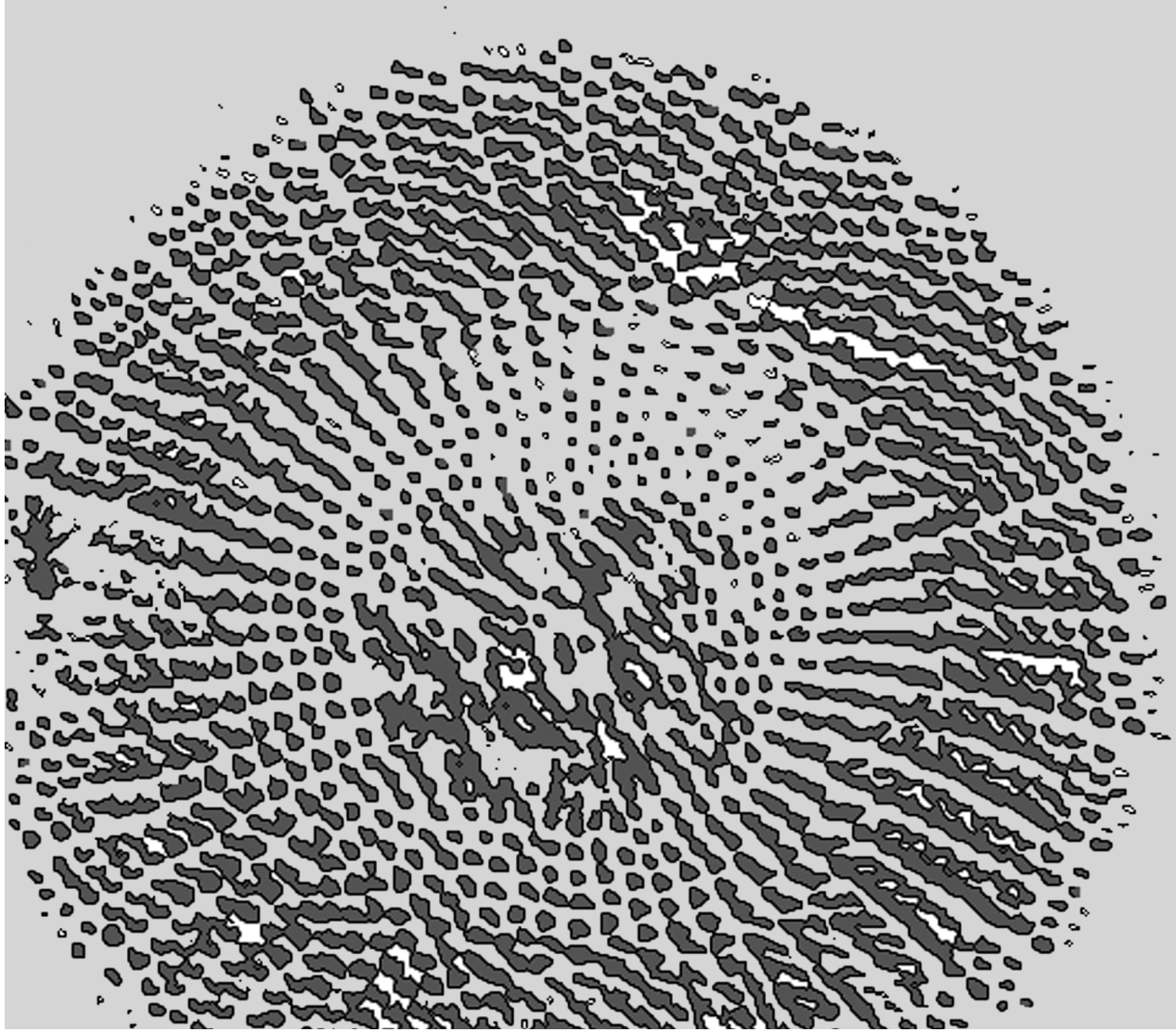
27th North American Diatom Symposium

2-6 October, 2024 Iowa Lakeside Laboratory



Welcome to the 27th North American Diatom Symposium (NADS)

The 27th NADS is being held on October 2-6, 2024 at Iowa Lakeside Lab (ILL) in northwestern Iowa as part of the celebration of 60 years of Lakeside's Ecology and Systematics of Diatoms. Iowa Lakeside Lab is a biological field station that was established on the shores of W. Lake Okoboji in 1909, and since 1963 has been the site of the annual Ecology and Systematics of Diatoms class. International symposium participants will present their work in diatom research including biodiversity, evolution, ecology, systematics, biological assessment, paleolimnology, and nanotechnology. In addition to the scientific program, the meeting will include traditional NADS activities (the Scum Run and auction). We hope you will join us in Iowa in October for an exciting meeting!

The History of NADS

The North American Diatom Symposium (NADS) is a biennial meeting, usually held at field stations throughout the United States and Canada. The first NADS meeting took place in October of 1970 at Cedar Creek in central Minnesota (now the University of Minnesota's Cedar Creek Ecosystem Science Reserve); this inaugural meeting was organized by J. Platt Bradbury and Rick Drum. That site was notable for being the study location for R. L. Lindeman's classic paper "The trophic-dynamic aspect of ecology", 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.

ince that date, NADS has been hosted at field stations across North America, including Florida, Colorado, Manitoba, Kentucky, South Carolina, Alabama, Ohio, Minnesota, Iowa, Wisconsin, Georgia, Maine, Pennsylvania, Indiana, 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.

History of Iowa Lakeside Laboratory

https://iowalakesidelab.org/about/history

Lakeside Lab was founded in 1909 by Dr. Thomas Macbride and colleagues from the University of Iowa, for "the study of nature in nature." Ownership was held at first by a private stock company, the Lakeside Laboratory Association. In 1936 the Association deeded the station to the State of Iowa, "to be held in trust for the accommodation, promotion, support and maintenance of scientific studies and research."

A major construction program took place in the mid 1930s, when the Civilian Conservation Corps built five stone laboratories, four student cabins, a bathhouse, and other amenities. Additional buildings were added in the 1960s and 70s. The Waitt Building, opened in 1998, provided a modern water quality laboratory, additional classrooms, and staff offices.

After nearly a century of excellence in college and graduate-level teaching and research, however, Lakeside faced a crisis in the early 1990s when the Iowa Board of Regents recommended closing the Lab due to dropping enrollments and a dwindling state budget. In response, concerned citizens, Lakeside faculty, and alumni banded together to discuss how to save Lakeside. Under the leadership of the University of Okoboji Foundation, a task force formed and met with the Regents and university presidents, and convinced the Regents to reconsider their recommendation to close the Lab.

The individuals that rallied to save the Lab from closure did not retire their efforts but founded the Friends of Lakeside Lab to ensure continued support and community input into Lab operations. In 2006, Lakeside was designated a Regents Resource Center, expanding both its audience and its mission. Today the Lab is a place where people of all ages and backgrounds can "study nature in nature."

VENUE:

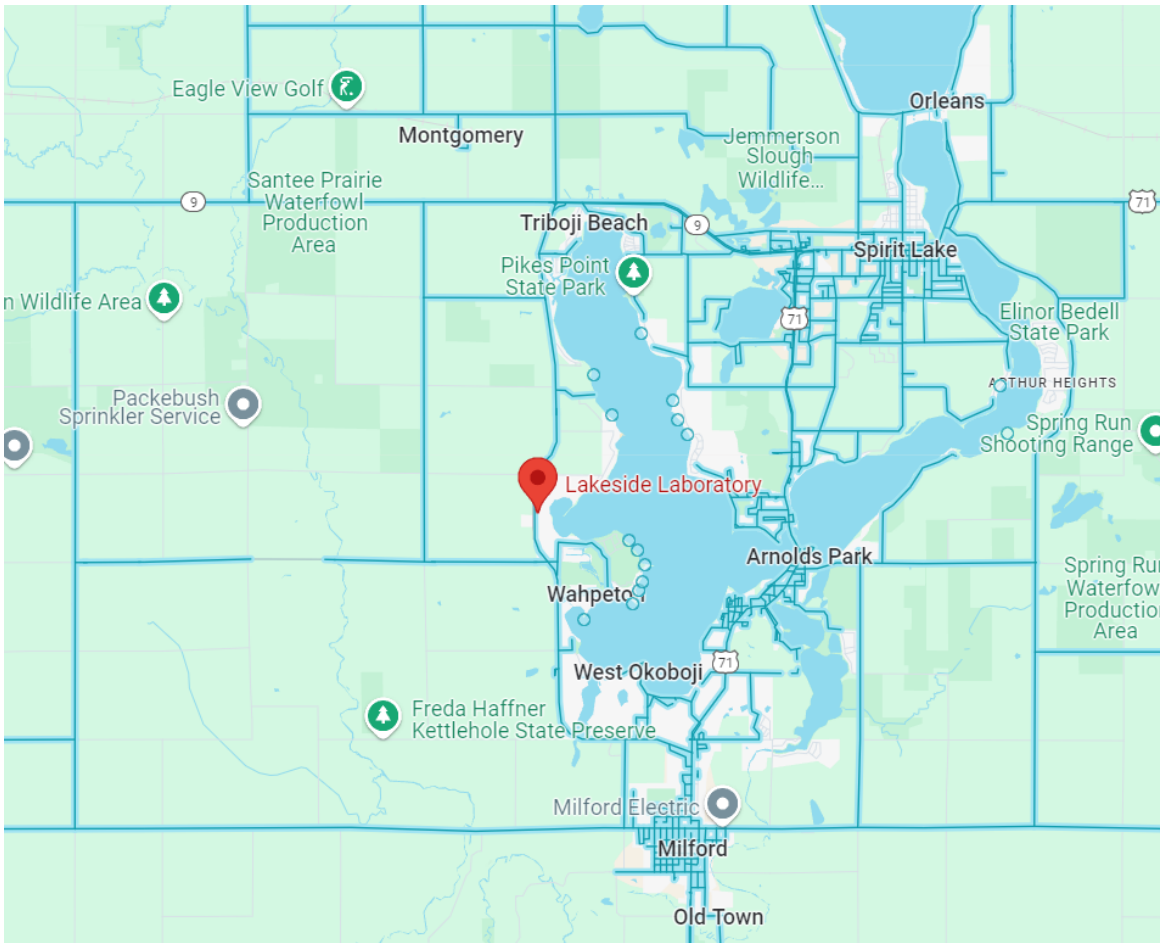
Iowa Lakeside Laboratory Lat: 43.380309 Long: -95.183517
1838 Highway 86, Milford, IA 51351
712-337-3669

AIRPORT TRANSPORTATION

If you need a ride or can offer a ride, please add your information to the NADS rideshare spreadsheet. We will be contacting people to connect you to each other, as well as running a van shuttle from Sioux Falls.

Traveling by Car:

The easiest way to get to Lakeside is by car. A car is also useful, but not essential, in order to get around locally, because the Laboratory is located some miles from restaurants, theaters, bars, etc. We are located on Highway 86, north of Milford IA. As you get close on Highway 86, look for the silver water tower on the opposite (west) side of the road from the Laboratory. Lakeside's entrance is marked by stone gates that are normally open. When you arrive, please check in at the Dining Hall. There is plenty of free parking.



WEATHER

Temperatures in early October at Lakeside range from mean lows around 50 F to mean highs around 70 F. We recommend bringing clothing to cover that range and more! Nights could be downright cold, so bring a warm jacket and a hat for socializing around the campfire.

PLEASE BRING

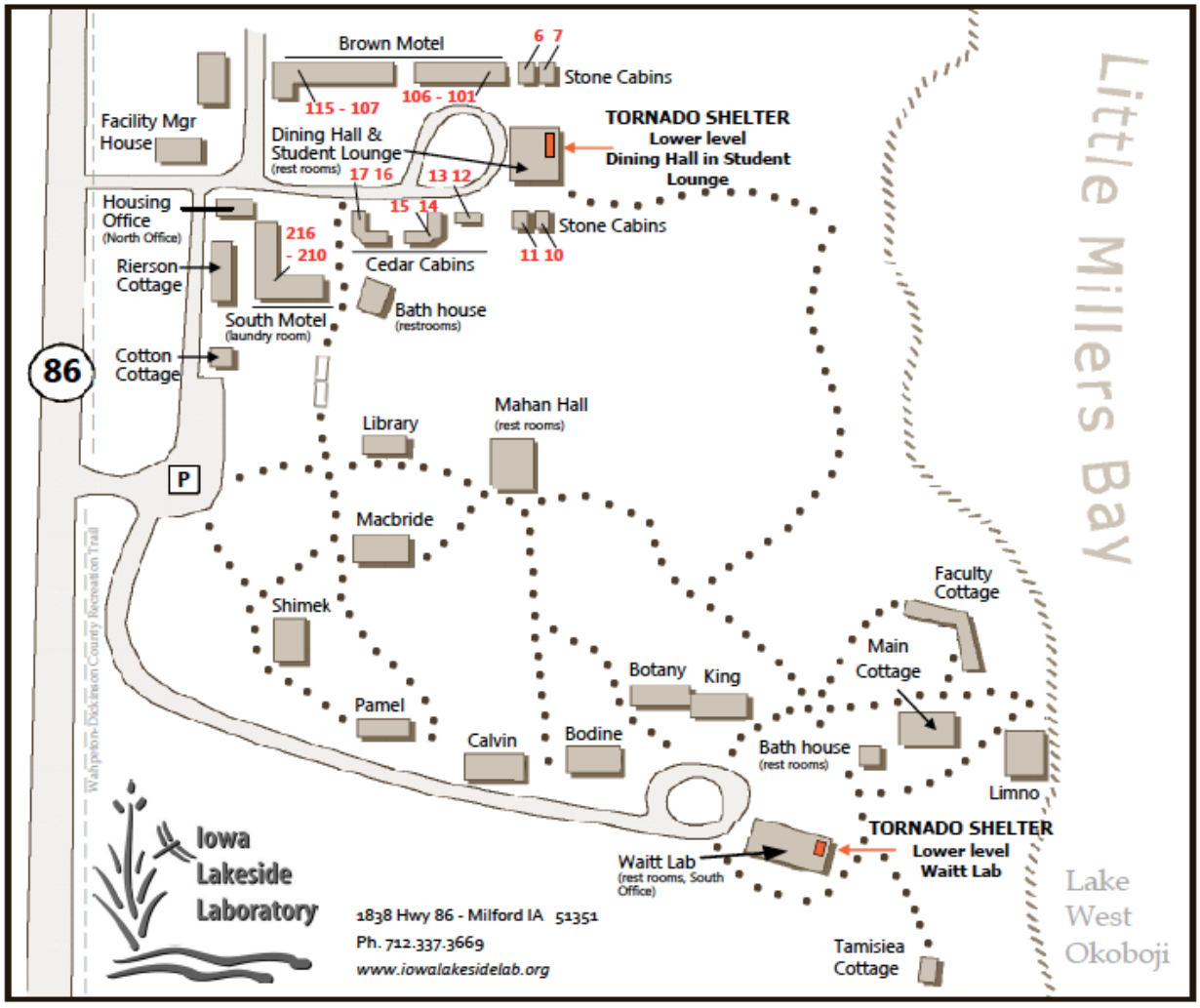
A flashlight or headlamp is needed to navigate the field station at night. A coffee mug / beverage container will save us from using disposable cups. We will offer prizes for the best containers!

STUDENT TRAVEL AWARDS

The International Society for Diatom Research (ISDR) is providing support for students attending NADS. Fifteen awards of $200 will be given to support travel and registration expenses for undergraduate and graduate students presenting their diatom research at the meeting (oral or poster). Student awardees are expected to serve as session moderators and in other leadership roles at the meeting. To be considered for an award, submit a short (200 words) essay describing the nature of your research and how this travel award will help your professional development.

CHECK-IN

Check in for registration, Symposium program, name tags, housing assignments, and t-shirts at the Dining Hall, beginning at 5 – 9 PM Wed. Oct. 2nd. Mandatory meeting for all students with travel awards – meet for a moderator training session 7 PM, also at Dining Hall.



PAYMENT
Balances due for registration, housing, tshirts can be made by our online system. The form states that you are paying for "lodging and facility rental", but don't be dissuaded! This is the right place for paying for NADS stuff.

POSTERS
Posters may be up to 48"W x 32"H or 32"W x 48"H, presenter's choice.

ORAL PRESENTATIONS
Plenary talks are set for 25 minutes with 5 minutes for discussion. Regular talks are 12 minutes for presentation and 2 minutes for discussion. Please add your power point presentation to our shared google drive folder by October 1. Label your presentation by the presenting author's LAST NAME_FIRST NAME

AUCTION
Be ready for the fabulous NADS Auction on Friday night. Bring your items; everyone has something valuable to donate to help raise money for NADS! Proceeds from the auction support student travel. Bid early, bid often, and please bring cash, check, or venmo.

PROCEEDINGS OF THE 27TH NADS
Opportunity knocks! Submit your manuscripts to the Proceedings of the 27th NADS. We are partnering with the Academy of Natural Sciences of Philadelphia to publish a Proceedings from the meeting. ANSP has an agreement with the BioOne publishers so that the proceedings will be published as open access, online-only journal articles. **Manuscripts are due on December 31, 2024**. Stay tuned for author instructions on manuscript and figure format.

NADS 2024 ORGANIZING COMMITTEE

Lead Organizers	Sarah Spaulding, Mark Edlund
Co-Organizers	Becky Bixby, Mariena Hurley, Steve Main, Kalina Manoylov, Dennis Vander Meer, Julie Wolin
Auction	Mark Edlund, Paula Furey
Scum Run	Virginia Card, Janai Southworth
NADS Webmistress	Sarah Hamsher
Audio Visual Media	Kui Hu, David Burge
Time Keeper, zoom	Willa June Crow

NADS SPONSORS

The generosity of our sponsors makes this meeting possible. We give heartfelt thanks to Rhithron, Balogh Books, Iowa Lakeside Lab, and the International Society for Diatom Research.

The **International Society for Diatom Research** (isdr.org) promotes the study of marine, freshwater, modern, and fossil diatoms across the wide range of disciplines of biology, geology, paleoecology, cell metabolism, cell biology, metabolomics, nanotechnology, forensics, systematics, nomenclature, taxonomy, and biogeochemistry. Our society welcomes investigators from all disciplines and nations. The society:

- holds biennial, international conferences
- supports young scientists through the Young ISDR program
- offers travel funding to attend conferences to students, members from select countries
- publishes the international journal, *Diatom Research*
- connects people around world to study the important roles of diatoms in ecosystems

ISDR provided $ 3,000 to support student travel and registration presenting at the 2024 North American Diatom Symposium. Congratulations to our NADS recipients!

Anna Agi, Georgia College & State University
Hirak Parikh, Indiana State University
Samantha Hormiga, Florida International University
Lindsey Carlson, University of Vermont
Sristika Adhikari, Indiana State University
Adam Dingmann, St. Cloud State University
Sydney Brown, George Mason University
E. Mary Mullins, Tarleton State University
Hanna Innocent, Florida International University
Natalie Aranda, University of Colorado, Boulder
Isabelle Rytlewski, University of South Florida
Lane Allen, University of Colorado, Boulder
Oliver McLellan, The Ohio State University

Early Career Research Awards – ISDR offers annual awards for ECR students. By joining, ECRs are eligible to be considered for an award.

BECOME A MEMBER TODAY (isdr.org)

Join our international community of students and researchers striving to understand the multifaceted lives of diatoms. Membership is open to everyone.

Follow us on @young_isdr, @isdr_diatom and Young Diatomists (@youngisdr) on Instagram

27th NADS Program

Wednesday, October 2:

5:00-9:00 PM Registration

7:00-10:00 PM Light snacks and Social

Thursday, October 3:

7:00-8:15 Breakfast- ***Lakeside Dining Hall***

8:20-8:30 Opening remarks and Welcome - ***Lakeside Conference Tent***

8:30-10:00 Student Session 1 - ***Lakeside Conference Tent*** **(Moderators: Oliver McLellan and Izzi Rytlewski)**

- **8:45 Allen, Lane** - FRUSTULE SYMMETRY AND CHIRALITY IN THE SYMMETRICAL BIRAPHIDS
- **9:00 Hormiga Samantha et al.** - CARBONATE SEDIMENT PRODUCTION IN COASTAL WETLANDS: PERIPHYTON CONTRIBUTIONS AND DIATOM INDICATORS
- **9:15 Kleindl, Paige et al.** - HYDROLOGIC DRIVERS OF MACROPHYTE AND MICROBIAL MAT BIOMASS COVARIATION IN WETLANDS: AN OBSERVATIONAL AND EXPERIIMENTAL TEST OF THE STRESS GRADIENT HYPOTHESIS
- **9:30 Innocent, Hanna & E. Gaiser.** - THE EFFECTS OF NITROGEN:PHOSPHORUS RATIOS ON PHYTOPLANKTON AND BENTHIC ALGAL COMMUNITIES IN LAKE OKEECHOBEE
- **9:45 Johnson, Katherine et al.** - UPDATES TO 2023 VOUCHER FLORA FOR A SOUTH CAROLINA STREAM WITH A RICH HISTORY OF DIATOM RESEARCH
- **10:00 Carlson, Lindsey et al**. - LONG-TERM RESPONSES TO PHOSPHORUS FERTILIZATION IN BENTHIC DIATOM COMMUNITIES IN AN ARCTIC TUNDRA RIVER

10:00-10:30 Coffee Break - ***Conference Tent*** **/ Poster Set Up –** ***Mahan Hall***

10:30-12:00 Student Session 2 - Lakeside Conference Tent (Moderators: Samantha Hormiga and Lindsey Carlson)

- **10:30 Blanton, Jenna et al.** - THE EFFECT OF A LOW-HEAD DAM REMOVAL ON DIATOM SPECIES ASSEMBLAGES
- **10:45 Rytlewski, Isabelle (Izzi) & T. Whitmore** – FACTORS INFLUENCING THE OCCURRENCE OF *AULACOSEIRA* SPECIES IN SUBTROPICAL POLYMICTIC LAKES OF FLORIDA
- **11:00 Aranda, Natalie et al.** – ASSOCIATIONS BETWEEN TARDIGRADE ABUNDANCE AND *HANTZSCHIA* AND *LUTICOLA* TURNOVER IN THE FRESHWATER STREAMS IN THE DRY VALLEYS
- **11:15 McLellan, Oliver et al.** - FIRST DOCUMENTATION OF AN EXOTIC FRESHWATER DIATOM (*DISCOSTELLA ASTEROCOSTATA*) IN INLAND LAKES OF OHIO
- **11:30 Burgess, Andrew -** SCIENCE STORYTELLING: USING VIDEO TO CONNECT RESEARCH WITH ACTION
- **11:45 Heins, Megan et al. -** DIATOMACEOUS SEDIMENT CLASTS FROM UNDER THE ROSS ICE SHELF: DISCRETE RECORDS IN TIME

12:00-1:15 Lunch - ***Lakeside Dining Hall***

1:30-3:00 Lakeside Alumni Session 1; CWR era - *Lakeside Conference Tent* (Moderators: Lane Allen and Adam Dingman)

- **1:30 Plenary Talk: Dr. Evelyn Gaiser** -THIRTY-SIX YEARS OF THINKING LIKE A DIATOM: THE POWER OF PERSISTENT ATTACHMENTS
- **2:00 Main, Stephen** – IOWA DIATOM HERBARIA ENTER THE DIGITAL AGE
- **2:15 Wee, Jim** – TWO DIATOM HERBARIA IN IOWA UNDER THE OVERSIGHT OF THE IOWA BOARD OF REGENTS
- **2:30 Siver**, **Peter** - DIATOMS OF THE DEEP

3:00-3:30 Coffee Break - *Conference Tent* / Poster Set Up – *Mahan Hall*

3:30-5:00 Lakeside Alumni Session 2; EFS era - *Lakeside Conference Tent* (Moderators: Hanna Innocent and Anna Agi)

- **3:30 Plenary Talk: Dr. Jeffrey Stone** -TBD
- **4:00 Edlund, Mark & D. Mann** – 'TIS THE SEASON: SEASONALITY OF DIATOM SEXUAL REPRODUCTION
- **4:15 Bixby, Becky & A. Burdett** – HOW WILL ALGAL COMMUNITIES IN ARIDLAND FRESHWATERS FARE IN A WARMING AND CHANGING WORLD?
- **4:30 Spaulding, Sarah, et al.** – CLARIFICATION OF THE ECOLOGICALLY IMPORTANT SPECIES, *COSCINODISCUS OCULUS-IRIDIS* EHRENB.
- **4:45 Wolin**, **Julie & M. Edlund** – 27 YEARS OF DIATOM(IST) ASSEMBLAGES 1970 – 2024

5:00-6:00 Break

6:00-7:15 Dinner- *Lakeside Dining Hall*

7:30-9:00 Scientific Session 1 – Poster Presentations (7:30-9:00) & Social – *MacBride Hall and Mahan Hall*

Friday, October 4:

7:00-8:15 Breakfast- *Lakeside Dining Hall*

8:20-8:30 Announcements – *Lakeside Conference Tent*

8:30-10:00 Lakeside Alumni Session 3 – *Lakeside Conference Tent* (Moderators: Sydney Brown and Mary Mullins)

- **8:30 Plenary Talk: Dr. David Burge** – LAKESIDE DIATOMS – THE NEXT GENERATION
- **9:00 Ashworth, Matt et al.** – CHLOROPLAST GENOME ORGANIZATION IN THE EPIZOIC DIATOM ACHNANTHES ELONGATA VARIES BY HOST AND GEOGRAPHY
- **9:15 Bishop, Ian et al. –** A NEW, SIMPLIFIED TWO-STATION APPROACH FOR MODELING METABOLISM IN TAILWATERS SUBJECT TO EXTREME DIEL FLOW VARIATION?
- **9:30 Brylka, Karolina et al.** – EVOLUTION OF DIATOMS THROUGH THE EYES OF PALEONTOLOGY: WHAT'S NEW, WHAT'S NEXT
- **9:45 Card, Virginia** – WHAT DOES IT TAKE TO BREAK AN *ULNARIA*?

10:00-10:30 Coffee Break – *Conference Tent*

10:30-12:00 Lakeside Alumni Session 4 – *Lakeside Conference Tent* (Moderators: Natalie Aranda and Hirak Parikh)

10:30 Plenary Talk: Dr. Victoria Chraïbi- FITTING FRUSTULES INTO THE FUTURE OF UNDERGRADUATE EDUCATION

11:00 DePaolis, Jess et al. – ESTABLISHING FOUNDATIONAL QUESTIONS FOR RECONSTRUCTING THE PALEOENVIRONMENT OF THE BERING LAND BRIDGE USING DIATOMS VARIES BY HOST AND GEOGRAPHY

11:14 Potapova, Marina et al. – ADVANCING ACCESS TO THE DIATOM SLIDE COLLECTION AT THE ACADEMY OF NATURAL SCIENCES OF DREXEL UNIVERSITY BY WHOLE-SLIDE IMAGING AND VIRTUAL MICROSCOPY

11:28 Schulte, Nick et al. – DIVERSITY OF FRESHWATER ALGAL ASSEMBLAGES ACROSS THE UNITED STATES AS REVEALED BY EDNA METABARCODIN

11:42 Noble, Paula et al. – BENTHIC ALGAL COMMUNITIES IN THE NEARSHORE OF LAKE TAHOE (USA) ASSESSED BY COMPLEMENTARY TOOLS OF MICROSCOPY AND ENVIRONMENTAL DNA?

12:00-1:15 Lunch – *Lakeside Dining Hall*

1:30-3:00 Rex Lowe 80th! Session 1- *Lakeside Conference Tent* (Moderator: Paula Furey)

1:30 Plenary Talk: Dr. Jane Marks – ECOSYSTEM CONSEQUENCES OF A NITROGEN FIXING PROTO-ORGANELLE

2:00 LaLiberte, Gina – ADVENTURES IN ALGAE THANKS TO REX

2:15 Johansen, Jeff – HISTORICAL WATER QUALITY RECONSTRUCTIONS OF TINKERS CREEK, OHIO THROUGH EXAMINATION OF DIATOMS FROM FISH GUTS AND PERIPHYTON

2:30 Pillsbury, Bob et al. – THE EEFFECT OF *DIDYMOSPHENIA GEMINATA* BLOOMS ON THE BACTERIAL COMMUNITIES ASSOCIATED WITH LAKE SUPERIOR AND ASSOCIATED NORTH SHORE STREAMS

2:45 Lowe, Rex – HOCHUNK BOILING SPRINGS AND STAR WARS

3:00-3:30 Coffee Break – *Conference Tent*

3:30-5:00 Rex Lowe 80th! Session 2 – *Lakeside Conference Tent* (Moderator: Gina Laliberte)

3:30 Kireta, Amy – STEM OUTREACH, PREACHING THE GOOD DIATOM WORD

3:45 Stepanek, Josh – TIPTOEING ACROSS THE RUBICON: THE ROLE OF ELEVATED CONDUCTIVITY INLAND WATERS IN DIATOM ECOLOGICAL EVOLUTION

4:00 Furey, Paula – THE POWER OF A DIATOM: GROWING ALGAL LITERACY AND INSPIRING FUTURE DIATOMISTS

4:15 ROAST

4:50-6:00 Break or Workshop (*Lakeside Conference Tent* Best Practices in Species Descriptions – Potapova, Aycock)

6:00-7:15 Dinner- *Lakeside Dining Hall*

8:00-10:00 NADS Auction/Social – *Mahan Hall*

Saturday, October 5

7:00-8:15 Breakfast- ***Lakeside Dining Hall***

8:25-8:30 Announcements - ***Lakeside Conference Tent***

8:30-10:00 Scientific Session 2 (Oral) - ***Lakeside Conference Tent*** **(Moderators: Lindsey Carlson and Sristika Adhikari)**

8:30 Hu, Kui et al.– WHY HAS THE NORTH SHORE OF LAKE SUPERIOR BECOME A HOTSPOT FOR THE NUISANCE ALGA *DIDYMOSPHENIA GEMINATA*?

8:45 Gretz, Michael– DIDYMO STALKS: IF THEY LOOK LIKE TOILET PAPER AND FEEL LIKE TOILET PAPER.....

9:00 Hurley, Mariena – PRELIMINARY FINDINGS FROM THE DELAWARE RIVER WATERSHED INITIATIVE

9:15 Aycock, Laura – ANSP DIATOM NEW TAXON FILE

9:30 Coenen, Jason et al. – USING MARINE DIATOMS AND SILICOFLAGELLATES FROM SEYMORE ISLAND TO RESOLVE THE INFLUENCE OF DECCAN TRAPS VOLCANISM AND METEORITE IMPACT OVER THE CRETACEOUS-PALEOGENE EXTINTION EVENT

9:45 Roberts, Wade & A. Alverson – GENOME-SCALE RESOLUTION OF CRYPTIC SPECIATION IN A COSMOPOLITAN MARINE DIATOM

10:00-10:30 Coffee Break – ***Conference Tent***

10:30-12:00 Scientific Session 2 (Oral) - ***Lakeside Conference Tent*** **(Moderators: Izzy Rytlewski and Samantha Hormiga)**

10:30 Spanbauer, Trisha - DIATOM COMMUNITY DYNAMICS AT THE ONSET OF A CYANOBACTERIAL BLOOM IN THE WESTERN BASIN OF LAKE ERIE

10:45 Scotese, Kyle – *STAURONEIS MARGINISTRIATA* SP.NOV., A NEW DIATOM SPECIES FROM GROUND WATER SEEPS AT STEBBINS GULCH NATURAL AREA, OHIO USA

11:00 Stancheva, Rosalina et al. – SURVIVAL STRATEGIES OF DIATOMS IN NON-PERENNIAL STREAMS IN SOUTHERN CALIFORNIA

11:15 Streib, Laura et al. – *ENCYONEMA LARVATUM* SP. NOV.: A NEW DIATOM SPECIES IDENTIFIED FROM THE MID-PLEISTOCENE OF LAKE MALAWI, EASTERN AFRICA

11:30 Reavie, Euan et al. – CLIMATE CHANGE, INVASIVE SPECIES, AND NUTRIENT POLLUTION ARE TO BLAME FOR CHANGING DIATOMS IN THE WORLD'S LARGEST FRESHWATER LAKE SYSTEM

11:45 Frankovich, Tom et al. – 100 YEARS LATER: NEW DISCOVERIES AND OBSERVATIONS ON CETICOLOUS DIATOMS

12:00-1:15 Lunch – ***Lakeside Dining Hall***

1:30-2:30 Business Meeting – host the next NADS – 2026!
SFS Taxonomic Cert (Malik, Hurley), DONA feedback (DONA Board)

2:30-2:50 Coffee Break

2:50-4:00 Free Time, collecting, collaborating, open discussions, pontoon ride

4:00-6:00 Scum Run/Pinata-*Lakeside Lab*

6:00-7:15 Dinner - *Lakeside Dining Hall*

7:15-8:00 Workshop - Diatoms in Education (*Lakeside Conference Tent* Organizers: Chraïbi, Card, Janai)

8:00-8:45 Workshop – Diatom Collections in the 21st Century (*Lakeside Conference Tent* Organizers: Potapova, Wee, Aycock, Main)

9:00 Social/Scum Run Awards-*Lakeside Conference Tent or Mahan Hall*

Sunday, September 27

7:30-8:30 Breakfast & Departure - *Lakeside Dining Hall*

9:00 Optional Collecting Trips

POSTER SESSION: Thursday, October 3 - *MacBride Hall and Mahan Hall*

P 1 USING SPECIES-LEVEL IDENTIFICATION OF DIATOMS TO ASSESS HYDROLOGICALLY VARIABLE AQUIFERS
Agi, Anna*, Colón-Gaud, J. Checo, and Manolov, Kalina

P 2 CHLOROPLAST EVOLUTION IN DIATOMS THROUGH PHYLOGENOMICS
Amaral, Mailor W.W.*, Chang, Aimee C.G., Greenwood, Megan, Ikudaisi, Catherine, Hamsher, Sarah E., Miller, Scott R., Abresch, Heidi, Li, Jingchun, and Kociolek, Patrick

P 3 DIATOM COMMUNITIES FROM NON-PERENNIAL STREAMS IN SOUTHERN CALIFORNIA, USA
Stancheva, Rosalina*, **Brown, Sydney**, Woodward, Deborah, Loflen, Chad, and Busch, Michelle, H.

P 4 CHARACTERIZING BENTHIC ALGAL ASSEMBLAGE RESPONSES TO A FLOW INTERMITTENCY GRADIENT IN A CENTRAL TEXAS RIVER
Collins, Ailish*, Furey, Paula, Nowlin, Weston

P 5 AN INVESTIGATION OF DIATOM COMMUNITIES ALONG THE EVEREST BASE CAMP ROUTE, NEPAL
Cook, Terresa, Stone, Jeffery, Nicholson, Kirsten

P 6 STREAM DYNAMICS AND SPECIES CONSTRAINTS INFLUENCING STALK FORMING DIATOMS CREATE AN ENVIRONMENT OF OPPORTUNITY FOR GRAZING SPECIES
Dingmann, Adam and Matthew Julius

P 7 VALVE ULTRASTRUCTURE AND SYSTEMATIC POSITION OF *RHOPALODIA WETZELII*
Greenwood, **Megan** Felipe Serino, Silvia E. Sala, José M. Guerrero, Amelia A. Vouilloud, J. Patrick Kociolek

P 8 PHYLOGENOMIC INSIGHTS FROM MITOCHONDRIAL GENOMES OF DIATOMS
Ikudaisi, Catherine*, Aimee Caye G. Chang, Mailor W. W. Amaral, Megan Greenwood, Heidi Abresch, Sarah E. Hamsher, Scott Miller, Jingchun Li, J. Patrick Kociolek

P 9 DIATOM ASSEMBLAGES OF THE ALASKAN ARCTIC COASTAL PLAIN BEFORE RECENT RAPID CLIMATE CHANGE: REEXAMINATION OF LEONARD FREESE'S COLLECTIONS
Leppik, Sylvia, Potapova, Marina

P 10 ALGAL COMMUNITY RESPONSE TO PULSE AND PRESS DISTURBANCES IN CENTRAL TEXAS PONDS
Mullins, Mary*, Chraïbi, Victoria

P 11 PLEISTOCENE SEDIMENTS OF LAKE MALAWI, WITH A CLOSE RELATIONSHIP TO THE *CYCLOTELLA MENEGHINIANA* SPECIES COMPLEX
Parikh, Hirak* , Sizemore, Christian , Strieb, Laura , Julius, Matthew , Jovanovska, Elena , Stone, Jeffery, R ,

P 12 EPIZOIC DIATOM DIVERSITY OF SEA TURTLES AT TEXAS STATE AQUARIUM
Pennell, Robynne*, Chraïbi, Victoria

P 13 IMPACTS OF CANOPY COVERAGE AND ULTRAVIOLET RADIATION ON STALK PRODUCTION OF *DIDYMOSPHENIA GEMINATA*
Rimer, Nuphar*, Pillsbury, Robert, Moerke, Ashley

P 14 HOW FLOW AND DRY CONDITIONS INFLUENCE ALGAL SPECIES COMPOSITION AND PRODUCTIVITY IN INTERMITTENT RIVERINE POOLS IN TEAXAS RIVERS
Rojas-Pina, Incy

P 15 DIATOMS OF LAKE TANGANYIKA
Sristika Adhikari*, Jeffery R. Stone, Michael M. McGlue

P 16 PALEOLIMNOLOGICAL STUDY OF THE RELATIONSHIP BETWEEN DIATOM GENERA AND LAKE INFLUENCES IN LAKE CHICHOJ, GUATEMALA
Tanner, Kaya, Stone, Dr. Jeffery, Obrist-Farner, Dr. Johnathan, Boyd, Mason, Winningham, Christopher

P 17 A NEO AND PALEOLIMNOLOGICAL APPROACH TO UNDERSTANDING AULACOSEIRA ECOLOGY IN NORTHER MAINE, USA
Villacís, Leonardo A. *, Jasmine E. Saros

P 18 VOUCHER FLORA OF COAL CREEK, A SMALL, INTERMITTENT STREAM AFFFECTED BY WILDFIRE
Allen, Lane*and Diane McKnight

P 19 PALEOLIMNOLOGICAL STUDY OF FOX LAKE, INDIANA
Williams, Sydney

P 20 GENOMIC EVOLUTION IN CHLOROPLAST AND MITOCHONDRIAL DNA OF DIATOMS
Chang, A.C.G.*, Amaral, M.W.W., Greenwood, M., Ikudaisi, C., Hamsher, S.E., Miller, S.R., Li, J., Kociolek, J.P.

P 21 INFLUENCE OF AERIAL EXPOSURE ON MORTALITY RATES AND ASSEMBLAGE STRUCTURE OF BENTHIC STREAM DIATOMS
Byington, Aimee, **Chraïbi, Victoria***

P 22 CLASSIFICATION SYSTEM OF LIPAROGYRALES DANZ & KOCIOLEK (THOSE DIATOMS FORMERLY ASSIGNED TO ORTHOSEIRACEAE
Danz, August*, Kociolek, J. Patrick

P 23 WIDESPREAD OCCURRENCE OF *ACHNANTHIDIUM* CF *SUBATOMUS* “HIDING” IN *ACHNANTHIDIUM RIVULARE* (POTAPOVA AND PONADER 2004) POPULATIONS IN WESTERN WASHINGTON, USA.
Davis, Clint

P 24 DIATOM CAMP: SIXTY-PLUS YEARS OF TEACHING ECOLOGY AND SYSTEMATICS OF DIATOMS AT IOWA LAKESIDE LAB
Edlund, Mark B. and Spaulding, Sarah A.

P 25 READY, SET, NADS! A BRIEF HISTORY, 1970-2024
Edlund, Mark B. and Wolin, Julie A.

P 26 TAXONOMIC IDENTIFICATION OF DIATOM SPECIES FOUND IN CRESCENT BAY LAKE, COULEE DAM, WASHINGTON
Eichman, Julia Christensen, Eichman, Charissa A.

P 27 RHOPALODIALES OF MICHIGAN: A PRELIMINARY FLORA
Sandman, Olivia, Miller, Parker, Kociolek, J. Patrick, Li, Jingchun, Miller, Scott, **Hamsher, Sarah E.***

P 28 PRELIMINARY ANALYSIS OF HOLOCENE CLIMATE AND DIATOM RECORD IN LAKE HELENA MT
Sargent Arianah*, **Patricia Heiser**, Margaret Todd

P 29 ASSESSING THE LONG-TERM IMPACTS OF REMEDIATION ACTIVITIES ON DIATOM COMMUNITIES IN SILVER BOW CREEK, MONTANA, USA
Malik, Heera*, Vander Meer, Dennis

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FRUSTULE SYMMETRY AND CHIRALITY IN THE SYMMETRICAL BIRAPHIDS

Allen, Lane*, University of Colorado, Boulder

Frustule symmetry has been used to classify Nitzschioids for well over a century and is implicit in asymmetrical biraphids that are asymmetric along the apical axis such as *Cymbella*, but there has been little to no discussion of this feature in symmetrical biraphids. Some symmetrical biraphids such as *Luticola* display cis, or hantzschioid symmetry while others such as *Neidium*, *Muelleria*, and *Pinnularia* display inconsistent frustule symmetry, with roughly half of the specimens observed displaying cis symmetry and half displaying trans symmetry. Some taxa are known to display chirality in the orientation of organelles during mitosis, however chirality can also be observed in the frustule morphology of *Neidium* and *Scoliopleura*. Frustule symmetry and chirality appear to be high level sorting features that may be useful for hypothesizing the phylogeny of extinct clades.

ASSOCIATIONS BETWEEN TARDIGRADE ABUNDANCE AND *HANTZSCHIA* AND *LUTICOLA* TURNOVER IN THE FRESHWATER STREAMS IN THE DRY VALLEYS

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Adams, Byron, Brigham Young University

The microbial mats living in the freshwater streams of the Antarctic Dry Valleys are host to a myriad of cyanobacteria, algae, and microfauna whose ecosystem-level interactions are not fully understood. Much research has been done to understand how diatoms, a silicious based brown algae, respond to changing environmental conditions. These studies, however, have lacked any consideration of grazing within the stream and how this may affect the diatom community despite known grazers such as tardigrades being present in significant abundances. In this study, four types of microbial mats were sampled– red, orange, black and green– across eight separate streams in Taylor Valley. All animals were extracted from a subsection of the sample and counted to obtain a relative abundance. Another subsection of sample was analyzed to find the proportion of diatoms that were alive at the time of collection. When compared, these data suggest the impact tardigrade grazing may have on diatom abundance which has implications for how we understand turnover in the diatom community. Diatoms live in the critical zone in the Dry Valleys and can be an indicator for streamflow and provide insight for the depth of the active layer. In addition, these findings can be used to reevaluate the role of tardigrades in stream ecosystems where their influence as top-down controllers has not been previously considered.

CHLOROPLAST GENOME ORGANIZATION IN THE EPIZOIC DIATOM *ACHNANTHES ELONGATA* VARIES BY HOST AND GEOGRAPHY

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Bosak, Sunčica, University of Zagreb
Majewska, Roksana, Nord University
Frankovich, Thomas, Florida International University

As we continue to document the diversity of epizoic diatoms, we can channel greater effort into understanding the nature of the interaction between the diatoms and their host organisms. Among epizoic diatoms, *Achnanthes elongata* stands out as one of the more widely-distributed species, having been documented on manatees, diamondback terrapins and four species of sea turtle on both sides of the Atlantic Ocean. We isolated and cultured *A. elongata* cells from manatees in Georgia and Florida, diamondback terrapins in New Jersey, Kemp's ridley sea turtles in Georgia, green sea turtles in Florida and the Caribbean and loggerhead turtles in Florida, the Azores and the Adriatic Sea. While DNA sequence data from these strains could not resolve much in the way of host specificity or biogeography, the size and organization of the chloroplast genomes varied significantly across the strains. While gene order tended to be conserved within strains from the same host species, significant changes in gene order were detected between strains from green sea turtles, loggerheads and manatees. Genome expansion was also observed in diamondback terrapins and between the strains isolated from different manatee populations. This suggests some level of reproductive isolation between the *A. elongata* populations, despite the conservation of morphology and DNA sequence similarity.

ANSP DIATOM NEW TAXON FILE

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Ever needed to search for descriptions and images of newly established diatom taxa in a centralized location? Look no further than the Academy of Natural Sciences (ANSP) Diatom New Taxon File (DNTF). Started by Dr. Ruth Patrick in the 1950s, this resource was maintained by the ANSP Diatom Herbarium staff led by Dr. Charles Reimer, who created index cards documenting images and descriptions of almost all diatom taxa described after 1932. As of 2016, all physical cards were scanned and uploaded to a website, and we developed a process to create new cards virtually. Learn more about updates to the DNTF along with other useful resources provided by the ANSP Diatom Herbarium.

A NEW, SIMPLIFIED TWO-STATION APPROACH FOR MODELING METABOLISM IN TAILWATERS SUBJECT TO EXTREME DIEL FLOW VARIATION

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Tailwater ecosystems are often highly productive river reaches where food webs rely disproportionately on local, autochthonous energy production, commonly rooted in benthic diatom communities. While in situ continuous dissolved oxygen (DO) data is increasingly being used to estimate gross primary productivity (GPP) and ecosystem respiration (ER), this approach is complicated in tailwaters, because the dissolved oxygen of releases are frequently far from equilibrium and there can be substantial diel variation in flow to meet hydropower or other needs. To address these idiosyncrasies, we developed a new two-station open channel metabolism model to accurately estimate reach-scale GPP and ER in tailwaters. Our approach accounts for sub-daily flow variation and considerably simplifies model implementation compared to previous efforts. We apply our model to a 16+

year DO time series and estimate daily GPP, ER and gas exchange velocity (K600) for a 12-km reach of the Colorado River downstream of Glen Canyon Dam. We compare our modelâ€™s performance to a more complex modeling effort that fit a portion of the same DO time series (Payn et al. 2017) and confirm that GPP estimates using our approach do not substantially deviate from estimates that required far greater runtimes and technical expertise. Overall, our results indicate that the Glen Canyon tailwater is highly productive and predominantly heterotrophic, with GPP peaking both in mid-spring and late-summer and regularly reaching 12-17 g O2 m-1 d-1. The times series also captures several interesting metabolic responses to both natural and artificial environmental disturbances, such as record high water temperature in 2022 resulting from low reservoir elevations and abrupt shifts in discharge associated with recent seasonal high-flow experiments. We expect that our new model will help resolve an analytical bottleneck in tailwater ecology and will spur further algal research in these ecologically, culturally and recreationally valued ecosystems.

HOW WILL ALGAL COMMUNITIES IN ARIDLAND FRESHWATERS FARE IN A WARMING AND CHANGING WORLD?

Bixby, Rebecca J*, University of New Mexico
Ayesha S Burdett, River Bend Ecology

Light can be a key driver of diatom assemblages, influencing biomass and diatom assemblage structure. Turbid rivers in aridland regions, like the southwestern US, often carry high sediment loads associated with tributary inputs that result in light-limited reaches. Algal communities grow in compressed habitats along shallow sandbars and bank edges (“bathtub ring”) with sufficient light availability to support photosynthesis. The goal of this ongoing research is to quantify the bathtub ring in terms of diatom diversity and structure in river systems that have in-stream light limitation co-limited by additional environmental drivers. To map this bathtub ring, we have sampled algal communities laterally along with environmental parameters (e.g., velocity, depth, turbidity, and hydraulics) in the Rio Grande, central New Mexico, USA. Initial work in shallow, sandy bottom reaches with moderate turbidity indicated that there were thresholds to growth at 18 cm water depth and 0.15 m/s flow velocity. Our additional research has shown that these thresholds are more dynamic in reaches with more complex geomorphology and heterogeneous substrates. Efforts to understand bathtub ring dynamics has led to modeling relationships among turbidity, depth, and light attenuation to predict the bathtub ring spatially and temporally. In recent summers with less frequent monsoonal events and greater water withdrawals, lower flows of less turbid water have resulted in a much wider bathtub ring, sometimes spanning the entire width of the river. Additionally, this wider bathtub ring was composed of a greater proportion of cyanobacteria versus low-light adapted diatoms. We predict that channel-wide bathtub rings related to increased water withdrawals and a warming climate will become more common in aridland rivers with unknown consequences to the food web structure, carbon dynamics, ecosystem services, and drinking water quality

THE EFFECT OF A LOW-HEAD DAM REMOVAL ON DIATOM SPECIES ASSEMBLAGES

Blanton, Jenna*, Stone, Jeffrey., Gooley, Aaron, C. Indiana State University, Terre Haute, IN.

Across the United States, dam removals are increasing in frequency. While often intended to have positive effects on the river’s ecology, short-term effects can be negative, and more research is needed on the ecological impacts of dam removals. Last October, a low-head dam was removed from Otter Creek in Terre Haute, Indiana. A low head dam is a small, run-of-river dam that does not form a reservoir and were typically built to power grist mills or saw mills. Prior to the dam removal, we implemented a BACI (Before, After, Control, Impact) design study. Benthic diatoms were collected from woody substrate above and below the dam site at Otter Creek, as well as at a paired control site: Big Racoon Creek. Big Racoon Creek has a similarly sized low-head dam and is very close by to Otter Creek. Samples were collected at the same points the following Summer and diatoms were counted to compare changes in species composition before and after the dam removal at both the impact and the control site.

EVOLUTION OF DIATOMS THROUGH THE EYES OF PALEONTOLOGY: WHAT’S NEW, WHAT’S NEXT

Brylka, Karolina*, Lund University, Sweden
Andrew J. Alverson, University of Arkansas Fayetteville, USA
Sylvain Richoz, Lund University, Sweden
Matt P. Ashworth, The University of Texas at Austin, USA
Daniel J. Conley, Lund University, Sweden

Diatom fossil record provides a unique and direct perspective on the diversity, biogeography and early evolution of the diatom lineage. Diatom record dates back to the lower Cretaceous (120-100 Ma), where diverse communities were described worldwide from various yet isolated niches. The early fossil record is generally scarce and in the past ten years only a handful of studies documented new diatom communities. Diversity and the distribution of the earliest fossils suggests prior evolutionary events, which is further supported indirectly via molecular phylogenies suggesting the age of origin to be 200 Ma. In this talk I will present our efforts in searching for the oldest diatoms, surrounding difficulties and well as guidelines of where to look in future. Furthermore, I will present first comprehensive Cretaceous Diatom Database, a tool to investigate diversity, taxonomy and biogeography of the earliest communities. Collectively I will share the newest developments in the early diatom fossil record and the guidelines for further research.

LAKESIDE DIATOMS – THE NEXT GENERATION

David Burge, Science Museum of Minnesota, NRRI

After many years of being a student, TA, researcher, and visiting lecturer, David co-taught the Lakeside Ecology and Systematics of Diatoms class in 2024. This talk will highlight his ideas and dreams for the next generation of Lakesiders.

SCIENCE STORYTELLING: USING VIDEO TO CONNECT RESEARCH WITH ACTION

Burgess, Andrew D., University of Iowa

The importance of public engagement with scientific research is at an all-time high, but the competitiveness of online attention makes it difficult to connect research outcomes with wide audiences capable of driving change. Field and lab-based research has inherent beauty and storytelling merit with immense potential to engage people from all backgrounds. For the past five years, I’ve had the opportunity to work with several research labs and organizations on communicating their projects through video, including the USDA Agricultural Research Service, Lakeside Lab, and others. The projects span program summaries, impact stories, short films, and even grant application supplements, each with unique needs, insights, and solutions. The principles used to capture and communicate these science stories, however, are universal

enough that any researcher can use them in writeups, applications, and even social media posts to make connections that promote research and build trust in science. I will showcase past projects, share what I've learned, and explore takeaways that can be implemented anywhere.

WHAT DOES IT TAKE TO BREAK AN ULNARIA?

Card, Virginia, Metropolitan State University

The valves of long slender diatom cells in genera such as *Ulnaria*, *Fragilaria* and *Synedra* are sometimes found broken in sediment samples and prepared slides. Small diatomivorous zooplankton such as copepods and cladocera must break them in order to ingest the cell contents inside. How much force does it take to bend and break a long slender diatom? Which cells are easier to break, larger ones typical of the early stages of the life-cycle or smaller ones from the later stages? This question was modelled using beam theory and the material properties and structural geometry of example taxa within the Fragilariaceae. The properties of physical models, the analogous structures of stems and branchlets of taxa within the Asteraceae and Sapindaceae (sunflowers and boxelders) were measured using a very cool instrument (Instron 3400 Universal Testing System), and the results compared to modelled values. The forces calculated for the diatoms very small and were affected by the valve thickness and the relative proportion of silica in the valve material, as well as the relative length and width of the cell. Audience participation may be involved.

LONG-TERM RESPONSES TO PHOSPHORUS FERTILIZATION IN BENTHIC DIATOM COMMUNITIES IN AN ARCTIC TUNDRA RIVER

Carlson, Lindsey* University of Vermont
Edlund, Mark, Science Museum of Minnesota
Bowden, William B., University of Vermont

We evaluated the impacts of long-term phosphorus enrichment on diatom communities the Upper Kuparuk River, Alaska (USA) by comparing epilithic diatom samples collected annually in P-fertilized and Reference reaches between 1997 and 2022. Previous research documents that the low-level P enrichment profoundly influenced community structure in the fertilized reach of the river, notably by stimulating luxuriant growth of two species of mosses that had never been observed in the reach previously. However, the 25-year long set of epilithic diatom samples from the P-enrichment experiment had not been analyzed previously. Permutational multivariate analysis of variance (PERMANOVA) and Redundancy Analysis revealed persistent shifts in diatom communities attributable to phosphorus enrichment. In particular, the species *Nitzschia paleacea* and *Reimeria sinuata* were reliable indicators of P-enriched conditions. Diatom communities did not immediately revert to pre-fertilization compositions when the P-fertilization treatment was terminated in 2017. This is likely due to an interaction with the moss community that colonized the fertilized reach during the enrichment phase of this experiment and persisted for several years after the enrichment ended. These findings highlight the importance of long-term studies in understanding and managing the impacts of nutrient enrichment on aquatic ecosystems, particularly in regions facing rapid environmental changes.

FITTING FRUSTULES INTO THE FUTURE OF UNDERGRADUATE EDUCATION

Chraïbi, Victoria, Tarleton State University

Public undergraduate education in the United States is undergoing multiple concurrent transitions that present challenges and opportunities for the study of diatoms. Master's programs are being phased out at many universities in preference for PhD programs, leading to a baccalaureate-to-PhD pipeline that requires students to fulfill heightened expectations for research and publication while an undergraduate. At the same time, the transition from face-to-face teaching to online and asynchronous learning limits hands-on experience in laboratory and field skills. Summer field courses that used to be a staple of environmental education programs compete with students completing core classes, holding full-time jobs, and providing familial support. To our benefit, diatoms present multifaceted research opportunities that span scientific disciplines, lab and field settings, technologies, budget sizes, and learned skills. Ensconcing undergraduate opportunities for research in coursework offers opportunities to include service-learning, community outreach, and collaborative investigation. How can we, the diatomist community, benefit from modern technologies that enable long-distance collaborations, produce diatom educational materials, remove barriers to participation, and mentor the new generation of diatom experts?

USING MARINE DIATOMS AND SILICOFLAGELLATES FROM SEYMORE ISLAND TO RESOLVE THE INFLUENCE OF DECCAN TRAPS VOLCANISM AND METEORITE IMPACT OVER THE CRETACEOUS-PALEOGENE EXTINTION EVENT

Jason Coenen, Virginia Tech, David Harwood, and Thomas Tobin

Seymour Island, located on the northeastern tip of the Antarctic Peninsula, includes well-exposed outcrops of Maastrichtian to Danian marine strata that contain rich and diverse fossils recording details of the Cretaceous-Paleogene (KPg) event. The KPg event is known for its catastrophic impact on climate and biological diversity. Initial siliceous microfossil characterization at this site provided an account of siliceous microfossils' extinction, recovery, and evolutionary response during this dynamic period of Earth's history. Recent work highlights the potential influence of Deccan Trap volcanism on the siliceous microfossil record and the environmental calamity due to the meteorite impact.

ESTABLISHING FOUNDATIONAL QUESTIONS FOR RECONSTRUCTING THE PALEOENVIRONMENT OF THE BERING LAND BRIDGE USING DIATOMS

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Caissie, Beth, USGS Minerals, Energy, and Geophysics Science Center
Fowell, Sarah J., University of Alaska, Fairbanks
Dura, Tina, Virginia Tech

During periods of low sea level throughout the Pleistocene, including the Last Glacial Maximum (LGM), the Bering Land Bridge (BLB) connected the Eurasian and North American continents, creating a migration corridor for plants, animals, and humans. Reconstructing the environment of the BLB, especially during and after the LGM, has important implications for archaeological, paleontological, and geological research. However, paleoenvironmental reconstructions made over the last several decades have focused on reconstructing Western and Eastern Beringia to infer the environment of the lowlands of the BLB. Preliminary stable isotope, sedimentary, and diatom analyses of cores retrieved from the Bering Sea in August 2023 identify a basal freshwater unit overlain by massive marine mud. The

freshwater-marine transition represents flooding of the emergent BLB at the conclusion of the LGM. Analysis of palynomorphs and diatoms from the basal freshwater unit have the potential to answer longstanding questions about the paleoenvironment of Central Beringia. Was it an arid steppe, a shrub-covered tundra, a complex tidal river system, extensive marshland, or a combination of environments? How variable was it over space and time? Here we establish foundational questions to understand how to best conduct paleoenvironmental reconstructions of the BLB. Modern diatom assemblages from a variety of coastal environments (i.e., lagoons, tidal rivers, marshes, etc.) across a range of salinity can be used as a proxy to compare to fossil diatom assemblages and interpret the ecological shifts downcore. A dearth of modern diatom datasets from northern Alaska confines us to previously produced diatom datasets from south-central Alaska to help establish the diatom assemblages common in transitional coastal environments. The modern datasets from this work will provide a framework for developing a modern dataset for northern Alaska and for reconstructing the paleoenvironments of the BLB. We present future directions for this research, including the best methods for creating a modern coastal diatom dataset in northern Alaska, and consider future insights such as the climate and geomorphological evolution of the BLB, and the timing of sea level advancement after the LGM.

'TIS THE SEASON: SEASONALITY OF DIATOM SEXUAL REPRODUCTION

Edlund, Mark B.*, Science Museum of Minnesota, St Croix Watershed Research Station
Mann, David G., Royal Botanic Garden Edinburgh, Edinburgh, Scotland, UK

During the last 170 years, data have gradually accumulated on the diatom life cycle, documenting its unique pattern, in which slow size reduction during vegetative cell divisions in the diploid phase alternates with rapid size restitution via a special cell – the auxospore. However, while the cytological events of auxosporu- lation are quite well understood and recent studies have begun to reveal some of the underlying genetic, physiological and biochemical controls, progress in documenting the phenology of reproduction has lagged. Currently, the principal advances in understanding the ecology of diatom reproduction are coming from studies of selected phytoplankton species. They demonstrate tight coupling between the diatom life cycle, population densities, and seasonal changes in the characteristics of the water column. For benthic diatoms - comprising by far the majority of diatom species - there is far less information, much of it anecdotal but nevertheless valuable. Here we make a comprehensive review of over 490 occurrences of auxosporulation in natural populations of diatoms including many observations from Iowa Lakeside Lab, revealing an unexpectedly strong seasonal pattern, with N Hemisphere maxima in March-April and late summer, which deserves further study. We use these occurrences to review the ecological significance of auxosporulation. Meanwhile, transcriptomics is beginning to show how reproduction is triggered and controlled and how it may affect population growth and structure in natural populations.

100 YEARS LATER: NEW DISCOVERIES AND OBSERVATIONS ON CETICOLOUS DIATOMS

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Majewska, Roksana, Nord University
Sullivan, Michael J., Madison, Mississippi
Huggins, Jessica L. Cascadia Research Collective
Stepanek, Joshua G., Colorado Mountain College
Ashworth, Matt P., University of Texas
Wells, Randall S., Chicago Zoological Society

Biofilms from the skin of ten cetacean species and from the baleen of gray, humpback, and common minke whales were examined for ceticolous diatoms. Two new epizoic diatoms, *Tursiocola cymbelloides* sp. nov. and *Halamphora baleenicola* sp. nov. were described from baleen of gray whales (*Eschrichtius robustus*) and a humpback whale (*Megaptera novaeangliae*), respectively. New ultrastructure details are also described of the rarely observed ceticolous diatoms *Epiphalaina aleutica*, *Tursiocola staurolineata*, *Plumosigma rimosum*, *Bennettella ceticola*, and *Epipellis heptunei*. A newly named structure, the “solea”, associated with the polar raphe endings of *P. rimosum* is described in detail, as is a rudimentary butterfly structure in *E. aleutica* that further blurs the distinctions between the diatom genera *Epiphalaina* and *Tursiocola*. This study also adds four cetacean species to the relatively short list of cetaceans examined microscopically for diatoms.

THE POWER OF A DIATOM: GROWING ALGAL LITERACY AND INSPIRING FUTURE DIATOMISTS

Furey, **Paula C. ,** St. Catherine University

Who inspired you to become a diatomist? What thoughts and *feelings* did you experience the first time you saw a diatom? How many diatoms have you met on your journey to where you are today? Are there any special diatoms you would like to give a shout out to if you could? Have you ever stored diatoms in your fridge at home, or carried them in your pocket because you forgot a bag but *have* to look under a microscope? Perhaps you have given yourself a papercut flipping through diatom books or spent so much time perfecting a diatom image under a microscope that your neck got stiff or you forgot to eat? How many times have you shared your favorite piece of diatom trivia, like: ‘fish don’t smell fishy..they smell diatomy!’? Now look to the future: Who will our future diatomists be? What opportunities are there to inspire them? What kinds of training are available—or will be—for them? What resources are needed? I will share some thoughts from recent conversations with diatomists and phycologists, as well as resources I am developing with collaborators to help grow algal literacy and inspire future diatomists. Bring your thoughts on this topic to the NADS meeting, including reflections on how diatomists like Rex Lowe have inspired and trained you.

THIRTY-SIX YEARS OF THINKING LIKE A DIATOM: THE POWER OF PERSISTENT ATTACHMENTS

Gaiser, Evelyn*, Florida International University

As an incoming master’s student at Iowa State in 1989, I tried to enroll in Lakeside’s summer Limnology course but it had already filled, so I was encouraged to take the diatom course instead. That twist of fate changed the course of my career and that of many students who have since come through my lab and the Lakeside course. In this presentation, I will reflect on my experience in Dr. Charlie Reimer’s last summer of teaching “Ecology and Systematics of Diatoms” and how it influenced my career. In teaching us how to “think like a diatom” Dr. Reimer encouraged us look at and draw living diatoms, exposing us not only to their incredibly diverse appearances but also the myriad of ways that diatoms associate with each other, their substrates, and other microbes. This approach caused me to notice epizoic diatoms on cladocerans in Lake West Okoboji, that became the subject of my M.S. thesis and continues to motivate my

research on benthic mat-dwelling diatoms. Research in my lab has shown that mat-dwelling diatoms often produce copious mucilage that promotes facilitative interactions with bacteria to access limiting nutrients, protects them from harmful UV light, and provides moisture during drought. In essence, the mechanism that allows diatoms to attach themselves to others sustains them through stressful conditions. In a similar way, I've been attached to Lakeside Lab for 36 years through my own research on diatoms and through my students who have also trained and taught there. We have formed persistent attachments to the place of Iowa Lakeside Lab and to other diatomists that has provided career-sustaining expertise and inspiration and life-sustaining friendships and collaborations.

DIDYMO STALKS: IF THEY LOOK LIKE TOILET PAPER AND FEEL LIKE TOILET PAPER.....

Gretz, Michael R., Michigan Technological University

Didymosphenia geminata produces prodigious amounts of extracellular material in the form of stalks. These stalks are exuded from the cell terminus and, because they are continuous with cell division, divide to produce woven large mats that have been likened to toilet paper mixed in brown masses in streams. If it looks like toilet paper and feels like toilet paper it's composition must be like that of toilet paper, right? Wrong! That Didymo stalks are chemically different from toilet paper is perhaps not surprising, but it turns out Didymo has diverged from atypical diatom stalk chemistry and molecular organization in some interesting ways. Didymo stalks are unique. This is an important consideration in control and mitigation of Didymo blooms.

DIATOMACEOUS SEDIMENT CLASTS FROM UNDER THE ROSS ICE SHELF: DISCRETE RECORDS IN TIME

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Harwood, David, University of Nebraska-Lincoln
Coenen, Jason, University of Nebraska-Lincoln
Leventer, Amy, Colgate University

Reconstructing the history of the West Antarctic Ice Sheet (WAIS) is important to our understanding of its future response to climate change, as our world warms into the next century. WAIS plays an important role in global climate dynamics and will lead to sea level rise as the ice sheet shrinks. In order to better predict the ice sheet's future response to our changing climate, we must first understand the drivers and environmental factors of past ice sheet changes. We can document times of past ice sheet retreat through the use of siliceous marine microfossils, specifically records of photosynthetic fossil organisms - diatom algae - that grew in West Antarctic marine seaways during times of decreased ice sheet cover. In this study we are examining the presence of age-diagnostic diatoms to reconstruct a composite history of the marine sediment strata present beneath the WAIS. Specifically, we are examining isolated diatomaceous soft sediment clasts that have been eroded and transported by ice, in order to identify discrete time intervals of peak deglacial conditions when seas covered broad areas of West Antarctica. This study examined sediments collected by the Ross Ice Shelf Project (RISP) coring in 1978 from beneath the Ross Ice Shelf, and by coring from the RVIB Nathaniel B. Palmer in 1994 from the Eastern Ross Sea. Preliminary research results from both sample sets reveal that some of the clasts are barren of diatoms, whereas others contain rich assemblages of siliceous microfossils. Age determination through diatom biostratigraphy indicate discrete ages ranging from the early Oligocene to late Miocene. Examination of these discrete, microfossil-bearing sediment clasts will help determine the ages of subglacial marine sediment strata in a more direct way, as most samples of matrix sediment are highly fragmented and of mixed ages. By analyzing the diatomaceous clasts, we are sampling pieces of primary sediment material, with the goal of constructing a clearer picture of the assemblages present and create a more accurate picture of the composite marine strata and depositional record hidden under the Ross Ice Shelf and interior regions of the West Antarctic Ice Sheet.

CARBONATE SEDIMENT PRODUCTION IN COASTAL WETLANDS: PERIPHYTON CONTRIBUTIONS AND DIATOM INDICATORS

Hormiga Samantha*, Evelyn E. Gaiser, Michael S. Ross, James W. Fourqurean, and Rosario Vidales, Florida International University

Coastal ecosystems are rapidly transforming as sea levels rise faster than ecosystems can build elevation through biological processes that accrete organic matter and inorganic sediment; these inorganic sediments can be either generated in situ (e.g., calcium carbonates) or be of allogenic origin. Benthic microbial communities (periphyton) contribute to organic and inorganic sediment production, possibly contributing to elevation gains through mineral accretion. While coastal gradients are known to shape periphyton composition and production, rates of mineral production by periphyton have not been assessed despite their potential role in driving mineral accretion. It is also unclear whether periphyton diatom composition is related to accretion - if so, it offers a possible tool for palaeoecological investigations of past mineral accretion. This study examines the drivers of coastal periphyton mineral production and whether periphytic diatoms may be used to characterize gradients in these drivers. Periphyton mineral production rates and diatom assemblage composition were measured along three coastal gradients of surface water salinity, conductivity, pH, and periphyton nutrient content in the Biscayne Bay Coastal Wetlands of South Florida. Periphyton mineral production rates ranged from 0.20-0.53 g/m2/d and were greatest at sites with the lowest salinity and phosphorus content. Diatom assemblages that sorted consistently along the coastal gradient of phosphorus and salinity were reliable indicators of periphyton mineral production, with seven taxa indicating higher rates and seven indicating low rates. Diatoms can provide a helpful link between biotic and abiotic processes, indicating where periphyton-driven mineral production contributes most to inorganic carbon cycling and where periphyton contributes the most to mineral-driven elevation recovery and, hence, to resiliency to sea level rise.

PRELIMINARY FINDINGS FROM THE DELAWARE RIVER WATERSHED INITIATIVE

Hurley, Mariena, The Academy of Natural Sciences of Drexel University

The Delaware River Watershed Initiative (DRWI) was a 10-year collaboration (2013-2023) working across the Delaware River Basin to reduce pollution, protect headwaters, and promote water-smart practices and policies. This collaboration included more than 50 organizations across New Jersey, Pennsylvania, Delaware, and New York whose purpose was to protect the rivers and streams that provide drinking water for more than 15 million people across 4 states. Work was concentrated within eight priority areas, or clusters within the basin, where organizations collected chemical, physical, and biotic data yearly at over 300 sites. Monitoring was designed to characterize the cluster geographies and assess impacts of on-the-ground conservation actions, such as BMP implementation. Periphyton collection was part of the yearly monitoring, with up to 40 samples collected each year. From each sample, the diatom and macroalgae (when

available) communities were analyzed. A basin-specific diatom MMI was created to help monitor and track changes across the basin. Comparisons across sites with varying land cover, chemical, and physical properties will be analyzed and shared with partner organizations and the funder with the intention of informing future conservation work in the Delaware River Basin and other watersheds.

THE EFFECTS OF NITROGEN:PHOSPHORUS RATIOS ON PHYTOPLANKTON AND BENTHIC ALGAL COMMUNITIES IN LAKE OKEECHOBEE

Innocent, Hanna, Gaiser, Evelyn E., Florida International University

Harmful algae blooms (HABs) affect lakes worldwide and nitrogen (N) and phosphorus (P) are well-known drivers of these blooms. However, it is less understood how variations of N and P around the Redfield ratio affect HAB formations, specifically blooms that begin in the benthos. Benthic algal assemblages form the inoculum of most phytoplankton blooms and compete for nutrients and light with phytoplankton. It is, therefore, important to quantify variability in the planktonic and benthic N:P ratios in lakes where the ratio is close to the optimal Redfield ratio. Lake Okeechobee, the largest lake in the southeastern United States, is a shallow lake in Florida that experiences HABs due to eutrophication, wind disturbance, and high-water levels due to flood control and water storage techniques. This has reduced benthic habitat availability and increased open-water phytoplankton habitat, altering the algal composition. Benthic algal productivity and phytoplankton biomass were studied in the lake across 3 habitats (canal, pelagic, littoral) that differed in N:P ratios. Planktonic and benthic diatom taxa abundance and richness were also measured across habitats. Results show a strong water and benthic N:P gradient within and among the three sites, with the canal and pelagic sites varying close to the Redfield ratio. Phytoplankton biomass in the canal increased as N:P increased, suggesting N-limitation. In the littoral and pelagic sites, phytoplankton biomass decreased with increasing N:P, suggesting P-limitation. Periphyton productivity showed no significance between sites, but overall, there was a significant inverse relationship where periphyton productivity decreased as benthic N:P increased, suggesting P-limitation. Results also show a distinct separation of diatom species by site and substrate type. These data indicate that habitats in Lake Okeechobee differ in water TN and TP concentrations and regulate phytoplankton biomass differently. Studying how nutrient ratios in the benthic assemblage itself regulates benthic algal production is the next step to understanding how variations in the N:P ratios in phytoplankton and benthic assemblages impact developing HABs. This research will aid in future eutrophication management of large, shallow lakes by understanding how the variability of N:P ratios influence both benthic algal and phytoplankton assemblages.

UPDATES TO 2023 VOUCHER FLORA FOR A SOUTH CAROLINA STREAM WITH A RICH HISTORY OF DIATOM RESEARCH

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Kalina Manoylov, Georgia College & State University

In 2023 we published a study comparing collection methods using diatometer and composite sampling methods in a South Carolina stream, protected for more than 60 years. We found that sampling methods yielded high biodiversity and evenness indices, but composite and diatometer assemblages in 2018 shared less than 36% of species. Therefore, we recommend using both composite and diatometer methods when assessing stream diatom biodiversity. We also compared past and present composite data using 1956 archived slides collected by Dr. Charles Reimer for Academy of Natural Sciences reports for the same stream (Upper Three Runs Creek). We found that dominant diatom species in our study indicate an acidic and nutrient rich environment, which is consistent with what was documented by the 1950s ANSP reports. In our 2023 publication's supplementary materials we provide a voucher flora with over 200 micrographs for the operational taxonomic units (OTUs) encountered. Also included in the supplementary materials are charts of dominant taxa and a species complex with corresponding literature providing autecology information. A new taxon, *Gomphonema marriae* K.M.Johnson, Manoylov & Edlund, sp. nov. was documented during this study. Here, we share future revisions and updates to our 2023 publication.

STEM OUTREACH, PREACHING THE GOOD DIATOM WORD

Kireta, Amy, University of Minnesota Duluth

Effective youth STEM engagement is critical in recruiting the next generation of diverse STEM professionals. Further, building trust between STEM experts and the community supports and promotes more informed and engaged citizens. We will explore a selection of best practices of community engagement, including diversity, equity, inclusion, and STEM Justice. We will highlight examples from youth programming, including the Teen Science Cafe, monthly workshops and socializing programmed by and for high school students. There will be time to share best practices and examples of stellar community engagement from the group.

HYDROLOGIC DRIVERS OF MACROPHYTE AND MICROBIAL MAT BIOMASS COVARIATION IN WETLANDS: AN OBSERVATIONAL AND EXPERIIMENTAL TEST OF THE STRESS GRADIENT HYPOTHESIs

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In wetland ecosystems, resource gradients, particularly hydrology, can substantially alter the community structure and biomass of macrophytes and microbial mats. Habitats that experience prolonged desiccation (i.e., short hydroperiods) are considered resource-stressed and may cause macrophytes and mats to compete for limiting resources. The stress gradient hypothesis predicts that abiotic stress should result in greater facilitative co-regulation of producer dynamics. To determine if macrophyte and microbial biomass covary along hydrologic gradients within short-hydroperiod wetlands and to determine the types of interactions that occur, we conducted two observational surveys and an experiment in Everglades National Park, FL, USA. Macrophyte and microbial biomass were measured at 139 census sites in 2003 and along six transects in 2004 representing a gradient of short-hydroperiod wetlands. Each census and transect site was characterized into one of eight hydrologically-regulated macrophyte community types. Environmental drivers of macrophyte and mat biomass and their interactions were evaluated using structural equation models. The experiment consisted of biomass removal of macrophytes or microbial mats in three wetlands with contrasting hydroperiods for one year and interactions were assessed using two-way analysis of variance. In the surveys, hydrology and biological interactions influenced macrophyte and microbial biomass,

with stronger macrophyte-mat interactions observed in the shortest-hydroperiod transect sites dominated by Schoenus and Cladium wet prairies. We found direct negative effects of macrophyte biomass on microbial biomass and vice versa, and a significant positive effect of microbial response to hydrology on macrophyte biomass. Experimental macrophyte removal resulted in an increase in microbial biomass while mat removal reduced biomass of the dominant macrophyte Cladium jamaicense. The facilitative effect of mats on macrophyte biomass in desiccation-prone wetlands may be driven by soil moisture retention conferred by the desiccation-resistant microbial mat. Stress-induced facilitation supported the stress gradient hypothesis and as resource stress was alleviated, competitive interactions were observed. As freshwater flows lengthen Everglades hydroperiods, interactions may shift from facilitative to competitive, altering producer distributions on the landscape. Future work entails examining the ultrastructure of diatoms and cyanobacteria within the microbial mat to determine how macrophytes and the benthos function differently as mat substrates and influence microbial response to phosphorus enrichment.

WHY HAS THE NORTH SHORE OF LAKE SUPERIOR BECOME A HOTSPOT FOR THE NUISANCE ALGA *DIDYMOSPHENIA GEMINATA*?

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The nuisance benthic diatom *Didymosphenia geminata* can grow in thick, mucilaginous mats that exclude the growth of other algae and change the microhabitat. Although D. geminata was historically reported in Lake Superior since the 1960s, a nuisance bloom of *D. geminata* was observed in 2018 in a tributary, the Poplar River. Since then, the establishment and expansion of this nuisance alga have raised concerns from the public and natural resource managers. Here, we present data collected during a monthly survey of periphyton and water chemistry on five streams on the North Shore and nearby Lake Superior during the ice-free period (May to Oct) from 2021 to 2023 as well as 26 lake-stream pairs sampled once during each summer. Our goals were to characterize the timing and spatial extent and identify the drivers of *D. geminata* blooms. We showed that *D. geminata* was present in eight streams and many lakeshore sites, with higher density observed in streams compared to shore sites. The months with the highest didymo densities were from August to October. Among the streams, Devil Track had the highest density throughout the years. The multiple linear regression analysis revealed that changes in dissolved inorganic carbon and chlorophyll-a accounted for 22% of the variation in *D. geminata* density across our stream sites. Our findings provide crucial information for developing effective management strategies to mitigate the spread of this nuisance alga and minimize its impacts on freshwater ecosystems along the North Shore of Lake Superior.

ADVENTURE IN ALGAE THANKS TO REX

LaLiberte, Gina – Wisconsin Department of Natural Resources

Rex Lowe changed my life! I thought that fish were the coolest organisms ever, and then I took Rex's Phycology field course at the University of Michigan Biological Station and fell in love with algae. My work with Rex led to a job with the Wisconsin Department of Natural Resources that encompasses many aspects of algae and cyanobacteria. I will discuss some of my WDNR projects over the years, from diatom paleolimnology and stream bioassessment to my current work with cyanobacteria. Thank you, Rex, for being a fantastic ambassador for algae!

HOCHUNK BOILING SPRINGS AND STAR WARS

Lowe, Rex, University of Wisconsin, Center for Limnology and Bowling Green State University

The boiling springs of Pheasant Branch Conservancy in Madison Wisconsin had sustained the Hochunk Indian nation for hundreds of years. The springs also support a diatom flora that is rich in numbers, but poor in species representation. In this report, I will discuss the importance of this ecosystem, both two native Americans, and of course to diatoms dominated by morphologically diverse *Meridion circulare*. What does this have to do with Star Wars? Stay tuned.

IOWA DIATOM HERBARIA ENTER THE DIGITAL AGE

Main, Stephen, Wartburg College Emeritus

Research collections of diatoms at Iowa Lakeside Laboratory and Iowa State University are being listed in digital format available to interested water quality and taxonomic scientists. The contents of these collections and related information is described. Avenues for access will be discussed. And the guidance of Charlie Reimer will be invoked.

ECOSYSTEM CONSEQUENCES OF A NITROGEN FIXING PROTO-ORGANELLE

Marks, Jane, Northern Arizona University

Microscale symbioses can be critical to ecosystem functions, but the nutrient dynamics of these interactions in nature are often cryptic. We used stable isotopic tracers and nanoSIMS imaging to quantify the phenology of nitrogen (N) and carbon (C) dynamics of a three-member symbiosis that supports a salmon-bearing river food web within a naturally assembled epiphytic microbiome over its summertime succession. After winters with riverbed-scouring floods, the macroalga *Cladophora glomerata* uses nutrients in spring runoff to grow streamers >10 meters long. During summer flow recession, N inputs wane and *Cladophora* becomes densely epiphytized by three species of *Epithemia*, diatoms with N-fixing endosymbionts descended from a free-living cyanobacterium. During epiphyte succession on *Cladophora*, N fixation rates increased as *Epithemia* spp. became dominant, and total C fixation rates of assemblages declined. At the microscale, *Cladophora* C-fixation declined to near zero, while *Epithemia* C-fixation increased. The shift in C-fixation from *Cladophora* to *Epithemia* results in a tenfold increase in C transfer to grazing caddisflies. In response to demand for N, the diatom allocates high levels of newly fixed C to the endosymbiont. Consequently, these proto-organelles have the highest rate of C and N accumulation in this tripartite symbiosis during the biologically productive season, and one of the highest rates of N fixation reported for any river ecosystem.

FIRST DOCUMENTATION OF AN EXOTIC FRESHWATER DIATOM *(DISCOSTELLA ASTEROCOSTATA*) IN INLAND LAKES OF OHIO

McLellan, Oliver *, The Ohio State University
Mark B. Edlund, Science Museum of Minnesota
David R.L. Burge, Science Museum of Minnesota; University of Minnesota Duluth, Natural Resources Research Institute
Trinity S.N. Shirk, The Ohio State University

Jill S. Leonard-Pingel, The Ohio State University at Newark

An analysis of surface sediment samples from eleven inland lakes in Ohio revealed the presence of an exotic diatom species, *Discostella asterocostata* (Lin, S.Q.Xie and Cai) Houk and Klee 2004, in seven lakes. While the presence of *D. asterocostata* has been documented in the waterways of states surrounding Ohio, this is the first documentation of the species in the lakes of Ohio. Previous research suggests a link between the presence of *D. asterocostata* in North America and the spread of the invasive bighead carp (*Hypophthalmichthys nobilis*) and silver carp (*H. molitrix*) throughout the Mississippi Watershed. These fish have been reported in the Ohio River Watershed, part of the eastern Mississippi Watershed, which contains all seven Ohio lakes in which *D. asterocostata* has been found. The remaining four lakes are located in the Lake Erie Watershed, where the lack of *D. asterocostata* is possibly due to efforts to prevent the spread of invasive carp from the Ohio River into neighboring watersheds. Retrieval and analysis of a sediment core from the Ohio lake with the highest relative abundance of *D. asterocostata*, Hargus Lake, may shed some light on the arrival time of *D. asterocostata* in Ohio waterways. In addition to documenting the spread of *D. asterocostata* throughout the Ohio River Watershed, this research highlights the efficacy of surface sediment analysis as a cost-effective way to document the spread of exotic micro-organisms such as diatoms, potentially presaging the spread of other exotic and invasive species.

BENTHIC ALGAL COMMUNITIES IN THE NEARSHORE OF LAKE TAHOE (USA) ASSESSED BY COMPLEMENTARY TOOLS OF MICROSCOPY AND ENVIRONMENTAL DNA

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Theroux, Susanna, Southern California Coastal Water Research Project
Chandra, Sudeep, University of Nevada Reno

We characterize the community structure and composition of algal mats in the nearshore-littoral-bottom habitat of Lake Tahoe from a 0 to 50m depth, and compare the results of microscopy and environmental DNA as tools for algal identification. Lake Tahoe is a high transparency, deep oligotrophic lake where concerns of clarity loss and the degradation of water quality including benthic algal growth have driven decades of monitoring and management by the agencies. Whole algal community identifications and enumerations were performed using the Palmer-Maloney method on Lugols-preserved material, and from cleaned diatom strewn slides in Zrax mountant. DNA metabarcoding was performed on epilithic and epipsammic periphyton scrapes targeting the bacteria, eukaryote, and diatom communities using 16S, 18S, and rbcL primer sets, respectively. Diatoms comprise the majority of the live algal community, followed by filamentous and coccoid forms of cyanobacteria, and lesser amounts of green algae. These general results are seen in both Palmer-Maloney and DNA data. A more detailed view of the diatom community shows the eublittoral zone is dominated by a fragilarioid-gomphonemoid-cymbelloid assemblage with strong seasonality. September samples showed a larger portion of short colonial fragilarioids. Benthic mats below 2 m are strongly dominated by an *Epithemia*-cyannobacteria assemblage, with *Cocconeis, Sellaphora*, and *Halamphora* increasing in abundance with depth. *Epithemia* was found living to 50m depth, with over half of the observed valves live. A comparison of diatoms from rbcL and microscopy shows that while the total species richness is comparable, only 41 species were shared between both DNA and microscopy datasets, roughly 25% of the species. At the genus level, the harmonization between eDNA and microscopy improves to 80% for absence/presence, but there is a poor match between abundance counts of amplicon sequence variants (ASVs) versus valves in strewn slides. Future aspirations include improving DNA reference library coverage for species-level diatom work, especially for targeted species of interest in the nearshore.

THE EEFFECT OF *DIDYMOSPHENIA GEMINATA* BLOOMS ON THE BACTERIAL COMMUNITIES ASSOCIATED WITH LAKE SUPERIOR AND ASSOCIATED NORTH SHORE STREAMS

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Sabrina Mueller-Spitz, Mark Edlund, Heidi Rantala, David Burge, Jordan Campell

The diatom *Didymosphenia geminata* (Lyngb.) has recently exhibited nuisance blooms along the north shore of Lake Superior, the largest lake in North America. We examined the relationship between these outbreaks and their associated bacterial communities to attempt to gain insights into why these blooms are occurring and how this diatom is changing its environment. In 2021 and 2022, we collected periphyton from 20+ tributaries and paired lakeshore sites along the North Shore of Lake Superior from Duluth, Minnesota, to the Canadian border. We also sampled 5 transects within Lake Superior along a depth gradient ranging from 0.5-16 m *Didymosphenia* densities were determined by microscopy. Microbial communities were characterized by targeted amplicon sequencing of 16S rRNA. We detected *Didymosphenia* populations in seven streams and several nearshore sites during this study. Preliminary analysis shows that unique bacterial assemblages exist between the lake and stream habitats with lake samples showing much more variability compared to stream samples. Focusing on just cyanobacterial taxa yielded similar results. Also, both lake and river sites appear to have similar bacterial composition when *Didymosphenia* is present and is caused by the loss of biodiveristy.

ADVANCING ACCESS TO THE DIATOM SLIDE COLLECTION AT THE ACADEMY OF NATURAL SCIENCES OF DREXEL UNIVERSITY BY WHOLE-SLIDE IMAGING AND VIRTUAL MICROSCOPY

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Zarella, Mark, Mayo Clinic

The goal of this project funded by the National Science Foundation is to develop a novel research tool for diatomists and to facilitate access to the holdings of the Diatom Herbarium at the Academy of Natural Sciences. By leveraging modern slide-scanning technology, we produce high-quality images of diatom slides that can be viewed and studied online through a 'virtual microscopy' application built on the OMERO image viewing platform. This tool allows users to zoom in, pan across slide images, focus through different focal planes, and capture images at various magnifications. We have already scanned approximately 3,000 slides, including key diatom surveys from rivers and lakes in the eastern United States (such as EPA EMAP 1991-1994, USGS NAWQA 1993-2000, NRSA-2007, collections of the New Jersey Department of Environmental Protection 2006-2014) and historical collections from Alaska (1950-60s). This approach to digitization of diatom slides not only facilitates data sharing and collaboration but also democratizes research by providing open access to these collections, eliminating the need for physical travel, shipping, and microscopy. Additionally, it opens new possibilities for the development of image analysis

tools and enhances public education about microbial diversity and the vital role microorganisms play in the biosphere.

CLIMATE CHANGE, INVASIVE SPECIES, AND NUTRIENT POLLUTION ARE TO BLAME FOR CHANGING DIATOMS IN THE WORLD'S LARGEST FRESHWATER LAKE SYSTEM

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As a significant freshwater resource, reorganization of the base of the Laurentian Great Lakes food web is a concern for management. Phytoplankton data, particularly diatoms, provide an early warning tool to uncover impacts because they are sensitive to environmental changes and have a high turnover rate. Monitoring of phytoplankton reveals changes in all lakes in both pelagic and nearshore environments, and on short (decadal) and long (centennial) timescales. After accumulating two decades of phytoplankton monitoring data, several patterns emerge. Changes in phytoplankton communities are attributed to eutrophication (excess nutrient inputs and larger precipitation events) and oligotrophication (owing to invasive, filter-feeding mussels). Diatoms are declining, flagellated algae are increasing in relative abundance, and the abundance of cyanophytes is increasing. Atmospheric warming, which is changing lake physical characteristics such as stratification, also appears to be a driver of phytoplankton community reorganization. Also, there are definable cliques of taxa that likely reflect alliances or antagonistic relationships and may be further driven by bottom-up processes that define seasonal phytoplankton community structure. The implications of climate, nutrients and invasive species drivers on changes in these primary producers will be discussed.

GENOME-SCALE RESOLUTION OF CRYPTIC SPECIATION IN A COSMOPOLITAN MARINE DIATOM

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We can now generate high-throughput omics data from single cells up to entire communities. Nevertheless, the widespread use of genomics for species identification in algae has been limited. Diatoms are particularly species rich and understudied from a genomics perspective yet play key roles in primary production and biogeochemical cycling. Diatom species are traditionally diagnosed and classified based on morphological features of the silica cell wall, where names are assigned to more-or-less morphologically similar phenotypes. However, many species are morphologically similar or too small for accurate identification. Genetic variation can then be a powerful tool to document population differentiation and identify cryptic species. We characterized genetic variation within the cosmopolitan diatom *Thalassiosira profunda* using a genome skimming approach. This small species has a valve diameter of 2-5 Âµm, making it difficult to identify using microscopy. We generated a chromosome-level reference genome and genome skimming data for 8 additional strains identified as *T. profunda* that were collected from geographically distant regions. We found evidence for at least 5 distinct species masquerading as *T. profunda*. While the 18S rDNA gene is a commonly used barcode marker for high-throughput species identification, 18S was nearly identical and largely uninformative across *T. profunda*. Our results demonstrate the use of genome skimming and provide evidence that cryptic diatom species are more widespread than morphology alone would suggest.

FACTORS INFLUENCING THE OCCURRENCE OF *AULACOSEIRA* SPECIES IN SUBTROPICAL POLYMICTIC LAKES OF FLORIDA

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The state of Florida has nearly 8,000 naturally occurring lakes with diverse pH, nutrient loads, and color. Strong wind stress and shallow lake basins cause many of these freshwater systems to be polymictic. We studied the diatom flora in surface sediments of 181 lakes. Although often characterized as eutrophic, cool-water planktonic species, members of the *Aulacoseira* genus were found inhabiting various trophic conditions in these warm, shallow lakes. We observed *Aulacoseira ambigua* in 128 lakes with an N2 value of 95. *Aulacoseira granulata* and *A. granulata* var. *angustissima* were found in eutrophic lakes with circumneutral to alkaline waters with slight to moderate color. In contrast, *A. herzogii, A. muzzanensis*, and *A. tenella* were observed primarily in mesotrophic to eutrophic systems that were acidic to circumneutral with moderate to high color. Our study also showed several taxa that might be unexpected in shallow, warm-temperate lakes. *A. subarctica* occurred in highly eutrophic, alkaline conditions. *A. pusilla, A. alpigena*, and *A. cf. lacustris f. tenuior* were observed in a very wide range of trophic-state and pH conditions. *A. coroniformis*, previously described only from a peat sequence in Florida, was observed in three lakes with diverse water quality. *A. pseudoamericana* was observed in two acidic lakes. *A. distans*, which DONA describes as "probably an extinct species", was found in the flora of 37 lakes.

DIVERSITY OF FRESHWATER ALGAL ASSEMBLAGES ACROSS THE UNITED STATES AS REVEALED BY EDNA METABARCODING

Schulte, Nicholas O.*, Craine, Joseph M., Leopold, Devin R., Devitt, Jessica, Fierer, Noah, Jonah Ventures

Algal bioassessments have historically relied upon microscopy-based identifications that can be slow, expensive, taxonomically restricted, and/or inconsistent across analysts and time. Metabarcoding of water column DNA (environmental DNA, or eDNA) can characterize assemblages more quickly, at lower cost, and with higher taxonomic precision than microscopy. As such, eDNA metabarcoding has the potential to improve bioassessments, but relationships between environmental conditions and eDNA-derived algal assemblage composition need to be determined first. We performed metabarcoding of a plastid 23S rRNA gene region for 1230 freshwater eDNA samples collected from 51 lakes and 617 streams across the conterminous United States to test for assemblage-wide patterns that may indicate ecological condition. Samples were collected by citizen, academic, and research scientists using a standardized commercial kit. This effort constitutes the largest published water column eDNA survey yet of algal diversity across freshwaters in the United States. We detected 14,943 algal exact sequence variants (ESVs) from 11 divisions. The richness and abundance of cyanobacteria was higher in lakes, while streams were dominated by diatoms. Nationwide, only 1% of variation in stream assemblages was explained by catchment integrity. The remaining, explicable 19% was associated with forest cover, stream order, elevation, and broad-scale spatial variables. Nevertheless, select ESVs were candidate indicators of gradients in stream catchment integrity and possible eutrophication. Together, we show that algal eDNA metabarcoding has potential for measuring ecological condition relative to water quality. Yet, further sampling along anthropogenic gradients is needed before algal eDNA can be used for large-scale biomonitoring

in the United States. We also found that only 2% of algal ESVs could be assigned to U.S. morphospecies, highlighting the importance of building a more comprehensive reference sequence database to integrate existing morphospecies autecology with eDNA-based bioassessments.

STAURONEIS MARGINISTRIATA SP.NOV., A NEW DIATOM SPECIES FROM GROUND WATER SEEPS AT STEBBINS GULCH NATURAL AREA, OHIO USA

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As one of the most diverse groups of algae, diatoms seemingly speciate with every niche opportunity. When managed or preserved for natural conditions, aerophilic habitats such as wet walls, seeps, and springs provide unique niche space for diatom diversification. With over 300 species, the genus *Stauroneis* occupies a wide variety of niches on every continent. Here we document the ecology and describe a new species of *Stauroneis* occurring within an iron-rich wet wall seep located at Stebbins Gulch on the Holden Arboretum in Ohio, USA. Distinguished by valve shape and shortened striae at the margin of the stauros, the discovery of this new species highlights the importance of preserved natural areas to the maintenance of global biodiversity.

DIATOMS OF THE DEEP

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Although our understanding of the presence and evolution of diatoms over geologic, or deep, time has improved in recent decades, much mystery remains due, in part, to barriers involved with working with fossils. Locating appropriate fossil sites with good preservation and age constraints, collecting the rock material, and extracting specimens from the rocks are a few of the barriers involved with examination of fossil diatoms. Selected freshwater diatoms uncovered in seven very different localities and time periods spanning a 60 million-year period from 82 Ma to 12 Ma will be presented. This span of geologic time begins in the late Cretaceous under a Greenhouse Earth and slowly transitions to near the beginning of the Icehouse Earth that we experience today. Species within or related to the genera *Aulacoseira, Eoseira, Adlafia, Eunotia, Pinnularia, Cocconeis, Humidophila, Ulnaria, Ambistria* and *Fideliacyclus* will be discussed. Some of the study sites are among the oldest localities known to harbor freshwater diatoms, and special attention will be given to early raphe-bearing taxa. Some of the collections represent specific time periods and waterbodies, while others span tens of thousands of years and evolving environments. One site, the Wombat locality near the Arctic Circle in Canada, covers a time period during which the waterbody transitioned from marine to freshwater. Another, the Giraffe Pipe, represents a site with arguably the best-preserved collection of eukaryotic protists worldwide. Still, another is of a marine site where glacial drop material originating from freshwater sites was dropped and buried in the ocean during the Cretaceous. Specific and rather rare features found on species of *Aulacoseira, Ambistria* and *Fideliacyclus* will be highlighted, and when available, inferred environmental conditions presented.

DIATOM COMMUNITY DYNAMICS PRIOR TO THE INITIATION OF A CYANOBACTERIAL BLOOM IN THE WESTERN BASIN OF LAKE ERIE

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Zepernick, Brittany N., University of Tennessee Knoxville & University of North Carolina at Chapel
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Great Lakes Environmental Research Laboratory

The western basin of Lake Erie is the most productive region of the most eutrophic lake in the Laurentian Great Lakes system. Every year diatom dominated algal flora succumbs to a cyanobacterial harmful algal bloom (HAB) in late summer. Here, we track high-resolution algal dynamics by assessing chlorophyll concentrations of major algal groups using a BBE PhycoLabAnalyser and diatom counts from tow net samples to better understand the transition from a diatom dominated algal bloom to a cyanobacteria dominated HAB. Sampling was carried out multiple times a day (~ every 5 hours) from 14 July 2023 to 20 July 2023. During the study, there were fluctuations in total chlorophyll from <10 to >30 ppb with alternating dominance of diatoms and cyanobacteria throughout the study period. We found relatively abundant and stable concentrations of *Aulacoseira granulata* throughout the study period, while there was decreasing concentrations of *Aulacoseira islandica* and increasing concentrations of *Stephanodiscus binderanus* coincident with increasing dissolved silica as time progressed. Dominant diatoms during periods of increased cyanobacteria were *Aulacoseria granulata*, *Fragilaria crotonensis*, and *Asterionella formosa*. Throughout the study period, dominance of diatoms and cyanobacteria oscillated while most nutrients steadily decreased, and temperature increased. Our results suggest competition and resource partitioning is shaping community dynamics and dominance patterns just prior to HAB initiation. Future work includes metatranscriptomics and algal pigment analysis from co-collected samples that will allow for probing the functional traits of major algal groups during this period. Collectively, this broad suite of high-resolution data collected continually over multiple days will allow for an unprecedented understanding of how cyanobacterial HABs establish dominance in a dynamic and competitive ecosystem.

CLARIFICATION OF THE ECOLOGICALLY IMPORTANT SPECIES, *COSCINODISCUS OCULUS-IRIDIS* EHRENB.

Spaulding, S.A., Nesterovich, A. and Jennings, A.

In high arctic marine waters, *Coscinodiscus* species are often low in relative abundance and in many planktonic collections, members of the genus are not even reported. Yet, recent studies show that periods of time with high concentrations of biogenic silica in marine sediments may be attributed to arctic surface water with enhanced concentrations of Si and P (Jones et al. 2003, Kelleher et al. 2020). In fact, such high periods of primary production result in significant concentrations of *C. oculus-iridis* being deposited in marine sediments. However, the taxon has been characterized as being present in a variety of ecological conditions (cold water, high April sea ice, or no sea ice; Oksman et al. 2019, Luostarinen et al. 2020). Such disparate conditions lead us to question the identity of this taxon and if more than one species of *Coscinodiscus* is present. To further the modern and paleo-reconstruction of arctic conditions, we examine the original Ehrenberg material of *C. oculus-iridis* along with the *Coscinodiscus* from high arctic marine sediments and clarify the identity and morphological features of the specimens..
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SURVIVAL STRATEGIES OF DIATOMS IN NON-PERENNIAL STREAMS IN SOUTHERN CALIFORNIA,

Stancheva Rosalina*, George Mason University

Non-perennial streams in southern California's arid Mediterranean climate experience rapid water availability changes between wet and dry phases. Diatoms inhabiting this challenging environment have morphological, physiological, and life history traits that provide resistance to dry phases and resilience following wetting. Resistant taxa usually take refuge in isolated pools, under plant matter, or in moist sediment. In studied streams, *Nitzschia* cf. *palea* and *Fistulifera saprophila* were recorded in abundance within the extracellular polysaccharide mucilage of red, green, and golden macroalgae and cyanobacteria, such as *Draparnaldia, Chaetophora, Sirodotia*, *Tetrasporopsis* and *Nostoc*. This endogloeic microhabitat retains water and nutrients for an extended period and serves as a refuge for diatom cells during the drying of the streams. Other diatoms have desiccation-tolerant, dormant life stages (cells or spores) that promote survival during a dry phase. The species diversity of diatoms able to produce resting spores in streams is little known because many of them are omitted in the diatom counts due to their large cells. The access to qualitative macroalgal fresh samples from non-perennial streams in southern California allowed us to document the formation of internal resting spores with double silica walls and accumulation of storage products in the following species: *Achnathes coarctata, Aulacoseira italica, Eunotia* cf. *bilunaris, Eunotia pectinalis, Eunotia quaternaria, Halamphora veneta, Meridion circulare, Meridion constrictum, Hantzschia amphioxis, H. calcifuga, Fragilariforma nitzschioides,* and *Fragilariforma virescens*. Diatom sensitivity and tolerance to desiccation stress are understudied which limits the predictions for their distribution and survival in changing climate conditions.

TIPTOEING ACROSS THE RUBICON: THE ROLE OF ELEVATED CONDUCTIVITY INLAND WATERS IN DIATOM ECOLOGICAL EVOLUTION

Stepanek, Joshua G., Colorado Mountain College Vail Valley

In terms of total volume, elevated conductivity inland waters are nearly equal to that of freshwaters worldwide. While large saline lakes often dominate in terms of area, smaller, frequently groundwater-fed systems are commonly found throughout North America. Although these diverse systems have been the subject of taxonomic and ecological studies, the species present have seldom been evaluated in the larger context of diatom ecological evolution and the transitions between marine and inland waters. In this context, unresolved questions include whether these floras represent marine taxa that have gained a foothold in inland waters, freshwater/euryhaline taxa that have adapted to elevated conductivity environments, or a flora unique from both marine and freshwater lineages. Additionally, brackish water habitats have recently been proposed as ecological “stepping stones” for lineages moving from marine to fresh waters. To explore the role elevated conductivity waters may play in the ecological evolution of diatom lineages, I present an updated molecular phylogeny for the genus *Halamphora*, including representatives from coastal marine, freshwater, and elevated conductivity inland waters, and use overlaid ecological data to test these hypotheses.

ENCYONEMA LARVATUM SP. NOV.: A NEW DIATOM SPECIES IDENTIFIED FROM THE MID-PLEISTOCENE OF LAKE MALAWI, EASTERN AFRICA

Streib, Laura*, Syracuse University
Stone, Jeffery, Indiana State University
Parikh, Hirak, Indiana State University
Scholz, Christopher, Syracuse University

We documented the siliceous microfossil assemblages in relation to Deccan Trap pulses 100 meters below the meteorite impact event. Additionally, there is a change in preservation just 5 meters below the KPg and throughout the Lopez de Bertodano Formation Unit 10. In this interval with enhanced preservation, there is an exceptionally well-preserved sample 15m above the KPg (~50,000 years post-impact) preserved with ash, which was recently described. Vegetative cells dominate this assemblage and highlight the potential influence of increased nutrients from volcanism post-KPg. Diatom communities seem to respond to potential Deccan intervals, which likely provided a source of nutrients to enhance diatom productivity. Future taxonomic and cell volume studies are planned to differentiate the relative influence of Deccan volcanism and the impact event on marine siliceous microfossils in the Polar Regions.

TWO DIATOM HERBARIA IN IOWA UNDER THE OVERSIGHT OF THE IOWA BOARD OF REGENTS

Wee, James L.*, Department of Biological Sciences, Loyola University New Orleans

In recent years various universities prioritizing graduate programs and faculty research have closed their herbaria and sent their plant collections elsewhere, often to land-grant institutions (personal communication, Langellier 2024). In Louisiana where I reside, Tulane University sent its herbarium collections to Louisiana State University in 2016, and more recently Duke University closed its herbarium. Two of the three state universities in Iowa, the University of Iowa and University of Northern Iowa, recently sent their plant collections to Iowa State University’s Ada Hayden Herbarium. This national trend is alarming by itself and parallels the public’s general lack of scientific literacy and understanding of science as a process exposed during the recent Covid pandemic. The high esteem held by Iowa and Iowans for Iowa Lakeside Laboratory as an institution of higher learning is supported by the fact that ILL is the only institution listed along with Iowa’s three state universities under the oversight of the Iowa Board of Regents (https://www.iowaregents.edu/). Over the sixty-three years the Ecology and Systematics of Diatoms course has been taught at ILL it has become the field station’s flagship course and known among diatomists internationally. The course’s herbarium is a pillar of its academic structure and using it is an important student experience. In contrast, the noteworthy diatom holdings deposited in the Ada Hayden Herbarium at ISU are very poorly known. This presentation seeks to initiate and inform a discussion about these two sister herbaria to facilitate their use and solidly their vitality as scientific resources.

Langellier, R. L. 2024. Guest Essay, To Save Life on Earth, Bring Back Taxonomy. The New York Times, July 7, 2024, 6:00 a.m. ET.

https://www.nytimes.com/2024/07/07/opinion/to-save-life-on-earth-bring-back-taxonomy.html

27 YEARS OF DIATOM(IST) ASSEMBLAGES 1970 – 2024

Wolin, Julie A., Cleveland State University, Cleveland, OH
Mark B. Edlund, St. Croix Watershed Research Station, Science Museum of Minnesota, Marine on St. Croix, MN

The 2024 Iowa Lakeside meeting of The North American Diatom Symposium represents the twenty-seventh time that diatomists have formally gathered for NADS and the fourth time the group has met at Iowa Lakeside Lab (1978, 1995, 2009, 2024). The first meeting, called "*Ecology of Freshwater Diatoms*," was held in October 1970 at the Cedar Creek Natural History Area in Minnesota and organized by J. Platt Bradbury and Ryan Drum. Four years later, the group gathered at Hocking Hills in Ohio for the "*Second North American Symposium on Diatom Systematics and Ecology*", a meeting that set the stage for the now biennial gathering of this informal society. In 1978 (Iowa Lakeside Lab) and 1979 (University of Michigan Biological Station) the meeting was held in adjacent years to reset the timing of the meeting to occur in alternate years from the International Diatom Symposium. Over the last 50-plus years NADS has been held in 16 states and once in Canada (1993, Delta Marsh). Here's a brief history of NADS documenting the first twenty-six meetings with highlights from their programs, photos, and attendees.

Poster Abstracts

USING SPECIES-LEVEL IDENTIFICATION OF DIATOMS TO ASSESS HYDROLOGICALLY VARIABLE AQUIFERS

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Manolov, Kalina, Department of Biological and Environmental Sciences, Georgia College & State University, Milledgeville, GA, USA

Species-level identifications are routine and necessary for accuracy in diatom analyses. Modifications of spring-fed wetlands within a nature preserve were associated with manmade fish hatchery ponds at Bo Ginn National Fish Hatchery in Millen, Georgia. Ponds were modified based on inundation period with five temporarily inundated and three permanently inundated. The goals of this research were 1. to identify diatoms to the lowest taxonomic level, 2. to compare algal community metrics between permanent and temporary wetlands from top and bottom sediment cores, and 3. to assess value of taxonomic precision in water quality. Legacy physicochemical conditions were analyzed in all eight ponds in Spring 2020. A benthic core sampler was used to collect sediment samples. The top and bottom of each core sample were enumerated following standard protocols for diatom analyses. Bottom of sediment core in temporary wetlands had higher species richness (30) compared to the top (18). Temporary ponds had higher total species richness (40) compared to permanent ponds (24). Nutrients measured in the water column at the time of coring were low. Planktonic chain forming araphid diatoms dominated all communities. Shannon diversity was low and varied from 0.246 and 0.412 in temporary ponds and was driven by high abundance of *Staurosira construens* Ehrenberg. Diatom diversity decreased over time for the five temporary ponds. Evenness was also low. In permanent ponds, there was no change in the biological diversity. The cosmopolitan *S. construens*, known as acidophilous and oligosaprobic, dominated all samples regardless of flooding condition. The water source for the ponds within Magnolia Springs State Park, Georgia was sampled in May 2024. Abundance of araphid chain forming diatoms persists in the pond, but algal biomass was dominated by high nutrient representatives of Cyanobacteria, Chlorophyta and Streptophyta. Abundant nutrient tolerant diatoms from genera like *Pinnularia, Navicula*, and *Nitzschia* were also documented. This research focuses on the importance of understanding aquatic habitats with legacy anthropogenic uses and their transition to a novel state.

VOUCHER FLORA OF COAL CREEK, A SMALL, INTERMITTENT STREAM AFFFECTED BY WILDFIRE

Allen, Lane*and Diane McKnight, University of Colorado, Boulder

Coal Creek is a small intermittent stream flowing out of the Colorado Front Range. It is subject to diversions both out of and into the stream. It presents a classic example of urban stream syndrome as it passes through Superior and Louisville. Much of the watershed was impacted by the Marshall fire. Buildings and vehicles were incinerated within the urbanized portion of the watershed. In order to understand diatom response to wildfire, samples have been collected every month from four sites. The first site is upstream of the area affected by the fire. The second site is within the area affected by the wildfire, but upstream of the urbanized watershed. The third site is located within the burned, urbanized watershed, while the last site is downstream of the area affected by the fire. Prior to counting valves, a voucher flora was constructed, and over 120 taxa ranging from oligotrophs to halotrophs have been documented.

CHLOROPLAST EVOLUTION IN DIATOMS THROUGH PHYLOGENOMICS

Amaral, Mailor W.W.*, University of Colorado Boulder
Chang, Aimee C.G., University of Colorado Boulder
Greenwood, Megan, University of Colorado Boulder
Ikudaisi, Catherine, University of Colorado Boulder
Hamsher, Sarah E., Grand Valley State University, Allendale and Muskegon
Miller, Scott R., University of Montana, Missoula
Abresch, Heidi, University of Montana, Missoula
Li, Jingchun, University of Colorado Boulder
Kociolek, Patrick, University of Colorado Boulder

The origin of chloroplasts may have evolved once while the acquisition of chloroplasts is believed to have occurred independently in numerous lineages. In the case of diatoms, there is some data to suggest that they had at one time a chloroplast derived from green algae, which was subsequently lost, and a new chloroplast was derived from a symbiosis with a red alga. The data for the initial green algal origin of a chloroplast in diatoms is equivocal and has been challenged in the literature. Additionally, an underexplored more recent symbiosis has occurred within a lineage of canal raphe diatoms known as the Rhopalodiales, which host obligate endosymbiotic blue-green algae. Therefore, plastomes can provide substantial information on organismal molecular evolution and dynamics, including size variations, GC content, number of genes, nucleotide substitutions, and diversification. This study delves into structural variations, genomic patterns, and phylogenetic relationships within diatom chloroplasts based on 120 publicly-available plastomes plus newly assembled Rhopalodiales genomes. The results show a consistent, circular structure of the genome, as well as an inverse relationship between genome size and GC content. Plastome sizes ranged from 111,539 bp in *Pseudo-nitzschia* multiseries to 216,580 bp in *Climaconeis* cf. *scalaris*, whereas the GC content ranged from 28.40 % in *Climaconeis* cf. *scalaris* to 35.80 % in *Guinardia striata*. Examining total gene content, *Climaconeis* cf. *scalaris* had the highest count with 238 genes and *Pseudo-nitzschia* multiseries displaying the lowest with 194 genes. Our analyses also showed concordance with other data on diatom relationships, revealing non-monophyly of groups such as "radial centrics". “non-radial centrics” and araphid diatoms, while showing monophyly for raphid diatoms. Preliminary data on the plastomes of the Rhopalodiales also show concordance with other analyses regarding their phylogenetic position to other closely related genera as well as within the Order.

INFLUENCE OF AERIAL EXPOSURE ON MORTALITY RATES AND ASSEMBLAGE STRUCTURE OF BENTHIC STREAM DIATOMS

Byington, Aimee, Tarleton State University
Chraïbi, Victoria*, Tarleton State University

This study characterized chronic desiccation stress on long-term diatom assemblage. Diatoms collected from the Colorado and Bosque Rivers of Texas were cultured onto glass microscope slides in stream mesocosms, then exposed to varying lengths of desiccation stress at ~39°C and high light punctuated by brief submersion over the course of 6 weeks. Mortality rates and genus-level community assemblage were

assessed on a weekly basis to identify taxon-specific desiccation tolerance and to characterize long-term assemblage shifts. Taxa that demonstrated desiccation tolerance were *Amphora, Planothidium*, and *Gomphonema*, in particular *G. truncatum*. The communities that were exposed to the minimum stress treatment had the highest abundance and the lowest mortality rate. The high stress treatment resulted in a significant reduction in diatom abundance and diversity, leaving only a few live cells. Overall, this study demonstrated that the benthic diatoms collected from the Colorado and Bosque Rivers may not survive weeks of desiccation in high air temperature, though no assemblage reached 100% mortality after six weeks.

GENOMIC EVOLUTION IN CHLOROPLAST AND MITOCHONDRIAL DNA OF DIATOMS

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Hamsher, S.E., Department of Biology and Annis Water Resources Institute, Grand Valley State University, Allendale and Muskegon, MI, USA
Miller, S.R., Division of Biological Sciences, University of Montana, Missoula, Montana, USA
Li, J., Museum of Natural History and Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, CO 80309, USA
Kociolek, J.P., Museum of Natural History and Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, CO 80309, USA

Diatoms play a crucial role in global oxygen production, carbon dioxide absorption, and silica cycling, making them essential to photosynthesis and aquatic ecosystems. Recent genomic sequencing advancements have provided new insights into their evolutionary dynamics, revealing that their genomes are often chimeric, shaped by symbiotic relationships and horizontal gene transfer. This study explored the evolutionary dynamics of diatoms across various lineages by analyzing 120 publicly available plastomes and 70 mitogenomes data. We compared genomic events in plastomes and mitogenomes, finding that gene losses were more frequent in plastomes, while sporadic losses were more common in mitogenomes. Notably, significant gene losses were observed in the plastomes of *Fragilariopsis cylindrus, Pseudo-nitzschia multiseries, Astrosyne radiata, Odontella sinensis*, and *Nitzschia inconspicua*. The most frequently lost genes included those related to photosynthesis (psb28, psbW, rbcR), the cyclohexadienyl dehydrogenase gene tyrC, and the peroxiredoxin gene bas1. In mitogenomes, the tatA gene, which encodes an inner membrane translocase protein, was repeatedly lost across various diatom taxa. The analysis also revealed that mitogenomes generally have higher nucleotide substitution rates than plastomes, indicating a faster evolutionary rate. However, synteny analysis showed that plastomes typically undergo greater structural rearrangements compared to mitogenomes, except for the genus *Coscinodiscus*.

CHARACTERIZING BENTHIC ALGAL ASSEMBLAGE RESPONSES TO A FLOW INTERMITTENCY GRADIENT IN A CENTRAL TEXAS RIVER

Collins, Ailish*, Texas State University
Furey, Paula, St. Catherine University
Nowlin, Weston, Texas State University

Intermittent rivers and ephemeral streams (IRES) make up >50% of global river networks and their numbers are projected to increase as climate change progresses. Until recently, IRES remained understudied, resulting in insufficient environmental protection despite their global prevalence and importance. In addition, the number of IRES is expected to increase as climate change progresses. In more arid regions, where IRES are more prevalent, algae are often the dominant primary producer due to the scarcity of macrophytes and limited riparian vegetation. Algae in these IRES systems can have bottom-up effects on food webs and ecosystem functioning. However, drying and re-wetting could act as a stressor on biota like algae and lead to shifts in biomass and functional diversity. The goal of this study is to understand how the abundance and traits of benthic algal assemblages respond to an intermittency gradient. We hypothesize that algae with desiccation tolerant and resistant traits will increase in abundance with flow intermittency. In this study, we collected benthic algae samples from riffles and pools at nine sites with varied flow conditions in the San Saba River (central Texas, USA) throughout Summer 2024. Sections of the San Saba River are intermittent and encompasses a wide hydrological gradient: the groundwater-fed upper reach has relatively consistent flow; the middle reach frequently undergoes drying and fragmentation; and the lower reach often contracts without losing flow completely. We deployed unglazed ceramic tiles in riffle and pool mesohabitats at each site, and collected and redeployed tiles every three weeks. We additionally collected limestone cobbles from mesohabitats at each site every three weeks to capture natural stream assemblages. We assessed biomass (ash-free dry weight (AFDW) and chlorophyll-a concentration), and algal assemblage composition from biofilms scraped from tiles and rocks. Preliminary results indicate that rocks had similar AFDW in early and late summer across all sites, but higher late-summer chlorophyll-a values. Future analyses and directions include assessment of the effects of hydrological condition on algal biomass as well as the composition of the assemblage to understand if algal traits respond to differences in flow regime.

AN INVESTIGATION OF DIATOM COMMUNITIES ALONG THE EVEREST BASE CAMP ROUTE, NEPAL

Cook, Terresa, Indiana State University
Stone, Jeffery, Indiana State University
Nicholson, Kirsten, Ball Sate University

The Himalayan Mountains are an ecologically diverse area that is vastly unexplored. As the highest mountain range in the world, the region can provide a unique understanding of diatoms and their response to changing environmental factors. This study focuses on samples collected for three consecutive years (2017, 2018, 2019), from streams and rivers along the Everest Base Camp (EBC) Route. Spatial and temporal factors associated with diatom community changes will be explored. Differences in sample elevation and surrounding geology can provide new insights into the microscopic world of diatoms.

CLASSIFICATION SYSTEM OF LIPAROGYRALES DANZ & KOCIOLEK (THOSE DIATOMS FORMERLY ASSIGNED TO ORTHOSEIRACEAE)

Danz, August*, University of Colorado, Boulder

Kociolek, J. Patrick, University of Colorado, Boulder

Liparogyrales constitutes many of those taxa formerly assigned to the Orthoseirales R.M. Crawford in Round et al. 1990. Included within the order are Phycavernosaceae Danz & Kociolek, with the genus *Phycavernosa* S. Blanco, and *Liparogyraceae* Danz & Kociolek, with the "resurrected" genera *Liparogyra* Ehrenberg and *Stephanosira* Ehrenberg, the genus *Guarreraea* Kociolek, J.M.Guerrero & Van de Vijver, the new genus *Aerophilia* Danz, Van de Vijver, & Kociolek, and four groups with aphyletic positions. We present: 1) the need for the change in classification away from Orthoseirales—namely the lack of carinoportulae in the type of *Orthoseira, O. americana* (Kützing) Round, R.M.Crawford & D.G.Mann ex Spaulding & Kociolek, the character that has come to define taxa of Liparogyrales, 2) the morphology based phylogeny that gave rise to this new classification scheme, including comments on the 42 taxa and characters included in the analysis, and 3) lingering questions facing Liparogyrales placement within the broader diatom tree of life—foremost, Liparogyrales relationship with the melosiroid vs biddulphioid diatoms, a relationship that remains uncertain with differing support from molecular vs morphological data.

WIDESPREAD OCCURRENCE OF *ACHNANTHIDIUM* CF *SUBATOMUS* "HIDING" IN *ACHNANTHIDIUM RIVULARE* (POTAPOVA AND PONADER 2004) POPULATIONS IN WESTERN WASHINGTON, USA.

Davis, Clint* Rhithron Associates Inc.

Currently on DONA there are several "linear-elliptic" to "elliptic" taxa that are represented (see *A. rivulare, A. deflexum, A. atomus, A. crassum, A. delmontii*), however recently another morphologically similar taxon has come to our attention in the Pacific Northwest. Identification for this *A. rivulare*-like form has changed over the years in our ongoing Washington dataset (*A. rivulare* 2009-2016; *A. crassum* 2017-2020; *A. subatomus* 2021-2024). Currently identifying it as *A. subatomus* agrees with another regional study in Washington (USGS PNSQA voucher flora). Uncertainty in its identity, wide regional occurrence and high abundance of this taxon warrants more investigation and discussion within the diatomist community. Our goal is to 1) draw attention to this abundant, wide-spread taxon, 2) provide an initial description of morphology based on LM observations and 3) report the geographic extent in Washington streams and rivers.

STREAM DYNAMICS AND SPECIES CONSTRAINTS INFLUENCING STALK FORMING DIATOMS CREATE AN ENVIRONMENT OF OPPORTUNITY FOR GRAZING SPECIES

Dingmann, Adam and Matthew Julius
St. Cloud State University

Microalgae are well known for their importance in aquatic ecosystems and for their utility as primary producers and environmental indicators. These attributes are emphasized here, especially for stalk forming diatoms, occurring in stream systems. Attention is paid to the influences stream morphology has on the distribution of algae in streams. Maximum current velocities and flood frequency appear to be of particular importance in regulating community structure through re-initiation of the benthic algal successional cycle. Flow regimes are particularly important in determining both which algal group is present broadly and as a selective agent for "niche" species within specific systems. Diatom morphology in stalk forming taxa appears influenced by species size and laminar flow dynamics. These variations in community structure directly influence grazing activities of algivorous fishes and other grazers.

DIATOM CAMP: SIXTY-PLUS YEARS OF TEACHING ECOLOGY AND SYSTEMATICS OF DIATOMS AT IOWA LAKESIDE LAB

Edlund, Mark B.[1] and Spaulding, Sarah A.[2]
[1]St. Croix Watershed Research Station, Science Museum of Minnesota, Marine on St. Croix, MN 55047
[2]University of Colorado Boulder, and USGS, INSTAAR

In 1963, Iowa State University professor Dr. John Dodd asked Dr. Eugene Stoermer if he would teach a diatom class at Iowa Lakeside Laboratory. Stoermer agreed and taught the first "Diatom Clinic" at Lakeside in 1963 with five students who met informally to work on their material and discuss taxonomy and research. Stoermer taught for two more years, after which Dr. Charlie Reimer, Diatom Curator at the Academy of Natural Sciences, took over teaching duties for the next 24 years (1966-1989). Charlie formalized the class structure to include field, lecture, identifications, tests, and a research project. Charlie also created the Lakeside Diatom Herbarium, transporting it from Philadelphia to Lakeside each summer. Dr. Stoermer returned to teach from 1990-2000 incorporating research grade microscopy, digital imaging, and databasing in the class. From 2000-2023, a group of four diatomists, Drs Sarah Spaulding (UColorado, USGS), Mark Edlund (Science Museum of MN), Marina Potapova (ANSP-Drexel), and Sylvia Lee (USEPA) shared teaching responsibilities, oversaw remodeling of Macbride lab, obtained and databased the heavily used Reimer Diatom Herbarium, and secured funding for a class teaching assistant (the J.C. Kingston Fellow) and to outfit the lab with high end Leica research microscopes and digital cameras for each student. In 2024 the class was taught by new professors (and Diatom Camp alumni) Drs David Burge (University of Minnesota-Duluth; Science Museum of Minnesota) and Victoria Chraïbi (Tarleton State University). For over 60 years the course has maintained its long-held purpose of introducing students to field collection, sample preparation, and the biology, ecology, taxonomy, systematics, and applications of diatoms for environmental assessment and research.

READY, SET, NADS! A BRIEF HISTORY, 1970-2024

Edlund, Mark B. [1] and Julie A. Wolin[2] and
[1]St. Croix Watershed Research Station, Science Museum of Minnesota, Marine on St. Croix, MN 55047
[2]Cleveland State University, Cleveland, OH

The 2024 Iowa Lakeside meeting of the The North American Diatom Symposium represents the twenty-seventh time that diatomists have formally gathered for NADS and the fourth time the group has met at Iowa Lakeside Lab (1978, 1995, 2009, 2024). The first meeting, called "Ecology of Freshwater Diatoms," was held in October 1970 at the Cedar Creek Natural History Area in Minnesota and was organized by J. Platt Bradbury and Ryan Drum. Four years later, the group gathered at Hocking Hills in Ohio for the "Second North American Symposium on Diatom Systematics and Ecology", a meeting that set the stage for the now biennial gathering of this informal society. In 1978 (Iowa Lakeside Lab) and 1979 (University of Michigan Biological Station) the meeting was held in adjacent years to reset the timing of the meeting to occur in alternate years from the International Diatom Symposium. Over the last 50-plus years NADS has been held in 16 states and once in Canada (1993, Delta Marsh). Here's a brief history of NADS documenting the first twenty-six meetings including their programs, photos, t-shirts, highlights, and attendees.

TAXONOMIC IDENTIFICATION OF DIATOM SPECIES FOUND IN CRESCENT BAY LAKE, COULEE DAM, WASHINGTON

Eichman, Julia Christensen, Retired
Eichman, Charissa A.

Crescent Bay Lake is located near the Grand Coulee Dam in Washington state, between the towns of Grand Coulee and Coulee Dam. In the 1930s, during the construction of the Grand Coulee Dam, a large conveyer belt was used to move excavated material between the Dam and Rattlesnake Canyon. In 1942, Rattlesnake Canyon was diked to prevent sewage from Grand Coulee from entering Lake Roosevelt. This formed Crescent Bay Lake. Because of this, the lake is known locally as “Lake Urine” and “Poop Lagoon”.1 It includes a taxonomy list and photographs of the diatoms present. It is the beginning of a study.

VALVE ULTRASTRUCTURE AND SYSTEMATIC POSITION OF *RHOPALODIA WETZELII*

Greenwood, Megan University of Colorado Boulder
Felipe Serino, Universidad Nacional de La Plata
Silvia E. Sala, Universidad Nacional de La Plata
José M. Guerrero, Universidad Nacional de La Plata
Amelia A. Vouilloud, Universidad Nacional de La Plata
J. Patrick Kociolek, University of Colorado Boulder

Rhopalodia wetzelii was described in 1927 by Hustedt from fossil material collected in the Atacama Desert in Chile. Although described from fossil material, it has been reported living in high altitude saline lakes in Bolivia, Chile and Argentina. From the Frenguelli Collection, housed at the Museo de La Plata (LPC), a sample of diatomite from the Atacama Desert was analyzed under the light microscope (LM) and scanning electron microscope (SEM). Observations document unique morphological features including an extremely contorted valve, internal volate occlusions, round and oblong portulae, and a markedly elevated keel with thick costate fibulae supporting it. Hustedt notes “Diese interessante Art steht unter den andern Formen der Gattung völlig isoliert da.” Many of the features presented here suggest that it differs from the generitype, *R. gibba*, as well as other species assigned to the genus.

PHYLOGENOMIC INSIGHTS FROM MITOCHONDRIAL GENOMES OF DIATOMS

Ikudaisi, Catherine*, University of Colorado, Boulder
Aimee Caye G. Chang, University of Colorado, Boulder
Mailor W. W. Amaral, University of Colorado, Boulder
Megan Greenwood, University of Colorado, Boulder
Heidi Abresch, Division of Biological Sciences, University of Montana, Missoula, Montana, USA
Sarah E. Hamsher, Department of Biology and Annis Water Resources Institute, Grand Valley State University, Allendale and Muskegon, MI, USA
Scott Miller, Division of Biological Sciences, University of Montana, Missoula, Montana, USA
Jingchun Li, University of Colorado, Boulder
Patrick Kociolek, University of Colorado, Boulder

Organellar genomes play an indispensable role in providing insights into understanding the phylogeny of diatoms and their ecological interactions including other living organisms. Despite their compact size and ease of data handling, syntheses of whole mitochondrial genomes of diatoms are rare. We present the features of mitochondrial genomes, summarizing data for over 70 taxa in previous studies. We obtained mitochondrial genomes of diatoms and consider their genome sizes and other diagnostic metrics. We use whole mitogenome data to derive a phylogeny for the diatoms and explore our results with previous classification schemes. Our preliminary findings support previous studies (and are concordant with data from chloroplast genomes) that challenge some traditional taxonomic classifications, thereby revealing the potential of incorporating mitochondrial and other organellar data into phylogenetic analyses. Future work of the whole mitogenomes of Rhopalodiales, a monophyletic group of diatoms that harbor endosymbiotic Cyanobacteria, will further enhance our understanding of diatom evolution across various scales of study.

DIATOM ASSEMBLAGES OF THE ALASKAN ARCTIC COASTAL PLAIN BEFORE RECENT RAPID CLIMATE CHANGE: REEXAMINATION OF LEONARD FREESE’S COLLECTIONS

Leppik, Sylvia, Drexel University
Potapova, Marina, Drexel University

Transformations of diatom assemblages in the Arctic, driven by climate change or pollution, have traditionally been studied using paleolimnological approaches, focusing primarily on changes in lake and pond ecosystems. However, museum collections offer a different source of information on past biota. Diatom samples and slides from these collections provide unique opportunities for characterizing assemblages both quantitatively and qualitatively. In addition to lacustrine environments, samples collected from rivers, wetlands, and other habitats allow for a comprehensive characterization of assemblages across the entire landscape. We revisited Dr. Leonard Freese’s 1951 collections of diatoms from the Alaskan coastal tundra in the vicinity of Point Barrow to document the assemblages that existed in this area before the onset of the current rapid climatic change. We examined 148 samples collected from fresh and brackish waters, representing a variety of habitats, using light and scanning electron microscopy. The resulting voucher flora, documenting species occurrence, is complemented by relative abundance data and ecological community analysis. We also studied type materials to confirm the identities of species described by Patrick and Freese in 1961. This data serves as baseline information or a reference point for future investigations into the effects of climate change and various human impacts on the Alaskan biota.

ASSESSING THE LONG-TERM IMPACTS OF REMEDIATION ACTIVITIES ON DIATOM COMMUNITIES IN SILVER BOW CREEK, MONTANA, USA

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Silver Bow Creek, situated in Butte, Montana, has faced extensive environmental challenges stemming from over a century of mining activities. These activities resulted in significant contamination from waste rock, slag, mill tailings, and other pollutants. This historical pollution severely affected the ecological integrity of Silver Bow Creek, rendering large sections of the floodplain devoid of vegetation due to the toxic nature of the deposited materials and affecting the surface water, sediment, and overall health of the watershed. Excessive sediment increased nutrient availability, and heavy metal contamination have altered the composition of diatom communities within Silver Bow Creek. These communities are dominated by more tolerant, opportunistic, and motile species within *Mayamaea, Eolimna, Cocconeis, Nitzschia*, and *Navicula*. In response to these environmental concerns, remedial actions were coordinated by MTDEQ in consultation with the U.S. EPA to address the contamination and restore the ecological balance of Silver Bow Creek. The Streamside Tailings Operable Unit (SSTOU) within Silver Bow Creek has been a primary focus of these remedial actions, divided into four subareas based on geologic and topographic features, with a total of 16 monitoring sites. By 2019, major remedial activities in all SSTOU subareas had been completed. This

study aims to assess the long-term impacts of remediation activities on diatom communities in Silver Bow Creek. Our goals are to evaluate the effects of these remedial activities on diatom communities, particularly exploring differences in the composition of tolerant taxa between SSTOU subareas with varying amounts of tailings/impacted soil deposited in these subareas. This comprehensive approach will enhance our understanding of ecological recovery and inform future management strategies.

TEMPORAL DIATOM COMMUNITIES' DYNAMICS IN THE EPIPELON FROM THE SAVANNAH RIVER, GEORGIA

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Diatom communities incorporate special and temporal changes in conditions and are a powerful tool inferring larger scale changes within aquatic ecosystems. This research relates physicochemical conditions measured by USGS instruments at a location with characteristics inferred from satellite images to algal community metrics. During that time there was a significant alteration in the Savanna River harbor that influenced the river upstream. Diatom communities wer analyzed before, during (2015), and after the deepening of the Savannah Port. Surface benthic diatoms were collected at low tide from 2011 to 2021 seasonally. Widening and deepening of the Savannah River no change is salinity, DO, T, and pH, however after the alteration, there were significant decreases in chlorophyll a measurements and sedimentation. Significant changes in species richness (decrease 26 percent) and diversity were due potentially to changes in sedimentation and increase in water clarity. Freshwater benthic diatoms decreased through time and were replaced by marine planktonic diatoms. All taxa with higher than 10 percent relative abundance are documented with light microscopy. Specific taxonomy and ecology is discussed for *Cymatosira belgica* Grunow, *Cylindrotheca gracilis* I. Hirn and *Minidiscus* spp. An alternative to multiple sampling locations approach is combined with deep taxonomy at a single sampling location to understand changes in a dynamic riverine system with tidal influence.

ALGAL COMMUNITY RESPONSE TO PULSE AND PRESS DISTURBANCES IN CENTRAL TEXAS PONDS

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This study characterized the compositional response of algal communities to press (long-term shading) and pulse (short-term planktivory) disturbances. Twelve mesocosms in each of three ponds at Timberlake Biological Field Station received either none, one, or both types of disturbance and were sampled six times over 28 days. Diatoms, green algae, and cyanobacteria were identified and enumerated, and algal pigment concentrations were quantified. Preliminary results show that by abundance, cyanobacteria were dominant in all ponds. There were differences in assemblage among the ponds, which were separately characterized by *Pseudoanabaena, Raphidiopsis*, and *Achnanthes*.

DIATOM RESPONSE TO 8500 YEARS OF LAND USE CHANGES AT A MID-ELEVATION LAKE IN ECUADOR

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Humans have altered Andean landscapes for more than 12,000 years. Evidence of plant cultivation in the Andes began at c. 8000 calibrated years before present (hereafter cal yr BP), and signs of animal domestication are present after 5000 cal yr BP. The effects of these cultural and land use changes on aquatic systems, however, are still unknown. Here we present a high-resolution 8500-yr diatom history of Lake Llaviucu, a mid-elevation lake at ~3115 m a.s.l., located in the Cajas National Park, Ecuador. We used charcoal, maize pollen and coprophilous spores, indicating camelid domestication, as proxies of land use change. Charcoal is present from 8500 cal yr BP, as both pastoralism and maize production start at c. 6000 cal yr BP. Maize cultivation peaks at c. 4000 cal yr BP and pastoralism at 1500 cal yr BP, during Incan domination. The diatom assemblage was dominated by benthic species (*Brachysira* spp*, Achnanthidium* spp, *Gomphonema* spp*, Encyonopsis* spp, and *Denticula* spp). As pre-Columbian populations declined in response to European arrival, at 450 cal yr BP, the lake became a planktonic-dominated system. *Tabellaria floculosa* and *Ulnaria ulna* were the most abundant diatom taxa, indicating a low pH, low nutrient concentration and poor mineralization. A second period of community change happened over the last 50 years. *Discostella stelligera* became the dominant taxa, possibly in response to climate change. The most recent 450 years of community changes at Lake Llaviucu are without parallel in the prior 9000 years.

CYCLOTELLA CHINYANJAENSIS SP.NOV. A NEW CENTRIC DIATOM SPECIES FROM PLEISTOCENE SEDIMENTS OF LAKE MALAWI, WITH A CLOSE RELATIONSHIP TO THE *CYCLOTELLA MENEGHINIANA* SPECIES COMPLEX

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Fossil diatoms found in ancient and large African lakes are invaluable in understanding historical environmental conditions. This is particularly evident in Lake Malawi, the second oldest and largest of these lakes, where fossil diatoms have been used to track lake-level fluctuations over time. A series of overlapping cores collected through the Lake Malawi Drill core Project have yielded an exceptional fossil archive spanning over a million years. Using light and scanning electron microscopy, we observed the fossil diatom diversity in Lake Malawi and identified an unknown centric diatom species, which we have named *Cyclotella chinyanjaensis*. This species appears intermittently throughout the sediment cores, increasing in abundance, particularly during transitional periods between sustained wet and dry phases. The last substantial abundance occurred ~35 ka years ago. *Cyclotella chinyanjaensis* shares morphological similarities with the *Cyclotella meneghiniana* group (e.g., *C. meneghiniana, C. quillensis, C. agassizensis*, *C. gamma, C.* scaldensis, and *C. litoralis*). However, unlike the characteristic tangential undulation on the valve faces of its relatives, this taxon is not undulated, even in the largest valves observed. Additionally, it possesses 3–4 rimoportulae on the costae within the ring of marginal fultoportulae, as opposed to the single rimoportula found in other morphologically similar species.

EPIZOIC DIATOM DIVERSITY OF SEA TURTLES AT TEXAS STATE AQUARIUM

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Previous research has described unique diatom taxa inhabiting the carapace and neck skin of sea turtles. This undergraduate research characterizes the assemblage of diatom genera found on sea turtles that were either in rehabilitation or residing at the Texas State Aquarium in July 2023. Diatoms were collected, with the assistance of the aquarium veterinary team, 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. This study summarizes the diatom taxa found on nine Kemp's ridley (Lepidochelys kempii), green (Chelonia mydas), and loggerhead (Caretta caretta) sea turtles. It compares assemblages among species, between the skin and neck of the same species, as well as with a barnacle and the habitat walls. This study is a continuation of a long-term research collaboration with the Texas State Aquarium to characterize the diatom assemblages of the four sea turtle species common in the Gulf of Mexico.

IMPACTS OF CANOPY COVERAGE AND ULTRAVIOLET RADIATION ON STALK PRODUCTION OF *DIDYMOSPHENIA GEMINATA*

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Since 2015, the freshwater diatom *Didymosphenia geminata* (didymo) has caused seasonal nuisance stalk production in the St Mary's River, the major outlet from Lake Superior to Lake Huron. Previous studies found that the epilithic algal biomass and chlorophyll-a decrease with increased canopy coverage. Presence of didymo cells and ability to form prolific colonies respond similarly, being positively correlated with stream width and negatively correlated with canopy coverage. However, in shallower water, the increased exposure to ultraviolet radiation (UVR) can cause the inverse; epilithic algal biomass and chlorophyll-a decreased in sites without canopy and increased in sites with partial coverage. Other stalked genera have been found to have higher abundance in shallow water (<1.5m) and with minimal canopy coverage, but were negatively affected with increased shade or when moved to deeper water. Planting foliage and opening flood gates to drain Lake Superior and raise water levels in the St Mary's River have been considered for management of didymo. To study the potential of increasing canopy coverage and reducing UVR through increased water depth, new and established Didymo colonies were subjected to various levels of shading in combination with UV-blocking plexiglass in outdoor artificial streams for two weeks. Colony behavior was observed through counts of total Didymo cells/cm2, total stalk length/cm2, instances of branching/cm2 and dividing cells/cm2 and cell health. Chlorophyll-a µg/cm2, ash-free dry mass µg/cm2 (AFDM) and standing crop index were proxies to observe how the total algal biomass was affected. Mature colonies had higher abundances overall from day zero compared to day 14. New colonies had a higher proportion of live cells out of total cell abundance and higher amounts of AFDM. Although new colonies had lower abundances in most variables by the end of the experiment, general trends indicated that increased canopy coverage and reduced UVR caused stagnation of stalk production in mature colonies. Dunn's test (Hochberg adjustment) showed no significant differences between treatments over time in total stalk length and AFDM, and only one significant increase in instances of branching between treatments, though some treatments appear to be more effective.

HOW FLOW AND DRY CONDITIONS INFLUENCE ALGAL SPECIES COMPOSITION AND PRODUCTIVITY IN INTERMITTENT RIVERINE POOLS IN TEAXAS RIVERS

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RHOPALODIALES OF MICHIGAN: A PRELIMINARY FLORA

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The Rhopalodiales are a group of diatoms with cyanobacterial endosymbionts that fix nitrogen for their diatom hosts and includes the genera *Rhopalodia, Epithemia*, and *Tetralunata*. Our work is focused on documenting and describing the Rhopalodiales of Michigan. Towards these ends, > 400 samples have been collected in Michigan to capture the diversity of this group. Based upon these preliminary observations there appears to be 7 species of Rhopalodiales in Michigan, represented within 63 taxon names that include infraspecific taxa and homotypic synonyms; 1 of these species appear to be new to science. This study is part of a collective effort to describe the diversity and evolution of the Rhopalodiales and their close relatives using morphological and molecular data from the diatom host and the endosymbiont that will allow us to better understand the evolution of this unique relationship.

PRELIMINARY ANALYSIS OF HOLOCENE CLIMATE AND DIATOM RECORD IN LAKE HELENA MT

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Lake Helena presently occupies the lowest part of the Helena Valley basin at 1113m (3650 ft) ASL. Near Helena Montana and just east of the continental divide, the valley sits at the transition between the Rocky Mountain and prairie ecosystems. Lake Helena is a shallow lake (max depths 2.5 m) established when the Missouri River was dammed to form Hauser Lake in 1920. It is fed by streams that were heavily impacted by mining activities starting in the 1860s. Using historical maps from 1899, we identified several pre-dam ponds and wetland area with the potential to provide sediment record spanning both 'pre- and post-settlement' climate and environmental conditions in the surrounding watersheds. Multiple cores averaging 2-2.5m depth show alternating layers of lower organic silt sediments interspersed with more organic muck and peaty horizons. The Mazama Ash appears ~ 40 cm from the bottom and indicates that we have a record dating back to least 7,700 and likely beyond 8000 cal yr BP. Analysis of charcoal (relative abundance of wood vs grass), XRF elemental/metals analysis, and ongoing studies of plant macrofossils and pollen are being used to reconstruct environmental conditions through the Holocene. Of particular interest are the interbedded silts and organic strata that appear to record changing hydrologic conditions in the pre-dam wetland system. It is our hope that diatom stratigraphy will help us interpret paleo hydrologic conditions through the Holocene and better understand the impact of human activities on sedimentation rate, mining impacts, and agriculture since the mid1800s.

LATE HOLOCENE HYDROCLIMATE VARIABILITY INFERRED FROM THE DIATOM RECORDS OF THREE MIDWESTERN LAKES

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Sediment cores were collected from lakes across the midwestern United States with the goal of reconstructing changes in atmospheric circulation and precipitation seasonality over the last 2000 years. One of the most significant modes of climate variability in the Midwest is the Pacific North American (PNA) pattern. During negative phases of the PNA, anomalously wet conditions are found in the Midwest, while drier conditions are found in the western United States. Conversely, positive phases of the PNA are associated with drier conditions in the Midwest and wetter conditions in the western United States. High resolution diatom records were developed for three lakes: Clear Lake (Cerro Gordo County, IA), Marl Lake (Waushara County, WI), and Pretty Lake (Lagrange County, IN). The lakes span a west to east gradient from 93 to 85°W, though all lakes are located east of a proposed hydroclimate dipole at 96°W. The diatom records vary in their response to climate, likely due to regional differences in climate variability as well as differences in lake sensitivity to hydroclimate and diatom sensitivity to limnological changes. Clear Lake, which is polymictic and hydrologically open, has the largest surface area but is also the shallowest lake (max. depth = 5.9 m). The diatom record of Clear Lake is dominated by small Fragilarioid taxa, though it also contains a planktic assemblage dominated by two species of meroplanktic *Aulacoseira*. Though lake level may have changed through time, the persistence of tychoplankton and its dominance throughout the record indicates that Clear Lake remained relatively shallow throughout the last 2,000 years. Increases in benthic diatom abundance are associated with oxygen isotope values of calcite indicative of wetter conditions, suggesting that increases in lake level were associated with the expansion of wetlands along the lake's margins. Marl Lake, a hydrologically closed lake with a small surface area and maximum depth of 10.6 meters, showed the strongest evidence of lake level variation. Most of the variation occurred between planktic and tychoplanktic species (primarily belonging to the genera *Pseudostaurosira*, *Staurosira*, and *Staurosirella*), although recent sediments showed large variation in benthic abundance as well. We interpret changes in planktic abundance to reflect lake level variability, with higher abundances of planktic taxa associated with higher lake levels. Although historic lake level lowstands may be attributable in part to groundwater withdrawals, past lake level fluctuations are controlled by hydroclimate, via its impact on surface runoff and groundwater levels. The diatom record suggests that the most recent lowstand of Marl Lake, which lasted more than a decade, may have been more extreme than anything experienced in the last 1500 years. While lake level appears quite variable over the last 1500 years, drier conditions appear more frequently in the earlier part of the record, with wetter conditions in recent centuries. Pretty Lake (IN), which is also hydrologically closed, is the deepest of the lakes (max. depth = 25 m) and meromictic. Pretty Lake is dominated by planktic taxa. Nutrient variability and strength of stratification appear to best explain diatom variability, with a weak diatom response to lake level variation. High lake levels appear to be associated with wetter and warmer winters of the negative phase of the PNA pattern. The planktic assemblage suggests a deep thermocline, high N, and low P during this period. Lower lake levels are associated with colder and drier conditions (positive PNA). Increased ice cover and a shortened summer season is inferred from diatoms indicative of weaker stratification.

DIATOMS OF LAKE TANGANYIKA

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Studies related to exploring paleolimnology by using fossil diatoms have been increasing recently. However, fossil diatoms from the African Great Lakes are still understudied. Lake Tanganyika is the second deepest, second oldest, second largest, and longest lake in the world. It borders four countries in East Africa: The Democratic Republic of Congo, Tanzania, Zambia, and Burundi. Fossil diatoms from Lake Tanganyika are a great source of paleolimnological information. We studied diatoms from each centimeter of a 109-cm long sediment core (spanning back to ~2070a years BP) from Lake Tanganyika. We could successfully identify some diatoms, but others are still in the identification process. Among the plankton, two Aulacoseira taxa (A. cf. subarctica, A. cf. crassipunctata) and six Nitzschia taxa (N. cf. asterionelloids, N. sp1, N. cf. aequalis, N. cf. bacata, N. cf. adapta, N. cf. spiculum) remain unidentified and may be new to science. Benthic taxa belonging to several genera (Placoneis, Encyonema, Planithoidium) also do not fit any known species. Nitzschia lacustris dominates most of the record, except for a brief period from ~280 to 510 CE, when different species of the genus Aulacoseira were dominant. A higher abundance of long, needle-shaped, lightly silicified, and highly buoyant species like Nitzschia lacustris indicates that the lake was oligotrophic for most of its history. A brief episode with a shift in dominance to species belonging to the genus Aulacoseira indicates an increase in silica concentration, probably as a result of enhanced upwelling or inflow of additional terrigenous silica into the lake.

DIATOM COMMUNITIES FROM NON-PERENNIAL STREAMS IN SOUTHERN CALIFORNIA, USA

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Benthic diatoms have multiple traits that provide resistance to drying and resilience following wetting in non-perennial streams, although their patterns of biologic diversity are still broadly under researched. Southern California has a mediterranean climate with cool, wet winters and hot, dry summers, with almost all rainfall precipitation occurring between October and May. Benthic diatoms were collected between March and May 2015-2017, following one of the most severe droughts in the state's recorded history (2012-2015). Collections were from 20 non-perennial streams primarily with unimpacted reference conditions and natural land cover (chaparral, grassland, and oak or pine forest) during 27 sampling events. We identified 225 diatom species in total, a hundred of which were rare and observed in a single sample. The top ten most common species recorded in at least 70% of the samples are listed in decreasing order: *Planothidium frequentissimum* (Lange-Bertalot) Lange-Bertalot, *P. lanceolatum* (Bréb. Ex Kütz.) Lange-Bertalot, *Achnanthidium minutissimum* (Kütz.) Czarnecki, *Ulnaria ulna* (Nitzsch) Compere, *Nitzschia linearis* W. Smith, *N. palea* (Kütz.) W. Smith, *Cocconeis placentula* Ehr. sensu lato,

Halamphora veneta (Kütz.) Levkov, *Gomphonema micropus* Kütz. and *Navicula veneta* Kütz. Eight species of *Epithemia* and *Rhopalodia* containing N2-fixing cyanobacterial endosymbionts were recorded in 68% of the samples. Maximum species richness was 69 and minimum richness was 16 species per sample. A novel to science species, *Cocconeis ectorii* L. D. Mora, Stancheva & R. Jahn, was recently described from one of the sites Long Canyon Creek but based on previous sequence data this species has cosmopolitan distribution. Diatom community structure and diversity indices are explored. This study provides insight into the diversity of desiccation-tolerant diatoms adapted to harsh conditions in non-perennial streams.

PALEOLIMNOLOGICAL STUDY OF THE RELATIONSHIP BETWEEN DIATOM GENERA AND LAKE INFLUENCES IN LAKE CHICHOJ, GUATEMALA

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The paleolimnology of Guatemala is severely understudied despite lakes being the main source of freshwater for the Guatemalan people. The use of these understudied lakes over time by the Guatemalans is now beginning to show signs of underdevelopment in the youth of the country. Analysis of diatom taxa of the lake sediment layers can reveal how humans, climate change, and natural disasters have influenced the lake over time. Unfolding the history of the lake may reveal how the lake could react in future similar events, and aid in that preparation for the people of Guatemala who rely on this water source. Specific interactions this research intends to focus on is the humans, climate change, and natural disasters have influenced the lake over time through diatom genera found in the lake sediment. The lake has been know to be eutrophic since the 1980s, following an earthquake that occurred in Guatemala in 1976. It is believed that this may have caused the lake to become eutrophic, however our project intends to examine how people have affected the lake's composition.

A NEO AND PALEOLIMNOLOGICAL APPROACH TO UNDERSTANDING *AULACOSEIRA* ECOLOGY IN NORTHERN MAINE, USA

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Diatoms from the genus *Aulacoseira* are common in temperate freshwater lakes, often dominating the phytoplankton community. Paleoecological studies frequently interpret high abundances of *Aulacoseira* spp. in fossil assemblages as indicative of deep mixing and/or high turbulence which is considered essential to keep these heavily silicified cells afloat. However, cell size varies approximately by an order of magnitude (~2-24 µm for mantle height and valve diameter) among different species, likely modulating the spatial and seasonal distribution within the water column, in addition to varying light and nutrient preferences. In this study we aim to disentangle the effect of stratification, light, and nutrient supply on *Aulacoseira* spp. assemblages in two stratifying ponds in northern Maine (Crawford Pond: 19.8 m max. depth; Big Pleasant Pond: 15 m max. depth) to refine our paleoenvironmental reconstruction of this area. Preliminary sediment core analysis revealed at least 12 *Aulacoseira* taxa, dominated mainly by *A. subarctica, A. ambigua,* and *A. aff. pusilla*, making this an ideal site to examine the response of different cell sizes to shifting thermal structure, light regime, and nutrient load on varying temporal scales. The spatial and seasonal distribution of these species, along with light and nutrient preference, is being assessed through water profile and sediment trap recordings at a weekly to biweekly resolution throughout the ice-free season. So far, the thermocline was established in both ponds a month after ice-out (Julian day 147) at ~3 m depth and subsequently deepened to ~4-6 m depth two months later (Julian day 209). This change prompted a consequential deepening of the chlorophyll maximum zone between ~3-6 m depth and ~3-5 m depth in Crawford and Big Pleasant ponds, respectively, along with increased transparency in both ponds (~6-7 m depth and ~5-6 m depth, respectively, for $z_{1\%PAR}$). The diatom assemblage data will be juxtaposed with the thermal structure dynamics, together enriching the sediment core analysis from these ponds and enabling us to gauge the natural variability of assemblage shifts and its relationship with decadal to centennial scale climate change in northern Maine.

PALEOLIMNOLOGICAL STUDY OF FOX LAKE, INDIANA

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Abandoned coal pits have an interesting effect on water quality and aquatic life as they develop and are associated with unhealthy conditions such as elevated heavy metals. Fox Lake was a part of the Chieftain No. 20 mine, which closed in 1969 before there were more strict regulations relating to coal mine operators, closure, and reclamation. Diatoms fossilized in the sediment can be analyzed to understand how water quality and the environment has been altered through time. We will be studying how the abandonment of coal pits, climate changes, and how human use has affected the lake's environmental conditions since its formation. A sediment core was collected and separated into twenty-six individual samples from Fox Lake for diatom counting and identification and to take heavy metal readings on an X-ray fluorescence machine. We found that diatoms from early formation of the lake were indicative of low nutrient availability and low species diversity, while diatoms from recent sediments were diverse and indicative of high nutrient availability. Our results also included species that are invasive to North America, such as *Discostella astercostata*. Our findings suggest that the lake had poor productivity and water quality after the mine's abandonment and has shifted to a productive, nutrient rich lake as people altered the surrounding landscape.