tennessee at Martin Coon Creek Science Center (hereafter UTMCCSC). UT Martin used the pandemic shutdown to refurbish and upgrade the site and expand educational programing and research. While there are several published summaries about the history of the discovery and scientific investigations of the Cretaceous fossils in the Coon Creek Formation (e.g., Wade, 1926; Brister, 1994; 2016; Wingard, 2016), until now little has been written concerning the educational programing and impact of the Coon Creek Science Center since 1988, nor has the non-Cretaceous geology of the site been summarized.

The Eta Alpha Chapter of Sigma Gamma Epsilon (SGE), which has been instrumental in the redevelopment and programing at the site since 2017, when negotiations with the Pink Palace Museum for the UT Martin to administer the site began in earnest, is delighted to be able to host the 46th Biennial Convention of the SGE at the site. This paper summarizes the overall geologic setting, general paleontology, geoscience education history, and opportunities of the site for SGE field trip participants, visitors, visiting researchers, and potential interns. Additionally, this paper highlights some of the numerous research opportunities available for geology students who wish to participate in ongoing research at the site.

SITE HISTORY

The type locality for the Coon Creek Formation was originally known as the “Old Dave Weeks Place” in the literature, named after the Weeks family who purchased the property in 1867. In 1888, Dave Weeks purchased the property from his mother (his father had passed away in 1867) for $125, at which point additional acreage was purchased to bring the size of the farm to approximately 250 acres (Brister, 2016). Weeks began to develop it as a subsistence farm concentrating on cotton and corn crops (Wade, 1926; Brister, 1994; Wingard, 2016). Dave Weeks died in 1941 and the farm passed to his brother Tad Weeks. In 1953, the property was purchased by the A.Z. Smith family who built the current house on the site of the Weeks cabin, added a barn (torn down in 2019) and a mailbox identifying the property as “The Fossil Farm.” The Smiths charged visitors by the carload to collect from “the fossil beds” (Brister, 2016). The “old Dave Weeks” house, which was near where the current caretaker house built by the Smiths in 1975 now stands, was abandoned at some point after 1941, but was still standing on the site in the 1970s (Russell and Parks, 1975). It was during the 1970s that the Pink Palace Museum in Memphis began regular collecting trips to The Fossil Farm and began showcasing the fossils in its natural history exhibit in Memphis.

By the late 1980s, the aging Smith family desired to sell the property, but in a way that preserved the fossil deposit for future study. The Pink Palace purchased the site in 1988 for $200,000 and the Coon Creek Science Center (CCSC) was constructed and opened that year (Brister, 2016) and was known by that name until 2019. In the early 1990’s, the University of Tennessee at Martin entered into a relationship with the science center and Pink Palace Museum in which UT Martin served as the coordinator for scientific research and post-secondary education programs on the site by providing paleontological and geological expertise, while the Pink Palace and Coon Creek staff focused on K-12 programs and public programs, especially for the Memphis-Shelby County populous (Gibson, 2011). In late 2019, UT Martin assumed primary control of the facility through a long-term (40-year) lease-agreement and the site was renamed The University of Tennessee at Martin Coon Creek Science Center (UTMCCSC). The Pink Palace Museum underwent reorganization at this time to become the Museum of Science and History (MoSH). MoSH retains ownership of the Coon Creek property itself and serves as the repository for scientifically significant fossils and artifacts collected on the site.

HISTORY OF GEOLOGIC STUDY

The history of geologic study at Coon Creek is filled with luminaries in geology and this history is included into programing for visitors to the site. The Coon Creek Formation takes its name from the modern 2nd-order creek that has eroded into the upper part of the formation at the type locality (Wade, 1926). Coon Creek flows north into White Oak Creek, which then flows east into the Tennessee River.
Fossils from what is now called the Coon Creek Formation, but not collected directly off of the “Old Dave Weeks” place, were first described by Tennessee’s first State Geologist, Gerard Troost (Troost, 1840; Corgan and Gibson, 1991; Gibson and Corgan, 1992), who described fossils being found in the glauconite-rich “green sands” in the region. Troost had embarked on a 29-day trip by horseback and train to West Tennessee from Nashville on October 24, 1833 (Gibson and Corgan, 1992). While conversing with local farmers during his excursion, Troost learned of a water well being dug that had revealed numerous shells and added a side trip to the site to investigate the find. Troost mistakenly identified the fossils as large individuals of the genus Gryphaea; however, the fossils Troost saw were more likely the large, coiled oyster Exogyra (Gibson and Corgan, 1992). The following day he was traveling in what was then Perry County and encountered more marl fossils that included the oyster Ostrea.

Several other prominent Tennessee geologists added to the knowledge of this “green sand marl.” Nelson Saylor (1866) depicted the “green sand marl” as the base of the Cretaceous system on his “An Outline Geological Map of Tennessee,” but it was the second State Geologist of Tennessee James M. Safford (1869) who organized the fossiliferous Cretaceous strata of West Tennessee into a meaningful stratigraphic framework (Wade, 1926). Safford described the “Green Sand or Shell Bed formation” from Hardin, McNairy, and Henderson counties in his seminal “Geology of Tennessee” in 1869. He recognized the green coloring in the sand as coming from the abundant occurrence of the mineral glauconite, also noting that the mineral provided an excellent fertilizer for the area. Safford published a page-long list of the taxa he collected from the “marl” exposed at several localities, but his collection did not come from the location that would become the future type-section. Safford’s fossils were identified by the prominent paleontologists Timothy Abbott Conrad and William More Gabb. Safford (1869) accurately described the most seminal feature of the formation writing, “it abounds in fossils” and that it “is pre-eminently [sic] the shell-bed of the post-Paleozoic beds of West Tennessee.”

The Coon Creek tongue was elevated to formational status in Tennessee by Russell in 1966 as part of the publication of the 1966 Geologic Map of Tennessee (Hardeman et al., 1966) based upon the fact that in Tennessee the Coon Creek Formation sediments differ significantly from the typical Ripley sediments of Mississippi. While the site was known to and visited by many geologists in the years after Wade’s work, there was little paleontological work of significance until 1950, when Norman Sohl, who would later to become president of the Paleontological Society, began fieldwork toward his dissertation from the University of Illinois at Urbana-Champaign under the eminent paleontologist Bernhard Kummel (Wingard, 2016). Norm Sohl’s choice to work on Cretaceous gastropods at Coon Creek was influenced by the U.S. National Museum (Smithsonian Institution) paleontologist Ralph Imlay and U.S. Geological Survey paleontologist John Reeside, with encouragement of U.S. Geological Survey stratigrapher and paleontologist Lloyd W. Stephenson when he established the “Ripley Sand Member,” later to become the Coon Creek Formation, as a northward thinning stratigraphic “tongue” in Tennessee within the Ripley Formation (Stephenson, 1914; Stephenson and Monroe, 1940). The Ripley Formation had been named by E.W. Hilgard (1860) for exposures near Ripley, Mississippi and Coon Creek Formation equivalent stratigraphy is still called Ripley Formation outside of Tennessee.

The fauna of the Coon Creek Formation owes part of its pedigree to paleobotanist E.W Berry (1919) who had been working to identify the fossil plants from all West Tennessee deposits, later correlating them with strata along the East Coast. It was Berry who introduced Vanderbilt University geology graduate Bruce Wade, from nearby Trenton, Tennessee, to the exquisitely preserved invertebrate fossils being collected in the region and Wade began his study of the fossils as his PhD dissertation topic at Johns Hopkins University. After publishing over a dozen shorter papers on the Coon Creek Formation from 1917-1922 (e.g., Wade, 1917), his work culminated in his now seminal U.S. Geological Survey Professional Paper 137 “The Fauna of the Ripley Formation on Coon Creek, Tennessee” in 1926 (Wade, 1926; Brister, 1994; Brister, 2016; Wingard, 2016), which is still considered the primary taxonomic guide for most invertebrate fossil groups from the Coon Creek Formation. For a detailed biography of Bruce Wade and comprehensive list of Wade’s publications, the reader is referred to Brister (1994).

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Geological Survey stratigrapher L.W. Stephenson (Wingard, 2016), thus beginning a long association between the Coon Creek site and the U.S. National Museum (Smithsonian Institution) and the U.S. Geological Survey that continues to this day. Sohl’s thesis (1951) and dissertation (1954) were published as U.S. Geological Survey Professional Papers (Sohl, 1960; 1964a; 1964b), remaining the sole resource on Cretaceous gastropods of the region until Bandel and Dockery (2016).

There are numerous early studies that focused on the biostratigraphy of the Coon Creek Formation. Stephenson (1914) established the biozonation that was used by Wade (1926) utilizing the large oyster *Exogyra* which he used to correlate the Coon Creek Formation (within the *E. costata* biozone, and the included *E. cancellata* subzone) throughout the Gulf coast and upwards along the Atlantic coast. The earliest microfossil studies on the Coon Creek Formation were conducted by Berry and Kelley (1929), Cushman (1931), Berryhill (1955), and Granata (1960). Mosasaurs were known from the Coon Creek Formation since the identifications by C.W. Gilmore published in Wade (1926) opened with a summary of the stratigraphy (Ebersole, 2016) and history of the site (Brister, 2016; Wingard, 2016) and included taxonomic studies of plants (Dilcher, 2016), fish otoliths (Stringer, 2016), bryozoans (McKinney and Taylor, 2016), echinoids (Ciampaglio and Phillips, 2016), pterosaurs (Harrell et al., 2016), and palynology (Baghai-Riding et al., 2016), and gastropods (Bandel and Dockery, 2016).

Perhaps the earliest paleoecological study was conducted by Moore (1974) in an unpublished, but often cited, M.S. thesis from The University of Tennessee, Knoxville, in which Moore updated much of the bivalve taxonomy from Wade’s original work. At the nearby Thompson Farm locality, Dunagan and Gibson (1993) documented *in situ* assemblages mixed with assemblages that showed varying degrees of local reworking attributed to bioturbation (probably mostly by echinoids), which also represents the earliest ichnological study from the Coon Creek Formation. Shell repair (Vermeij and Dudley, 1982) and drilling predation studies (e.g., Kelley and Hansen, 1996; Kelley et al., 2001; Kittich et al., 1981) have been the focus of many paleoecological investigations, mostly using museum collections from Coon Creek. Griffin and Gibson (1998), Jones and Gibson (2000a; 2000b), Rhenberg (2007), and Gibson (2023) focused on biotic interactions and taphonomic characteristics preserved in the Coon Creek fauna.

In 2002, UT Martin geologists hosted a special session of invited scientific papers that were presented at the Southeastern Section of the Geological Society of America annual meeting held in Memphis, which was the first scientific symposium devoted to the Coon Creek Formation. It was co-sponsored by the Southeastern Section of the Paleontological Society and the Southeastern Section of the National Association of Geoscience Teachers and included a field trip to visit the site. At this time, the site was recognized as a “lagerstätten deposit” (“motherload deposit”), which is generally considered the highest level of classification for fossil deposits, due to its abundance of pristinely preserved fossils and faithful recording of paleoecological conditions.

The papers from this symposium were compiled and published as Alabama Museum of Natural History Bulletin 33, volumes 1 and 2 (Ehret et al., 2016a; 2016b) representing the most comprehensive study of the Coon Creek fauna since Wade’s (1926) original work. These compiled bulletins opened with a summary of the stratigraphy (Ebersole, 2016) and history of the site (Brister, 2016; Wingard, 2016) and included taxonomic studies of plants (Dilcher, 2016), fish otoliths (Stringer, 2016), bryozoans (McKinney and Taylor, 2016), echinoids (Ciampaglio and Phillips, 2016), pterosaurs (Harrell et al., 2016), and palynology (Baghai-Riding et al., 2016), and gastropods (Bandel and Dockery, 2016).

More recently, Vrazo and others (2018) applied carbon isotopes to demonstrate that the decapods in the Coon Creek Formation utilized terrestrial plant-based organic matter as primary in their diet, thus demonstrating the usefulness of stable isotopes to understanding the Coon Creek fauna. Byl and others (2021; 2023), Cunningham and others (2022), and Gibson and others (2022) have reported on the presence of microcystin and saxitoxins, the toxins that cause red tides in modern oceans, preserved within the shells of the Coon Creek fauna. Kovalski and others (2022) and Kovalski (2024) evaluated stable isotopes (e.g., δ¹⁸O, Mg/Ca, Ba/Ca, Sr/Ca, and δ¹³C) to conclude from the bivalve *Pterotrigonia thoracica* to infer paleoecological and geochemical parameters within the Coon Creek ecosystem. These studies, made possible due to the amazing geochemical preservation of the Coon Creek lagerstätten fauna, may offer a mechanism for the periodic kill events that resulted in several mosasaur skeletons found on the site (Byl et al., 2023). Self-Trail and others (2024), used calcareous microfossils (benthic and planktic foraminifera, calcareous nanofossils, and ostracods) and palynomorphs

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(pollen, spores, algal remains, and dinoflagellates) to refine the geologic age of the Coon Creek type locality to the late Campanian (76.0-76.8 Ma) and having been deposited in inner to middle neritic water depths (0-56 m [0-180 ft]). Prior to this study, the Coon Creek Formation was reported as either Campanian or Maastrichtian in age.

LOCATION AND REGIONAL GEOLOGIC SETTING

The visitor’s geoscience education experience begins with their drive to the UTMCCSC. The UTMCCSC is situated within the West Tennessee Uplands physiographic province which is characterized by gently rolling hills deeply incised with steep-walled narrow creeks, such as Coon Creek (Fenneman, 1938; Floyd, 1990). The overall climate is humid to subtropical.

The Coon Creek Formation is exposed as part of a north-south trending outcrop belt within the Mississippi Embayment in western Tennessee and eastern Mississippi (Figure 1). Regionally the outcrop belt is traceable around the Gulf Coast northward up the Atlantic Coastal Plain (Figure 1A).

Paleogeographically, Coon Creek sediments were deposited within a large, partially enclosed, and sheltered bay that formed along the southern margin of the Late Cretaceous Interior Seaway within the landmass of Appalachia. The bay and its sediments were the result of continued infilling the Late Neoproterozoic-age Reelfoot Rift System, famous for the New Madrid Seismic Zone, and associated Paleozoic and Mesozoic subsidence activity, and associated with the Cretaceous position of the Bermuda hot spot (Cox and VanArsdale, 2002, and references cited therein), although there is no record of volcanic activity within the Coon Creek Formation sediments. The embayment was proximal to, and connected to, the Cretaceous Interior Seaway system to the west and the Atlantic Ocean to the east and represents the sea level high stand that bisected Cretaceous North America into two landmasses, Appalachia to the east and Laramidia to the west.

The Coon Creek Formation is clastic dominated, composed of gray to dark-green, micaeous, glauconitic, quartz sand that is locally highly fossiliferous. Moore (1974), Russell and Parks (1975), Dunagan and Gibson (1993), and Self-Trail and others (2024) interpret the Coon Creek to represent a series of clastic coastal to offshore marine environments tracking the initiation of a regional sea level regression. Depositional lithofacies of the Coon Creek Formation grade laterally and vertically into the McNairy Sand (Figure 2) consisting of non-glaucous quartz sand, sandstone, and clay (Russell and Parks, 1975) representing

![Late Cretaceous Outcrop Distribution](https://www.sgeearth.org/)

**Figure 1:** Regional setting and location of the Coon Creek Formation and the University of Tennessee at Martin Coon Creek Science Center (UTMCCSC). (A) is the Upper Cretaceous outcrop distribution in the southeast showing location of the Coon Creek type-locality (CC) and the University of Tennessee at Martin (Star). (B) is a close-up map showing north-south oriented Cretaceous outcrop belt (in green) within the West Tennessee Uplands physiographic province and the location of UTMCCSC (yellow circle X) in McNairy County, just south of Enville, Tennessee.
barrier sand bars and beach environments prograding across the area during regression. The underlying Demopolis and Sardis formations represent an open marine transgressive highstand sequence prior to Coon Creek time. These units consist of glauconitic sand (Sardis Formation) that grade upwards and laterally into sandy- and silty-marl with localized argillaceous chalk (Demopolis Formation). The Coon Creek thus occupies the critical hinge position in the transgressive-regressive sequence sea level shift.

GEOLOGIC FEATURES AT THE SITE USED FOR VISITOR PROGRAMING

Geomorphology of the UTMCCSC

In addition to programs focused on the fossil deposit, UTMCCSC offers programming related to basic geologic processes, especially processes highlighted in public education Earth science classes and University-level introductory geology courses. Fluvial and mass wasting processes are integral to understanding the fossil exposures of Coon Creek. Figure 3 is a site map of the UTMCCSC with locations of geomorphic features related to modern physical geology used in geoscience education programming. Often overlooked by visitors who are focused on finding fossils, but of great educational value, are the interacting modern geologic processes and landforms that can be viewed by visitors on their way to the fossil exposures. It is important to point out these processes at the beginning of a visitor’s experience, usually on the walk to the fossil deposit, so that they understand why there is such a mix of modern and ancient geologic features visible simultaneously and have a better grasp of the effects of temporal and spatial scales in the historical geology of the Coon Creek site. Visitors often confuse the ancient Coon Creek Formation with the modern Coon Creek fluvial system as being part of the same geologic process occurring at the same time and confusion can result in understanding how the modern terrestrial Coon Creek geologic system that they see on their visit relates to the ancient ocean Coon Creek ecosystem that they are reconstructing with the fossils and sediments.

At the UTMCCSC, fluvial processes (along with anthropogenic drainage changes) have resulted in a geomorphic expression of a series of five narrow elongate floodplains separated by short east-flowing shallow tributaries that have been informally named for prominent geologists associated with the Coon Creek Formation (Figure 3). The most southern branch (Weeks Branch) begins adjacent to the caretaker’s house and is the most significant as it drains an artificial farm pond (Safford Pond) built by the Weeks family and has deeply incised the modern floodplain, requiring the construction of a foot bridge by the UT Martin Engineering program students and another foot bridge built by local Eagle Scouts. The perennial Weeks Branch is the shortest of the cross-drainages at 200 meters (660 feet) long, steeply incised, with a nearly straight channel until it reaches the floodplain where it makes one wide meander offset before emptying into Coon Creek. Weeks Branch has the highest rate of incising as evidenced by being 1.5 meters (4.9 feet) deep at mid-course, next to the Fossil Cleaning Pavilion, and up to 3 meters (10 feet) deep with a 1.3 meter (4.3 feet) tall waterfall at the confluence with Coon Creek. The waterfall at the confluence of Coon Creek and Sohl Branch (Figure 4) is used to explain to visitors how temporary baselevel cutting works as a fluvial process and how modern landforms are the result of depositional and erosive geologic process that interplay over varying geologic time scales.
Four artificial ponds have been built on the property by damming the upper reaches of drainages. Three of these ponds occur on the western hill slope and one occurs on the eastern edge of the property in the next valley to the east of Coon Creek. Safford Pond (Figure 3), constructed in the 1950s, occurs near the site of an old brick kiln operated by the Weeks family in the late 1800s, and is used for limnology studies by visiting groups, especially pond water geochemistry and food.

Figure 3: Site map of the UT Martin Coon Creek Science Center showing important geomorphic, geologic, and infrastructure features (Not drawn to scale). MH&C area is shown in more detail in the inset and is the area with cabins, restrooms, showers, first-aid. Inset Map shows details of the buildings in the MH&C – black rectangle with dots = Mess Hall, Numbered boxes are cabins and buildings: 1 = Evergreen cabin (UT Martin Research cabin), 2 = Dogwood, 3 = Cypress, 4 = Birch, 5 = Aspen (Intern's cabin), 6 = Lively Paleontology Lab, 7 = Fossil Prep Pavilion. FP = Floodplains (listed numerically). Area of Creek Walk Program outlined by dashed box.
web concepts. Troost Pond is named after Gerard Troost and occurs near the cabin complex. Three other cross-drainages, Sohl Branch (named for U.S. Geological Survey paleontologist Norman Sohl), Wade Branch (named for geologist Bruce Wade), and Russell Branch (named for Mississippi State geologist Ernest Russell) are less incised into the floodplain. None of these cross-drainages have artificial ponds at their headwaters. Each of the cross-drainage branches develop waterfalls with splash pools at the base of the waterfall that often concentrates more resistant fossils such as bone, teeth, and large fossil oysters as a lag, like the splash pool at Sohl Branch that produces the largest numbers of fossils as a pool lag gravel after extensive rains.

Although not obvious from the topographic map (Leapwood 7.5-minute topographic quadrangle) for the site due to the 20 foot contour interval, there is a distinct widening of intermittent stream channels at the topographic level of the floodplain floor for Coon Creek (Figure 5). Best visible in winter when the leaves have dropped from the trees, the steeper and shorter cross-drainages on the east side of Coon Creek display marked widening of their respective valleys at the stratigraphic level where the more clay-rich lower fossiliferous horizon of the Coon Creek Formation is encountered. This is the same stratigraphic level for the temporary baselevel waterfall development discussed above. Downcutting slowed relative to enhanced lateral erosion to widen the cross-channel floors and reduce the steepness of their V-profile. It should be noted that the level at which lateral cutting increases coincides with the stratigraphic level within the Coon Creek Formation that clay content increases, and groundwater percolation slows within the sediment, showing a positive feedback relationship between clay content and erosion characteristics. The east cross-drainages are much steeper in gradient and shorter in length than the west cross-drainages, so the enhanced widening of these drainages is all the more unusual when compared to the western branches.

**Modern Geology: Coon Creek Fluvial Processes**

The modern north-flowing Coon Creek channel is confined to the east side of the floodplain with tall, steep,
east walls (up to 20 meters [66 feet]). As the UTMCCSC occurs near the headwaters for Coon Creek, the course of the channel is relatively straight with only moderate meandering. Within the channel itself, point bar and slip-off slope development is subdued due to the deep, narrow, V-shaped cross-section; however, there are typical meander channel features visible along the channel that are good for educating visitors on fluvial processes and geomorphic landforms typically discussed in a physical geology course (e.g., point bar deposition, graded bedding, cut bank erosion, thalweg development, grain size sorting, etc.). Levee development along the incised channels is subdued, less than 0.5 meters (1.6 feet) tall.

Coon Creek has become deeply incised by over 100 years of farming practices that lacked conservation methods and was characterized by controlling the channelization. The primary concern for the Weeks family in the early days was to drain the narrow floodplains quickly for crops and to curtail channel migration into the planting area. The only area along the creek where Coon Creek meanders westward enough to expose a floodplain on the east side of the creek is the extreme northern edge of the property (FP 5 in Figure 3) where the remains of plow furrows from the 1940s are visible on the floodplain within a small grove of trees that have reclaimed the floodplain (these are becoming less visible as time passes). Further to the north, the Coon Creek valley widens considerably as it approaches the confluence with White Oak Creek and the channel develops a wider meander pattern into the valley with better development of wider floodplain on both sides of the creek.

As noted, the modern Coon Creek is itself a young geomorphic feature of partly anthropogenic origin. According to Sohl (1954), Dave Weeks dug a drainage furrow for a field he had in cultivation along what is now the east side of the Coon Creek valley, establishing the current channel. Within a mere 20 years, meandering processes ceased, and erosion had deepened the drainage channel to ~5 meters (16 feet) total cut bank highwall relief, thus locking-in the current drainage

Figure 5: Photo looking east from the floodplain during a winter snow showing widening of the east-side cross-drainage valleys at the level of the floodplain and the temporary base level created at the contact with the clay-rich Coon Creek Formation (Photo Credit: M.A. Gibson).
track. Continued incising of Coon Creek has rapidly exposed the steep-faced fossiliferous strata which can be traced under the floodplain to the west. The average downcutting rate is calculated at 3.05 cm/yr (1.20 in/yr) between the years of 1988 and 2024 (see discussion below).

The fossiliferous mounds used by the UTMCCSC for fossil collecting by visitors are constructed by trenching through the floodplain “overburden” into fresh fossiliferous Coon Creek material under the floodplain (Figure 6). The floodplain overburden sediment averages 3-5 meters (10-16 feet) thick. The floodplain overburden sediments overlying the fossiliferous Coon Creek horizon are silt- and clay-dominated and contain several gravel channels cross-sections with reworked ferruginous sandstone (ferricrete) channel lags mixed with weathered and reworked Coon Creek sands and clays, much like sediments within the modern creek. These channels represent the paleodrainages of “earlier Coon Creeks” that meandered across the floodplain prior to meander restriction established by Weeks when he dug the current drainage pathway on the east side of the floodplain (Sohl, 1951). The fertile floodplain that Dave Weeks farmed is the surface upon which the current soil horizons have formed and is now the grassed-over field across which visitors walk to reach the creek exposures for fossil collecting (FP 1 and FP 2 in Figure 3).

Modern Coon Creek is actively transporting clay and sand reworked from the surrounding hillside and hilltops and material eroding from several stratigraphic units. Iron-cemented siltstone and sandstone, or “ferricrete” clasts, are major components of the modern creek sediment (see alluvial fan in Figure 4). Ferruginous sandstone lag gravels are found in the modern Coon Creek and in the paleochannels indicating that this has been a common occurrence for an extended period of time. Paleochannels and slope deposits resembling the modern creek sediments occur in the upper portions of the cutbank exposures along the creek in three separate areas on the property that probably represent earlier (higher elevation) fluvial events in the history of the Coon Creek valley. Reworked Coon Creek fossils are often found in the modern creek sediments but not in the modern floodplain deposits, reflecting that the incising into the Coon Creek Formation is a relatively recent occurrence.

There are two types of ferricrete within the channel sediments (both modern and paleochannels). Resistant, dark red-brown, coarse, sandy, unfossiliferous, cemented (hard) ferricrete is derived from the hilltops and higher

Figure 6: Photo showing trenching of a fossil mound on the floodplain for visitor digging. Mounds are used for small as ADA compliance for very small children and others not able to participate in the Creek Walk Program and for providing bulk sample buckets for shipping to schools for remote programming. Gray pile on left is Coon Creek matrix, floodplain sediments are piled on the right (Photo Credit: M.A. Gibson).
paleochannels are visible in several areas of the creek, pseudofossils. Predictable discussions about the origin of mimetoliths and the ancient Coon Creek Formation itself. Typically, visitors to the modern creek channel and underlies the floodplain surface. However, close comparison reveals that this sediment contrasts markedly from the sediments of the modern geomorphic landscape. While much of the ferricrete occurs as clasts in the soils topping the hilltops, it also works its way down from the surrounding hilltops to accumulate as lag gravel within the modern stream, as it did for the paleochannels. The visitor is thus treated to a glimpse of what will eventually happen to the modern Coon Creek, thus allowing them to “read forward” into geologic time and the processes of the geologic cycle that are the result of “landscape evolution.” These geologic lessons are easily transferable to other areas of the West Tennessee Uplands.

Modern Geology: Environmental Lessons

Environmental geology lessons are an important part of the educational mission of UTMCCSC. As noted earlier, when the Weeks family purchased land that Coon Creek ran through in 1867, the then unnamed Coon Creek was just a small drainage ditch with few fossils exposed (Sohl, 1951). Weeks deepened and widened the drainage by hand shovel to carry away rainwater from his newly developed bottomland. Within 20 years or so, meandering had ceased and erosion had deepened the drainage, exposing the fossils that had laid buried for over 70 million years. As an interesting sidenote popular with visitors, Weeks would grind the fossilized shells into a meal that he could feed to his chickens, providing calcium to strengthen their eggs.

How do we know that over a meter of downcutting has occurred along Coon Creek in the area of the type-section across from the first floodplain since 1988? This was determined by measuring the base of a set of stairs constructed at creek level in 1988 to its current position on the side of the channel in 2024. That stop along the Creek Walk Program for visiting colleges is one of the most illustrative in demonstrating the impact that human activity can have, even as it relates to small-scale, localized subsistence farming. Erosion processes are easily understood when they are fresh and occur suddenly; however, slower erosion that revegetates as it proceeds is less obvious to observers unless...
there is some obvious marker, like our stairs, to serve as a visual aide to seeing the impact.

**Modern Geology: The Role of Ice**

On the Leapwood 7.5-minute topographic quadrangle, Coon Creek is mapped as a perennial stream; however, it acts more as an intermittent stream and has significant periods of time with only a trickle of water moving sluggishly from pool to pool downstream, especially during the dryer months of the year. The creek is often dry for several weeks at a time, except for isolated pools of water fed by springs in the creek wall. Local relief along Coon Creek can be as much as 30 meters (98 feet) to the top of adjacent hills with over 15 meters (49 feet) of exposed cutbank on the east side of the creek locally. Incising by water action alone does not appear to be capable of creating this amount of relief in the time that the creek has been in existence.

A fortuitous winter ice storm that stranded the author on the site for a few days led to the discovery that ice plays a major role in the incising and erosion of Coon Creek. During the winter months, the moist outer surface sediments of the channel walls (up to 10 centimeters [3.9 inches] deep into the bank) often freezes and can produce extensive patches of needle ice (Figure 7). This ice formation in the outer few centimeters results in expansion during freezing and nearly vertical separation fractures under the frozen slabs. The slabs of coherent sediment exfoliate from the outcrop and spall-off into the channel as subsequent thawing occurs. Repeated freeze-thaw cycles result in localized mass wasting surfaces cutting under the rooted zone (Figure 8) that steepen the outcrop walls and results in numerous treefalls. As the UTMCSC is situated near the headwaters of Coon Creek, heavy winter and early spring rains flush through the channel and contribute to the quick incising of the creek. Seasonal small-scale mass wasting processes are underappreciated as a fluvial process, but it is well-illustrated during winter Creek Walk Programs at the UTMCSC. Additionally, these features offer an opportunity for the visitor to learn about the sometimes episodic nature of some “hidden” geologic processes and the role that seasonality and time play in geology to produce features that appear at odds to the more obviously daily processes.

**Modern Geology: Landscape Evolution**

Drawing attention to the above geomorphic processes and features allows docents to introduce the concept of “landscape evolution” over geologic time scales of decades through centuries to millenia, through differential erosion processes, to be presented to visitors. Additionally, groundwater processes that, mostly, are hidden to the average visitor and difficult to understand, are readily visible within the stratigraphy of the walls of Coon Creek. Evidence of differential erosion rates are visible in the geomorphology of the tributaries entering Coon Creek and the temporary baselevel of the floodplain itself.

The upper stratigraphy at the site is more-sandy and percolates groundwater well, while the clay-rich lower stratigraphy is better sealed from percolating groundwater. Differences in groundwater content and percolation can be seen as a visitor takes a hike on the nature trail, which traverses all of the geomorphic regions on the site. As noted above, the result is that the creeks incising the surrounding hills slow their downward cutting upon reaching the clay-rich horizon and begin to cut laterally, thus widening the stream profile at the contact with the clay-rich portion (Figure 5). Numerous springs occur along the creek bank where the more porous and permeable floodplain sediments sitting on top of the Coon Creek Formation meets the less permeable and lower porosity clay-rich Coon Creek Formation sediments and groundwater begins to flow laterally. These sites on the Creek Walk Program serve as places to explain geologic processes related to groundwater movement (e.g., water tables and perched water tables, porosity-permeability relationships, and sediment characteristics) to visitors.

Figure 7: Photo of needle ice formation in Coon Creek bank wall (pencil for scale). Notice the small tan sediment caps at the ends of each need ice crystal (Photo Credit: M.A. Gibson).
Several chalybeate horizons (Figures 8 and 9) are visible on the creek walls as iron-stained surfaces that accentuate the stratigraphy (specifically the location of contacts and minor perched water table surfaces) and relative percolation rates, again providing opportunities to see the relationship between processes of ancient geologic history and modern geomorphic expression.

**Modern Geology: Uplands and Soils**

Hill tops at the UTMCCSC have second- and third-generation forests. The original hardwood forest on the property was harvested in the 1870s when the Weeks family

![Figure 8: Photo of creek wall showing role of mass wasting in erosion of Coon Creek banks. Freezing of the water in the outer few centimeters of the creek wall, with volume increase, produces vertical fractures separating the outer slabs of sediment, which slide down the face upon thawing to produce debris aprons at the bottom of the outcrop. Eventually the debris aprons are reworked downstream. Clay-rich Coon Creek sediments result in numerous levels of perched water tables that form chalybeate horizons (Photo Credit: M.A. Gibson).](image-url)
Figure 9: Photo of type-section showing Coon Creek Formation internal stratigraphy and large-scale slump overhang produced by undercutting of the rooted horizon. Horizon 4 ledge passes under the slump overhang. Recently fallen limonite and ferricrete talus blocks from Horizon 4 occur at the base of the debris slope, partially blocking the Coon Creek channel (Photo Credit: M.A. Gibson).
acquired the property and the site was then modified for use as farmland. When the A.Z. Smith family acquired the site in the late 1950s, all farming ceased and a mix of hardwoods and pine recovered the hilltops; however, the Memphis Museum harvested most of the hardwoods from the uplands in 2011, except for the southwestern portion of the property that houses the UTMCCSC and Caretaker’s House. The floodplains were kept barren of trees for the most part. Currently the upland is planted with fast-growing pine for later harvesting upon maturity of the trees.

Precipitation runoff during the tree harvesting, and for a few years afterward, caused some problems with increased runoff sedimentation into Coon Creek until the growth of the pines could stabilize the slopes. The soils developing on the site belong to the “Lu” (Luftee) soil systems on hilltops (Brown, 1997). Overall, soils are classified as strongly acidic, fine, sandy loams that are occasionally flooded, moderately well drained and permeable, with moderate available water capacity, and displaying a seasonal, high water table.

In 2020, a 4-kilometer-long (2.5 mile) hiking trail was cut on the property that begins at Weeks Branch near the Fossil Cleaning Pavilion and meanders north through the planted pine forest to the UTMCCSC property line on Hardin Graveyard Road, where it then turns east to cross Coon Creek. After steeply climbing to the top of the eastern upland, the trail turns south along the eastern edge of the property following the hill ridgeline, until it turns west to descend and re-cross Coon Creek at the entrance site of the beginning of the Creek Walk Program on the second floodplain just south of the confluence with Wade Branch. The trail is used for forestry and wildlife programming and for viewing the origin of the ferricrete that is so prevalent as gravel in Coon Creek.

As previously noted, erosion and mass wasting processes have produced steep, nearly vertical, walls in the Coon Creek banks. The channel shows significant undercutting of the rooted horizon on both sides of the creek (Figure 9). The type-section outcropping on the first floodplain has a significant overhang that extends nearly 0.4 meters (1.3 feet) outward from the steep face of the hill and is held together by a thick root mat from the tree and shrubs that used to be on the surface. The overhang shows significant sagging due to the undercutting and the beginning of separation cracks near the channel wall. This feature serves as another geologic process discussion stop for visitors where modern mass wasting processes (e.g., slides and falls versus creep, etc.) are emphasized. Many smaller, and less dangerous, overhangs occur along the Coon Creek channel illustrating the meandering nature of the fluvial system and starkly contrasting cutbank erosion processes with point bar depositional process (e.g., Figure 4). Fallen and curved trunks of trees in various growth stages on the overhangs along the creek are used to demonstrate the slow nature of these processes to visitors (Figure 4). Additionally, these trees can be used to introduce dendrochronology and dendrogeomorphic processes (e.g., Stotts et al., 2014) to visitors by comparing tree ages with degree of trunk curvature and tree falls.

Anthropogenic Impacts: Environmental Action Research

Does the digging for fossils along the creek by visitors and researchers impact the ecology of Coon Creek as would be expected due to the volume of visitors and the enhanced erosion produced by digging tools? Most of the active digging on the creek for the past 20 years has been confined to a 200 meter (660 foot) stretch along the middle section of the creek where an access slope was cut through the Coon Creek levee berm in 1988 when a mosasaur skeleton was found at a meander bend in the creek (Figure 3). Approved groups and scientific studies are allowed along the other areas of the creek, but only on a limited and controlled basis. We can document enhanced erosion of the creek channel banks, along with increased sedimentation rate within the channel, within this portion of the creek. This is evidenced by: (1) a wider channel profile; (2) slightly wider stream meander development; (3) more abundant, larger, and deeper overhangs on cutbanks; (4) numerous holes left behind by digging tools; (5) steeper waterfalls and splash pools; and (6) larger point bars with more fine-grained Coon Creek matrix sediment relative to ferricrete co-occurring within the high-visitation portion of the creek.

Does the fossil digging activity degrade the geochemical quality of Coon Creek waters. Part of the UTMCCSC “action research” programing is to have some visitor groups conduct water quality studies (using the same kits that they would use in most introductory environmental geology courses) along the creek, which includes identifying and counting riparian fauna, at various times of the year and comparing with nearby creeks. Additionally, studies have been conducted before, during, and at various times after individual digging programs to identify short-term impacts. There are no significant differences in the geochemistry profile of Coon Creek.
Creek and nearby creeks with the sole exception of fecal coliform bacteria, which is lower in Coon Creek than in nearby creeks. This is attributed to the UTMCSCC sitting near the headwaters of Coon Creek with limited cattle grazing in the uplands surrounding the Center or on the property itself. Much of the land to the east of the UTMCSCC belongs to a hunting club.

There are several recurring results noted by these “citizen science,” place-based, action projects that have been conducted over the years. As would be expected: (1) water clarity decreases and turbidity increases during and just after digging events along the active reach, and to a lesser degree downstream, of Coon Creek; (2) the physical profile in this reach of the creek is becoming wider than adjacent creek channel reaches; (3) meanders in this reach are slightly wider; (4) there is a greater volume of reworked fine-grained sediment within the digging reach, and just downstream of it; and finally, (5) in Coon Creek the numerous small-hole excavations that are dug by visitors influence channel bottom shape and result in the bedload sediments moving through these “potholes” to remain turbid the longest (with average small pothole, based upon the size of fossil excavated, is usually no more than 20 cm [7.9 in] in diameter) and with potholes remaining visible for a couple of weeks during the dryer season until erosion sculpts the edges and sediment infills the small depocenter created by the digging. The recovery time of the most in-stream turbidity to water clarity is short, usually minutes to a few hours and generally is less than the turbidity that occurs during heavy runoff periods produced by rain.

In summary, undoubtedly, digging for fossils on the creek has an anthropogenic physical impact; however, there is no evidence of large-scale or long-term negative impact over the history of excavations at Coon Creek.

SEDIMENTOLOGY AND STRATIGRAPHY OF THE COON CREEK TYPE SECTION

Russell and Parks (1975) and Russell and Keady (1983) delineated two traceable lithofacies within the Coon Creek Formation, the boundary between them often marked by phosphatic concretions and platy ferruginous sandstone layers. The lower Coon Creek lithofacies is a massive-bedded, glauconitic, fossiliferous bluish to green clayey-sand and sandy-clay that tends to weather brown and locally contains carbonate concretion horizons. Only this lower Coon Creek lithofacies is exposed along the creek exposures of the UTMCSCC fossil site (Figure 10; Self-Trail et al., 2024). Comparison of the UTMCSCC fossil site with the nearby Thompson Farm exposure (Dunagan et al., 1992; 1993; Dunagan and Gibson, 1993) indicated that some lateral variation in lithofacies exists locally and regionally. Dunagan and Gibson (1993) attribute this variation to some degree to be original patchy sediment characteristics of the sea floor being preserved due to lack of reworking.

The upper Coon Creek lithofacies consists of red siderite concretion beds interbedded with dark gray to red micaceous silty-shale (Russell and Parks, 1975) and was termed the “ferruginous clay member” (limonite/siderite) by Wade (1926). This lithofacies is best exposed in the Selmer region to the south and northward along Bible Hill in Decatur County. The upper lithofacies is generally invertebrate-poor, but locally vertebrate-rich.

At the UTMCSCC, four distinct fossiliferous horizons (Figure 10) can be visually delineated within the Coon Creek type-section lithofacies (Ebersole, 2016; Self-Trail et al., 2024). Surface weathering of each horizon accentuates the visibility of that horizon for the visitor, and serves to focus meaningful discussions of stratigraphy to visitors. Docents point out that modern weathering processes are superimposed upon the original stratigraphy, yet are also influenced by that stratigraphy, so as, to produce a distinct zonation visible on the outcrop surface. The lowermost Horizon A is unweathered, fossiliferous, dark gray, glauconitic, micaceous clayey-sand and sandy-clay of the “classic” Coon Creek. This horizon is generally confined to the exposures near creek level upwards approximately 3-5 meters (10-16 feet). While it appears moist on the surface, digging just a few centimeters results in sediment that is clay-rich and nearly dry, not percolating water readily. This is one of the primary factors that enhances the pristine fossil preservation of the Coon Creek invertebrate fauna as there is little percolating moisture for dissolution, nor has there been throughout most of the burial history.

Overlying Horizon B is a tan, oxidized, mottled clay and clayey-sand that was extensively bioturbated, mostly by echinoids as echinoid traces are abundant. Shelly fossils are leached from this horizon. Stratigraphically upward, Horizon C is a weathered limonitic fourth horizon rich in molds and casts of invertebrates and iron-cemented sandstone. Horizon C appears to represent a highly leached and possibly condensed shell bed. The upper few decimeters of Horizon C are clay-rich and leached of fossil material with the exception

https://www.sgeearth.org 10.62879/c89492955
of rare bivalve and gastropod molds or “ghosts” visible on weathered surfaces. The remaining upper exposure above Horizon D grades into the tan, mottled, ferruginous, and rooted soils horizons that are developed in the Coon Creek Formation sediments and that are devoid of any of their original sedimentary features. These upper soil horizons are usually only visible under the cutbank overhang at the top of the highest exposed sections along the creek (Figures 9 and 10). Nowhere on the property is the contact with the overlying McNairy Sand visible in outcrop.

This stratigraphic zonation, which so clearly shows a weathering (diagenetic) overprint prograding downward into unweathered Coon Creek Formation, is used in geoscience education lessons on weathering processes to illustrate the dynamic nature of weathering in the region. It demonstrates to visitors the complex combination of original

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**Figure 10:** Lithology and fossil content of the type-section of the Coon Creek Formation showing stratigraphic and fossiliferous horizons within the Coon Creek Formation. Photo taken to left (north) from outcrop in Figure 9 (modified from Ebersole, 2016).
stratigraphic characteristics and weathering enhancement, with zones accentuated by differences in shell preservation, grain size characteristics, clay content, and groundwater regime. Often particular zones, especially Horizon B, can be delineated and correlated locally by the seasonal growth of moss and algae on the outcrop surface (Figure 9).

PALEONTOLOGY AT THE COON CREEK SCIENCE CENTER

Brief Overview of Biota Preserved at the CCSC Fossil Site

A detailed discussion of the vast invertebrate fauna of the Coon Creek Formation, even if restricted to the UTMCCSC fossil site, is beyond the scope of this summary. The primary reference, indeed, the acknowledged taxonomic “bible” for the Coon Creek fauna, remains Wade (1926); however, much of that taxonomy is now out-of-date and there have been revisions of faunal elements since that time disseminated in the paleontological literature. The UTMCCSC provides a generalized field identification sheet for the most conspicuous fossil taxa encountered by visitors to the site. The Mess Hall (Figure 11) and Clinton W. Lively Paleontology Lab (Figure 12) contain collections of identified and labeled specimens that are available for visitors to help with taxonomic identifications.

Although mostly recognized for its invertebrates, the Coon Creek biota also contains a significant component of vertebrate remains including the sabre-tooth fish *Enchodus* (Hudson and Gibson, 2024) and a possible squirrelfish (Gibson et al., 2018), sharks, mosasours, plesiosaurs, and turtles (e.g., Wade, 1926; Collins, 1951; Russell, 1967; Whetstone, 1977). Stringer (2001; 2016) provide exhaustive treatments of fish otoliths (ear bones), noting ten fish taxa represented by only by their otoliths. Gilmore (in Wade, 1926) figured several mosasaur bones and fish remains (including otoliths). Since 1990, skeletal remains of at least two additional mosasours have been uncovered at the UTMCCSC fossil site (Evans and Gibson, 2021) along with one gastrolith and a few teeth of a suspected plesiosaur.

Terrestrial and marine plant fragments have been recovered from the Coon Creek fossil site, although plants are better known from other units (e.g., Berry, 1919; 1925; 1928). Most of the macrofossil terrestrial plant input into the Coon Creek marine ecosystem is represented by plant lignite. For a more recent review of the flora associated with the UTMCCSC fossil site and equivalents, see Dilcher (2016).

As noted in the paragraph on micropaleontology, pollen is a common component within Coon Creek sediments.

Trace fossils from the Coon Creek Formation in general and the UTMCCSC fossil site have received little attention but offer potential for deciphering microenvironments and sedimentation parameters within the Coon Creek Formation. Moore (1974) discussed trace fossils within his sedimentology discussion; Dunagan and Gibson (1993) and Dunagan and others (1993) discussed trace fossil...
distribution, primarily produced by echinoids, at the nearby Thompson Farm exposure and were the first to apply ichnofossil analysis to the Coon Creek Formation. In addition to burrow type trace fossils within the Coon Creek sediments, or as inclusions within the sediment, many of the fossil shells have been bored by predatory naticid gastropods (e.g., Kelley and Hansen, 1996; Kelley et al., 2001) and shell repair from predation (Vermeij and Dudley, 1982). Borings made by the sponge Cliona, belonging to the ichnogenus Entobia, were discussed by Griffin and Gibson (1998), Jones and Gibson (2000a; 2000b), and Gibson and Dunagan (2003).

**Diagenesis and Fossil Exposure**

A distinctive feature of the Coon Creek fossil site is the lack of any significant diagenetic overprinting on the sediments or in the preserved fauna within the lower Coon Creek lithofacies. The clay-rich lower horizons of the Coon Creek Formation exposed at the UTMCCSC are well-sealed from percolating groundwater, which protects the fossils from altering until complete exhumation in the modern and associated atmospheric exposure. Calcareous shells (original aragonite and calcite) of fossils are unaltered and most of the aragonitic ammonoid cephalopods still contain their iridescent nacre. The glauconitic, micaceous, clayey-sands and sandy-clays are only lightly indurated by clay coatings on the sand grains and not by any post-burial cementation of quartz or carbonate cements, at least not to any great degree. Limited thin section study has failed to reveal the presence of cement overgrowths on fossils or sand grains. The slight degree to lack of induration makes it possible to easily remove fossils from the matrix with simple tools such as dental picks. Sediment is easily removed from the fossils with a light touch and water and the sediment can even be carved into display stands for the fossils (Figure 13).

The only partially indurated nature of the matrix is one of the factors that makes collecting fossils enjoyable to visitors.
Docents guide visitors on preparation techniques using dental picks, awls, and aspirator bottles of water (Figure 14). The matrix separates from the sediment easily and fossils can be completely extracted for further cleaning, or can be only partially extracted. Partially extracted fossils are encouraged so that a portion of the original sea floor lithology remains with the fossil and becomes part of the lessons for visitors. Removal of the entombing sediment removes part of the scientific context needed for proper interpretation of a fossil and reconstructing the original paleoenvironment of deposition. To illustrate paleoautecology of taxa from the Coon Creek Formation, shells are often partially excavated from their sediments, but oriented in living position relative to their substrate position to allow visitors to better visual animal-sediment relationships in what would have been the living Cretaceous ecosystem of the Coon Creek Formation (Figure 15).

Additionally, the matrix contains abundant microfossils (e.g., fish otoliths, foraminifera, pollen, ostracods, etc.) as well as minerals necessary for a complete picture of the environment (e.g., glauconite, muscovite). The UTMCCSC has several slightly more advanced programs for exploring micropaleontology using the Coon Creek matrix. It is noted that the Coon Creek sediments are highly micaceous, which is one line of evidence that the paleoenvironment of the Coon Creek ecosystem was not too distant from a shoreline and within a protected region as mica does not survive long in a marine setting.

Some features attributed to localized early diagenesis are present, indicating some sluggish fluid migration and active sediment geochemistry, although there have been no studies to date to determine the timing or nature of fluid – sediment interactions. The most prominent of these features are the likely early diagenetic carbonate concretion zones traceable along the creek exposure (Figure 16). Large (up to 4 meters [13 feet] length by 0.9 meters [3 feet] in diameter) concretions occur along as many as four distinct horizons along the creek bed exposure. The calcareous concretions are well indurated, rounded in form, and always have their greatest dimension horizontal. The concretions produce prominent ledges and protective overhangs and localized rapids or waterfalls along the creek bed.
Internally, the concretions are fine-grained, clayey- and silty-limestone, with the clastic component matching the surrounding sediment lithology. The concretions lack internal zonation, but contain an invertebrate fauna of diminutive bivalves, shell hash pods, and especially aragonitic fossils such as the bivalve *Inoceremus* and scaphites, some of which are quite large. At present the origin of these concretions is not understood; however, the concretions are thought to represent early diagenetic processes of carbonate formation at shallow depth within the Cretaceous seafloor. It should be noted that the source of the carbonate forming the concretions is not from dissolution of the enclosing or surrounding macrofauna as these fossils are well-preserved within and around the concretions. Microbial action associated with burial within the sediment is suspected as the nucleating mechanism. The concretions are common in the modern creek bed sediments, making up the largest clast component, and popular with collectors because they are fossiliferous and contain well-preserved aragonitic shell material and steinkerns after being exposed to dissolution in the creek.

Sandwiched between the highly fossiliferous shell-producing lower horizons one and two of the UTMCCSC fossil site exposure and below burrowed Horizon B (Figure 10) and the extensively weathered interval near the top of the section is the red to tan, oxidized, “bioporous” Horizon C. Fossil molds and rare casts are abundant, with many of the now dissolved shells quite large and unbroken. The molds

**Figure 14:** Photo of students in the Fossil Prep Pavilion, the last stop of the Creek Walk Program where much of the docent interpretation of fossils occurs with visitors. (A) An overnight group of college students working with dental tools under supervision of instructors and interns. (B) Typical Public Day group in the Fossil Prep Pavilion with Dr. Gibson (standing) providing interpretation information on this particular find of fossils for the day (Photo Credit: M.A. Gibson).
often touch one another indicating that this horizon was originally a clast-supported sediment prior to dissolution of the fauna. This part of the stratigraphy displays varying degrees of induration owing to its porous nature and its weathering characteristics differ significantly from the underlying “classic Coon Creek.” In some areas it occurs as a slight ledge-former and produces blocks of “fossiliferous ferricrete.” In other areas, this layer is not well indurated, or perhaps became leached more recently, to produce a soft iron-stained clayey-sand with limonitic fossil molds. As noted earlier, this Horizon D is providing some of the ferricrete that comprises so much of the sediment load of Coon Creek. Horizon D is thought to be a shell-bed lag deposit related to the regressive nature of the upper Coon Creek, likely representing a sediment-starved interval. Alternatively, this could be an actual thick winnowed shell-bed from one or more storm events. Further study of this horizon is needed.

Taphonomic and Paleoecological Studies

The biota preserved at the UTMCCSC fossil site is considered a lagerstätten deposit because of its abundance and diverse well-preserved marine invertebrates, but a diverse assemblage of marine vertebrates and rare plant fragments (marine and terrestrial) enhance its status. Taxonomically, the invertebrate component is dominated by marine gastropods and pelecypods; however, cnidarians, echinoderms, annelids, porifera, ectoprocts, and arthropods are also preserved. This cross-kingdom diversity is one of the characteristics that establishes the importance of the Coon Creek biota to understanding the dynamics of Late Cretaceous sea level changes of the southeastern tip of the Cretaceous Interior Seaway and the adjacent early Atlantic.

The Coon Creek Formation is a lagerstätten with characteristics of being both a “concentration lagerstätten” (due to the abundance and diversity of fossils) and a “conservation lagerstätten” (sensu, Seilacher et al., 1985; Gibson and Dunagan, 2003). Not only are original shell mineralogies intact (i.e., konservät lagerstätten; Seilacher et al., 1985), but the biota has not suffered taphonomically from effects of compaction or other structural geology processes. Accordingly, delicate ornamentation, such as the long spines of gastropods, the wing-like apertural flares of shells of Petrocerella, and more weakly calcified forms, such as carapaces of Avitelmessus crabs, are preserved unbroken, articulated, and uncrushed. One specimen of the crab Dakoticancer overanus was described as still retaining color markings (Kesling and Reimann, 1957). The unaltered nature of the fossils provides.
Taxonomic studies have been and will continue to be a dominant focus of research in the Coon Creek biota; however, advances in stable isotope geochemistry techniques, only recently applied to the Coon Creek fauna, are unlocking the Coon Creek fauna potential to as a source of information concerning sea water geochemistry, such as salinity and temperature (e.g., Vrazo et al., 2018; Kovalski et al., 2022; Kovalski, 2024; Self-Trail et al., 2024).

There have been few focused paleoecological studies of the Coon Creek biota as a whole (e.g., paleocommunity studies, paleobiogeography, etc.), beyond generalized regional environmental implications of the marine fauna, thus this remains a promising area of future study. Two studies are notable, however, for their focus on “specimen-level” and “outcrop level” paleoecology, especially animal-sediment relationships. Dunagan and Gibson (1993) studied fossil zonation at the Thompson Farm exposure of the Coon Creek Formation, exposed approximately 5 km (3.1 mi) northwest of the UTMCCSC fossil site. They noted that the Coon Creek fauna is distinctly zoned vertically, contains an abundant ichnofauna, and preserves remnants of the original distributional patchiness of organisms inhabiting the sea floor. Moore (1974) recognized four animal-sediment/substrate relationships that he traced regionally: matrix-supported isolated individuals within the glauconitic sands (with varying degrees of minor reworking), horizontal lenses of shell valves, “pods” of fossil shells (“giblet pods”), and fossil-bearing concretions.

Where they occur, horizontal fossil lenses usually are dominated by one or two species, are more common within the lower glauconitic lithofacies exposed near creek level, and may contain the more exotic elements of the biota (e.g., accumulations of pelagic or vagrant ammonites) or concentrations resembling shell beds or lags. Some of the beds may represent taphonomic accumulations while others appear to be thanatocoenoses. For example, a bed concentrated with ammonite shells occurs approximately 0.2 meters (0.7 feet) above creek level in the same area as most of the post-1988 mosasaur finds. In the same geographic location, just at and below creek level, a bed rich in reworked and concentrated Pterotrigonia (Scabrotrigonia)

Figure 16: West looking photograph of a cutbank along Coon Creek showing snow-covered diagenetic carbonate concretions (white arrows) in creek wall and a ferricrete boulder clast (black arrow) (Photo Credit: M.A. Gibson).
Thoracica bivalves occurs near a bed consisting almost exclusively of Inoceramus shells. In the Pterotrigonia bed, many of the shells are either articulated, although not in inferred living position, suggesting some minor reworking (physical or bioturbation).

Overall, the Coon Creek fauna represents a diverse array of benthic shallow marine habitats with infaunal, epifaunal, sessile, vagrant, pelagic, benthic, and sclerobiotic habits. Most bivalves are infaunal deposit and suspension feeders; however, abundant mobile predatory gastropods and ammonites are also well represented as well as scavenging and predatory decapods. Shallow to deep burrows are often preserved. Often in-living-position deeper burrows are found. This abundance and diversity of ecological types indicates that additional detailed study of biotic interactions preserved within the Coon Creek biota would be fruitful.

HISTORICAL, CULTURAL, AND ARCHAEOLOGICAL RESOURCES

The UTMCCSC has a historical and geoarchaeological record that is becoming part of the research and programing for the site. Native American lithic points produced by are found in both the creek bed itself, which are derived from the fields surrounding the headwaters of Coon Creek to the south, and weathering out of Coon Creek’s floodplain sediments. The latter are interpreted to have points that were lost during hunting by the Indigenous inhabitants, buried, and later exhumed during field plowing by the Weeks’ as they were buried shallowly and within the plow zone of the floodplain. During the rainy 2002 GSA fieldtrip, a particularly important white quartzite point 15 cm (5.9 in) long was located on floodplain two (Figure 17). White quartzite, a metamorphic rock, is not indigenous to West Tennessee, even in transported gravel deposits, so this point was clearly a trade item. It was placed on display in the Mess Hall; however, the point was stolen from the display case during one of the periods that the site was shut down. Most of the points found are Sykes or White Springs culture points, which dates to the Middle Archaic Period, 4-5 Ky (Emma Hughes, personal communication, 2024).

As noted, the UTMCCSC sits on the original Weeks farmstead, which was active in the late 1800s. Geoarchaeological programing has not been fully developed at UTMCCSC yet, but geoarchaeological excavation opportunities for visitors in the future are planned. The Weeks family operated a brick kiln on the site, locating just north of the house along the Weeks Branch drainage using clays derived from the Coon Creek Formation sediments. Little remains of the kiln today; however, brick and other artifacts litter the ground surface. Floodplain three (Figure 3) contains the remains of 13 black, organic-rich, soil mounds that were stockpiled on the western side of the floodplain during the Weeks years of farming, presumably to add organics to the floodplain soils; however, the soils were never applied to the fields. The site origin of the black soils is not known, but the Black Belt Prairie soil province is nearby to the south. Sediment input to the site opens the research avenue of investigating “legacy sediments” both in the creek and on the surrounding floodplains (e.g., Wade et al., 2020).
The UTMCCSC is situated in a region with historical significance. Two Civil War sites are within a short drive of the site and the center has produced programming that includes the topic of military geology. The Battle of Shiloh occurred on April 6-7, 1862, and is only 20 km (12 mi) south of the UTMCCSC within the same outcrop belt. The role that the local geology played in this battle is well-known (e.g., Kemmerly, 2014; 2016). Military geology is a popular topic with visitors to the area and they are keenly interested in the connections between geology and Civil War history.

Closer to the UTMCCSC, only nine kilometers (5.6 miles) to the north, is the small community of Jacks Creek. Jacks Creek supplied recruits to Confederate General Nathan Bedford Forrest’s newly formed 13th Cavalry in September of 1863. On December 23, 1863, a surprise skirmish took place when some of Bedford’s troops encountered part of a Union column moving northwest from Corinth, Mississippi (e.g., Dyer, 1942). Mapping of the region by UTMCCSC geologists indicates that the local geology played a significant role in this skirmish as the skirmish occurred because the Confederate troops were bogged down in a local swampy area that was the result of water standing on a perched water table on the clay-rich sediments of the Coon Creek Formation.

Although not related to geology directly, UTMCCSC visitors are also piqued when they learn that the UTMCCSC is located only 2 kilometers (1.2 miles) to the east of the birthplace of Buford Pusser of the Walking Tall movie fame from the 1970s (for details of these murders, see Morris, 1995; Broughton and Kirby, 2018; Baldwin and Baldwin, 2021 and references cited within). It is known that Pusser visited the Coon Creek fossil site as a youth (Dwana Pusser, personal communication to Michael Gibson, 2005). One potentionally fruitful line of research that relates to local hydrogeology may involve the numerous whisky-still operations that Pusser was famous for uncovering and destroying.

THE UTMCCSC GEOSCIENCE EDUCATION MISSION

The scientific importance of the Coon Creek lagerstätten is well-established and clearly the site is worthy of preservation. What makes the UTMCCSC unique is that it is a type-section and lagerstätten deposit that is available to the public, as well as researchers, for education and personal collection. The UTMCCSC is unique among fossil sites because visitors can freely collect from the lagerstätten deposit and are provided geoscience educational programming tailored to the fossils the visitor actually collect. Each visitor is participating in citizen science and action research during their visit. Docents practice actualistic approaches, including open-ended inquiry-based pedagogy, to geoscience education using all aspects of the Coon Creek Formation, both modern and ancient (e.g., Gibson and Brister, 2002; Hudson and Gibson, 2023).

Geoscience education and programing at the UTMCCSC has evolved since its opening in 1988. At that time, there was a focus on summer programing and nature camps for grade school age children. Programing was akin to traditional summer nature camps with focus outdoor activities related to modern plants and animals, stars, and the playing of games, but was different from most summer camps in that it included significant fossil programing. These camps were organized and run by a live-in camp director, the late Bobby King, and a staff of local, self-trained naturalists (mostly nearby teachers or staff from the Pink Palace Museum in Memphis). Camp participants lived in the cabins on the site for various periods of time with catered meals provided by the staff of the camps. Child development was emphasized in the campus as well. Programing included crafts, skits, and singing. Several Coon Creek Camp songs were written.

By the middle 1990s, the summer camp model was not economically tenable for the Pink Palace to maintain. The decision was made for CCSC programing to shift away from running summer camps to providing short few hour-long to single day-long experiences that concentrated solely on the fossils. Access to the CCSC was by reservation through the Memphis Museum offices only (no drive-up visitation), limited to a couple of hours with a specified fossil program, and all overnight programing ceased to be run by the Pink Palace Museum. At this point, any fossils that were found by the visitor could be confiscated by the staff if they were deemed important. Bobby King left the CCSC and the caretaker’s house was vacated. Two local residents that were self-trained on the Coon Creek fossils, Vicky Goodrum and Pat Broadbent, were employed to serve as program docents and caretakers of the site. Essentially, as the years passed, visitation dropped off dramatically, as did access to the site by amateurs, local residents, and even researchers. The CCSC was winterized from November through March each year with no programing. Only UT Martin faculty had access to the site to run their own research and programing during these months. The rural location of the site resulted in deteriorating roads and interrupted services, which
contributed to the decline of the facilities and resulted in several instances of break-ins and vandalism.

Because the Pink Palace did not have PhD level geoscience-trained staff, faculty from The University of Tennessee at Martin became involved in the paleontology research and geoscience education programing as part of a collaboration that continues today. Funded by external grants, K-12 teachers utilized the UTMCCSC to participate in Tennessee- and National Science Standards-based programing and extended stay camps for Tennessee teachers primarily. From 1989 until the COVID-19 pandemic began, a series of GeoCamps and GeoTrekks, funded by Eisenhower Title II grants and National Science Foundation funding, were run by faculty from UT Martin and UT Knoxville in collaboration with the Tennessee Earth Science Teachers (TEST) and the Tennessee Higher Education Commission (THEC). TEST was the association of Tennessee earth science teachers and higher education faculty that formed to promote Earth science education in Tennessee (e.g., Byerly and Gibson, 1999; Gibson and Brister, 2002). TEST was responsible for authoring, validating, and training teachers on Earth science content of the Tennessee Science Standards (Watson and Gibson, 2006).

UT Martin became the primary authority for access to the site for scientific studies by professional paleontologists and to be present to host overnight university geology class visits. Only university classes were granted overnight privileges under supervision of UT Martin faculty. During this time period, Vicky Goodrum and Pat Broadbent continued to run Pink Palace programing for the Memphis – Shelby County school children and occasional public visitation, but visitation continued to drop off markedly. UT Martin’s role in running programing at the site continued to expand throughout the years from 2000 through 2019. The CCSC continued to be a financial strain on the Pink Palace Museum, especially with declining visitation and limited program topics. With the exception of a few university paleontology class visits, and some small, faithfully recurring, local group visits, the CCSC was essentially mothballed for much of the year, and remained that way for more than a decade. During this time, maintenance lapsed, and the facilities continued to degrade. UT Martin maintained a research cabin (Evergreen Cabin) on the site and continued to maintain the Mess Hall collections for university visits and researchers.

Driven by the severe economic downturn of 2007-2009, in 2009 the geology program at UT Martin underwent a reorganization. The Department of Geology, Geography, and Physics, which had been in the College of Engineering and Natural Sciences, was broken-up and geology was moved into the College of Agriculture and Applied Science to become part of the newly renamed Department of Agriculture, Geosciences, and Natural Resources. At the same time, the Dean of the college, Dr. Jerry Gresham, recognized the agricultural education value of the CCSC and opened negotiations with the Pink Palace Museum to take-over the CCSC property as an agricultural site. For the next decade, numerous proposals were developed between UT Martin, the Pink Palace Museum, Memphis Museums Inc., the local governments of McNairy County and Hardin County, the cities of Selmer and Adamsville, and even several State of Tennessee agencies in attempts to find the most adventitious arrangement that would allow UT Martin to become the primary steward of CCSC, allow the Pink Palace to remain involved, obtain adequate funding to run the site, keep the site open and available to the public, and most importantly, conserve and preserve the fossil resources on the site. Negotiations were complex, fraught with problems, and there were many policy and jurisdictional hurdles to tackle, which led to many false starts and failed proposals.

In 2018, the Pink Palace Museum and its properties underwent a reorganization that paved the way for a breakthrough in negotiations. The director of the Pink Palace Museum was removed by the advisory board and a new director took over the reigns of the museum and its properties, which included the CCSC. Under the new director, the Pink Palace Museum reorganized into the Museum of Science and History (MoSH). Under the new administrative leadership, MoSH immediately agreed on a 40-year-long lease of the CCSC to the geology program within the Department of Agriculture, Geosciences, and Natural Resources at UT Martin and granted UT Martin full stewardship of the site (MoSH retained ownership of the land and facilities).

At the same time, the Kenneth V. Bordeau Paleontology Endowment was established at UT Martin through an inheritance gift from the Bordeau estate. The Bordeau Paleontology Endowment would provide funding for the paleontology-related programing and maintenance of the fossil collections of UT Martin. Kenneth V. Bordeau (1923-2011), a micropaleontologist, had been one of the original “founding fathers,” and the first paleontologist faculty, of the geology program at UT Martin, which was established in 1972 (Gibson, in preparation). UT Martin paleontologist Dr. Michael A. Gibson became the director of the newly renamed
UT Martin Coon Creek Science Center (UTMCCSC), which was placed under the direct supervision of UT Martin’s Selmer Center in nearby Selmer, Tennessee. The director of the Selmer Center, Alan Youngerman, himself with a geologist’s background, became the primary administrator for the UTMCCSC. Year-round access, new programing and expanded hours of operation were developed to support the mission of the UTMCCSC and a student intern program was instituted to provide trained docents for research and programing.

**COVID-19 Pandemic**

The COVID-19 Pandemic postponed the planned 2019 opening of the UTMCCSC, but did not stop work at the site, following pandemic protocols, which was allowed during the pandemic because of the remoteness of the site. Renovations began immediately with grounds equipment supplied by the agriculture program at UT Martin and new maintenance facilities added from funding by the Bordeau Paleontology Endowment.

In 2021, with the lifting of the COVID-19 pandemic shutdown, the UTMCCSC resumed operations, now with the added benefit of a paleontology laboratory that was moved onto the site during the pandemic to replace an old barn that housed a small laboratory and which had been torn down when it became unsafe (Figure 3). In 2024, funding was provided through private donations for programing at the UTMCCSC and the paleontology laboratory was dedicated in memory of that donor as the Clinton W. Lively Paleontology Lab. More facilities continue to be added. As noted earlier, a 4-km-long (2.5 mi) nature trail was also cut, along with installation of weather station facilities, and an astronomy telescope with associated programing for both.

UT Martin geology graduate and paleontologist Josh Ratliff, was hired to become the site caretaker and he and his family live on-site in the Smith house, now called the Caretaker’s House (Figure 3). Ratliff also taught geology courses at the UT Martin Selmer and Parsons centers. The UTMCCSC was officially dedicated as a UT site within the UT System on April 30, 2021, by UT System President Randy Boyd and UT Martin Chancellor Keith Carver. Since opening, the UTMCCSC has expanded programing and paleontology research to include pond ecology, forestry, agriculture, geoarchaeology, and more (Hudson et al., 2023). The site has had over 5,400 visitors since the dedication. The Eta Alpha Chapter of Sigma Gamma Epsilon, along with the GeoClub, has adopted the UTMCCSC as its own and is highly involved in all activities at the site including programing and maintenance. The chapter often conducts its outreach programs and chapter initiations at the site. In 2023, Gibson retired after 35 years of teaching at UT Martin and 27 years as Eta Alpha Chapter advisor. Josh Ratliff became the second director of the UTMCCSC.

**Expanded K-16 Educational Opportunities at the UTMCCSC**

The UTMCCSC is a geoscience education facility and there are many opportunities for students and teachers to participate in ongoing STEM programing and research at the UTMCCSC. Eta Alpha Chapter members of SGE at UT Martin took the initiative to collaborate with STEM educators across Tennessee to spearhead the drive to establish an official state fossil for Tennessee in 1998 (Gibson et al., 1997; Gibson and Martin, 1998; Bacon et al., 1997; White and Gibson, 1997a; 1997b; Martin and Gibson, 1999; Brusatte, 2003). After researching fossil candidates and running a year-long polling drive of K-12 and university educators across Tennessee, the Coon Creek bivalve *Pterotrigonia thoracica* (Figure 15) was identified as the winning candidate and, in 1998, the Tennessee Legislature passed House Joint Resolution 552, sponsored by Senator Roy Herron and Representative Mark Maddox, as the Official State Fossil of Tennessee, making Tennessee the 38th state to designate a state fossil. Recently this species was taxonomically revised and the species assigned to the new genus *Tennessiella* by Cooper (2016).

The Tennessee Earth Science Teachers (TEST) is an organization of teachers from across Tennessee that began in the early 1990s and was instrumental in developing and distributing hands-on, inquiry-based K-16 curricula, including teacher training, across Tennessee (e.g., Byerly and Gibson, 1999; Gibson and Brister, 2002; Gibson, 2018). TEST has been a continuous user of the Coon Creek site and its fossils for decades. Much of the programing uses the state fossil, “Ptero,” as a vehicle for the training STEM educators on use of the National Science Standards and State of Tennessee Science Framework, demonstrating the educational potential of Coon Creek in both formal and informal education settings. Several of the interns at the UTMCCSC are also local STEM teachers and they have run teacher-led training workshops using the Coon Creek fossils as their focus at the annual Tennessee Science Teachers Association (TSTA) meetings.
Public Days and Creek Walk Program

The UTMCCSC is open for visitation by reservations through the UT Martin Selmer Center. Organized group visits can be arranged for most any time, including most weekends, as long as docents can be on hand to provide programs. Each third weekend of the month is designated as Community Days, and the facility is open to anyone (e.g., amateur collectors, families, tourists, etc.) by making a reservation to guarantee a slot for a Creek Walk Program.

There are many programs available for visitors to the UTMCCSC; however, the most popular program, for which all docents are trained to be able to deliver, is the Creek Walk Program, which typically run about three-four hours long and accommodates up to thirty visitors. The program is open-ended, inquiry-based in terms of pedagogy and personalized to the visitors. Upon arrival at the UTMCCSC, visitor meet in the Mess Hall to handle billing and receive an orientation by their docents for the program (Figure 18). This is an opportunity for the docents to get to know the visitors, learn a little about their knowledge background and goals for the day, and provide them an opportunity to peruse the displays of fossils and history lessons in the Mess Hall for later use. A short lecture on the history of the UTMCCSC site is presented by the docents. After gearing-up (all necessary implements are supplied by the UTMCCSC, but visitors may bring their own collecting gear), visitors are guided to the creek entrance. Along the walk, many of the basic geologic features and processes described in this paper are introduced to the visitor.

Figure 18: Photograph of a Community Day group beginning their Creek Walk Program in the Mess Hall where they are provided with historical background to the site and a safety lesson. Informational and fossil identity displays are visible on the wall around the room (Photo Credit: M.A. Gibson).
Once in the creek (Figure 3, Figure 19), there is an orientation to the stratigraphy of the Coon Creek Formation, common fossils, and a demonstration on how to excavate fossils and field-wrap them to protect them from damage. A one to two-hour period is allowed for the visitors to wander within the designated creek area and collect freely. No large-scale digging is allowed, except by the docent. Docents shadow visitors, being sure to mingle and provide help and information as needed. Exactly which fossils will be discovered cannot be predicted, so all discussions are tailored to the precise fossils, and geologic phenomena, being encountered by the visitors (Figure 20). It is necessary for docents to be versant on the ecological details of a wide variety of taxa and geologic concepts.

After visitors have collected their fossils and protected them in the field setting, the visiting group then returns to the Mess Hall area, specifically to the Fossil Preparation Pavilion, to begin the process of exposing and caring for their fossils (e.g., see Figure 14). First, visitors are instructed on the best techniques to remove the sediment matrix and “carve” the sediment for the presentation of a fossil and how to repair delicate or broken specimens (e.g., see Figure 15). Docents interact with each visitor as they work sharing additional insights into the individual fossils that the visitor has collected, but also expounding on discussion items that have arisen during the programing. Lessons on reconstructing life histories of individual species and fossil individuals, along with larger-scale lessons related to global change and conservation are introduced to the visitors while they work on their fossils. Docents then make sure that all fossils are identified and prepared for travel.

The visitors to the program were previously introduced to their role as citizen scientists. In this way, should any of them have discovered fossils that the docents deemed important for further study or conservation, the visitor is offered the opportunity to donate the specimen (always with a trade of another fossil, usually from a Paleozoic formation nearby) and to visit the paleontology laboratory to help catalog and curate their specimen. The visitor can fill-out the specimen card with their name entered as “collector” along with their contact information. Any published results that involve their specimen is sent to the visitor upon publication. The program ends with a question-and-answer period during clean-up and preparation for leaving. Creek Walk Programs can be tailored to specific types of experiences using any
The concepts presented in this paper; however, the fossil program is the most popular. Overnight and day-long visitors, especially organized groups, such as SGE (Figure 21), receive more in-depth coverage with additional topics tailored toward their education and experience level. All programing includes personalized instruction on the fossils that each visitor finds.

**SUMMARY**

The UTMCCSC was built on the site of the type-locality and type-section for the Upper Cretaceous Coon Creek Formation lagerstätten, thus ensuring the site and its fossil riches will be preserved intact and available to the public. The Coon Creek Formation is internationally recognized for its high biodiversity (more than identified 500 species), high abundance (1 m³ [35 ft³] of sediment contains as much as 200 fossil individuals), pristine preservation (many of

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Figure 20: (A) Articulated and in-living-position *Crassatella* bivalve in-place before excavating. Once digging commenced, it was determined that this was one specimen in a cluster of *Crassatella* (B) (Photo Credit: M.A. Gibson).
the invertebrates are unaltered to the point of preserving the original mother-of-pearl luster and color pattern and allowing meaningful geochemical study), lack of compaction of the sediment (resulting in no distortion of the fossils), leading to ease of extraction (the sediment allows fossils to be separated from matrix using only simple hand tools), that demonstrates paleoecological fidelity (many of the species are preserved complete, with delicate ornamentation intact, and in-living-position, suggesting rapid burial with little disturbance later).

Traditionally, the field research conducted on the Coon Creek Formation was limited to the relatively few scholars disseminating the information in scientific journals only available to professionals. Non-professional visitors collected fossils and took them home, their information to be lost to the scientific community until the construction of the Coon Creek Science Center in 1988. Traditional K-12 (and collegiate) students and highly-motivated life-long learners rarely have hands-on access to this kind of resource or are allowed to participate in original STEM field research. Museums – long considered the “university of the masses” – have always been leaders in the realm of life-long learning, by passively (look, don’t touch) using objects (the “real thing”) to interpret and bridge the gap between abstract science and observable, concrete, and relevant concepts. The UTMCCSC was established to bring the experience of first-hand field research to any visitor.

The UTMCCSC fossil site is scientifically valuable and accessible to learners from elementary school age to post-doctoral status. It is one of the few internationally significant fossil sites to invite both the layperson and the scholar to engage in observation, excavation, and study of well-preserved fossils of great antiquity. As put forth by its mission statement, the University of Tennessee at Martin Coon Creek Science Center educates and engages responsible citizens to lead and serve in a diverse world through education, conservation, stewardship, and research. Our mission at the UT Martin Coon Creek Science Center is to: (1) promote conservation and stewardship of the Coon Creek fossil site and its resources through education and research; (2) study and document the paleobiological, geological, ecological, and human history preserved at the Coon Creek Science Center and the surrounding region; (3) stimulate visitor interest and educate the public about ancient life, ecosystems, and the geologic history preserved in West Tennessee; (4) expose visitors to the processes of modern science and scientific methods as practiced at the UT Martin Coon Creek Science Center; and (5) provide opportunities to students and the public to participate in “citizen science.”

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Volume 93, Issue 1, Article 2 (2024) Gibson | Research Article

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News Update

46th biennial convention of Sigma Gamma Epsilon, University of Tennessee at Martin, September 16-18, 2022

Richard L. Ford* and Lee S. Potter^A

The Society of Sigma Gamma Epsilon, P.O. Box 324, Cedar Falls, IA 50613 USA

ABSTRACT

The Society of Sigma Gamma Epsilon (SGE), the national honorary society for the Earth sciences, held its 46th biennial convention (September 16-18, 2022) at satellite facilities of University of Tennessee at Martin (UT Martin) located in Selmer, Tennessee. The convention was hosted by SGE’s Eta Alpha Chapter and the Department of Agriculture, Geoscience, and Natural Resources at UT Martin. Ten (10) of SGE’s approximately 60 active chapters sent delegates to the convention. The traditional convention field trip, an outing to UT Martin’s Coon Creek Science Center, focused on collecting and preparing marine fossils from the Upper Cretaceous Coon Creek Formation. Key accomplishments of the convention include amending the Society’s constitution to reflect changes in membership categories, the adoption of a new mission statement, and broad-ranging discussions related to the revitalization of local chapters following the COVID-19 pandemic. This report provides details about the convention proceedings and provides the various reports presented by national officers, individual chapters, and student committees.

KEYWORDS

Sigma Gamma Epsilon; Biennial convention; University of Tennessee at Martin

INTRODUCTION

The Society of Sigma Gamma Epsilon (SGE), the national honorary society for the Earth sciences, held its 46th biennial convention in the area of Selmer, Tennessee, at facilities of the University of Tennessee at Martin (UT Martin). The convention ran from September 16 through 18, 2022, and was hosted by SGE’s Eta Alpha Chapter and the Department of Agriculture, Geoscience, and Natural Resources at UT Martin. The Eta Alpha Chapter was chartered in 1997 and, under the guidance of Dr. Michael Gibson (Faculty Advisor), has been one of the Society’s most active chapters ever since. This was Eta Alpha’s first time hosting a national convention. Meetings were held at the UT Martin McNairy County Center/Selmer (UTM Selmer Center), a satellite campus of UT Martin. Saturday’s field excursion was held at the Coon Creek Science Center, a field station located in McNairy County that is owned by the Memphis Museum of Science & History but operated by UT Martin on a long-term lease. Many convention attendees flew into the Memphis International Airport and made their way east to Selmer, while other delegations drove directly to the Selmer area. Participants had the choice of staying in cabins or camping at the Coon Creek Science Center or lodging at the Southwood Inn in Selmer.

The Eta Alpha Chapter had originally planned to host SGE’s 45th biennial convention during the spring of 2020, but that event was canceled due to the global pandemic. A one-day virtual convention was held in April 2021 (Walters and Even, 2021), and this 46th convention marked a happy return to SGE’s traditional convention format. Ten (10) of SGE’s approximately 60 active chapters sent delegates and
alternates to this convention (Table 1). A total of 40 students, faculty, and SGE staff registered for the convention.

As a student organization, SGE is governed by its national conventions. Table 2 (Ford, 2012) is a historical listing of SGE’s biennial conventions and includes citations for the convention reports, which are published in the Society’s peer-reviewed journal The Compass. Constitutional amendments passed at convention take effect immediately. Other committee reports approved by the delegates are considered recommendations to the National Council, which may be implemented, if feasible, after further study and deliberation by the National Council.

**SUMMARY OF CONVENTION PROCEEDINGS**

**Friday, September 16, 2022**

Convention registration began at 3:00 pm under the direction of Associate Director Paula Even, and National President Diane Burns called the opening session to order around 4:00 pm. Following introductions, Dr. Burns presented her president's report (Figure 1). President Burns noted the impact that the COVID-19 pandemic had on chapter activities and called on chapters to reengage their members and stay dedicated to their science. She welcomed Janet Vote, the new National Editor of The Compass, who was nominated by the National Council to fill the vacancy created when former editor Dan Curtis stepped down. President Burns also called attention to SGE’s poster session at the upcoming annual meeting of the Geological Society of America in Denver, CO. Sigma Gamma Epsilon is an associated society of GSA. She thanked Dr. Jim Walters and Paula Even, the outgoing National Secretary-Treasurer and Associate Director, respectively, for their dedicated service to SGE. (The reports from all the national officers are presented

**Table 1: 2022 SGE biennial convention delegates and alternates.**

<table>
<thead>
<tr>
<th>Name</th>
<th>Chapter</th>
<th>University</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harley Bailey</td>
<td>Rho</td>
<td>Indiana University</td>
<td>Delegate</td>
</tr>
<tr>
<td>Madisyn Rex</td>
<td>Beta Upsilon</td>
<td>Bowling Green State University</td>
<td>Delegate</td>
</tr>
<tr>
<td>Anthony Kilber</td>
<td>Gamma Chi</td>
<td>Eastern Illinois University</td>
<td>Delegate</td>
</tr>
<tr>
<td>Carolyn (CJ) Kams</td>
<td>Gamma Chi</td>
<td>Eastern Illinois University</td>
<td>Alternate</td>
</tr>
<tr>
<td>Emilia J McGuire</td>
<td>Gamma Chi</td>
<td>Eastern Illinois University</td>
<td>Alternate</td>
</tr>
<tr>
<td>Michael Otzwirk</td>
<td>Gamma Chi</td>
<td>Eastern Illinois University</td>
<td>Alternate</td>
</tr>
<tr>
<td>Lex Watts</td>
<td>Gamma Chi</td>
<td>Eastern Illinois University</td>
<td>Alternate</td>
</tr>
<tr>
<td>Jaxx Smith</td>
<td>Delta Psi</td>
<td>Western Illinois University</td>
<td>Delegate</td>
</tr>
<tr>
<td>Izzy Heathman</td>
<td>Epsilon Omega</td>
<td>University of Texas at San Antonio</td>
<td>Delegate</td>
</tr>
<tr>
<td>Joseph Pelren</td>
<td>Eta Alpha</td>
<td>University of Tennessee at Martin</td>
<td>Delegate</td>
</tr>
<tr>
<td>Taylor Baker</td>
<td>Eta Alpha</td>
<td>University of Tennessee at Martin</td>
<td>Alternate</td>
</tr>
<tr>
<td>Allison Bohanon</td>
<td>Eta Alpha</td>
<td>University of Tennessee at Martin</td>
<td>Alternate</td>
</tr>
<tr>
<td>Natalie Hudson</td>
<td>Eta Alpha</td>
<td>University of Tennessee at Martin</td>
<td>Alternate</td>
</tr>
<tr>
<td>Sarah Nolin</td>
<td>Eta Alpha</td>
<td>University of Tennessee at Martin</td>
<td>Alternate</td>
</tr>
<tr>
<td>Sydney Williams</td>
<td>Eta Alpha</td>
<td>University of Tennessee at Martin</td>
<td>Alternate</td>
</tr>
<tr>
<td>Alec Siurek</td>
<td>Theta Omicron</td>
<td>Indiana University Northwest</td>
<td>Delegate</td>
</tr>
<tr>
<td>Katherine Hartter</td>
<td>Theta Sigma</td>
<td>University of Arkansas at Little Rock</td>
<td>Delegate</td>
</tr>
<tr>
<td>Mariela Saavedra Duran</td>
<td>Theta Sigma</td>
<td>University of Arkansas at Little Rock</td>
<td>Alternate</td>
</tr>
<tr>
<td>Shannon Bione</td>
<td>Theta Sigma</td>
<td>University of Arkansas at Little Rock</td>
<td>Alternate</td>
</tr>
<tr>
<td>Logan Contos</td>
<td>Theta Upsilon</td>
<td>Eastern Connecticut State University</td>
<td>Delegate</td>
</tr>
<tr>
<td>Jacob McCourt</td>
<td>Theta Upsilon</td>
<td>Eastern Connecticut State University</td>
<td>Alternate</td>
</tr>
<tr>
<td>Mimi White</td>
<td>Iota Beta</td>
<td>University of Tennessee at Chattanooga</td>
<td>Delegate</td>
</tr>
<tr>
<td>Caden Powers</td>
<td>Iota Beta</td>
<td>University of Tennessee at Chattanooga</td>
<td>Alternate</td>
</tr>
<tr>
<td>Evan Ritchey</td>
<td>Iota Beta</td>
<td>University of Tennessee at Chattanooga</td>
<td>Alternate</td>
</tr>
</tbody>
</table>

https://www.sgeearth.org  10.62879/c53794820
Table 2: List of SGE biennial conventions, 1915-2022 (Modified after Ford, 2012).

<table>
<thead>
<tr>
<th>#</th>
<th>Location</th>
<th>Dates</th>
<th>Host Chapters</th>
<th>Delegates</th>
<th>Report in The Compass</th>
<th>Field Trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lawrence, KS</td>
<td>October 8, 1915</td>
<td>Alpha</td>
<td>1</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>Kansas City, MO</td>
<td>April, 1918</td>
<td>NA</td>
<td>Unknown</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>Columbia, MO</td>
<td>April 2-3, 1920</td>
<td>Epsilon</td>
<td>Unknown</td>
<td>v. 1(1), 1920</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>Pittsburg, PA</td>
<td>April 7-8, 1922</td>
<td>Beta</td>
<td>11</td>
<td>v. 3(1), 1922, p. 1-8</td>
<td>Auto tour of Pittsburgh</td>
</tr>
<tr>
<td>6</td>
<td>Ann Arbor, MI</td>
<td>April 2-3, 1926</td>
<td>Iota</td>
<td>11</td>
<td>v. 6(4), 1926, p. 71-88</td>
<td>Canceled due to snowstorm</td>
</tr>
<tr>
<td>7</td>
<td>Lincoln, NE</td>
<td>April 6-7, 1928</td>
<td>Delta</td>
<td>14</td>
<td>v. 8(4), 1928, p. 85-109</td>
<td>None</td>
</tr>
<tr>
<td>8</td>
<td>Norman, OK</td>
<td>April 4-5, 1930</td>
<td>Gamma</td>
<td>20</td>
<td>v. 10(4), 1930, p. 97-137</td>
<td>Fossil collecting /Arbuckle Mtns</td>
</tr>
<tr>
<td>9</td>
<td>State College, PA</td>
<td>April 1-2, 1932</td>
<td>Lambda</td>
<td>24</td>
<td>v. 12(4), 1932, p. 155-180</td>
<td>Geology of the State College area</td>
</tr>
<tr>
<td>10</td>
<td>Los Angeles, CA</td>
<td>December 27-28, 1935</td>
<td>Omega &amp; Alpha Gamma</td>
<td>24</td>
<td>v. 16(2), 1936, p. 43-70</td>
<td>Geology of the Los Angeles basin</td>
</tr>
<tr>
<td>11</td>
<td>Austin, TX</td>
<td>December 30-31, 1937</td>
<td>Zeta</td>
<td>26</td>
<td>v. 18(2), 1938, p. 84-111</td>
<td>Oil fields of Austin area</td>
</tr>
<tr>
<td>12</td>
<td>Salt Lake City, UT</td>
<td>March 21-23, 1940</td>
<td>Mu</td>
<td>27</td>
<td>v. 20(4), 1940, p. 235-264</td>
<td>Bingham Canyon copper mine</td>
</tr>
<tr>
<td>13</td>
<td>Columbus, OH</td>
<td>April 9-11, 1942</td>
<td>Sigma</td>
<td>31</td>
<td>v. 22(4), 1942, p. 243-262</td>
<td>Shawnee Pottery Company</td>
</tr>
<tr>
<td>14</td>
<td>St. Louis, MO</td>
<td>October 23-25, 1947</td>
<td>NA</td>
<td>27</td>
<td>v. 25(1), 1947, p. 1-86</td>
<td>Anheuser-Busch brewery</td>
</tr>
<tr>
<td>15</td>
<td>Denver, CO</td>
<td>October 20-22, 1949</td>
<td>NA</td>
<td>32</td>
<td>v. 27(1), 1949, p. 13-102</td>
<td>Canon City pegmatite</td>
</tr>
<tr>
<td>16</td>
<td>Hot Springs, AR</td>
<td>December 6-7, 1951</td>
<td>Alpha Psi</td>
<td>37</td>
<td>v. 29(2), 1952, p. 124-226</td>
<td>Geology of the Hot Springs area</td>
</tr>
<tr>
<td>17</td>
<td>Salt Lake City, UT</td>
<td>October 29-31, 1953</td>
<td>Mu, Alpha Sigma, &amp; Beta Gamma</td>
<td>46</td>
<td>v. 31(2), 1954, p. 97-133</td>
<td>Geology of the Wasatch Mtns</td>
</tr>
<tr>
<td>18</td>
<td>New Orleans, LA</td>
<td>November 3-5, 1955</td>
<td>Beta Eta</td>
<td>42</td>
<td>v. 33(2), 1956, p. 122-156</td>
<td>Oil fields of south Louisiana</td>
</tr>
<tr>
<td>20</td>
<td>Houston, TX</td>
<td>April 7-9, 1960</td>
<td>Beta Iota</td>
<td>48</td>
<td>v. 37(4), 1960, p. 324-328</td>
<td>Hockley salt dome &amp; mine</td>
</tr>
<tr>
<td>21</td>
<td>Albuquerque, NM</td>
<td>April 26-28, 1962</td>
<td>Beta Mu</td>
<td>Unknown</td>
<td>Never published</td>
<td>Unknown</td>
</tr>
<tr>
<td>22</td>
<td>Lawrence, KS</td>
<td>March 30-April 1, 1965</td>
<td>Alpha</td>
<td>26</td>
<td>v. 43(1), 1965, p. 71-72</td>
<td>Geology along Kansas turnpike</td>
</tr>
<tr>
<td>23</td>
<td>Cincinnati, OH</td>
<td>April 11-13, 1968</td>
<td>Alpha Delta &amp; Alpha Theta</td>
<td>19</td>
<td>v. 47(1), 1969, p. 36-49</td>
<td>Fossils of the Cincinnati area</td>
</tr>
<tr>
<td>24</td>
<td>Norman, OK</td>
<td>December 3-5, 1970</td>
<td>Gamma</td>
<td>13</td>
<td>v. 49(1), 1971, p. 4-5</td>
<td>Geology of the Wichita Mtns</td>
</tr>
<tr>
<td>25</td>
<td>Arlington, TX</td>
<td>April 26-28, 1973</td>
<td>Beta Omega</td>
<td>18</td>
<td>v. 51(1), 1973, p. 4-5</td>
<td>Stratigraphy of Fort Worth area</td>
</tr>
<tr>
<td>26</td>
<td>Las Vegas, NV</td>
<td>October 16-18, 1975</td>
<td>Gamma Nu</td>
<td>34</td>
<td>v. 53(3), 1976, p. 107-120</td>
<td>Cedar Breaks N.M. to SLC</td>
</tr>
<tr>
<td>30</td>
<td>Troy, NY</td>
<td>October 7-9, 1984</td>
<td>Delta Theta</td>
<td>30</td>
<td>v. 63(1), 1985, p. 18-23</td>
<td>Geologic record of Iapetus</td>
</tr>
<tr>
<td>31</td>
<td>San Antonio, TX</td>
<td>November 13-15, 1986</td>
<td>Delta Xi</td>
<td>40</td>
<td>v. 64(2), 1987, p. 103-125</td>
<td>Llano uplift of central Texas</td>
</tr>
</tbody>
</table>

Continued...
Table 2 (Continued): List of SGE biennial conventions, 1915-2022 (Modified after Ford, 2012).

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<th>Field Trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>Lawrence, KS</td>
<td>September 20-23, 1990</td>
<td>Alpha</td>
<td>27</td>
<td>v. 69(3), 1992, p. 272-293</td>
<td>Geology along Kansas turnpike</td>
</tr>
<tr>
<td>34</td>
<td>Greenville, NC</td>
<td>October 8-11, 1992</td>
<td>Epsilon Phi</td>
<td>17</td>
<td>v. 70(2), 1993, p. 69-85</td>
<td>Coastal Plain phosphate mines</td>
</tr>
<tr>
<td>35</td>
<td>Pullman, WA</td>
<td>March 31-April 2, 1995</td>
<td>Xi</td>
<td>Unknown</td>
<td>Never published</td>
<td>Channeled Scablands</td>
</tr>
<tr>
<td>38</td>
<td>Cedar City, UT</td>
<td>October 11-13, 2002</td>
<td>Eta Epsilon</td>
<td>16</td>
<td>v. 77(1), 2002, p. 5-22</td>
<td>Zion National Park</td>
</tr>
<tr>
<td>39</td>
<td>Boca Raton, FL</td>
<td>April 15-17, 2005</td>
<td>Eta Theta</td>
<td>14</td>
<td>v. 79(3), 2005, p. 73-88</td>
<td>Coastal geology of Jupiter Island</td>
</tr>
<tr>
<td>40</td>
<td>Cedar Falls, IA</td>
<td>October 19-21, 2007</td>
<td>Gamma Sigma</td>
<td>12</td>
<td>v. 82(1), 2009, p. 1-24</td>
<td>Geology of northeastern Iowa</td>
</tr>
<tr>
<td>42</td>
<td>Charlotte, N.C.</td>
<td>November 3, 2012</td>
<td>NA</td>
<td>18</td>
<td>v. 85(2), 2013, p. 35-60</td>
<td>None/GSA meeting</td>
</tr>
<tr>
<td>43</td>
<td>Lawrence, KS</td>
<td>March 27-29, 2015</td>
<td>Alpha</td>
<td>22</td>
<td>v. 87(2), 2015, Article 3</td>
<td>Geology of northeastern Kansas</td>
</tr>
<tr>
<td>44</td>
<td>Charleston, IL</td>
<td>September 22-24, 2017</td>
<td>Gamma Chi</td>
<td>8</td>
<td>v. 91(2), 2021, Article 1</td>
<td>Geology of Charleston, IL, area</td>
</tr>
<tr>
<td>45</td>
<td>Virtual / Zoom</td>
<td>April 10, 2021</td>
<td>Gamma Chi</td>
<td>13</td>
<td>v. 91(2), 2021, Article 3</td>
<td>None</td>
</tr>
<tr>
<td>46</td>
<td>Selmer, TN</td>
<td>September 16-18, 2022</td>
<td>Eta Alpha</td>
<td>10</td>
<td>This article</td>
<td>Fossils of Coon Creek Science Ctr.</td>
</tr>
</tbody>
</table>
The podium was then turned over to National Secretary-Treasurer Jim Walters (Figure 2). Dr. Walters reported that the number of active members at the end of the 2021-2022 academic year, 718, was down significantly from the pre-pandemic high of approximately 1,000 members. The number of active chapters, also down, stood at 61 at the end of the last academic year. Dr. Walters then summarized the Society’s financial status. During the most recent fiscal year (2020-2021), expenses exceeded income and resulted in a net deficit of $9,245. The largest source of annual income continues to be the interest earned from the Society’s stock portfolio and the largest expense is the part-time salary paid to the Associate Director, SGE’s only paid employee. Lastly, Dr. Walters thanked all the national officers for their dedication to SGE, Dr. Michael Gibson for hosting the convention, and Paula Even for her tireless work in running the Society’s day-to-day operations for the past 13 years.

Next up were the reports of the National Vice Presidents, Dr. Michael Gibson (Southeastern Province) (Figure 3), Dr. Steve Bennett (Central Province) (Figure 4), and Dr. Rick Ford (Western Province) (Figure 5). The vice president for the Northeastern Province, Dr. Alexander Stewart, was unable to attend the convention and his report was read to the delegates by President Diane Burns. A common theme was sounded in each of these four reports, namely the number of active chapters is down and there are no active petitions for new chapters at this time. Some chapters went inactive as a direct result of the COVID-19 pandemic. However, each regional vice president expressed their eagerness to assist inactive chapters in reengaging with their departmental

Figure 1: SGE President Dr. Diane Burns opens the convention (All photos in this manuscript by L.S. Potter).

Figure 2: National Secretary-Treasurer Dr. James Walters reports on the health of The Society.

Figure 3: Dr. Michael Gibson, Southeast Region Vice President, gives his report.
majors and the national organization. In addition, as part of his Southeastern Province report, Dr. Gibson reviewed the efforts of the Eta Alpha chapter to organize and host this convention and his efforts to produce an SGE faculty advisor handbook. Chapter advisors are the cornerstone in SGE’s organization and they play a key role in the long-term viability of individual chapters.

Following the reports of the national officers, the proceedings moved to the chapter reports. These PowerPoint presentations, typically a highlight of SGE conventions, were presented by the delegates and focused on each chapter’s activities since the 45th biennial convention in April 2021. The reports were delivered in chapter order, oldest (Rho Chapter, Indiana University Bloomington, chartered in 1926) to youngest (Iota Beta Chapter, The University of Tennessee at Chattanooga, chartered in 2020) (Figures 6 – 15). Like the officer reports, the chapter reports expressed the common theme of disruptions due to the pandemic. One delegate summarized the situation very succinctly, “COVID kind of screwed things up.” However, on a much more hopeful note, every chapter report documented the culture of service to others that is a hallmark of SGE’s most engaged chapters. The variety of service projects being undertaken is inspiring.
Figure 8: Delegate Anthony Kilber delivers the Gamma Chi Chapter report.

Figure 9: Delegate Jaxx Smith delivers the Delta Psi Chapter report.

Figure 10: Delegate Izzy Heathman delivers the Epsilon Omega Chapter report.

Figure 11: A delegate delivers the Eta Alpha Chapter report.

Figure 12: Delegate Alec Siurek delivers the Theta Omicron Chapter report.

Figure 13: A delegate delivers the Theta Sigma Chapter report.
At approximately 4:45 pm the chapter reports were temporarily suspended in order for two special guests to be introduced to the convention. Alan Youngerman, Director of the UTM Selmer Center (and a former economic geologist), introduced Larry Smith, Mayor of McNairy County, to the delegates. Mayor Smith welcomed all the attendees to Tennessee, McNairy County, and the town of Selmer (Figure 16). He expressed his hope that SGE would have a successful convention and enjoy the field outing to the Coon Creek Science Center. Next, Director Youngerman read a letter from Dr. Keith Carver, Chancellor, University of Tennessee at Martin (Figure 17). Chancellor Carver sent his regrets, that due to illness he would not be able to address the delegates in person. In his letter, Dr. Carver welcomed SGE to the Selmer Center and the Coon Creek Science Center, two important UT Martin campuses. He commented on the importance of honor societies in the career development of students and expressed his excitement for the paleontological resources of the Coon Creek Science Center. At approximately 5:00 pm, President Burns adjourned the proceedings and invited everyone to break for a pizza dinner.
At approximately 6:15 pm President Burns reconvened the session and the chapter reports were completed. This was followed by a first-ever geology t-shirt contest, organized by President Burns and Associate Director Even (Figure 18). The student attendees had been encouraged to wear their most interesting geology-themed t-shirt for the opening session, as an ice-breaker activity and to promote our science. All of the convention participants voted for their favorite design and the winning students, Izzy Heathman (Epsilon Omega Chapter, UTSA) and Amber Newbille (Iota Beta Chapter, UT Chattanooga), each received an Amazon “You Rock” gift card.

At approximately 6:45 pm President Burns reviewed the committee assignments (Table 3). She instructed all the committees to start their deliberations by addressing the question “How do we reinvigorate chapters and recruit new members?” All committees were asked to reconvene at 7:15 to report out on their suggestions. Key points from this open discussion include the importance of chapter visibility on campus, the need for SGE to improve its social media presence, and the desire to find ways to help students pay the initiation fee. The Membership & Scholarship Committee was asked to summarize this discussion as part of their final report. The committees then went back to individual deliberations and worked until approximately 8:30 pm (Figures 19 – 21).

Saturday, September 17, 2022 (Field Trip Day)

Participants returned to the UTM Selmer Center around 8:00 am for a continental breakfast and a research poster session. Three SGE members, Tony Kilber, CJ Karns, and

Figure 18: President Burns congratulates t-shirt contest winners Izzy Heathman (left) and Amber Newbille (right) on their creative expression in support of the Earth sciences.

Figure 19: Members of the Constitution and Bylaws Committee discuss important changes.

Figure 20: Members of the Ritual and Insignia Committee in deliberation.
Table 3: Committee assignments for the 46th SGE biennial convention.

<table>
<thead>
<tr>
<th>Name</th>
<th>Chapter</th>
<th>Position</th>
<th>Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logan Contos</td>
<td>Theta Upsilon</td>
<td>Delegate</td>
<td>Constitution &amp; Bylaws, Chair</td>
</tr>
<tr>
<td>Dr. Rick Ford</td>
<td>Eta Gamma</td>
<td>National Officer</td>
<td>Constitution &amp; Bylaws, Facilitator</td>
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<td>Taylor Baker</td>
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<td>Evan Ritchey</td>
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<td>Braxton Lee Anzalone</td>
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<td>Harley Bailey</td>
<td>Rho</td>
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<td>Ritual &amp; Insignia, Chair</td>
</tr>
<tr>
<td>Dr. James Walters</td>
<td>Gamma Sigma</td>
<td>National Officer</td>
<td>Ritual &amp; Insignia, Facilitator</td>
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<tr>
<td>Emilia J McGuire</td>
<td>Gamma Chi</td>
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<td>Sarah Nolin</td>
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<td>Alec Siurek</td>
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<td>Meredith Shaw</td>
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<td>Mimi White</td>
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<td>Dr. Michael Gibson</td>
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<td>Maggie O’Rear</td>
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<tr>
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<tr>
<td>Dr. Steve Bennett</td>
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<td>Mariela Saavedra Duran</td>
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<td>Caden Powers</td>
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<td>Amber Newbille</td>
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<td>Izzy Heathman</td>
<td>Epsilon Omega</td>
<td>Delegate</td>
<td>Chapter Affairs, Chair</td>
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<td>Dr. Diane Burns</td>
<td>Gamma Chi</td>
<td>National Officer</td>
<td>Chapter Affairs, Facilitator</td>
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<td>Jacob McCourt</td>
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<td>Sera Thomas</td>
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<td>Katherine Hartter</td>
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<td>Paula Even</td>
<td>Gamma Sigma</td>
<td>Staff</td>
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<td>Carolyn (CJ) Kams</td>
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<td>Natalie Hudson</td>
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<tr>
<td>Dr. Ashley Manning-Berg</td>
<td>Iota Beta</td>
<td>Advisor</td>
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Mariela Saavedra Duran, presented their results from recent undergraduate research projects. Following the poster session, the committees met to continue their work until 10:00 am, at which time all participants traveled to the Coon Creek Science Center (2983 Hardin Graveyard Rd., Adamsville, TN). Shortly after arriving at the Coon Creek Science Center participants were treated to a cookout lunch prepared by Alan Youngerman (Director, UTM Selmer Center) and members of the Eta Alpha Chapter and UT Martin Geoclub, along with several science center interns (Figure 22).

Before departure, Dr. Michael Gibson presented an overview of the geology of the Coon Creek site, the type section for the world-famous lagerstätte (a sedimentary deposit that exhibits exceptional fossil preservation) of the marine Coon Creek Formation (Upper Cretaceous) (Figure 23). Details of the geology and paleontology of the site are provided in an associated article by Dr. Gibson (2024) published in this issue of The Compass. Dr. Gibson’s presentation also provided tips on collecting strategies and fossil preparation procedures (Figure 24).

After lunch, a short walk from the mess hall brought the participants to the incised channel of Coon Creek, where the fossil-bearing formation is exposed in the channel’s bed and banks. Staff of the Coon Creek Science Center and members of the Eta Alpha Chapter guided and assisted the convention participants during the field session (Figures 25 – 29). After an afternoon of collecting, the students brought their fossils to a dedicated outdoor preparation area to remove the fine-grained matrix and prepare the fossils for further study and transport home (Figures 30 – 32). Some delegates later moved to the mess hall to continue committee work. A tradition of the Coon Creek Science Center is to display homemade...
Figure 24: Students receive final instructions from Dr. Michael Gibson before beginning the hunt for fossils.

Figure 25: Four participants search for fossils in the creek wall.

Figure 26: A happy searcher at the dig face.

Figure 27: A gastropod find, in matrix.

plaques crafted by educational groups during their stay at the center. An artistic group of delegates made a plaque to commemorate SGE’s 2022 visit to Coon Creek and it is now proudly on display in the mess hall (Figures 33 and 34).

All the convention participants gathered in the mess hall at approximately 4:30 pm to engage in a panel discussion, facilitated by President Burns and members of the Gamma Chi Chapter, on how chapters can work to attain the annual Quality Chapter and Chapter Service awards (Figure 35). The convention banquet followed, catered by Poppy’s Barbeque (a family operation owned by the family of UT Martin geology graduate Jake Snider) and featured authentic Southern barbeque and all the fixings. During dinner, Dr. Roy Van Arsdale (The University of Memphis), an expert on active tectonics and the New Madrid seismic zone, gave a presentation titled “The Mississippi River Through Deep Time” (Figure 36). After a question and answer session with the guest speaker, President Burns addressed the delegates and presented special service awards to Dr. Michael Gibson (Figure 37), for organizing this convention, and the canceled 2020 convention, and leading the day’s field activities, Dr. Jim Walters (Figure 38), for his inspired 13 years of service as National Secretary-Treasurer, and Ms. Paula Even (Figure 39), for her dedicated work as Associate Director (2009-2022). After the dinner program telescopes were set up outside and participants were invited to join astronomer Dr. Lionel Crews (UT Martin) for a star party. This concluded a very full day of convention activities.

**Sunday, September 18, 2022**

Following a continental breakfast at the UTM Selmer Center, President Burns called the convention back in session at approximately 9:00 am. She began the session by reading a report from National Editor Dan Curtis, who was unable...
to attend the convention. Mr. Curtis reported that three (3) issues of The Compass had been published since the last convention in April 2021 (v. 91/issue 1, v. 91/issue 2, and v. 92/issue 1), comprising eight (8) research articles, two (2) convention reports, and one field trip guide. In addition, there were 5,713 full-text document downloads since the last convention in April of 2021. Interest in The Compass is strong, with most users finding articles from the Google search engine, as opposed to databases such as ScienceDirect. (The National Editor’s report is presented with the other national officer reports, following the minutes of the convention.)

During the last session of the convention the various committees presented their reports and the delegates and national officers voted on their recommendations. Each of the ten (10) delegates and four members of the National Council (Walters, Bennett, Ford, and Gibson) in attendance could cast a vote. President Burns, as chair of the convention, would cast a vote only in the event of a tie. (The Committee Reports are presented in their entirety at the end of this report, following the chapter reports.)

The Constitution & Bylaws Committee reported first. The Committee studied and approved a number of changes to the constitution and bylaws, proposed by the National Council, and presented them to the convention; they were passed by a unanimous vote of the delegates and national officers:

- Delegates to the 45th convention had approved a change in the fee structure such that, beginning in August 2021, all new members of SGE would pay a one-time initiation fee for a lifetime membership. This necessitated removing the Life member category from the constitution and updating the membership categories (Article II, new sections 4-8): Regular Membership (members who join as students); Associate Membership (members who join as practicing geoscientists or university faculty); Inactive Members; and Honorary Membership.

- Article XI, section 1, was amended to have the National Editor, as well as the National Secretary-Treasurer,
Figure 30: Preparing fossils from Coon Creek is best done immediately after collection. The fossils are exposed and then consolidated with a special glue mixture.

Figure 31: Preparing fossils.

Figure 32: A student with a diverse collection.

Figure 33: Student-artists planning the SGE contribution to the Coon Creek plank collection.
appointed by the National Council, as opposed to be elected during a convention. The amendment also permits non-faculty, but otherwise qualified individuals, to serve in these positions. The rationale behind these changes is that these two national officers require special skill sets that the National Council, as opposed to the student delegates, are in a much better position to evaluate.

- A new section 6 was added to Article V, requiring SGE chapters to be an officially recognized student organization on their campus.

- In order to broaden input related to proposed changes to the constitution and/or SGE policies, Article X, section 2, was amended to require a convention agenda be set by the National Council and communicated to all active chapters during the academic semester prior to the date of the national convention.

The Constitution and Bylaws Committee also recommended that the National Council consider a future change to Article II, section 11, regarding the dissolution of SGE and the distribution of its assets. The National Council agreed to study this issue.

The Ritual & Insignia Committee had been charged to consider the nomination of Dr. Larry Davis, former National Editor, for honorary membership in the Society, plan the creation of a handbook for chapter officers, and determine if a chapter was ready to extend an invitation to host SGE’s next convention. Honorary membership in SGE may be granted to an individual who has demonstrated high scientific attainment in the field of the Earth sciences and who has contributed to the goals of the Society. The committee was provided a nomination letter written by Dr. Jim Walters, on behalf of the National Council, that outlines the important contributions made by Dr. Larry Davis, former National Editor of *The Compass*. Dr. Davis spearheaded the effort to shift *The Compass* from a traditional print journal to an online, open-access digital journal. The nomination letter is included with the Committee’s full report. Acting as an Awards Committee, the Ritual and Insignia Committee recommended that the full convention approve the nomination of Dr. Davis, which it did by a unanimous vote of the delegates and national officers.

The Ritual and Insignia Committee charged the National Council with creating an officer’s handbook prior to the Society’s next convention. None of the chapters represented at the convention were able to provide a firm commitment to host SGE’s next convention, and this remains an important piece of unfinished business that will be addressed later by the National Council. However, the Committee’s report indicates that the Rho Chapter (Indiana University Bloomington) had expressed an interest in hosting the next convention, subject to departmental approval and administrative support. SGE’s
The 41st biennial convention (2010) was hosted by the Rho Chapter (Table 2).

The Membership & Scholarship Committee was charged with compiling a list of ideas that could help with the recruitment of new members. The committee captured the key ideas from Friday evening’s open discussion in their report and added additional thoughts from their deliberations. A key recommendation is having chapters actively work to increase their visibility on campus and to have departmental faculty actively engaged in identifying students who are eligible for membership in SGE. The committee also approved a new mission statement for the Society that was drafted by President Burns. When presented to the whole convention, a few changes were made and then the version presented below was unanimously approved by the delegates and national officers.

Sigma Gamma Epsilon is a national honor society that supports and encourages academic excellence, professionalism, and scholarship in the Earth Sciences. With guidance from the National Officers, student members shape and maintain the constitutional objectives of this honor society. The Society is committed to diversity and inclusion and promotes collaboration between and among faculty, students, and professionals in colleges and universities.

The Communications Committee was charged with reviewing the Society’s webpage and making recommendations as to how it could be improved, evaluating the Society’s use of social media and making recommendations as to how this could be improved, and making suggestions on how The Compass could be used to highlight the student research presented in SGE’s poster session at the annual meeting of the Geological Society of America. A key recommendation of the Committee is for the Society’s webpage to be formatted in such a way to facilitate ease of viewing on smart phones. After a lively discussion on the convention floor about the Society’s use of social media, a special Social Media Study Group was formed with student delegates and alternates volunteering to serve. Two of the chapter advisors in attendance volunteered to work with the student group. This group was charged with meeting virtually to discuss the wide variety of social media platforms now in use and to report back to the National Council later in the academic year with specific recommendations. [Despite repeated attempts by the faculty advisors during fall semester 2022 to pull the group together for a virtual meeting, the students never responded and the study group never met.] The Communications Committee suggested that if a themed issue of the The Compass was to be focused on the research presented by members at SGE’s poster session, it could also include information about past recipients of SGE’s research awards (Austin A. Sartin and Charles J. Mankin Outstanding Research Awards) and personal reflections on how undergraduate research and membership in SGE benefited them in their professional career.

Figure 35: A thoughtful after-dinner brainstorming session for chapter project ideas.

Figure 36: Dr. Roy Van Arsdale (The University of Memphis), an expert on active tectonics and the New Madrid seismic zone, gives a presentation titled “The Mississippi River through deep time.”
The Chapter Affairs Committee was charged with reviewing the criteria for the Quality Chapter Award, Chapter Service Award, and W.A. Tarr Award (given by active chapters to outstanding geoscience graduates). The committee charges specifically asked if the Quality Chapter Award might be named in honor of an individual, like the Society’s W.A. Tarr Award. Associate Director Paula Even had submitted a letter to the committee recommending that the Quality Chapter Award be named in honor of National Secretary-Treasurer Jim Walters, in recognition of his diverse and sustained service to the Society. The Committee supported the recommendation and the letter (included with the committee report) was read on the convention floor. This recommendation was approved by a unanimous vote of the convention delegates and national officers. The National Council agreed to update the webpage and related documents to reflect the James C. Walters Quality Chapter Award.

In its oral presentation to the whole convention, the Chapter Affairs Committee recommended that the various deadlines associated with the Quality Chapter Award and Chapter Award be adjusted so that the awards would be received by chapters prior to end-of-semester awards ceremonies in the spring. The committee also recommended that the Quality Chapter requirement of a fall and spring initiation ceremony (which they noted is particularly difficult for small chapters to accomplish) be changed to two initiations (fall and spring) and a scholarly act OR one initiation (fall or spring) and two scholarly acts. The Committee’s report states that scholarly acts include such things as poster presentations, professional development series, and internships. Following the convention, the National Council concluded that the recommendations related to award deadlines and the addition of the scholarly act requirement for the Quality Chapter Award needed further study. Thus, the Council agreed to adhere to the pre-convention award criteria and deadlines for the 2022-2023.
The Nominations Committee presented a slate of candidates for National President and the regional vice presidents. After a reminder from the convention floor, a candidate for National Editor was added to the ballot.

- National President – Dr. Steve Bennett
- National Editor – Janet Vote (incumbent)
- National Vice President (Northeastern Province) – Dr. Alexander Stewart (incumbent)
- National Vice President (Southeastern Province) – Dr. Michael Gibson (incumbent)
- National Vice President (Central Province) – Dr. Diane Burns
- National Vice President (Western Province) – no candidate was identified

This slate was approved by unanimous vote of the convention delegates and national officers. These national officers will serve until the next biennial convention, tentatively scheduled for spring 2025. Dr. Burns will also serve as Past President during the next biennium.

The Council members listed above will be joined by Dr. Rick Ford (Past President and former Western Province Vice President), serving as National Secretary-Treasurer. He was selected by the National Council in January 2022 to succeed Dr. Jim Walters upon his retirement from that position at the end of the 46th biennial convention. Dr. Ford will also serve as acting vice president for the Western Province until the National Council can fill that vacancy. With the constitutional change approved at this convention, future National Editors will also be appointed by the National Council.

After the committee reports, President Diane Burns thanked all the delegates and alternates for their participation in the weekend’s activities and for their important committee work. Dr. Ford conducted a raffle with three ΣΓΕ hats as the prizes, and the National Officers recommended that complimentary associate memberships in the Eta Alpha Chapter be extended to Alan Youngerman (Director, UTM Selmer Center) and Josh Ratliff (on-site manager of the Coon Creek Science Center) in recognition of their significant contributions to the weekend’s success. President Diane Burns gaveled the 46th Biennial Convention of The Society of Sigma Gamma Epsilon closed at 10:20 am.

End of convention minutes.

**NATIONAL OFFICER REPORTS**

**National President’s Report**

Greetings to all – what a long, strange trip it has been. This will be my last SGE Convention as your president, as I have served the maximum number of consecutive terms. I pause for just a brief a moment for some personal reflections… while we have seen unprecedented upheavals in society in general through the last few years that have exponentially increased the difficulties faced in keeping our honor society afloat, we have persevered. Despite COVID-19, our chapters and members still actively engaged in scholarship, research and service. Despite the Great Resignation, our members and chapters still are heavily invested in our science. Despite all, Sigma Gamma Epsilon still stands as a community of investigation, inquiry and integrity. We stand proud – of our accomplishments, our unwavering dedication to science and to all of our members. It has been my honor to have served this Society in this role.

Since the last convention, which was digital due to pandemic issues, there have been some significant changes
that will be of interest to the Society. We welcome Janet Vote, University of TX, San Antonio, as our new Editor-in-Chief. She has taken on this role from Dan Curtis, who was acting Editor since 2020. Janet brings a lot of energy, enthusiasm and fresh ideas to our Society, and I look forward to her oversight of our journal for the foreseeable future. Please consider talking to her about featuring YOUR research in The Compass – it’s one of the best, first places for a geology student to have a publication! The first edition under her leadership will be published after this meeting so that we can include all of the Convention’s proceedings and reports in it. Along with showcasing your research projects, there is also a series called “On the Outcrop” that highlights important localities of geologic interest. Please consider contributing articles for that as well!

The Sigma Gamma Epsilon technical session at the Geological Society of America’s annual meeting continues to inspire and to draw many talented student researchers to report on their investigations. We held these sessions despite constraints from the pandemic, although we did not have as robust of a representation as we would have liked. The students who participated, however, demonstrated their academic prowess as well as honed research skills. The national officers had the pleasure of reviewing all of these excellent projects and were pleased to bestow the Austin A. Sartin and the Charles J. Mankin Best Poster awards at each meeting to two deserving students. This poster session continues to be a highlight and a pleasure for all of the national officers, and we look forward to having even more outstanding research projects to review in the coming years.

With this convention, we say “Thank you for your great contributions!” to Dr. James Walters, outgoing National Secretary-Treasurer, and to Paula Even, Associate Director. Both of these individuals have been tireless workers in their roles of keeping our society running smoothly. They will be sorely missed. Thankfully, Dr. Rick Ford will be taking over the role of National Secretary-Treasurer. Rick is well-versed in all things Sigma Gamma Epsilon, having been a regional Vice President for many years as well as actively engaged in all aspects of our society. I am sure we are in great hands. Lee Potter, who is affiliated with the University of Northern Iowa, is assuming the role of Associate Director.

Dr. Michael Gibson, VP of the Southeast Section of SGE, has generously volunteered and spent much time on developing a most exciting convention for us this year. With a promise of both fossil hunting as well as star-gazing, this event was quite a treat! I hope all enjoyed a safe and productive convention.

Dr. Diane Burns
National President (2017-2022)

National Secretary-Treasurer’s Report

The last in-person Sigma Gamma Epsilon Biennial Convention was held in the fall of 2017 at Eastern Illinois University. Following that meeting, and due to the COVID-19 pandemic, the next SGE Convention took place in April 2021 as a virtual meeting using the Zoom platform. Since that last convention, membership has declined from approximately 1,000 members to currently about 718 active members. This decline is attributable to various constraints placed upon Chapters and less overall activity because of the pandemic. There have been no new Chapters installed and there are currently 61 active Chapters. Since that last Convention, only five Chapters have reactivated, but nine have gone inactive. This trend is disturbing, and it is imperative for the health of the Society that we seek to reverse this trend. Hopefully, with COVID-19 restrictions easing and academic institutions resuming more-or-less normal activities, we will see our numbers increase.

Related to this, of course, is a reduction in our income, since initiation fees and dues paid by members and sale of SGE pins, honor cords, and stoles have also declined. Fortunately, our stock portfolio continues to remain relatively strong and allows us a cushion of financial security. As you know, we recently changed our initiation fee and annual dues structure and have instituted a one-time initiation fee with no annual dues. This was approved by the delegates at the 2021 Biennial Convention and it is hoped that it will prove to be a positive change. Major expenses continue to be funding the Biennial Conventions, the annual W.A. Tarr Awards, Quality Chapter Awards, and Chapter Service Awards, the SGE best poster awards at the Geological Society of America annual meetings, expenses associated with the SGE booth at GSA annual meetings, expenses associated with site visits to schools petitioning for the establishment of SGE chapters, and our Associate Director’s part-time salary.

The following is a summary of our expenses and income since the 45th Biennial Convention in 2021. I also provide information on number of awards presented during that period of time, since this is also some indication of degree of activity of the Society.
2020-2021 Fiscal Year: Income and Expenses

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<td>Net Income (deficit)</td>
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2021-2022 Academic Year: Awards Presented

- **W. A. Tarr Awards (Outstanding Geoscience Graduates)**: 21
- **Chapter Service Awards (Gamma Sigma, Gamma Chi, and Eta Gamma chapters)**: 3
- **Quality Chapter Awards (Gamma Sigma and Gamma Chi chapters)**: 2
- **Austin A. Sartin Award (outstanding poster presented at GSA/Portland, October 2021)**: 1
  - *Lauren Gossett, Iota Beta Chapter*
- **Charles J. Mankin Award (outstanding poster presented at GSA/Portland, October 2021)**: 1
  - *Anuva Anannya, Eta Xi Chapter*

Southeastern Province Vice President's Report

There remain eleven states that make up the southeastern province of Sigma Gamma Epsilon and the section has a total of 51 chapters. As previously reported in 2021, the last school visit and new chapter to be completed prior to or since the onset of the pandemic was the University of Tennessee at Chattanooga Iota Beta Chapter in late February of 2020. I am proud to report that the Iota Beta Chapter is making a large showing at this meeting – kudos!

As previously reported in my last report, the Eta Alpha Chapter at the University of Tennessee at Martin was to host the 2019-2020 Convention and had developed a field trip opportunity to the internationally famous Coon Creek Science Center lagerstätte fossil site. The COVID-19 pandemic resulted in this field trip convention being rescheduled and the change to a “Zoom” conference hosted by Eastern Illinois University. We persevered and rescheduled (again) for UT Martin to host a field setting for 2022 and here we are! The SGE members and faculty at UT Martin are excited to have you visit our fossil site, collect some fossils from the Coon Creek Science Center deposit, and we hope the experience leads to the develop of collaborations with nearby chapters to expand geosciences to our collegiate and pre-collegiate communities! Welcome to Tennessee!

Sadly, there has been little growth regarding new chapters over the past two years in the section; however, I have received inquiries from schools in Florida (follow-ups went ignored) and University of Memphis. As of this writing, I anticipate a chapter request from the University of Memphis folks in the coming weeks. My hope is that we are post-pandemic enough for program expansion at universities in the southeast.

Also, many southeastern chapters have become inactive for a variety of reasons, not just COVID-19. There are many changes in society and interactions among students. Students have many things competing for their attention and students carry many burdens these days. Along these lines, I have been asked to spearhead the writing of an “SGE Advisors Handbook”, which my first draft is nearly complete at this writing and will go to the national officers for review and editing this academic year. One component of that handbook will be a prospective letter to those chapters that have become inactive with encouragement and advice on how to re-activate. I encourage all chapters to reach-out to their neighboring chapters to network and revitalize. There is strength in numbers and strength in alliances. Additionally,
take full advantage of the opportunities SGE offers chapters and members to socially and professionally network, share research, publish their research, and develop the skills necessary to function as a professional in the geosciences. I have been an SGE member since 1981 and have found the camaraderie, collegiality, and professional rewards one of the highlights of my career.

Dr. Michael A. Gibson  
National Vice President (Southeastern Province)

Central Province Vice President’s Report

The central region includes 32 chapters in ten states, Illinois (7), Iowa (4), Kansas (4), Minnesota (2), Missouri (5), Nebraska (2), Michigan (1), North (1) and South Dakota (1) and Wisconsin (5). Eight of the chapters are currently active but very recently the national office was contacted about the process of re-activating one of these chapters in Illinois. No new chapters have been installed in the Central Province since the last national convention in 2021.

Of the eight active chapters, Illinois contains the most chapters (3) and Iowa, Kansas, Missouri, South Dakota, and Wisconsin each contain one active chapter. Although the number of active chapters is small, there are some very active chapters in this region as evidenced by the fact that both 2022 Quality Chapter Awards were earned by chapters in this province (Gamma Sigma, University of Northern Iowa; Gamma Chi, Eastern Illinois University).

I will continue to serve as a resource for those inactive chapters that need guidance during the process of reactivation.

Dr. Steve Bennett  
National Vice President (Central Province)

Western Province Vice President’s Report

The Western Province of Sigma Gamma Epsilon (SGE) comprises 13 states, plus that portion of Texas west of the 103° W meridian. Three states, Alaska, Hawaii, and Wyoming, have never hosted a chapter of SGE. During SGE’s history, a total of 36 chapters have been installed within the province. However, only a small number of those chapters have been active at any given time, even before the COVID-19 pandemic. As of August 2022, coming out of the pandemic, only eight (8) Western Province chapters are considered to be active: Omega (USC); Alpha Gamma (UCLA); Alpha Lambda (UTEP); Zeta Nu (Colorado Mesa); Eta Gamma (Weber State); Eta Upsilon (Pacific); Theta Eta (Puget Sound); and Theta Psi (Westminster College). There has been some indication that the Xi Chapter (Washington State) may be trying to reactivate. At present, there are no petitions for new chapters. It is my hope that during the upcoming GSA meeting I will be able to connect with students interested in reactivating an existing chapter or establishing a new chapter.

I was elected National Vice President for the Western Province in April 2021, during our last convention, which was a one-day, “Zoom” event hosted by the Gamma Chi Chapter (Eastern Illinois). I took over from Dr. Richard (Rip) Langford, the long-serving advisor to the Alpha Lambda Chapter (University of Texas at El Paso). Under his guidance, the Alpha Lambda Chapter has consistently been counted among SGE’s active chapters and has been a regular participant in SGE’s poster session at the annual meeting of the Geological Society of America. I would like to take this opportunity to thank Dr. Langford for his many, many years of service to the student members of Sigma Gamma Epsilon through his work as a chapter advisor and regional vice president.

On behalf of the Western Province members and faculty advisors, I would like to congratulate the Eta Gamma Chapter (Weber State University) and its advisor, Dr. Ryan Frazier, for earning Chapter Service awards in 2021 and 2022 and a Quality Chapter Award in 2021. Annually, only a few chapters across the whole society are recognized with these awards and Eta Gamma is consistently counted among the Society’s most active chapters.

I will be stepping down as Western Province Vice President following this convention and taking on a new role as your National Secretary-Treasurer. You will learn more details during the course of this convention. I look forward to working with the new Western Province Vice President, and the rest of the National Council, to advance the mission and goals of our society. Clearly, coming out of the pandemic, we have much work to do to help geoscience students across the country to re-establish local chapters (or to establish new chapters), so that they can enjoy the benefits of working and socializing together as they train to become the next generation of geoscientists. This will be a priority of mine as your National Secretary-Treasurer.

Lastly, a big “thank you” to Dr. Diane Burns (National President), Paula Even (Associate Director), and all the members of the Eta Alpha chapter (UT Martin) -- and their amazing faculty advisor, Dr. Michael Gibson -- for organizing and hosting our 46th biennial convention. This is my ninth
national convention, and I am a past president of SGE (2005-2010), so I understand and appreciate the time and effort necessary to organize such an event. I’m confident that we will have a very productive and enjoyable weekend together.

Dr. Richard L. (Rick) Ford
National Vice President (Western Province)

Northeastern Province Vice President’s Report

The Northeastern Province of Sigma Gamma Epsilon (SGE) comprises 16 states from Kentucky, Ohio and Michigan in the west, through Virginia to the Chesapeake Bay and north to Maine. The region is the largest SGE Province with 90 chapters having been chartered since SGE’s founding in 1915, with Beta chapter (University of Pittsburgh) being the 2nd oldest (the only other chapter chartered in 1915 along with Alpha at the University of Kansas). As of August of 2022, 29 chapters are active:

- Rho (Indiana University)
- Chi (University of Kentucky)
- Alpha Mu (Virginia Tech)
- Beta Upsilon (Bowling Green State University)
- Gamma Zeta (Kent State University)
- Gamma Kappa (Albion College)
- Gamma Lambda (Indiana State University)
- Delta Alpha (College of William & Mary)
- Delta Epsilon (Wright State University)
- Delta Omicron (Hope College)
- Delta Tau (Slippery Rock University of Pennsylvania)
- Epsilon Beta (Ohio University)
- Epsilon Nu (University of Massachusetts, Lowell)
- Epsilon Omicron (George Mason University)
- Zeta Beta (West Chester University)
- Zeta Phi (University of Rochester)
- Eta Kappa (University of Vermont, Trinity)
- Eta Mu (Juniata College)
- Eta Lambda (Susquehanna University)
- Eta Nu (James Madison University)
- Eta Xi (St. Lawrence University)
- Eta Tau (University of Dayton)
- Theta Alpha (Adrian College)
- Theta Beta (SUNY, New Paltz)
- Theta Xi (Allegheny College)
- Theta Omicron (Indiana University Northwest)
- Theta Rho (Temple University)
- Theta Upsilon (Eastern Connecticut State University)
- Iota Alpha (Marietta College).

The Province lost two chapters due to the closing of supporting programs and, as a direct result of COVID-19, three chapters went inactive in 2021 and five chapters went inactive in 2020. Post COVID-19 saw the return to classes, which prompted two chapters to reactivate in 2022.

Our Province has done very well at the Geological Society of America annual meetings since 2019, receiving four (of six) poster awards (i.e., National Council, Austin A. Sartin and the Charles J. Mankin) for excellence in student research.

I was elected National Vice President for the Northeastern Province in April 2021, during our last convention hosted by the Gamma Chi Chapter (Eastern Illinois University). I am the chapter advisor for Eta Xi at St. Lawrence University. Since my election, I have worked with the National Council to see our way through the impacts of COVID-19 and continue to reach out to chapter advisors to get our Province numbers in the upward direction. I am eager to continue to support Sigma Gamma Epsilon in the years to come.

Dr. Alexander K. Stewart, US Army (retired)
National Vice President (Northeastern Province)

National Editor’s Report

Since the last convention in 2021, there have been 3 issues comprising 8 new articles, 2 convention reports, and 1 field trip guide published in The Compass. There have been 5,713 total full-text document downloads since the last convention in April of 2021. Yearly totals for the previous five years are as follows: 2021: 3,899 downloads; 2020: 3,848 downloads; 2019: 3,380 downloads; 2018: 3,322 downloads; and in 2017: 3,133 downloads. The slight increase in publications has resulted in more downloads; with continuous submissions we can hopefully continue this upward trend. The top five downloaded documents between April 2021 and current (September 2022) are, in descending order, “Is Geology a Real Science?” by Larry Davis (editorial published in 2012), “Dinosaur Tracks and Trackways in the Escalante Member of the Entrada Formation” (Middle Jurassic), “Twentymile Wash, Grand Staircase-Escalante National Monument, Utah” by Robert Eves, et al. (research paper published in 2012), “Concentration of Metals Associated with the Native Copper Deposits of Northern Michigan” by Daniel R. Blakemore, et al. (research paper published in 2016), “Tools of the Geology Trade and Their Origin” by Dan Merriam and Walter Youngquist (editorial published in 2012), and “Mary Anning: Princess of Paleontology and Geological Lioness” by Larry Davis (editorial published in 2012).
Educational institutions made up 56% of downloads in this period (at 287 separate institutions), with commercial (33%) and government (5%) entities making up most of the remainder. Our primary referrer (the source that linked a viewer to The Compass website) has remained Google, with other search engines comprising the remaining highest spots. This would indicate our journal is found primarily through standard internet search engines rather than composite educational journal platforms like ScienceDirect or Elsevier.

Dan Curtis  
National Editor  
The Compass: Earth Science Journal of Sigma Gamma Epsilon

CHAPTER REPORTS

Rho Chapter (Indiana University Bloomington)

The Rho Chapter of Sigma Gamma Epsilon has recently been getting back into the swing of in-person events following a lull during the COVID-19 Pandemic. We inducted 16 new members and 1 returning member in Spring 2022. The main activities organized by our chapter were the 2022 Crossroads Conference, monthly joint meetings with our department GeoClub, and semesterly meetings with the IU chapter of the American Meteorological Society (AMS).

The Crossroads Conference is an annual research conference organized by the members of the Rho chapter of Sigma Gamma Epsilon. It is a rich tradition for the Department of Earth and Atmospheric Sciences (EAS) at Indiana University. The conference is composed of student oral and poster presentations, a career fair, and a keynote speech by a geoscience professional. The 2022 conference keynote speaker was Greg Byer, Technical Expert in Geophysical Services at Arcadis North America. There were representatives from Arcadis, Terracon, and the Indiana Geological and Water Survey present at the career fair, as well as Resume Review by Dr. Sarah Pietraszek-Mattner of The Science Profession. There were fifteen poster presentations and ten oral presentations from undergraduate, Masters, and PhD students. Congratulations to Rho chapter member, Anne Kort, who served as the 2022 Conference Convenor!

There were three monthly meetings held in the spring semester. One highlight was our February meeting where we had a question-and-answer session between graduate students and undergraduate students. This seemed to be very popular with all students and most stayed much later past the meeting end time to continue discussing advice for undergraduate coursework, graduate school selection, future careers, and much more. We plan to have another meeting like this one in the fall semester with a focus on the graduate school application process. There was one joint semesterly meeting with SGE, GeoClub, and AMS in April. We used this meeting as a time to connect students from different disciplines within our department and to celebrate the end of the school year. This semesterly meeting was successful and we plan to do it again this semester.

This fall semester is exciting for us. Our monthly meeting activities will include research lab tours (led by graduate students for undergraduates and graduates), preparation for ScienceFest (our largest department outreach event of the year), an in-depth resume and CV workshop for students, and another grad/undergrad Q&A.

Elizabeth Sherrill  
Rho Chapter President

Beta Upsilon Chapter (Bowling Green State University)

The Beta Upsilon chapter of SGE at BGSU contains 9 members, yet remains a strong presence in the School of Earth, Environment, and Society. Due to concerns regarding COVID-19 on campus, the chapter had limited ability to hold large scale events, but still met regularly to induct new appointees, discuss fundraising and opportunities for the future, and host the end of year banquet for the geology majors and faculty. While in the past two years, activities on and off campus have been restricted, the Beta Upsilon Chapter looks positively to the future for increasing the sense of community and scholarship in the Geology department and on campus as a whole.

To foster the sense of community in the Geology department, we plan to hold events like St. Barbara’s Day in December, to bring together faculty and students for a night of food, festivities, and fun. During pre-final exam week, faculty and students bring in dishes and leave them in the main office for “Goodie Day,” a day to boost moral for exam week with food and community. In addition, the chapter plans to use student talents, such as crocheting, sewing, painting, and gem tree making to raise money for monthly pizza dinners and other social events for students and faculty alike. The chapter also plans to close out the year with a food drive for the Falcon Food Pantry, a food pantry on campus that provides accessible and nutrition food options...
To foster the sense of scholarship in the Geology department, SGE members are encouraged to maintain high scores, but most importantly, are encouraged to pursue undergraduate research in their respective interests. Over seventyfive percent of the chapter is involved or has been involved with individual undergraduate research, with one student even having been awarded over $6,000 in competitive grants for this purpose. Students study topics related to ancient environments, dinosaurs, diatoms, Pb in soils, lake dredge, and much more. Overall, everyone is excited to bring back the camaraderie and scholarship in the chapter, and department as a whole. We hope to foster goodwill within the university and bring our passion for geology and geoscience to others in a way that demonstrates our potential for leadership, stewardship, and service.

Madisyn Rex  
Beta Upsilon Chapter President & Convention Delegate

Gamma Chi Chapter (Eastern Illinois University)

The Gamma Chi chapter at EIU has – despite the challenges of the recent past – maintained our core devotion to service and scholarship. In the short year and a half since the last Convention, the Gamma Chi chapter has already logged over 135 service hours and still counting. Our members engaged in internships at the Eagle Mining Company and Argonne National Laboratories and several will be presenting research at national conventions as well as submitting their work for publication. Our chapter averaged adding one member each semester since the last convention, and two more are due to be initiated this year. Currently, we stand with 7 members led by President Emma McGuire, Vice President Michael Otzwirk, Secretary John Marron and Treasurer Tony Kilber.

In the year and a half since the last biennial convention, the participating members have been able to continue with service hours despite limitations from the pandemic. Gamma Chi members kept our 2-mile stretch of State Highway 16 cleaned and maintained through the Adopt-A-Highway Program. We get great exposure through this endeavor, both by the signage provided by IDOT as well as our regular group cleanups with brightly dressed vests announcing our altruism.

One way our members connect with the community is via the Urban Butterfly Initiative, which is a non-profit organization that has a large presence in and around the EIU campus. Through working with the UBI, Gamma Chi members were able to cultivate butterfly and honeybee gardens around campus and throughout the community. We participated in the first ever Scouts on CAMPus for the region’s Scouts. Hosted by EIU, almost three dozen Scouts from throughout the central Illinois area spent a week on campus during the summer and engaged in 25 different merit badge events. Gamma Chi represented Earth Science and helped 6 Scouts earn their Geology Merit Badge. Last, EIU’s Gamma Chi chapter made dog toys from old t-shirts, which creates a more positive environment for the animals at our local shelter while simultaneously recycling old clothes. Due to the chapter’s dedication and hard work, we have received the Quality Chapter Award and Chapter Service Award every year since the inception of each!

Anthony Kilber  
Gamma Chi Chapter Convention Delegate

Delta Psi Chapter (Western Illinois University)

Since the last face-to-face SGE Convention in September of 2017, the Delta Psi Chapter at Western Illinois University has had an average membership of around five members. The Department of Geology was merged with the former Department of Geography and Meteorology. Our chapter is now housed in the Department of Earth, Atmospheric, and Geographic Information Sciences, or EAGIS. Since the merger we have encouraged meteorology majors to join our chapter. We are happy to report that we have been successful in these efforts and have four meteorology majors currently in our ranks.

Many of our members are also members of the WIU Geology Club so we periodically coordinate field trips with them. For example, in Fall of 2018 we coordinated with our Geology Club to visit an underground gypsum mine near Sperry, Iowa. We’ve also taken trips to quarries, or to collect geodes from streams beds at select locations in Western Illinois.

Before COVID-19, our main fundraisers consisted of selling geology-themed t-shirts of our creation and old geology books at the Geodeland Rock, Gem, Mineral, and Fossil Show held on our campus every March. We are planning to pick back up on fundraising this year. The shirts we don’t sell at the show are offered for sale to our fellow students and faculty members.
Jaxx Smith  
Delta Psi Chapter Secretary & Convention Delegate

Epsilon Omega Chapter (The University of Texas at San Antonio)

The Epsilon Omega Chapter has been diligently working to become more of a presence at The University of Texas at San Antonio (UTSA) within the Earth Sciences departments. Since the last convention in 2021, our chapter has grown with multiple initiation ceremonies where we have welcomed many new geology students to the society. With 8 inducted in the Fall of 2021, and 2 inducted in the Spring of 2022, we are now 13 members strong and have a lot of interested new inductees for the upcoming semester.

Our chapter has also experienced some leadership changes since the 2021 convention. Our President graduated in 2021, so our Vice President moved into that role. There have been some changes in the Vice President role, including the necessity to have an interim officer for one semester, but we have a bold and excited member who has stepped up to the plate for the Fall 2022 semester. We will also be welcoming a new Secretary in the Fall of 2022 as our previous officer sadly changed majors. Lastly, our amazing Treasurer will continue in her position that she started in when our chapter was re-established in the Fall of 2019. This new crew of officers have some fun plans for the upcoming semester, including camping and kayaking trips, fundraising opportunities, and community service.

Our chapter can often be seen participating in networking and service activities throughout the year. In the 2021-2022 school year, members helped with department socials and volunteered in a university wide service day. For the service event, the group was split up and joined by local community college students to clean up a variety of parks, lakes, and public gardens. This was a great opportunity for our members to reach their required service hours for the semester, meet the next generation of Earth Science students to get them excited for UTSA, and to help our community. We have found this aspect of networking to be very important in our community and often use this as marketing for new members.

Our participation in BestFest, a fundraising event for UTSA organizations, should also be mentioned. BestFest is held during the week of graduation and is highly visited by students, alumni, faculty, and staff. This one-day event offers the opportunity for organizations to sell something in order to raise money. Many choose to sell food, drinks, or games, however our chapter wanted to do something a little closer to home. We stepped a bit out of the normal ‘BestFest box’ and decided to host a “Create Your Own Pet Rock” booth. Officers and members worked for many weeks to perfect the idea and ultimately decided to have a variety of river rocks, paints, and googly eyes available for students and children to create their own pet rock. It was a huge hit and we raised nearly $400. With BestFest approaching, many people have asked if pet rocks will be returning!

Lastly, it is important to recognize our advisor, Janet Vote, and our department chair, Saugata Datta, for all their hard work and continued support. Without them cheering on our organization it would have been much harder to get where we are. We have agreed that recruitment is a big goal for this semester, and they are both helping us reach our fullest potential. Along with monthly member and officer meetings, our students and advisor will attend safety meetings as required by UTSA, fulfill service hours, and network with other organizations around the university. The officers of the Epsilon Omega Chapter are hopeful for a great year with new opportunities for our members.

Izzy Heathman  
Epsilon Omega Chapter President & Convention Delegate

Eta Alpha Chapter (University of Tennessee at Martin)

Since the previous convention, the Eta Alpha chapter has successfully managed to maneuver through the pandemic and has engaged in activities for the benefit both of its members and its community. Our chapter was initially slated to host the biennial convention in the spring of 2020, and most of our activities in the fall of 2019 were devoted to preparing for that event. When the pandemic lockdown began, the convention was postponed, and the chapter went on an effective hiatus of activities excluding the initiation of new members. Our chapter president from 2021-2022 did attend and present a chapter report at the online convention hosted by Eastern Illinois University in 2021. We have been looking forward to and working hard to prepare for hosting the convention in person for a long time now!

The University of Tennessee at Martin acquired the Coon Creek Science Center, a marine Cretaceous fossil site, in 2021; much of the recent efforts of our chapter have been directed towards the restoration, renovation, and implementation of the site. Several chapter members have
worked and volunteered at the site, collecting, analyzing, and preserving field samples as well as educating groups from the general public who wish to know more about the history of West Tennessee’s geology. Collaborative workdays were also held with other organizations from our university such as the University Scholars Program. The official ribbon cutting ceremony for the site was in April of 2021. Since its inauguration, several SGE chapter members have conducted research involving specimens collected from the site.

As facilities continue to re-open to greater extent, the Eta Alpha chapter has resumed and heightened its initiation rate, gaining new members over the past two initiation cycles for a total of at least 11 students and 6 faculty, including our newest instructor. We also sponsored an information table this August at our university’s Organization Fair with the intent to gauge interest in the student body, where we received twenty signatures of interested students. Our chapter works closely with the university’s GeoClub, and we are planning various collaborative activities with them in the near future. In October 2021, we hosted an educational table during the Discovery Park of America’s Earth Science week, identifying rocks, minerals, and fossils for the public and running a trivia game for children. In the spring of 2022, we visited a fluorspar mine and a mineral museum. Future fundraising activities and field trips are still being planned. Our chapter also continues to present members with the W.A. Tarr award, with the most recent awardees being Shay Briggs (2020), Jack Garrett (2021), and Joseph Pelren (2022).

Joseph Pelren
Eta Alpha Chapter President & Convention Delegate

Theta Omicron Chapter (Indiana University Northwest)

The Theta Omicron chapter of Sigma Gamma Epsilon at Indiana University Northwest was reactivated in the spring semester of 2022 with two new members. While a large graduating class combined with the COVID-19 pandemic prolonged Theta Omicron’s inactivity, early on during this spring semester a department-wide interest in the chapter’s return helped to rally current members and get new members inducted. By midway through the spring semester, Theta Omicron was back to fully functioning. While there are only a handful of active members in Theta Omicron at the moment, we are expecting to have several new members inducted this school year, which will effectively increase our chapter size by approximately 33%.

The first activity that Theta Omicron helped to facilitate was writing tests and running the earth science events for Indiana University Northwest’s annual Science Olympiad regional competition. Members of the chapter wrote tests, sat in and proctored tests during the day of the competition, and graded tests once they were complete. Chapter members were also responsible for the recruitment and oversight of volunteers from the student body, especially within the geology department. Other volunteer opportunities presented themselves during our annual beach cleanup, run in partnership with Alliance for the Great Lakes, during which members of Theta Omicron volunteer their time and efforts to hosting a cleanup of the local Marquette Park Beach, one that is frequented by the department for studying sediment transport processes along the lakeshore and how the continual change in Lake Michigan water levels affect foredune development. Marquette Park Beach is both important to the geology department and the surrounding community, and getting out to help make a difference by engaging the public is important to our chapter. Additionally, members of Theta Omicron recently hosted a local charter school who reached out to the department looking for hands-on earth science activities for students. Theta Omicron, in collaboration with the Sustainability Club at IUN, worked with students to help plant several new trees on campus. Following this, volunteers from Theta Omicron walked students through the geology department to show them our department’s collections and ran both a rocks & minerals lab and a fossils lab with students. Showing students what life was like ~400 Ma and the limestone rocks that lie as evidence underneath their feet really helped to make geology more tangible for them.

This summer, Theta Omicron has offered a few field trips to the Mazon Creek lagerstätte, known world-wide for its soft-body preservation, which is across the border from our chapter in Illinois. On average, trips consist of 5-10 people, including faculty, geology department students, and anyone else with an active interest in learning about the lagerstätte and seeing the life it preserves first-hand. During the spring, Theta Omicron helped to create connections and set up a field trip to an active aggregate quarry in Francesville, Indiana, for geology students to attend. This field trip provided both opportunities to collect fossils and to get a glimpse at what the industry side of geology may have to offer post-graduation.

Currently, Theta Omicron is working with our sister IUN
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Geology Club to help take a group of students to the Denver 2022 annual Geological Society of America conference this October. With our successful collaboration for a joint trip to the regional GSA in Cincinnati this year, this joint initiative aims to get students interested in learning more about post-graduation opportunities including jobs in industry and graduate schooling, as well as for those who are attending to present research of their own. Current plans are to drive as a caravan and do some roadside geology to and from the conference. Fundraising will be used to help defer costs of travel and lodging for students, but as of this publication the means of fundraising have not yet been decided upon. Theta Omicron also has held and plans to create an annual alumni talk for current students in the geology department to attend. During this talk, alumni return via Zoom to discuss their paths post-graduation and their experiences during this time. The goal of this talk is to help students, especially those nearing graduation, to start thinking about their post-graduation plan and to ask questions about the application process for work or graduate school. The first talk held this past spring was a huge success, and plans to hold one again in the spring of 2023 are already in place.

While our club has had a fantastic start since reactivation early in the spring semester of 2022, our ambitions are still high and we are in the process of planning more activities and providing more for students in the department. We also aim to focus on creating fundraising events and setting up opportunities for students to share their undergraduate research with students on campus. Our goal is to create a biweekly or monthly meeting time for a few students to get up and present their work in front of an audience, giving each student a chance to practice their presentation and public engagement skills in a more relaxed environment, preparing them for future talks or public outreach they will have to do in the future. With a new batch of members on the horizon and plenty to offer, the Theta Omicron chapter of Sigma Gamma Epsilon is certainly alive and well, and will continue to focus on serving our community, campus, and department to the very best of our ability!

Alec Siurek  
Theta Omicron Chapter President & Convention Delegate

 Theta Sigma Chapter (University of Arkansas at Little Rock)

In the year since the Spring 2021 Sigma Gamma Epsilon national convention, our chapter has added four new members, while eight additional members graduated with their Bachelors or Masters degrees. We are hoping to recruit several new members this coming fall semester as our candidate pool of potential earth science majors in our program has also grown since the 2021 convention. In addition to adding new members, we are excited to start hosting more in-person events and expand our community service outreach. A few service projects that are currently being developed by the chapter include participating in the Little Rock Adopt-A-Street program and restarting our weekly tutoring sessions for introductory earth science students which had been suspended due to COVID-19 restrictions on campus.

Unfortunately, COVID-19 and inclement weather this past Spring hindered some of the events in which we had planned to participate, but we were able to take part in a campus-wide cleanup and additionally we removed nearly a dozen bags of garbage from our one-mile stretch of Highway 300 near Pinnacle Mountain State Park.

This Fall we are hoping to recruit several new members to replace those that have graduated (or left school) over the past two years, develop some new and exciting service and social events, revive our department’s currently inactive Geology Club student organization, and participate in some highway and city cleanups scheduled for later this semester.

Shannon R. Bione  
Theta Sigma Chapter Vice President

 Theta Upsilon Chapter (Eastern Connecticut State University)

During the last 18 months, our chapter has been at a bit of a low ebb due to COVID-19 restrictions for on-site gatherings and because we also had fewer returning members and new candidates eligible for induction. During the 2021-22 academic year, we only had 6 active members. Nevertheless, we continued to run an external speaker series inviting in representatives from local industries to give professional presentations and to inform our majors about the regional job market for earth and environmental science graduates. In addition, we ran a successful earth science game show night and helped raise funds via UNICEF for Ukrainian Children in Need. We also had a picnic day at a local state park. During the 2021 spring semester, we ran a geo-hike to a local waterfall and traprock ridge in the Connecticut River valley and visited Yale’s Peabody Museum. We also trained several SGE members to be peer resumé mentors to help all of our
majors prepare polished résumés for graduate employment.

Fortunately, we now have a larger cohort of 13 members who have met the eligibility criteria and we are again very optimistic about our chapter and how it can contribute to the life of our department and campus community during 2022-23. For the coming year, we have decided to ramp up our activities to include: 1) At least one Saturday field trip each semester including a coastal geology excursion in CT or RI and a summit hike in CT or southern NH; 2) A geology game show and pizza dinner night; 3) A visiting speaker series with invitees from academia and industry; 4) A science outreach activity with children from a nearby STEM school; 5) A social event like a bowling trip, night skiing trip, escape room, or museum trip; 6) A fundraiser for a worthy cause, possibly for Ukrainian refugees, which was successful last year; 7) An Earth Day activity – details still to be decided; 8) The annual induction event in May.

Dr. Dickson Cunningham
Theta Upsilon Chapter Faculty Advisor

Iota Beta Chapter (The University of Tennessee at Chattanooga)

The Iota Beta Chapter of Sigma Gamma Epsilon at The University of Tennessee at Chattanooga was activated in Spring 2020. Following the initiation of this chapter, membership declined because COVID-19 restrictions limited recruitment opportunities on campus. By the time we returned full-time to campus, we had only 2 returning members, including the chapter president, Will Stuart, who has presided since 2020. We held a recruitment event in Fall 2021 and initiated 7 new members and 1 new advisor. The chapter currently has 5 returning members, and we look forward to seeing new members after our September 2022 recruitment drive.

Members of Iota Beta are committed to finding volunteer and/or outreach opportunities that benefit our community. In Fall 2022, Iota Beta will formally adopt a stream segment in cooperation with a local non-profit organization called MyWaterways.org. We will dedicate this stream segment to Dr. Mark Schorr. Dr. Schorr taught stream ecology for more than 20 years at UTC and worked closely with MyWaterways.org, and we hope to preserve his legacy by hosting annual cleanup events to improve water quality and fish habitats in our adopted stream.

We have no field trips planned at this time. We hope to add more to our calendar when our membership roster increases this fall.

Iota Beta members look forward to serving as volunteers on the Environmental Team for the 2022 Chattanooga Iron Man races. This is a great opportunity for us to introduce ourselves to the local community. Ironman generously offers grants to student volunteer groups, so this will also be our first fundraising activity.

Iota Beta is proud to recognize member Lauren Gossett (2020–present). Lauren presented her research on microplastics in Mountain Creek, Tennessee at the Geological Society of America’s 2021 Fall Meeting in Portland, OR, and received SGE’s “Best Student Poster” award.

Mimi White
Iota Beta Chapter President-Elect & Convention Delegate

COMMITTEE REPORTS

Constitution and Bylaws Committee Report

The Committee worked from a marked-up version of the 2016 constitution that shows all of the changes that were proposed by Dr. Rick Ford (Western Province Vice President), on behalf of the National Council. The national office retains a copy of this draft constitution. The Committee approved all of the proposed changes, which are summarized above in the convention minutes.

In addition, the Committee had been charged to consider a constitutional or policy change that would require the National Council to set the convention agenda at the GSA annual meeting immediately preceding the national convention. The Committee took that a step further, and crafted an amendment to Article X, section 2, stating “An agenda for the National Convention will be set by the National Council and communicated to all active chapters during the academic semester prior to the date of the convention.”

Dr. Richard L. (Rick) Ford, on behalf of
Logan Contos, Chair of the Constitution and Bylaws Committee

Ritual and Insignia Committee Report

The Ritual and Insignia Committee of the 46th National Convention of the Society of Sigma Gamma Epsilon met on the evening of September 16 and on the morning of September 17, 2022. This report was delivered before the National Council and Advisors, Delegates, and Alternates
of the chapters present at that convention on the morning of September 18, 2022. The Committee was charged with the goals of identifying ways to improve new interest in our local chapters of the Society, the planning of the writing of an officer handbook, the approval process for the Honorary Membership in Sigma Gamma Epsilon of Dr. Larry E. Davis, emeritus, and the question of hosting the 47th Biennial Convention of the Society.

When asked to come up with new strategies for improving interest in the Society, the Ritual and Insignia Committee responded with one theme: outreach. The Committee suggests that social media, print, and flier advertisements in addition to social events be used for outreach into our university and department communities. It was also suggested that outreach be extended not just to upperclassmen geology majors, but also unto underclassmen, non-majors, and professors.

The Ritual and Insignia Committee also moved that an officer handbook must be made, moving further that it only be several pages in length and that particular emphasis be placed on the duties of officers overall and in individual positions, as well as strategies for chapter operation and engagement. The Committee charges the National Council with the writing of this document, and suggests that the Secretary-Treasurer spearhead the drafting of the handbook. However, the Secretary-Treasurer should not be charged to act alone. The Committee further suggests that the National Council act on this motion prior to the 47th National Convention, but does not charge the Council to be held to this soft deadline.

The Ritual and Insignia Committee has also approved Secretary-Treasurer James Walters’ nomination (below) of Dr. Larry E. Davis to Honorary Membership for his decades of service to the Society. This service includes: being the chapter advisor at Washington State University (Xi Chapter), the Vice President of the Western Province, and as Editor of The Compass. As Editor, Davis transformed The Compass from a standard print journal into the online, open-access journal that it is today. In a sense, Davis “brought The Compass into the 21st Century.” The Society owes a great debt to Dr. Davis’ foresight, leadership, and service. In a sense, Davis “brought The Compass into the 21st Century.” The Society owes a great debt to Dr. Davis’ foresight, leadership, and service. The Delegates present at the 46th Biennial Convention unanimously voted in favor of The Ritual and Insignia Committee’s motion.

Ultimately, the Ritual and Insignia Committee was charged with the question of which chapter will host the 47th Biennial National Convention of the Society. The Committee suggests that the host chapter be one of the chapters present at the 46th Biennial Convention, but leaves open the possibility of asking active but not present chapters to host. Rho Chapter expressed current interest prior to the presentation of this report, but this is contingent upon the approval of the Leadership and Advisor of Rho Chapter as well as of the approval of the Department of Earth and Atmospheric Sciences of Indiana University, the College of Arts and Sciences of Indiana University, and of the Administration and Facilities of Indiana University-Bloomington.

Harley Bailey  
Rho Chapter Delegate and Chair of the Ritual and Insignia Committee

Nomination of Dr. Larry E. Davis to Honorary Membership (September 15, 2022)

I wish to formally nominate Dr. Larry E. Davis for Honorary Membership in Sigma Gamma Epsilon.

Dr. Davis is currently an Emeritus Professor in the Division of Natural Sciences, at the College of Saint Benedict/Saint John’s University, Collegeville, MN. Dr. Davis has been a staunch supporter of SGE over the years and has served the Society in several capacities, including Chapter Advisor (Xi Chapter), Western Province Vice President, and most recently Editor of The Compass, the Earth Science Journal of SGE. As Editor, Larry was responsible for moving The Compass from a standard print journal to an open-access online journal. The journal enjoys strong readership with international recognition. The Society is greatly indebted to Larry for his foresight and his efforts in bringing our journal into the 21st century.

It is appropriate that we recognize Dr. Larry Davis for his service and dedication to SGE by naming him an Honorary Member.

James C. Walters, National Secretary-Treasurer, on behalf of the National Council

Membership and Scholarship Committee Report

At the 2022 Sigma Gamma Epsilon national convention, the matter of declining membership due to the COVID-19 pandemic was a major topic for most of the attending chapters. Therefore, the various convention committees conducted breakout sessions to discuss ideas that chapters may consider implementing in order to boost their visibility on their campuses and in their communities. The committees
then presented their ideas to the body of the convention. This report is a summary of those ideas presented. This should not be considered an exhaustive list, but rather a stepping-stone for chapters to boost their memberships where applicable.

One of the main issues is there is a greater need for outreach, both around universities as well as in the communities. Generally speaking, hanging flyers and word of mouth is one way to get the word out about SGE. Additionally, faculty advisors can choose to search student records for students who are eligible to join SGE and email them directly with an invitation. Additionally, to bridge the gap between SGE and members of the community, professors and professionals with experience in honor societies could be invited to speak to groups of students about the benefits of having a membership.

Another way to engage the community and increase interest in the earth sciences is for professors to work with their institutions to create dual-enrollment earth science courses in high schools. In this way, young people would be exposed to the earth sciences in a meaningful way. A young person who has a positive experience in an earth science course in high school may be convinced to pursue an earth science degree when they move on to college. Though this is not a direct means to increase membership in SGE in the short term, this method, if executed properly, would help spread awareness of the earth sciences throughout the community. Should students in these classes choose to attend their duel enrollment professor’s university, they would already have some credits to apply toward a future SGE membership, as well as good rapport with their professor.

Additionally, chapters could invite professors to their meetings and special events to give talks on special topics. Some of these professors may also be encouraged to invite their students to attend these talks, perhaps with the incentive of an extra credit should the student write a short paper on the proceedings. Faculty advisors of SGE chapters might communicate with their colleagues and invite them to participate with or even join SGE through this process. Additionally, chapter members may arrange to visit introductory earth science courses to give small five- to ten-minute presentations on SGE and the benefits of joining an honor society.

Many chapters expressed a need to increase the visibility of SGE on their campuses. One suggestion is to build an SGE showcase where students can see displays related to their chapter, be it a geology display in a wing of classrooms or a board with posters and pictures showing the chapter’s past events as well as information on upcoming events and meetings. Additionally, chapters can table at their campus events. Club fairs, poster displays, and other events provide a convenient opportunity to boost SGE visibility on campuses. One idea that was particularly well liked was that of a poster competition, where the posters would be artistic creations with an earth science theme.

Tangent to the subject of increasing visibility was that of modernizing communication, a vital component that chapters might overlook. Specifically, the social media platform Facebook is no longer considered an effective means of communication with members of the generation of students who are now entering colleges across the nation. As the nature of the use of social media changes, it is imperative to continually reevaluate which methods of communication are most effective in engaging new generations of students.

It is also important for chapters to work with their campus’ student engagement departments to ensure that their chapter is an officially recognized organization within that campus. Beyond being a matter of liability, it will also allow students of that campus better access to chapter information. At many campuses, the chapter would then be able to utilize the campus organization portal through the campus website to disseminate information to a wider audience.

Sometimes students are hesitant to join SGE because the cost of dues may be too high. Although SGE has recently implemented a lifetime membership tier involving a one-time cost to the member, chapters might consider using some of their funds to assist students in the payment of these dues in some circumstances, especially when a student is experiencing financial hardship but would still like to participate. Chapters should also be sure to clarify the benefits that come with a membership to SGE, informing potential new members of the special insignia that can be worn at graduation, for example. Chapters should also emphasize SGE’s prestigious history to all new members and potential members, because this helps to legitimize SGE in the eyes of others, giving even more incentives to students to join.

Because of the COVID-19 pandemic, many SGE chapters have experienced a decline in membership and have expressed a desire to attract new students to their chapters. The committees of the Sigma Gamma Epsilon National Convention hope that with the distribution of this report,
SGE chapters will be able to use some of these ideas to help boost their membership.

Mimi White  
Iota Beta Chapter Delegate and Chair of the Membership and Scholarship Committee

Communications Committee Report

1. Our website, www.SGEearth.org, needs to be consolidated to just that one address. We must find any links that result in redirects and replace them with the correct address. To that end, the website needs to be cell phone readable. We also would like to see a clickable map showing all the chapters’ locations. Links need to be on social media pages besides Facebook, such as Snap Chat, Tik Tok, Instagram, perhaps even Discord. Input for the website should be directed to potter@sgeeearth.org.

1.5. There is also strong interest in having a student representative for the national office. This person would be in charge of social media and have the ability to delegate responsibilities to direct reports from each chapter.

2. It is important for chapters to go on field trips for more hands-on experience to reinforce what has been learned in the classroom and to reward them for their participation and academic excellence. It would be a good idea for chapters who are geographically close to each other to go on joint field trips as well. This would have a number of benefits, not the least of which is the solidification and maintaining of bonds between members of said chapters. There could even be extra credit for participating in events and field trips. Chapters also need to respond when they are contacted, whether by the national office or other chapters. Otherwise, these joint outings and participation in events might not happen. Each chapter also needs to be filing reports.

3. We need to make the need for nation-wide shortage of geologists better known. We also need more communication with other departments. Physics and chemistry students, for instance, could be persuaded to be geophysicists or geochemists. This would be easier if the professors from these adjacent departments were more involved. We need to make SGE better known to the entire student body. It would behoove us to have showcases in common areas showing stoles, chords, an issue of The Compass, rocks/minerals, etc.

4. We need to find workarounds for GPA and credit hours requirements. This is excluding students who are already aware of SGE and wish to join but have not yet met said requirements. There could be dual enrollment for classes in high school that count towards membership in SGE. This would be an excellent opportunity to plant that bug in students’ ears and cultivate future members early on. That said, we need to list the courses necessary for membership in SGE. There could even be just one or two ‘make-or-break’ courses that can result in admittance if the student achieves an A or a B.

5. Geology club meetings should occur at the same time as SGE meetings. Much of the same discussions and activities happen at both, but SGE business would be discussed after all non-members leave. On their way out, they can be reminded that as soon as we get them initiated they can join us for these meetings.

6. The Compass wants to do a GSA issue with extended abstracts and photos of the winners, but there are concerns about “double publication” problems. We think there should be an issue discussing the winners and recognizing them for their achievements, but also having testimonials from past winners who are now professionals in their fields. They can discuss how their participation in research has benefited them in their careers.

Anthony Kilber  
Gamma Chi Chapter Delegate and Chair of the Communications Committee

Chapter Affairs Committee Report

The Chapter Affairs Committee had many points of business at the 46th Biennial Convention in Selmer, TN. Our committee consisted of facilitator Dr. Diane Burns, chair Izzy Heathman from University of Texas at San Antonio, Madisyn Rex from Bowling Green State University, Michael Otwirk from Eastern Illinois University, Jacob McCourt from Eastern Connecticut State University, and advisor Joshua Spinler from University of Arkansas at Little Rock. The committee had many deliberations, agreements, and fun findings throughout the process.

Similar to the other committees, one main point of interest was discussing how chapters could grow and introduce more members to the society. We decided the most
important things for chapters to focus on are pointing out the benefits of SGE, working closely with the departments at their school, and utilizing chapter funds for support to new members. Specific recommendations were made to build up from the department by hosting tutoring sessions to help students meet GPA requirements to join, hosting big group meetings with professionals to promote the society, and directly asking department chairs for help with promotion of the chapter.

The Chapter Affairs Committee was also tasked with updating SGE awards. The first award we discussed was the Quality Chapter Award as there were a few changes we were looking to make. After deliberation and careful consideration of the name, we decided to recommend we change the name to be the James C. Walters Quality Chapter Award to honor Dr. Walters who is now retired. We brought this idea to the convention and all delegates voted to change the name after hearing the proposal (citation by Paula Even is provided below). This change should be seen on the website soon.

In addition to the name change, we carefully looked at the requirements for the award and wanted to pinpoint what a quality chapter should do. Both the committee and other delegates during voting decided to add a few options of completing scholarly acts to earn the quality award. There will soon be a living document posted for chapters to share their ideas on what scholarly activities they are completing for the award. The award and all of the details will be posted on the website.

Next, we looked at the service and W.A. Tarr Award. The only changes we made to these were to the dates. The due dates were changed across all awards to eliminate confusion of different due dates. Most important to note was that we changed the time frame for completing tasks from academic year to award year, April 1st – March 31st. The committee felt this allowed for more chapters to participate when they are most available. We also made the deadline for awards to from May 31st to April 1st so chapters could host initiations before the end of the semester and be able to present the awards.

All of our changes were brought to the attention of the convention and all delegates voted yes on our motions. Changes to the awards should be made soon for chapters to apply. We encourage all to apply to the newly updated James C. Walters Quality Chapter Award, the Chapter Service Award, and the W.A. Tarr Award. They all include great recognition and monetary awards!

Izzy Heathman

**Recommendation that the Quality Chapter Award be named in honor of Dr. James C. Walters**

Dr. Walters is currently an Emeritus Professor in the Earth & Environmental Sciences, at the University of Northern Iowa in Cedar Falls, Iowa. Dr. Walters served as SGE National President from 1995 to 2000 and as SGE National Vice-President for the Central Province both before and after his time as President. He planned and executed the 40th convention in 2007. He was recognized for his dedication and service in 2007 when he was named an Honorary Member of SGE. Dr. Walters was instrumental in the moving the national office from the Oklahoma Geological Survey (Norman) to UNI in 2009. At this time, he assumed the role of National Secretary-Treasurer which he has held for the past 13 years.

His dedication and service to the Society has been remarkable. All of this has been in addition to serving as an advisor for more years than I know. He was the Gamma Sigma Advisor when I went back to college in 1999 and served as their advisor until he retired. However, he was an advisor for many, many years before 1999. Long before there was a Quality Chapter Award, Dr. Walters advised Gamma Sigma Chapter meeting those requirements by having fall and spring initiations, having monthly meetings, conducting service projects, awarding the Tarr Award annually, and meeting deadlines.

It is appropriate that we recognize Dr. James C. Walters for his outstanding service and dedication to SGE and the exemplary example of being a quality advisor and conducting a quality chapter for many years by naming the Quality Chapter Award the James C. Walters Quality Chapter Award.

Paula Even
SGE Associate Director (2009-2022)
Gamma Sigma Member since 2000

**Nominations Committee Report**

The Nominations Committee for the 2022 biennial Sigma Gamma Epsilon Convention included as Facilitator, Paula Even, SGE Associate Director, Katherine Hartter (Chair) of Theta Sigma Chapter at University of Arkansas at Little Rock, Carolyn (CJ) Karns of Gamma Chi at Eastern Illinois University, Natalie Hudson of Eta Alpha at the
University of Tennessee at Martin and Ashley Manning Berg of Iota Beta Chapter at the University of Tennessee at Chattanooga. The attending delegates of the convention are responsible for electing the national officers including President, Vice Presidents of Central, Western, Northeastern, and Southeastern Provinces. Each officer will serve from convention to convention, a duration of two and a half years, which constitutes one term. There are no term limits on a Vice President of a Province, however there is a two-term limit for the office of President.

The following were nominated for service:

- **President:** Steve Bennet, Delta Psi advisor at Western Illinois University, (Former Central Province Vice President)
- **Central Province:** Diane Burns, Gamma Chi advisor at Eastern Illinois University (Former President and Central Province Vice President)
- **Southeastern Province:** Dr. Michael A. Gibson: Eta Alpha advisor at University of Tennessee at Martin (Incumbent)
- **Northeastern Province:** Dr. Alexander Stewart: Eta Chi advisor at St. Lawrence University (Incumbent)
- **Western Province:** TBD

**Katherine Hartter
Theta Sigma Chapter Delegate and Chair of the Nominations Committee**

**ACKNOWLEDGEMENTS**

We would like to thank all the student delegates and committee chairs for their work in preparing the chapter and committee reports that are presented in this summary of SGE’s 46th biennial convention, and for their participation in SGE’s 46th biennial convention in general. Getting to know these young geoscientists gives us confidence in a bright future for our science. We would also like to thank Steve Bennett, Diane Burns, Paula Even, Alexander Stewart, and Jim Walters for their careful review of the convention minutes.

**REFERENCES CITED**


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**Recommended Citation:** Ford, R.L. and Potter, L.S., 2024, 46th biennial convention of Sigma Gamma Epsilon University of Tennessee at Martin, September 16-18, 2022: The Compass: Earth Science Journal of Sigma Gamma Epsilon, Vol. 93, Iss. 1, Art. 3, Pp. 46-78, doi: 10.62879/c53794820.

Available at: [https://digitalcommons.csbsju.edu/compass/vol93/iss1/3](https://digitalcommons.csbsju.edu/compass/vol93/iss1/3)
**NEWS UPDATE**

**Sigma Gamma Epsilon chapter and student awards for academic year 2022-2023**

Lee S. Potter*

The Society of Sigma Gamma Epsilon, P.O. Box 324, Cedar Falls, IA 50613, USA

**ABSTRACT**

The Society of Sigma Gamma Epsilon (SGE) encourages efforts to broaden the education and impact of its members through community outreach. In academic year 2022-2023, four awards were given at the chapter level: The Chapter Service Award to the Gamma Chi Chapter; and the James C. Walters Quality Chapter Award to the Gamma Sigma, Gamma Chi, and Epsilon Omega Chapters. Individual merit was recognized through the W. A. Tarr awards given to twenty-two members by their respective chapters. Two awards, the Austin A. Sartin and Charles J. Mankin Outstanding Poster Awards, were given to four students for merit in scientific communication at the 34th Annual SGE Student Poster Session at the Geological Society of America Annual Meeting in Denver, Colorado, on October 10, 2022.

**KEYWORDS**

Sigma Gamma Epsilon, SGE, Service Award, Quality Chapter Award, W. A. Tarr Award, Outstanding poster award, Austin A. Sartin Award, Charles J. Mankin Award, annual student poster session

**INTRODUCTION**

Sigma Gamma Epsilon (SGE), the national honor society in the Earth Sciences, provides awards to honor outstanding achievements by our chapters and our members. For academic year 2022-2023, the National Council is pleased to announce the SGE chapters that have qualified for the Chapter Service Award and the first James C. Walters Quality Chapter Award (formerly the Quality Chapter Award). The Council also announces twenty-two individual members that were awarded the W. A. Tarr Award at their respective chapters as outstanding students in the Earth Sciences. Finally, the results of the 34th Annual Student Poster Session at the Geological Society of America (GSA) Annual Meeting, Denver, 2022, are discussed including the two outstanding poster awards (Austin A. Sartin and Charles J. Mankin Outstanding Poster Awards).

**CHAPTER SERVICE AWARD**

SGE is an organization that values the engagement of its members in the educational enterprise, both for their betterment and for improving understanding and impact of Earth Science in the broader community. To that end, members are expected to help with service projects in their departments, schools, and community.

The SGE Chapter Service Award is presented to chapters that exhibit exemplary service to their communities. Required service hours are based on the number of active members in the Fall semester and an average of six hours must be documented per award year. For 2022-2023, the members of the Gamma Chi Chapter (Eastern Illinois University, Charleston, Illinois) demonstrated their commitment to engagement with the campus and broader community. Numerous activities were described in the chapter’s application with specific examples of assisting local Scouts with merit badges (Figures 1 and 2), ongoing maintenance of their assigned Adopt-a-Highway section.

*Corresponding author: potter@sgeearth.org*
Figure 1: BSA on CAMPus scouting troup at Eastern Illinois University (Photo: Gamma Chi Chapter).

Figure 2: BSA on CAMPus Scouting event on the campus of Eastern Illinois University in Charleston, Illinois June 4-8, 2022 (Photo: Jay Grabiec).

Figure 3: Members of the Gamma Chi Chapter pose during an Adopt-a-Highway event in March 2023 (Photo: Gamma Chi Chapter).

(Figure 3), providing a student research forum to engage the community (Figure 4), staffing a display table at Springfest (Figure 5), volunteering for the Urban Butterfly Initiative (UBI), and collecting plastic bottle caps for recycling in partnership with Life Academy in Matton, Illinois. The later activity diverts material from landfill and produce a sturdy product, park benches.

The chapter’s combined volunteer hours were greater
than the 6-hour average per member minimum. This award is acknowledged with a certificate and monetary award. The National Council extends its congratulations to the Gamma Chi Chapter for earning the Chapter Service Award through their exceptional efforts.

**JAMES C. WALTERS QUALITY CHAPTER AWARD**

At the 2022 SGE Biennial Convention in Selmer, Tennessee, delegates voted unanimously to rename the Quality Chapter Award to the James C. Walters Quality Chapter Award (*Ford and Potter, 2024*). Dr. James C. Walters recently stepped down as National Secretary-Treasurer, but has held several National Offices, and served as advisor to the Gamma Sigma Chapter (University of Northern Iowa, Cedar Falls, Iowa) for many years. Renaming the award honors him for nearly 50 years of service to the Society.

To qualify for this award, chapters must regularly report returning and new members, list officers, award the W. A. Tarr award to an exceptional student, and provide at least two hours service to the community per member each academic year.

Three chapters applied for the award in Spring 2023 and met the qualifications for the award. They are Gamma Sigma (University of Northern Iowa, Cedar Falls, Iowa), Gamma Chi (Eastern Illinois University, Charleston, Illinois), and Epsilon Omega (The University of Texas at San Antonio). These chapters exemplify the qualities described above and received a certificate and monetary award. Details of the service component for each chapter are described below.

The National Council extends congratulations to these chapters for their work to exemplify the reporting and service that defines a quality chapter, and to increase their departments’ visibility in the community at large.

**Gamma Sigma Chapter**

In 2022-2023, the Gamma Sigma Chapter members demonstrated their commitment to engagement with the campus and broader community with a diverse portfolio of activities. These activities included: (1) Trash cleanup in parks and roadways in Black Hawk and Scott Counties; (2) Staffing a Halloween haunted house for children in the Department of Earth and Environmental Science; (3) Assisting with show nights at the department observatory; (4) Burning and seeding a prairie; (5) Providing support for environmental activities; and (6) Delivering the keynote address for an environmental film series.

**Gamma Chi Chapter**

The noteworthy contributions of the Gamma Chi Chapter are detailed in the Chapter Service Award section above.

**Epsilon Omega Chapter**

In 2022-2023, the Epsilon Omega Chapter helped steer the Earth and Planetary Science Department’s volunteer committee with several members and the chapter advisor serving on the committee. They contributed student members to several events. Three events named in the award application included the following activities: (1) Volunteered help at the John Jay Science Fair, a high school event that was open to the community; (2) Students of a local elementary schools were treated to several demonstrations of geologic processes and the rock cycle; and (3) Organized Earth Day festivities, which included a student research poster session within the department, facilitated the judging of the posters, offered tours of the department, and hosted an Earth Science trivia contest for visiting high school students.

**W. A. TARR AWARDS**

The W. A. Tarr Award was established in March of 1949, to distinguish exceptional students in the Earth Sciences. Twenty-two students received the W. A. Tarr Award during the 2022-2023 academic year. Qualifying criteria for this award is defined as the following:
“Any student in the Earth Sciences and an active member of the Society of Sigma Gamma Epsilon at a school with an active chapter of the Society is eligible to receive the Award. An active chapter is one which submits annually the members form with appropriate dues by November 1. The recipient of the Award must be majoring as an undergraduate or be a graduate student in some phase of the Earth Sciences, (e.g., Geology, Metallurgy, Mining, Petroleum or Geological Engineering, Ceramics, Geophysics, Hydrology, Oceanography, Environmental Sciences). The Award preferably should be granted to a graduating senior or graduate student. (It is not contemplated that the Award will be made more than once to the same person).

Scholarship is the essential basis of the Award, but personality, leadership, contribution to the school, and ability to get along with people are worthy of consideration. The selection of the student to receive the Award shall be made by a committee consisting of members of the Active Chapter and three faculty members – two of whom shall be members of the Society. The Faculty Advisor, in conjunction with the chapter, shall set up the method of selecting the Award Committee.

The W. A. Tarr Awardee for academic year 2022-2023 as listed by chapter and institution are displayed in Table 1.

### 34TH ANNUAL STUDENT POSTER SESSION, GEOLOGICAL SOCIETY OF AMERICA ANNUAL MEETING AND OUTSTANDING POSTER AWARDS

The Society again hosted its annual Student Poster Session at the Geological Society of America Annual Meeting (GSA Connects 2022, Denver, Colorado) on Monday, October 10 from 2:00 to 6:00 P.M. This marks the 34th consecutive annual venue for student work at GSA. The session was sponsored by SGE, and by GSA Quaternary Geology and Geomorphology Division; GSA Limnogeology Division;

### Table 1: W. A. Tarr Awardees for academic year 2022-2023 listed by chapter and school.

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<tr>
<th>Name</th>
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<td>Morgan Garrity</td>
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<td>Alpha Mu</td>
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<td>Maddy G. Devin</td>
<td>Alpha Chi</td>
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<td>Jace Bell</td>
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<td>Shannon Bione</td>
<td>Theta Sigma</td>
<td>University of Arkansas at Little Rock</td>
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<td>Emily Watling</td>
<td>Theta Upsilon</td>
<td>Eastern Connecticut State University</td>
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<td>Autumn Toms</td>
<td>Theta Chi</td>
<td>Georgia Institute of Technology</td>
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<tr>
<td>Wyatt Rollins</td>
<td>Theta Psi</td>
<td>Westminster College</td>
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GSA Soils and Soil Processes Division; GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division; and GSA Marine and Coastal Geoscience Division. Judging for the two Best Poster Awards was completed by National Officers Richard L. Ford and Alexander Stewart, and a guest judge Scott Beason, Park Geologist at Mount Rainier National Park. Owing in part to COVID-19 pandemic slowdowns, only ten abstracts were submitted to the session.

After the judging was complete, two awards were given to the authors of three posters. Each award included a certificate and monetary award. Complete titles and abstracts for the posters submitted to the session can be found in Beason (2024), Article 5 in this issue of The Compass.

The National Council thanks all the authors for communicating their research at this venue and congratulates the winners of the Outstanding Poster Awards.

**The Austin A. Sartin Award**

The 2022 Austin A. Sartin Outstanding Poster Award was awarded to *Audrey Bowman* and *Annabella Kennedy*, two members of the Eta Xi Chapter at St. Lawrence University in Canton, New York. Aubrey and Annabella were co-authors on two complementary poster presentations that reported on the use of dendrochronology techniques to evaluate slope-stability modeling in Alaska (Figures 6 and 7). Dr. Alexander Stewart, faculty advisor for the Eta Xi Chapter, is their research advisor. Audrey’s and Annabella’s abstracts are found online at [https://gsa.confex.com/gsa/2022AM/meetingapp.cgi/Paper/380984](https://gsa.confex.com/gsa/2022AM/meetingapp.cgi/Paper/380984) and [https://gsa.confex.com/gsa/2022AM/meetingapp.cgi/Paper/382103](https://gsa.confex.com/gsa/2022AM/meetingapp.cgi/Paper/382103), respectively.

**The Charles J. Mankin Award**

The 2022 Charles J. Mankin Outstanding Poster Award was awarded to *Kathryn Baumann* and *Hannah Bates*, two members of the Eta Sigma Chapter at Middle Tennessee State University in Murfreesboro, Tennessee. Kathryn and Hannah were co-authors on a poster presentation that reported on the use of petrological and geochemical techniques to determine potential protoliths for the metamorphic rocks exposed at Chunky Gal Mountain, part of the Blue Ridge Mountains of North Carolina (Figure 8). Dr. Warner Cribb, chapter advisor for Eta Sigma Chapter, is their research advisor. Their abstract is found online at [https://gsa.confex.com/gsa/2022AM/meetingapp.cgi/Paper/382188](https://gsa.confex.com/gsa/2022AM/meetingapp.cgi/Paper/382188).
REFERENCES CITED


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NEWS UPDATE

Sigma Gamma Epsilon student research poster session, Geological Society of America Annual Meeting 2022, Denver, Colorado, USA

Scott R. Beason*

National Editor, The Compass, National Council of The Society of Sigma Gamma Epsilon, P.O. Box 324, Cedar Falls, IA 50613 USA.

ABSTRACT

The Society of Sigma Gamma Epsilon sponsors an annual poster session at every Annual Meeting of the Geological Society of America. The 2022 Sigma Gamma Epsilon undergraduate research poster session took place during the 2022 Geological Society of America Annual Meeting in Denver, Colorado, USA, on Monday, October 10, 2022. Ten (10) posters were presented in Exhibit Hall F at the Colorado Convention Center between 2:00 PM and 6:00 PM at the poster session. Titles, authors (italics for the presenting author), affiliations, and abstracts for each poster are listed in this report.

KEYWORDS

Sigma Gamma Epsilon, poster session, student research, Denver, Colorado, Geological Society of America

Poster 124-1, Abstract 380321

STREAM QUALITY CHANGES 10 YEARS AFTER LOWHEAD DAM MODIFICATIONS, BUCK CREEK, SPRINGFIELD, OH

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Recreational modifications to three lowhead dams along a 9-km reach of Buck Creek and its tributary Beaver Creek in Springfield, Ohio, effectively removed barriers to downstream sediment transport. The modifications provide an opportunity to study changes in stream habitat, surface and substrate water chemistry, and macroinvertebrates 10 years post modification. We examined three sites at each dam: a reference riffle upstream of the dam, the impacted zone in the formerly impounded area, and the recovery riffle downstream. We compared our results with data collected prior to and immediately following modification. Substrate water was extracted from a well driven into the channel bed for comparison with surface water chemistry. Dissolved oxygen (DO), biochemical oxygen demand, fecal coliform, total coliform, nitrate, temperature, and pH were measured and summarized as a Water Quality Index (WQI). Macroinvertebrates were collected using a kick-frame net, identified at the order level, and summarized as a Pollution Tolerance Index (PTI). Substrate habitat was evaluated using the substrate metric of the Qualitative Habitat Evaluation Index (QHEI).

WQI, PTI, and substrate QHEI were consistently highest in the upstream reference riffle but decreased to their lowest level in the impacted area and were intermediate in the recovery riffle. They also generally decreased downstream and over time, from pre-modification to present. For example, in the impacted reach at Snyder Park, PTI changed from 15 to 5 in the years since modification. This is consistent with decreases in DO, the most heavily-weighted factor in WQI, from 9.03 to 0.27 mg/l, and the QHEI substrate score from 19 to 7, which characterizes a change from sand and fine
gravel to sand and detritus, at this same site over the same time period. Our results suggest that channel bed substrate impacts substrate water quality, in particular DO, which in turn affects the macroinvertebrates that live in the substrate. The hydraulic impact of dam modification in conjunction with the existing channel morphology in the impacted area at the time of modification allows for the throughput of sand and finer-grained materials but has slowed the transport of gravel and cobble; this should be considered in future engineering designs.


Poster 124-2, Abstract 380984

Austin A. Sartin Outstanding Poster Co-Award Winner

GROUND-TRUTHING A REMOTE SENSING LANDSLIDE MODEL USING REACTION WOOD PRESENCE IN TREE RINGS NEAR GLENNALLEN, ALASKA

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Alaska’s interior transportation corridors are susceptible to landslide events and are often burdened by excessive repair costs and prolonged repair time. The state requires a new model that can project long-term landscape stability given the constraints of a limited landslide inventory. Miandad et al. (2020) developed a remote sensing model using LiDAR and Normalized Difference Vegetation Index (NDVI) to identify stable slopes, landslide susceptible slopes, and landslide slopes across Alaska with tests at four study sites. We ground-truthed an identified landslide area between the Trans-Alaskan pipeline and the Richardson Highway south of Glennallen, AK; the area is characterized topographically by a steep slope and several areas of exposed ground cover. We sampled 29 black spruce (Picea mariana) that were preferentially tilted by obtaining core samples (n=58), which were taken from each tree—one from the tree’s direction of tilt and the other perpendicular to the first. Samples were dot-counted and statistically verified using a digitized measuring system that generated a master chronology of individual growth years spanning from 1821-2021 (correlation, 0.63). With a focus on the tree-tilt cores (n=29) and data prior to 1921 excluded from analysis due to a small sample size, the mean value of recorded reaction wood is 16.2% for the 100 years (1921-2021) with a maximum of 47.6% in 1938 and a minimum of 3.4% in 2014. Exceptionally, 1930-1946 saw the largest increase in reaction wood with an average of 31.2%, which likely indicates slope instability. A 5.9% average increase, above background, in reaction wood from 2003 to 2007 potentially implies a recent slope instability. By extension, a site event must have occurred in 2021-2022, for all trees were tilted (mean=11.8°) across a disturbed slope revealing tensile cracks, mud slurries, and extensionally split trees. Given the LiDAR data was collected in 2011, it is unclear whether the model picked up on background instability or peak instability from 1930-1946 or 2003-2007 and from what factors of slope, curvature, roughness or NDVI determined this area as a landslide. Incorporating yearly rates of NDVI and LiDAR model parameters, when available, into the model could give greater insight into future stability based on the fluctuation of data values.


Poster 124-3, Abstract 382103

Austin A. Sartin Outstanding Poster Co-Award Winner

USING REACTION WOOD IN BLACK SPRUCE (PICEA MARIANA) TO TEST A SLOPE-STABILITY MODEL IN THE GLENNALLEN REGION, ALASKA

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The advent of remote-sensing technologies (e.g., LiDAR) has been vital to understanding the Earth’s landscape. The Alaskan transportation sector, for example, relies on these technologies to develop models to better understand landscape stability in Alaska (i.e., Miandad et al., 2020).
These desktop models, however, require ground truthing to confirm their accuracy. Based on a model developed by Miandad et al. (2020) that combines LiDAR and Normalized Difference Vegetation Index (NDVI) to identify slope instabilities we focused on one of their “landslide susceptible” polygons located south of Glennallen, AK. Two cores were preferentially taken from tilted black spruce (Picea mariana) trees (n=57) with “a” cores taken on the down-tilted side to maximize reaction-wood data and “b” cores taken perpendicularly. Samples were prepared for microscopic analyses and were digitized and evaluated with Cybis.se programs resulting in a master chronology from 1911 to 2021 (correlation=0.505). Reaction-wood data during the last 100 years (1921-2021) averaged 12.7% of recorded widths with a maximum of 38% (2016) and a minimum of 0%. Assuming reaction wood represents slope instability, the first instability event recorded was 1934-1942 (mean 20.6%). The second major instability event recorded in the last century started in 2009 and continues with increasing reaction-wood counts (24% to 32%) to 2022 (100% as all trees were tilted). The model defines “landslide susceptible” regions as places where landslides have not occurred, but are predicted to; therefore, we suggest the designation of this study site as a “susceptible” is erroneous. Likely, the model’s use of LiDAR (2011 flight) and NDVI is not sensitive enough to detect a coeval instability event, which caused approximately 25% of trees in the polygon to tilt and initiate reaction-wood growth. As a result, areas deemed “landslide susceptible” should be monitored more closely than the model may imply to protect associated infrastructure.

Flaw connectivity between master and relay faults in the Ikertòq shear zone demonstrates that multiple ruptures during ancient earthquakes occurred during a single seismic event. The Ikertòq shear zone (ISZ) is part of the Paleoproterozoic Nagssuqtqidian orogeny continental collision in West Greenland that includes a > 50 km pseudotachylyte system. As part of an NSF REU, this team mapped various faults throughout a 2 km transect on high-resolution UAV images of exhumed pseudotachylyte vein systems on the western end of Sarfänguit island to investigate the kinematics of multi-fault ruptures during individual seismic events. Pseudotachylyte veins exhibit a complex rupture geometry with linked kinematics between oblique reverse master faults striking approximately 240 and steep east-west relay faults dominated by strike-slip movement. Near complete exposure of veins provide a unique opportunity to document fault linkages and the partitioning of slip, including the interconnectivity of flow patterns of melt in pseudotachylyte veins, as well as angular ladders of melt. We measured the thickness of pseudotachylyte fault veins and injection veins along transects to examine slip partitioning between multiple reverse faults and strike-slip relay faults. Melt thickness is used as a proxy for earthquake slip since the pseudotachylyte melt occurred on faults that exhibit preexisting brittle displacement. The results of preliminary calculations from energy balance equations show that typical slip on some oblique reverse master faults was on the order of a meter or less, while typical slip on some east-west relay faults was cm scale. Our data clarify that most slip occurred on oblique reverse master faults with subsidiary slip on east-west relay faults.

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Poster 124-4, Abstract 380367

Kinematics of Complex Multi-Fault Earthquake Rupture Recorded by Pseudotachylytes from the Ikertòq Shear Zone, Greenland: An NSF REU Study

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Poster 124-5, Abstract 380427

Lithologic Influence on Pseudotachylyte-Bearing Fault Zones in the Ikertòq Shear Zone, Greenland: An NSF REU Study


https://www.sgeeearth.org 10.62879/c95747422 87
NSF REU STUDY

CHANAR, Anna Rose¹, MEAUX, Seija², MUÑIZ LLORENS, Vanesa³, ALLEN, Joseph L.⁴, and SHAW, Colin A.⁵

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High-resolution mapping of an extensive pseudotachylyte system in the Ikertôq shear zone of southwestern Greenland shows that the occurrence and style of interconnected pseudotachylyte-bearing faults are influenced by the lithology of the host rocks. The Ikertôq shear zone is a frontal structure of the Paleoproterozoic Nagssugtoquidian Orogen of which includes a 50 kilometer long pseudotachylyte system. Pseudotachylytes are vein-like rock melts that formed as a result of friction in shear zones, and are considered a proxy for paleo-earthquakes. These structures give insight into seismic behavior in the mid-upper crust. As part of an NSF REU, field observations were collected and laboratory analysis will be performed using electron microprobe, optical petrology, and scanning electron microscope (SEM) instrumentation. Our mapping of the lithologic units and boundaries along a transect of Sarfannguit Island identified lithologies varying from mafic intrusions, gabbroic pods, tonalite, felsic and intermediate gneisses, and metasedimentary rocks. Field observations such as rock unit descriptions, lithologic logs and maps show that the degree of foliation in a gniess has significant influence on the development of pseudotachylyte and fault geometry. Areas with well-foliated gneiss are characterized by a complex geometry of throughgoing pseudotachylyte-bearing faults, damage zones, imbricate wedges, and relay faults. In areas with less-foliated, thicker-banded gneiss, pseudotachylytes are less abundant and exhibit a less complex Riedel geometry. Our ongoing work will focus on gaining a better understanding of the petrology and tectonic setting of the transect.


Poster 124-6, Abstract 380430
BRITTLE IMBRICATE WEDGES CONTROL OUTCROP-SCALE GEOMETRY OF PSEUDOTACHYLYTES IN THE IKERTÔQ SHEAR ZONE, GREENLAND: AN NSF REU STUDY

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Previous studies have described the geometry of pseudotachylyte-bearing faults in the Ikertôq shear zone (ISZ) as “paired shears.” This study found these are more complex structures formed in preexisting, wedge-shaped, imbricate damage zones. As part of an NSF REU, this project conducted outcrop-scale mapping in part of the 50-km ISZ pseudotachylyte system on Sarfannguit Island in southwestern Greenland. The pseudotachylyte system is comprised of master oblique-reverse faults concordant to strongly foliated host gneisses linked through discordant strike-slip relay faults. Within the imbricate wedges, pseudotachylytes are complexly distributed around rotated and folded gneissic blocks between stacked systems of master reverse faults.

This study mapped five imbricate wedges using high resolution drone imagery in map view and hand photography on vertical outcrops. This resulted in a new geometrical three-dimensional perspective. Wedges form where foliation is platy, typically between more coherent hanging wall and footwall blocks. Preliminary calculations indicate average rotations of eight to eighteen degrees within the damage zones. Field measurements suggest the upper fault in the imbricate wedge is approximately planar, while the lower fault splays off the upper fault at a twenty to thirty degree angle, creating a concave-up cuspate geometry.
Both faults have the same shear sense, with fold axes and pseudotachylyte slickenlines indicating reverse oblique offset, usually with a component of dextral shear. Initial deformation and brecciation of the blocks is interpreted as forming prior to the pseudotachylyte-forming event.


**CHEMICAL HETEROGENEITY IN PHENGITE FROM THE ULTRAHIGH-PRESSURE GNEISS, TSO MORARI TERRANE, INDIA**

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The white mica, phengite, is a hydrous, high-pressure mineral that can preserve the chemical signatures of the fluids present during its growth in high pressure environments. The Tso Morari Ultrahigh Pressure (UHP) Terrane in NW India contains a large compositional range of phengite. It is also well suited for researching the importance and origin of fluids within subduction zones because it preserves early and deeply subducted rocks. The samples are primarily white-mica-bearing, quartzo-feldspathic gneiss. Six gneiss samples collected along a 10 m traverse. Mica within each sample were analyzed for mineral chemistry and size ratio of grains. Sample numbering increases with closeness to an eclogite block with TM1 furthest away and TM11 closest. Phengite samples > 5 m from the contact with the eclogite preserved the highest silicon concentrations (6.98 Si p.f.u.) while samples at the contact (TM11) and 2-3 m away preserve intermediate compositions between muscovite and phengite (6.45 Si p.f.u.). The grains in TM2 all have Si averages of 6.88 p.f.u., suggesting most crystals grew in the UHP event. The compositions of mica grains in TM3 and TM11 have similar Si concentrations of 6.42 Si p.f.u. Suggesting a recrystallization event during exhumation. FeT/Mg values as markers of pressure and temperature respectively we have grains that grew at both at near peak conditions and during exhumation. In this preliminary part of the study white mica (phengite) is the primary mineral used because it is a hydrous, high pressure phase that characteristically contains boron when tourmaline is absent. Initial electron probe data has confirmed both high pressure phengite and retrograde lower pressure phengite in the samples. The next steps will be to determine if the micas have distinct in situ δ11B concentrations. Previous studies suggest that the phengite would have low boron concentrations and highly negative δ11B values that are below the range of values expected by MORB basalts and the mantle.


**PETROLOGIC INVESTIGATION OF METAMORPHIC ROCKS AT GLADE GAP, CHUNKY GAL MOUNTAIN IN THE WESTERN NORTH CAROLINA BLUE RIDGE MOUNTAINS**

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Chunky Gal Mountain, located in the southwestern N.C. Blue Ridge Mountains, is a tectonic mélange largely consisting of greenschist, amphibolite, and granulite facies metamorphic rocks emplaced along the Chunky Gal Mountain Fault (Lacazette and Rust, 1089; Peterson, 2014). This research identifies and describes variations in the geochemical and mineralogical compositions of rocks exposed at Glade Gap on the eastern flank of Chunky Gal Mountain using data obtained by x-ray fluorescence, x-ray diffraction, and petrographic analysis. Prior studies (McElhaney and McSween, 1983) show that likely Chunky Gal Mountain protoliths include pelitic sedimentary and mafic to ultramafic igneous rocks. The objectives of this research are to construct a detailed description of rocks exposed at Glade Gap and to correlate their geochemical and mineralogical variations to specific protolith compositions. Major element oxide concentrations (wt %) of most Glade Gap samples are...
consistent with previous Chunky Gal studies reporting a pelitic protolith (SiO₂ = 66.1-77.0, CaO = 2.2-3.2, Fe₂O₃ = 2.5-7.7, MgO = 0.2-1.9, K₂O = 1.5 – 4.1 wt%) and a mafic protolith (SiO₂ = 44.2-53.6, CaO = 10.9-16.7, Fe₂O₃ = 7.0-14.3, MgO = 4.4-8.5, K₂O = 0.14-0.31 wt%) when plotted on an ACF diagram. Calc-silicate samples also are present (SiO₂ = 56.5, CaO = 19.7, Fe₂O₃ = 5.6, MgO = 1.4, K₂O = 2.8 wt%). Petrographic and XRD analysis show that mafic protolith samples are dominated by quartz + hornblende + plagioclase + chlorite + epidote. Pelitic protolith samples are dominantly characterized by quartz + biotite + phlogopite + garnet. Calc-silicate samples contain quartz + hornblende + biotite + phlogopite + calcite + epidote + titanite. Field relations suggest that rocks characteristic of mafic protoliths were emplaced east of the Chunky Gal Mountain Fault, while those characteristic of pelitic protoliths were emplaced west of the fault.


**Poster 124-9, Abstract 383350**

**TRACKING MAGMATIC PROCESSES USING ZIRCON TRACE ELEMENT COMPOSITION AT CERRO UTURUNCU, BOLIVIA**

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Zircon trace element compositions from Cerro Uturuncu present a unique opportunity to track magmatic processes and magma storage temperatures and timescales. Uturuncu resides in the back arc of the Central Volcanic Zone (CVZ) in Chile and is unique compared to similar age and composition arc-front equivalents. Whole rock trace element contents suggest that Uturuncu is derived from a garnet-free, plagioclase-stable, radiogenic source despite the depth of the subducted slab being greater than 150 km. Here we present zircon trace element contents from Uturuncu lavas and compare these data to zircons from large-volume domes along the arc-front and Volcan Ollagüe to determine the conditions of magma storage during zircon crystallization. Uturuncu zircon show little variation between samples spanning 750ky and generally reflect the whole rock signatures compared to the arc front. Large volume Altiplano Puna Volcanic Complex (APVC) domes, including the Chao Dacite, show unique zircon trace element trends and consistently have higher Hf contents and Th/U, U/Yb and Ce/Yb ratios, and lower Gd/Yb ratios. Titanium-in-zircon temperatures are variable between samples ranging from 650°C to over 900°C, are relatively consistent with a sample. Zircon temperatures typically surpass zircon saturation temperatures, suggesting that zircon crystallized and was entrained in a hot zone within the magmatic system. Trace element ratios suggest a transition from a garnet signature to a titanite/apatite fractionation and cooling signature with time. Ollagüe zircons show similar trends but the correlation with age and temperature. Collectively, Uturuncu zircon trace element data suggests that magma feeding Uturuncu lavas was stored and rejuvenated periodically. Storage conditions show similarities in trace element signature with both other CVZ arc front volcanoes and the APVC domes. We conclude that Uturuncu storage conditions and magma sources are initially more similar to the arc front composite volcanoes than the APVC ignimbrites and domes, but transition to become a hybrid between these two end members.


**Poster 124-10, Abstract 380335**

**EVALUATING THE POROSITY AND ROCK STRENGTH OF CARTER COUNTY, KY**

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Carter Caves State Resort Park (CCSRP) located in, Carter County, KY, is a fluviokarst system consisting of 106 km² deeply incised valleys characteristic of the Cumberland Plateau.

https://www.sgeearth.org 10.62879/c95747422
Stratigraphically the region consists of approximately 25m of Mississippian age limestone of the Slade Formation overlain by the lower Carter Caves sandstone member of the Mississippian Paragon Fm. Over the course of the last decade, numerous studies conducted terrain analyses to characterize CCSR P for cave collapse, paleoclimate data, and evolutional history. These studies have primarily focused on the use of digital elevation models (DEM) and GIS driven techniques to identify and correlate cave levels to stream incisions. This region lacks numerical descriptions of in-situ parameters, such as porosity and rock strength, that are commonly used as components in hydrogeologic and karst genesis models. There has been minimal efforts completed to conduct or advance any research in porosity in recent time. Ultimately, this has limited the ability and domain to which further advancements in characterizing CCSR P could be done.

Two samples of the Warix Run member and five samples of the Mill Knob member of the Slade formation were collected near the entrances to Horn Hollow cave. The Mill Knob member consists of light-olive-grey quartzose calcarenite and lesser calcilutite, while Warix Run contains calcarenite and calcilutite with lesser amounts of dolomite and shale. In general, both also contain medium- to coarse-grained red and grey chert, silt, and sand with large crossbedding. All locations were evaluated for rock strength using a Schmidt hammer, and four samples were evaluated for porosity. Thin sections of these samples were acquired and applied with a blue dye epoxy to enhance the visibility of any pore spaces. Using ImageJ and INFINITY ANALYZE 7, 25 images at 4x magnification of each slide were digitized to calculate the average porosity of each sample as well as a cumulative average for both geologic members. The porosity data for Mill Knob displays a mean of 5.05%, with a range from 3.16% to 6.62% while the Warix Run sample had a porosity of 2.63%. Rock strength data for Mill Knob shows a mean of 28.5 n/mm², with a range from 21.5 to 42 n/mm² while Warix Run had a strength of 26.25 n/mm².


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Letter to the members of SGE from your new editor

Scott R. Beason*
National Editor, The Compass, National Council of The Society of Sigma Gamma Epsilon
Park Geologist, Mount Rainier National Park, 55210 238th Avenue East, Ashford, WA 98304, USA

Members of SGE:

Hello! I would like to take this opportunity to introduce myself to you and provide the society with an update of some big changes coming to The Compass. As the newest National Editor, I am looking forward to providing the members of Sigma Gamma Epsilon with an update on what I would like to achieve for The Compass. One of my first publications was in The Compass (“The Lithostratigraphy and Depositional Environments of the Pella Formation (Mississippian) in Keokuk and Wapello Counties, Southeastern Iowa” - Vol. 80, No. 2, 2007), so it makes me happy to come back and serve the society in this role!

I am a graduate of the University of Northern Iowa (UNI) in Cedar Falls Iowa, with a bachelor’s degree in 2005 and master’s degree in 2007. I joined Sigma Gamma Epsilon in the Fall of 2002 at UNI’s Gamma Sigma chapter. I served as Gamma Sigma Chapter Treasurer in Fall 2003-Spring 2004, and Chapter President in Fall 2004-Spring 2005. I recall with fondness the various initiation ceremonies and events that the Gamma Sigma chapter offered. I also try to keep in touch with the students and faculty from UNI and make it a point to stop by the SGE booth at Geological Society of America (GSA) annual meetings.

My day-to-day job is the Park Geologist at Mount Rainier National Park, a role that I have served in since March 2010. I lead the park’s Geology and Imminent Threats programs and am the first NPS geologist at Mount Rainier since the park’s establishment in 1899. My research is focused on studying the geologic landscape in the park to help inform sustainable management of the natural and cultural resources at Mount Rainier in an increasingly warming climate. I am very interested in glaciers and glacial recession, debris flows, flooding, seismic and non-contact methods of streamflow measurement, and the downstream impacts of newly introduced sediment provided to rivers as a result of climate change. I am also interested in the hazards posed by the active geologic processes in the park, especially with respect to ensuring the safety of the park’s employees and visiting public. My job affords me the opportunity to work with some amazing scientists at the park, as well as the United States Geological Survey, and many academic institutions in the region.

This spring, I received an email from Lee Potter, the associate director of SGE and faculty member at UNI, about peer reviewing an article for The Compass. In his email, Lee mentioned that the National Editor role was newly vacant. I jumped at the opportunity to serve in this role, and I accepted the position of National Editor in March 2024. I looked at the past issues of The Compass and have several ideas about how we can improve the look and feel of the journal.

I have many short-term goals as the National Editor, including, but not limited to:

- **Update the look and feel of The Compass.** I have worked hard to improve the publication format, including a complete redesign of the journal with a common format in Adobe InDesign, fonts, colors, etc., and a styling that better matches other scientific journals.

- **A new manuscript template.** I have introduced a new manuscript template as a Microsoft Word document that should help authors write articles for the journal.

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and improve the process of peer review. This is like formats that we use in the National Park Service to facilitate the publication process. The new manuscript template can be found at the following page: https://digitalcommons.csbsju.edu/compass/instructions.html.

- Digital Object Identifier (DOI). Starting with Volume 93, we will be instituting a digital object identifier (DOI) for our journal. This will allow for better referencing and accounting of our material in perpetuity.

- Improved peer review flow. I want to improve the process and flow of submitting articles and initiating the peer review process. This should help facilitate the publication of articles in a timely manner.

- Updates to the DigitalCommons site. I want to update the look and feel of the DigitalCommons site at The College of Saint Benedict and Saint John’s University (CSB/SJU), where the digital version of The Compass lives. A big “thank you” is in order to David Wuolu and CSB/SJU for hosting our journal!

The long-term goals that I have as National Editor include, but are not limited to:

- Improve the “On The Outcrop” series. The “On The Outcrop” series highlights outcrops of geologic significance with photos and a brief article. I would like to see more submissions in this category and will work to improve the series.

- Redistribute issues of The Compass. I would like to create a version of The Compass that is distributed (as a PDF) to all SGE members during each publication cycle. Each issue would have front matter, news/updates, and all research articles.

- A more stable publication cycle. The Compass used to be published quarterly and has recently seen a stagnation of that publication cycle. I hope to see a return to the quarterly publication cycle while I serve as the National Editor.

Tied into that last bullet point is a solicitation I have for all SGE members: Please submit manuscripts to The Compass! I know that there is a significant amount of undergraduate and graduate level research that is being undertaken – I see the results of that at our well-attended and excellent poster sessions at GSA! Let’s move forward from the posters and publish the work that you and your coauthors are undertaking. As I mentioned previously, The Compass was one of my first journal articles and many scientists have The Compass listed on their publication lists. The Compass is a great way to learn about the process of submitting your work to the peer-reviewed publication world and I hope to see an increase in manuscripts in the coming years!

I hope you can tell that I am excited about this opportunity to serve the society and improve The Compass. I look forward to working with all of you and can’t wait to see where we go! If you are in Anaheim at GSA this fall, stop by and say “hi” to all of us at the SGE Booth (#511). Feel free to contact me at scott_beason@nps.gov, or editor@sgearth.org. Let’s get some manuscripts submitted and published!

Sincerely,

Scott R. Beason, MS, LG
National Editor, The Compass

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On the back cover...

The Muddy Fork of the Cowlitz River cuts through Tertiary intrusive diabase and basalt of the Ohanapecosh Formation at Box Canyon on the southeast side of Mount Rainier National Park, Washington. The river, sourced at the Cowlitz and Ingraham Glaciers on the peak’s southeast face, has incised a narrow 5 to 9 meter (15 to 30 feet) by 55 meter (180 feet) deep chasm.

(Photo Credit: National Park Service/Public Domain)

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