ALSO INSIDE
Faculty and student updates, MGRRE, Michigan Geological Survey, Advisory Council, Award recipients, and Department achievements

WELCOME TO DINOSAUR PARK
Featuring Dinosaur Park
The Department of Geological and Environmental Sciences at Western Michigan University is constructing an interactive Dinosaur Park that will not only serve as a vibrant addition to the university community, but will also be used in general education and upper level geology courses as a three-dimensional laboratory and museum exhibit.

Dinosaur Park
The newly created Dinosaur Park supplements the existing outreach programs of the Schmaltz Geological Museum and the CoreKids initiatives at WMU. The park currently hosts life-size replicas of Triceratops, Stegosaurus and Utahraptor. Plant materials include a variety of Mesozoic-like flora including conifers, ginkgos, and ferns. Future installations will include additional dinosaurs, various dinosaur trackways, rock-walls depicting stratigraphic and chronological relationships, and rock outcrops indicating subsurface, geological structures. Installation of these additional features will begin during the summer of 2019.
Dear Friends and Alumni,

Over the past year, the faculty, staff and students of Geosciences, now the department of Geological and Environmental Sciences, continued to deliver on all fronts including research, education, and outreach activities. We are fortunate and excited about hiring Dr. Mine Dogan, who joined us in July of 2018. Mine is a near surface geophysicist with added experience in geochemistry, modelling, and hydrology. She received her B.Sc. and M.Sc. in Geophysical Engineering in 2003 and 2007, respectively, and her Ph.D. in 2013 from the Department of Geological Sciences at Michigan State University on the characterization of aquifers and modeling flow and transport. She then accepted postdoctoral and senior research appointments at the University of Wyoming’s Center for Environmental Hydrology and Geophysics, and at the Department of Environmental Engineering and Earth Sciences in Clemson University. During her stay at Clemson (2015-18), she participated in an EPSCOR project aimed at understanding the fate and transport of radionuclides in soils. Mine’s research interests are diverse and include both theoretical and practical investigations in fluid flow, heat, and solute transport in various media with emphasis on fractured systems. She wears many hats: she is an aggressive researcher as attested by her strong publication and funding record, and an experienced educator who taught a wide range of courses before coming to WMU. Mine brings a wealth of experience to WMU and comes to us at a critical time to lead our efforts in developing a UAV certificate in geophysical and remote sensing applications in environmental and geological sciences, a program to be launched in summer of 2019. She will be responsible for the geophysical aspects of the certificate and my group in the Earth Sciences Remote Sensing (ESRS) facility for the remote sensing parts.

After serving this department for thirty-three years, Professor Bill Sauck will be retiring in spring of 2019. His contributions to this department have been phenomenal and everlasting. Over the years, Bill developed and taught general and specialized geophysical courses (gravity, magnetic, seismic, radar, electric), and supervised many of our graduate students who have since served in academic institutions and in the industry. I had the privilege of working with Bill in the field in the Eastern Desert of Egypt and in the Mojave Desert and through watching him, I got to realize what goes into acquiring meaningful geophysical data and making sound interpretations. You probably need to go with him to the field, or sit in one of his courses, to fully appreciate his approach. Given his commitment over the years, I am hoping, and I am pretty sure, that Dr. Sauck will continue to assist our department and our students as needed after his retirement. I want to take this opportunity to wish Bill the best and thank him for his contributions over the years.

The Michigan Geological Survey continued to identify and implement research and projects that benefit students and the citizens of Michigan. These include, but are not limited to, identifying additional water resources for the City of Portage, quantifying groundwater storage in Michigan’s aquifers using remote sensing techniques, developing collaborative efforts with the Michigan energy industry for expedited mapping of water sources using seismic data, and 3D geologic mapping to identify additional geologic resources (water and aggregates) in the Cass County.

MGRRE focused on student success by conducting industry-sponsored research to increase natural gas storage and CO2 sequestration, by creating hands-on laboratory exercises for WMU students, and by hosting relevant activities led by researchers from other universities. The GSA published a Special Paper documenting research conducted at MGRRE by Bill Harrison and his team about Michigan Basin geologic processes and natural resources. MGRRE also completed a project to rescue cores and cuttings representing Michigan’s two major freshwater aquifers, aggregate materials, and shallow bedrock formations. This project produced comprehensive direct data needed to sustainably use and manage these resources, while mitigating potential risks. MGRRE offered technical workshops for members of industry and government, providing current research findings about geological resources. Peter Voice’s CoreKids program reached 8,000 students at the Kingman Museum, MSU Science Museum, MiCareerQuest Southwest, and gem and mineral meetings.

Year after year, our department secures considerable external funding from various state, federal, and international agencies. Last year, we secured $1,062,447 in external funding and within 6 months of this year, and we have already secured $1,407,476 in grant funding. Our faculty and students published over 25 publications last year and gave over 30 presentations in national and international meetings (GSA, AGU, and AAPG). This year, the GSA annual meeting was held in Indianapolis and the AGU in Washington DC. Both within driving distances. We used the departmental vans to get our faculty and students to these destinations and rented houses within walking distance to the Convention Centers to accommodate them. The department covered all the expenses for the GSA participants and partial expenses for the AGU participants. We had over fifteen presentations in each of these two meetings.

The Michigan Geological Survey continued to identify and implement research and projects that benefit students and the citizens of Michigan. These include, but are not limited to, identifying additional water resources for the City of Portage, quantifying groundwater storage in Michigan’s aquifers using remote sensing techniques, developing collaborative efforts with the Michigan energy industry for expedited mapping of water sources using seismic data, and 3D geologic mapping to identify additional geologic resources (water and aggregates) in the Cass County.

MGRRE focused on student success by conducting industry-sponsored research to increase natural gas storage and CO2 sequestration, by creating hands-on laboratory exercises for WMU students, and by hosting relevant activities led by researchers from other universities. The GSA published a Special Paper documenting research conducted at MGRRE by Bill Harrison and his team about Michigan Basin geologic processes and natural resources. MGRRE also completed a project to rescue cores and cuttings representing Michigan’s two major freshwater aquifers, aggregate materials, and shallow bedrock formations. This project produced comprehensive direct data needed to sustainably use and manage these resources, while mitigating potential risks. MGRRE offered technical workshops for members of industry and government, providing current research findings about geological resources. Peter Voice’s CoreKids program reached 8,000 students at the Kingman Museum, MSU Science Museum, MiCareerQuest Southwest, and gem and mineral meetings.

Year after year, our department secures considerable external funding from various state, federal, and international agencies. Last year, we secured $1,062,447 in external funding and within 6 months of this year, and we have already secured $1,407,476 in grant funding. Our faculty and students published over 25 publications last year and gave over 30 presentations in national and international meetings (GSA, AGU, and AAPG). This year, the GSA annual meeting was held in Indianapolis and the AGU in Washington DC. Both within driving distances. We used the departmental vans to get our faculty and students to these destinations and rented houses within walking distance to the Convention Centers to accommodate them. The department covered all the expenses for the GSA participants and partial expenses for the AGU participants. We had over fifteen presentations in each of these two meetings.
We made GOOD progress on our project to renovate and expand Dr. Schmaltz’s Museum. The project is intended as an outreach and educational activity. The museum has both an indoor and an outdoor component. The indoor component includes the Duncan’s extensive mineral collection, the Mastodon fossils, and the shark teeth collection. The outdoor component includes developing a dinosaur park. Over the summer, we have started working on this project. We acquired and installed Utahraptors (two installed), Stegosaurus, and Triceratops modules, and planted vegetation that was present when dinosaurs roamed the land such as ferns and gingko trees.

In the spring, we plan on increasing our collection by acquiring additional dinosaur modules, dinosaur footprints, and stratigraphic successions. Drs. Robb Gillespie and Andrew Caruthers are overseeing the development of the Dinosaur Park and Dr. Caruthers accepted the position of the curator of the museum effective summer 2018. The first phase of the project will require an investment of $300,000, $25,000 of which have been committed by the college, $7,000 by our department, and $20,000 contributed by donors to date. Only a few days ago, Dr. Caruthers generated a $30,000 endowment for the museum.

We are looking for donors to help us reach our goal and at the same time preserve and honor the legacy of the founder of our department, Dr. Lloyd Schmaltz.

My research team includes ten Ph.D. students: Mustafa Emil (Turkey), Karem Abdelmohsen (Egypt), Sita Karki (Nepal), Hannah Pankratz (USA), Esayas Gebremichael (Ethiopia), Hossein Sahour (Iran), Abdulaziz Aljammaz (Saudi Arabia), Guzalay Sataer (China), Moein Izadi (Iran), and Mohamed Elhebery (Egypt). Last year, our research team delivered over fifteen contributed and invited talks in the annual meetings of the GSA and AGU. Four articles were accepted for publication in Remote Sensing, Journal of Geophysical Research, Science of Total Environment, and Surveys in Geophysics. My students are joining the work force even before graduation. Esayas successfully defended his thesis in fall 2018, and accepted a research associate position at the University of Alabama in Huntsville. Sita will be defending her thesis in spring of 2019 and she too secured a research position in the Irish Centre for High End Computing at the National University of Ireland. Hannah will be defending her thesis in spring of 2019 and she has been teaching at the University of Toledo starting in fall of 2018.

I am looking forward to seeing you all at our spring banquet on April 12, 2019, learn more about your successes, get your feedback on our efforts, and work with you on advancing the educational, research, and outreach mission of our department.

Dr. Mohamed Sultan,
Department Chair
In the Department of Geological and Environmental Sciences...

We offer a variety of academic programs for college students and professionals seeking education in earth sciences, environmental science, resource exploration and recovery. Through its national and international collaborators, the department highly encourages off-campus joint internships and training opportunities for students in diverse, fundamental and applied research fields. Our efforts, and the determination of students, have led to the placement of alumni in prestigious national and international institutions. We encourage the enrollment of highly qualified and motivated students and are proud of our alumni who are working in a wide range of geological and environmental sciences professions.
Greetings friends and alumni: It was another really good year. There were a number of graduate students that graduated this year that had included me on their committees. Sarah Vandermeer completed her Ph.D. defense and finished the final iteration of her mapping of the Pictured Rocks National Lakeshore area – award winning work. Nate Charlton, still working for the Parks Service, returned for a few days to successfully defend his Master’s thesis. Alex Koerber wrapped up his igneous master’s work in a frenzied burst of activity, with Nick Moleski only a semester behind. Both Ben Seiderman and Karl Backhaus completed their glacial mapping projects. They did a great job with their defenses, adding yet another section to the Michigan glacial mapping efforts. New graduate students, Tyler Norris (glacial mapping) and Kevin Rupp (Upper Peninsula igneous intrusions), are both busy doing summer field work. I suspect their busy summer will lead to another busy year for me.

Five of our graduate students, Austin Johnson, Brooks Ryan, Hannah Pankratz, Mohammed Hashim, and Neal Turluck, formed our new IBA team for the “American Association of Petroleum Geology” (AAPG) international “Imperial Barrel Award” (IBA) competition. Similar to last year, the team was given all the geological and geophysical data needed to determine the oil and gas potential of an area, and then they presented their results and recommendations to a panel of industry experts. I was their faculty advisor, and Kyle Patterson was their “outside consultant.” Long nights ensued, and the team made a terrific presentation, but, no medal this year. However, every team member gained valuable experience and insights. Just being on an IBA team is something special to put on a resume, and that’s just what Neal Turluck did. He included his IBA experience on a scholarship application, and was awarded one of 20 international Exxon/Mobil SEG scholarships. Sometimes things “pay-off” in subtle ways.

Andrew Caruthers has been named the curator of the Schmaltz Geology Museum in Rood Hall, and somehow, I’m still not sure how, I have become the person leading the charge for our new outdoor geology lab next to Rood Hall (and behind Lee Honors College). This area will serve a dual purpose. First, it will contain a number of rock outcrops to give students the opportunity to identify rock types, fossils, faults, and correlate sections in the field. The outcrops will be specifically arranged so they can be employed for all manner of structural geology exercises. We’ll use these “outcrops” for a number of our geology courses, but in particular, for our new “Field Methods” module beginning next summer. Secondly (and perhaps the most fun - the part to get the students curious about what’s going on in the area), will be the Mesozoic Setting. The WMU Landscaping group is already busy putting in Ginkgo trees, Ferns, and other Mesozoic plants. And, the life-sized dinosaurs have begun to arrive. Yup - that’s right - life-sized dinosaurs. We already have the two Raptors, and a Stegosaurus is in shipping (Wayfairer.com – no shipping – go figure). We’ll be adding dinosaur footprints (trace fossils) done as stepping stones throughout the area. This will give students the opportunity to “track down” the dinosaurs by type of foot print, stride length, impression depth, etc. and will lead them directly to the dinosaurs themselves. I suspect Dr. Peter Voice will be extra busy with his “Dinosaurs” course this next year. Eventually, we plan to expand the footprint network out into the general campus area to give the students a “trail” to follow to Rood Hall and discover the dinosaurs and geology. Footprints are expected to sell-like-hotcakes, so put your order in today.

I’m still doing my usual GEOS 1000 “Dynamic Earth,” GEOS 3220 “Ocean Systems” (both classroom and on-line), and GEOS 1500 “Natural Hazards and Disaster” during the spring semester. New text-book editions and changes to the online homework portions of the courses are keeping me busy. Back at home, its grass, bushes, and bugs. The work never ends – it just gets more difficult as you get older. Be careful what you wish for.◆

Greetings to all of you. In the last year I have continued to teach and perfect my online graduate courses and have put GEOS 6000 (Hydrogeochemistry) online for the first time. This is a course that Al Kehew used to teach but had not taught for several years. I changed the course and put an emphasis on organic hydrogeochemistry, because we have so many other courses that deal to varying degrees with the inorganic side of things. Our new Hydrogeology Certificate was the major motivation for many of us putting 5000 and 6000-level courses online, and it seems to be humming along nicely.

Research-wise, I have continued to conduct research on plant-based surfactants, mostly saponins, which comes from the soapbark tree (Quillaja saponaria) grown mostly in Chile. I have also begun to research in earnest a group of contaminants called per- and polyfluoroalkyl substances (PFAS). As you may know, Michigan has a lot of PFAS-contaminated sites, and one hears about something related to PFAS contamination almost daily on the news here in Michigan. There are about 3,000 different individual chemicals in the PFAS family, and they are generally considered to be among the most toxic and persistent organic contaminants in our soil and sediments, and groundwater and surface waters. So, it looks like I have my work cut out for me! ◆
Good day everyone! This has been another exhilarating and exhausting year in the Department. I continued on as Graduate Advisor, Faculty Teaching Specialist and Director of K-12 Outreach.

The Dinosaur class was a success – with the help of some talented individuals at the Extended University Programs office, I built a semester-long, general education course on dinosaurs. The course covers basic geology, paleontology, and evolutionary biology in the context of the Mesozoic world. I have to admit, I learned a great deal about dinosaurs during the process! By the time you read this article, the course will have been taught 4 times – with the most recent class consisting of more than 100 students!

In addition to the Dinosaurs course, I also taught several courses that I have been teaching routinely – Advanced Stratigraphy, Historical Geology, Structural Geology, and Field Mapping. For the Structural Course, my teaching assistant, Hannah Pankratz, and I wrote a lab manual – we successfully tested this past spring and over the summer will revise it. I also took the students on a very cold weekend trip to Baraboo Wisconsin to explore the Baraboo Syncline, last April. For Historical, I kept up the tradition of a spring field trip to Grand Ledge – this year it was an optional trip due to the weather. Several students found very nice fossils – including (and this is a first for me at the site) a pygidium of a trilobite.

Graduate advising mostly went well – though there was still a bit of a learning curve for me to get through. I am currently serving on 11 thesis/dissertation committees – which also keeps me quite busy. This year, I was allowed to start advising Honors theses for undergraduate students – my first student Elizabeth Gaines will start a project this fall, looking at the Amherstburg Limestone.

In between classes and visits with students, I worked on several manuscripts – three of which were published early in 2018. For Bill Harrison, Mike Grammer, and Dave Barnes’s, GSA Special Paper volume, I co-authored 2 articles and the introduction. I am quite proud of the paper “Evaporite facies of the Michigan Basin”, which Bill and I co-authored. It was an amazing opportunity to learn a great deal about salt and rock gypsum – and gave me the opportunity to meet and work with a famous evaporite sedimentologist, Charlotte Schreiber. The second paper dusted off work that I did as a student at WMU with Mike and Bill – and is the summation of many years work on the Silurian Burnt Bluff Group. The introduction to the volume includes some new research – I presented some of the natural resource production statistics for Michigan in it. In addition, I co-authored a manuscript with some Irish colleagues on some suggestions for best practices in acquiring U-Pb age dates from detrital zircons – this manuscript should be published sometime this fall.

CoreKids survived another year – a donation from the Michigan AIPG helped fund the activities this year. We worked with approximately 16,000 children at 25 events. I presented on our teacher workshops at North Central GSA in a session co-chaired by Lisa Anderson (WMU, 2009) and myself. It was a very cold trip to Ames, IA, with a lot of fun driving to get back. Lisa and I will co-chair an outreach session at NC-GSA again in the 2019 meeting in Manhattan, KS. I had the opportunity to go to the annual meeting of the American Association of Petroleum Geologists this spring, as the new delegate for the Michigan Basin Geological Society, I was able to participate in the legislative workings of AAPG. It wasn’t all work though – I also took the time to visit the Great Salt Lake for the first time! I also enjoyed an evening at the Natural History Museum of Utah, where the picture above was taken.

DID YOU KNOW?

At present, over 700 species of dinosaurs have been identified and named. However, palaeontologists believe that there are many more dinosaur species to still be discovered.
Greetings! Over this past year I have enjoyed expanding my teaching duties while also making strides in research activities. Starting fall 2017 and extending into spring 2018, I have begun to teach two courses for the Department, GEOS 3120 (Geology of National Parks and Monuments) and GEOS 3010 (Minerals and Rocks). While both of these courses offer very different areas of focus, their content covers several key concepts in geoscience, necessary for a central understanding of Earth Systems Science and the geologic evolution of North America. I am grateful for this opportunity and look forward to continued success in these courses in the future.

In terms of research activities, my time is divided into two areas of focus. I am working with Dr. Steve Kaczmarek and the folks at MGRRE to study the significance of the organic carbon isotope record in halite sequences of the Silurian Salina Group (Michigan Basin), and I am also part of an international collaboration exploring the dynamics of two mass extinction events in the eastern part of the Panthalassa Ocean; the latter has been funded by the National Geographic Society. I am looking forward to another exciting field season in Alaska (photos from 2017 field season) where we are expecting to continue our investigation of the controlling mechanisms and magnitude of the end Triassic and Early Jurassic mass extinctions. In regards to both of these projects, I am happy to report publications this past year in the Bulletins of American Paleontology, GSA Bulletin, and the Proceedings of the National Academy of Sciences.

Lastly, I have accepted a new position in the Department as Curator of the Schmaltz Museum. The high level of recent monetary support from Alumni and friends of the Department has facilitated renovation and transformation of the museum from a basic collection of minerals and minor fossils to a functional research museum. This renovation will become a springboard for funding, community education, and student research / professional development in our Department. I am looking forward to this new role in the Department and the opportunity to participate in the renovation process. 

Dr. Andrew Caruthers

DID YOU KNOW?

The name ‘Triceratops’ comes from the Greek language, with ‘tri’ meaning three and ‘keratops’ meaning horned face. Triceratops lived in the late Cretaceous Period (around 65 million years ago). They had anywhere between 400 and 800 teeth, although only a small percentage of these were in use at any one time as they were constantly replaced throughout its lifetime.

Ph.D. student Selva Marroquín and Dr. João Trabucho-Alexandre working at the Grotto Creek Section, Wrangell Mountains in southern Alaska (2017 field season).
In fall 2018, senior undergraduate student, Katharine Rose, was awarded, the Undergraduate Research Excellence award from the Office of the Vice President for Research. She engaged in a study on the spatial distribution of sulfur isotope ratios in the Eagle and Eagle East economic sulfide Ni-Cu-PGE deposit in UP Michigan. Her work was presented in the Annual Meeting of the Institute of Lake Superior Geology (ILSG) in Iron Mountain, MI in May 2018.

Nick Moleski is in the final phase of writing his M.S. thesis on the sulfur isotope characteristics of volcanogenic massive sulfide deposits in the Penokean Belt of northern Wisconsin and UP Michigan. Nick presented his findings in the Annual Meeting of the Geological Society of America, North-Central Section, at Ames, IA, in April 2018.

Kevin Rupp is in his first year of the M.S. program on the new gabbroic intrusion associated with the Eagle East intrusion. His initial results were presented in the ILSG meeting at Iron Mountain.

In spring 2018, Alex Koerber graduated with an M.S. degree. The title of his thesis is: “Geochemical and petrological investigation of the prospective Ni-Cu-PGE mineralization at the Echo Lake intrusion, in the Upper Peninsula of Michigan”. His graduation marked the completion of a project funded by Altius Resources Inc. which started in 2017.

Three articles have been published in peer-reviewed journals and as book chapters based on work which I have been doing on Alaskan-type complexes. Two of the articles were based on my collaboration with authors from the Chinese Academy of Sciences. My continuing work on the Alaskan-type complex at Salt Chuck, AK was presented at the 13th International Platinum Symposium at Polokwane, South Africa in July 2018. One article, based on the M.S. thesis of Anthony Boxleiter, who graduated in 2015, was submitted to Ore Geology Reviews. Three new articles are being prepared for publication based on the works of Kevin, on the Echo Lake intrusion; Nick, on the Penokean Volcanic Belt and the combined results from M.S. student, Ben Hinks, who graduated in 2016 and the new sulfur isotope data generated by Katharine.

I have taught the courses: Mineralogy, Petrology and Economic Geology in the fall and spring semesters. I am engaged with the online version of the GEOS 1000: Dynamic Earth in Summer II semester. At the end of spring 2018, I participated in a field trip of the Geoclub to Iceland. There were sixteen members of the group which conducted field studies in the southeastern and southern coastline of Iceland.
I continue to enjoy my administrative role as an Associate Dean with the College of Arts and Sciences, working on initiatives related to promoting research, fostering graduate education, and enhancing diversity and inclusion across the College. In June, I was promoted to the rank of Professor and warmly thank my colleagues in the Department of Geological & Environmental Sciences and the Mallinson Institute for Science Education for their support of my research, teaching, and service over the years.

Congratulations in my research group go to Dr. Peggy McNeal, who completed her Ph.D. in Nov. 2017 and will start as an Assistant Professor in the Department of Physics, Astronomy, & Geosciences at Towson University this fall. Congratulations also goes to Laura Tinigin, who completed her M.S. Geosciences in July 2018 and will continue at WMU in the Ph.D. Science Education – Geosciences program. In addition to Laura, my research group includes Ph.D. student Sammy Nyarko, M.S. student Jay Cockrell, and Megan Doorlag, an undergraduate double major in Earth Science Education and Secondary Earth Science Education. A new M.S. student will join us this fall.

Administrative work leaves little time for other academic pursuits, but I’ve been delighted to work on *Pathways to Science Teaching* (wmich.edu/science/pathways), a new project seeking to reform the preparation of science teachers at WMU through creation of a summer program involving scientific research, teaching preparation, and teaching practice. This project is co-directed by Steve Kaczmarek (Geological and Environmental Sciences), Todd Ellis (Mallinson Institute and Geography), Steve Bertman (Institute of the Environment & Sustainability), and Paul Vellom (Teaching, Learning, and Educational Studies). Our first cohort of 8 students have been busy conducting a water quality study along Portage Creek and teaching middle school youth in the ATYP summer program. It has been amazing to work with such a talented group of future educators.

The name Brachiosaurus comes from Greek words meaning ‘arm’ and ‘lizard’. The name refers to the interesting nature of Brachiosaurus legs which were longer at the front than the back. The weight of Brachiosaurus has been estimated between 30 and 45 metric tons.
Dr. Michelle Kominz

This past year was particularly busy for me. I think this happened because I wrote and submitted a proposal to the ACS PRF (American Chemical Society, Petroleum Research Fund) new initiatives program. Okay, so how is someone who is so old qualify for a “new initiatives” program? Much of my research over the past 40 years has used the “backstripping” method with the goal of determining tectonics or sea-level change. But a by-product of the analysis is geohistory, which generates the time vs. burial depth of sediments, including their lithologies, porosities and compaction. If you add a thermal model to the geohistory data, voila, you can estimate hydrocarbon maturation through time. This was something that I studiously avoided doing for about 35 years, until Kirk Wagenvelt, now at Exxon-Mobil, and a graduate of our geochemistry major, came to work with me on Michigan Basin maturation. That work gave me the foundation needed to write a proposal. And, meanwhile, Jack Hybza (M.S. candidate) had begun an expansion of that project. So I knew that sedimentation/stratigraphy students here were eager to have an introduction to thermal modeling and this proposal could provide the means to make it happen. It is almost July and the proposal was funded. In addition to Jack, who is working on geodynamic and geothermal modeling of a cross section of wells across the basin, Derek Patterson has joined the team, focused on understanding the current thermal gradients and heat flow in the Michigan basin.

This does not mean that work in the Wanganui Basin and the Canterbury basin of New Zealand, or the Northwest Shelf of Australia has abated. Not at all. So, research life is full.

Meanwhile, teaching this past year was ocean systems. I had the privilege of teaching the face-to-face version of the class both in the fall and in the spring. And, since I am unable to teach a class without modifying it, I modified the class to match the format that Robb Gillespie has been running in his class for many years. That is, I increased the number of online exams and reduced the number of in-class exams. This resulted in slightly more than no-one coming to review sessions. I have not figured out how to fix this problem yet. But I have ideas.

And my other job as an undergraduate advisor, has morphed me into also being the queen of assessment. Between being the exit interviewer for most of the students in the department and knowing the details of most of the degree programs in the department, it was self-evident that I should become queen. Fortunately, Steve Kaczmarek is also on the team, so we try to generate evaluations that will be of use to the department in improving the programs that we offer. And we try to convince our colleagues that this is of value. Because the upper administration (President, Provost etc.) is in a constant state of flux, criteria could change at any minute.◆
Dr. William Sauck

Here are some highlights since July 31 of 2017. We made our usual late July-early Aug. four-week trip to our beach home in Sao Luis, Brazil. Then, back to my full-time fall semester job. I was assisted in Geos-5600, a large class of 22, by my experienced TA, Hannah Pankratz. Geos5630, Electrical Methods, had an enthusiastic class of nine, and nobody got shocked!

Immediately after Christmas, I went for 2 weeks with Dr. Sultan and Hannah Pankratz to Jazan City, in the far SW of Saudi Arabia, and was uncomfortably close to the Yemen border. We saw Predator drones flying missions out of the local civilian airport. We did some passive seismic work and also worked with the Saudi Geological Survey crews doing magnetic and gravity surveying. Both inbound and outbound, I stayed for a few days at the Saudi Geol. Survey headquarters in Jedda; a very impressive research campus, the complex build largely by the USGS many years ago.

My spring (off) semester again allowed us to escape the MI winter from Jan. 18 to Mar. 21 at our Brazil home. I continued surveys on Sao Luis Island with the Tromino passive seismic instrument. On our return trip we detoured to the far S of Brazil, to Florianopolis in Santa Catarina state for 5 enjoyable days.

Mar. 23 was a busy day with a pair of final M.S. thesis defenses by 2 of Dr. Kehew's advisees who also did a substantial amount of passive seismic work; Ben Seiderman and Karl Backhaus. Next was the trip to the SAGEEP conference in late March, in Nashville. I presented a wide-ranging talk in the Education Section about forty years of experiences teaching geophysics Laboratory exercises. Ben Seiderman presented his poster with the results of his passive seismic work in the Portage and Schoolcraft NW Quadrangles. Partly as a result of contacts made there, Ben has since taken employment in geophysical exploration for minerals with Zonge, Inc. in Nevada, while Karl is back with the NY Geological Survey. Another of Dr. Kehew's M.S. students, Tyler Norris, has ably continued the HVSR passive seismic surveying in the Climax and E. Leroy Quadrangles just E of Kalamazoo.

On the family front, Kelly's and my families total 9 children, 20 grandchildren and 3 great-grandchildren. In April we made a trip to Tucson for me to meet faculty and former classmates and participate in the UofA Geosciences Dept. 2-day student conference "GeoDaze", followed by a family trip to San Diego. On the way back, we encountered high winds and a dust storm several thousand feet above ground near the Denver airport where we were to have a plane change. This led to delay in landing and another 6-hr delay in our departure to Grand Rapids. That put us into GRR at 3am on April 18, where we still had to chip our car out of enveloping ice – welcome back to MI!

Dr. Alan Kehew

Over the past year, I have continued mapping the glacial geology of southwestern Michigan. Under 2 USGS programs, we are currently mapping in Cass County. Last fall, on my sabbatical, I began the compilation of maps I have made over the past twenty years or so, and I hope to complete a regional surficial geologic map of southwest Michigan before I retire in the near future. Another project that I am happy to report is finished is USGS Special Paper 530, "Quaternary Glaciation of the Great Lakes Region", which I co-edited with Brandon Curry of the Illinois State Geological Survey. In addition to my paper in the volume (with, John Esch of MDEQ and Sita Karki of our department), there were papers by former Ph.D. grads Andy Kozlowski and Brian Bird. It was great to get this volume out! Also over the past year, I have been revising my textbook, “Geology for Engineers and Environmental Scientists”. Pearson dropped this book after 3 editions over thirty years, even though it is a consistent adoption for some departments. Luckily, Waveland Press offered to publish the 4th edition, and publication is underway now.

This spring, 3 outstanding graduate students finished: Sarah VanderMeer (Ph.D.), Karl Backhaus (M.S.), and Ben Seiderman (M.S.). They were among the best of forty-some grad students I have had at WMU and I was really sorry to see them go.

Outside of work, I managed to fit a Smithsonian tour of Italy into my sabbatical. It was a great experience and Pompeii was one of the best places. I never realized how close to the city Vesuvius really is. It was really weird but the local guide for that day was wearing a WMU broncos baseball cap.

Last and definitely least, I have had a strange desire to try to write some fiction over the past few years. The result of this is two novels, "Glen Canyon" and "Invisible Danger", both of which are in the mystery/thriller genre with a geology theme. They are both available on Amazon (self-published) in paperback or e-book form. Recently, I received a royalty payment from Amazon in the amount of $0.01 as a direct deposit into my bank account, so I really think this line of work has a great future for me.◆

DID YOU KNOW?

A Tyrannosaurus Rex bite was more than twice as powerful as a lion’s bite. It had jagged teeth 6 inches (15 cm) long.
The year gone by was very satisfactorily productive. The isotope lab continues to be active with a large number of samples being processed. I had the advantage of delivering a keynote address at the 7th European Conference on Mass Spectrometry held in the historic city of Rome. The conference organizers were smart enough to arrange the meeting a good twenty-five miles from the tourist attractions so the participants were forced to be at the meeting all day! While my experience in the past has been attending meetings in geosciences, this was unique in that the organizers invited papers in any research area that used a mass spectrometer. I therefore had the opportunity to listen to some great applications of mass spectrometry in areas as diverse as medicine and material science. I also convinced a well-known scientist from NASA who was at the meeting to visit us and give a departmental seminar. That was scheduled this past fall.

My Ph.D. student, Shelby Hurst, is progressing towards graduation. She and I got a very good peer-reviewed paper accepted in the Encyclopedia of Water Science and Technology. Lincoln Grevengoed has joined to do his M.S. in isotope hydrology. His topic looks to be a very good problem on the applied sciences. After a lapse of several years, I am glad to have an undergraduate student carrying out research in my lab. She, Stephanie Buglione, also received the Undergraduate Research Excellence Award from the College of Arts and Sciences.

I am pleased to announce the launching of my new on line course Isotope Hydrology. This is a complete course in that it deals with stable as well as radioactive isotopes that are routinely used by hydrologists.

Besides being well known for its history, Rome is apparently also a city of pickpockets! While I was not a victim of pickpocketing, I decided to pull a prank on my wife to explore the humorous side of this danger. My wife’s surprise is depicted above! Picture courtesy of Sowmya Krishnamurthy.

Greetings everyone. Another year has come and gone in a flash! With many of my courses developed, I was able to spend more time this year on research and field work. This summer Ryan Cascarano became my first Masters student at WMU to graduate. He did very well on his thesis project which involved developing a dye tracer methodology for characterizing subsurface flow paths within the hyporheic zone. One thing about Ryan many may not know is that, in addition to his solid field skills, he is an excellent photographer – included are some of his project photos from field work conducted in mid-May. Clay Joupperi is close behind Ryan and is working towards defending his research on the characterization of the Overisel and Salem gas storage reservoirs this fall.

Tanten Buszka, in his final year as an undergraduate, helped to design and commence a sodium bromide tracer study in Port Charlotte, Florida. This project will serve as Tanten’s thesis and involves characterization of the surficial sandy aquifer in the region to better understand subsurface transport of septic effluent to Charlotte Harbor. In addition to Tanten coming aboard as a Master’s student this fall, Madi Wayt has joined us from LSU. Please give her a warm welcome. Romeo Akara and Xiang Fan are both making good progress on their doctoral research.

On a personal note, my family and I have been here for a little over two years now and are really enjoying Kalamazoo and the surrounding area. We went kayaking in Lake Michigan this summer and recently spent some time in Colorado hiking and fly fishing in Rocky Mountain National Park.
Dear friends: it’s been another exciting and productive year in the Carbonate Petrology and Characterization Laboratory (CPCL).

Below are a few highlights pertaining to our continued efforts to build upon the solid tradition of research and education at WMU. First, our team had a very strong showing at the 2018 annual AAPG Convention, which was held in Salt Lake City, Utah, in May. Of the 8 graduate students in the CPCL, 7 gave technical presentations. More importantly, they represented our department and university extremely well. The students were confident, professionally polished, and technically sound. Watching these young and talented scientists showcase their work to a crowd of academics and industry professionals was very exciting for me.

I can say without hesitation that the conference was the highlight of my year. The trip was fun and productive, and helped reenergize and refocus our team heading into the summer research season. A few of us also took some time after the meeting to unwind by exploring the desert southwest.

In Feb., Brooks Ryan and I traveled to Doha, Qatar to meet with our collaborators as part of a 3-year, $155,000 research project funded by ExxonMobil Research Qatar. We were there to examine outcrops, modern depositional settings, drill cores, thin sections, and geochemical data. The goal of the project, which constitutes the bulk of Brooks’ Ph.D. thesis, is to unravel the diagenetic history of the Eocene carbonates that underlie much of the country. Very little is known about these rocks, which is surprising considering they represent an important aquifer. Our work shows that although they were never deeply buried, these carbonates have an extremely complicated diagenetic history.

We also got word in June that our grant proposal to study calcite microcrystal diagenesis was funded by the U.S. National Science Foundation. This is a 2-year collaborative project between Western Michigan University and Iowa State University. The WMU portion of the grant will provide $156,000, most of which will support Mohammed Hashim’s Ph.D. research. The goal of the project is to use laboratory experiments, geochemistry, and advanced imaging techniques to study how carbonate sediments evolve chemically and physically after deposition. We are very excited for this opportunity; stay tuned for updates!

Dr. Stephen Kaczmarek

Below are a few highlights pertaining to our continued efforts to build upon the solid tradition of research and education at WMU. First, our team had a very strong showing at the 2018 annual AAPG Convention, which was held in Salt Lake City, Utah, in May. Of the 8 graduate students in the CPCL, 7 gave technical presentations. More importantly, they represented our department and university extremely well. The students were confident, professionally polished, and technically sound. Watching these young and talented scientists showcase their work to a crowd of academics and industry professionals was very exciting for me.

I can say without hesitation that the conference was the highlight of my year. The trip was fun and productive, and helped reenergize and refocus our team heading into the summer research season. A few of us also took some time after the meeting to unwind by exploring the desert southwest.

In Feb., Brooks Ryan and I traveled to Doha, Qatar to meet with our collaborators as part of a 3-year, $155,000 research project funded by ExxonMobil Research Qatar. We were there to examine outcrops, modern depositional settings, drill cores, thin sections, and geochemical data. The goal of the project, which constitutes the bulk of Brooks’ Ph.D. thesis, is to unravel the diagenetic history of the Eocene carbonates that underlie much of the country. Very little is known about these rocks, which is surprising considering they represent an important aquifer. Our work shows that although they were never deeply buried, these carbonates have an extremely complicated diagenetic history.

We also got word in June that our grant proposal to study calcite microcrystal diagenesis was funded by the U.S. National Science Foundation. This is a 2-year collaborative project between Western Michigan University and Iowa State University. The WMU portion of the grant will provide $156,000, most of which will support Mohammed Hashim’s Ph.D. research. The goal of the project is to use laboratory experiments, geochemistry, and advanced imaging techniques to study how carbonate sediments evolve chemically and physically after deposition. We are very excited for this opportunity; stay tuned for updates!

Dr. Stephen Kaczmarek
With regards to teaching, I've made good progress with Physical Geology, Sedimentation and Stratigraphy, and Carbonate Depositional Systems over the past year. The students in these courses continue to amaze me with their thirst for knowledge and their drive to succeed. What I've learned is that they thrive best when engaging in hands-on activities, especially in the field. I also had the opportunity to teach 5 weeks over summer as part of a 3-year, $365,000 NSF-funded project called Pathways to Science Teaching. One goal of the project is to use an intensive summer research experience to inspire future educators to identify more strongly as scientists. This year the students chose to explore how land use impacts water quality along Portage Creek, a major tributary of the Kalamazoo River. The results were promising and add to our knowledge about how road salt impacts local waterways. We hope to present this work at GSA in the fall.

Finally, I’d like to recognize the success of CPCL graduate, Matt Hemenway, who earned his M.S. degree this summer, and is now working as a geologist in Houston, TX. Matt is a remarkable individual, and will undoubtedly serve as a wonderful WMU ambassador as he moves forward in his career. His thesis project is currently being written up for publication, as are a number of other projects by CPCL team members including Cameron Manche, Brooks Ryan, Matt Rine, and Mohammed Al Musawi. Staying on the subject of publications, I am proud to report that the CPCL team published 4 peer-reviewed papers in 2018 and was very active at national meetings and conferences. A strong publication record is one of the many ways in which this team strives to showcase the Department of Geological and Environmental Sciences as a center of research excellence.

Of course, there were a number of other important accomplishments coming out of the CPCL this year, but we’ll have to cover those some other time. Please feel free to reach out with any inquiries. We’re always happy to engage with our friends via a tour of our laboratory or by grabbing a cup of coffee.

We wish you and yours all the best, and as always, Go Broncos! ◆

**WHAT HAPPENED TO THE CRETACEOUS PERIOD?**

The Cretaceous Period began 145 million years ago (Mya) and ended 66 Mya. It lasted for 79 million years and was the longest and the third and final period of the Mesozoic Era. The Cretaceous Period ended with a mass extinction event in which 70% of all species became extinct, including all non-avian dinosaurs. The Cretaceous Period was preceded by the Jurassic Period, and followed by the Paleogene Period.

**DID YOU KNOW?**

Ceratosaurus were carnivores that lived in the late Jurassic Period. The name is pronounced ‘sih-rat-uh-saw-rus’ and means ‘horned lizard’. This carnivorous dinosaur had a strong jaw with teeth like blades. Their length was around 20 feet and weighed around 980 Kg or the size of a small car.
The Department is excited to announce Phase 1 construction of Dinosaur Park on the northeast side of Rood Hall, behind Lee Honors College. Dinosaur Park is an aesthetic three-dimensional collection of interactive museum exhibits that will not only help students of all ages visualize an important era in Earth history, but will also incorporate real-world datasets from many sub-disciplines to aid in laboratory and classroom exercises. With Phase 1 well under way, we are pleased to see the addition of several life-sized dinosaur replicas to our geological family here at Western Michigan University!

We are proud to introduce our new friends: *Utahraptor* (two installed), *Stegosaurus*, and *Triceratops* (Figs. 1–5); and are looking forward to the potential addition of a *Brachiosaurus*, *Parasaurolophus*, and *Spinosaurus* within the coming year if funding becomes available. Phase 1 will also see the addition of several dinosaur trackways that will be set to scale, and will extend across the park in various directions. These trackways will form the basis behind laboratory exercises which focus on measuring stride length as a proxy for systematic classification of dinosaur species. The park is open to all visitors, we just ask that you do not feed the dinosaurs!

---

**Ginkgo Biloba** A plant that shared the earth with the dinosaurs. *Gingko* has gone through minimal changes in its lifetime.
Monetary support is a critical component to the construction of Dinosaur Park. With your help, we can make invaluable additions that will focus on: Geologic time and rock units within the Michigan Basin, important stratigraphic relationships and unconformities in the rock record, and the dynamics of the end Cretaceous mass extinction. We are currently accepting donations to help supplement construction costs and future exhibits at Dinosaur Park and the Schmaltz Museum. Please visit us at:

WMICH.EDU/GEOLOGY/GIVING

TO DONATE

CAN YOU SPOT THE RAPTOR?
Investigate the dinosaur photo (left) to see if you can find the Raptor!

LOCATION
Dinosaur Park is open to the public and is located on the northeast side of Rood Hall.

OPEN
Monday - Sunday

PARKING
If visiting on Saturday or Sunday, you may park in the lot just outside of Rood Hall. If you are visiting during the week, you will need to obtain a parking pass through parking services.

Figure 2
Triceratops gets a ride across campus.

Figure 3
Triceratops fully installed at its new home in Dinosaur Park.

Figure 4
Nick Gooch (Facilities Services) secures Stegosaurus to cement pedestals prior to assembling the tail and dorsal plates.

Figure 5
Dr. Sultan poses with the nearly completed Stegosaurus exhibit.
DID YOU KNOW?

Tyrannosaurus is from the Greek word meaning Tyrant Lizard. A Tyrannosaurus Rex had a life span of around 30 years.
Hello friends and alumni! Our Hydrogeology Field Course (HFC) has been continuously running for over thirty years and has provided the summer field camp experience to many budding scientists from the Midwest and beyond! Matt Reeves and I spend ten months a year in preparation for opening day. We are focused on an overall camp experience while bridging the gap between fundamental knowledge and applied techniques for our students. We want our campers to develop a passion for groundwater science while meeting new people, building professional networks and learning how to work together as a team. Each year, the HFC provides an environment for students to grow physically, mentally and emotionally while preparing themselves for rewarding careers. I believe camp can help build a person’s self-esteem, leadership qualities, character, and so much more. I have been at a camp either as a camper, counselor, unit leader, or director since 1984, and I have been a Camp Director for the best hydrogeology field camp in the world since 2011. I have dedicated my life to camping.

Our campers build character and develop friendships and skills. My favorite thing about being a part of a geology field camp is watching the relationships that would not normally be built during the regular academic school year. Some best friends are made at summer camp every year. Being a WMU hydro field-camper is all about making friends, trying tons of cool activities, and having the time of your life! In every activity, our staff help teach the campers new skills and facilitate learning in a safe and fun environment. We really care about each camper and go out of our way to make sure that you feel comfortable and happy, and that you are enjoying everything that our program has to offer. Our goal this year will be that every camper makes a strong connection with others. Our program is extremely successful in helping connect our students with potential employers and that is why I love to connect with these campers! Each year I am amazed to see how quickly they develop and how well they are doing. We are happy to report that two of last year’s campers (Doug Keto and Camille Buckley) received USGS/NAGT cooperative field internships and we are hopeful that this year’s nominees will also. This year’s nominees are Adam Donne (WMU), Samantha Huntoon (UW-Milw.), and Liam Knudsen (U of Idaho).

I am VERY pleased to announce that we were, astonishingly, able to move forward on installing a new, 5-inch production well at the Asylum Lake Preserve well field. Our friends at Midwest GeoDrill, Valley Farm Supply, Johnson Screens, Baroid, Katz Well Drilling, and Franklin Electric all made significant contributions of time, labor and materials to make this possible for our students. A HUGE thanks to all our supporters and especially to Brock Yordy for helping us put this all together. It’s truly humbling to us to see how generous and supportive our industry supporters repeatedly are.

As always, I am beyond excited to spend my summer at beautiful Asylum Lake Preserve, surrounded by the positive energy of committed and caring support from our friends, colleagues, faculty, staff, and students. We are so grateful to have you as part of our collegiate family and genuinely appreciate your trust and support. See you this summer!

Tom Howe,
Camp Director

The HFC is one of very few hydro-technical programs in the United States. The program, developed in 1987, is directed by Tom Howe and Dr. Matt Reeves. This applied course has trained hundreds of students from around the nation and abroad. The Hydrogeology Field Course teaches the following skills: aquifer testing, environmental surface geophysics, groundwater sampling and monitoring, HAZWOPER training, remediation and well drilling and installation. The majority of the geophysical testing, field work and training for this course is conducted at the Asylum Lake research and training site, which was developed to provide advanced field work and hands-on experience.
CoreKids, the K-12 Outreach Program for the Survey, MGRRE and the Department, had another very successful year—we conducted fewer events, but worked with more than 16,000 students, teachers and parents. During the 5 years that I have run this program, we have worked with a total of more than 80,000 people. Due to limited funding this year, we had to reduce the number of in-school events to just a handful. We focused on reaching as many people as we could by providing educational content at mineral shows and science/STEM career days.

We had seventeen teachers attend our workshop, Bridging the Gap Between Geology and Chemistry. It was very well received. One of the highlights, was that each teacher brought a sample to be analyzed with our hand-held x-ray fluorescence analyzer. As I write this newsletter, we are gearing up for round 2, as a second workshop will be held in August.

I had the pleasure of attending the 50th anniversary meeting of the Michigan Earth Science Teachers Association in October. The contributions of Western Michigan University to the Association were highlighted in their history video (available to watch here: https://www.youtube.com/watch?v=HhraDOoocQ) with photos and comments about Dick Passero and Lloyd Schmaltz, who were both organizers of the first Association meeting! This year, the group met in St. Clair Shores where activities included a workshop on GIS as well as a banquet and celebration of the association.

Once again, we enjoyed working with Lisa Anderson (WMU, 2009). In April, we co-chaired a session at North Central GSA. Lisa started the GO-MPS outreach session 5 years ago – and we have co-chaired several of the sessions over the past couple of years. GO-MPS is designed to be a forum on geology outreach – and stands for Geological Outreach-Museums, Parks and Surveys. We had 5 talks in our session – including a talk on the Bridging the Gap workshop that I presented.

We had continuing success in fund raising which resulted in the CoreKids endowment reaching the $10,000 level this past year. At that level, the funds will now be credited with earnings on an ongoing basis. This endowment will hopefully lead to some financial stability for CoreKids in the future. The contributions from alumni are greatly appreciated.

Visit wmich.edu/geology/corekids to learn more!
Once again, I had the opportunity to teach field camp this past summer and once again, we had a great two weeks in the field. This year, I had a new (and very capable) teaching assistant, Kevin Rupp, help me. We took 9 students into the field. The first couple of days were spent traveling up the coast of Lake Michigan looking at coastal and glacial geology. The first night we stayed in Orchard Lake State Park, sharing the campground this time with a wedding party. On the second day, we stopped at Crystal Lake and the Sleeping Bear Dunes. In the afternoon, we drove through the drumlins of northern Leelanau County – stopping to look at several roadcuts that exposed their internal structures and composition. We then stayed in Traverse City for a night before heading to the Upper Peninsula. We stopped in St. Ignace to look at the Mackinac Breccia at St. Anthony’s rock, a Nippissing age sea stack and the students collected samples of the breccia at a road cut north of town. We then drove to Paradise, MI and stayed at the Tahquamenon Rivermouth Campground for a night. The next day was spent at the Tahquamenon Falls and Pictured Rocks.

After that journey, we finally made it to Marquette. Due to our normal dorm being closed, we were upgraded to really nice accommodations in a NMU apartment complex. During the ten days, the students learned about the local stratigraphy, looked at ancient pillow basalts and stromatolites, and practiced field methods and mapping. Highlights of the trip included stopping at Jasper Knob to look at the banded iron formations and stopping at the Lake McClure tsunamiite deposits – 1.8 billion year old deposits related to the Sudbury impact! The students also spent time collecting specular hematite from the Champion Mine’s tailing piles. We finished up with 2 days of mapping Marquette Mountain.

Next year, the field camp will be changing for the first time in a long time. We will be adding a third week to the course – with a week on campus focused on methods.◆

NEW COURSES COMING SUMMER 2019

GEOS 5650 - Geological Field Methods
This Field course will focus on both traditional field mapping techniques as well as new, emerging technologies such as satellite GPS, GIS, Digital Tablets, Smart Phone Apps and Drone observations. Students taking this course will gather geological field data, correctly enter it into a notebook (both traditional and digital), and then be able to use these data to produce a geological map and make appropriate geological interpretations of the area.

GEOS 5660 - Geological Field Studies
This course introduces students to the tectonic setting, rock types, geologic history, geologic hazards and resources, landforms, and surficial processes found throughout the Michigan region.

GEOS 5720 - UAV’s: Geophysics and RS Lab
This course will train students how to inspect rock outcrops in the field, collect geological data using approved field methods and how to record those data both manually and digitally. They will learn how to make geological maps and geological cross-sections employing those collected data. They will then, in turn, become adept at interpreting rock mineralogy, associated textural characteristics, rock structures, and deformation changes to reconstruct the geological history of the study area.
Greetings to alumni and friends. The year has been a busy forum for the Advisory Council with our focus on how to support the Department of Geological and Environmental Sciences (GES) including funding for the expanded Lloyd Schmaltz Geology Museum. The Advisory Council met in April and again in Oct. 2018 during which the Council received numerous updates regarding the status of the University as well as the College, the Department, the Michigan Geological Survey and MGRRE. Higher education funding and enrollment continue to be a challenge for the University. However, the Department continues to be recognized by University administrators for its performance and many successes. Speaking of successes, the Council was pleased to welcome and congratulate Dr. Roger Steininger as the Department’s 2018 Geological Alumni Achievement Award recipient. As a Provisional Council Member, Dr. Steininger has come full circle since he was on the first Advisory Council Board created by Dr. Schmaltz over 36 years ago.

**Major initiatives that are the focus of the Advisory Council include:**

- Student Outreach
- Fundraising for the Lloyd Schmaltz Museum
- Fundraising for the Department

The Student Outreach Committee continues to plan opportunities for the Council to interact with students helping to improve their college experience, and provide guidance for future career development and job opportunities. The Council is also exploring the possibility of creating an endowment to fund the Seminar Series at the Department. An endowment would allow for permanent funding to attract several notable speakers annually. This is a great program to expose the students to geological and environmental information from a broader perspective.

Renderings for the Schmaltz Museum revitalization were presented to the Council. The efforts to raise funds continue with the initial funding needs for the development of formal designs for the Museum and ultimately major funding for the overall construction of the first phase. Stay tuned as information will soon be distributed describing the need. This is a great opportunity to support and enhance the presentation of the fantastic mineral and fossil collections. The remodeled museum can be a quality resource that will be used as a recruiting tool for the University and the Department. If you have not yet had the opportunity, you must visit the Dinosaur exhibit between Rood Hall and the Lee Honors College. This is the first phase of an outdoor exhibit that is part of the Museum that will continue to expand.

In an effort to increase alumni interaction and involvement, the Council is working on an annual alumni dinner that will provide opportunities for networking, fellowship, and fundraising for the Department. Borrowing from Council Member Richard Laton’s successful annual dinner programs at California State University Fullerton, the Council is in the planning stages of an exciting and fun annual event.

The Council is excited to welcome the new Geophysicist Dr. Mine Dogan to the Department, and looks forward to working with her in the future. Additionally, the Council is pleased to formally welcome Kyle Patterson, the newest member to the Council.

Again, as the longest serving Council at Western Michigan University, we look forward to exciting times at the Department and continuing our service to the students, faculty, administration and alumni. If you are interested in serving on the Advisory Council, please let myself (Jeffrey Hawkins) or Dr. Sultan know of your interest.
Dr. Roger Steininger was selected for the Alumni Achievement award by the Department of Geological and Environmental Sciences because of his long history of mineral and business successes since his graduation from the Department in 1964 with a B.S. Roger attained his M.S. in Geology from Brigham Young University and his Ph.D. from Colorado State in Earth Resources in 1986. After receiving his M.S., Roger worked for national and international mineral exploration and development companies and then after receipt of his Ph.D., in 1987, he formed his own consulting company to work for many companies to support focused exploration in those geologic terrains having gold and other precious metals. Dr. Steininger’s distinguished career has noted his association with and personal discovery of numerous mineral discoveries including the 20+ million-ounce Pipeline gold deposit in Nevada. In 2009, Dr. Steininger formed NuLegacy Gold Corporation. He recently retired after discovering the Iceburg gold deposit in Nevada. He is also the recipient of the 2016 Honored Alumnus Award from the Warner College of Natural Resources, Colorado State University. As noted by Dr. Steininger, these achievements started with the solid geological base supplied by Lloyd Schmaltz, and others, in the Western Michigan University Geological and Environmental Sciences Department.
As we write this newsletter each year, we are reminded of all the talented students and inspiring industry members we have had the privilege of working with for 35 years. We appreciate hearing from you and always enjoy learning about your successes. And we are very grateful for your financial support which keeps us running.

Since Sept. 2017, we have hosted 3 in-house industry workshops related to gas storage. We also presented a core workshop here at MGRRE in partnership with Battelle Memorial Institute about Niagaran reservoir characterization. As a partner in the Midwest Regional Carbon Sequestration Partnership (MRCSP), we shared research results and MGRRE cores, thin sections, and well records.

Bill Harrison addressed the Governor’s Summit on Extractive Industries in Feb., discussing the major geologic processes that have produced Michigan’s geologic resources. Speakers included regulators, industry and government leaders. Several hundred members of industry and government attended the meeting in Lansing.

The Geological Society of America published 2 rare special papers focusing on WMU faculty expertise. These papers always begin with an invitation from the Society to submit a proposal on a topic. Dr. Kehew proposed and edited a volume about quaternary glaciation of the Great Lakes Region.

The Society requested a compilation of research carried out using MGRRE’s extensive geological collections. Bill Harrison, Dave Barnes, and Mike Grammer took up this challenge by soliciting and co-authoring “Paleozoic Stratigraphy and Resources of the Michigan Basin” Special Paper 531. The publication describes the geologic processes and distribution of natural resources in the Basin. Published in April 2018, all but 2 of the fifteen chapters of the Paper document research carried out at MGRRE by Bill, Dave, Mike, Peter Voice and their students.

PTTC Workshop
In April, we held our spring PTTC workshop. MOGA invited us to partner with them to present a joint event together with their 16th Annual Michigan Petroleum Conference at the Grand Traverse Resort in Acme. Great idea. That was a very exciting event where about 100 people attended the PTTC workshop and MOGA added more than 100 attendees to the Petroleum Conference. Everyone had the chance to share ideas and network at breaks, lunch, the core workshop and the strolling reception.

The PTTC workshop focused on the Traverse formation. Speakers included Bill Harrison, Peter Voice, John Fowler, Mike Barratt, Chuck Knox, Adam Wygant, Murray Matson and Allen Modroo.

• Bryan Roth accepted MGRRE’s 2018 Lifetime Achievement Award on behalf of his father, legendary petroleum geologist Bill Roth.

• Industry members examined cores and talked with our graduate students, including Mohammed Al Musawi, Austin Johnson, Clay Joupperi, Cameron Manche, Matthew Rine, Matthew Hemenway, and Zaid Nadhim, who presented their research posters and discussed their work.

• On a personal note, Bill and Linda Harrison were surprised to receive a very generous gift from MOGA donors, presented by Dave Maness, Bill Strickler, and Wayne Goodman. We are so amazed and grateful.
Visiting MGRRE

In May, President Montgomery, Vice President for Research Kinzy, Interim Provost Stapleton, and Dean Koretsky toured MGRRE and learned about the work carried out by MGRRE/MGS. We welcome their input and support.

We are also working to curate and inventory donations of cores by MDOT, MDEQ, and Michigan industries from 144 wells as well as cuttings from 28 wells donated by industry.

Steve Kaczmarek continues to work with a team of graduate and undergraduate students collecting high-resolution bulk elemental data from drill cores at MGRRE with his new X-ray fluorescence analyzer. The team is assessing these data to determine if geochemical trends can be used to help provide additional stratigraphic constraint within a number of important reservoirs in the Michigan Basin. The data are also being used to make inferences about the paleoenvironmental conditions during deposition and diagenesis of these reservoir rocks.

MGRRE faculty, staff, and students participated in several professional conferences this past year. Bill Harrison and Peter Voice attended the AAPG Preservation of Geoscience Data Committee meeting, held at the National AAPG meeting in Salt Lake City. Bill Co-chairs that Committee and Peter is the recording secretary. At the Great Lakes Section of GSA in Ames, Iowa, Peter presented 2 papers and co-chaired a technical session. One of those papers, on the Traverse Limestone reservoir characteristics, was co-authored by Bill. The other paper described a Teacher workshop about using X-ray Fluorescence as classroom exercise. Also graduate students, Mohammed Al-Musawi and Zaid Nadhim, presented their research posters at that GSA conference. At the Sept. 2017 Eastern Section AAPG meeting in Morgantown W.Va., Peter co-chaired a technical session focusing on Approaches to Improve Reservoir Performance and presented a paper co-authored by Bill Harrison.

Peter Voice continues to lead CoreKids, the K-12 outreach program. You can read his faculty page for a full update of his new teaching activities.

Once again we ask for your help in contacting your legislators to ask for their support for on-going funding of our work at MGRRE and the Survey. More than half the cores, samples and data that we archive here were acquired since we became part of the Michigan Geological Survey—so those materials actually belong to the State and benefit all its citizens. We need funding from all our citizens to keep these irreplaceable geological records for use by this generation and more to come.

To you, our extended geology family, we send our wishes for all good things in the coming year.

We commend our geology students Mohammed Hashim, Austin Johnson, Hannah Pankratz, Brooks Ryan, and Neal Turluck, who represented WMU in the 2018 Eastern Section AAPG Imperial Barrel Award competition. Each of them made formal presentations to a panel of industry judges. The team was guided by faculty advisor Dr. Robb Gillespie and industry advisor Kyle Patterson. Even though the team didn’t come home with a medal, they can be very proud of their hard work and professional presentations.

In the archival area, Jenny Trout and Linda Harrison are supervising several students who are curating and inventorying a legacy collection of cuttings from more than 1,000 wells. This project, funded by a grant from the USGS National Geologic and Geophysical Data Preservation Program, will require many more months to complete. Considering these wells were drilled throughout the State and will never be drilled again, we are paying attention to detail and taking good care of these unique geologic records of our geologic history and resources.
Greetings alumni and friends from the Director of the Michigan Geological Survey, John A. Yellich. The Michigan Geological Survey (MGS) received the June 2016 funding ($500k) to propose and successfully complete a number of projects/tasks, as reported last year. MGS then petitioned legislators in the spring 2018 and received an additional funding of $500k to support a validated geologic understanding in priority areas, including those areas impacted by PFASs, an emerging contaminant. However, this allocation did not have annual funding, a recurring budget renewal. The lack of annual funding prevents MGS from building a qualified full time technical staff to support geological science in Michigan. Michigan is lacking in substantive geologic data in many areas including those areas to adequately track water quantity and quality and where contaminants are moving in the subsurface groundwater regime. MGS will continue to focus on geological data acquisition and mapping for a greater understanding of critical water resource areas. MGS will provide selective research studies to support the PFAS impacts, the ongoing USGS mapping, and the research programs associated with the MGRRE- Repository, Outreach- Core Kids and incremental M.S. and Ph.D. student research projects that can support these data voids.

MGS Director, John Yellich has been elected Vice President of the Association of State Geologists (AASG) and has assumed a greater role in seeking continued, and increased, Federal support for mapping projects for all State geological surveys. Yellich was in DC in Sept. and met with Tim Petty, Interior Department, Assistant Secretary of the Water and Sciences and Dr. James Reilly, Director of the US Geological Survey. Yellich presented the case for more Federal funding for geological mapping in Michigan and other areas of the US, providing examples of where Michigan has not committed monies needed to present real science associated with the various geologic environments of the State. Additionally, examples of areas where Michigan has been using non-factual or flawed data to support environmental and social decisions concerning water resources. Michigan’s lack of truly scientific geologic data will result in increased cost and time to adequately quantify water resources to determine where groundwater is flowing, and where any contaminants will impact the citizens of Michigan. MGS is also supporting the Ottawa County Planning and Development Department in implementing a water resource program that includes conservation, protection, and recharging of the limited fresh water resources that are available to the fastest growing region in Michigan. The primary functions mandated by the 2011 Legislation that created the MGS at WMU includes the investigation of the geological resources of the state, the collection and archival of samples, cores, cuttings, and records of geological investigations and studies in the state. MGS is presenting the case to be the “go to” geological expert for the State of Michigan. MGS believes it has demonstrated the justification for annual funding which must be provided by the Legislature and Governor’s office. The completed research has presented a scientific approach to validated geological science to the public and to 21st Century users.
Geologic Developments and Accomplishments

The following is a brief summary of this past year’s geologic developments and accomplishments in pursuit of annual funding from the Michigan Legislature. Michigan has not conducted broad, natural resource research projects for more than 30 years, only incremental data compilation projects. The earlier and current Legislative one-time grants have allowed MGS to continue to provide geologic data and programs which have permitted MGS to initiate demonstration studies and programs that would be provided by a fully funded survey. A funded survey would support the societal and economic benefits and sustainable environmental protection of our water and other natural resources for local, county, and state initiatives. More specific beneficiaries are individuals, industry, city and county planning departments and commissioners, and the Michigan Departments of Environmental Quality (DEQ), Natural Resources (DNR), Agriculture and Resource Development (MDARD), and Transportation (MDOT).

MGS continues to operate on “soft” money from Federal and State grants, and until there is an annual budget, MGS cannot hire permanent full time staff to meet mandated geological investigation requirements, nor can it receive an increase in matching Federal funds for mapping programs. From Jan. 1, 2018 to Sept. 30, 2018, MGS has been granted funds from the USGS, MDEQ, MDOT and the Michigan Legislature ($35,000, $68,800, $75,412, $125,400, $23,600, $500,000), respectively, for a total of $828,212 to be used for the period Oct. 1, 2018 to Sept. 30, 2019. Please see our website (wmich.edu/geologysurvey) for a summary of this past year’s geologic investigations.

MGS published on May 31, 2018, a strategy for groundwater monitoring for the state of Michigan, under a grant from the MDEQ-WRD. The title is: Preliminary Report Addressing Considerations for a Strategic Groundwater Management Plan for Michigan. The focus of the plan is that groundwater reflects the geology, and how the basic water quality will change in the different geologic environments. This can impact the elements that may be in solution or are introduced to that groundwater. The report documents that there is historical background data collected at licensed landfills that must have pre, during, and post monitoring of all the groundwater systems at each location. These upgradient background wells have been in place for tens of years. There are 78 active and 60 closed landfills in Michigan which have a long history of groundwater monitoring. MGS presented examples from three landfills located in three geographic areas; the UP, Marquette bedrock and glacial; then Wexford glacial; and Eaton glacial with two aquifers. We are pressing DEQ for a meeting to discuss implementing this program.

MGS provided technical geologic documentation for HB 5638 authored by Representative Aaron Miller, which mandates a program/process for using factual geologic and hydrogeologic data provided by qualified geoscientists to the Water Withdrawal Assessment Tool (WWAT) in the Site Specific Review (SSR) process. The WWAT supports Michigan’s compliance with the Great Lakes Compact on water and stream preservation.

One of the primary remote sensing data tools is Light Detection and Ranging (LiDAR) which provides the strategic benefit of a more rapid assessment of surface features. LiDAR is now a foundational mapping tool for MGS geologic projects, which until the last five years, Michigan had been lagging the adjoining states. MGS lobbied with the State DEQ, MDARD, and DTMB as well as the Natural Resource Conservation Service (NRCS) of the US Department of Agriculture and through these collaborative state and Federal efforts more of the critical areas of Michigan in need of LiDAR data will be collected in the next two to three years. LiDAR data can be used by every regulatory, and research department, and business development opportunity in Michigan, including the MGS.

MGS/WMU had studied the Great Lakes shorelines for more than fifteen years in areas being impacted by residential and business development and by changes in lake levels. Federal agencies were not committed to a continually programed study of Great Lakes shorelines. Michigan alone, more than any other state, has in excess of 3,126 miles of Great Lakes shorelines. MGS presented a case for Lake Michigan studies in collaboration with the Illinois State Geological Survey and the Indiana Geological Survey to the USGS, NOAA, and the US Corps of Engineers. A resulting benefit of the discussions and meetings is a proposed collaborative research program being outlined by the USGS FEDMAP program, which will evaluate the Lake Michigan Basin nearshore geology and the associated shorelines. MGS, and the Illinois, Indiana, and Wisconsin geological surveys will develop an evaluation program to assess the near shore geology utilizing 3D mapping techniques, and review the shoreline geology’s response to natural and anthropogenic activities and changes using remote sensing and field mapping functions. All parties are soliciting some form of Federal, State or local funding support for this research effort.

MGS supported the USGS demonstration airborne aeromagnetic geophysical survey in a portion of the UP. This was completed in August 2018. Scientific data will be compiled by the USGS with support from MGS to present validated subsurface geological data for an area not previously published at this level of detail. MGS is proposing a collaborative program with
the Michigan Technological University (MTU), Department of Geological and Mining Engineering and Sciences in support of the USGS aeromagnetic data compilation, LiDAR data, and field confirmation of geology and rock structural controls, a demonstration. This is in an area north of Menominee, Michigan.

MGS appreciates the continued support from the Associations and members of the Michigan Oil and Gas Association, the Michigan Aggregates Association, the Michigan Manufacturers Association and its sub-committees of Environment and Mining, Michigan Groundwater Association, the Michigan Association of Professional Landmen, the Ottawa County Road Commission and Ottawa County Planning Department, the Southwest Michigan Water Resource Council, the American Institute of Professional Geologists and other agencies and organizations not named here, plus all the individuals who signed the letter of funding support for the MGS.

Michigan Geological Repository for Research and Education

MGRRE continues to be the geologic research foundation of the Michigan Geologic Survey through its workshops and research conducted in collaboration with USGS, DOE, industry, faculty and students. Specifics of the 2017-2018 accomplishments are summarized in the MGRRE section of this newsletter. Any State funding for MGS is coupled with the ability to maintain the core repository, and the research it offers, that has directly resulted in economic benefits to the State of Michigan. Michigan has received tens of millions of dollars in energy related tax and royalty revenues averaged over the last 30 years, that is a direct result of MGRRE research and programs, yet Michigan has not provided any annual funding for this research and sample storage facility. Nearly 30% of the samples at MGRRE are from Michigan State lands, which has also resulted in specific state revenues. Lastly, since 2011, when MGS was assigned to WMU, more than half of the MGREE cores have been received from various facilities that no longer wanted to maintain this invaluable rock and sample data. This is Michigan core, and no state funding has been allocated. Local citizens and professionals are requested to contact your legislators to both remind and request annual funding for MGS/MGRRE, a resource for assessing and sustainably managing our natural resources.

The USGS recognized MGRRE as the national “poster repository” for the USGS National Geologic and Geophysical Data Preservation Program (NGGDPP), when the USGS highlighted the NGGDPP funded MGS/MGRRE data preservation program. MGS/MGRRE was used to present the benefits of a core repository when in 2008 core and data were rescued from a facility that was going to dispose of the core. These core were brought to and stored at MGRRE. NGGDPP funding allowed MGRRE to catalog the core and data, which was then placed on the MGRRE website. This archived data resource was identified on the MGRRE website by a prospective mineral mining company/developer. The developer came to MGGRE, examined and had the core analyzed, which resulted in the 2013 re-discovery of the purest quality potash in the US, located in Osceola and Mecosta Counties. This natural resource asset has an estimated in place value of $65 billion dollars, and is currently in the pre-development and final permitting process. Below is the USGS article/link, January 2017. www.usgs.gov/center-news/mineral-discovery-could-mean-billions-michigan.

WMU and MGRRE have a number of professional presentations and publications associated with this facility, staff, and student research. They are listed in this newsletter for 2017-18.

Economic Minerals

Dr. Joyashish Thakurta is researching favorable geologic provinces in the Upper Peninsula that may host economic minerals. Dr. Thakurta has students involved in research studies in areas of geologic interest and importance, and has found industry support for student research projects focused on the geology and mineral assemblages in Michigan.

CoreKids

Geology outreach is the foundation for education of what geology and natural resources mean to our society, and how they relate to our geologic setting in Michigan. The Core Kids program is the outreach component of the MGS, MGRRE and WMU Department of GES. Dr. Peter Voice has been the coordinator of this program for the last five of the over 16 year recognized program. Funding for CoreKids has thankfully been through generous donations and grants. Noting that this program is now expanding to involve the mineral, gem, geologic, and teacher associations, we now have a more diverse contact audience, not only K-12 schools. More information on Dr. Voice’s successes can be found in the newsletter. Dr. Voice has increased both the numbers and composition of contacts. His contacts are now focused on events that are most effective, and have resulted in CoreKids donations with specific benefits to WMU students, i.e., scholarships. The following is a summary table of the last five years.

<table>
<thead>
<tr>
<th>Academic year</th>
<th>Number of contacts</th>
<th>Conferences &amp; teacher workshops</th>
<th>School visits &amp; allied partner programming</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-14</td>
<td>16,175</td>
<td>7</td>
<td>65</td>
</tr>
<tr>
<td>2014-15</td>
<td>23,329</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>2015-16</td>
<td>10,473</td>
<td>2</td>
<td>45</td>
</tr>
<tr>
<td>2016-17</td>
<td>14,875</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>2017-18</td>
<td>16,590</td>
<td>1</td>
<td>20</td>
</tr>
</tbody>
</table>

CoreKids metric summary, 2013-18
Surface Mapping, Groundwater, and Natural Resources

The USGS National Cooperative Geologic Mapping Program (NCGMP) has been actively funding state geologic mapping for over 25 years, which in all US states has been focused on critical-need areas. Michigan is now faced with a new groundwater dilemma termed emerging contaminants, perfluoroalkyl substances (PFAS). Since early 2017, the identification of water resource impacts by this carcinogen has multiplied from 35 to hundreds and perhaps thousands of locations in just over a year. This includes community and individual drinking water supplies. Michigan has little to no compiled geologic knowledge of the many natural resources that may exist within its borders. Now the PFAS impacts presents the case that most of the technical experts cannot say where the groundwater is flowing, because most of the subsurface geology has not been compiled and mapped in sufficient detail and consistency to predict, direction and rate of flow, further evidence of the continuous lack of focus on geology. It would be relatively useless to show a map having PFAS locations, because the number and locations will change tomorrow.

MGS has briefly summarized the natural resources by geology and geographic areas and where Michigan has and where we do not have data on the subsurface geology and the location(s) of the supporting data. (On the right).

The mapping products produced by MGS through the NCGMP Federal matching funds program has increased in the last five years because of the additional incremental funding provided from 2014 to present. MGS produced five (5) quadrangle maps in 2017, and will publish three more Cass County quadrangles plus an updated bedrock map of Wayne County in 2018. The Cass County mapping products have been recognized by the Michigan DEQ Water Resource Division (DEQ-WRD), Michigan Department of Agriculture and Rural Development (MDARD), and Michigan Farm Bureau (MFB) as a significant contribution to understanding and managing the water resources of Cass County. This recent mapping program has validated geologic data in Cass County which presents additional glacial sediments (over 240 feet below existing data) that can support water resources in Cass County. This regional data has never been published or presented prior to this multi-year mapping project.

Investigation and mapping today is of much greater value because classic “boots on the ground” is still required to confirm the validity of all mapping information, and this also includes remote sensing data. The geologic data available today includes, but is not limited to, the following: subsurface drilling (wireline core, rotosonic core, and Geoprobe), historic drill hole and water well validation and analysis, and most recently combining quality LiDAR data for quantifying the surface type, then depth and thickness of glacial sediments when utilizing the Tromino Passive seismic tool. All these data subsets that were not previously integrated are now available to prepare more comprehensive surface and subsurface 3D map products. Maps produced by the combination of remote technology and field derived data can more rapidly provide that “derivative” data to better understand the geologic natural resources of aggregates and groundwater, as well as providing mapping details to document depth and thickness of the glacial sediments for improved assessment of groundwater pathways. This information is needed in the event of a major spill which can result in a release resulting in an environmental catastrophe. Additionally, these data can support defining the direction and flow of recently identified PFAS contamination which the latest water sampling has
The benefits of standardization are in the use of geologic data or program to compile it into a standard geologic database. This data has been collected for over thirty years with no funding mechanism as provide validation of water well logs. This data has been a wealth of basic geologic understanding for many areas, as well as provide validation of water well logs. Most of this data is in paper files and would provide a long time and it is costly. The Michigan Oil and Gas Association Newsletter highlighted the relevance of the energy industry collaboration with MGS in a recent publication (Sept. 28, 2018) to rapidly assess water resources using seismic and MGS research data to map buried bedrock valleys and presented on the Survey’s homepage: wmich.edu/geologysurvey. It is listed as the first news article.

This collaboration also resulted in an energy industry-M-DNR collaborative agreement to provide seismic data to MGS when seismic surveys are completed over State land. This new data resource can be open filed at MGS, and used to more rapidly map larger areas for this potential groundwater resource. Buried bedrock valleys could potentially contain high quantities of fresh groundwater for use by communities, future business development, and agriculture. This Calhoun County Tromino bedrock valley project has expanded the research project initiated in the City of Portage which covered one quadrangle (~55 sq. mi.), and this had shown additional water resources for the City.

MGS has presented the case to multiple Michigan associations and departments that all subsurface geologic information needs to be standardized. There are over 30,000 201-213 regulatory investigation and remediation sites that have collected geologic data. Most of this data is in paper files and would provide a wealth of basic geologic understanding for many areas, as well as provide validation of water well logs. This data has been collected for over thirty years with no funding mechanism or program to compile it into a standard geologic database. The benefits of standardization are in the use of geologic data to support a greater understanding of the subsurface, and in managing all of our geologic resources.

For example, Michigan does not validate the location of water well data at the time of entry to Wellogic, therefore, water well data currently represents over 600,000 data points that must be validated for location by each person looking at the files before it can be used. Plus each person must validate any subsurface lithologic data submitted by the driller. In addition, Michigan does not have a formal training program for logging water well drill cuttings by the licensed well drillers. The data validation and driller training program is long term and MGS has proposed and is currently training new license applicant drillers for the last three years. The Michigan Groundwater Association’s licensed well drillers want to see this type of program initiated to train new and existing well drillers in data collection and data input to Wellogic, which is a standard database. The American Institute of Professional Geologists (AIPG) has also indicated there should also be standardized format and data base for “geologic” data in an open file format.

Remote Sensing and Airborne Surveys
Dr. Mohamed Sultan and his research colleagues in the Remote Sensing Laboratory provide the foundation for understanding the use of satellite and other indirect mapping methods. The WMU/MGS laboratory proposed an Interferometry test program to study sinkholes in the State of Qatar. WMU/MGS has completed the data compilation and training of four Qatar engineers in using and interpreting interferometry data, a technical success. The Remote Sensing lab staff have shown areas of subsidence in the more active development areas of Qatar. MGS also funded a Ph.D. candidate, Hossein Sohour who utilized NASA satellite data from the Gravity Recovery and Climate Experiment (GRACE) program from 2002 to 2016 to assess the total groundwater changes in Cass/St. Joseph and Ottawa/Kent counties. The demonstration program was a success and Hossein initiated a statewide Lower Peninsula (LP) analysis as a portion of his doctoral dissertation. The initial results are favorable to understanding and monitoring temporal water storage changes during this time period. This Gravity Recovery and Climate Experiment (GRACE) outlined above represents another research component of the MGS/WMU that can support the management of the natural resources of the State of Michigan. The success of the Qatar program has demonstrated the use of Interferometry in mapping subtle subsidence (mm per year) in surface features, a key to identifying active sinkholes, and is being applied to Lake Michigan nearshore slope movements.

Michigan has the longest shoreline on the largest fresh water bodies in the world, totaling 3,126 miles. That is more than the entire East Coast of the US at 2,165 miles for eight states. The mapping of Michigan’s shorelines will greatly enhance our understanding of existing conditions, and allow for the monitoring of changes in shore and bluff configurations as they respond to population impacts and changes in lake levels. Remote Sensing technologies will be an integral component to a collaborative USGS, NOAA and USACE research program currently being planned. The use of Unmanned Aerial Systems (UAS) will also be a component of this Federal research
program, which is also a new program being developed at WMU in association with the College of Aviation. UAS information will also be invaluable in real time data collection, when integrating the management of surface water resources and runoff during major storm events that can cause extensive structural or environmental damage.

MGS continues to seek funding for permanent staff, office, core repository and teaching facility.

Respectfully,

John A. Yellich, Director
Current Job Title: Museum Scientist I
Current Employer: New York State Museum

What is responsibilities do you hold in your current position?
I am currently a Museum Scientist I for the New York State Geological Survey, a research division within the New York State Museum. My job involves creating geologic maps of areas across the State of New York. Mapping involves field work in these areas, drilling cores to determine what lies below the ground and geophysics/lab work to determine what makes up these materials. The final maps are submitted to both the state and federal governments for use to the public at no cost. Uses for these maps range from remediation work of contaminated sites to finding the locations of subsurface aquifers with clean water and aggregate resource exploration to help rebuild the roads in the State of New York and surrounding areas.

This job allows me to interact with the public and school groups to help educate and answer questions on how the landscape came to be and what can it tells us. It helps get our youth involved in science and educate the public on the environment and show that we are working for them to help better the future!

What activities, resources, or people helped you prepare for your career?
The biggest activity that helped prepare me for my career was getting involved with my department and also with my teachers and fellow classmates. Finding a niche, or helping with research both developed skills that I am still using today, but also made an impact on the things around me that helped make people look up to and relied on me to get things done. A strong work ethic, a will to learn and want to exceed will take anyone a long way!

What advice do you have for others pursuing a career similar to yours?
Do not be afraid to take on a challenge. A challenge may seem stressful, but breaking down the project or issue can ease this stress and the end result will be well worth it. Challenges bring out the best in us and help us get over adversity. The more will, the more that can be done and nothing can stop it!

Karl Backhaus, M.S. 2018
Gailh Dinanta, M.A.
I’m doing research on geophysical instrumentation with specific topics to detect peat thickness. I’m following courses which related to it. and now I’m planning to publish my journal within The 2018 IEEE Asia-Pacific conference on Geoscience, Electronics and Remote sensing Technology (AGERS). [see http://Indoaessgrss.org/aegers-2018/]

Elizabeth Palmer, Ph.D.
I have been working on understanding the surface roughness of Asteroid Vesta at the centimeter-to-decimeter scale using orbital radar observations by the NASA Dawn mission. At this scale, we can constrain the dominant physical processes that are smoothing or roughening the surface’s texture, and also assess the safety of potential surface trafficability (e.g., for future rovers, landers, and/or sample collection missions).

Cameron Manche, Ph.D.
I am working on evaluating dolomite stoichiometry as a record of changing dolomitizing fluid chemistry. I am also working on kinetic controls on the stoichiometry and cation ordering in ancient sedimentary dolomites.

Guzalay Sataer, Ph.D.
I am currently working on landslide detection on lake shore of Michigan using InSAR techniques.

Tyler Norris, M.S.
I am currently mapping bedrock topography and glacial features in the East Leroy and Climax Quadrangles to determine glacial drift thickness and water resources. This project involves the use of various geophysical methods, GIS mapping, and fieldwork.

Neal. S. Turluck, M.S.
I am working on capillary rise of water in fine grained sand.

Andrew Barrette, M.A.

Kristen Foley, M.S.

Tanten Buszka, M.S.

Chanho Park, M.S.

Galih Dinanta, M.A.

Christ Romero, M.S.

Beau Haag, M.S.

Katharine Rose, M.S.

Moein Izadi, Ph.D.

Madison Wayt, M.S.

Mollie McCormick, M.A.

Parasaurolophus

DID YOU KNOW?
Parasaurolophus were able to walk on either two legs or all fours. Researchers estimate that the Parasaurolophus was around 31 feet in length and weighed around 2.7 tons.
The Society of Exploration Geophysicists (SEG) student chapter at Western Michigan University is going through its fourth year as an organization on campus and its third year as a registered student organization. SEG has been ranked as “Ridge” chapter by SEG as this is an accomplishment because there are only 8 chapters that are ranked in this category out of 49 student chapters in the US. and only 33 student chapters worldwide out of ~250 student chapters received this ranking.

We hosted our second annual “Adopt-A-Grad” welcome dinner at the beginning of the fall semester. This event is made possible from the generous donations of faculty and staff from the department. All new graduate students who attend have their dinner paid for and get to talk to returning graduate students. This event was created to share experiences and create a strong community in the geosciences amongst all graduate students. The chapter hosted its third annual Ping-Pong tournament and potluck on the first week of Dec. The event was organized to provide students and staff some down time during the busy school semester. The Ping-Pong tournament is our largest fundraiser and had a great turnout with over 8 ping-pong teams.

As our final event of the school year, we hosted the second annual hammer swinging competition. Where students, faculty, staff, and advisory council members have the chance to see if they can make the largest P-wave. This event took place on the same day as the annual end of the year banquet and the Advisory Council meeting.

We organized our first Recruitment and Advertisement event which was a part of joint meeting with Kalamazoo Geological and Mineral Society. The event was organized on the first day of the Summer II Hydrogeology Field Course during the Surface Geophysics module at the Asylum Lake Geophysical Test Site. Around 50 people attended the meeting and SEG provided the pizza and drinks made possible through an operational grant (~1000) from the Graduate Student Association and Student Assessment Fund.

We held our officers’ election on Feb. for the office year 2018/19 and submitted our annual report to SEG.

Member’s Highlight
Our dedicated member Neal Turluck represented our chapter at the SEG Annual Meeting in Anaheim, CA this October. Neal received a travel grant to attend the annual meeting and the SEG/ExxonMobil Student Education Program (SEP). SEP is a 2-day short course that prepare students for the challenges in the oil industry.

This has been an eventful and productive year for the Western Michigan University – American Association of Petroleum Geologists student chapter. In April, five members of the student chapter competed in the AAPG – Imperial Barrel Award (IBA) Competition. Over the course of 8 weeks, the WMU IBA team assessed the hydrocarbon bearing potential of the Norwegian North Viking Graben. The WMU IBA team of Mohammed Hashim, Austin Johnson, Hannah Pankratz, Neal Turluck, and Brooks Ryan advised by Dr. Robb Gillespie and Kyle Patterson of Miller Energy had an excellent performance presenting at the Eastern Section AAPG Regionals in Pittsburgh. In May, Dr. Harrison, Dr. Kaczmarek, Dr. Voice, and 9 graduate student members of the AAPG student chapter presented at the 2018 AAPG Annual Conference and Exhibition in Salt Lake City, Utah. Student members include: Mohammed Al-Musawi, Hanna Cohen, Mohammed Hashim, Matthew Hemenway, Clay Joupperi, Jack Hybza, Cameron Manche, Zaid Nadhim, Brooks Ryan. The WMU – AAPG student chapter welcomes the new graduate students and is looking forward to another productive year.

IBA team picture taken at the Eastern Section AAPG IBA Competition on April 7, 2018.
The Geology Club ended the 2017-18 year with an amazing “first” for the student organization, an international trip! After a hard-fought year of fundraising and meticulous preparation, the group was able to partake in a trip to the dynamic and geologically active country of Iceland. Taking place in early May, the trip was certainly exciting as we battled wind, rain, and freezing temperatures including one morning of waking up to several inches of snow burying our tents that wasn’t present the night before! Every moment was worth it though. As we traveled Iceland’s famed Ring-Road we got to see amazing geological processes first-hand, we hiked mountains, stopped at more waterfalls than we could count, and even experienced the Phalloglogical Museum! The preparation and the trip itself was not always easy-going, but every moment was worth it and each member that participated in the trip certainly has a new, amazing, life-enriching experience they can look back on.

Moving forward, Erin Hugget returns as president to the club with Raigen Blake stepping into the role of Vice-President. Stephanie Buglione now helps support the club as club secretary and Michael Roberts is our new acting treasurer. A big thank you to our previous officers whom without which, Iceland would never had happened.

Plans for the next year of Geology Club are already in motion. Preparations are being made for the next annual trip which will be announced at the end of October. Regularly held bake/mineral sales are being planned. Come by and see us! Annual t-shirt designs have been decided and purchasing announcements will be made soon. We are also actively seeking new ways to engage previous and potential members. We hope to better interact with students and are looking forward to what this year has in store for us!

DID YOU KNOW?

Dinosaur eggs come in all shapes and sizes. They tend to be ovoid or spherical in shape and up to 30cm in length - about the size of a rugby ball. The smallest dinosaur egg so far found is only 3cm long. Once the egg has been fossilised, it will become hard like rock, but it will retain a structure of its own.
### Endowments

<table>
<thead>
<tr>
<th>ENDOWMENTS</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Geosciences Endowment</td>
<td>$14,408.35</td>
</tr>
<tr>
<td>Douglas Daniels Endowed Geosciences Scholarship and Award</td>
<td>$12,277.66</td>
</tr>
<tr>
<td>Empowering Geosciences</td>
<td>$13,669.83</td>
</tr>
<tr>
<td>Envirologic Technologies Endowed Scholarship</td>
<td>$22,544.90</td>
</tr>
<tr>
<td>Geosciences Advisory Council Quasi-Endowment</td>
<td>$11,900.71</td>
</tr>
<tr>
<td>Lloyd Schmaltz Quasi-Endowment</td>
<td>$16,706.79</td>
</tr>
<tr>
<td>Geosciences Operating Quasi-Endowment</td>
<td>$25,062.54</td>
</tr>
<tr>
<td>W. David Kuenzi Memorial Quasi-Endowment</td>
<td>$73,685.39</td>
</tr>
<tr>
<td>William and Linda Harrison Scholarship</td>
<td>$22,228.09</td>
</tr>
<tr>
<td>Barry and Beth McBride Endowment for Geosciences</td>
<td>$13,443.41</td>
</tr>
<tr>
<td>Laton-Labmbright Field Camp Scholarship Endowment</td>
<td>$46,409.72</td>
</tr>
<tr>
<td>Randall Kerhin Graduate Scholarship in Geosciences</td>
<td>$11,195.81</td>
</tr>
<tr>
<td>Mohamed I. Sultan Endowment for Geosciences</td>
<td>$13,443.41</td>
</tr>
<tr>
<td>Alan E. Kehew Endowment</td>
<td>$17,238.41</td>
</tr>
<tr>
<td>John and Kelly Grace Endowment of Geosciences</td>
<td>$10,712.76</td>
</tr>
<tr>
<td>Alumni, Faculty and Friends of Geosciences Endowment</td>
<td>$13,923.80</td>
</tr>
<tr>
<td>Shirley J. Aiken Geosciences Endowment</td>
<td>$12,008.49</td>
</tr>
<tr>
<td>The Core of Four Endowment for Geosciences</td>
<td>$12,897.15</td>
</tr>
<tr>
<td>CoreKids Geosciences Endowment</td>
<td>$11,223.55</td>
</tr>
<tr>
<td>LLoyd Schmaltz Museum of Earth History Endowment</td>
<td>$30,000.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$393,757.22</td>
</tr>
</tbody>
</table>

### Pending Endowments

<table>
<thead>
<tr>
<th>PENDING ENDOWMENTS</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geosciences Study Abroad Endowment</td>
<td>$1,100.00</td>
</tr>
<tr>
<td>Peter J. Kaczor Geology Scholarship</td>
<td>$4,225.00</td>
</tr>
<tr>
<td>Ronald Chase Endowment</td>
<td>$2,847.00</td>
</tr>
<tr>
<td>Chris Schmidt Endowment</td>
<td>$2,125.00</td>
</tr>
<tr>
<td>Tom Straw Endowment for Geosciences</td>
<td>$6,676.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$16,973.00</td>
</tr>
</tbody>
</table>

### Grants

<table>
<thead>
<tr>
<th>GRANTS</th>
<th>FUNDING AGENCY</th>
<th>TITLE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>William Harrison</td>
<td>U.S. Geological Survey</td>
<td>Data Preservation 7</td>
<td>$49,394.00</td>
</tr>
<tr>
<td>Stephen Kaczmarek</td>
<td>Exxon Mobil Qatar</td>
<td>Qat Coastal Research</td>
<td>$95,000.00</td>
</tr>
<tr>
<td>Michelle Kominz</td>
<td>National Science Foundation</td>
<td>Micro Crystal Diagenesis</td>
<td>$155,671.00</td>
</tr>
<tr>
<td>Mohamed Sultan</td>
<td>American Chemical Society</td>
<td>Hydrocarbon Maturation</td>
<td>$110,000.00</td>
</tr>
<tr>
<td>Mohamed Sultan</td>
<td>National Aeronautics and Space Administration</td>
<td>GRACE Aquifer Infiltration</td>
<td>$49,999.99</td>
</tr>
<tr>
<td>John and Kelly Grace Endowment of Geosciences</td>
<td>The National Academy of Sciences</td>
<td>NAS Egypt Aquifer System</td>
<td>$168,143.00</td>
</tr>
<tr>
<td>Joyashish Thakurta</td>
<td>Lundin Mining Corporation</td>
<td>Jazan Salt Dome Outcrop</td>
<td>$220,000.00</td>
</tr>
<tr>
<td>John Yellich</td>
<td>Michigan Department of Environmental Quality</td>
<td>PFAS Data Triage</td>
<td>$125,401.00</td>
</tr>
<tr>
<td>Joyashish Thakurta</td>
<td>Ground Water Research and Education Foundation</td>
<td>Geophysical Assessment Proof of Concept/Demonstration</td>
<td>$74,521.00</td>
</tr>
<tr>
<td>Joyashish Thakurta</td>
<td>Michigan Department of Environmental Quality</td>
<td>Mapping, projects, and data compilation</td>
<td>$500,000.00</td>
</tr>
<tr>
<td>Joyashish Thakurta</td>
<td>U.S. Geological Survey</td>
<td>Great Lakes Geologic Mapping Coalition</td>
<td>$68,800.00</td>
</tr>
<tr>
<td>Joyashish Thakurta</td>
<td>U.S. Geological Survey</td>
<td>State Mapping</td>
<td>$75,117.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>$1,717,397.99</td>
</tr>
</tbody>
</table>

*Most recent grants are placed at the top for each recipient

---

**GIVING**

To make a gift, visit give.mywmu.com/givetogoosciences

The Department of Geological and Environmental Sciences at Western Michigan University takes great pride in the sense of family that we have maintained ever since our founding in 1965. Your contribution enriches the experience for current and future students, faculty, and staff by adding an extra margin of excellence to our program which, as a result, helps us to attract top faculty and students. Additionally, your contribution creates opportunities for research, scholarships, field opportunities, fellowships, campus enhancements and more. Join us by making a gift to the Department of Geological and Environmental Sciences.
Individual and corporate donors

INDIVIDUALS
Lynette Abbate
Robert Ahrens
Mary S. Ahrens
Jerry L. Aiken
Eliot A. Atekwana
Michael J. Barcelona
David A. Barnes
Teresa P. Barnes
Richard H. Becker
Anthony R. Boxleiter
Regina Capuano
Robert J. Charney
Brian L. Coles
Byron J. Cook
Betty Cowles
Stanford L. Curtiss
Kay L. Curtiss
Kristine Ann Daniels
Leroy L. DeNooyer
Michael Dickman
Catherine S. Dickman
Timothy J. Dolehanty
Michele L. Dolehanty
James H. Duncan, Sr.
James H. Duncan, Jr.
Heather A. Engel
Andrew D. Erich
Pamela S. Evans
Michael G. Faulkner
James J. Ferritto, Jr.
John H. Fowler
Janet Fowler
Robert K. Garrison
Linda C. Gillespie
Wayne C. Goodman
Marty Goodman
Terri R. Halbach
Cathy L. Hampton
Jeffrey C. Hawkins
Gaston Holland
Judy L. Holland
Cameron C. Hoover
Paulette Hervi Hughes
James A. Huver
Tom Jordan
Thomas C. Kamin
Edward N. Kerr
Kevin A. Kincare
Joshua P. Kirschner
Jeffrey B. Klan
Michael Kovacich
Michelle Kovacich
Evie J. Kuncaitis-Huver
W. Richard Laton
John W. Leonard III
Letitia L Little
Karen A. Lockwood
James B. Mackie
Thomas Kent Mahan, Jr.
Todd R. Mall
Rosalie K. Maness
James D. Meinke
Suzanne K. Merrill
Adam M. Milewski
Timothy J. Mitchell
James C. Morgan III
Diana Morton-Thompson
Lew Murray
Howard Nevins
Ronald A. Parker
Kyle J. Patterson
Sara Pearson
Cal Reed
Millie Reed
Gerald E. Rogers
Donna M. Rogers
Christopher Ross
Charles Roth
Barbara Roth
Claudia Roth
Lloyd J. Schmaltz
Brian R. Shaw
David R. Steele
William K. Steinmann
Kim L. Steinmann
William T. Stelzer
Susan J. Stelzer
William Strickler
Alan Tipka
Sarah J. Tipka
David E. Travis
Arthur Washburn
Patricia Washburn
Stephen G. Whisner
Michael Wireman
Mike Winkler
Gary L. Worman
Karen A. Yellich
David W. Young
Rudy Ziehl

CORPORATE DONORS
Allan P. & Nancy Hascall Trust
Barratt Consulting, LLC
Brian T. Terhune, LLC
Brock Engineering
C. John and Reva Miller Charitable Fdn.
Cobra Oil & Gas Corporation
Compliance Environmental, Inc.
C. John and Reva Miller Charitable Fdn.
Cobra Oil & Gas Corporation
Earth Forensics, Inc.
Envirolec Technologies
Evans Geophysical, Inc.
Geraldine A. McClure Trust
Haggard Foundation
HB Concepts LLC
Innova Exploration
Johnstone Company
Lease Management, Inc.
Lloyd Schmaltz IRA
Manhattan College
Michigan Association of Pro. Landmen
Michigan Oil & Gas Association
Michigan Wireline Services, Inc.
Muskogon Development Co.
Nancy Jo Durham Living Trust
Pale Morning Dove, LLC
Plante & Moran, PLLC
Schmude Oil
Shell Oil Company Foundation
Steininger Living Trust
Summit Petroleum Corporation
The Dart Energy Foundation, Inc.
Trendwell Energy Corporation
West Bay Exploration

We thank you!

GES | 2018 36
Awards and achievements

DEPARTMENTAL AWARDS
- Advisory Council Endowment
  Charles Ewing
- Alan E. Kehew Endowment
  Tyler Norris
- Core of Four Endowment
  Charles Ewing
- David Kuenzi Research Grant
  Mohammed Al Musawi, Ryan Cascarano, Hanna Cohen, Katherine Dvorak, Esayas Gebremichael, Matt Hemenway, Clayton Joupperi, Sita Karki, Alex Koerber, Hannah Pankratz, Zaid Nadhim, Sarah VanderMeer
- Douglas Daniels Endowment
  Raigen Blake
- Empowering Geosciences Endowment
  Hossein Sabour and Gushaliyai Sataer
- Envirolodic Technologies Endowment
  Raigen Blake and Neale Turluck
- John and Kelly Grace Endowment
  Stephanie Buglione
- Kalamazoo Geological and Mineral Society
  Karem Abdelmohsen, Joy Kiefer, and Neale Turluck
- Laton-Lambright Field Camp Endowment
  Xiang Fan
- Lauren D. Hughes Environmental Scholarship
  Kathleen Dragos, Charles Ewing
- Lloyd and Marilyn Schmaltz MGRRE Award
  Elizabeth Gaines
- Lloyd and Marilyn Schmaltz Pro. Activities Award
  Shelby Hurst, Hannah Pankratz
- Mohamed Sultan Endowment
  Karem Abdelmohsen, Mustafa Emil
- Randall Kerhin Graduate Endowment
  Karem Abdelmohsen
- Undergraduate Senior Honor Awards
  Earth Science Education - Matthew Gibson
  Earth Science - Mason White
  Geology - Joseph Kniss, Bradley Rizzo
  Geophysics - Nicholas Shaw
  Hydrogeology - Douglas Keto

SERVICE AWARDS
- Distinguished Advisory Council Member
  Thomas Kamin
- Faculty Service Award
  Stephen Kaczmarek
- Staff Service Award
  Michelle Gates
- Distinguished Student Service Award
  Sita Karki
- CAS Advising Excellence Award
  Michelle Kominz

UNIVERSITY AWARDS
- Stephanie Buglione—Undergraduate Research Excellence Award
- Hanna Cohen—Graduate Research Assistantship Award
- Esayas Gebremichael—Research and Creative Activities Poster and Performance
- Day’s Outstanding Poster Presentation Award, Dissertation Completion Fellowship
- Shelby Hurst—Graduate Student Research Grant, Graduate Research Assistantship Award
- Nick Molekis—Dept level Graduate Teaching Effectiveness
- Elizabeth Palmer—All-University Graduate Research and Creative Scholar Award, Department-level Graduate Research and Creative Scholar Award, Graduate Student Research Grant
- Hannah Pankratz—All-University Graduate Teaching Effectiveness Award, Department-level Graduate Teaching Effectiveness Award, Graduate Research Assistantship Award
- Bradley Rizzo—Phi Beta Kappa Honor Society
- Katharine Rose—Presidential Scholar Award, Undergraduate Research Excellence Award

EXTERNAL AWARDS
- Karem Abdelmohsen—Farouk El-Baz Student Research Grant
- Hanna Cohen—Society for Sedimentary Geology (SEPM) Grant, North Central Section and Mineralogy, Geochemistry, Petrology, and Volcanology division’s Geological Society of America (GSA) Travel Grant
- Esayas Gebremichael—National Association of Black Geoscientists (NABG) Travel Grant
- Cameron Manche—Society for Sedimentary Geology (SEPM) Grant
- Hannah Pankratz—Society of Exploration Geophysicists (SEG) Student Travel Grant
- Nicholas Shaw—AAPG Deana and Paul Strunk Military Veterans Scholarship
- Neale Turluck—Riverside Energy Michigan Inc. scholarship and the Midwest Mineralogical and Lapidary Society of Michigan Scholarship, Society of Exploration Geophysicists (SEG/EexonMobil) Student Education Program Travel Grant
- Sarah VanderMeer—USGS Best Student Geologic Map and AIPG Michigan Section Best Graduate Student Poster

Publications and conference presentations

Dr. Andrew Caruthers


Dr. Stephen Kaczmarek

**Publications and conference presentations**


† Student of SEK

**Dr. Michelle Kominz**

2018 G. Tagliaro, C.S. Fulthorpa, S.J. Gallagher, C.M. McHugh, M. Kominz, and L.L. Lavier, Neogene silicilastic deposition and climate variability on a carbonate margin: Australian Northwest Shelf, Marine Geology, accepted, 15p., doi.org/10.1016/j.margeo.2018.06.007


**Dr. Heather Petcovic**


**Publications († indicates student co-author)**

**Dr. Matt Reeves**


**Dr. Mohamed Sultan**


**Dr. Joyashish Thakurta**


Authors in italics are students supervised by Thakurta

GES | 2018 38
Please keep in touch!
Please take a moment to let us know how you are, where you are, and what you're up to! While you're at it, please also share where you are currently employed, what you do there, what your professional interests are, and your contact information so that we can continue sending you newsletters and updates regarding alumni events.

Send word of your adventures to:
Mrs. Kathryn Wright
Department of Geological and Environmental Sciences
Western Michigan University
1903 W Michigan Ave
Kalamazoo, MI 49008-5241 USA

Email: kathryn.wright@wmich.edu
Phone: (269) 387-5486