
26th NORTH AMERICAN DIATOM SYMPOSIUM
BRAZIL, INDIANA 2022

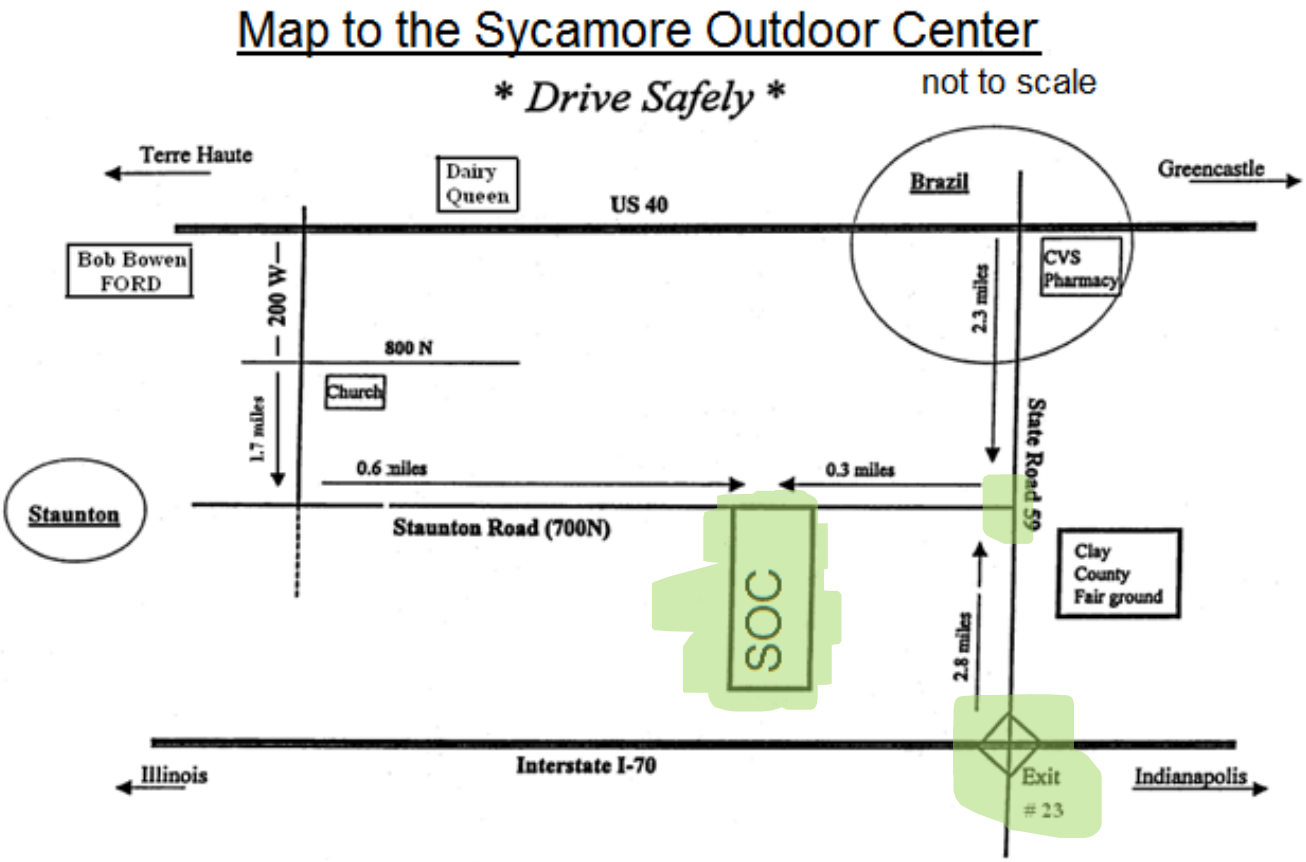
**The History of NADS**

The North American Diatom Symposium (NADS) is a biennial meeting, often held at field stations throughout the United States and Canada. The first NADS meeting was held in October of 1970 at Cedar Creek in central Minnesota (now the University of Minnesota's Cedar Creek Ecosystem Science Reserve); the inaugural meeting was organized by J. Platt Bradbury and Rick Drum. That site was notable for being the location of study for R. L. Lindeman's classic paper "The trophic-dynamic aspect of ecology", which was published in Ecology 23:399–418. The first meeting was attended by a total of 23 diatomists. After several days of discussion with no formal papers the group sat in a circle and talked about diatom ecology. This meeting resulted in a paper by Platt (Bradbury, J. P. 1973. Ecology of freshwater diatoms. Nova Hedwigia. 24:145–168.), which was essentially a verbatim record of that conversation.

Since that date, NADS has been hosted at field stations across North America, including Florida, Colorado, Manitoba, Kentucky, Alabama, Ohio, Minnesota, Iowa, Wisconsin, Georgia, and Michigan. NADS usually attracts 70-100 diatomists from around the world. The meeting is designed to provide a student-friendly atmosphere, ample opportunities to network and socialize, the ever-popular scum run, local field collecting trips, and lively auction of diatom related valuables. NADS is an informal society, that is, there are no formal officers or structure.

## About the Sycamore Outdoor Center (Brazil, Indiana)

In the mid-1960s, Indiana State University purchased the property for the ISU Field Campus with the intent of making an outdoor recreation and learning laboratory facility. The campus was eventually rebranded as the Sycamore Outdoor Center, and a huge investment was made into recreating it as a recreational space. The Sycamore Outdoor Center is a scenic 80-acre plot of land located approximately 18 miles east of Terre Haute, Indiana and is still considered a part of the ISU Campus. The Outdoor Center accommodates educational programs and services. It features 8 lakes, houses the Keystone Adventure Program, 8 platform tents, full-sized classroom facilities, and climbing wall.




# Driving Directions

## Via U.S. 40 (From Terre Haute)

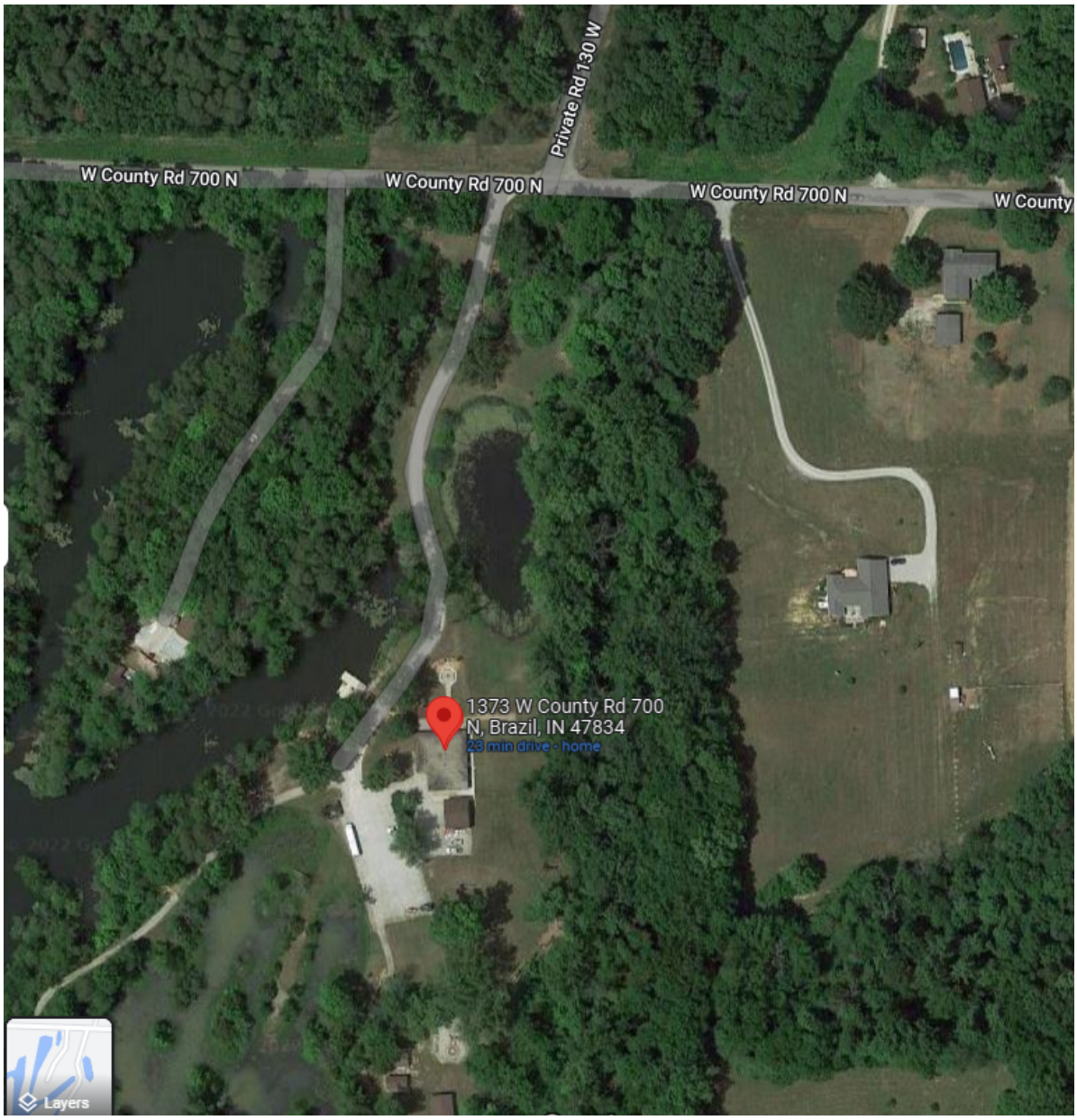
Before getting to Brazil, on your left, you will see the Brazilian Bowling Lanes and a Bob Bowen Ford Dealer-ship. Slow down and after about a 1/2 mile, the highway will curve to the left. Just before the curve, you will see a stop sign and a green Indiana State Sycamore Outdoor Center sign indicating a right turn. Turn right/South on that road (County Road 200 W). Proceed South and go to the second 4-way stop. Turn left and about a 1/2 mile on your right will be the ISU SOC sign and entrance. Turn right onto the white rock road and proceed through the gate.

## Via Interstate 70 (From Terre Haute)

Get off on the Brazil-Linton exit ramp (exit #23) on Highway 59. Turn left and proceed North toward Brazil approximately 2.8 miles. You will see a green Staunton Road sign pointing to the left and a sign for Pine Lakes subdivision. Turn left/West (onto 700 N) and after a 1/2 mile, you will see the ISU SOC sign. Turn left onto the white rock road and proceed through the gate.

## Via Interstate 70 (From Indianapolis)

Get off on the Brazil-Linton exit ramp (exit #23) on Highway 59. Turn right and proceed North toward Brazil approximately 2.8 miles. You will see a green Staunton Road sign pointing to the left and a sign for Pine Lakes subdivision. Turn left/West (onto 700 N) and after a 1/2 mile, you will see the ISU SOC sign. Turn left onto the white rock road and proceed through the gate.




**For the 26th NADS**

**Registration/Meeting Room:** The Sycamore Outdoor Center has one main building (marked on the map above); You can park in the parking area in front of the building – there is a gate with a sign for the Outdoor Center on the driveway where you can enter the grounds. Note: all presentations, posters, meals, coffee breaks, book displays, microscopes and mixers will be in the main building and the associated pavilion area around it. If you have opted to camp or stay in one of the bunk houses, these areas are located just south of the main building (visible at the southern edge of the image above).

Most of the recommended hotels are located off of I-70, either at exit 23, exit 11, or exit 7.

# The NADS 2022 Organizing Committee

**Jeffery Stone**
Co-Organizer for NADS 2022

**Laura Lopera Congote**
Co-Organizer for NADS 2022

**Karlyn Westover**
Co-Organizer for NADS 2022

**Mark Edlund / Paula Furey**
Auction Organizers for NADS 2022

**Julie Wolin / Rebecca Bixby / Sabrina Brown**
Scum Run Organizers for NADS 2022

**Sarah Hamsher**
NADS Webmistress

**Shelly Smith**
Logo Design

**About the NADS 2022 logo:**

While visiting the Sycamore Outdoor Center Jeffery Stone collected some diatom samples from Sycamore Lake (the main lake, next to the building where the meeting is being held) and sent them off to Shelly Smith (https://www.studiocornix.com/) who used the sample to draw diatoms that occur in the lake. Shelly then used a combination of ink and pigments made exclusively from algae, turned into watercolors, to paint the inked logo. The background component of the logo was painted with pigments that Shelly created when Jeffery sent her local coal and hematite from Indiana (collected from Cagles Mill – not far from the meeting location), which she crushed and made into watercolors.

For the past several years, Shelly has been retracing some of Ehrenburg's collecting sites and creating art based upon them. Shelly will be presenting on Friday, September 23 – and showcasing some of her artwork at the meeting. You can check out some of her artwork here: https://www.studiocornix.com/after-ehrenberg

**Auction, Auction! - Don't forget NADS Auction Friday night** - bring your items to help raise money for our students. Proceeds help out with student travel, and everyone has something they can donate! Diatom and algae memorabilia, that extra copy of P&R'75, a bottle of wine or six pack from your local microbrew/vineyard, your best homebrew, art and handmade crafts, t-shirts, books and reprints. We think we've seen it all, but I bet you can bring something different that someone will take home. Bid early, bid often, and please bring cash or check!

**T-Shirts, Housing, and Mugs:** Please note that your registration fees did not include the t-shirt, mug, or on-site housing costs. These must be paid for at the meeting, so please bring some form of payment (cash, check, Venmo, PayPal).

**Turkey Run Field Trip:** We have arranged for a half day that can be spent hiking or just relaxing at Turkey Run State Park (Friday 9AM – 4PM). You aren't required to come along, but there will be a charter bus that transports everyone who is interested in attending to and from the site. If you want to check out the site in advance, here is the website: https://www.turkeyrunstatepark.com/ - the hiking trails are rated across a range of difficulties for length and intensity. There's also covered bridges and other activities – the entry fee to the park is covered by your registration, but if you want to do some other activity that costs money, you'll have to cover that cost.

If you aren't interested in the field trip, feel free to spend time relaxing, hanging out, or canoeing around at the Outdoor Center or find your own activities for the afternoon, but please be back by 4PM for the keynote!

**The NADS Program for 2022:**

**Wednesday, September 21:**

2:00 PM Arrival, Registration open
7: 00 PM Dinner, Mixer

**Thursday, September 22:**

8 AM Breakfast
9 AM Welcome – Jeffery R. Stone

9:15 AM Challenges in establishing a Jurassic fossil record of diatoms highlights multiple sources of uncertainty in the oldest diatom fossil – Karolina Brylka, Andrew J. Alverson, R.A. Pickering, S. Richoz, and Daniel J. Conley
9:45 AM Genome size evolution in diatoms – Wade Roberts and Andrew J. Alverson
10: 15 AM Barriers and bridges to the evolutionary success of diatoms – Andrew J. Alverson and Daniel J. Conley

10:45 AM Snack and Coffee Break

11:00 AM Unravelling a natural evolutionary experiment: the colonization of low-salinity habitats in the Baltic Sea by the ancestrally marine diatom *Skeletonema marinoi* – Eveline Pinseel, Teofil Nakov, Elizabeth Ruck, Koen Van den Berge, Kala Downey, Kathryn Judy, Olga Kourtchenko, Anke Kremp, Conny Sjöqvist, Wade R. Roberts, Mats Töpel, Matthew W. Hahn, Anna Godhe, and Andrew J. Alverson
11:30 AM Diatom paleofloras beneath the West Antarctic Ice Sheet: feeding modern microbial ecosystems and revealing ice sheet history – David Harwood, Jason Coenen, and Amy Leventer

12:00 PM Lunch

1:30 PM A small lake with a large story to tell: what does it take to represent an epoch – Paul B. Hamilton, Francine McCarthy and R. Timothy Paterson
2:00 PM Historical lake ice records and potential for paleoenvironmental interpretation of diatom assemblages in varved sediments – Virginia Card
2:30 PM Generalized Additive Models (GAMs) as tools for identifying the onset of ecological change in high-altitude lakes – Laura Lopera Congote, Jeffery R. Stone, Mike M. McGlue, and Laura Streib
3:00 PM A paleolimnology study of historical wild rice (*Zizania palustris*) in Lac Vieux Desert, MI – Elynor Head, Chad Yost, and Jeffery Stone
3:30 PM Why are there phytoliths in my diatom samples, and what can I do with them? – Chad Yost

4:00 PM Snack Break

4:30 PM **Keynote:** Mark B. Edlund – Diatoms and the Lakeside legacy

5:30 PM Posters
7:30 PM Dinner + Evening Mixer

**Friday, September 23:**
8:00 AM Breakfast

9:00 AM Depart for Turkey Run Field Trip (Box Lunch/sandwich combos)
4:00 PM Return from Turkey Run

4:30 PM **Keynote:** Shelly Smith - After Ehrenberg: Retracing the Artistic Legacy of Early Microbiological Exploration
5:15 PM Outreach Workshop – led by Shelly Smith & Janai Southworth
6:30 PM Dinner
8:00 PM NADS Auction and evening mixer event!

**Saturday, September 24:**
8AM Breakfast
9AM Diatom community dynamics in the Savannah River Estuary – Kalina M. Manoylov
9:30 AM *Didymosphenia geminata* in the St. Marys River (Michigan, USA) – Robert W. Pillsbury
10:00 AM Brighty of the Grand Canyon – Sarah Spaulding

10:30 AM Snack and Coffee Break

11:00 AM Extreme teratological forms in Antarctic diatom cultures neglected during the COVID-19 pandemic – Lane Allen and Anne Troeltzsch
11:30 AM Use of diatoms and other algae in a novel wastewater treatment system – Cassandra Ceballos, Jennifer Slate, Kuldip Kumar, and Martin A. Gross
Noon Effects of non-native watercress on diatoms, macroinvertebrates, and sediments – Elizabeth Bergey

12:30AM Lunch
2:00 PM Scum Run

6:00 PM Business Meeting
7:00 PM Dinner

**Sunday, September 25:**
9AM Departures

**Oral Presentations – Day 1**

1. Challenges in establishing a Jurassic fossil record of diatoms highlights multiple sources of uncertainty in the oldest diatom fossil – Karolina Brylka, Andrew J. Alverson, R.A. Pickering, S. Richoz, and Daniel J. Conley
2. Genome size evolution in diatoms – Wade Roberts and Andrew J. Alverson
3. Barriers and bridges to the evolutionary success of diatoms – Andrew J. Alverson and Daniel J. Conley
4. Unravelling a natural evolutionary experiment: the colonization of low-salinity habitats in the Baltic Sea by the ancestrally marine diatom *Skeletonema marinoi* – Eveline Pinseel, Teofil Nakov, Elizabeth Ruck, Koen Van den Berge, Kala Downey, Kathryn Judy, Olga Kourtchenko, Anke Kremp, Conny Sjöqvist, Wade R. Roberts, Mats Töpel, Matthew W. Hahn, Anna Godhe, and Andrew J. Alverson
5. Diatom paleofloras beneath the West Antarctic Ice Sheet: feeding modern microbial ecosystems and revealing ice sheet history – David Harwood, Jason Coenen, and Amy Leventer
6. A small lake with a large story to tell: what does it take to represent an epoch – Paul B. Hamilton, Francine McCarthy and R. Timothy Paterson
7. Historical lake ice records and potential for paleoenvironmental interpretation of diatom assemblages in varved sediments – Virginia Card
8. Generalized Additive Models (GAMs) as tools for identifying the onset of ecological change in high-altitude lakes – Laura Lopera Congote, Jeffery R. Stone, Mike M. McGlue, and Laura Streib
9. A paleolimnology study of historical wild rice (*Zizania palustris*) in Lac Vieux Desert, MI – Elynor Head, Chad Yost, and Jeffery Stone
10. Why are there phytoliths in my diatom samples, and what can I do with them? – Chad Yost

***Keynote:*** Diatoms and the lakeside legacy – Mark B. Edlund

**Oral Presentations – Day 2**

***Keynote:*** After Ehrenberg: Retracing the Artistic Legacy of Early Microbiological Exploration – Shelly Smith

**Oral Presentations – Day 3**

1. Diatom community dynamics in the Savannah River Estuary – Kalina M. Manoylov
2. Brighty of the Grand Canyon – Sarah Spaulding
3. *Didymosphenia* blooms in Minnesota's North Shore region: that's snot what we were expecting - Joseph Mohan, Mark Edlund, David Burge, Heidi Rantala, Robert Pillsbury, and Danielle Kuball
4. Extreme teratological forms in Antarctic diatom cultures neglected during the COVID-19 pandemic – Lane Allen and Anne Troeltzsch
5. Use of diatoms and other algae in a novel wastewater treatment system – Cassandra Ceballos, Jennifer Slate, Kuldip Kumar, and Martin A. Gross

6. Effects of non-native watercress on diatoms, macroinvertebrates, and sediments – Elizabeth Bergey

**Day 1 - Posters**

1. Freshwater salinization along the Cuyahoga River – Julie A. Wolin, Brittany Dalton, Laura Egensperger, and Alexandra Ferkul
2. A diatom bioassessment of the Maumee River watershed –Sabrina R. Brown, Michaela Hunt, Sloane Livingston, Autumn Saddler, Hallie Webb, Nat Shingler, and Katelyn Smith
3. Application of the national multimetric index to reference rivers and streams in Washington, USA – Heera Malik, Clinton Davis, Dennis Vander Meer, Sean Sullivan, and Edna Pedraza
4. Comparison of diatom community dynamics in reference stream and recovering agricultural stream in middle Georgia, USA – Sydney Brown and Kalina Manoylov
5. Diatom algae and other epizoic microorganisms on the shells of two snapping turtles: *Macrochrlys temminckii* and *Chelydra serpentina* – Sara Crow, Hanna Karic, Angelica Adams, and Jennifer Slate
6. Epibiotic diatom assemblages on Texas freshwater turtles – Graham Derzon-Supplee, Jesse Meik, and Victoria Chraïbi
7. Epizoic diatom diversity of Gulf of Mexico sea turtles – Cynthia Flores, Victoria Chraïbi, Matt Ashworth
8. 
9. Algal assemblage response to contrasting environmental variables in waters in the Red River and Guadalupe River basins in Texas in response to climate change and variable flow – Jaidan Ludescher, Tonya Ramey, Weston Nowlin, and Paula C. Furey
10. Coastal carbon flux: periphyton contributions and diatom indicators – Samantha Hormiga and Evelyn Gaiser
11. Diversity of large-celled *Pinnularia* in northeastern North America – Laura Aycock, Micaela Kersey, and Marina Potapova
12. A voucher flora of diatoms from fens in the Tanana River floodplain, Alaska – Veronica A. Hamilton, Sylvia S. Lee, Allison R. Rober, and Kevin H. Wyatt
13. Typification of Neidium bisulcatum, and a description of a similar Neidium sp. that has historically led to confusion – Lane Allen and Paul Hamilton
14. Analyzing species parameters in the genus *Hannaea* from the upper Kuparuk River, Alaska – Lindsey Sahlmann, Ana M. Morales-Williams, Mark Edlund, and William B. Bowden
15. A new species? – an unusually long *Eunotia* (Bacillariophyceae) from Big Creek Lake, Alabama, USA – Furey, Paula C. and Lynn A. Brant
16. Evidence of sub-stage climactic shifts during MIS 11 refined from diatom assemblage reconstruction in the Valles Caldera, New Mexico – Savannah Cutler, Peter Fawcett, and Rebecca J. Bixby

17. The Diatom Dark Ages: Identification of mid-Cretaceous Arctic Platform diatoms from the basal transgression of the Kanguk Formation, Devon Island, Nunavut, Canada – Megan Heins
18. Morphological changes in endemic *Surirella* (*Iconella*) in response to a 225 ka cold event in Lake El'gygytgyn, northeast Russia – Madisyn Rex, Jeffery Snyder, and Melina Luethje
19. Characterizing and understanding multistigmate Gomphonema from Olorgesailie – Daphne Coffey, Laura Lopera Congote, and Jeffery R. Stone
20. Marl Lake: reconstructing past lake levels using diatoms – Christian Sizemore, Terresa Cook, Karlyn S. Westover, and Jeffery R. Stone
21. Diatom-inferred seasonal fluctuations in a rural pond, Defiance Co., Ohio – Katelyn Smith, and Sabrina R. Brown
22. Siliceous microfossil responses to the Cretaceous Paleogene mass extinction event from Seymour Island, Antarctic Peninsula – Jason Coenen, David Harwood, and Thomas Tobin

# ABSTRACTS

## Session 1: Thursday Morning

**Presenter:** Karolina Brylka (she/her)

### CHALLENGES IN ESTABLISHING A JURASSIC FOSSIL RECORD OF DIATOMS HIGHLIGHTS MULTIPLE SOURCES OF UNCERTAINTY IN THE OLDEST DIATOM FOSSIL

Brylka, K.[1], Alverson, A. J.[2], Pickering, R.A.[1], Richoz, S.[1], and Conley, D. J.[1]

[1] Department of Geology, Lund University, Sölvegatan 12, 223 62 Lund, Sweden
[2] Department of Biological Sciences, University of Arkansas Fayetteville, AR 72701, USA

**Abstract:** Knowledge of past biodiversity and organismal evolution requires a fossil record, all of which are incomplete. This incompleteness alters the understanding of diversification dynamics, rates of evolution, and impacts on the paleoenvironment. Integrating fossil information with molecular phylogenies allows the scientific community to estimate origin time of a given group and the divergence times of major clades, however these inferences require a good fossil record. For any group of organisms, it is unlikely to discover fossils that date back precisely to the estimated time of origin. As a result, molecular clock studies for groups such as foraminifera, coccolithophores, angiosperms, and diatoms predict that these lineages are older than their earliest fossils. Molecular clocks estimate that diatoms originated near the Triassic–Jurassic boundary (200 Ma), but the fossil record surrounding this period is scarce or nonexistent. The oldest available evidence comes from the Lower Jurassic (182 Ma) and is represented by three species in the genus *Pyxidicula*. Although *Pyxidicula* falls close to the estimated origin time and its resemblance to some radial centric diatoms aligns with expected ancestral diatom characters, there are several uncertainties about the age, identity, and overall reliability of these important fossils. Despite these reservations, *Pyxidicula* is widely accepted and used in many evolutionary contexts. During our search for Jurassic diatoms, three study sites yielded microfossils initially recognized as diatoms. After applying extensive morphological and elemental evaluations, as well as an additional age control measures, the recognized fossils were rejected. Our experience led us to systematically reevaluate the evidence supporting *Pyxidicula* as the oldest diatom fossil, which we ultimately reject as reliable. Omitting *Pyxidicula* creates a > 80 Ma year gap between the estimated time of origin and the oldest abundant fossil diatom record, altering understanding of early diatom evolution, and highlighting deficiencies in our understanding of early diatom evolution. Future searches for Cretaceous and Jurassic diatoms should include several precautions, safeguards, and application of validation tools presented here.

**Presenter:** Wade Roberts

GENOME SIZE EVOLUTION IN DIATOMS

Roberts, Wade and Alverson, Andrew J.

Department of Biological Sciences, University of Arkansas, Fayetteville, Arkansas 72701, USA

**Abstract:** Genome size varies greatly across diverse lineages of eukaryotes. It has been implicated in the form, function, and ecological success of species. Several evolutionary theories predict that genome size can vary due to shifts in gene content, repetitive DNA content, or cell volume. To test these predictions in diatoms, we generated genome size estimates for 57 strains, representing 52 species that span both marine and freshwater habitats. Genome sizes ranged from 30 Mb to 2 Gb. We tested for correlations between genome size, gene content, repetitive DNA content, and cell volume. Increases in genome size were strongly correlated with both repetitive element expansions and cell volume, but not gene content. While genome size had phylogenetic signal, there was no difference between marine and freshwater species. Our results demonstrate that proliferation of repetitive DNA content contributes to genome size diversity in diatoms.

**Presenter:** Andrew Alverson (he/him)

# BARRIERS AND BRIDGES TO THE EVOLUTIONARY SUCCESS OF DIATOMS

Andrew J. Alverson[1] and Daniel J. Conley[2]

[1]University of Arkansas
[2]Lund University

**Abstract:** Diatoms are commonly referred to as one of the most "successful" lineages. Definitions of success vary among researchers and disciplines, and definitions often confound different measures of success. What is success? Are diatoms successful? If so, how are they successful, what has led to their success, and is this question worth asking?

**Presenter:** Loren Bahls

# DIATOM DISPERSAL IN DEEP TIME AND SLOW MOTION: HOW GEOLOGIC, CLIMATIC AND EVOLUTIONARY PROCESSES IN THE FAR DISTANT PAST HAVE SHAPED MODERN DIATOM FLORAS IN THE AMERICAN NORTHWEST

Bahls, Loren

**Abstract:** The species compositions of three regional diatom floras--Cascade Mountains, Northern Rocky Mountains and Northwestern Great Plains--are examined for clues to their origins. While some floristic features can be explained by a region's fossil record and current geology, climate and water chemistry, most of each flora's makeup was determined by processes that predate most fossil records. The origin of these floras dates from about 150 million years ago, when the North American craton began to separate from Europe and the remainder of Pangea. Here I present evidence that continental drift, seawater incursions, volcanism, and glaciation played major roles in shaping modern diatom floras of the American Northwest. These findings suggest that many diatom species predate the earliest fossil records for those species and that many diatom lineages are much older than previously thought. They also indicate that diatom dispersal has been occurring since the very first diatoms appeared and that dispersal can occur in very slow motion (i.e., geologic time) as well as in episodic jerks and starts in real time. Moreover, each region's flora is distinguished by a unique set of presumed endemic species, which are here defined as local, regional or continental endemics, depending on their confirmed distribution and probable point of origin. Endemics likely arose from sister taxa through a process of isolation, genetic drift and speciation. A lake, pond or wetland is essentially an island of water in a sea of land where the principle of island biogeography also applies.

**Presenter:** Eveline Pinseel (she/her)

# UNRAVELLING A NATURAL EVOLUTIONARY EXPERIMENT: THE COLONIZATION OF LOW-SALINITY HABITATS IN THE BALTIC SEA BY THE ANCESTRALLY MARINE DIATOM *SKELETONEMA MARINOI*

Pinseel, Eveline[1], Nakov, Teofil[1], Ruck, Elizabeth[1], Van den Berge, Koen[2,3,4], Downey, Kala[1], Judy, Kathryn[1], Kourtchenko, Olga[5], Kremp, Anke[6], Sjöqvist, Conny[7], Roberts, Wade R.[1], Töpel, Mats[5], Hahn, Matthew W.[8], Godhe, Anna[5], and Alverson, Andrew J.[1]

[1]Department of Biological Sciences, University of Arkansas, Fayetteville, AR, USA
[2]Department of Statistics, University of California, Berkeley, CA, USA
[3]Department of Applied Mathematics, Computer Science and Statistics, Ghent University, Ghent, Belgium
[4]Bioinformatics Institute Ghent, Ghent University, Ghent, Belgium
[5]Department of Marine Sciences, University of Gothenburg, Gothenburg, Sweden
[6]Leibniz-Institute for Baltic Sea Research, Rostock, Germany
[7]Faculty of Science and Engineering, Åbo Akademi University, Turku, Finland
[8]Department of Computer Science, Indiana University, Bloomington, IN, USA

**Abstract:** The salinity gradient separating marine and freshwater environments represents one of the major ecological divides for prokaryotic and eukaryotic microbes, including diatoms. Yet, the mechanisms by which marine diatoms adapt to, and ultimately diversify in, freshwater environments are poorly understood. Here, we take advantage of a natural evolutionary experiment that has played out over the past 8,000 years in one of the world's largest brackish water bodies: the colonization of the Baltic Sea by the ancestrally marine diatom *Skeletonema marinoi*. To unravel the evolutionary mechanisms behind *S. marinoi*'s colonization of the Baltic Sea, we combined population genomics (Pool-seq) with transcriptomics (RNA-seq). Our results showed that *S. marinoi* genotypes obtained from the inner Baltic (low salinity) and outer Baltic (high salinity) exhibit genome-wide molecular differentiation. Such signal of geographic differentiation could be the result of reduced gene flow between populations in the inner and outer Baltic, as well as a signal of local adaptation. Indeed, the RNA-seq data showed that different strains of *S. marinoi* differ significantly in their response to changes in salinity, as the strain effect overshadowed the salinity effect in the transcriptome response. However, we did not detect consistent differences in gene expression patterns between strains isolated from the inner and outer Baltic. Altogether, our dataset offers a unique perspective on the evolutionary drivers behind the colonization of low salinity environments by an ancestrally marine diatom.

**Presenter:** David Harwood

# DIATOM PALEOFLORAS BENEATH THE WEST ANTARCTIC ICE SHEET: FEEDING MODERN MICROBIAL ECOSYSTEMS AND REVEALING ICE SHEET HISTORY

Harwood, David[1], Jason Coenen[1], and Leventer, Amy[2]

[1]University of Nebraska-Lincoln,
[2] Colgate University

**Abstract:** Multiple ages of fossil marine diatom assemblages recovered from sediments collected beneath the West Antarctic Ice Sheet identify past times when West Antarctica was covered by productive marine seas and siliceous biogenic sediments accumulated in sedimentary basins. Glacial erosion and transport of marine sediments mixed diatom floras of many ages, which can be separated into discrete biostratigraphic assemblages and used to date times of deglacial and marine conditions. This report will summarize the state of knowledge from a variety of sites in the Ross, Thwaites, and Ronne-Filchner sectors of West Antarctica to compare and contrast ice sheet sensitivity in conjunction with recent numerical models of ice sheet behavior. Recent hot-water drilling into Mercer Subglacial Lake during the SALSA Project to study microbial ecosystems within Antarctica's subglacial wetlands identified fossil diatom sources of relict marine carbon (Oligocene and Late Miocene) that help 'feed' the microbial communities. Future stratigraphic drilling planned for the international SWAIS 2C Project seaward of the grounding-line at Kamb Ice Stream and at Crary Ice Rise will further advance this history with the recovery of long (~200 meter) drill cores of what are anticipated to be in situ marine diatom-bearing sediments of Neogene age.

**Session 2: Thursday Afternoon**

**Presenter:** Paul Hamilton (he/him)

# A SMALL LAKE WITH A LARGE STORY TO TELL: WHAT DOES IT TAKE TO REPRESENT AN EPOCH

Paul B. Hamilton[1], Francine McCarthy[2], and R. Timothy Paterson[3]

[1]Collections and Research Division, Canadian Museum of Nature, Ottawa, K2J 4S7 Canada
[2]Dept. of Earth Sciences, Brock University, St. Catherines L2S 3A1 Canada
[3]Ottawa-Carleton Geoscience Center and Department of Earth Sciences, Carleton University, Ottawa K1S 5B6 Canada

**Abstract:** As society addresses the reality of our changing global environment, the International Commission on Stratigraphy is considering the recognition of a new Epoch, the Anthropocene. A Global Boundary Stratotype Sections and Points (GSSPs, reference point to define the lower boundaries within the geologic time scale) is being considered from 12 locations around the globe with one representative site to be chosen in the year 2022. This presentation considers one site, Crawford Lake, Ontario Canada and its recent paleolimnology record to evaluate the Great Acceleration of the proposed Anthropocene. Crawford Lake contains annually varved sediments documenting high resolution environmental changes in the lake. Physical, biological, and chemical data are used to support the proposal that the sediments of Crawford Lake capture local, regional and global changes in our climate. If a new geological time is recognized, we hope the sediment record of Crawford Lake will be selected to represent the Golden Spike marking the lower boundary of an Anthropocene Epoch.

**Presenter:** Virginia Card (she/her)

# HISTORICAL LAKE ICE RECORDS AND POTENTIAL FOR PALEOENVIRONMENTAL INTERPRETATION OF DIATOM ASSEMBLAGES IN VARVED SEDIMENTS

Card, Virginia

Metropolitan State University, St. Paul, Minnesota

**Abstract:** Dimitic lakes lose their winter ice-cover in spring in response to loss of snow cover, increasing solar insolation and warming air temperatures. The date of this phenological event for individual lakes typically varies within a window of several weeks, and its timing affects the physical, chemical and biological conditions in the lake in the following months. The relationship between the timing of ice-out and the diatom community composition of a year as represented in the lake sediment, particularly varved sediment, is studied for its potential as an annual resolution paleoenvironmental indicator. Calibration of the diatom records for this purpose depends on the accuracy of the historical environmental records to which they are compared. In this study, the accuracy of seventeen very long (>100yrs) historical records of ice-out dates from eleven lakes in the Northern United States was assessed by three methods, the frequency and magnitude of errors calculated, and methods for identifying and correcting errors developed and evaluated. Analysis found that for dates more than 100 years old, modal precision is 1 day, mean accuracy 2.3 days, frequency of major errors 6%, and success rate of detection and correction of major errors 63%. These results provide an estimation of the potential precision and accuracy for reconstructing pre-historic lake ice-out dates using diatom assemblages from varved lake sediment calibrated using historical ice-out records, and confirm with very high confidence that ‘normal’ ice-out dates on these well-observed lakes are occurring 5–10 days earlier than 100 years ago.

**Presenter:** Laura Lopera Congote (she/her)

# GENERALIZED ADDITIVE MODELS (GAMS) AS TOOLS FOR IDENTIFYING THE ONSET OF ECOLOGICAL CHANGE IN HIGH-ALTITUDE LAKES

Laura Lopera Congote[1], Jeffery R. Stone[1], Mike McGlue[2] Laura Streib[3]

[1]Indiana State University, Department of Earth and Environmental Systems
[2]University of Kentucky
[3]Syracuse University

**Abstract:** Diatom paleoecology often results in large and complex data sets that need to be dissected in several ways to understand the history of ecosystem change. One of the strongest tools to do this is Generalized Additive Models (GAMs). In this study, GAMs were used to identify the onset of ecological change in two high-elevation lakes in the Sierra Nevada, California. Our results suggest that traditional statistical approaches such as Stratigraphically Constrained Cluster Analysis (CONISS) and Principal Component Analysis (PCA) yield information regarding diatom species succession in the ecosystem and how this relates to environmental change, while the GAMs reveal critical ecosystem shifts. Additionally, we were able to discern differential ecosystem response in these lakes. In this case, the deeper lake showed an earlier response to warming with respect to the shallower lake analysed. The ecological changes identified in the lakes are related to changes in nutrient cycling as a response to increasing temperatures and a more stable thermocline. The 70-year lag identified between the lakes is hypothesized to be a function of lake depth, and hence, depth of the thermocline. A deeper thermocline is more stable and more sensitive to increasing temperatures. Our approach yielded valuable information for understanding lake dynamics in the Sierra Nevada.

**Presenter:** Elynor Head

# A PALEOLIMNOLOGY STUDY OF HISTORICAL WILD RICE (*ZIZANIA PALUSTRIS*) IN LAC VIEUX DESERT, MI

Head, Elynor, Yost, Chad, and Stone, Jeffery R.

Indiana State University, Department of Earth and Environmental Systems

**Abstract:** Lac Vieux Desert is a freshwater lake located between the border of northern Michigan and Wisconsin. The lake once supported a thriving stand of wild rice (*Zizania palustris*), a culturally important plant for the Lac Vieux Desert Ojibwe community. The objective of this study is to understand how changes in lake conditions may have impacted the wild rice population. To understand this change, a transect of three cores were recovered by the U.S Army Corps of Engineers to be analyzed for pollen, phytoliths, and diatoms. For this study, we collected subsamples continuously at 1-cm (~ 10yr) intervals to determine the abundance and composition of diatom assemblages from the early 1800s to present day. Since diatoms are ecological indicators, a change in the abundance of a species observed in assemblages overtime relays a change in the past lake environments. At approximately 7-cm from the top of the core, (~70 years ago), there was an increase in the abundance of the benthic species *Geissleria acceptata*. *Geissleria acceptata* is common in environments of moderate to high ionic strength, which suggests an elevation in lake salinity. From 0 to 11-cm from the bottom (~present to 110 years ago) *Staurosira construens* and *Staurosira venter* are abundant. *Staurosira construens* and *Staurosira venter* thrive in benthic and planktonic environments with elevated alkalinity. The abundance of these three species indicates an increase in water depth of Lac Vieux Desert since ~1950, when the earliest damn was constructed. Samples after ~1950 occasionally contained spikes in charcoal, which may be related to logging and increased human activity surrounding the lake. Overall, from the present to 1950, Lac Vieux Desert transitions from being more abundant in benthic species to becoming more tychoplantonic, indicating an increase in water level within this time span.

**Presenter:** Chad Yost (he/him)

# WHY ARE THERE PHYTOLITHS IN MY DIATOM SAMPLES, AND WHAT CAN I DO WITH THEM?

Yost, Chad

Indiana State University, Department of Earth and Environmental Systems

**Abstract:** Phytoliths are opal silica infillings, casts, and outgrowths of plant cells produced by some terrestrial and aquatic plants. Because their size range and chemical composition is identical to that of diatoms, phytoliths can occur in diatom sample preps and sometimes in unprocessed smear slides. The goal of this talk is to provide an overview of the most common and easy to identify phytoliths, and to suggest ways in which simple phytolith counts could complement diatom-based limnological studies.

**Thursday Keynote:** Mark Edlund (he/him)

DIATOMS AND THE LAKESIDE LEGACY

Edlund, Mark B.

St. Croix Watershed Research Station, Science Museum of Minnesota, 16910 152nd St. N., Marine on St. Croix, Minnesota 55047 USA

**Abstract:** Summer 2023 will be the 60th year that Ecology and Systematics of Diatoms has been taught at Iowa Lakeside Laboratory! What was started by Gene Stoermer in 1963 as a clinic for researchers to gather has become an annual training ground for undergrads, graduate students, and professionals from the US and abroad. The class has dramatically expanded diatom research from a handful of museum and agency researchers studying diatoms in the 1960s to fostering academic programs throughout the world. At its core, the class has always strived to introduce everyone to microscopy, diatom diversity, ecology, biology, and systematics, and to teach the fundamentals of using diatoms as tools. The class has created a legacy by discovering and documenting the world's biodiversity, responding to scientific need, changing how we communicate science, and most importantly building community within each class, at Lakeside, and inviting everyone to be part of the wonderful world of diatoms.

**Friday Keynote:** Shelly Smith (she/her)

# AFTER EHRENBERG: RETRACING THE ARTISTIC LEGACY OF EARLY MICROBIOLOGICAL EXPLORATION

Smith, Shelly

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**Abstract:** Dr. Christian Gottfried Ehrenberg was one of the foundational microbiological scientists, identifying thousands of species of microorganisms including many desmids, algae, and diatoms. Like many scientists working prior to microscopic photography, Dr. Ehrenberg produced illustrations to accompany his descriptions and texts, visually demonstrating his discoveries. One of the most prolific scientists of his time, Dr. Ehrenberg left behind over 3,000 illustrations in varying mediums, creating an artistic legacy that accompanies his taxonomic work.

The Ehrenberg microorganism collection of sample records and illustrations is digitized and can be downloaded for free from the Natural History Museum of Berlin. Leveraging these publicly available records, I researched and re-traced the steps of the historical scientific expeditions that sourced the sample materials for Dr. Ehrenberg's collection. Focusing on locations in western North America, I collected water and soil from locations of famous scientific and exploration groups like the The Geological Exploration of the Fortieth Parallel and the John C. Frémont Expeditions. Using these contemporary samples, I compared the current microbiolgocial presence to the historical organisms Dr. Ehrenberg recorded with his illustrations over 150 years ago.

Inspired by the way Dr. Ehrenberg organized and thought about microorganisms and the way he composed his illustrations, I'll discuss the historical roots of most major historical microbiology collections, what was present and absent when looking back at the microbiological record, and the art I am making as part of my ongoing research on Dr. Ehrenberg's collection.

**Session 3: Saturday Morning**

**Presenter:** Kalina Manoylov (she/her)

DIATOM COMMUNITY DYNAMICS IN THE SAVANNAH RIVER ESTUARY

Manoylov, Kalina M.

Department of Biological and Environmental Sciences, Georgia College and State University, Milledgeville, GA 31061 USA

**Abstract:** The Savannah River, important as a water resource in Georgia is altered in the last few years to serve anthropogenic alterations, with deep water dredging at the Savannah port starting in Sept 2015. Within estuaries, vertical mixing often occurs in the water column, which causes a swell of nutrient rich, high salinity water to the surface. The response of microbial community to those changes remain unknown. Seasonal sampling at the Savannah River Estuary at USGS site 02198920 was performed from 2016 to 2021. The objectives of this study were to identify diatom species composition to the finest level possible and infer changes in the microbial community indices prior to dredging. Relate algal population metrics were related to large scale changes like sedimentation, flow and salinity. Algal communities were dominated by diatoms. Diatom species were classified as freshwater, marine, or brackish. Morphometric measurements for each taxon were collected. Non-motile, planktonic diatoms like *Cymatosira belgica* Grunow and *Minidiscus spp* were potentially overlayed on the sediment with water retrieval, but community dynamics within the diatom community showed significant changes through time. Mixing between the Savannah Rivers natural freshwater flow and influxes of saltwater from the Atlantic Ocean allowed unique niche partitioning to occur along sedimentation and salinity gradients. Species like *Cylindrotheca gracilis(Bréb.ex Kütz.) Grunow* were not documented during and after dredging. Further evidence of community alterations was found by observing size variations within diatom populations that persisted like *Pleurosira laevis* (Ehr.) Comp. and *Cyclotella littoralis* Lange et Sybertsen.

**Presenter:** Sarah Spaulding

BRIGHTY OF THE GRAND CANYON

**Author Information:**

**Abstract:**

**Presenter:** Joseph Mohan (he/him)

# *DIDYMOSPHENIA* BLOOMS IN MINNESOTA'S NORTH SHORE REGION: THAT'S SNOT WHAT WE WERE EXPECTING

Mohan, Joseph[1], Edlund, Mark[1], Burge, David[1], Rantala, Heidi[2], Pillsbury, Robert[3], and Kuball, Danielle[2]

[1]Science Museum of Minnesota, St. Croix Watershed Research Station
[2]Minnesota Department of Natural Resources
[3]University of Wisconsin Oshkosh, Department of Biology and Microbiology

**Abstract:** We are monitoring an invasion of *Didymosphenia geminata* (Didymo) into streams along Minnesota's North Shore of Gichigami (Lake Superior). We aim to determine the extent, cause, and future of Didymo in these streams. While Didymo is typically found in Lake Superior, it had not been documented in North Shore streams until it was found in the Poplar River in 2018. Sampling in 2021 detected Didymo in 7 more streams two of which were abundant mat-forming blooms. Ongoing monitoring of Didymo seeks to understand if these Didymo invasions are atypical in this region and uncover the sources and cause of the invasions and blooms. Measures of Didymo abundance are accompanied by a suite of ecological, physiological, and chemical parameters. We use these parameters to determine the habitat preferences and cues that lead to invasions and blooms. Our findings will determine which streams are most at risk of developing future or worsening blooms. These efforts are a collaboration of stakeholders in the North Shore Region determined to build a robust water and fisheries management response to keep Didymo at bay.

**Presenter:** Lane Allen (he/him)

# EXTREME TERATOLOGICAL FORMS IN ANTARCTIC DIATOM CULTURES NEGLECTED DURING THE COVID-19 PANDEMIC

Allen, Lane[1], and Troeltzsch, Anne[2]

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**Abstract:** Over the course of the COVID-19 pandemic access to lab spaces was restricted, making it impossible to properly maintain Antarctic diatom cultures in the CU Boulder culture collection. When the lockdowns were lifted, these cultures were inspected to determine if they were salvageable, and it was discovered that a number of them had developed extreme teratological forms. The development of teratological forms in long-term cultures is a well-known phenomenon, but the factors that drive it are poorly understood. Osmotic stress, low flow, light intensity, unfavorable pH, temperature, and trace metals are just some of the potential stimuli that can induce the development of teratological forms. In this study, trends in the types of teratological forms found in cultures will be reviewed in an effort to elucidate the factors that drive them. The lentic conditions in cultures may have favored the development of teratological forms, or they may have formed as the media evaporated leaving them in a pool of ever concentrating solutes. Another possibility is that the conditions that drive sexual reproduction were not effectively replicated in the incubator. This last hypothesis is supported by the fact that the teratological forms documented were often well below published size ranges for these taxa. Additionally, other cases of teratological forms in cultures frequently include specimens much smaller than they are typically found in nature. Lastly, the diatoms in the McMurdo dry valleys are subject to extreme hydrological variation in the streams, and water with high pH, and no flow in the cryoconites, yet the diatoms in these habitats do not develop teratological forms above natural background levels.

**Presenter:** Cassandra Ceballos

# USE OF DIATOMS AND OTHER ALGAE IN A NOVEL WASTEWATER TREATMENT SYSTEM

Ceballos, Cassandra[1], Slate, Jennifer[1], Kumar, Kuldip[2], Gross, Martin A.[3], and Wen, Zhiyou[3]

[1]Northeastern Illinois University
[2]Metropolitan Water Reclamation District of Greater Chicago
[3]Gross-Wen Technologies, Inc.

**Abstract:** The potential of a novel tertiary treatment to reduce total phosphorus (TP) and total nitrogen (TN) in wastewater was assessed. A revolving algal biofilm (RAB) system, on which algae grew on vertical belts that rotated through wastewater tanks, was used to treat wastewater that had undergone secondary treatment at the O'Brien Water Reclamation Plant in Skokie, Illinois. Diatom algae were sampled biweekly from January - July 2021 and identified by light microscopy and the relative abundance of each species calculated. Chlorophyll a, ash-free dry mass, and diatom biovolume were also measured, to estimate the total biomass. Utilization of carbon substrates by microbial communities were measured with Biolog Ecoplates. TN was not reduced by the algal biofilm treatment, but TP was significantly reduced by the treatment. Multivariate linear regression modeling found that chlorophyll a, ash-free dry mass, and microbial activity were significant factors in TP removal in the RAB system. Highly motile, eutrophic diatom species were common in the algal biofilm. Nonmetric multidimensional scaling (NMDS) revealed that the diatom community changed over time, with species such as *Sellaphora saugeressii*, *Nitzschia palea*, and *Navicula cryptocephala* being dominant from January - April and taxa such as *Discostella* spp. and *Gomphonema parvulum* becoming more abundant from May - July. The RAB system did not impact the functional diversity of microbes, but total microbial activity increased as a result of the RAB treatment. These findings show that an algal biofilm can serve as a tertiary treatment to further reduce TP in wastewater effluent. The diatoms, other algae, and associated microorganisms in the biofilm recover nutrients that would otherwise be discharged into surface waters. The organic biomass that is produced may be repurposed to create valuable bioproducts such as fertilizer, biofuel, and bioplastics.

**Presenter:** Liz Bergey (she/her)

# EFFECTS OF NON-NATIVE WATERCRESS ON DIATOMS, MACROINVERTEBRATES, AND SEDIMENTS

Bergey, Elizabeth

University of Oklahoma

**Abstract:** Watercress (*Nasturtium officinale*) is a semi-aquatic to aquatic perennial that was introduced from Europe. In Oklahoma, watercress dominates springs to the point that the presence of watercress often signals the location of springs and other areas of upwelling water. Watercress forms mats that produce a 3-dimensional architecture that extends from the substrate into the air and these mats may provide habitat for diatoms and macroinvertebrates and affect water flow and sediment characteristics. Fourteen springs (12 with watercress) in the limestone Arbuckle uplift were surveyed in July 2021. Watercress had a significantly lower diatom density than rocks and other organic substrates (aquatic plants and submerged wood). Diatom taxonomic composition differed among substrates (watercress, rocks, other organic substrates), and among springs. Watercress had higher abundances of *Cocconeis*, *Meridion* and *Eunotia*, and rocks had more *Achnanthidium* and *Amphora* relative to the other substrate types. Netted macroinvertebrate abundance was significantly lower in watercress than in other aquatic plants but was similar to the abundance in organic detritus, whereas the abundance of sediment-dwelling macroinvertebrates did not differ within and outside of watercress beds. Watercress had a high abundance of predatory damselflies and ostracods, other plants had high abundances of amphipods, mayflies, and snails. Detritus had higher abundances of planarians, chironomids and caddisflies. Sediment beneath watercress had more substrate-dwelling macroinvertebrates (oligochaete worms, fingernail clams, and nematodes), whereas non-burrowers (damselflies, a mayfly and amphipods) were more abundant in sediments outside of watercress beds. Sediment particle size differed among springs but not between sediments under watercress mats and those outside. There was more sediment organic matter under watercress beds than outside of beds. In conclusion, watercress plants have little benefit for diatoms and above-sediment macroinvertebrates but the increased organic matter in the sediment below watercress may increase the macroinvertebrate biodiversity of springs.

**Poster Session**

**1 - Presenter:** Julie Wolin (she/her)

FRESHWATER SALINIZATION ALONG THE CUYAHOGA RIVER

Wolin, Julie A.*, Dalton, Brittany, Egensperger, Laura and Ferkul, Alexandra

Department of Biological, Geological and Environmental Sciences, Cleveland State University, Cleveland, Ohio 44115 USA

**Abstract:** Over fifty years ago, the Cuyahoga River was pivotal in development of the U.S. Clean Water Act. In 2019, the Cuyahoga River was internationally recognized as a symbol of regulatory and restoration success. We revisit the sites of two historic studies along the Cuyahoga conducted in 1973 – 1974 and June 1992 at Hiram Rapids, Old Portage, and Independence, Ohio as part of a wider study to determine change in the Cuyahoga River since the Clean Water Act. Physiochemical and periphytic diatom data were collected weekly from July 10 – August 22, 2019. Surface water chemistry was analyzed in situ using a Vernier LabQuest2 and surface grab samples were analyzed in the lab for phosphate with a Vernier GoDirect SpectroVis Plus Spectrophotometer and LabQuest2. Data comparison from 1973 – 1974 and 2019 show mean phosphate concentrations decreased at all three sites. Concentrations at Hiram Rapids decreased from 0.3 mg/L (1.1 – 0.1 mg/L) to 0.1 mg/L (0.4 – 0 mg/L); Old Portage from 0.7 mg/L (2.8 – 0.2 mg/L) to 0.2 mg/L (0.2 – 0.2 mg/L); and Independence from 1.3 mg/L (3.6 - 0.1 mg/L) to 0.8 mg/L (1 – 0.7 mg/L), respectively. However, mean chloride concentrations increased at Independence; 212 mg/L (129 – 294 mg/L) to 393 mg/L (87 – 953 mg/L). Data limitations include availability of only max, min, and mean values from the 1973 – 1974 study, as well as variability in seasonal sampling and timing between the three studies. Future work will include analysis of diatom community composition across the three studies to better understand water quality changes between 1973 – 2019.

**2 - Presenter:** Sabrina Brown (she/her)

# A DIATOM BIOASSESSMENT OF THE MAUMEE RIVER WATERSHED

Brown, Sabrina R., Hunt, Michaela, Livingston, Sloane, Saddler, Autumn, Webb, Hallie, Shingler, Nat, and Smith, Katelyn

Division of Natural Science, Applied Science, and Mathematics, Defiance College, Defiance, OH 43512

**Abstract:** Maumee River is the main water source for the City of Defiance, Ohio, and it is a major tributary of Lake Erie. Anthropogenic eutrophication of the Maumee River is a significant concern due to the local impacts on Defiance residents' drinking water and regional impacts from harmful algal blooms (HABs) in Lake Erie. The purpose of this research project is to assess water quality of the Maumee River and its tributaries (Tiffin and Auglaize Rivers) in and around Defiance, Ohio using diatom assemblages.

The goal of this research is to rank and analyze summer water quality patterns over a five year period. Here we provide preliminary results from a field collection of sites on the Maumee River and tributaries conducted in 2021 and 2022. Diatoms were collected via plankton tows and periphyton grab samples. Samples were processed in 35% hydrogen peroxide to remove organic matter, rinsed thrice, and permanently mounted to slides. Diatom frustules were identified and enumerated under the microscope. The diatom assemblages were dominated by Fragilaria, Aulacoseira, and Navicula. Impacts of a large flooding event were seen at all locations. The results indicate that the amount of organic pollution is likely higher on the Maumee River and that turbidity strongly influences the diatom assemblage.

**3 - Presenter:** Heera Malik

APPLICATION OF THE NATIONAL MULTIMETRIC INDEX TO REFERENCE RIVERS AND STREAMS IN WASHINGTON, USA

Malik, Heera, Davis, Clinton, Vander Meer, Dennis, Sullivan, Sean, and Pedraza, Edna

Rhithron Associates Inc, 33 Fort Missoula Road, Missoula, Montana 59801 USA

**Abstract:** Recently, Carlisle et al. (2022) developed the National Multimetric Index (MMI) for benthic diatoms to address several limitations (taxonomic inconsistency, natural covariates, sensitivity to stressors) in bioassessment programs within the United States. One of the great advantages of this MMI is that it is calculated using web-based software, with free access and is user friendly. We applied the West region MMI (Carlisle et al., 2022) to a long-term diatom dataset, (2010–2020) collected by Washington State, Department of Ecology as the part of their Environmental Assessment Program. These sampling sites are classified as best professional judgment (BPJ) reference sites by Washington State, based on low anthropogenic stressors and good ecological conditions. Ideally, these sites would be used as baseline for evaluating ecological conditions in other streams. We analyzed a subset of Washington State data collected from 19 different reference sites, spread across 7 ecoregions. These sampling sites were sampled between 2010-2020 with varied frequencies. About 15 sites were sampled annually (between 8–11 times), and 4 sites were sampled only 1–6 times in total. Our goal was to evaluate any long-term changes in the ecological conditions of these reference sites over the years, using the diatom MMI. A total of 600 diatom valves were counted and identified to species level. The data collected over the years was harmonized and updated to current taxonomic nomenclature. We further created species with slash group. The slash group here represents species that were prone to taxonomic inconsistency over the years and were grouped together to avoid any misrepresentation. We used 3 slash groups for species belonging to genus *Achnanthidium*, *Cocconeis*, and *Gomphonema*. According to MMI results, 9 sites showed temporal variability in likely impairment status, 5 sites were found to be likely impaired, and 5 sites were unimpaired. Further investigation is needed to understand the mechanisms behind these changes and causing those biological responses.

**4 - Presenter:** Sydney Brown (she/her)

# COMPARISON OF DIATOM COMMUNITY DYNAMICS IN REFERENCE STREAM AND RECOVERING AGRICULTURAL STREAM IN MIDDLE GEORGIA, USA

Sydney Brown and Kalina Manoylov

Georgia College & State University

**Abstract:** Streams are monitored under the Clean Water Act in the United States, comparing streams in questions to reference streams. Reference stream criteria varies from regions, with Milledgeville, Georgia falling into Environmental Protection Agency (EPA) Region IV, ecoregion IX. Reference stream criteria set for this ecoregion are based on 25th percentiles of an aggregation of nutrient data collected; reference stream criteria set for total phosphorus (TP) and total nitrogen (TN) as 0.037 mg/L and 0.69 mg/L, respectively. Tobler Creek is a recovering agricultural stream on the site of Andalusia Farms in Milledgeville, Georgia. Andalusia Farm was listed on the National Register of Historic Places in 1980 and designated as a National Historic Landmark by the National Park Service in 2022. In this research, we are interested in the community dynamics of diatoms in Tobler Creek throughout its recovery period. Diatoms are used as bioindicators for water quality due to their quick responsiveness to chemical changes in the environment. The goals of this research are to (1) assess the rates of nutrient recovery in Tobler Creek, (2) assess the community dynamics of diatoms in response to nutrients, and (3) investigate various taxa tolerances to nutrients. Nutrient data was collected in 2011 and 2022. In 2011, TP was 0.69 mg/L and nitrate nitrogen was 0.58 ± 0.3 mg/L with TP exceeding criteria set for reference streams with a 31-year recovery. We found that in 2022, nitrate nitrogen never exceeded 0.064 mg/L and phosphorus was nearly undetectable in the environment, with Tobler Creek finally meeting reference stream criteria with an additional 11-year recovery period. Additionally, diatom communities differed in structure. *Gomphonema parvulum* (Kützing) Kützing 1849, a high-nutrient taxa, is found at much lower relative abundances in 2022 with different *Gomphonema* species dominating the environment. It is important to continue research in respect to diatom communities in the Southeastern United States, since relatively little taxonomic information is analyzed in this region.

**5 - Presenter:** Sara Crow (she/her)

DIATOM ALGAE AND OTHER EPIZOIC MICROORGANISMS ON THE SHELLS OF TWO SNAPPING TURTLES: *MACROCHRLYS TEMMINCKII* AND *CHELYDRA SERPENTINA*

Crow, Sara, Karic, Hanna, Adams, Angelica, and Slate, Jennifer

Biology Department, Northeastern Illinois University

**Abstract:** Snapping turtle shells are host to an understudied community of diatoms and other epizoic microorganisms. The alligator snapping turtle (*Macrochelys temminckii*) rarely leaves the water except to lay eggs and is designated as endangered in Illinois. While the common snapping turtle (*Chelydra serpentina*) is more abundant, habitats of both turtles are declining due to development and water pollution. We identified taxa of microscopic epizoic organisms from the shells of two captive turtles, an adult *M. temminckii* and a juvenile *C. serpentina* collected in northeastern Illinois. The microorganisms found on the shells were also compared to those found on rocks and logs within their tanks to determine if a taxon only grew on the turtle shells. Common diatoms found on both turtle species included *Cocconeis placentula* var. *lineata*, *Eunotia* cf. *rushforthii, Pinnularia* spp. and *Gomphonema* spp. Rotifer animals, testate amoebae and chrysophyte algae were also found on both turtle species. The macro-alga *Basicladia* was abundant on the *M. temminckii* turtle, along with *Vampyrella* amoebas and *Vorticella* ciliates. Principal Component Analysis revealed that diatoms and chrysophyte cysts from the *M. temminckii* shell were similar to the taxa on the rocks and logs within its tank. However, samples collected in fall differed from those collected in spring, and the community on the *M. temminckii* shell differed from that on the *C. serpentina* shell. These results suggest that the diatom and crysophyte communities differ between species of snapping turtles. Further research should examine potential mutualistic benefits between these snapping turtle species and their epizoic communities.

**6 - Presenter:** Vicky Chraïbi (she/her)

# EPIBIOTIC DIATOM ASSEMBLAGES ON TEXAS FRESHWATER TURTLES

Graham Derzon-Supplee[1], Jesse Meik[2], Victoria Chraïbi[2]

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**Abstract:** Turtles (Testudines) often host epibiotic floral communities on their shells, of which diatoms can be a major component. Turtle ecology varies across age, sex, and species, and the basibiont habitat conditions provided by their shells vary accordingly. This undergraduate study evaluated the degree to which epiphytic diatom assemblages vary across turtle sizes, sexes, and/or species. Turtles were surveyed in the upper Guadalupe River of Texas in June 2021 and March 2022. Diatom samples were scrubbed from the entire carapace of each turtle, as well as rocks collected at the study site to provide environmental reference points. Up to 200 cleaned diatom valves were counted per sample; diatoms were identified to genus level. Non-metric multidimensional scaling was used to create 2-dimension ordination of the observed relative abundance data of assemblages found on rocks, Texas cooters (*Pseudemys texana*), stinkpots (*Sternotherus odoratus*), and Cagle's map turtles (*Graptemys caglei*). ANOVA testing showed significant differences in assemblage between turtles and environmental substrate (rocks), as well as between Texas cooters and stinkpots. No significant differences were found between sexes. Linear correlation showed a significant relationship between log-corrected turtle mass and NMS axes 1 and 2. These results imply that diatom assemblage differs in correlation with turtle size and species, supporting the potential of turtle ecology studies based on carapacial diatom assemblages.

**7 - Presenter:** Vicky Chraïbi (she/her)

EPIZOIC DIATOM DIVERSITY OF GULF OF MEXICO SEA TURTLES

Cynthia Flores[1], Victoria Chraïbi[2], Matt Ashworth[3]

[1]Department of Wildlife and Natural Resources,
[2]Department of Biological Sciences, Tarleton State University, Stephenville, Texas
[3]Department of Molecular Biosciences, University of Texas at Austin

**Abstract:** Many diatom taxa are specialized to live on animals as epibionts. Previous research has found diverse and unique diatom taxa on the carapace and neck skin of sea turtles. This undergraduate research aims to characterize the assemblage of diatom genera found on sea turtles inhabiting the Gulf of Mexico that were either in rehabilitation or residing at the Texas State Aquarium from 2019-2022. Diatoms were collected by the aquarium veterinary team during inpatient procedure by scrubbing quarter-sized sections of tissue with a toothbrush that was then rinsed into a vial and stored in ethanol. Cleaned valves were enumerated and identified to genus. Initially, this study compared the epizoic diatom assemblages between the carapace and skin of individual Kemp's ridley sea turtles (*Lepidochelys kempii*). *Nitzschia* was dominant on the carapace whereas *Tursiocola* was dominant on the neck skin. Even so, there was no statistically significant difference in overall diatom assemblage between the carapace and neck skin due to other genera held in common by both locations. This study will continue to compare seasonal differences in diatom assemblages of the same species of sea turtle and differences in diatom assemblages among the four sea turtle species common in the Gulf of Mexico.

**9 - Presenter:** Jaidan Ludescher (she/her)

# ALGAL ASSEMBLAGE RESPONSE TO CONTRASTING ENVIRONMENTAL VARIABLES IN WATERS IN THE RED RIVER AND GUADALUPE RIVER BASINS IN TEXAS IN RESPONSE TO CLIMATE CHANGE AND VARIABLE FLOW

*Ludescher, Jaidan[1], Ramey, Tonya[2], Nowlin, Weston[2], Furey, Paula C.[1]

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**Abstract:** Freshwaters in Texas are warming and experiencing higher variability in flows due to climate change. Flows can vary from drought conditions during summer to high-volume scouring events following severe storms. These changes may cause shifts in algal assemblage structure that may impact water quality and other biota. During July 2022, as part of a larger collaborative project, we examined algal assemblages at two sites in central and northern Texas with different chemical and hydromorphological conditions. Sandies Creek (Guadalupe River basin) had a wetted width of 6.4 m, fine sand and silt substrates with occasional large woody debris, high canopy cover (66 to 75%), low flow (0.16 m/s), and warm water (30.58°C) with moderate dissolved oxygen (DO; 4.81 mg/ L) and conductivity (1169 µs/cm). In contrast, Wichita River (Red River basin) had a wetted width of 8.7 m, gravel and sand substrate, limited canopy cover (0 to 66%), moderate flow (0.29 m/s) and warm water (32.86°C) with higher DO (6.33 mg/L) and conductivity (17820 µs/cm). We predicted these contrasting environmental conditions would shape the algal assemblage structures, where the warm, low flow, low light conditions of Sandies Creek would support cyanobacteria and location specific diatoms and the warmer, saltier, light-rich waters with more stable substrates of Red River would be support a diatom rich assemblage. At each site, we made a composite benthic algal sample from three submerged cobble-sized rocks and collected visible macroalgae to assist in identification. We created a voucher flora that we will use to complete relative abundance counts of major algal groups, and dominant genera present at each site. Preliminary examination of Sandies Creek (Guadalupe basin) revealed a high abundance of cyanobacteria like *Anabaena* and *Nostoc* as well as diatoms such as *Terpsinoë*. Wichita River (Red River basin) contained a diverse diatom flora of Nitzschioid, Naviculoid, Cymbelloid, and Surirelloid taxa. The next steps include algal counts and a more detailed examination of the chemical characteristics. These data will help assess Texas river water quality in the context of contrasting biomes and in response to drought, and will inform algal analysis as part of a larger collaborative project.

**10 - Presenter:** Samantha Hormiga (she/her)

COASTAL CARBON FLUX: PERIPHYTON CONTRIBUTIONS AND DIATOM INDICATORS

Hormiga, Samantha and Gaiser, Evelyn

FIU Institute of Environment, SFWMD, NSF

**Abstract:** There is extensive research in South Florida investigating the effects of agricultural and urban runoff on freshwater diatoms, but there is a lack of diatom research examining the effects of saltwater intrusion on coastal environments experiencing sea level rise. Diatom communities change in response to the salinity gradient present throughout the Biscayne Bay Coastal Wetlands (BBCW). In these areas, there are fringe mangroves that surround the border of the bay. At high tide, saltwater that is flushed in becomes trapped over the fringed border. Pulses of saltwater mix with fresher water changing the salinity and pH of the wetland. Saltwater intrusion of these coastal habitats has led to fluxes in carbon cycling and organismal biodiversity. Coastal diatoms that show preferences for freshwater, brackish, and marine water have been identified in transects along BBCW. The effects of freshwater restoration on periphyton contributions to mineral soil accretion in coastal wetlands experiencing sea level rise will be analyzed. Periphyton mats are prolific throughout the Florida Everglades, but their role in the carbon cycle has been understudied. Wetlands experiencing higher salinity tend to be acidic and are dominated by peat soils. Areas receiving restored freshwater flows support periphyton production. These periphyton mats precipitate calcium carbonate in alkaline (freshwater) environments. The project focuses will evaluate short-term periphyton contributions to calcification by measuring accretion rates on artificial substrates. I will relate these rates to changes in the long-term inorganic carbon accretion rates in lead-210 dated sediment cores. I will also be identifying the diatoms along the coastal gradient to see if they can serve as indicators of changes in calcification rates. Preliminary data indicates that salinity and pH are important environmental drivers that change diatom assemblages and carbon stores in coastal gradients. I hope to provide a tool for indicating where periphyton-driven calcification is an important contributor to soil accretion to help understand elevation feedbacks as sea level rises.

**11 - Presenter:** Laura Aycock (she/her)

DIVERSITY OF LARGE-CELLED PINNULARIA IN NORTHEASTERN NORTH AMERICA

Aycock, Laura, Kersey, Micaela, and Potapova, Marina

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**Abstract:** Large-celled species of *Pinnularia* commonly occur in lakes and wetlands, but at lower abundances than smaller diatom species. Routine enumeration methods often fail to detect large taxa due to the small area of the microscope slide used in counts, leading to poorly observed morphological variation within populations. Moreover, large-celled diatoms are commonly illustrated in floras and other identification resources at variable magnifications, which further complicates comparison and species identification. A reexamination of lake sediment data from the Northeastern United States revealed considerable inconsistencies in the identifications of large-celled *Pinnularia* species, leading us to conduct a taxonomic revision of these diatoms. We used traditional microscopy and whole-slide scanning approach to detect species of interest in recent and Quaternary lake sediments and in benthic samples. We present an account of large *Pinnularia* species common in the area, including several undescribed taxa, and highlight difficulties in establishing species boundaries using morphological data.

**12 - Presenter:** Veronica Hamilton (she/her)

# A VOUCHER FLORA OF DIATOMS FROM FENS IN THE TANANA RIVER FLOODPLAIN, ALASKA.

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**Abstract:** The structure and function of boreal peatland ecosystems may be changing because of warming temperatures and human activities. Traditionally, plants have been the focus of study in Alaskan peatlands, but diatoms can be highly diverse, abundant, and important in biogeochemical processes. Therefore, characterizing diatoms in boreal peatlands is necessary to promote knowledge about their distribution patterns and to support future assessments of biological change in these sensitive ecosystems. This study evaluated the distribution of diatom species across a gradient of boreal fen types (rich, moderate, poor) with the goal of building a voucher flora for peatlands of interior Alaska. Diatoms were collected from 72 peatland sites in 2017 using natural transitions in water chemistry (e.g., pH) and vegetation community structure to distinguish among peatland types. Samples for diatom identification were acid-cleaned, permanently fixed to microscope slides, and identified to species level. More than 85 species from 30 genera have been identified. *Tabellaria, Eunotia, Pinnularia,* and *Gomphonema* are the most prevalent genera in all peatland types. *Tabellaria* dominated the rich fen and was less abundant in the moderate and poor fens, while *Eunotia* showed the opposite trend. By providing light micrographs of diatom taxa representing their full morphological range, this flora has expanded our regional knowledge of diatom biodiversity in Alaskan peatlands since Foged's treatment in 1981.

**13 - Presenter:** Lane Allen (he/him)

# TYPIFICATION OF *NEIDIUM BISULCATUM*, AND A DESCRIPTION OF A SIMILAR *NEIDIUM* SP. THAT HAS HISTORICALLY LED TO CONFUSION

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**Abstract:** In a sample recovered from a vernal pool approximately 3,600 meters above sea level in the Indian Peaks Wilderness, there was a remarkable population of *Neidium* (Pfitzer, 1871) matching recently published descriptions of *Neidium bisulcatum* (Lagerstedt) Cleve 1894. Upon closer inspection, there were in fact two distinct taxa in this population. Both taxa have a very similar valve outline and stria densities; however, despite overlapping length ranges, the width ranges of these taxa do not overlap. Once specimens were placed into groups based on width range, other synapomorphies became apparent. The broader taxon is generally longer, with eccentric proximal raphe ends that frequently reach the edge of the central area. The smaller of the two taxa has shorter proximal raphe ends that never reach the edge of the central area and noticeably smaller helictoglossae. The larger of the two taxa is an excellent fit for the original description by Lagerstedt in 1873, as well as for the description provided by Cleve in 1894. In the intervening century, a number of unrelated taxa have been identified as *Neidium bisulcatum* leading to the application of an erroneously broad morphological species concept for this taxon in literature. The larger of the two taxa appears to be *Neidium bisulcatum sensu stricto*, while the smaller of the two merits recognition as a separate and novel species.

**14 - Presenter:** Lindsey Sahlmann (she/her)

# ANALYZING SPECIES PARAMETERS IN THE GENUS HANNAEA FROM THE UPPER KUPARUK RIVER, ALASKA

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**Abstract:** Arctic ecosystems are warming faster than the global average and are an early warning indicator of global change. Permafrost, the thick layer of soil that remains frozen throughout the year in polar regions, is beginning to thaw and it is likely that carbon and nutrients previously immobilized in soil will mobilize, impacting the biogeochemistry and ecological functioning of Arctic streams. In 1983, the Arctic Long Term Ecological Research (Arc LTER) Upper Kuparuk River Experiment (UKRE) began to monitor a five kilometer reach of the Kuparuk River on the Alaskan North Slope where it is a fourth order stream. Long-term benthic algal samples were collected from 1997 to 2022 and have been preserved with 0.1 mL of 50% glutaraldehyde. These samples have been stored since collection and are now being analyzed for the first time. We are characterizing diatom assemblage composition to determine if there have been long-term successional shifts, and to understand how the diatom communities in these streams are responding to climate change. Preliminary analyses indicate *Hannaea* is one of the dominant genera across years, characterized by its arcuate valve structure and central ventral swelling. Two species are present, *Hannaea arcus* and *Hannaea linearis*, and distinguished primarily by length. *H. arcus* has a maximum documented length of 80 µm and more pronounced ventral swelling while *H. linearis* has a documented length range of 82 µm to 130 µm. However, each of these species present in the reference reach of the Kuparuk River exceed previously defined parameters. Further characterization of these species is in progress to better understand and define the populations present.

**15 - Presenter:** Paula Furey (she/her)

# A NEW SPECIES? AN UNUSUALLY LONG *EUNOTIA* (BACILLARIOPHYCEAE) FROM BIG CREEK LAKE, ALABAMA, U.S.A.

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**Abstract:** *Eunotia* Ehrenb., a diverse diatom genus, is characterized by asymmetry about the apical axis, uniseriate striae, a short raphe system with conspicuous helictoglossae, and one or more rimoportula. Commonly found in soft waters with low pH and conductivity, *Eunotia* can constitute a dominant portion of all frustules in some habitats. Species range from < 20 µm long to ones > 300 µm. Several species have frustules that are narrow, arch to some degree, or undulate on the dorsal margin. Collections from an artificial reservoir, Big Creek Lake, Alabama USA revealed a Eunotioid-rich flora that included a particularly long, nearly straight, chain-forming *Eunotia* with spatulate ends with rounded apices that may be new to science. Swelling near the apical ends was equal and symmetrical on the ventral and dorsal sides. Except for swelling near the ends of the valve, the ventral margin appeared nearly straight while the dorsal margin slightly arched as the mid-valve slightly widened. Length ranged from 140 µm to >400 µm, with one specimen as long as 450 µm. Width at the mid-valve (5 µm) narrowed to 4–5 µm near the spatulate ends (7–8 µm wide). The short raphe, not easily seen in girdle view under light microscopy, recurved back 3–5 µm on face of valve. Each valve end had one prominent, tooth-like rimoportula at or close to apex. The fine striae, 16/10 µm, became slightly radiate near the apex. The straight, or almost so, frustule, along with its long length and symmetry, and its colonial habit separate it from many other *Eunotia* species. It differs from *E. spatulata* J.Veselá et J.R.Johans. by the symmetry of its spatulate apices, chain-like colonies, and much greater length. Valves of *E. eurycephala* (Grunow) Nörpel-Schempp et Lange Bertalot, as described, are much narrower and shorter than the Big Creek taxon, but otherwise are similar. This algae-rich habitat included other *Eunotia* species, *Peronia fibula* (Bréb. ex Kütz.) R.Ross, other diatom genera like *Cymbella* Agardh, *Frustulia* Rabenhorst, *Gomphonema* Ehrenb., *Neidium* Pfitzer, *Nitzschia* Hassall, *Pinnularia* Ehrenb., *Tabellaria* Ehrenb. ex Kütz., and *Stauroneis* Ehrenb., and several desmids.

**16 - Presenter:** Savannah Cutler (she/her)

# EVIDENCE OF SUB-STAGE CLIMACTIC SHIFTS DURING MIS 11 REFINED FROM DIATOM ASSEMBLAGE RECONSTRUCTION IN THE VALLES CALDERA, NEW MEXICO

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**Abstract:** Samples from the Valles Caldera sediment core (VC-3) are being analyzed for diatoms to infer lake level change across MIS 11 (Marine Isotope Stage) through assemblage reconstruction. Comparison against previously published pollen, isotopic, and MAT (Mean Annual Temperature) data from Fawcett et al. (2011) will help refine our understanding of the climatic changes on the sub-orbital timescale in MIS 11. MIS 11 was the longest and warmest interglacial period of the past 500 kyr that occurred between ~426 ka and ~370 ka and is widely considered an analog for the Holocene and future climatic variance. Most records from MIS 11 are either marine or ice-core based, with comparatively few terrestrial records, making VC-3 unique among lacustrine sediment records spanning the middle Pleistocene. VC-3 captures climatic responses to insolation variations at a higher resolution and allowed Fawcett et al. (2011) to distinguish five sub-stage events. Other records of a similar caliber, such as the one from Lake Baikal in Siberia, only note three sub-stage events in MIS 11. The five substages - two cool and three warm - were identified from MAT estimates based on variations in pollen taxa and aquatic productivity proxies that were correlated with the three processional cycles within MIS 11. These climatic variations that occur throughout MIS 11 should have measurable impacts on the diatom community assemblages present, with secession from cold to warm / warm to cold taxa tracking rapid shifts in water conditions and by extrapolation, climate. Preliminary analysis of the samples corroborates this hypothesis with assemblage shifts from sections where benthic genera – such as *Pseudostaurosira, Epithemia,* and *Navicula* – dominate to sections where planktonic taxa – such as *Lindavia, Aulacoseira* and *Ellerbeckia* – dominate. Future work will quantify the relative abundance of different species for the purpose of reconstructing factors associated with the sub-stage events such as lake level change, open vs. closed basin conditions, eutrophication events, and precipitation source (winter snowpack vs. summer monsoon).

**17 - Presenter:** Megan Heins (she/they)

# THE DIATOM DARK AGES: IDENTIFICATION OF MID-CRETACEOUS ARCTIC PLATFORM DIATOMS FROM THE BASAL TRANSGRESSION OF THE KANGUK FORMATION, DEVON ISLAND, NUNAVUT, CANADA

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**Abstract:** The lower part of the mid-Cretaceous Kanguk Formation (Lower Turonian interval) contains an important paleontological record crucial to the characterization of a poorly known interval of fossil marine diatoms history. Kanguk Formation mudstones are exposed in a ~200 m-thick section on Devon Island, Nunavut, Canadian High Arctic. Diatoms at this location are well-preserved due to shallow burial on this Arctic Platform site. The rock sequence was protected from glacial erosion that removed much of the Cretaceous record by being down-faulted in a linear graben. Study of these well-preserved fossil diatoms allows for a documentation of the assemblage, identification of potentially important biostratigraphic events, and an opportunity to assess paleoenvironmental changes that may have influenced their growth and sedimentation. This study identified 45 fossil marine diatom species and varieties, representing 22 genera, and some taxa that are treated informally. The lower ~60 meters of the Kanguk mudstone sequence on Devon Island is barren of diatoms, indicating that environmental conditions suitable for diatom growth were not coincident with the initial transgression, but developed later, or that marine connections that allowed migration of diatoms into the Arctic occurred after the marine transgression. Planktonic and benthic species are present in similar abundance suggesting a shallow water environment. The lower interval of the Kanguk Formation reported herein spans a ~3 m.y. time interval (~90.5 to ~93.5 Ma, Early Turonian) as indicated by carbon isotope chemostratigraphic correlations and silicoflagellate biostratigraphy, which allow correlation to other Kanguk Formation sections that are dated with bentonite ages. The presence of diatoms *Gladius antiquus*, *Costopyxis antiqua*, and *Bascillicostephanus* sp. 1 support these ages. Several events are identified as potentially important new biostratigraphic datum levels, which help divide the *Gladius antiquus* Zone and increase biostratigraphic resolution. In ascending order these are: the first appearances (FA) of *Thalassiosira wittiana* and *Lepidodiscus elegans*, the last appearance (LA) of *Azpeitiopsis morenoensis*, and the FA of *Stellarima steinyi*. Future studies from other sections will be required to establish their use in biostratigraphy. Documentation of these diatom assemblages represents an initial phase in characterizing the early history of diatoms during the mid-Cretaceous. It will anchor future work higher in this stratigraphic section.

**18 - Presenter:** Madisyn Rex (she/her)

# MORPHOLOGICAL CHANGES IN ENDEMIC *SURIRELLA (ICONELLA)* IN RESPONSE TO A 225 KA COLD EVENT IN LAKE EL'GYGYTGYN, NORTHEAST RUSSIA

Madisyn Rex[1], Jeffery Snyder[1], and Melina Luethje[2]

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**Abstract:** Lake El'gygytgyn is a 13-km diameter impact-crater lake located in the northeastern Russian Arctic. Its extensively studied sediment record reflects the regional climate history spanning 3.6 million years. Ancient lakes, like El'gygytgyn, often have endemic diatom species, and the sediment record provides insight into their evolution in response to lake changes (e.g., climate, interspecies competition). A recent study of the dominant planktic genus *Pantocsekiella* over the last 1.2 million years documents abrupt changes in the morphology of these diatoms in response to extreme cold climate events. These changes are inferred to have resulted from extended ice cover limiting light availability to planktic populations. One of the most significant of these events occurred during an insolation low corresponding to MIS 7d (~225 ka), following an approximately 300-kyr interval of relative stability in the diatoms. Several large endemic species of the benthic genus *Iconella (Surirella)* also occur in the lake record. Preliminary observations of these species spanning this cold event (250-200 ka) indicate that they return with less diversity of forms, smaller size, and different ornamentation. These morphological differences are presented in the context of the longer record of the *Iconella* genus in El'gygytgyn. Observations of *Iconella* and other benthic diatoms in this interval may provide a greater understanding of the nature of these extreme cold events, ice extent, and their impact on diatom evolution in isolated lake systems.

**19 - Presenter:** Daphne Coffey (she/her)

CHARACTERIZING AND UNDERSTANDING MULTISTIGMATE *GOMPHONEMA* FROM OLORGESAILIE

Coffey, Daphne, Lopera Congote, Laura, and Stone, Jeffery R.

Indiana State University, Department of Earth and Environmental Systems

**Abstract:** Multistigmate *Gomphonema* are not new in regions throughout Africa, but exploration of Core 3A from Olorgesailie, Kenya provided evidence of a potentially new species. In specific, traditional and morphometric (landmark) analyses were used to showcase that the multistigmate *Gomphonema* observed in the core are different from other similar diatoms observed in eastern Africa.

**20 - Presenter:** Christian Sizemore

MARL LAKE: RECONSTRUCTING PAST LAKE LEVELS USING DIATOMS

Sizemore, Christian, Cook, Terresa, Westover, Karlyn S., and Stone, Jeffery R.

Indiana State University, Department of Earth and Environmental Systems

**Abstract:** A sediment core was extracted from the deepest part of Marl Lake in Wisconsin. From this core, we identified fossilized diatoms to understand shifts in the assemblages from 40 samples spanning about 400 years. Changes in observed diatom flora can provide information on past ecological shifts in the lake system, such as changes in pH, lake level, or nutrient flux. Throughout the 1-m long section of core that we analyzed, we found three significant wet periods and two significant dry periods, evidenced by changes in the relative percentage of planktonic diatoms. By integrating this record of fossilized diatoms with the longer record, we aim to reconstruct Midwest hydroclimate over the past 2,000 years.

**21 - Presenter:** Katelyn Smith

# DIATOM-INFERRED SEASONAL FLUCTUATIONS IN A RURAL POND, DEFIANCE CO., OHIO

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**Abstract:** Diatoms are a small, single celled algae that contains a silica cell wall. There are many different species of diatoms and algae that can be found floating in the top layer, middle layer or dwelling near the bottom. In order for an organism to effectively be used as a biological water quality indicator, it must be sensitive to changes in both the abiotic and biotic factors in an environment and the responses they make should be predictable, which allows for researchers to make reliable predictions. Identifying different diatom species can tell about the nutrients present in the water, the amount of sediment in the water, and the quality of the water. The Smith's recreational pond is a young pond in rural Northwest Ohio (41.418438, -84.628183). The pond gets treated regularly with copper sulfate and coloring. Samples were taken every week from June to December from the pond using a plankton net and notes of the weather and pond conditions were recorded. The samples were kept refrigerated until being processed in the lab using hydrogen peroxide. The processed samples were then made into slides and are to be examined under the microscope to count and identify the diatoms. Research conducted will give the Smith's information on how effective copper-sulfate treatment is and how assemblage changes with the changing conditions of the pond, from adding water to regular weather changes. The diatoms counted and identified resulted in two significant groups after a constrained cluster analysis was performed. Navicula was the dominant genus (>45%) during the first half of samples (July-October) and Nitzschia became the dominant genus (55-95%) near the end (November-December). This transition was largely due to the addition of a garden hose in July which created flowing water which Navicula prefer, compared to Nitzschia which prefer still water.

**22 - Presenter:** Jason Coenen (he/him)

# SILICEOUS MICROFOSSIL RESPONSES TO THE CRETACEOUS PALEOGENE MASS EXTINCTION EVENT FROM SEYMOUR ISLAND, ANTARCTIC PENINSULA

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**Abstract:** The Cretaceous-Paleogene (K-Pg) boundary is well known because of the catastrophic mass extinction event that impacted climate and biological diversity. The James Ross Basin, located at the northeastern tip of the Antarctic Peninsula, includes outcrops of Aptian-Albian to Paleogene strata. The best exposures studied are from the James Ross, Snow Hill, Seymour and Vega islands. Previous studies of the siliceous microflora from Seymour Island provided a glimpse of the response of diatom and silicoflagellate communities to the K-Pg extinction event. This report will build on previous findings and study abiotic and biotic changes associated with global perturbations resulting from: (1) Deccan Trap eruption series before and during the extinction event and (2) the Chicxulub bolide impact that ended the Cretaceous. Most diatom taxa survive across the K-Pg event, likely associated with their ability to form resting spores. The cell volume of diatom resting spores increases after the K-Pg event, perhaps indicating a selection for cells that could survive prolonged dormancy. Changes in diatom assemblages will be used to better understand environmental perturbations in the late Cretaceous. In contrast to the diatoms' general survival, only one genus of Cretaceous silicoflagellates, *Corbisema*, survives into the Paleogene, and its earliest Cenozoic representatives exhibit 'dwarph' morphologies and a recovery phase of radiation. Siliceous microfossil data will then be compared to well documented calcareous and geochemical observations from the K-Pg sections at Seymour island to develop a holistic view of the extinction from this shallow marine environment, and south polar setting.

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