Program and Abstracts

Charlie Reimer, 1923-2008

20th North American
Diatom Symposium

Iowa Lakeside Lab

September 23-27, 2009
Milford Iowa

Organizing Committee:

Sarah Spaulding and Mark Edlund, co-chairs
Sarah Hamsher, webmistress
Dennis Vander Meer, meeting sponsorships
Lynn Brant and Stephen Main, Reimer Celebration dinner
Matt Julius and students, social events
Anthony Menicucci and Becky Bixby, auction
Joy Ramstack, Will Hobbs, Avery Cook Shinneman, A/V
Evelyn Gaiser and students, scum run
Virginia Card, diatoms in education session

Introduction

Welcome to the 20th North American Diatom Symposium and the 100th year of Iowa Lakeside Laboratory. The North American Diatom Symposium (NADS) is a biennial meeting normally held at field stations throughout the United States and Canada. The meeting was first held in 1970 at Cedar Creek in Minnesota. Since that date, the gathering has been hosted at field stations in Florida, Colorado, Manitoba, Kentucky, Alabama, Ohio, Minnesota, Iowa, and Michigan. NADS usually attracts about 100-120 diatomists from North America and around the world. The meeting provides 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.

At this symposium, we celebrate the life of Dr. Charles Reimer. We celebrate his contributions to the field of diatom research and, moreover, we celebrate the rich personal connection that so many of us felt with him. Charlie taught the *Ecology and Systematics of Diatoms* course at Iowa Lakeside Lab for 28 years and spent several summers here thereafter. He not only established Lakeside Lab as an international destination for diatom study, he inspired generations of diatomists in the joyful pursuit to understand diatoms.

Website
www.northamericandiatomsymposium.org

Location of meals and scientific sessions
All meals (except for Wednesday evening) and oral presentations will be held in the Presbyterian Camp Lakeview Lodge Conference Center. It is a short walk between Lakeside and the "Presby Camp" via a path by the lake, the bike path next to Highway 86, or by car (for those who need a ride). See the map on page 4 of this program. The Wednesday evening meal will be held at the Lakeside Lab Dining Hall.

Registration
Please check in (or register) in Mahan Hall on Wednesday (3:00 – 5:00 PM) or in the Lakeview Lodge Conference Center on Thursday (7:00 – 8:30 AM). At registration you will receive your housing assignment, the program and abstracts, and t-shirt. Items to be donated at the auction should be left with the registration desk staff. Participants can also load power point presentations on a computer at the registration desk.

Posters
Posters should be displayed upon arrival at Lakeside and left in place until the end of the meeting Sunday morning. Posters will be on display in MacBride Hall and Mahan Hall. Please see pages 11-13 of the program for the location and number of each poster. A formal poster session will be held 7:30-9:00 PM on Thursday, when presenters should stand by their posters for a discussion session.

Presentation files (i.e. PowerPoint)
Please load your presentation onto our laptop computer at registration, if your talk is on Thursday, or on the day before your talk is scheduled.

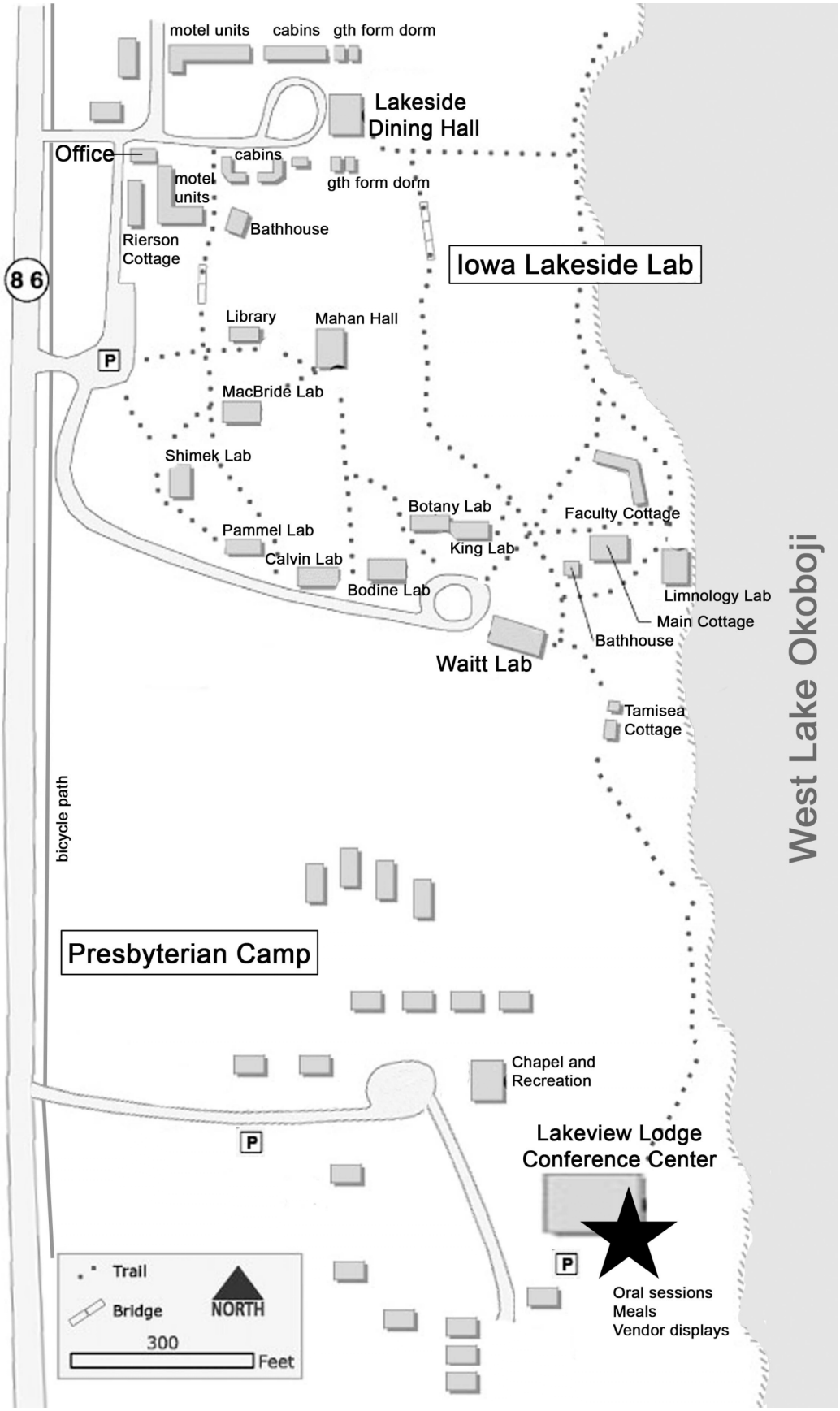
Internet Access
Computers are available for participants to use and access the internet (always open) in the King Lab. Wireless access to the internet is available in much of the lodging at Lakeside and in several buildings. The access code for the internet is "lakeside".

Sponsorship
Despite the current economy, our major sponsors were very generous in support of the NADS meeting this year. Sponsors help us offer travel awards to students and we offered $200 to 18 students to defray their travel expenses. Sponsors also help us keep the price of the meeting low and we greatly appreciate their donations. Please take time to thank the representatives of our lead sponsors: Iowa Lakeside Lab, The University of Iowa, Rhithron Associates, Fluid Imaging Technologies, Dave Beeson, Balogh International, Lubrecht and Cramer, Koeltz Scientific Books, and Rushforth Phycology. We also thank Annie Dunn (vanAnnies.com), the Phycology Section of the Patrick Center for Environmental Research (ANSP), Wildlands CPR, Meer Image, Tilley Endurables, Arnold's Perk, CC Screen Print & Embroidery, Sue Bee Honey, Brunel Microscopes, Water & Air Research, Peter Pryfogel, Well's Dairy, Fay Darling (Artist/Photographer and Digital Colorist), and Dr. Paul E. Hargraves (Emeritus Professor of Oceanography, University of Rhode Island, Affiliate Professor, Harbor Branch Oceanographic Institution, Florida Atlantic University, and Research Associate, Smithsonian Institution Marine Station). THANK YOU!

Note from our webmistress, Sarah Hamsher
At the last NADS, the group decided that it would be beneficial to have a permanent presence for the symposium online. An online presence would allow us to have a place to store information on our gatherings and resources on diatoms in North America. After some consideration, I decided to take on the task of creating the new website. My vision of the NADS website was to have a centralized online space to inspire, connect and collaborate with other diatom scientists in North America, and beyond.

In order to better serve our community, I queried the DIATOM-L listserv with questions about people's experience with NADS and what people might look for in a NADS website. The responses were overwhelmingly positive, with most of the feedback expressing excitement about a permanent website. The most common requests for content were for taxonomic and ecological resources and information about upcoming meetings. Most of the people that answered the survey had been to more than one meeting. Everyone had something good to say about their experience, whether they enjoyed the content of scientific presentations, connecting with the latest research, or spending time with colleagues.

Overall, I enjoyed designing the website. I would like to fill in some of the 'under construction' pages and add more information on taxonomy and methodology. I am hoping to recruit people at this meeting to contribute content to the pages and expand the coverage. If you would like to suggest information that should be on the website or are interested in contributing, please contact me.


motel units
cabins
gth form dorm
Lakeside Dining Hall
Office
cabins
motel units
gth form dorm
Bathhouse
Rierson Cottage
Iowa Lakeside Lab
8 6
Library
Mahan Hall
P
MacBride Lab
Shimek Lab
Botany Lab
Faculty Cottage
Pammel Lab
King Lab
Calvin Lab
Bodine Lab
Limnology Lab
Main Cottage
Bathhouse
Waitt Lab
Tamisea Cottage
West Lake Okoboji
bicycle path
Presbyterian Camp
Chapel and Recreation
Lakeview Lodge Conference Center
P
P
Oral sessions
Meals
Vendor displays
Trail
Bridge
NORTH
300
Feet

PROGRAM-AT-A-GLANCE

Thursday, September 24

7:15-8:15	Breakfast-*Lakeview Lodge Conference Center*
8:40-9:00	Opening remarks and Welcome-*Lakeview Lodge Conference Center*
9:00-10:00	Plenary Talk, Dr. David Jewson, University of Ulster: Diatom ecology: "Why do it?"
10:00-10:20	Coffee Break
10:20-12:00	Scientific Session I-Ecology (Oral Presentations-*Lakeview Lodge Conference Center*)
12:00-1:00	Lunch
1:30-2:50	Scientific Session IIa-Paleolimnology Oral Presentations
2:50-3:10	Coffee Break
3:10-4:50	Scientific Session IIb-Systematics and Taxonomy (Oral Presentations)
4:50-6:00	Break
6:00-7:00	Dinner
7:30-9:00	Scientific Session III - Poster Presentations-*Lakeside Lab, MacBride Hall and Mahan Hall*

Friday, September 25

7:15-8:15	Breakfast
8:40-10:00	Scientific Session IVa-Lakeside Alumni (Oral Presentations)
10:00-10:20	Coffee Break
10:20-11:40	Scientific Session IVb-Lakeside Alumni (Oral Presentations
12:00-1:00	Lunch
1:30-2:50	Scientific Session Va - Celebration of CW Reimer (Oral Presentations)
2:50-3:10	Coffee Break
3:10-4:50	Scientific Session Vb - Celebration of CW Reimer (Oral Presentations)
4:50-6:00	Break
6:00-9:00	Reimer Celebration Dinner and Social
9:00	NADS Auction-*Lakeside Lab, Mahan Hall*

Saturday, September 26

7:15-8:15	Breakfast
8:40-10:20	Scientific Session VI-Marine Environments & Education (Oral Presentations
10:20-10:40	Coffee Break
10:40-11:40	Plenary Talk, Dr. I. Gebeshuber, University Kebangsaan Malaysia: "Learning from diatoms: Biomimetic Approaches"
12:00-1:00	Lunch
1:30-2:50	Scientific Session VIIa - Nanotechnology and New Methods (Oral Presentations)
2:50-3:10	Coffee Break
3:10-4:30	Scientific Session VIIb-Monitoring (Oral Presentations)
4:30-6:00	Scum Run-*Lakeside Lab*
6:00-7:00	Dinner

7:30-8:45	Workshop - Diatoms in education; education in diatoms (Organizer: V. Card)
7:30-8:45	Workshop - Working towards taxonomic consistency (Organizer: S. Spaulding)
9:00	Business Meeting

Sunday, September 27

7:30-8:30	Breakfast
9:00	Collecting Trips-*Lakeside Lab Parking Lot*
12:00	Departures

1970 Cedar Creek MN
1974 Hocking Hills OH
1976 ANSP PA
1991 Clemson SC
1993 Delta Marsh MB
1995 Lakeside IA

North American Diatom Symposium

1978 Lakeside IA
1979 Douglas Lk MI
1981 Beaver Island MI
1983 Hocking Hills OH
1985 Hancock KY
1987 Treehaven WI
1989 Itasca MN
1997 Douglas Lk MI
1999 Pingree Park CO
2001 Ely MN
2003 Isla Morada FL
2005 Mobile AL
2007 Douglas Lk MI
2009 Lakeside IA

20th NORTH AMERICAN DIATOM SYMPOSIUM DETAILED PROGRAM

Thursday, September 24

7:15-8:15	Breakfast-*Lakeview Lodge Conference Center*
8:40-9:00	Opening remarks and welcome-*Lakeview Lodge Conference Center*, Peter van der Linden, Executive Director, Iowa Lakeside Laboratory and Jason McDuffie, Executive Director, Presbyterian Camp on Okoboji
9:00-10:00	Plenary Talk, **Dr. David Jewson**, University of Ulster: "Diatom ecology: Why do it?"
10:00-10:20	Coffee Break
10:20-12:00	Scientific Session I - Ecology (Oral Presentations) Co-moderators: Nathan J Smucker, R Keveren
10:20	**Cooper, JT** and Bergey, EA BIODIVERSITY AND ECOLOGY OF EPHEMERAL ROCK POOL DIATOMS IN SOUTHERN OKLAHOMA
10:40	**Smith, ME** and Manoylov, KM INFLUENCE OF AGRICULTURAL PRACTICES ON ALGAL COMMUNITY ON LAKE OCONEE, GEORGIA
11:00	**Bach, NA** and Pillsbury, RW THE EFFECTS OF DISTURBANCE AND NUTRIENT ADDITION ON A PERIPHYTON COMMUNITY DOMINATED BY *DIDYMOSPHENIA GEMINATA*
11:20	**Munyon, JW** and Gaiser, EE EFFECT OF PHOSPHORUS ON PERIPHYTON MAT STRUCTURE AND COMPOSITION USING EXPERIMENTAL MICROCOSMS
11:40	**Anderson, NJ** Pla, S, McGowan, S, Foy RH and Engstrom, DR THE ECOLOGICAL RESPONSE OF UPLAND LAKES IN IRELAND TO MULTIPLE STRESSORS: DIATOM PERSPECTIVES
12:00-1:00	Lunch
1:30-2:50	Scientific Session IIa-Paleolimnology (Oral Presentations) Co-moderators: Tisza Bell, Trisha L Spanbauer
1:30	**Hobbs, WO**, Fritz, SC, Stone, JR, Donovon, JJ, Almendinger, J, and Grimm, EC DIATOM RESPONSE TO GROUNDWATER FLUCTUATIONS IN A CLOSED-BASIN LAKE OVER THE LAST 8500 YRS
1:50	**Scotese, K** and Wolin, J A 30 LAKE DIATOM TP CALIBRATION SET FROM THE ERIE / ONTARIO DRIFT PLAIN ECOREGION
2:10	**Westover, KS** and Bigler, C A HIGH-RESOLUTION DIATOM-INFERRED CLIMATE RECONSTRUCTION FROM A DEEP ALPINE LAKE
2:30	**Ramstack, JM**, Shinneman, ALC, Edlund, MB, Juggins, S, and Williamson, J PALEOLIMNOLOGY OF SHALLOW LAKES: LIMITATIONS OF DIATOM-BASED TRANSFER FUNCTIONS AND A MULTI-PROXY APPROACH
2:50-3:10	Coffee Break
3:10-4:50	Scientific Session IIb-Systematics and Taxonomy (Oral Presentations) Co-moderators: Joshua Cooper, Josh G Stepanek
3:10	**Hamsher, SE,** Evans, K, Mann, DG, and Saunders, GW BARCODING DIATOMS: EXPLORING ALTERNATIVE MARKERS TO COI
3:30	**Ashworth, MP**, Ruck, EC, Romanovicz, DK, Lobban, CS, and Theriot, EC ULTRASTRUCTURE AND MOLECULAR EVIDENCE REVEAL ARAPHID PENNATE ANCESTRY FOR A ROUND, UNDESCRIBED TROPICAL DIATOM

3:50	**Kociolek, JP** THREE NEW SPECIES OF THE DIATOM GENUS *GOMPHONEMA* EHRENBERG FROM INDIA AND PHYLOGENETIC RELATIONSHIPS OF THE FRESHWATER CYMBELLOID AND GOMPHONEMOID DIATOMS
4:10	**Thomas, EW** and Kociolek, JP NOT JUST CURVATA, ANYMORE – INTERESTING RHOICOSPHENIA GRUNOW OF CALIFORNIA, U.S.A.
4:30-6:00	Break
6:00-7:00	Dinner
7:30-9:00	Scientific Session III - Poster Presentations (*Lakeside Lab, MacBride Hall and Mahan Hall*
9:00-	Evening Social-*Lakeside Lab, Dining Hall*

Friday, September 25

7:15-8:15	Breakfast
8:40-10:00	Scientific Session IVa-Lakeside Alumni (Oral Presentations) Co-moderators: Ruchi Bhattacharya, Nicholas Bach
8:40	**Stoermer, EF** A BRIEF HISTORY OF DIATOM STUDIES AT IOWA LAKESIDE LABORATORY
9:00	**Nakov, T** and Theriot, E PRELIMINARY MOLECULAR PHYLOGENY OF THE CYMBELLALES (BACILLARIOPHYCEAE)
9:20	**Carrick, HJ,** Price, KJ and Wagner, R PHOSPHORUS RETENTION IN STREAMS: APPLICATION OF AN IN SITU ENRICHMENT SYSTEM (ISES) TO ASSESS THE CONTRIBUTION OF BENTHIC BIOFILMS
9:40	**Shinneman, ALC**, Fritz, SC, Bennett, D, and Schmeider, J INFERRING LAKE DEPTH USING DIATOM ASSEMBLAGES IN THE SHALLOW, SEASONALLY VARIABLE LAKES OF THE NEBRASKA SAND HILLS (USA)
10:00-10:20	Coffee Break
10:20-11:40	Scientific Session IVb-Lakeside Alumni (Oral Presentations) Co-moderators: Set Ismael Castro, John Manier
10:20	**Main, SP** SOME INTERESTING DIATOMS FROM IOWA WETLAND MITIGATION SITES
10:40	**Stone, JR**, and Cohen, AS LATE-PLEISTOCENE DIATOM PALEOECOLOGY OF LAKE MALAWI: EVIDENCE OF EXTREME SHIFTS IN DEPTH AND MIXING REGIME
11:00	**Hein, MK** A POTENTIALLY NEW SPECIES OF *RHOICOSIGMA* FROM THE BAHAMAS
11:20	**Smucker, NJ** and Vis, ML DIATOM SUCCESSION IN ACID MINE DRAINAGE IMPACTED STREAMS: IMPLICATIONS FOR BIOFILM STRUCTURE AND FUNCTION
12:00-1:00	Lunch
1:30-2:50	Scientific Session Va - Celebration of CW Reimer (Oral Presentations) Moderator: Mark Edlund, A/V: Jay Munyon
1:30	**Lowe, RL** and Sherwood, AR DISTRIBUTION AND MORPHOLOGICAL VARIABILITY OF *COSMIONEIS* (BACILLARIOPHYCEAE) IN HAWAII
1:50	**Gaiser, EE** *MASTOGLOIA SMITHII* THWAITES *EX* WM. SMITH: A STRUCTURAL ENGINEER OF CALCAREOUS MATS IN KARSTIC SUBTROPICAL WETLANDS

2:10	**VanLandingham, SI** ALLEGED UNCONFORMITY AT THE HUEYATLACO ARCHAEOLOGICAL SITE (PUEBLA, MEXICO) ADVOCATED BY THE CENTER FOR THE STUDY OF THE FIRST AMERICANS IS NEGATED BY 37 LINES OF DIATOM CORRELATION
2:30	**Potapova, M** SERVING THE COMMUNITY OF DIATOMISTS: DR. REIMER'S LEGACY AT THE ANSP DIATOM HERBARIUM
2:50-3:10	Coffee Break
3:10-4:50	Scientific Session Vb - Celebration of CW Reimer (Oral Presentations) Co-moderators: Mary Ellen Benson, Ashley Sanders
3:10	**Theriot, EC**, Ashworth, MP, Jansen, RK, Nakov, T, and Ruck, EC THE DIATOM PHYLOGENY: STATUS AND PROSPECTS
3:30	**Garrison, PJ**, LaLiberte, GD, and Ewart, B THE IMPORTANCE OF WATER LEVEL CHANGES AND SHORELINE DEVELOPMENT IN THE EUTROPHICATION OF A SEEPAGE LAKE
3:50	**Bixby, RJ** and Zeek, EC A SIMPLE METHOD FOR CALCULATING VALVE CURVATURE
4:10	**Stevenson, RJ** HOW CAN DIATOMS BE USED TO ASSESS ECOSYSTEM SERVICES?
4:30	**Manoylov, KM**, Morales, EA, and Bahls, L FOUR NEW ARAPHID DIATOMS (BACILLARIOPHYTA) FROM RIVERS IN NORTH AMERICA
4:50-6:00	Break
6:00-9:00	Reimer Celebration Dinner and Social
9:00	NADS Auction-*Lakeside Lab, Mahan Hall*

Saturday, September 26

7:15-8:15	Breakfast
8:40-10:20	Scientific Session VI-Marine Environments & Education (Oral Presentations) Co-moderators: Lisa Kunza, Sylvia Seulbe Lee
8:40	**Burr, KL**, Litton, GM, and Brunell, MS DIATOMS OF THE GENUS *THALASSIOSIRA* FROM THE TIDAL SAN JOAQUIN RIVER, STOCKTON, CALIFORNIA USA
9:00	**Warnock, J** and Scherer, R REFINING MARINE DIATOM PALEOPRODUCTIVITY ESTIMATES FOR THE SOUTHERN OCEAN
9:20	**Wachnicka, A**, Gaiser, E, and Collins, L L EARNING FROM FOSSIL DIATOM RECORDS ABOUT PAST ENVIRONMENTAL CONDITIONS IN TWO SUBTROPICAL SOUTH FLORIDA ESTUARIES
9:40	**Julius, M**, Mayama, S, Katoh, K, Ohmori, H, Seino, S, Osaki, H, H, Hoffer, J, Lingle, K, Conroy, K, Lee, JH, Cheong, C, Lobo, EA, Witkowski, A, Srivibool, R, Muangphra, P, Jahn, R, and Kulikovskiy, M SIMRIVER AN INTERNATIONAL EDUCATIONAL TOOL EXPANDING UNDERSTANDING OF AQUATIC ECOSYSTEMS AND ENHANCING APPRECITAON OF DIATOMS
10:00	**Card, VM** DIATOM DIVERSITY AS A POLLUTION INDICATOR: AN INQUIRY-BASED LAB ACTIVITY FOR UNDERGRADUATE ECOLOGY COURSES
10:20-10:40	Coffee Break
10:40-11:40	Plenary Talk, **Dr. I. Gebeshuber**, University Kebangsaan Malaysia: "Learning from diatoms: Biomimetic Approaches"
12:00-1:00	Lunch

1:30-2:50	Scientific Session VIIa - Nanotechnology and New Methods (Oral Presentations) Co-moderators: Teofil Nakov, Amanda Pappas
1:30	**Nelson, H**, Ellis, S, and Poulton, NJ AUTOMATIC DETECTION, IDENTIFICATION, AND CLASSIFICATION OF PLANKTON USING A CONTINUOUS IMAGING PARTICLE ANALYZER (FLOWCAM)
1:50	**Tiffany, MA**, Nagy, SS, and Gordon, R THE BUCKLING OF DIATOM VALVES
2:10	**Stepanek, JG**, Janisch, R, and Julius, ML FROM MICRO TO MACRO: DETERMINING HYDRODYNAMIC PROPERTIES OF STALK FORMING DIATOMS
2:30	**Pillsbury, RW** and Stevenson, RJ THE RESPONSE OF DIATOMS TO AGRICULTURAL WATERSHEDS OF RIVERS FROM THE UNITED STATES
2:50-3:10	Coffee Break
3:10-4:30	Scientific Session VIIb-Monitoring (Oral Presentations) Co-moderators: Evan Thomas, Jonathan P Warnock
3:10	**Reavie, E** CONSEQUENCES OF TAXONOMIC DISCORD IN A GREAT LAKES MONITORING PROGRAM
3:30	**Kireta, AR,** Reavie, ED, Sgro, GV, Angradi, TR, Jicha, TM, Bolgrien, DW, and Hill, BH DIATOM INDICATORS OF DISTURBANCE IN U.S. GREAT RIVERS
3:50	**Charles, DF** DOCUMENTATION OF UNDESCRIBED DIATOM TAXA IN SURVEY AND MONITORING PROGRAMS
4:10	**Sgro, GV**, Reavie, ED, Kireta, AR, Angradi, TR, Jicha, TM, Bolgrien, DW, and Hill, BH COMPARISON OF DIATOM-BASED INDICES OF WATER QUALITY FOR MID-CONTINENT (USA) GREAT RIVERS
4:30-6:00	Scum Run-*Lakeside Lab, meet at Dining Hall for start*
6:00-7:00	Dinner
7:30-8:45	Workshop - Diatoms in education; education in diatoms (Organizer: V. Card)
7:30-8:45	Workshop - Working towards taxonomic consistency (Organizer: S. Spaulding)
9:00	Business Meeting

Sunday, September 27

7:30-8:30	Breakfast
9:00	Collecting Trips - Meet in Lakeside Lab Parking Lot
12:00	Departures

POSTER SESSION, *Thursday, September 24*

7:30-9:00 Scientific Session III - Poster Presentations - *Lakeside Lab, MacBride Hall (Posters P-1 thru P-18) and Mahan Hall (Posters P-19 thru P-38)*

P-1 Barinova, S and Tavassi, M CONTINENTAL ISRAEL DIATOM ALGAE GEOGRAPHIC DISTRIBUTION

P-2 Bell, T and McKnight, D A SHIFT IN DIATOM SPECIES REGIME DUE TO INCREASED PHOSPHORUS ASSOCIATED WITH THE THAW OF ALPINE PERMAFROST

P-3 Beyene, A, and Triest, L FRESHWATER POLLUTION AND DIATOM COMMUNITIES IN THE UPPER AWASH CATCHMENT, ETHIOPIA

P-4 Bhattacharya, R, Hausmann, S, Hubeny, B, Boss, S, Black, J, and Brown, E PAST FLOOD RECONSTRUCTION FROM LOWER WHITE RIVER, ARKANSAS USING DIATOMS AND SEDIMENT GEOCHEMISTRY AS PROXIES

P-5 Benson, ME FIRST OCCURRENCES IN A HIGHLY DIVERSE LATE EOCENE FRESHWATER DIATOM FLORA FROM THE FLORISSANT FORMATION, CENTRAL COLORADO, USA

P-6 Black, JL, Hausmann, S, Pienitz, R, Salonen, V, St-Onge, G, Bouchard, M, Cunningham, L, Francus, P, and Lamothe, M THE “CRYSTAL EYE OF NUNAVIK” (PINGUALUIT CRATER LAKE): DIATOM INFERRED PALEOENVIRONMENTAL RECORD FOR THREE PREVIOUS INTERGLACIAL PERIODS

P-7 Carboni, CA and Slate, JE TWO NEW PROPOSED *DIPLONEIS* AND *SYNEDRA* TAXA FROM THE EVERGLADES

P-8 Carra, M and Card, VM EVOLUTIONARY THEORY AND DIFFERENTIAL RATES OF SEXUAL REPRODUCTION IN DIATOMS

P-9 Castro, SI and Wolfe, AP HAVE ATMOSPHERIC EMISSIONS PRODUCED FROM THE EXTRACTION OF THE ATHABASCA OIL SANDS AFFECTED CANADIAN SHIELD LAKES?

P-10 Edlund, MB and Brant, LA *EUNOTIA CHARLIE-REIMERI*, A NEW *EUNOTIA* WITH AMPHOROID FRUSTULE SYMMETRY

P-11 Edlund, MB, Umbanhowar, CE and Ochiagha, C LINKAGES AMONG LANDSCAPE, WATER QUALITY, AND PLANKTONIC DIATOM COMMUNITIES IN THE CANADIAN LOWER ARCTIC

P-12 Edlund, MB DIATOMS IN PHILATELY: POSTAGE STAMPS DEPICTING DIATOMS

P-13 Siver PA, Wolfe AP and Edlund, MB EOCENE NONMARINE DIATOMS FROM NORTHERN CANADA

P-14 Eilers, RB and Manoylova, KM THE DIATOM ERA - ENVIRONMENTAL RESPONSIBILITY THROUGH AWARENESS, ATTITUDE, AND ACTION

P-15 Furey, PC, Lowe, RL, and Johansen, JR NEW *EUNOTIA* EHRENBERG TAXA FROM THE GREAT SMOKY MOUNTAINS NATIONAL PARK

P-16 Geyer, KM, Weilbacher, ME, and Manoylov, KM RESPONSE OF ALGAL COMMUNITY

TO ANTHROPOGENICALLY-INDUCED TEMPERATURE DIFFERENCES IN LAKE SINCLAIR, BALDWIN COUNTY, GEORGIA

P-17 Keveren, R, Hausmann, S, Kaufman, DS, Black, JL, and Dixon, JC RECONSTRUCTION OF PALEOLIMNOLOGICAL CHANGES THROUGH THE HOLOCENE: DIATOM BIOSTRATIGRAPHY OF GREYLING LAKE, CHUGACH RANGE, SOUTH-CENTRAL ALASKA

P-18 Kociolek, JP, Graeff, C, and Thomas, E A DESCRIPTION OF THE FRUSTULAR MORPHOLOGY OF *FRUSTULIA CREUZBERGENSIS* (KRASSKE) HUSTEDT, WITH COMMENTS ON ITS SYSTEMATIC POSITION

P-19 Kociolek, JP, Laslandes, B, Bennett, D, Thomas, E, Brady, M, and Graeff, C DIATOMS OF THE UNITED STATES. I. TAXONOMY, ULTRASTRUCTURE AND DESCRIPTIONS OF FIFTY NEW SPECIES AND OTHER RARELY REPORTED TAXA FROM LAKE SEDIMENTS IN THE WESTERN U.S.A

P-20 Kociolek, JP, Lowe, RL, and Sherwood, AR NEW SPECIES OF THE DIATOM GENUS *GOMPHONEMA* EHRENBERG (BACILLARIOPHYCEAE) FROM HAWAII

P-21 Kunza, LA, Pool, JR, Andrejic, J, Castro, SI, Inthongkaew, S, Jovanovska, E, Kohler, TJ, Main, SP, Manier, JT, Nakov, T, Purkey, MK, and Spaulding, SA *NEIDIUM* PFITZER FROM THE REIMER DIATOM HERBARIUM

P-22 LaLiberte, GD, and Garrison, PJ USING LAKE HISTORIES IN NATURAL RESOURCE MANAGEMENT: RECONSTRUCTION OF NUTRIENT LEVELS, SECCHI DEPTH, AND ALGAL BLOOM HISTORIES IN BIG ROUND LAKE, WISCONSIN, USA

P-23 Lee, SS, Rosi-Marshall, EJ, Peterson, CG, Kennedy, TA, Kampman, JR, and Wellard, HA EFFECTS OF TEMPERATURE AND VELOCITY FLUCTUATIONS ON DIATOM COMMUNITY COMPOSITION IN STREAMS

P-24 Manier, JT, Castro, SI, Inthongkaew, Kohler, TJ, Kunza, LA, Pool, JR, Purkey, MK, and Spaulding, SA NOTES ON IOWA DIATOMS: COMPARISON OF THE MORPHOLOGICAL RANGE OF MODERN POPULATIONS WITH SPECIMENS IN THE REIMER DIATOM HERBARIUM

P-25 Menicucci, AJ and Noble, PJ ELEVATION OF A VARIETY OF TETRACYCLUS LANCEA TO THE SPECIES LEVEL FROM THE QUINCY DIATOMITE, CENTRAL WASHINGTON, USA

P-26 Miranda, ALB and Kociolek, JP TAXONOMY AND ULTRASTRUCTURE OF SEVERAL DIATOM SPECIES FROM CARAJÁS NATION FOREST, PARÁ STATE, BRASIL

P-27 Noble, PJ, Chandra, S, and Kreamer, DK VARIATIONS IN THE VERTICAL DIATOM DISTRIBUTION IN A DEEP NEAR-OLIGOTROPHIC ALPINE LAKE DURING THE ONSET OF STRATIFICATION, FALLEN LEAF LAKE, CALIFORNIA

P-28 Ognjanova-Rumenova, N, Manoylov, KM, and Stevenson, RJ CHANGES IN CENTRIC DIATOM COMMUNITIES FROM TOP AND BOTTOM SEDIMENTS IN 24 MICHIGAN LAKES, USA

P-29 Ozbay, G, Coyne, K, Pappas, A, Lee, K, Reining, B, and Ko, A EVALUATION OF BENTHIC DIATOMS AS WATER QUALITY INDICATORS IN THE BLACKBIRD CREEK WATERSHED, DELAWARE

P-30 Purkey, M, Noble, PJ, Smith, SB, Karlin, RE, and Menicucci, AJ DIATOM RESPONSE TO THE TSOYOWATA ASHFALL IN FALLEN LEAF LAKE, CALIFORNIA

P-31 Ren, L and Potapova, M REPRESENTATIVES OF THE GENUS *PROSCHKINIA* FROM CHIHUAHUAN DESERT, NEW MEXICO

P-32 Ress, JA, Thomas, EW, Lowe, RL, and Kociolek, JP TWO INTERESTING GOMPHONEMOID DIATOMS FROM PSEUDOAERIAL HABITATS IN THE UPPER PENINSULA, MICHIGAN (U.S.A.)

P-33 Rushforth, SJ, Edlund, MB, Spaulding, SA, and Stoermer, EF THE REIMER HERBARIUM AT IOWA LAKESIDE LABORATORY

P-34 Sanders, AFP, Rines, JEB, and Wee, JL SOME *CHAETOCEROS* SPECIES FROM AN OLIGOHALINE, SUBTROPICAL ESTUARY

P-35 Spanbauer, TL, Stone, JR, Saros, JE, and Fritz, SC *CYCLOTELLA* RESPONSE TO CLIMATE CHANGE DURING THE HOLOCENE: AN ANALYSIS OF THE DIATOM PALEOECOLGY OF A PRISTINE ALPINE LAKE IN GLACIER NATIONAL PARK

P-36 Stone, J and Westover, K THE DIATOM WIKI: AN ONLINE COMMUNITY RESOURCE

P-37 Winter, D, Sjunneskog, C, and Chow, J NEAR-SHORE *THALASSIOSIRA* SPECIES FROM THE PLIOCENE SECTION OF THE ANDRILL AND-1B DRILLCORE, MCMURDO SOUND, ANTARCTICA

P-38 Winter, D, Vander Meer, D, and Bollman, W DIATOM QUALITY ASSURANCE PROTOCOLS: METHODS, DIFFICULTIES AND SUGGESTIONS FOR IMPROVEMENT

P-39 Zalack, JT, Wolin, JA, and Stevenson, RJ DEVELOPMENT OF A MULTIMETRIC LAKE DIATOM CONDITION INDEX FOR THE CONTINENTAL UNITED STATES

ABSTRACTS FOR ORAL AND POSTER PRESENTATIONS

THE ECOLOGICAL RESPONSE OF UPLAND LAKES IN IRELAND TO MULTIPLE STRESSORS: DIATOM PERSPECTIVES

N. John Anderson[1], Sergi Pla[1], Suzanne McGowan[2], Robert H. Foy[3] and Daniel R. Engstrom[4]

[1]Department of Geography, Loughborough University, Loughborough, LE11 3TU, U.K.
[2]Department of Geography, University of Nottingham, Nottingham, U.K.
[3]Agri-Food & Biosciences Institute, Newforge Lane, Belfast BT9 5PX, Northern Ireland, U.K.
[4]St. Croix Watershed Research Station, Science Museum of Minnesota, Marine on St. Croix, MN, USA

Afforestation has been promoted as an alternative to extensive agriculture in upland regions of Ireland but ploughing, fertilization and planting on organic moorland soils is likely have considerable effects on ecologically sensitive upland lakes. These lakes are also subject to changing sulphate deposition, DOC losses and temperatures. Given the lack of monitoring predating the initial afforestation in 1950s, it is difficult to evaluate how these multiple stressors impact on oligotrophic upland lakes. To define the extent of these impacts for a series of upland lakes in northwest Ireland, covering a gradient from complete catchment afforestation to control sites with no planting, we took sediment cores and used a range of palaeolimnological techniques (diatom and HPLC pigment analyses, ^{210}Pb dating and aquatic macrofossils) to describe recent trends in diatom diversity, dry mass accumulation rates, algal biomass, DOC and changes in macrophyte cover. Diatom stratigraphic changes at these small upland lakes is remarkably complex and often pre-dates the start of afforestation. Unambiguous response to catchment fertilization was observed at only one site (increased abundance of *Asterionella formosa*). Other changes include recovery from natural (?) acidification (decline in *Tabellaria binalis*) and the increase of small *Cyclotella* spp, which is being increasingly observed in northern hemisphere lakes and probably reflects increased atmospheric nitrogen deposition. These species changes over the last 100-years preclude the application of transfer functions to infer a chemical variable, i.e. pH, DOC or nutrients and highlight the problems that can result from reducing ecological complexity to a single reconstructed variable. *Thursday 11:40 AM ORAL PRESENTATION*

ULTRATSRUCTURE AND MOLECULAR EVIDENCE REVEAL ARAPHID PENNATE ANCESTRY FOR A ROUND, UNDESCRIBED TROPICAL DIATOM

Matt P. Ashworth[1], Elizabeth C. Ruck[1], Dwight K. Romanovicz[2], Christopher S. Lobban[3], Edward C. Theriot[4]

[1] Section of Integrative Biology, University of Texas at Austin, Austin, TX 78712, USA
[2] Institute for Cellular and Molecular Biology, of Texas at Austin, Austin, TX 78712, USA
[3] University of Guam, Mangilao, Guam 96923, USA
[4] Texas Natural Science Center, University of Texas at Austin, Austin, TX 78712, USA

Recent sampling of diatoms in Guam has revealed a wealth of undescribed diversity. One of these undescribed taxa, tentatively referred to as “starry centric,” is a round diatom with elongate chloroplasts that radiate from an internal cup-like structure in the center of the valve. This cup-like structure is similar to structures found in the araphid pennate diatom genera *Cyclophora* and *Hustedtiella*, and in fact preliminary molecular phylogenetic analysis suggested a close relationship between “starry centric” and *Cyclophora*. Further investigations into the ultrastructure of these diatoms (determined by TEM) and a more expansive, 3 gene molecular phylogenetic analysis have continued to suggest a close relationship between these two taxa. While this is hardly the first round diatom suggested to be derived from an araphid pennate lineage, it might be the most distinct synapomorphy (in this case, the cup-like structure in the valve) uniting two such morphologically dissimilar diatoms. *Thursday 3:30 PM ORAL PRESENTATION*

THE EFFECTS OF DISTURBANCE AND NUTRIENT ADDITION ON A PERIPHYTON COMMUNITY DOMINATED BY *DIDYMOSPHENIA GEMINATA*

Nicholas A. Bach[1] and Robert W. Pillsbury[1]

[1]Department of Biology and Microbiology University of Wisconsin Oshkosh, Oshkosh, WI

The invasive diatom *Didymosphenia geminata* can successfully compete with native periphyton communities in cold-water, oligotrophic streams, often degrading the utility of trout streams. In Rapid Creek, SD, *D. geminata* occurs in discreet, high density patches while visually absent from other sections. Starting in 2007, nutrient additions (N and P) were continuously added to a section of Rapid Creek for another study. This allowed us to place a series of ceramic tiles in 4 distinct habitats; 1) native periphyton with no nutrient addition, 2) *D. geminata*-dominated periphyton with no nutrient addition, 3) native periphyton with nutrient addition, and 4) *D. geminata* -dominated periphyton with nutrient additions. Tiles from each habitat were also subjected to three disturbance patterns (low, medium, and high). All tiles were scraped, measured for chlorophyll a, and algal species composition determined. The experiment ran for 21 days in July, 2008. Low disturbance tiles had significantly ($p = 0.001$) greater periphyton growth rates compared with medium and high disturbance tiles. Algal biomass determined from rocks suggest that the stream is nutrient limited. However results from the tiles indicate that short-term, periphyton, growth rates are greater without nutrient addition ($p=0.001$). This may be due to shifts in the species composition and architecture of the periphyton mats, in which the community is changing from one dominated by araphids (*Diatoma* sp. and *Fragilaria* sp.) to one of primarily *Achnanthidium* sp. A pilot experiment comparing an existing periphyton communities to bare rock suggest that *D. geminata*, in Rapid Creek, is slow to colonize and prefers established periphyton communities ($p = 0.001$) in order to attach. Implications for the management of *D. geminata* will be discussed.
Thursday 11:00 AM ORAL PRESENTATION

CONTINENTAL ISRAEL DIATOM ALGAE GEOGRAPHIC DISTRIBUTION

Sophia Barinova and Moti Tavassi

Institute of Evolution, University of Haifa, Mount Carmel, Haifa, 31905, Israel

Israel presents a unique diversity of algal environments for such a small territory. Taxonomic diversity of freshwater algae of Israel includes 1621 species of 289 genera from ten taxonomical divisions. The diatoms constitute 32.3% (523 species). A notable feature of the taxonomic structure is a large proportion of monomorphic species. The freshwater algae are collected from a wide range of altitudinal belts, from coastal plains to mountainous areas about 2000 m high and over the four phytogeographic realms recognized on the basis of the higher plant differentiation. Here we analyze statistical regularities of diatom distribution and compare them with the phytogeographic zonation based on higher plants. We recognized 42 types of geographic ranges combined in six phytogeographic domains. Four clusters of diatom taxa correspond to the coastal plains (I), the Judean and Galilean highlands (II), piedmonts (III), and the Dead Sea – Kinneret Lake Rift Valley. Cosmopolitan or widespread in the Northern hemisphere species are prevail, with a considerable participation of rare and endemic elements. Close correspondence was found in distribution of higher plants and diatoms of the Paleotropical, Sakharo-Arabian and Sudano-Zambesian provinces. The endemic diatoms, altogether 10 species (about 1% of the algoflora, which is not a negligible number for a small territory), are confined to the Rift Valley and the adjacent areas of Central Negev. They are interpreted as neoendemics mostly, reflecting the Quaternary history of the Rift Valley environments and biota. The freshwater ecosystems under such climates might have approached those of the northern Israel today. Differentiation of endemic species might have occurred under the impact of aridization through the Holocene and the recent warming. *P-1 POSTER PRESENTATION*

A SHIFT IN DIATOM SPECIES REGIME DUE TO INCREASED PHOSPHOROUS ASSOCIATED WITH THE THAW OF ALPINE PERMAFROST

Tisza Bell and Diane McKnight

Institute of Arctic and Alpine Studies, University of Colorado, 1560 30th Street Boulder, CO 80303

Green Lake 4 is an alpine lake in Rocky Mountain National Park, Colorado. Many alpine lakes similar in productivity and elevation to Green Lake 4, have shown a recent shift in diatom species. Nitrogen has been shown to be increasing in alpine lake systems of the Rocky Mountain Front Range due to atmospheric deposition. Species associated with oligotrophic systems are being replaced with more common species that are tolerant of higher nutrient concentrations. However, little is known about the role phosphorous. The bedrock of the watershed in which Green Lake 4 sits is composed of apatite. When eroded, dissolved, and introduced into alpine lakes by snowmelt, apatite acts as a phosphorus surrogate. With recent warming in the alpine area of Green Lake 4 and the melting of alpine permafrost, a pulse in stream flow has been observed in the fall months of the last twenty years unrelated to any precipitation events and is likely the result of thawing permafrost. In order to understand the effects of this pulse in stream flow and mobilization of available phosphorous, the top 10cm of the sediment core, representing approximately the last 20 years will be analyzed including diatom community abundance and identification reflecting the diatom diversity and abundance, in the water column during this period based on comparisons from previous research in the lake. *P-2 POSTER PRESENTATION*

FIRST OCCURRENCES IN A HIGHLY DIVERSE LATE EOCENE FRESHWATER DIATOM FLORA FROM THE FLORISSANT FORMATION, CENTRAL COLORADO, USA

Mary Ellen Benson

Department of Geological Sciences, University of Colorado, Boulder, Colorado 80309, USA

The 34 million-year-old lake sediments of the Late Eocene Florissant Formation in central Colorado contain the most diverse (genus-rich) early freshwater diatom flora on record. Six genera were identified by Frank Round and David Williams, as reported by Harding and Chant in 2000. A preliminary examination by Eugene Stoermer, cited by Meyer in 2003, indicated that taxa with affinities for 19 modern genera were observed. A reported, but undescribed, minimum of 30 species were recognized by Lohman, as stated by Lohman and Andrews in 1968; but neither location information nor a list of taxa was provided. The present investigation has resulted in the identification of a minimum of 20 genera, many with multiple species, from a single field site. Descriptions of these taxa, their geochronology, and an overview of the relationship of diatom assemblages with associated biota and with sedimentological parameters within the lake beds are on-going aspects of this study. It is anticipated that this Late Eocene record will provide to the greater diatom research community necessary paleontological data for interpreting the stratigraphic and phylogenetic history of several diatom lineages. The Florissant diatom flora, composited from all sources above, is compared in composition and taxon richness with published accounts of pre-Neogene freshwater floras of Cretaceous and Middle Eocene age. Similar to the Middle Eocene lake beds of Canada and Wyoming, the Late Eocene Florissant lake deposit is in its own unique position to inform the evolutionary record of the earliest of freshwater diatoms. First, it is unique in its position relative to global climate change, as Florissant lake existed during the final phase of the warmer global climates of the Paleogene, just prior to major cooling trends that characterized the Neogene. As well as the superior taxon richness and the decidedly modern taxonomic affinity, the Florissant flora, as a consequence of its greater diversity, yields the first reported occurrence in the geologic record of 14 genera. These first-appearing genera represent centric, araphid, biraphid, and monoraphid morphologic groups. Although they must be treated as apparent first occurrences due to the innate incompleteness of the fossil record, such appearances confirm that many of the modern genera had evolved before the end of Paleogene time. The Florissant flora, thereby, provides concrete evidence of the sequence and timing of phylogenetic changes that accompanied the Late Paleogene to Neogene increase in freshwater diatom taxonomic diversity and adds the context of global climate. *P-5 POSTER PRESENTATION*

FRESHWATER POLLUTION AND DIATOM COMMUNITIES IN THE UPPER AWASH CATCHMENT, ETHIOPIA

Abebe Beyene [1, 2], Ludwig Triest [1]

[1]Plant Science and Nature Management, Vrije Universiteit Brussel, Pleinlaan 2, B-1050 Brussels, Belgium
[2]School of Environmental Health, Jimma University, P.O.Box 378, Jimma, Ethiopia

Uncontrolled population growth in developing countries leads to agricultural intensification and crowded urban settlement, which have increased pressure on the environment through time. Despite this pollution alarm little is known about the

ecological status of rivers and streams flowing through agricultural and urban landscapes. Physicochemical and biological river water quality assessment were carried out in the Upper Awash Catchment that is impacted by agricultural malpractices in the upstream sites and receive untreated waste from the capital city (Addis Ababa) in downstream sites. Both physicochemical and biological data revealed that there was drastic ecological water quality deterioration as result of both severe agricultural and urban impact. Dissolved oxygen (DO) was depleted to a level of 0.2 mg/L, while chemical oxygen demand (COD) was reached a peak (1920 mg/L) in downstream sites. Diversity of diatom species was significantly reduced in urban impacted sites. Canonical Correspondence Analysis (CCA) was also revealed a gradient in diatom communities explained by this extreme pollution. *Navicula accomoda* Hust., *Nitzschia palea* Küz., and *Gomphonema parvulum* Küz. were the dominant diatom species found in the urban impacted sites, where as *Achnanthes minutissima* Küz., and *Nitzschia amphibian* Grun. were abundant in agricultural impacted sites. *P-3 POSTER PRESENTATION*

PAST FLOOD RECONSTRUCTION FROM LOWER WHITE RIVER, ARKANSAS USING DIATOMS AND SEDIMENT GEOCHEMISTRY AS PROXIES

Ruchi Bhattacharya[1], Sonja Hausmann[1], Bradford Hubeny[2], Stephen Boss[1], Jessica Black[1], and Erik Brown[3]

[1]Department. of Geosciences, Ozark Hall 113, University of Arkansas, Fayetteville, AR, 72701
[2]Department of Geological Sciences, Salem State College, 352 Lafayette St, Salem, MA 01970
[3] Large Lake Observatory, University of Minnesota Duluth, Duluth, MN 55812

The White River in South Eastern Arkansas has been subjected to major river regulation which has likely influenced the flood regime of the river and thus affected the wetland ecosystem of the lower White River. In order to understand the effect of river regulation on flooding frequency we aim to reconstruct the past flood history of the lower White River, South Eastern Arkansas. Sediments deposited in oxbow lakes along the White River by the100yr flood event in spring 2008 are used as a modern analogue for past flood events with diatoms and geochemistry as the major proxies. Thirty oxbow lakes were selected along the gradient of flooding frequency and surface sediment and water samples were collected from each lake. A principle component analysis (PCA) for water chemistry and sediment geochemistry found the lakes located proximal to the river channel are characterized by lower sill elevations, are deeper, more turbid, and have higher Zn concentrations suggesting a riverine signature. Lakes located farther away from the main channel are characterized by higher sill elevations, have more transparent water columns, are shallower, and have higher conductivity suggesting a higher input of saline ground water compared to riverine input. Analysis of the Diatoms analysis from the surface sediments of the 30 lakes is currently in progress and will be used together with the environmental data to construct a training set for flooding frequency. A 3m long sediment core was recovered from Maddox Bay Slough. Lead-210 dating of the top 28 cm of the core revealed an undisturbed high resolution record with an average sedimentation rate of 0.65 cm/year. AMS dating of a plant macrofossil showed a bottom age of AD 1280 ± 10 (Cal BP 670 ± 10). To identify the flood layers, the sediment cores were analyzed by a multi sensor core logger for magnetic susceptibility (MS), metals were analyzed by XRF scanning, and diatom assemblages were analyzed. Peaks in MS and Zn occurred when there was a decrease in diatom flux. Zinc and diatom concentrations are anti-correlated and are useful indicators of flood pulses along with MS. A comparison with the recorded peak gage height showed that over the past 50 years the flood peaks show an increase in *Fragilaria* spp. and a subsequent decrease in *Gomphonema* spp. Future work plan includes more detailed diatom analysis, grain size, and paleomagnetic analysis to help with further identification of the flood layers. *P-4 POSTER PRESENTATION*

A SIMPLE METHOD FOR CALCULATING VALVE CURVATURE

Rebecca J. Bixby[1] and Erik C. Zeek[2]

[1]Department of Biology and Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico, 87131 [2]Sandia National Laboratories, Albuquerque, New Mexico, 87185-1153

Many diatoms are differentiated by simple, discrete morphometric differences such as length, width, and striae counts. In addition, the curvature of the valve can also be a distinguishing morphometric character. Curvature calculation is an intermediate technique between simple, direct measurements (i.e., length, width) and more formal shape analysis. The goal of this work is to develop a simplified shape analysis to measure diatom curvature. The curvature (or the inverse radius) is estimated by measuring the length of a chord (a line that intersects a circle at two points) and the sagitta (the longest distance between the chord and the arc). These measurements correspond to the diatom valve length and valve deflection in an arc of a diatom. These measurements are incorporated into the equation: $c = 2b\,(a^2 + b^2)^{-1}$ (where c = curvature, a = half of the chord length, and b = sagitta). Why calculate the curvature rather than the radius? We chose curvature because a straight line has an infinite radius but zero curvature and many diatoms tend to be relatively straight. This equation has been utilized to estimate the curvature of the valve margin and of the center line. In addition, this analysis can also be applied to smaller sections of the valve (i.e., valve inflation, apices, and central striae). This method can also be used to estimate the diameter of centric diatoms when only part of the valve is present. We present two examples of using curvature measurements to determine morphological differences among taxa.

1. Valve margin curvature:
The curvature of the center-line of diatoms can be used to differentiate species of bent taxa. For example, species within the genus *Hannaea* exhibit different amounts of curvature; calculation of a curvature metric can be used to distinguish among species.
2. Measuring the (a)symmetry of diatom valves: This technique is useful for taxa with variable symmetry within the genus such as *Cymbella*, *Encyonema*, and *Eunotia*. If diatom is symmetric, the difference in curvatures of both margins will be near zero. If a diatom is asymmetric, differences in curvature of both margins will not be near zero, which indicates some degree of valve asymmetry. *Friday 3:50 PM ORAL PRESENTATION*

THE “CRYSTAL EYE OF NUNAVIK” (PINGUALUIT CRATER LAKE): DIATOM INFERRED PALEOENVIRONMENTAL RECORD FOR THREE PREVIOUS INTERGLACIAL PERIODS

[1,2]**Jessica L. Black**, [1]Sonja Hausmann, [2]Reinhard Pienitz, [3]Veli-Pekka Salonen, [4]Guillame St-Onge, [5]Michel Bouchard, [6]Laura Cunningham, [7]Pierre Francus, and [8]Michel Lamothe

[1]Department of Geosciences, University of Arkansas, 113 Ozark Hall, Fayetteville, AR 72701
[2]Université Laval, Québec, G1V 0A6, Canada,
[3]Department of Geology, Univ of Helsinki, P.O. BOX 64, Helsinki, FIN-00014, Finland,
[4]ISMER/GEOTOP, University of Quebec at Rimouski, Rimouski, QC G5L 3A1, Canada,
[5]Centre des Technologies de l'Environment de Tunis (CITET), Université de Montréal, Montréal, QC H3T 1J4, Canada,
[6]Abisko Scientific Research Station, Umea University, Abisko, SE-981 07, Sweden,
[7]Centre Eau, Terre et Environnement, Institut national de la recherche scientifique, 490 rue de la couronne, Québec, QC G1K 9A9, Canada
[8]Département des sciences de la Terre et de l'Atmosphère, Université du Québec à Montréal, CP 8888 Centre-ville, Montréal, QC H3C 3P8, Canada

The sediments of the 1.4. Ma old Pingualuit Crater Lake known as the "*Crystal Eye of Nunavik*" offer the unique opportunity to study terrestrial climate dynamics not only during the postglacial period, but over several hundreds of thousands of years as its deep sediment infill yields an uninterrupted arctic paleoclimate record. The Pingualuit meteoritic crater (Nunavik, Canada; 61°17' N, 73°41' W) is located in the northernmost part of the Ungava Peninsula in northern Quebec - close to the area where the Laurentide Ice Sheet reached maximum thickness during the last (Wisconsinan) glaciation. In May, 2007 ~10 m of sediments was recovered from the crater lake at a water depth of 270 m using a UWITEC piston percussion corer system. Here we present results of limnological measurements (PAR, UV light transparency), sedimentological (grain size, MS), micropaleontological (diatom), and stratigraphic interpretations of Pingualuit Crater Lake sediments. There are two decimetre-thick intervals in addition to the uppermost Holocene sediments composed of laminated, dark grey clayey-silts characterized by a relatively low density and magnetic susceptibility, that contrast sharply with the thicker over- and underlying sections with light grey, denser, sandy sediments. Moreover, these two intervals contain fossil diatoms and chrysophytes, suggesting that these two intervals represent ice-free conditions and thus interglacials, whereas the more extensive light grey and sandy sediments reflect glacial intervals. Initial TL dates indicate the first interglacial after the Holocene corresponds to MIS 5d and the second interglacial corresponds to MIS 7. The Holocene, MIS 5, and MIS 7 interglacials are characterized by three statistically different diatom assemblages, likely reflecting different forcing mechanisms controlling the lake environment during those warm times. In addition, the oldest interglacial period recovered MIS 7 was dominated by species of *Cyclotella* not yet described, and which went extinct directly after the end of MIS 7. The timing and magnitude of the interglacial periods have been reconstructed from Pingualuit Crater Lake and will be compared with other records from around the Arctic. *P-6 POSTER PRESENTATION*

DIATOMS OF THE GENUS *THALASSIOSIRA* FROM THE TIDAL SAN JOAQUIN RIVER, STOCKTON, CALIFORNIA USA

Kari L. Burr[1], Gary M. Litton[2] and Mark S. Brunell[1]

[1]Department of Biological Sciences, University of the Pacific, Stockton CA USA
[2]Department of Civil Engineering, University of the Pacific, Stockton CA USA

Several species of the diatom genus *Thalassiosira* Cleve, were observed in freshwater phytoplankton samples collected from a fifty-two kilometer reach of the San Joaquin River in the vicinity of Stockton, California, USA. The study was conducted between the South Airport Way bridge near Vernalis and the Stockton Deep Water Ship Channel during fall and summer of both 2005 and 2006. The entire reach is freshwater habitat with the lower twenty-eight km strongly influenced by tidal flow reversals driven by the San Francisco Estuary. Ninety four whole water samples were collected from surface waters during the months of July, August, September and October in 2005 and the months of July and August in 2006. Six species of *Thalassiosira* were identified using scanning electron and light microscopy: *T. weissflogii* (Grunow), *T. incerta* (Makarova), *T. decipiens* (Grunow), *T. visurgis* (Grunow), *T. lacustris* (Grunow) and *T. gessneri* Hustedt. Of the species observed, only *T. weissflogii* has been previously reported in the freshwater portion of the San Joaquin River. The other five species have been previously reported from sites in the San Joaquin - San Francisco Estuary characterized as brackish, suggesting they are distributed in waters of various salinities ranging from freshwater to brackish within the river and estuary. *Saturday 8:40 AM ORAL PRESENTATION*

TWO NEW PROPOSED *DIPLONEIS* AND *SYNEDRA* TAXA FROM THE EVERGRADES

Cecilia A. Carboni and Jennifer E. Slate

Biology Department, Northeastern Illinois University, Chicago, IL 60625 USA.

The Florida Everglades, one of the largest subtropical wetlands in the world, has an amazing variety of diatom taxa of both temperate and tropical origins. We analyzed samples from both phosphorus-enriched northern Water Conservation Area 2A (WCA-2A) and the relatively un-enriched southern WCA-2A. Samples were taken from floating algal mats, sediment cores, the epiphytic community, and submerged glass slides. The proposed new *Diploneis* species resembles *D. ovalis* (Hilse) Cleve, *D. elliptica* (Kutzing) Cleve, and *D. boldtiana* Cleve in some characteristics but differs from these described species in key ways. For example, our specimens have nearly parallel sides, weakly radiate striae in the middle of the valve that become almost circumpolar at valve ends, and narrow longitudinal canals that are slightly arched in the central area, with pores that appear to be an extension of the striae. Interestingly, Everglades specimens closely resemble images of specimens from Cuba and Uruguay, suggesting that they are part of a distinct tropical taxon. The new *Synedra* species we propose also appears to be tropical, as it resembles images of specimens collected in Jamaica, Mexico, and Central America. It has been called *S. minuscula* Grunow and *Fragilaria famelica* (Kutzing) Lange-Bertalot by other authors, but we feel that it more closely resembles *Synedra tenera* W. Smith. Still, it differs from all of these taxa by having no hyaline central area and a much narrower pseudoraphe that SEM images reveal is caused by a slight gap between median punctae. In summary, both of the new *Diploneis* and *Synedra* taxa we propose appear to be tropical taxa that differ from taxa previously described from temperate areas. *P-7 POSTER PRESENTATION*

DIATOM DIVERSITY AS A POLLUTION INDICATOR: AN INQUIRY-BASED LAB ACTIVITY FOR UNDERGRADUATE ECOLOGY COURSES

Virginia M. Card

Natural Sciences Department, Metropolitan State University, St. Paul Minnesota USA 55106

Species diversity is a widely used biological indicator of pollution, and a topic widely covered in undergraduate courses in ecology for both majors and general education students. This talk will present a lab activity for undergraduate science courses in which diatoms are used to investigate this topic. The activity was designed using the principles of open-ended inquiry-based learning in lab design and engages students fully in the scientific method. Students apply theory that they have learned in lecture to a real-world example, and then work in teams to develop the hypothesis, design the experiment, collect and analyze the data, and then use the results to test the hypothesis. The lab structure is adaptable for use by students at different levels of sophistication in science. In this activity, light microscopy of live material, a practicable diatom morphospecies concept, and the metrics of species richness and Simpson's diversity index are used to compare of the diatom flora of two water bodies near the University campus in St. Paul, Minnesota. Specific details and results from Fall semester will be provided. This activity has the obvious additional pedagogical benefit of engaging students in the careful examination of this complex and charismatic taxonomic group. Diatoms rule! *Saturday 10 AM ORAL PRESENTATION*

EVOLUTIONARY THEORY AND DIFFERENTIAL RATES OF SEXUAL REPRODUCTION IN DIATOMS

Meegen Carra and Virginia M. Card

Natural Sciences Department, Metropolitan State University, St. Paul Minnesota USA 55106

When compared with asexual reproduction, the costs of sexual reproduction are many, and include: 1. Cellular Mechanical Costs: due to the lost time when organisms could be reproducing asexually 2. Cost of Meiosis: due to the energy and materials required to produce gametes 3. Cost of Fertilization: due to the time and energy spent finding a mate 4. Cost of Recombination: due to the probability that the original parental genotype may be lost. Balancing these costs, sexual reproduction maintains genetic diversity within populations, increasing the chances that some individuals will be fit in any different conditions, as well as by purging deleterious alleles through recombination and expression of alleles through homozygosity. This is especially important when organisms live in environments that are undergo frequent or unpredictable change. The costs of sexual reproduction are felt acutely by unicellular populations that have both asexual and sexual life cycles, since their growth rate is a direct reflection of their fitness. Diatoms (family Bacillariophyta) are a common unicellular alga found in both marine and freshwater environments that possess sexual and asexual life cycles, and in diatoms, sexual reproduction has the added benefit of restoring the larger, vegetative size to a population. Due to differences in sexual reproduction, centric and araphid diatoms are inferred to experience a higher cost for sexual reproduction than raphid pennate diatoms. Based on this, we hypothesize that raphid pennate diatoms will have a undergo sexual reproduction more frequently than centric or araphid diatoms, and predict that in a given diatom community, raphid pennates will show evidence of more frequent and/or more recent sexual reproduction than araphid and centric species in the same community. Samples of diatoms from Lake Phalen in St. Paul Minnesota were collected and the most abundant species in each group was counted and measured: a raphid pennate from the genus *Rhopolodia*, an araphid pennate from the genus *Fragilaria*, and a centric from the genus *Cyclotella*. Histograms of the size distributions were constructed for each species and support the hypothesis that sexual reproduction, as indicated by cell size frequency distributions, has occurred most frequently, and most recently, in the raphid pennate species. *P-8 POSTER PRESENTATION*

PHOSPHORUS RETENTION IN STREAMS: APPLICATION OF AN IN SITU ENRICHMENT SYSTEM (ISES) TO ASSESS THE CONTRIBUTION OF BENTHIC BIOFILMS

Hunter J. Carrick, Keith J. Price, and Rebecca Wagner

School of Forest Resources, The Pennsylvania State University, University Park, PA 16802 USA

Factors that influence the assimilation and subsequent downstream transport of nutrients in streams are not completely understood. Stream biofilms (benthic bacteria, fungi, and algae suspended in mucilaginous matrix) appear to play an important role in phosphorus (P) assimilation and retention; however, few measurements have been reported in the literature and even fewer experiments have been run to quantify their role. We evaluated P uptake rates of benthic biofilms along a stream productivity gradient in the mid-Atlantic region (Plateau and Piedmont provinces in Pennsylvania). We did 5 experiments using an in situ enrichment system, ISES (after Gibeau and Miller 1989) in each province. ISES used polystyrene vials filled with agar and spiked with increasing concentrations of KH_2PO_4 to deliver 5 relevant P loading treatments (0 to 2.0 g $P/m^2/d$) that spanned the range of P point sources reported in the literature, while nitrogen (N) was added as a blocked factor (5 levels of P, 2 levels of N, 6 replicates, n=60). The vials were capped with porous porcelain disks that acted as a colonizing substratum. Experiments were incubated in each stream for 14-17 days, after which replicate biofilms were removed, and their P-uptakes rates were measured using short-term radiotracer ($H_3{}^{33}PO_4$) experiments in the laboratory. As anticipated, P uptake by the biofilms declined with increasing P loads in all experiments; the decline was described using a hyperbolic decay function. Moreover, P storage (as biologically bound polyphosphate) into the biofilm matrix increased with P loading, indicating that the decline in P uptake was related to increased P-storage in the biofilm. These data suggest that biofilms exposed to low P loads, were starved, and therefore exhibited the greatest uptake rates for P. Similarly, biofilms growing in streams that were less productive (lower conductivity and benthic chlorophyll levels) showed higher uptake rates compared to those in high productivity streams. We conclude many streams in the mid-Atlantic region appear to be close to P-saturation (high internal pools) and have comparatively lower capacity to remove new P from the water. If P inputs exceed biofilm uptake capacity (inducing saturation), we predict downstream reaches to experience greater in stream transport of nutrients to terminal coastal ecosystems like the Chesapeake Bay. *Friday 9:20 AM ORAL PRESENTATION*

HAVE ATMOSPHERIC EMISSIONS PRODUCED FROM THE EXTRACTION OF THE ATHABASCA OIL SANDS AFFECTED CANADIAN SHIELD LAKES?

Castro, S.I. and Wolfe, A.P.

Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB T6G 2E3, Canada

Due to energy demands in the 1970s, technology was developed to facilitate the extraction of bitumen sand in northern Alberta, Canada. Increasing oil prices and the development of more economically feasible technology for extraction, mining, and refining of tar sands in the last decade, has caused an increase in NO_x emissions. There is growing ecological concern as these emissions have the potential of causing lake acidification in the poorly buffered Canadian Shield lakes. Diatoms from dated sediment cores of four Canadian Shield lakes were analyzed to determine whether increased nitrogen emissions have caused changes in diatom abundance and species assemblages that may be indicative of recent lake acidification.
P-9 POSTER PRESENTATION

DOCUMENTATION OF UNDESCRIBED DIATOM TAXA IN SURVEY AND MONITORING PROGRAMS

Donald F. Charles

Patrick Center for Environmental Research, Academy of Natural Sciences, Philadelphia, Pennsylvania 19103 USA

Diatomists frequently find undescribed diatom taxa in samples they analyze. In some projects (e.g., USGS NAWQA), a quarter of all taxa found may be undescribed. These taxa are often important as ecological indicators and are sometimes abundant. They are therefore typically given a project-specific provisional name so they can be included in data analysis and interpretation. There is usually insufficient funding to support formal description of these taxa, though many descriptions are eventually published. With increases in projects involving more than one analyst, in needs to combine and compare datasets, and in efforts to analyze trends over time, greater attention is being paid to procedures for documenting undescribed taxa and making that documentation publically accessible to other diatomists. There are strong needs to develop guidelines and standards for documenting undescribed taxa, to provide central locations for making images available, and to encourage diatomists to document undescribed taxa and make that information available. At the Academy of Natural Sciences, Dr. Charles Reimer used an effective set of procedures to help maintain consistency in designations of undescribed taxa among several analysts involved in biological surveys initiated by Dr. Ruth Patrick over a period of several decades. They included naming conventions, pencil drawings of specimens organized in project specific loose-leaf books, circled specimens, and lists tracking changes in names. Modified versions of these procedures were used by participants in large-scale projects such as the USGS National Water-Quality Assessment program (NAWQA), the Paleoecological Investigation of Recent Lake Acidification project (PIRLA), and others. Elements of procedures found to be most useful include taking photographs and digital images of representative specimens, circling specimens on microscope slides and depositing the slides in diatom collections, documenting sample and slide information, and making images available on websites. These procedures should be used more widely to increase effectiveness of diatom data for environmental assessment and to provide resources for future formal published descriptions of taxa and their ecological characteristics. *Saturday 3:50 PM ORAL PRESENTATION*

BIODIVERSITY AND ECOLOGY OF EPHEMERAL ROCK POOL DIATOMS IN SOUTHERN OKLAHOMA

Joshua T. Cooper and Elizabeth A. Bergey

Oklahoma Biological Survey and Department of Botany, University of Oklahoma, Norman, Oklahoma 73019 USA

Because granite rock pools are a harsh environment for most aquatic life, diatoms living in rock pools habitats may be specialists – or not. Our objectives were to inventory rock pool diatom communities, and relate community composition to spatial, physical, and chemical variables. We sampled 20-30 rock pools at each of three geographically isolated granite outcrops in southern Oklahoma (a total of 74 were sampled). We also sampled variables of pool morphology and water chemistry and recorded spatial coordinates. Rock pools were strongly dominated by species of *Stauroneis, Hantzschia, Luticola*, and *Pinnularia*, which comprised almost one-half of the 90+ species. Most of the remaining species were rare. Some species do not fit known descriptions and a few are known primarily from arctic habitats. The three outcrops are distinguished by differences in the relative abundance of a few common species and by presence or absence of rare species. Rock pool diatom communities include specialists, tolerant species, and accidentals. *Thursday 10:20 AM ORAL PRESENTATION*

LINKAGES AMONG LANDSCAPE, WATER QUALITY, AND PLANKTONIC DIATOM COMMUNITIES IN THE CANADIAN LOWER ARCTIC

Mark B. Edlund[1], Charles E. Umbanhowar[2] and Chiji Ochiagha[3]

[1]St. Croix Watershed Research Station, Science Museum of Minnesota, 16910 152nd St. N, Marine on St. Croix, Minnesota 55047 USA
[2]Department of Biology and Environmental Studies, St. Olaf College, Northfield, Minnesota 55057
[3]Department of Geology and Geophysics, University of Minnesota, Minneapolis, Minnesota 55455 USA

Arctic regions of North America are undergoing a rapid response to climate change. Temperatures in the arctic have risen 0.4° C per decade over the past 40 years. Responses to this warming include increased lake productivity, permafrost thaw, shrub expansion, and northward shifts in the subarctic tree line. As part of a three-year project to study the Holocene history of lakes and landscapes and their response to climate, we undertook the first hydrobiological survey along the northern Manitoba boreal forest-tundra ecotone. A set of 37 lakes that spanned the boreal-tundra tension zone were sampled for plankton diatom communities and physico-chemistry in July 2008. Diatoms were collected with composited 10 µm-mesh plankton hauls from 5 m to surface. Water quality measures included dissolved and total nutrients, anions and cations, pH, conductivity, Secchi, and water column profiles were taken and analyzed with standard methods. Coupled with lake sampling, landscape variables including watershed area, watershed to lake area ratios, wetland area within 100 m of lake shore and wetland percent within 100 m of lake shore were calculated using GIS and groundtruthing. To investigate the linkages among landscape, lakes, and the siliceous plankton, water quality variables were first ordinated using PCA and RDA against

landscape variables. Two primary gradients were identified: a pH-conductivity-Ca gradient and a phosphorus-dissolved organic carbon-Fe gradient. Among the landscape variables, percent wetland within 100 m of lake and latitude were strongly correlated to water quality variables, suggesting that landscape position and development across the tundra-boreal ecotone exert strong influence on water quality. Planktonic diatom communities were prepared using standard oxidative and mounting techniques. Diatoms and cyst morphotypes were analyzed under oil immersion-DIC optics. Species counts were converted to relative abundance against total diatom and cyst counts and ordinated using nMDS. Summer plankton communities in northern Manitoba were characterized by rich *Tabellaria*, *Aulacoseira*, cyclotelloid, chrysophyte, and tychoplanktonic araphid floras. Ordinations of plankton communities were strongly correlated with the pH-conductivity-Ca and SiO2 gradients and secondarily along the phosphorus gradient. These results suggest that the landscape-water quality-diatom relationships will prove useful for interpreting historical patterns in sediment cores. *P-11 POSTER PRESENTATION*

DIATOMS IN PHILATELY: POSTAGE STAMPS DEPICTING DIATOMS

Mark B. Edlund

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

For topical stamp collectors, there are only thirteen postage stamps that have been released worldwide which depict diatoms. The earliest diatom stamp was released in 1963 by South Georgia (Falkland Islands) and depicts *Sheshukovia* or *Triceratium* cells on a ten shilling "plankton and krill" that was part of a 16 stamp set of Antarctic marine life. Antarctic diatoms have continued to be the most popular subjects for diatom stamps. As a primary food source for the krill *Euphausia*, *Corethron criophilum* and *Chaetoceras* spp. have been portrayed on stamps issued by Poland, the British Antarctic Territory, and the Australian Antarctic Territory. Other Antarctic subjects have been packice diatoms and the food web supporting whales in two issues by the French Southern and Antarctic Territories. Marine plankton from more temperate waters have been highlighted as parts of larger sets on plankton diversity (Portugal, Monaco) or natural history (Isle of Man). Some of these stamps have also been parts of commemorative sets issued to honor special events such as the centennial of the Port Erin Marine Laboratory, the 20th anniversary of the Conservation Commission on Antarctic Marine Life, and Monaco's Musée Océanographique. To date, however, no diatom specific stamp set has been issued, nor has a freshwater diatom been depicted on a postage stamp. *P-12 POSTER PRESENTATION*

EUNOTIA CHARLIE-REIMERI, A NEW *EUNOTIA* WITH AMPHOROID FRUSTULE SYMMETRY

Mark B. Edlund[1] and Lynn A. Brant[2]

[1]St. Croix Watershed Research Station, Science Museum of Minnesota, 16910 152nd St. N, Marine on St. Croix, Minnesota 55047 USA
[2]Dept. of Earth Science, University of Northern Iowa, Cedar Falls, Iowa 50614

A new *Eunotia* species, *E. charlie-reimeri* is described from Bear Meadows Bog near State College, Pennsylvania. Bear Meadows (N 40°43' W 77°46', elev. 550 m) is an open montane poor fen that is about 1.6 km long and 0.5 km wide with its open wetlands dominated by *Sphagnum*, sedges, swamp laurel, blueberry, sundews, *Rhododendron* spp., alder, *Spiraea* spp., and mountain holly. *Eunotia charlie-reimeri* has been collected intermittently from Bear Meadows over the last decade. Among the eunotioid diatoms, *E. charlie-reimeri* is characterized by its arcuate-lunate valve, prominent terminal raphe ends, and two rimoportulae per valve. Most importantly, it has amphoroid frustule symmetry, a character recently used to support the description of the new eunotioid genus *Amphorotia* Williams & Reid. A sister taxon, *E. sarraceniae*, was described by Gaiser and Johansen from South Carolina bays, and shares the characteristic amphoroid symmetry and lunate shape, but *E. sarraceniae* is more finely striated and has more rostrate ends than *E. charlie-reimeri*. *P-10 POSTER PRESENTATION*

THE DIATOM ERA$_3$ -ENVIRONMENTAL RESPONSIBILITY THROUGH AWARENESS, ATTITUDE, AND ACTION

Ruth B. Eilers[1] and Kalina M. Manoylov[2]

[1]Academic Outreach, Georgia College & State University, Smith House, Milledgeville, GA 31061 USA
[2] Department of Biological and Environmental Sciences, Georgia College and State University, Milledgeville, GA 31061 USA

Global loss of biodiversity ranks among the most pervasive environmental changes of our time. The goal of this research is to introduce microbial biodiversity to K-12 students, as algae are present in every aquatic habitat. In Georgia children are not exposed to algae and diatoms until later in their education. A new framework of teaching children alongside aquatic habitats has allowed the linking of biodiversity with gradients of human influence. Since this program is long term, current assessments are more qualitative than quantitative. Interest has been shown from students based on enthusiasm at programs we have offered, and word-of-mouth conversations with formal and informal educators indicates that there is a need and desire for implementation in the classrooms. We developed a simple questionnaire to be completed by students and teachers to assess current knowledge about algae and any misconceptions. Pre- and post-tests were also developed for the curriculum to assess student understanding of the information provided in programs. We have found that there is a need and desire for information about algae and diatoms in the schools. Our project offered teachers the opportunity to incorporate algal studies into their classroom with little to no cost. In addition to a detailed curriculum that can be performed by teachers, GCSU Academic Outreach has staff available to make visits to schools, or accommodate classes in a field trip setting to introduce them to algal studies using the Georgia Performance Standards. We have currently completed the K-2 curriculum. We also have developed an outline and goals for 3-12 curriculums and are continuing to compile data from a variety of sources to create a teacher-friendly booklet about algae and diatoms that will contain information relevant to Georgia Performance Standards. We have also determined which Georgia Performance Standards can best be covered for each grade level using our proposed curriculum. We also plan to offer teacher trainings either as one day workshops in the schools, or as part of a summer workshop for teachers. *P-14 POSTER PRESENTATION*

NEW EUNOTIA EHRENBERG TAXA FROM THE GREAT SMOKY MOUNTAINS NATIONAL PARK

Paula C. Furey[1], Rex L. Lowe[2], Jeffrey R. Johansen[3],

[1]Department of Integrative Biology, University of California at Berkeley, Berkeley CA, 94720, USA
[2]Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403-0218, USA
[3]Department of Biology, John Carroll University, University Heights, OH 44118, USA

The acidophilic diatom genus *Eunotia* is understudied and documentation of the morphological forms of *Eunotia* specific to North America are limited. The Great Smoky Mountains National Park (GSMNP), USA, has a range of acidic, aquatic habitats amongst a complex geology at a variety of altitudes, making it an ideal location to explore the biodiversity of this taxonomically challenging genus. We inventoried the *Eunotia* taxa from samples collected from the lake, streams, wet walls, ponds, and bogs found throughout the GSMNP. We identified over 50 sub-generic taxa of *Eunotia*, including several species new to science. We present a taxonomic description and image rich documentation, including both scanning and electron micrographs, of 13 proposed new species (*E. areniverma*, *E. boomsma*, *E. canicula, E. cataractarum, E. enischna, E. horstii, E. kociolekiana, E. mydohaimasiae, E. obliquestirata, E. orthohedra, E. papilioforma, E. richbuttensis, E. rushforthiana*). This timely study contributes to our understanding of the North American, *Eunotia* flora, and will facilitate taxonomic comparisons with past and recent *Eunotia* flora descriptions from Europe and elsewhere. *P-15 POSTER PRESENTATION*

MASTOGLOIA SMITHII THWAITES *EX* WM. SMITH: A STRUCTURAL ENGINEER OF CALCAREOUS MATS IN KARSTIC SUBTROPICAL WETLANDS

Evelyn E. Gaiser

Department of Biological Sciences and Southeast Environmental Research Center, Florida International University, Miami, Florida 33199 USA

Mastogloia smithii Thwaites *ex* Wm. Smith is the dominant diatom in microbial consortia that form thick stromatolitic mats in the karstic, freshwater wetlands of the subtropical Americas. Despite oligotrophy, frequent desiccation, high irradiance and temperatures and occasional fire, freshwater stromatolites in these wetlands can produce over 2000 g m^{-2} of organic biomass, prompting studies that examine stress resistance and maintenance of structural integrity under extreme conditions. Collections from over 300 sites in the Florida Everglades and similar wetlands in Belize, Jamaica and the Yucatan show *M. smithii* to be a persistent structural component of freshwater stromatolites, present in 97% of samples and comprising ~ 40% of frustule counts of a diverse diatom community. Valves at various stages of division have been observed encased in extracellular polysaccharide that exceeds the cell volume; SEM observations confirm issuance from girdle band pores resulting in suspension of the cell in the filamentous cyanobactieral matrix. Experiments manipulating phosphorus, irradiance, desiccation, grazers and fire show that *M. smithii* populations are (1) reduced to zero in the presence of above-ambient phosphorus concentrations, (2) unaffected by 99% irradiance reduction, (3) capable of persisting 8 months of desiccation, (4) protected from grazers by embedding in calcitic mats and (5) able to reform mats 20 days after fire. This widespread diatom taxon appears to play a critical role similar to that of stromatolitic cyanobacteria in subtropical wetlands, and its disappearance in the presence of enrichment threatens biodiversity and function in these systems that are increasingly influenced by urbanization. *Friday 1:50 PM ORAL PRESENTATION*

THE IMPORTANCE OF WATER LEVEL CHANGES AND SHORELINE DEVELOPMENT IN THE EUTROPHICATION OF A SEEPAGE LAKE

Paul J. Garrison[1], Gina D. LaLiberte[1], and Brian Ewart[2]

[1]Wisconsin Department of Natural Resources, Bureau of Science Services, Madison, WI 53716
[2]Northeastern Wisconsin Audubon Society, Gillett, WI 54124

Berry Lake is a small seepage lake in northeastern Wisconsin that has historically undergone water level fluctuations on the order of 2.5 meters. At the present time most of the lakeshore has fairly intensive development. Some of the dwellings are seasonal residents but an increasing number are full time residents. While it is unclear how climate change will affect the nutrient status of lakes, one hypothesis is that fluctuating water levels will result in higher nutrient levels as a result of the concentration of nutrients during low water levels and the introduction of nutrients as water levels rise with the flooding of the previously dry and vegetated shoreline. Shoreline homes contribute nutrients to lakes through increased runoff as well as effluent from septic systems. A sediment core was collected to estimate changes that have occurred during the latter part of the Holocene period. The diatom community was used to infer changes in nutrient levels. The dominant diatoms were taxa associated with macrophytes with planktonic species, e.g. *Cyclotella michiganiana* only compromising a small part of the community. Prior to 1930 the dominant taxa were *Navicula vulpina* and an undescribed species of *Navicula*. The latter species is similar to *N. wildii* and *N. cryptofallax*. The unknown *Navicula* differs from the other two taxa by the striae being further apart from each other around the central area compared with elsewhere in the cell. Also the axial area around the central area is more enlarged than in similar species. With the onset of development around 1930, *Achnanthidium minutissima* and benthic Fragilariaceae, e.g. *Staurosira construens* and *Staurosirella elliptica*, increased in importance. The abundance of *A. minutissima* peaked around 1980 while the benthic Fragilariaceae where highest near the top of the core. The diatom community in the core indicates that nutrient levels increased more as a result of shoreline development than the result of water level fluctuations. During the 1930s water levels were very low and they were at their highest during the mid 1980s. The diatom community indicated that low water levels and subsequent reflooding of previously dry shorelines did not increase nutrients. Instead nutrient levels increased as a result of the intensification of development during the last 20 years. *Friday 3:30 PM ORAL PRESENTATION*

PLENARY PRESENTATION Saturday 10:40 AM
LEARNING FROM DIATOMS: BIOMIMETIC APPROACHES

Ille C. Gebeshuber[1,2,3]

[1]Universiti Kebangsaan Malaysia, Malaysia
[2]Institut of General Physics & TU BIONIK Center of Excellence,
Vienna University of Technology
[3]Austrian Center of Competence for Tribology, AC^2T research GmbH, Austria

We live in interesting times. Biology has changed from being very descriptive to a science that can be acknowledged and understood (in terms of concepts) by researchers coming from “hard sciences” such as chemistry, physics, mathematics and engineering. The “hard sciences” rely on experimental, empirical, quantifiable data or the scientific method, and focus

on accuracy and objectivity. The amount of causal laws in the new biology (indicated by the ratio of causal versus descriptive knowledge) is steadily growing. Additionally, a new field that can be called "Biological Physics" is currently emerging. The languages of the various fields of science increasingly get compatible, and the amount of collaborations and joint research projects between researchers coming from the "hard sciences" and biologists has grown tremendously over the last years. Diatom biomimetics, i.e., technology transfer from diatom research to engineering, is especially promising. Biomimetics is a growing field that has the potential to drive major technical advances. It might substantially support successful mastering of current challenges for humankind. Various examples will be given to illustrate these points, including a novel micropump inspired by chain-forming diatoms, diatom hinges and interlocking devices as inspiration for emerging three-dimensional micro-electro-mechanical systems and diatom spores and resting stages as inspiration for architecture.

Srajer J., Majlis B.Y. and Gebeshuber I.C. (2009) *Microfluidic simulation of a colonial diatom chain reveals oscillatory movement*. Acta Botanica Croatia, in press

Gebeshuber I.C., Gruber P. and Drack M. (2009) *A gaze into the crystal ball - biomimetics in the year 2059* invited article, Proc. IMechE Part C: J. Mech. Eng. Sci. 50st Anniversary Issue, in press

Gebeshuber I.C., Stachelberger H., Ganji B.A., Fu D.C., Yunas J. and Majlis B.Y. (2009) *Exploring the innovational potential of biomimetics for novel 3D MEMS* Adv. Mat. Res. 74, 2009, 265-268

Gebeshuber I.C., Aumayr M., Hekele O., Sommer R., Goesselsberger C.G., Gruenberger C., Gruber P., Borowan E., Rosic A. and Aumayr F. (2009) *Bacilli, green algae, diatoms and red blood cells - how nanobiotechnological research inspires architecture*
Chapter IX in: "Bio-Inspired Nanomaterials and Nanotechnology" (Ed. Yong Zhou), Nova Science Publishers 2009, in press

RESPONSE OF ALGAL COMMUNITY TO ANTHROPOGENICALLY-INDUCED TEMPERATURE DIFFERENCES IN LAKE SINCLAIR, BALDWIN COUNTY, GEORGIA

Kevin M. Geyer[1], Michele E. Weilbacher[2], and Kalina M. Manoylov[2]

[1]Department of Biological Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061 USA
[2]Department of Biological and Environmental Sciences, Georgia College and State University, Milledgeville, GA 31061 USA

Algal community composition has long been regarded an excellent indicator of environmental change in aquatic systems, responding with quantifiable trends over relatively short time periods. We have used this relationship to examine the effects of significant water temperature gradients on algal community composition in Lake Sinclair, Baldwin County, Georgia. Steam-based power generated by a local factory (Georgia Power) results in the daily discharge of recycled lake water an average of 6ϒC (and up to 10ϒC) warmer than typical ambient temperatures, although chemically unchanged. Two sites were chosen for comparison of effects, one in the immediate "warmer" area of the power plant and the other approximately 2.5 km to the south representing typical background lake temperatures. Site temperatures were most divergent during the winter, while summer values remained much more similar. Algal samples were collected bi-weekly since October, 2007, along with measures of water temperature, pH, and conductivity. Lab analysis of algal diatom community composition was performed using cleaned (pre-digested organic) samples preserved on permanent slides. Warmer water temperatures were anticipated to promote a greater diversity of species, as our results demonstrate. Much of the cold water community was dominated by the species *Achnanthidium minutissimum* (Kützing) Czarnecki, with secondary abundances of other Pennate genera including *Nitzschia*, *Gomphonema*, *Synedra* and *Cymbella*. Warm water community composition was more diverse than cold water. The dominant species was again *A. minutissimum*, but secondary in abundance were *Navicula* and *Cymbella* species form were at much greater abundances than in cold water. Additionally, *Thalassiosira bramaputrae* (Ehrenberg) Håkansson et Locker and *Discostella stelligera* (Hustedt) Houk et Klee were identified uniquely in warm water. Thermal pollution is implicated here as a factor inducing changes in the normal algal community composition, which may impact other trophic levels and ultimately the overall ecology of Lake Sinclair. *P-16 POSTER PRESENTATION*

BARCODING DIATOMS: EXPLORING ALTERNATIVE MARKERS TO COI.

Sarah E. Hamsher[1], Katharine Evans[2], David G. Mann[2], and Gary W. Saunders[1]

[1]Department of Biology, University of New Brunswick, Fredericton, NB E3B 5A3 Canada
[2]Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR UK

DNA barcoding is a molecular technique that uses sequence comparisons of a short region of DNA, often the 5' region of the mitochondrial COI gene, to distinguish species. This marker has been used successfully to identify species of *Sellaphora*, but has not displayed wide utility in diatom taxa. Despite testing many primer combinations (25 in total), amplification of the COI from many collections has failed, possibly due to the presence of introns. Therefore, our study has focused on sequencing alternative barcoding markers including: the variable D2 region of the 28S rDNA (LSU); the large subunit of RUBISCO (*rbc*L); and the Universal Plastid Amplicon (UPA). The LSU and *rbc*L regions are often used to investigate relationships among species of diatoms. The UPA is a short region (ca. 330 bp) of the 23S plastid rDNA and is being promoted as a universal species identification tool for algae. A group of closely related *Sellaphora* species was studied to determine each marker's ability to discriminate among sister pairs of species. Culture collection material was utilized to further explore the benefits and limitations of LSU, *rbc*L, and UPA including the ease of developing universal primers, ease of amplification, and resolving power of each marker. The LSU region was amplified and sequenced using universal primers and can distinguish between 96% of species pairs. The *rbc*L region has the power to discriminate *Sellaphora* species, but the primers are not universal among protists. The UPA region, while easy to amplify using universal primers, could distinguish between only 20% of species pairs. Therefore, *rbc*L should be considered a primary marker for diatom barcoding and LSU should be sequenced as a secondary marker to compare diatoms to other protists in biodiversity surveys. *Thursday 3:10 PM ORAL PRESENTATION*

A POTENTIALLY NEW SPECIES OF *RHOICOSIGMA* FROM THE BAHAMAS.

Michael K. Hein

Water & Air Research, Inc., Gainesville, Florida 32608, USA

A potentially new species of *Rhoicosigma* is described from benthic marine macro-algae and seagrasses northwest of Andros Island, Bahamas. Specimens observed ranged in length from 30 - 70 microns and a width of 6 - 9 microns, with 30 - 32 striae in 10 microns. Specimens are similar to *R. compactum* (Greville 1857) Grunow 1867 but are smaller and have finer striae. The frustule is slightly sigmoid in valve view and arched in girdle view. The epivalve is concave with the raphe straight or gently flexed. The hypovalve is convex with the raphe strongly sigmoid. SEM reveals that the valves have loculate areolae with the areolae opening to the valve exterior as apically elongated slits. Externally, the proximal raphe endings are deflected in the same direction and terminate in pore-like expansions. The distal raphe endings are strongly bent in opposite directions and in the same direction as the curvature of the valve end. In contrast, the areolae openings on the interior of the valves are rectangular, being elongated apically. The proximal raphe endings are simple and straight whereas the distal raphe endings terminate in a conspicuous helictoglossa. Internally there is a V-shaped siliceous thickening on both sides of the central area. *Friday 11:00 AM ORAL PRESENTATION*

DIATOM RESPONSE TO GROUNDWATER FLUCTUATIONS IN A CLOSED-BASIN LAKE OVER THE LAST 8500 YRS

William O. Hobbs[1], Sherilyn C. Fritz[1], Jeffery R. Stone[1], Joseph J. Donovon[2], Jim Almendinger[3], and Eric C. Grimm[4].

[1]Department of Geosciences, University of Nebraska-Lincoln, Lincoln, NE 68588
[2]Department of Geology and Geography, West Virginia University, Morgantown, WV 26506
[3]St. Croix Watershed Research Station, Science Museum of Minnesota, Marine on St.Croix, MN 55047
[4]Illinois State Museum, Research and Collections Center, Springfield, IL 62703

Sediment records from closed-basin lakes in the climatically sensitive Northern Great Plains (NGP) have contributed significantly to our understanding of paleoclimatology in this region. It is becoming clearer that short-term climatic shifts can be asynchronous amongst lakes within the NGP, possibly as a result of local hydrologic variability. Here we investigate the response of diatom communities to changes in groundwater flow in the closed-basin Kettle Lake, North Dakota. A high-resolution (decadal) sediment record capturing the last 8500 years is analyzed for fossil diatom assemblages and aragonite concentration. Based on prior studies of the contemporary hydrogeologic setting, we use aragonite concentration as an independent proxy of groundwater flux to the lake (and thus lake water level) and identify diatom assemblages associated with high and low groundwater flow (humid and dry climate, respectively). The lacustrine communities associated with this gradient of groundwater flow are characterized by *Stephanodiscus* spp. (*S. hantzschii, S. parvus, S. minutulus*, and *S. niagare*) during times of high flow and *Nitzschia palaeacea*, *Nitzschia linearis*, *Synedra acus*, and *Chaetoceros* cysts at low flow. A semi-quantitative model of lake-level change along this gradient, based on basin morphology and diatom-inferred salinity reconstruction, shows a range of approximately 9 m during the last ~8000 years. Climatically, the diatom record reveals broad humid/wet periods from 8444 – 8139, 4435 – 1430 and 1050 – 574 cal yrsBP, punctuated with short multi-decadal droughts and extended dry periods offsetting the wet periods. The last 574 years (cal BP) of the record is characterized by higher than average diatom assemblage instability (as defined by rate-of-change) and high climatic variability. Our findings are coherent with other lake records in the region, in particular the rapid diatom regime shifts at 4435 and 1430 cal yrsBP, which suggest regional climatic forcing. We show that an independent proxy of hydrologic forcing on the diatom community can be an effective means of interpreting community shifts, which may be related to changes in habitat or physical limnology rather than water quality. *Thursday 1:30 PM ORAL PRESENTATION*

PLENARY PRESENTATION Thursday 9:00 AM
ECOLOGY: WHY DO IT?

David Jewson

University of Ulster, 96 Desertmartin Road, Magherafelt, County Derry BT45 5HE, Northern Ireland

Genetic studies are revealing new insights into evolutionary links, palaeoecology is providing evidence of community development over longer and longer timescales, while SEM investigations continue to give us more detailed information on the structure of the cell wall. Are ecological studies keeping pace? Examples will be drawn from a range of habitats (shallow to deep, cold to warm) and genera (*Aulacoseira, Cyclotella, Stephanodiscus*) to explore the ways in which ecology can benefit research in these areas. In particular, the importance of long-term studies of population dynamics will be discussed, as well as the benefits of combined laboratory and field studies for understanding interactions between species and the factors that affect growth and survival throughout the life cycle.

SIMRIVER AN INTERNATIONAL EDUCATIONAL TOOL EXPANDING UNDERSTANDING OF AQUATIC ECOSYSTEMS AND ENHANCING APPRECITAON OF DIATOMS

Matthew Julius[1], Shigeki Mayama[2], Kazuhiro Katoh[3], Hiroshi Ohmori[4], Satoquo Seino[5], Hiroyuki Osaki[6], H, Jeannette Hoffer, Kristin Lingle[1], Kathryn Conroy[1], Jung Ho Lee[7], Cheol Cheong[8], Eduard A. Lobo[9], Andrzej Witkowski[10], Rattanaporn Srivibool[11], Ptumporn Muangphra[12], Regine Jahn[13] and Maxim Kulikovskiy[14]

[1]Department of Biological Science, St. Cloud State University, USA;
[2]Department of Biology, Tokyo Gakugei University, Japan
[3]Experimental Station for Landscape Plants, The University of Tokyo, Japan
[4]Department of Agricultural and Environmental Biology, The University of Tokyo, Japan
[5]Department of General Systems Sciences, The University of Tokyo, Japan;
[6]Stream Graph Inc., Japan;
[7]Department of Biology Education, Daegu University, Korea;
[8]Department of Environmental Education, Daegu University, Korea;
[9]Laboratory of Limnology, University of Santa Cruz do Sul, Brazil;
[10]Department of Palaeoceanology, University of Szczecin, Poland;
[11]Institute of Marine Science, Brapha University, Thailand;
[12]Department of Biology, Silpakorn University, Thailand;

[13]Botanical Garden & Botanical Museum Berlin-Dahlem, Germany;
[14]Institute for Biology of Inland Water, Russian Academy of Science, Russia

The United Nations designated the safety and sanitation of water resources as one of its millennium goals, and suggested the issue be solved via international cooperative efforts. . Science education serves a critical role in promoting awareness nationally and internationally. We focus specifically on riverine environments, as the ecosystem is common in most countries and a water resource to many communities. SimRiver, a computer simulation developed for expanding the understanding of the relationship between human activity and water quality using diatoms, is a useful tool for achieving this aim. The computer software has been introduced in to K-12 science classrooms globally. Within the United States students in Minnesota and Hawai'i have been exposed to curricula incorporating SimRiver. This presentation will introduce the SimRiver software; specifically detailing how the program is integrated into science classrooms to meet state required learning standards and expands student awareness of urban planning and the impact of human activities on aquatic systems. Assessment results suggested that classes exposed to the curricula meet or exceed outcomes produced by traditionally employed curricula and that the student's are motivated to further student river systems and diatoms on an independent basis. Moreover, we are developing multilingual educational tools on the web site, which is composes a webbased SimRiver program, video movies, visual tools and a reporting system from classes using these tools for international communication to accomplish the goal. *Saturday 9:40 AM ORAL PRESENTATION*

RECONSTRUCTION OF PALEOLIMNOLOGICAL CHANGES THROUGH THE HOLOCENE: DIATOM BIOSTRATIGRAPHY OF GREYLING LAKE, CHUGACH RANGE, SOUTH-CENTRAL ALASKA

Raymond Keveren[1], Sonja Hausmann[1], Darrell S. Kaufman[2], Jessica L. Black[1], and John C. Dixon[1]

[1]Department of Geosciences, University of Arkansas, Fayetteville, Arkansas 72701 USA
[2]Department of Geology, Northern Arizona University, Flagstaff, Arizona 86001 USA

Reconstructing the temporal and spatial variability of Holocene climate change in southern Alaska has been the goal of a series of multi-proxy lacustrine investigations along the southern coast of Alaska. In collaboration with a recent study published by McKay and Kaufman (2009), analysis is underway of diatom assemblages preserved in a 3.5 m long sediment core dating to approximately 15ka before present. The core was recovered from Greyling Lake (61.38°N, 145.74°W): a hydrologically isolated proglacial lake in the central Chugach Mountains of south-central Alaska. Diatoms are known to be sensitive indicators of environmental change in lakes – responding quickly to factors such as light and nutrient availability. Preliminary results show large variations in the community dynamics of diatom species indicating significant limnological changes during the Holocene and Holocene-Pleistocene boundary. Early Holocene sediments (13-11ka) are dominated by the planktonic diatoms *Cyclotella tripartita* and *C. rossii*. The biodiversity of the diatom assemblages increase markedly during the period identified in this lake by McKay and Kaufman (2009) as the Holocene Thermal Maximum (9-5ka), and include many planktonic (*Cyclotella spp.*), tychoplanktonic (*Achnanthes spp., Navicula spp.*) and benthic (*Fragilaria pinnata,, F. pseudoconstruens, F. construens var. venter*) species. The dominance of littoral benthic genera such as *Fragilaria spp.* are present in sediments corresponding with the onset of Neoglaciation (4ka). These preliminary patterns corroborate with biogenic silica and organic matter analyses from nearby Hallet Lake (McKay et al., 2008). Higher resolution diatom counts are planned for the future with the goal of reconstructing detailed environmental changes in Greyling Lake. Further plans also include quantitatively inferring changes past the aquatic conditions by utilizing diatom-based transfer functions of Alaskan lakes (Gregory-Eaves et al., 1999) with implications for southern Alaskan climate change. *P-17 POSTER PRESENTATION*

DIATOM INDICATORS OF DISTURBANCE IN U.S. GREAT RIVERS

Amy R. Kireta[1], Euan D. Reavie[1], Gerald V. Sgro[2], Ted R. Angradi[3], Terri M. Jicha[3], David W. Bolgrien[3], Brian H. Hill[3]

[1]Natural Resources Research Institute, University of Minnesota Duluth, Ely, Minnesota 55731 USA
[2]John Carroll University, University Heights, Ohio 44118 USA
[3]United States Environmental Protection Agency, Mid-Continent Ecology Division, Duluth, Minnesota 55804 USA

The Environmental Monitoring and Assessment Program for Great River Ecosystems (EMAP-GRE) aims to evaluate conditions of the Ohio, Missouri, and upper Mississippi Rivers using a variety of physical, chemical and biological indicators. Algae are included in this suite of indicators, and this study evaluates the ability of phytoplankton and periphyton diatoms to track stress in the rivers. One hundred eighty four periphyton and 174 phytoplankton samples from the river headwaters to the confluence at St. Louis were analyzed. Both phytoplankton and periphyton were shown to be reliable disturbance indicators, although each group of diatom indicators captures different stressor aspects. Periphyton was a strong indicator for both agricultural and developmental disturbance, the latter representing stressors such as percent development and proximity to urban areas. Phytoplankton was the strongest indicator of agricultural disturbance but did not well reflect developmental stressors. Diatom indicators were also evaluated at various spatial scales with preliminary results indicating disturbance is most reliably evaluated using a geographically broader model. These new diatom-based tools will be presented highlighting differences between periphyton and phytoplankton and comparing results to concurrently developed soft algae indicators for the rivers. *Saturday 3:30 PM ORAL PRESENTATION*

NEW SPECIES OF THE DIATOM GENUS *GOMPHONEMA* EHRENBERG (BACILLARIOPHYCEAE) FROM HAWAII

J.P. Kociolek[1], R.L. Lowe[2] & A.R. Sherwood[3]

[1]Museum of Natural History and Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, CO
[2]Department of Biological Sciences, Bowling Green State University, Bowling Green, OH
[3]Department of Botany, University of Hawaii, Manoa, HI

A survey of nearly ninety aerophilous and freshwater collections from three islands (Kaua'i, Oahu and Hawai'i) showed the presence of 6 new species of the genus *Gomphonema* Ehrenberg. Some of these species are new interpretations of taxa previously reported from the Hawaiian Islands, others are new discoveries. We present descriptions

of these new taxa based on light and scanning electron microscopy. The diversity of this genus as a proxy for the freshwater diatom flora of the Hawai'i is discussed, in the context of a new three-year, NSF-supported biotic survey of the freshwater algae of the Hawaiian Islands. Based on preliminary observations of this and other freshwater raphid diatom genera, it would appear that the Hawaiian Islands support an endemic flora of freshwater diatoms far greater than previously reports would indicate. *P-20 POSTER PRESENTATION*

THREE NEW SPECIES OF THE DIATOM GENUS *GOMPHONEMA* EHRENBERG FROM INDIA AND PHYLOGENETIC RELATIONSHIPS OF THE FRESHWATER CYMBELLOID AND GOMPHONEMOID DIATOMS

J.P. Kociolek

Museum of Natural History and Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, CO, USA

Three new species from the Central Western Ghats, Karnataka State of India are described as new to Science. All three species have distinctly dilated proximal raphe ends, in addition to differentiated apical pore fields, septa, pseudosepta and a round stigmal opening. *Gomphonema sp. #1* is linear-lanceolate-clavate, has a wide axial area, and is 19-51 µm long, 3-7 µm broad. *Gomphonema sp. #2* is smaller than *G. sp. #1*, and has a hyaline area around the headpole. *Gomphonema sp. #3* is much smaller and more narrow than the other two species. These closely related species are distinguished by their sizes, shape and structure of the headpole, and striae densities. We assess the phylogenetic position of the new species within the clade of freshwater gomphonemoid and cymbelloid diatoms, incorporating data from these new taxa, as well as from the new genus *Rexlowea*. We compare our results with previous morphology- and molecular-based phylogenies. The cymbelloid diatoms do not appear to be monophyletic, yet the gomphonemoid diatoms are monophyletic. We discuss some biogeographic implications of the phylogenetic relationships and the new species from India. *Thursday 3:50 PM ORAL PRESENTATION*

A DESCRIPTION OF THE FRUSTULAR MORPHOLOGY OF *FRUSTULIA CREUZBURGENSIS* (KRASSKE) HUSTEDT, WITH COMMENTS ON ITS SYSTEMATIC POSITION

J.P. Kociolek, C Graeff and E.Thomas

Museum of Natural History and Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, CO 80309, USA

Frustulia creuzburgensis (Krasske) Hustedt was originally assigned to the genus *Navicula* Bory and later transferred to *Frustulia* Rabenhorst due to its unilaterally deflected external proximal raphe ends resembling those of *F. weinholdii* Hustedt *emend* Wallace. Unlike most members of the genus, *F. creuzburgensis* is found in saline waters, and has been reported from Europe, N. America, S. Africa and Hawaii. Light and scanning electron microscopy of *F. creuzburgensis* from coastal streams in California indicates the presence of porte-crayon arrangement around the external distal raphe ends, a feature used to diagnose *Frustulia*. However, there is also a lack of ribs bordering the raphe system, which is inconsistent with other members of *Frustulia*. A notch in the girdle bands at about mid-valve, accompanied by girdle band protuberances, is described for the first time in this species. Populations of this taxon produce both *cis* and *trans* frustules in a 1:2.5 proportion, respectively. Enlarged external areolar openings near the external proximal raphe ends are also described for the first time. We discuss the possible relationships of this enigmatic taxon amongst the Naviculales. *P-18 POSTER PRESENTATION*

DIATOMS OF THE UNITED STATES. I. TAXONOMY, ULTRASTRUCTURE AND DESCRIPTIONS OF FIFTY NEW SPECIES AND OTHER RARELY REPORTED TAXA FROM LAKE SEDIMENTS IN THE WESTERN U.S.A.

J.P. Kociolek[1,2] B. Laslandes[1,], D. Bennett[3], E. Thomas[1, 2], M. Brady[1,4] & C. Graeff[1,2]

[1]Natural History Museum, University of Colorado, Boulder, CO
[2]Deparment of Ecology and Evolutionary Biology, University of Colorado, Boulder, CO
[3]University of California San Diego, La Jolla, CA
[4]University of Texas, Austin, TX

From our examination of sediments from over two hundred lakes in the western United States, we have identified over 50 species that appear to be new to science. In addition, there are species that have never been reported previously from the United States, and we provide nomenclatural and other details for species we encountered in our examination of these sediments. Most major groups are represented. For each taxon we provide light microscopic observations, and for the majority of taxa we also include scanning electron microscopic observations. It appears that there are still many new taxa to be found in the flora of the United States. *P-19 POSTER PRESENTATION*

NEIDIUM PFITZER FROM THE REIMER DIATOM HERBARIUM

Lisa A. Kunza[1], Justin R. Pool[2], Jelena Andrejić[3], Set I. Castro[4], Suda Inthongkaew[5], Elena Jovanovska[6], Tyler J. Kohler[7], Stephen P. Main[8], John T. Manier[9], Teofil Nakov[10], Marcella K. Purkey[11], and Sarah A. Spaulding[12]

[1]Program in Ecology, Department of Zoology and Physiology, University of Wyoming, Laramie, Wyoming 82071, USA
[2]Department of Environmental and Plant Biology, Ohio University, Athens, Ohio 45701 USA
[3]Institute for Botany and Botanical garden "Jevremovac," Biological Faculty, Belgrade, Serbia
[4]Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Alberta T6G 2E3, Canada
[5]Earth Science Program, Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
[6]Institute of Biology, Faculty of Natural Sciences, Gazi Baba bb, 1000 Skopje, Republic of Macedonia
[7]School of Natural Resources, University of Nebraska, Lincoln, Nebraska 68583, USA
[8]Biology Department, Wartburg College, Waverly, Iowa 50677, USA
[9]USGS-Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin 54603, USA
[10]Section of Integrative Biology, University of Texas-Austin, Austin, Texas 78712, USA
[11]Mackay School of Earth Sciences and Engineering, University of Nevada-Reno, Reno, Nevada 89557, USA
[12]US Geological Survey, Fort Collins Science Center, 80526

The C.W. Reimer Diatom Herbarium at Iowa Lakeside Laboratory (ILL) contains 3,280 permanent diatom slides of collections made from prairie potholes, alkaline fens, acid bogs, eutrophic lakes, saline lakes, Pleistocene paleolakes, and Miocene fossil deposits near ILL. The herbarium has a focus on collections made within Dickinson County, a region with an important legacy of study by students and visiting researchers from the US, Canada, and international institutions. The herbarium is well documented by taxon and location catalogues. The taxon card catalogue contains over 2,800 records referencing 67 genera, and the location catalogue references collection sites from 51 counties in 16 states. Curated slides include over 300 species identifications made, or verified, by Reimer. During the 28 summers that Reimer taught the diatom course at ILL, his focus of study was *Neidium* in Dickinson County. We illustrate the 60+ *Neidium* specimens identified from the collection, show locations, and indicate identifications confirmed by Reimer in this poster presentation. *P-21 POSTER PRESENTATION*

USING LAKE HISTORIES IN NATURAL RESOURCE MANAGEMENT: RECONSTRUCTION OF NUTRIENT LEVELS, SECCHI DEPTH, AND ALGAL BLOOM HISTORIES IN BIG ROUND LAKE, WISCONSIN, USA

Gina D. LaLiberte and Paul J. Garrison

Wisconsin Department of Natural Resources, Madison, Wisconsin 53716 USA

Applied paleolimnology is useful for elucidating a lake's ecological history so that appropriate management or restoration goals may be set. Big Round Lake is a 411 hectare lake in northwestern Wisconsin (north central United States). In recent years the mean summer Secchi depth in Big Round Lake has been 2 meters, and the lake has experienced periodic cyanobacterial blooms. To determine whether the degraded conditions were due to recent disturbances, or if they were long-standing conditions, we retrieved a sediment core from the deepest area of the lake. The lake sediments dated from roughly 1850 to 2006. Bulk sediment accumulation rates and accumulation rates of geochemical variables were calculated using ^{210}Pb and the CRS model. The mean mass sedimentation rate was one of the lowest of 51 Wisconsin lakes for which we have determined mean sedimentation rates over the last 150 years. We analyzed the diatom community and found that the general composition has changed little over the past 150 years. *Aulacoseira ambigua*, *A. granulata*, small *Staurosira* spp., and *Pseudostaurosira brevistriata* were the most abundant diatoms in the core. There has been a slight increase in planktonic diatoms since the mid-1960s, possibly indicating a phosphorus increase. We used diatoms for a weighted average model of historical water clarity. The estimated mean Secchi depth for the past 150 years varied between 2.0 and 2.3 meters, which is very similar to the mean summer Secchi depth measured in recent years. We analyzed the sediments for other algal microfossils. Akinetes of the cyanobacteria *Anabaena* and *Aphanizomenon* were found throughout the core, and indicated the occurrence of algal blooms in Big Round Lake prior to European settlement in the region. *Aphanizomenon* was more common than *Anabaena* before 1940, and decreased relative to *Anabaena* starting in 1960, possibly indicating an increase in phosphorus levels. *Anabaena* has decreased since 1990, which may indicate a shift in dominance to *Microcystis*, which does not form akinetes. The increase in planktonic diatoms and decrease in *Aphanizomenon* since 1960 likely reflects increased phosphorus levels. Recent degraded conditions in the lake are likely not new to the lake, and reduced Secchi depths associated with cyanobacterial blooms have probably occurred long before European settlement in the region. *P-22 POSTER PRESENTATION*

EFFECTS OF TEMPERATURE AND VELOCITY FLUCTUATIONS ON DIATOM COMMUNITY COMPOSITION IN STREAMS

Sylvia S. Lee[1], Emma J. Rosi-Marshall[2], Christopher G. Peterson[2], Theodore A. Kennedy[3], Jeffrey R. Kampman[2] and Holly A. Wellard[2]

[1]Florida International University, Miami, FL 33174
[2]Loyola University Chicago, Chicago, IL, 60626
[3] USGS Grand Canyon Monitoring and Research Center, Flagstaff, AZ 86001

Water temperature and discharge associated with hydroelectric-dam operation can influence diatom communities. We examined the effects of temperature and fluctuating velocities on diatom communities grown on unglazed ceramic tiles in artificial streams, for a total of 38 weeks. We imposed 3 velocity treatments (6 replicates each): stable (15 cm·s^{-1}), low fluctuating velocities (22.12 to 45.45 cm·s^{-1}) and high fluctuating velocities (10.5 to 66.7 cm·s^{-1}). The 18 streams were divided into 2 temperature treatments maintained at 10°C and 15°C (9 replicates each). We focused on the prevalence of upright taxa, because they have been shown to be preferentially consumed by invertebrates. We tracked changes in community composition at week 7, week 19, and the end of the experiment. At week 7, there was a strong temperature effect ($p=0.004$) with more upright diatoms in 15°C streams. At week 19, there was a strong velocity effect ($p=0.022$) with more upright diatoms in high fluctuating streams. At the end of the experiment, both temperature ($p=0.003$) and velocity ($p=0.001$) were strong drivers, with more upright diatoms in 15°C streams with high velocity fluctuations. At week 20, *Gammarus lacustris* from the Colorado River were added to the streams and allowed to graze until the end of the experiment. There were significantly more upright diatoms in *Gammarus* gut contents than on the tile substrates, confirming the importance of upright taxa in invertebrate diets. Water temperature and velocity significantly influence the composition of diatom communities, an important basal food resource in aquatic ecosystems, and have important implications for dam management. *P-23 POSTER PRESENTATION*

DISTRIBUTION AND MORPHOLOGICAL VARIABILITY OF *COSMIONEIS* (BACILLARIOPHYCEAE) IN HAWAII

Rex L. Lowe[1] and Alison R. Sherwood[2]

[1]Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43402
[2]Department of Botany, University of Hawaii, Honolulu, HI

Cosmioneis Mann & Stickle, is a pennate diatom in the family Cosmiodeidaceae and order Naviculales. A single specimen of this genus (*Navicula pusilla* W. Sm., now *Cosmioneis pusilla* (W. Sm.) Mann & Stickle) had been previously reported from Oahu. In extensive surveys of algae of subaerial habitats on Maui and Oahu, Hawaii we collected populations of three species of Cosmioneis. Reports from other habitats describe *C. pusilla* as morphologically variable with valves ends ranging from subrostrate to strongly capitate. Our populations of *C.* cf. *pusilla* showed little variability and

were either strongly capitate or rostrate and are probably two separate species. In addition we found populations of a third putatively undescribed species of *Cosmioneis*. Here we will discuss the morphology and ecology of this genus in Hawaii. *Friday 1:30 PM ORAL PRESENTATION*

SOME INTERESTING DIATOMS FROM IOWA WETLAND MITIGATION SITES

Stephen P. Main

Biology Department, Wartburg College, Waverly, Iowa USA 50677

During 2005 and 2006 twelve wetland mitigation sites and three natural wetlands in Central Iowa were sampled. The 222 fresh collections examined microscopically. revealed 847 taxa including 615 non-diatom algae, 157 non-photosynthetic protozoans, and 75 microinvertebrates. Although several diatoms were observed in these live samples, subsequent analysis of prepared Naphrax mounts reveals a much greater diversity of diatoms than of all the other taxa. For instance, the fresh observations averaged 12 non-diatom taxa per sample. Naphrax mounts examined from the first two of the eight sampling dates average 45 diatom taxa per sample. Among the diatoms observed are members of the genera Craticula, Neidium, Playaensis, and Tryblionella which have not been reported from Iowa. Light and scanning electron microscopical observations will be reported. The three natural wetlands were a prairie pothole, a peatland marsh, and an upper floodplain river marsh. The non-diatom microorganisms of the created wetlands most resembled the upper floodplain river marsh communities; but no other site-related or seasonal patterns were found. Their diversity increased with more variation in physical structure at a site. The diatom distribution and diversity will be compared with these patterns. *Friday 10:20 AM ORAL PRESENTATION*

NOTES ON IOWA DIATOMS: COMPARISON OF THE MORPHOLOGICAL RANGE OF MODERN POPULATIONS WITH SPECIMENS IN THE REIMER DIATOM HERBARIUM

John T. Manier[1], Set I. Castro[2], Suda Inthongkaew[3], Tyler J. Kohler[4,] Lisa A. Kunza[5], Justin R. Pool[6], Marcella K. Purkey[7], and Sarah A. Spaulding[8]

[1]USGS- Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin 54603, USA
[2]Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Alberta T6G 2E3, Canada
[3]Earth Science Program, Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
[4]School of Natural Resources, University of Nebraska, Lincoln, Nebraska 68583, USA
[5]Program in Ecology, Department of Zoology and Physiology, University of Wyoming, Laramie, Wyoming 82071, USA
[6]Department of Environmental and Plant Biology, Ohio University, Athens, Ohio 45701, USA
[7]Mackay School of Earth Sciences and Engineering, University of Nevada-Reno, Reno, Nevada 89557, USA
[8]US Geological Survey, Fort Collins Science Center, 80526

Diatomists recognize, but underreport, that diatom populations from different regions differ in size range and morphology. In this study, we examined nine taxa from collections made from Iowa in 2009. We compared our specimens with specimens in the Reimer Diatom Herbarium, located at Iowa Lakeside Laboratory (ILL). Morphological range and size dimunition was examined for *Diploneis ovalis* ssp. *arctica* Lange-Bertalot, *Gomphonema angustatum* (Kützing) Rabenhorst, *Amphora normanii* Rabenhorst, *Amphora copulata* (Kützing) Schoeman et Archibald, *Encyonema muelleri* var. *ventricosum* (Temp. & Perag) Czarnecki, *Neidium iridis* (Ehrenberg) Cleve, *Neidium decens* Skv. *Anomoeoneis sphaerophora* Pfitzer. and an undescribed species of *Neidium.* We present images of living cells to document chloroplast structure of several of the taxa. This poster presentation by the students of the Systematics and Ecology of Diatoms course at ILL represents an effort to document the taxa and range of morphology in Dickinson County, Iowa. The summer field course has now completed documentation of a total of 41 taxa. We plan to make the taxonomic treatments available online in the future. P-21 POSTER PRESENTATION

FOUR NEW ARAPHID DIATOMS (BACILLARIOPHYTA) FROM RIVERS IN NORTH AMERICA

Kalina M. Manoylov[1], Eduardo A. Morales[2,3,4] and Loren Bahls[5]

[1]Department of Biological and Environmental Sciences, Georgia College and State University, Milledgeville, GA 31061USA
[2]Herbario Criptogámico, Universidad Católica Boliviana San Pablo, Av. Gral. Galindo No. 5381, Cochabamba, Bolivia
[3]Patrick Center for Environmental Research, The Academy of Natural Sciences, Philadelphia, PA 19103 USA
[4]Unidad de Limnología y Recursos Acuáticos, Universidad Mayor de San Simón, P.O. Box 992, Cochabamba, Bolivia
[5] The Montana Diatom Collection, 1032 12th Avenue, Helena, MT 59601 USA

Without taxonomic descriptions of new taxa found while enumerating algae from large national and regional programs like NAWQA and EMAP, ecological understanding of closely related microbes will continue to be a challenge in applied phycological studies for North America. Four new Fragilaroid species of diatoms from rivers located in different regions of the continental US were described. The first two are named in honor of the late Dr. Charlie Reimer: *Fragilariforma reimeri* sp. nov. and *Staurosira monita* sp. nov., where the latter species epithet was chosen to signify nobility. The other two larger araphid diatoms *Staurosirella magna* sp. nov. and *Staurosirella elegantula* sp. nov. were described to emphasize the dimensions of the first diatom and the outline of the second. *F. reimeri* (found in Alaska, Idaho, Missouri, Montana, Washington and Wyoming), has cruciform valves with a broadly rounded, tumid central area, narrower rounded apices and very fine striae more than 30 in 10 microns. This taxon with irregular cruciform shape in smaller specimens had been observed by other researchers in collections from Yellowstone National Park, but always reported as unknown. *S. monita* found in New Mexico and Montana and is a small rhomboid diatom with a deep mantle and alternate striae along the valve axis, shifting from parallel in the central area to radial toward the apices. *Staurosirella magna* found in Oregon and has heteropolar, lanceolate narrowly rounded apices and a length up to 76 microns. *S. elegantula* was originally discovered in Oregon and is heteropolar, has lanceolate shape with broadly rounded apices and hollow spines. It is unclear whether these taxa have been lumped under other names in the literature, but it is probable that at least some of these new taxa are being observed for the first time due to their distinctive morphology. Besides detailed morphological analyses at the LM and SEM levels, a comparison with similar taxa from the literature is presented. Ecologically *F. reimeri* and *Staurosira monita* have quite different ecologies based on our limited data. The first is a mountain diatom that prefers much lower conductivities, circumneutral pH, and lower nutrients (TN and

TP) than *S. monita* which is found mostly in desert streams with high conductivity, pH, some nutrients and temperatures. The two *Staurosirella* species were found at the same site, thriving in cold water low in nutrients, circumneutral pH and low specific conductivity. The finding of these four species in streams from several states in the US suggests that the knowledge of the araphid flora in the country is still far from complete. *Friday 4:30 PM ORAL PRESENTATION*

ELEVATION OF A VARIETY OF *TETRACYCLUS LANCEA* TO THE SPECIES LEVEL FROM THE QUINCY DIATOMITE, CENTRAL WASHINGTON, USA

Anthony J. Menicucci and Paula J. Noble

Geological Sciences, University of Nevada, Reno, 1664 N. Virginia St., Reno, NV, 89557

A new species of fossil *Tetracyclus* Ralphs is observed in the Miocene Quincy Diatomite and preliminarily described herein. In 1912, Hustedt described the diatom species *Tetracyclus ellipticus* var. *lancea f. subrostrata*, with the type locality as "Columbia River, Fossil". The type specimen of this form has subrostrate to subcapitate apices that are rapidly attenuated, and is distinctly smaller than specimens of nominate form. In 1996 Williams elevated *T. ellipticus* var. *lancea* to the species level, calling it *T. lancea* (Ehrenberg) Peragallo. Williams specified dimensions, number of rimoportulae, and striae count for *T. lancea*, but made no comment on the forms of this newly elevated species. Identifications of this diatom have been restricted to material from the Miocene of the NW United States, and are quite rare in the literature. The Quincy Diatomite, located in central Washington, is a pure diatomaceous silica deposit of Miocene age (approximately 15 Ma). *T. lancea* v. *subrostrata* is common in the Quincy Diatomite in 3 localities sampled in the western Quincy Basin. Populations observed within the deposit indicate this variety should be treated as a separate species; it is distinguished by a smaller size range, number and position of rimoportulae, striae count, and distinctive girdle band and septum shape. Specimens observed display measurements ranging 18-55µm whereas those provided by Williams for *T. lancea* are 60-140µm. The rimoportulae are more consistently located on the central valve margin in *T. lancea f. subrostrata*, whereas they are in a more variable location on the valve face, and less consistently on the valve margin in *T. lancea*; the number of rimoportulae in *T. lancea f. subrostrata* is also most commonly reduced to 1, whereas *T. lancea* ranges from 1-3. These observations are derived from hundreds of specimens from the Quincy Diatomite and provide strong evidence for elevation of this form to the species level. *P-25 POSTER PRESENTATION*

TAXONOMY AND ULTRASTRUCTURE OF SEVERAL DIATOM SPECIES FROM CARAJÁS NATIONAL FOREST, PARÁ STATE, BRASIL

Ana Luiza Burliga Miranda [1, 2] and J.P. Kociolek [2]

[1]Laboratório de Estudos de Impactos Ambientais, UNIVALI – Rua Uruguai 458 - Bloco 20 sala 139, Itajaí, SC, Brasil
[2]Museum of Natural History and Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, CO

Historical and recent literature suggest the diatom flora of South America, and especially Brasil, are quite unique, with many endemics described. Carajás National Forest is localized in Pará State of Brasil and created by Federal Decree in 1998. It is located in the Amazon region, with characteristics of humid equatorial climate, featuring more than 95% of area covered by forests, and the remainder, about 2 to 3% gaps formed by natural vegetation. This natural forest has a total area of approximately 411.000 hectares. It is limited to the area North of the Environmental Protection Area Igarapé do Gelado, Northwest with the National Forest of Tapirapé-Aquiri and in the West, with the National Indigenous Reserve Xikrin do Cateté. The Southwest is bounded by the river Itacaiúnas and Indigenous Reserve Xikrin do Cateté, is the southern most border with dry farms of others, the southeastern confines itself with the Igarapé Sossego and others properties East is limited by the river Parauapebas and others properties.
We are undertaking a survey of the diatoms of this national forest, and preliminary results suggest the diatom flora is unique within Brasil. In this poster we present ultrastructural and descriptions of interesting and unique species of the genera *Eunotia, Brachysira* and *Kobayasiella*. We discuss the uniqueness of the flora within South America and Brasil. *P-26 POSTER PRESENTATION*

EFFECT OF PHOSPHORUS ON PERIPHYTON MAT STRUCTURE AND COMPOSITION USING EXPERIMENTAL MICROCOSMS

Jay W. Munyon[1] and Evelyn E. Gaiser[1]

[1]Department of Biological Sciences, Florida International University, Miami, Florida 33199 USA

Periphyton is one of the most productive elements in the Florida Everglades ecosystem (17-10,371 g C m^{-2} yr^{-1}) existing as cohesive mats that attain biomass levels higher than those found in many other wetlands. The Everglades is a historically oligotrophic system (water total phosphorus < 10 ug L^{-1} in unenriched marsh), such that enrichment of this limiting nutrient, resulting from agricultural and urban development, can alter ecosystem metabolism. Small increases in phosphorus loading can result in major changes to periphyton productivity, structure, and composition. To determine the mechanisms driving observed enrichment responses, we exposed periphyton mats to enhanced phosphorus concentrations in sealed 6.5 L reaction vessels. A second set of antimicrobial treatments was used to examine how nutrients change the interaction among autotrophic and heterotrophic mat components. Dissolved oxygen sensors recorded measurements at 15 minute intervals and mat biomass, composition, nutrients and extracellular polysaccharide (EPS) concentrations were measured before and after a 4 day incubation period. Results show significant differences in EPS concentrations ($p = 0.011$) when enriched with phosphorus, an increase in chlorophyll a ($p = 0.018$) in response to antimicrobial additions, and numerous synergistic responses to combined phosphorus enrichment and antimicrobial addition treatments. Results of this study are important in gaining an understanding of the mechanisms by which the periphyton mat disassembles. *Thursday 11:20 AM ORAL PRESENTATION*

PRELIMINARY MOLECULAR PHYLOGENY OF THE CYMBELLALES (BACILLARYOPHYCEAE)

Teofil Nakov and Edward Theriot

Section of Integrative Biology, University of Texas at Austin, Austin, TX, 78712, USA

As currently circumscribed, the order Cymbellales Mann (Bacillaryophyceae) contains taxa that exhibit both isogamy (e.g. *Rhoicosphenia* Grunow) and physiological anisogamy

(members of the Anomoeoneidacae Mann, Cymbellaceae Greville and Gomphonemataceae Kutzing). The different modes of sexual reproduction in conjuction with the possible plesiomorphic state of chloroplast structure raises doubts over the monophyly of the order. Using molecular data from the nuclear and chloroplast genomes we test the monophyly of the Cymbellales and assess the relationships between some of the genera currently included of the order. Preliminary analyses indicate i) problems in identifying the sister group to the order, ii) basal position of *Rhoicosphenia* and *Anomoeoneis* and iii) unclear inter-generic relationships between *Cymbella*, Gomphonema and *Placoneis* due to moderate bootstrap support of higher nodes. The monophyly of the genera *Encyonema* and *Placoneis* is strongly supported whereas *Gomphonema* and *Cymbella* appear to be paraphyletic lineages containing species of *Gomphoneis* and *Cymbopleura*. We discuss the need for a more complete taxon sampling and inclusion of more molecular markers in inferring relationships within the Cymbellales. *Friday 9:00 AM ORAL PRESENTATION*

AUTOMATIC DETECTION, IDENTIFICATION, AND CLASSIFICATION OF PLANKTON USING A CONTINUOUS IMAGING PARTICLE ANALYZER (FLOWCAM)

Harry Nelson[1], Scott Ellis[1], and Nicole J Poulton[2]

[1]Fluid Imaging Technologies, Yarmouth, USA
[2]Bigelow Laboratory for Ocean Sciences, W. Boothbay Harbor, USA

The past decade has seen a significant increase in the development of plankton imaging systems. This development has been driven by the need and desire to reduce the sample processing time required to process plankton samples for the purpose of identification and enumeration. The Video Plankton Recorder, ZOOSCAN, and FlowCAM are the only three imaging instruments commercially available to scientists (Benfield, et al, 2007) that automate this process. Of these instruments, only the FlowCAM is capable for use in the laboratory for microplankton (20 µm – 200 µm) and mesoplankton (200 µm – 2 mm). Here we present data from a continuous imaging particle analyzer (FlowCAM®) that uses proprietary VisualSpreadsheet™ software to automatically detect, image, enumerate and now automatically classify plankton in real-time. Once the FlowCAM has analyzed a sample or batch of samples, the software has the ability to process digital images for automatic classification using user generated libraries or image training sets. These libraries can identify and quantify specific taxonomic groups (e.g., genus or species) or size classes of plankton automatically. An overview of the technology will be given, including a review of the algorithm that is used for image analysis, along with how the software interacts with the user when developing filters and training sets. Saturday *1:30 PM ORAL PRESENTATION*

VARIATIONS IN THE VERTICAL DIATOM DISTRIBUTION IN A DEEP NEAR-OLIGOTROPHIC ALPINE LAKE DURING THE ONSET OF STRATIFICATION, FALLEN LEAF LAKE, CALIFORNIA.

Paula J. Noble[1], Sudeep Chandra[2], and David K. Kreamer[3]

[1]Department of Geological Sciences and Engineering, University of Nevada, Reno, NV 89557 USA
[2]Department of Natural Resources and Environmental Science, University of Nevada, Reno, NV 89557 USA
[3]Department of Geoscience, University of Nevada, Las Vegas, NV 89154 USA

Monitoring of the Spring diatom bloom and limnology of Fallen Leaf Lake, Lake Tahoe Region, show both a seasonal succession and vertical variation of diatoms at specific depths from 0 to 50 meters that is related to onset of lake stratification. Monitoring is underway to provide modern calibration in an ongoing study of Holocene cores from the lake. Fallen Leaf Lake is characterized as a near-oligotrophic alpine lake that is slightly N limited with low conductivity (21mS/cm). Maximum depth is >100m and surface area is 5.6 km^2. Diatoms dominate the phytoplankton and chrysophytes are also common. Diatoms from surface and vertical plankton tows were examined to determine relative abundance and begin constructing a species list. In addition, live cells were enumerated from water collected at 12 discreet depths. Surface tows show a seasonal succession. The winter species *Aulacoseira italica* (22%) was still abundant in late April along with *Tabellaria fenestrata* (30%) and *Asterionella Formosa* (26%). In early June, *Urosolenia eriensis* was most dominant, followed by stellate *Fragilaria* colonies*, A. Formosa, T. fenestrata* and *P. bodanica*. In late June, *A. Formosa* and *T. fenestrata* were still abundant while *U. eriensis* and *Fragilaria* decreased. Depth samples taken in early and late June show a more complex story. Total concentration of live diatom cells was lowest in the upper 5m and peaked at 17.5m at the base of the metalimnion on June 1. The peak concentration dropped to a depth of 25m on June 26 as the lake progressively stratified and surface temperature rose to 16°C. Not all groups peaked at the same depth, however. *Fragilaria* dominated the 0-10m interval and peaked at shallower depths than the other species (15m on June 1, 5m on June 26). Cyclotelloid, *A. formosa*, and *T. fenestrata* concentrations all peaked ~17.5m on June 1, and 25m on June 26. *A. italica* was absent from counts of the epilimnion on both dates with peak abundance considerably lower at ~40m in the hypolimnion. It appears that some species dominant in the surface in early spring later peak at greater depths in early summer, suggesting a submergence to follow optimal conditions. Si concentrations were low (833-896 ppb) and did not vary significantly between epi- and hypolimnion in late June. Monitoring will continue into winter months, including detailed nutrient analyses, to characterize both seasonal and vertical changes in the diatoms, and identify controlling factors. *P-27 POSTER PRESENTATION*

CHANGES IN CENTRIC DIATOM COMMUNITIES FROM TOP AND BOTTOM SEDIMENTS IN 24 MICHIGAN LAKES, USA

Nadja Ognjanova-Rumenova[1], **Kalina M. Manoylov**[2] and R. Jan Stevenson[3]

[1]Institute of Geology, Bulgarian Academy of Sciences, Acad. G. Bonchev str. 24, 1113 Sofia, Bulgaria
[2]Department of Biological and Environmental Sciences, Georgia College and State University, Milledgeville, GA 31061 USA
[3]Department of Zoology, Michigan State University, East Lansing, MI 48824 USA

Diatom assemblages preserved in lake sediment records can provide proxy data of past environmental changes in biological conditions. Sediment cores were retrieved from 24 lakes in Michigan. Diatoms were analyzed from the 'top' and 'bottom' of each core to reconstruct land-use changes in this area.,So far analyzed fossil diatom assemblages from Michigan realm show a wide range of centric diatoms, belonged to genera *Cyclotella*, *Discostella*, *Puncticulata*, and *Stephanodiscus*. Centric diatoms were identified and evaluated with light and scanning electron microscopy. Diatom species composition in surface sediments and

differences between tops and bottoms corresponded to the current land use surrounding the lakes, which ranged from predominantly forest and rangeland to urban and agriculturally impacted. Inferred past conditions revealed that the observed morphotypes probably represent taxa with different ecological preferences. *P-28 POSTER PRESENTATION*

EVALUATION OF BENTHIC DIATOMS AS WATER QUALITY INDICATORS IN THE BLACKBIRD CREEK WATERSHED, DELAWARE

Gulnihal Ozbay[1], Kathryn Coyne[2], **Amanda Pappas[1]**, Katherine Lee[2], Benjamin Reining[1], and Alexander Ko[2]

[1]Agriculture and Natural Resources Department, Delaware State University, Dover, Delaware 19901 USA
[2]College of Earth, Ocean, and Environment, University of Delaware, Lewes, Delaware 19958 USA

Benthic diatoms have been used as water quality indicators in freshwater systems throughout the world (e.g. Kelly, Penny, Whitton 1995; Lowe, Pan 1996; Szczepocka, Szulc, 2009). The goal of this study is to evaluate the use of benthic diatoms as water quality indicators of the Blackbird Creek watershed in relation to land use. The land of Blackbird Creek consists of 43% agriculture, 35% forest, 17% wetlands, and 4% urban/residential area (Coyne, 2007). Sediment samples will continue to be collected from Blackbird Creek and DNA will be extracted from sediments using methods described in Coyne et al. (2001). Water samples are collected to analyze and record nutrients and water quality parameters of each site. DNA is extracted from the samples and analyzed using denaturing gradient gel electrophoresis (DGGE). DGGE produces a banding pattern or "fingerprint" of the microbial community (Muyzer et al., 1993), where each band represents a different species (Coyne, 2007). Potential indicator species will be identified and a quantitative estimate of species abundance using quantitative real-time PCR (QPCR; Coyne et al., 2005) will be obtained. To evaluate effects of nutrient enrichment on benthic diatom communities, a series of experiments will be conducted (Coyne, 2007). Sample DNA run on a DGGE gel have already shown a strong diatom species presence, but further analysis is required. The information gathered during this study will hopefully aid in identifying ecological problems such as eutrophication in Blackbird Creek. The knowledge gained in this study will be used to obtain a better understanding of the diatom communities present, determine the effects land use has on water quality, and provide strong information to aid the improvement of land management practices. *P-29 POSTER PRESENTATION*

THE RESPONSE OF DIATOMS TO AGRICULTURAL WATERSHEDS OF RIVERS FROM THE UNITED STATES

Robert W. Pillsbury[1] and R. Jan Stevenson[2]

[1]Department of Biology and Microbiology, University of Wisconsin, Oshkosh, 54901 USA
[2]Department of Zoology, Michigan State University, East Lansing, Michigan 48824 USA

The assessment of diatom assemblages have been useful in the construction of metrics for environmental monitoring. However diatom-based metrics for rivers heavily effected by agriculture have not received much attention. We analyzed diatoms, basin characteristics, and water chemistry data collected by the USGS National Water-Quality Assessment (NAWQA) program: Nutrient Enrichment Effects Team (NEET). This consisted of 232 rivers found within 8 regional study units across the United States chosen for their low urban influences as well as a range of agricultural activity within their watershed. Diatom-based metrics were developed using species traits (indicator species analysis), weighted average scores, and previously developed calibration sets for both the entire dataset and regional subgroups (determined by ordination and muli-response permutation procedures). The utility of these new metrics will be discussed. *Saturday 2:30 PM ORAL PRESENTATION*

SERVING THE COMMUNITY OF DIATOMISTS: DR. REIMER'S LEGACY AT THE ANSP DIATOM HERBARIUM.

Marina Potapova

The Academy of Natural Sciences of Philadelphia, Philadelphia, Pennsylvania 19103 USA

By the end of the 19th century several personal collections of North American diatomists have been deposited at the Academy of Natural Sciences of Philadelphia. In 1930-60ies these collections together with new additions were assembled into a Diatom Herbarium by the curators Drs. R. Patrick, M. Hohn, and C. Reimer. Dr. Reimer has been a devoted keeper of the Herbarium from 1960 to his death in 2008. Under Reimer's leadership it became an important research tool and educational resource for generation of North American diatomists. The Herbarium is now the second largest in the World and has extensive collections of modern and fossil, marine and freshwater diatoms, not only from North America, but from all over the planet. The goal of this presentation will be to describe the content and organization, as well as on-going renovations of the Herbarium. A special attention will be given to lesser known diatom collections stored at ANSP. We will discuss which resources are now available at the Herbarium and how it might better serve the needs of the research community of diatomists. *Friday 2:30 PM ORAL PRESENTATION*

DIATOM RESPONSE TO THE TSOYOWATA ASHFALL IN FALLEN LEAF LAKE, CALIFORNIA

Marcella Purkey, Paula J. Noble, Shane B. Smith, Robert E. Karlin, and Anthony J. Menicucci

Mackay School of Earth Sciences and Engineering, University of Nevada-Reno, Reno, Nevada 89557 USA

Changes in diatom diversity and abundance in response to an ancient volcanic ash-fall event at Fallen Leaf Lake, California in the Lake Tahoe Region is investigated for the first time. A sediment core containing the Tsoyowata ash (7950-7730 cal years BP) was sampled and relative abundances tabulated. An age model for the core based on a radiocarbon date and the ash layer indicates the sedimentation rate to be fairly high, averaging about 20 years per cm. The ash is 2cm thick and is overlain by a 1cm thick light gray layer at 291cm below the top. Examination of the post-ash succession above 291cm is complicated by a thin turbidite layer from 290-288cm, but no erosion is observed at the base of the turbidite. Overall, diatom assemblages throughout the core are dominated by centric diatoms with *Aulacoseira italica* being the most abundant. Cyclotelloid species are also locally abundant. Araphid pennates comprise between 10-35%, and raphid and monoraphid taxa comprise a much smaller portion, generally from 1-5%. Fluctuations in relative abundances are observed throughout the core, however the most dramatic change is in the post ash sample at 291 cm. This is the only sample where *A. italica* is not the most abundant species. *Discostella stelligera* has the highest abundance (25%) and exhibits a

marked increase from pre-ash samples (2-7%). *Asterionella formosa* was next abundant (21%), also increased from pre-ash abundances (1-8%). *A. italica* was markedly lower (18%), with pre-ash samples ranging from 47-87%. *S. construens* v. *venter* is also elevated approximately 5% above pre-ash levels. *A. italica* increases in abundance to 35% at 287cm (~60 y post-ash) then to pre-ash levels of 66% at 283cm (~140y post-ash). *D. stelligera* and *A. formosa* drop back to pre-ash abundance levels, but *S. construens* v. *venter* remains elevated (14-28%). Marked changes observed in the layer directly above the ash indicate an immediate ecologic impact. Previous studies of Mexican lakes have shown increases in *Fragilaria* spp. accompanied by a decrease in the abundance of *Aulacoseira* immediately following tephra deposition. These shifts have previously been interpreted to indicate a shift in the Si:P ratio towards higher silica concentrations. Whether related to Si levels or other factors, the diatom transition at Fallen Leaf Lake shows an immediate and marked impact on the diatom flora followed by a significant drop in *A. italica* that lasts for a ~140 year period before return to pre-ash conditions. P-30 POSTER PRESENTATION

PALEOLIMNOLOGY OF SHALLOW LAKES: LIMITATIONS OF DIATOM-BASED TRANSFER FUNCTIONS AND A MULTI-PROXY APPROACH

Joy M. Ramstack[1], Avery L.C. Shinneman[1,2], Mark B. Edlund[1], Steve Juggins[3], and Jeremy Williamson[4]

[1]St. Croix Watershed Research Station of the Science Museum of Minnesota, Marine on St. Croix, MN USA
[2]Department of Geosciences, University of Nebraska, Lincoln, NE USA
[3]School of Geography, Politics & Sociology, Newcastle University, Newcastle upon Tyne UK
[4]Polk County Land and Water Resources Department, Balsam Lake, WI USA

Diatom-based paleolimnological techniques have been used throughout Minnesota and Wisconsin (northcentral USA) to quantitatively reconstruct historical environmental conditions, including total phosphorus (TP) concentrations. Diatom-based TP reconstructions have been used as one line of evidence for developing regional and lake-specific nutrient standards. Weighted averaging reconstructions have worked well to infer past TP concentrations in deep lakes; however, shallow lakes have posed problems with these traditional methods. We have used a 145-lake diatom based transfer function to explore why TP reconstructions are often unreliable in shallow lakes, and to identify the stressors (beyond nutrient inputs) that may be driving the changes in diatom communities in these systems. To determine the ecological history of shallow lakes we have adopted a multi-proxy approach. Dated sediment cores from a subset of shallow lakes have been analyzed for diatom community composition (changes from benthic to planktonic assemblages, species turnover, and diversity measures), macrophyte abundance, biogenic silica, sediment phosphorus, and loss-on-ignition. The results of a multi-proxy analysis of Horse Lake (northwest Wisconsin) demonstrate that there have been dramatic changes in the ecological state of this lake over the past two hundred years. However, the diatom TP reconstruction in this lake was problematic; modern measured TP was much higher than modern inferred TP. The sediment record indicates that prior to the early 1900s this was a macrophyte-dominated lake with less turbid water and lower diatom productivity. By the 1970s, most of the macrophytes had disappeared, the planktonic portion of the diatom community had increased, and diatom productivity was increasing and has continued to increase into modern times. Extending paleolimnological techniques to include multi-proxy approaches in addition to diatom-based TP reconstructions will give lake managers a more complete picture of how the ecological conditions of shallow lakes have changed in conjunction with major-land use stressors, and will define appropriate ecological endpoints for lake restoration. *Thursday 2:30 PM ORAL PRESENTATION*

CONSEQUENCES OF TAXONOMIC DISCORD IN A GREAT LAKES MONITORING PROGRAM

Euan D. Reavie

Natural Resources Research Institute, University of Minnesota Duluth, Ely, MN 55731, USA

The EPA's Great Lakes National Program Office (GLNPO) is now in its 26th year of comprehensive monitoring of the Great Lakes. Pelagic monitoring includes physical and chemical parameters, phytoplankton, zooplankton and benthic invertebrates. Monitoring data have revealed significant changes in whole-lake conditions, particularly within the last decade, thus justifying GLNPO's mandate to track changes under the Great Lakes Water Quality Act of 1978. As a long-term monitoring program it is critical that operating procedures, particularly taxonomy of organisms, remain consistent over time. Changes in primary contractors for GLNPO's phytoplankton program necessitated taxonomic workshops for new analysts, but unfortunately several complex taxonomic issues arose. The impacts of taxonomic discord can be extensive, including poor indicator development and inability to adequately track long-term changes in the ecosystem. During the last two years substantial efforts were made to correct taxonomic inconsistencies in the diatom and other algal data, and ensure data quality. Based on Niche Theory, the environmental optima and tolerances of diatom species should be consistent over time. With this in mind we developed three Great Lakes phytoplankton-phosphorus transfer functions, each derived from samples collected in a particular year and assessed by different analytical laboratories. Taxonomic efforts focused on ensuring consistency between 1999 and 2007 datasets, and a 2003 dataset was left "uncorrected" (i.e., it contained several known taxonomic problems). Transfer functions were developed using weighted averaging and we tested each model's ability to estimate measured phosphorus. Workshop efforts to refine taxonomic consistency had a clear positive influence on maintaining species coefficients between 1999 and 2007, whereas the impact of even subtle taxonomic variations in 2003 resulted in large differences in species coefficients among models. With the promise of a revitalized algae program, innovative applications for these monitoring data are briefly presented. The diatoms are especially known to provide better integrated information about stressors than direct measurements, and they are particularly suited to paleolimnological applications. At a time when long-term data are needed to distinguish natural from human trends, and to reveal the causes and magnitudes of environmental insults, contemporary monitoring alone is not sufficient to answer important management questions regarding climate change, pollution and invasive species in the Great Lakes. New indicator-based and paleoecological applications, and attention to taxonomic quality, are needed to address the myriad environmental issues that require long-term data for critical remedial decisions. *Saturday 3:10 PM ORAL PRESENTATION*

REPRESENTATIVES OF THE GENUS *PROSCHKINIA* FROM CHIHUAHUAN DESERT, NEW MEXICO

Ling Ren and Marina Potapova

The Academy of Natural Sciences, Philadelphia, Pennsylvania 19103, USA

The species of the genus *Proschkinia* are typical inhabitants of the marine coastal waters and have rarely been recorded from inland water bodies. We report three species of *Proschkinia* from the benthic samples collected in Pecos River and three saline lakes in the Chihuahuan Desert in New Mexico. The relative abundance of *Proschkinia* reached up to 20% in some samples. The co-existence of two or three *Proschkinia* species in the same sample was observed. *Proschkinia* sp. 1 from New Mexico was most similar to *P. complanata* (Grunow) Mann, *P. complanatoides* (Hustedt ex Simonsen) Mann, and *Navicula hyalosira* Cleve, but differed from these species by striae density and frustule size and shape. *Proschkinia* sp. 2 had the size similar to *P. hyalosirella* (Hustedt ex Simonsen) Mann and *P. bulnheimii* (Hustedt) Mann, but differed from *P. hyalosirella* by striae density and from *P. bulnheimii* by the valve shape. *Proschkinia* sp. 3 was most similar to *P. complanata*, but differed from it by the narrower valve and finer striae density. Our data suggest that these three species are new for science. An examination of the type materials of the similar *Proschkinia* species will be conducted to clarify the identity of the *Proschkinia* populations from New Mexico. *P-31 POSTER PRESENTATION*

TWO INTERESTING GOMPHONEMOID DIATOMS FROM PSEUDOAERIAL HABITATS IN THE UPPER PENNINSULA, MICHIGAN, USA

Jennifer A. Ress[1], Evan W. Thomas[2], Rex L. Lowe[1], and J. Patrick Kociolek[2,3]

[1]Department of Biological Sciences, Bowling Green State University, Bowling Green, OH
[2]Department of Ecology and Evolutionary Biology, University of Colorado at Boulder, Boulder, CO
[3]Museum of Natural History, University of Colorado at Boulder, Boulder, CO

The diversity of Gomphonemoid diatoms has been a focus of increasing interest over the past 25 years of diatom research due to their abundance in many aquatic habitats as well as their interesting morphological characteristics. Diversity within the genus *Gomphonema* (Ehrenberg) can be reduced in practical taxonomy for a number of reasons. These reasons include a lack of good identification resources and past practices of "lumping" taxa into existing species that may not be the best fit. Aerial habitats of the Upper Peninsula of Michigan (UP) were surveyed in the summer of 2006 as a part a study investigating community structure in these habitats. Two interesting Gomphonemoid diatoms were observed that do not appear to fit into any current species concept. The first taxon, *Gomphonema sp. 1*, is broadly lanceolate with rounded apices, 20-40 µm long, 5-7.5 µm wide, has 12 striae in 10 µm in the middle of the valve and 17 striae in 10 µm at the apices. A central stigma is present, four larger areolae are present in the central area, and striae are composed of round areolae. Light (LM) and scanning electron (SEM) micrographs are presented. The second taxon, *Gomphoneis sp. 1*, is similar to the rarely reported *Gomphonema olivaceoides var. hutchinsoniana* Patrick, however the habitat is much different than the type locality – pseudoaerial rock wall in northern Michigan as opposed to an oligotrophic stream in eastern Pennsylvania. This taxon is linear with a tumid central area and rostrate apices, 15-22 µm long, 4-5 µm wide, and has 10-11 striae in 10 µm. Four stigmoids are present in the central area and striae are composed of two rows of areolae. LM and SEM images of *Gomphoneis sp. 1* are presented and will be compared to type material of *G. olivaceoides var. hutchinsoniana* Patrick when material becomes available (currently not in collection at ANSP). *Gomphonema olivaceoides* Hustedt has already been transferred to *Gomphoneis* (however is "invalid") and our taxon seems to fit better in this genus rather than in *Gomphonema*. *P-32 POSTER PRESENTATION*

THE REIMER DIATOM HERBARIUM AT IOWA LAKESIDE LABORATORY

S.J. Rushforth[1], M.B. Edlund[2], **S.A. Spaulding**[3], and E.F. Stoermer[4]

[1]Rushforth Phycology, Salt Lake City, UT
[2]St. Croix Watershed Research Station, 16910 152nd Street, N., Marine on St. Croix, MN 55047
[3]US Geological Survey, Fort Collins Science Center and INSTAAR, 1560 30th Street, University of Colorado, Boulder CO 80309
[4]School of Natural Resources, University of Michigan, 4392 Dexter Road, Ann Arbor, MI 48103

The Reimer Diatom Herbarium at Iowa Lakeside Laboratory (ILL) contains 3,280 permanent diatom slides of collections made from prairie potholes, alkaline fens, acid bogs, eutrophic lakes, saline lakes, Pleistocene paleolakes, and Miocene fossil deposits near ILL. The herbarium has a focus on collections made within Dickinson County, a region with an important legacy of study by students and visiting researchers from the US, Canada, and international institutions. The herbarium is well documented by taxon and location catalogues. The taxon card catalogue contains over 2,800 records referencing 67 genera, and the location catalogue references collection sites from 51 counties in 16 states. Curated slides include over 300 species identifications made, or verified, by C.W. Reimer. Most curated slides have diatom specimens identified to species, circled with a diamond objective marker, and often the specimen position is indicated on the slide label. Six holotypes are included in the herbarium and we present the first light micrograph images of the type specimens. We present documentation of the contents and current condition of the herbarium and report that it is now available to researchers for scientific study. Many of the sites represented in the Reimer Diatom Herbarium are the same locations visited each year by students and visiting researchers at ILL, resulting in an important resource for monitoring environmental change, resolving taxonomic issues, and understanding species distributions in unique habitats. *P-33 POSTER PRESENTATION*

SOME CHAETOCEROS SPECIES FROM AN OLIGOHALINE, SUBTROPICAL ESTUARY

Ashley F-P. Sanders[1], Jan E. B. Rines[2] and James L. Wee[1]

[1]Department of Biological Sciences, Loyola University, 6363 St. Charles Ave., New Orleans LA 70118, USA
[2]Residence Graduate School of Oceanography, University of Rhode Island, South Ferry Road, Narragansett, RI 02882-1197, USA

The Lake Pontchartrain basin estuary (LPBE) is shallow, wind-driven and comprised of two large embayments (1645 km^2), Lake Maurepas and Lake Pontchartrain. Salinities

generally range from freshwater to 3 ppt in the west (Lake Maurepas, Pass Manchac and western Lake Pontchartrain) to ca. 8 ppt in the east (eastern Lake Pontchartrain, Chef Menteur Pass) nearer the Gulf of Mexico. Salinities across the LPBE often are higher during the fall when rainfall is lower. Flushing times are reported from 60-120 days. Phytoplankton investigations in the LPBE emphasizing species-level identifications are few in number. This report is part of an ongoing, floristic investigation of the planktonic diatom genus *Chaetoceros* Ehernberg occurring at seven open-water sites over one annual cycle and spanning the east-west salinity gradient in the LPBE. The results reported here include monthly samples from November 2008 - June 2009, but updates through September are planned for the poster presentation. Two separate plankton tows (10 µm and 35 µm mesh size) were combined into a single sample at each sampling event until June 2009 when a second sample was added from a 63µm mesh-size plankton net tow. Temperature, salinity, pH and DO were recorded at the sample site. Samples were examined fresh or preserved in 0.5% glutaraldehyde or 0.5% glutaraldehyde with 1% formaldehyde in Sørensens buffer, depending upon the salinity. Nine *Chaetoceros* taxa including two unidentified species were observed in extreme eastern Lake Maurepas, Lake Pontchartrain or the Chef Menteur Pass. Salinities in the east ranged from a high of almost 10 ppt in November and December 2008, to a low of 2.2 ppt in April 2009. In the west, salinities varied between 2-5 ppt during the eight-month period. Likewise, temperatures ranged from 15♈ C in November 2008 to 34♈ C in June 2009. The number of species observed were greater in November-January, then decreased through April, and were absent in all subsequent samples. In the west, *C.* cf. *costatus, C. lorenzianus,* and *C. subtilis* were observed in eastern Lake Maurepas and *Chaetoceros affinis* at the western most Lake Pontchartrain site. The largest number of species were identified at the Chef Menteur Pass, the eastern most site, where *C. affinis, C.* cf. *decipiens, C. radicans, C.* cf. *similis,* and *C. subtilis* var. *abnormis* as well as the two unidentified taxa were observed. *P-34 POSTER PRESENTATION*

A 30 LAKE DIATOM TP CALIBRATION SET FROM THE ERIE / ONTARIO DRIFT PLAIN ECOREGION

Kyle Scotese[1] and Julie Wolin[2]

[1]BSA Environmental Services, Inc., 23400 Mercantile Rd, Suite 8
Beachwood, Ohio 44122
[2]Department of Biology, Geology, and Environmental Science, Cleveland State University, 2121Euclid Ave, Cleveland Ohio 44102

Nutrient enrichment in the form of anthropogenic phosphorous and nitrogen inputs has occurred in lakes worldwide. In the absence of historical water chemistry data, the extent to which human activity has impacted lakes in the Erie/Ontario drift and lake plain and Western Allegheny Plateau ecoregions is unknown. The objective of this study was to develop a surface sediment diatom calibration set from 30 lakes spanning a phosphorous and nitrogen gradient in the glaciated regions of northeast Ohio and northwest Pennsylvania with an additional lake in New York. No current training set exists for this geographic region. Surface sediment samples and water chemistry data were collected from selected lakes in fall 2006. Sediment samples were processed and analyzed for diatom species composition using a minimum count of 500 valves. The relationship between diatom species, environmental variables and water chemistry was determined using canonical correspondence analysis (CCA). Total phosphorus, ammonia, and magnesium were the three most statistically significant environmental variables, although maximum depth and nickel concentrations were also found to be important. The relationship between diatom species and environmental variables was established using weighted-averaging and the ecological indicator values (optima and tolerances) of 40 abundant diatom species were defined using C^2 software. The root mean squared error associated with prediction of the TP inference model was 17 ug/L, and the R^2 linear coefficient of correlation between observed and diatom-inferred TP values was 0.77. The optima developed in this research compare with other calibration studies of similar TP gradient lengths (12 ug/L-153 ug/L TP). Optima determined from other nearby regional studies are much lower than those from this project, illustrating the need for more regional calibration research. *Thursday 1:50 PM ORAL PRESENTATION*

COMPARISON OF DIATOM-BASED INDICES OF WATER QUALITY FOR MID-CONTINENT (USA) GREAT RIVERS

Gerald V. Sgro[1*], Euan D. Reavie [2], Amy R. Kireta[2], Ted R. Angradi[3], Terri M. Jicha[3], David W. Bolgrien[3], Brian H. Hill[3]

[1]John Carroll University, 20700 North Park Boulevard, University Heights, OH 44118
[2]Center for Water and the Environment, Natural Resources Research Institute, University of Minnesota Duluth, Ely, MN
[3]United States Environmental Protection Agency, Mid-Continent Ecology Division, Duluth, MN

One hundred eighty-four periphyton and 174 phytoplankton samples from Midwest Great Rivers (Ohio, Mississippi, and Missouri rivers) were selected in a random stratified design to represent a gradient of environmental quality conditions from an original set of 393 unbiased sample sites. Water quality was inferred using 16 commonly used diatom taxonomic indices. These included indices developed in Europe and Japan for assessing biologic oxygen demand (saprobity), trophic status, and general pollution. Four new weighted-average models developed by calibrating diatoms to total phosphorus (TP) in the rivers were also used to infer TP at the sample locations. Inferred data from all indices were compared to a suite of water chemistry and watershed stressor variables to determine the ability of the indices to track environmental quality. Some of the indices developed in Europe and Japan performed satisfactorily as indicators of water quality conditions in the basin using periphyton or phytoplankton data. The weighted-average models correlated more strongly than the other indices with measured phosphorus. Weighted average models based on periphyton also correlated more strongly with water chemistry and watershed stressor variables. *Saturday 4:10 PM ORAL PRESENTATION*

INFERRING LAKE DEPTH USING DIATOM ASSEMBLAGES IN THE SHALLOW, SEASONALLY VARAIBLE LAKES OF THE NEBRASKA SAND HILLS (USA)

Avery L.C. Shinneman[1], Sherilyn C. Fritz[1], Danuta Bennett[1,2], Jens Schmeider[1]

[1]University of Nebraska, Department of Geosciences, Lincoln, NE 68588
[1,2]University of California at Santa Barbara, Department of Ecology, Evolution, and Marine Biology, Santa Barbara, CA 93106

The Nebraska Sand Hills are a unique eco-region in the semi-arid Great Plains of the western United States. The water table underlying the Sand Hills is part of the High Plains/Ogallala aquifer, an important water resource for the central Great Plains. The aquifer reaches the surface in many inter-dune depressions creating thousands of lakes and wetlands which serve as critical habitat for migratory birds and other wildlife and support the local ranching economy. Understanding long-term hydrologic variability and its effect on the lakes is important for future water management planning. Lake levels are affected directly by fluctuations in the water table, which is recharged primarily by local precipitation and responds quickly to climatically induced changes in regional water balance. Modern instrumental records are available for only 50-100 years, and paleolimnological data provide important insights into the extremes and variability in moisture balance over longer time scales. A set of 69 lakes from across Nebraska was used to establish a statistical relationship between diatom community composition and water depth. This relationship was then used to develop a diatom-based inference model for water depth using weighted averaging regression and calibration techniques. Development of the inference model was complicated by strong intra-seasonal variability in water depth and the linkages between depth and other limnologic characteristics, including water clarity and nutrient concentrations. Analysis of historical diatom communities from multiple lakes allowed for the reconstruction of lake-level fluctuations over the past several thousand years. Comparisons of these reconstructions with instrumental records and additional proxy records showed that diatoms may not faithfully reflect short-term fluctuations in water level but do reflect large and persistent change in moisture availability. Thus diatoms are a useful addition to the tools available for understanding past drought in the central Great Plains, especially when trajectories of change are constrained by data from multiple sites or other proxies. *Friday 9:40 AM ORAL PRESENTATION*

EOCENE NONMARINE DIATOMS FROM NORTHERN CANADA

Peter A. Siver[1], Alexander P. Wolfe[2] and Mark B. Edlund[3]

[1]Botany Department, Connecticut College, New London, CT, USA
[2]Department of Earth & Atmospheric Sciences, University of Alberta, Edmonton, Alberta, Canada
[3]St. Croix Watershed Research Station, Science Museum of Minnesota, Marine on St. Croix, MN, USA.

Siliceous microfossils abound in lake sediments deposited in the Giraffe kimberlite diatreme, a Middle Eocene maar situated in the Northwest Territories of Canada. The lake persisted between the time of kimberlite emplacement at 48 Ma and final paludification at 40 Ma, as constrained by $^{87}Rb/^{87}Sr$ and fission-track ages. An exploration drill core taken from the crater in 1999 contains 113.1 m of organic sediment, including 44.8 m of peaty material underlain by 68.3 m of stratified lacustrine sediment, in many places finely laminated, and rich in siliceous microfossils. Overall, microfossils representing the Chrysophyceae and Synurophyceae dominate samples from the lacustrine facies. Despite the overwhelming abundance of chrysophytes, an astonishing diversity of diatom lineages is also present, including the orders Thalassiosirales, Aulacoseirales, Fragilariales, Tabellariales, Eunotiales and Naviculales. We present details concerning the ultrastructure and stratigraphic distributions of representatives of the genera *Cyclotella s.l.*, *Aulacoseira*, *Fragilaria s.l.*, *Oxyneis*, *Eunotia*, *Nupela* and *Pinnularia*. The complement of thalassiosiroid genera (*Cyclotella, Discostella, Puncticulata*) extends the antiquity of the fultoportula, and implies that the Thalassiosirales lineage is considerably older than previously thought. Species of *Aulacoseira,* with morphological affinites to modern taxa, dominate sections of the core corresponding to deep-water deposition, implying some degree of ecological stasis within this group. As observed throughout the material, the ultrastructure of the araphid diatom species is also directly comparable to modern taxa. The genus *Eunotia* became established as the lake transitioned to a more shallow and acidic waterbody. One of the observed morphotypes of *Eunotia* has a raphe spanning more than 80% of the valve length and a distinct hyaline central area between the proximal raphe endings, suggesting greater raphe development in certain ancient *Eunotia* relative to modern counterparts. The presence of *Eunotia*, along with *Nupela* and *Pinnularia,* further establish that nonmarine biraphid diatoms as a whole are more ancient than previously believed, dating to at least 45 Ma. Collectively, the exquisitely preserved microfossils from the Giraffe Pipe core have enhanced our understanding of freshwater diatom evolution as a whole, and provide valuable new mileposts to discipline molecular phylogenies. *P-13 POSTER PRESENTATION*

INFLUENCE OF AGRICULTURAL PRACTICES ON ALGAL COMMUNITY ON LAKE OCONEE, GEORGIA

Marka E. Smith[1] and Kalina M. Manoylov[1]

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

Algae are precise indicators of ecological conditions in lotic and lentic habitats. Water quality was assessed for five subregions of Georgia's Lake Oconee and its surrounding wetlands and tributaries over a 2 year period. Sites were chosen based on their level of human impact: suburban development greater than thirty years, modern suburban development, industry, agriculture, and an area of low human activity. Temperature, pH, dissolved oxygen and turbidity measurements were normal for oligotrophic lakes. 126 samples were collected and nutrient influx from construction, cattle farms and recreation were assessed within each habitat. Measurements of chlorophyll a and algal community relative abundance indicated that the least impacted and modern suburban areas had a significantly lower number of primary producers and were diatom dominated. Lacustrine diatom biodiversity of the Piedmont Region of Georgia is reported here for the first time. Preliminary data indicate that the majority of the 234 taxa were oligotophic and common. *Asterionella formosa* Hassal, *Achnanthidium minutissimum* (Kützing) Czarnecki and *Fragilaria crotonensis* Kitton dominated all samples with the exception of the old suburban and agricultural site. Higher nutrient sites were dominated by *Nitzschia acicularis* (Kützing) Smith, *N. palea* (Kützing) Smith and *Synedra ulna* (Nitzsch) Ehrenberg. These results suggest that algal community structure is responsive to changes in water quality and nutrient loading in the lakes, ultimately affecting upper trophic levels. *Thursday 10:40 AM ORAL PRESENTATION*

DIATOM SUCCESSION IN ACID MINE DRAINAGE IMPACTED STREAMS: IMPLICATIONS FOR BIOFILM STRUCTURE AND FUNCTION

Nathan J. Smucker[1] and Morgan L. Vis[1]

[1]Department of Environmental and Plant Biology, Ohio University, Athens, Ohio 45701 USA

Acid mine drainage (AMD) with high metal concentrations and acidic pH is a devastating legacy of coal mining that impairs the biology and habitat of thousands of stream kilometers in the USA. To improve assessments and restoration efforts, this research focused on how AMD impacts the structure and function of lotic biofilms. We documented algal diversity, biomass, bacterial abundance, and extracellular enzyme activity (EEA) during succession on tiles for 5 weeks in 8 streams (3 AMD, 3 downstream of an AMD discharge with aluminum actively precipitating at pH 5.3, 1 control recovered from AMD, and 1 control with no AMD). Succession was investigated in addition to AMD impacts because it is an important process in streams with frequent high flow events that can scour the benthos. The rate of algal biomass accrual was greatest in the non-AMD control, least in sites downstream of the discharge with metal precipitates, and intermediate in AMD sites. Diatom diversity and evenness were lowest in the worst AMD site, intermediate in sites downstream of the discharge, and greatest in control sites throughout succession, with distinct communities forming in the various stream types. *Eunotia exigua* dominated at pH 3.1, *Surirella roba* and *E. exigua* were abundant at pH 4.9, and *Achnanthidium minutissimum* had increased relative abundances downstream of the discharge. Phosphatase activity was greatest in AMD sites, indicating a response to P limitation likely due to P adsorbing to metals. Leucine-amino peptidase, a measure of N uptake, and ß-glucosidase (GLU) were greatest in control streams. GLU was related to algal biomass, likely because algal exudates are an important source of biofilm polysaccharides for bacteria. ß-xylosidase was consistent among streams, indicating similar roles of allochthonous carbon. Chlorophyll *a* to P ratios and EEAs indicated inefficient nutrient uptake in AMD streams, which has potential implications for nutrient dynamics downstream. AMD severely impaired biofilm structure and function, along with diatom assemblages and diversity. *Friday 11:20 AM ORAL PRESENTATION*

CYCLOTELLA RESPONSE TO CLIMATE CHANGE DURING THE HOLOCENE: AN ANALYSIS OF THE DIATOM PALEOECOLGY OF A PRISTINE ALPINE LAKE IN GLACIER NATIONAL PARK

Trisha L. Spanbauer[1], Jeffery R. Stone[1], Jasmine E. Saros[2], and Sherilyn C. Fritz[1]

[1]Department of Geosciences, University of Nebraska – Lincoln, Lincoln, Nebraska 68588 USA
[2]School of Biology & Ecology University of Maine – Orono, ME 04469 USA

Hidden Lake is a small, alpine lake located in an isolated, pristine region along the continental divide in Glacier National Park, Montana. In July 2007, we recovered a 65-cm core from the lake, as part of a series of lakes in alpine and subalpine settings, to evaluate variations in fossil diatom assemblages and potential environmental controls on paleoecological transitions in the fossil record. Despite the relatively short sediment archive, the base of the core dates to roughly 8,000 years ago; the core was sub-sampled continuously every 0.5 cm (each sample represents approximately sixty-eight years). Fossil diatom assemblages throughout the core are dominated by *Cyclotella comensis*, *Cyclotella bodanica* var. aff. *lemanica*, *Pseudostaurosira brevistriata*, and *Staurosirella pinnata*. During periods of warming and cooling *C. comensis* and *C. bodanica* var. aff. *lemanica* trend inversely. *Cyclotella bodanica* var. aff. *lemanica* is most abundant from ~600 to 1500 AD, corresponding approximately to the Medieval Warming Anomaly. During this period, *C. comensis* is found in relatively low abundances. *Cyclotella comensis* begins to increase in abundance at ~1450 AD, corresponding to the onset of the Little Ice Age. *Pseudostarurosira brevistriata* and *S. pinnata* are colonial benthic species commonly found in alpine lakes with low nutrient levels, and variations in their relative abundances are often difficult to interpret. Both taxa show declining abundances coincident with the increase in *C. comensis* at ~1450 AD. Results from this study will be compared with Holocene records from other lakes from Glacier National Park and a series of alpine and subalpine lakes in the Beartooth Mountains of southern Montana. *P-35 POSTER PRESENTATION*

FROM MICRO TO MACRO: DETERMINING HYDRODYNAMIC PROPERTIES OF STALK FORMING DIATOMS

Joshua G Stepanek[1], Robert Janisch[2], Matthew L Julius[1]

[1]Phytoplankton Laboratory, St. Cloud State University, St. Cloud, MN USA[2]Center for Microscopic Imaging and Analysis, St. Cloud State University, St. Cloud, MN USA

Diatomists have disproportionately used frustular morphology in taxonomic and systematic studies. While frustule shape has been used to distinguish coarse and fine taxonomic levels, little attention has been given to the selective pressure and evolutionary forces driving morphometric changes and functional optimality. Hypotheses which have been suggested, include regulation of sinking rates, resistance to predation, and nutrient uptake efficiency. These explanations have largely focused on planktonic “centric” diatoms, with little attention paid to pennate diatoms and the unique pressures experienced with a predominantly attached life style. Pennate diatoms spend the majority of their life cycle out of the plankton, attached and growing on a variety of substrates within the photic zone. This necessarily exposes these diatoms to forces created by flowing water, including both stream flow and wave action. This pressure is experienced most acutely by the stalk forming pennate diatom forms, as their high vertical profile moves them out of the viscous boundary layer into a higher flow environment. This investigation examines the hydrodynamic implications of stalk forming pennate diatom morphologies. Due to the diatoms microscopic size, hypotheses regarding hydrodynamic qualities have been historically difficult to test with any reliability. Through the use of atomic force microscope imaging and macro scale three dimensional rendering, diatom morphologies may now be subject to detailed hydrodynamic analysis never before possible. *Saturday 2:10 PM ORAL PRESENTATION*

HOW CAN DIATOMS BE USED TO ASSESS ECOSYSTEM SERVICES?

R. Jan Stevenson

Center for Water Sciences, Department of Zoology, Michigan State University, East Lansing, MI 48824 USA

Our waters have multiple uses, ranging from drinking water supply to supporting biological diversity. Water quantity and quality are important attributes for supporting these uses. Historically, policy of the United States Environmental Protection Agency has assumed that uses dependent upon

water quality would be supported if we managed for waters for as near natural as possible. Thus minimally disturbed biological condition became a management goal. A more culturally diverse perspective of water uses is needed as our economy and trade become more global, which require a global perspective of environmental management and sustainability. The concept of ecosystem services, including regulatory, supporting, provisioning and aesthetic services, has developed rapidly over the past decade as a method for justifying environmental management strategies. The US Environmental Protection Agency has initiated research to explore the relationships between ecosystem services and ecological condition (i.e., deviation from natural). Conceptually, tradeoffs are expected between ecosystem services and condition, especially provisioning services and ecological condition are very differently related to nutrient gradients, one of the key contaminant gradients associated with human activities. These tradeoffs will require major conceptual changes in US policy and challenge application of current assessment methods. Diatoms could be valuable indicators of ecosystem services, directly measuring biodiversity an aesthetic service, but also regulatory, provisioning, and supporting services as well. We can adapt some of our current tools for measuring ecosystem services, such as metrics of biological condition for aesthetic services and nutrient inference models for regulatory and provisioning services. However, refinements of these models are needed for full implementation. For example, hydrogeomorphic attributes of streams will be necessary to refine inferences of productivity and nutrient retention services in streams. In addition, new indicators and indicator concepts will be needed. Models of aesthetics in streams and lakes were developed for this paper using existing databases, and clearly show tradeoffs with models of productivity. These utilize diatom inference models for benthic filamentous green algae and water clarity. Thus, the concepts of diatom indicator applications grow from models of inferences of chemical conditions and biological condition to include models of other organisms and ecosystem functions. Use of diatom indicators as proxies for ecosystem services is another stage in the every-changing marriage of diatom taxonomy, physiology, ecology, and application. *Friday 4:10 PM ORAL PRESENTATION*

A BRIEF HISTORY OF DIATOM STUDIES AT IOWA LAKESIDE LABORATORY

Eugene F. Stoermer

Professor Emeritus, School of Natural Resources and Environment, University of Michigan, Ann Arbor, Michigan, USA

Lakeside Laboratory, because of its location in the naturally eutrophic recently glaciated region of central United States, attracted the interest of many Phycologists. This included such luminaries as Gilbert Morgan Smith and Gerald W. Prescott. The latter a native Iowan and returned to the University of Iowa to complete his M.S. and Ph. D. Diatoms, however, received relatively little interest from these investigators. The earliest regional records of diatoms were published by C.G. Ehrenberg, based on samples from Fort Dodge. Dr. Robert E. Buchanan, who would later achieve renown as editor of *Bergy's Manual of Determinative Bacteriology*, completed a M. S. thesis on algae, which mentioned some diatom species from the local region. Real interest in the group began with Dr. John D. Dodd, long-term instructor in Phycology at Lakeside Lab. Under Dodd's subtle guidance I, in a very real sense, became something of a vehicle for his vision. When presented with my proposal to study diatoms, he first demurred, but presented me with an application for a fellowship at the Academy of Natural Sciences, Philadelphia, at that time the only institution in the U. S. actively working on freshwater diatom systematics and ecology. Through the kindness of Dr. Ruth Patrick, the application was successful. When presented with a wildly over-optimistic dissertation proposal, Dodd indicated that it would be impossible with departmental funding, but presented me with a grant application form. Dodd skillfully converted my initial scribbles into a grant titled "Diatoms in Hard Water Habitats" that rode the first wave of environmental consciousness to support the research and training of a succession of students. When I proposed, at the completion of my terminal degree, to stay on at Iowa State University to do research on diatom ultrastructure he was not particularly pleased, but acquiesced under the condition that I "give something back" by initiating a diatom clinic at Lakeside Lab. When I finally did leave Dodd's lab I approached Dr. Charles Reimer, one of my major mentors at Philadelphia with the proposal that he continue the course. Charlie at first expressed reluctance to "spend his summer in the cornfields of Iowa", but Dodd somehow inveigled him to come "for one year". As the old saying goes, "it was all downhill from there". Charlie brought a broader vision, a more structured approach, and his reputation, that attracted a nation and international audience. The forward momentum that Charlie developed continues today. *Friday 8:40 AM ORAL PRESENTATION*

THE DIATOM WIKI: AN ONLINE COMMUNITY RESOURCE

Jeffery R. Stone and Karlyn S. Westover

Department of Geosciences, University of Nebraska-Lincoln, Lincoln, NE 68588, USA

The diatom wiki (http://frustule.jx3.net) is designed to house an array of useful scientific information online, including diatom terminology and taxonomic, ecologic, and stratigraphic data about diatoms. As the online community database grows, it will be expanded to include useful references, encyclopedic and biographic information about diatom research and authorities, and it will be further developed as an educational scientific resource. Our mission is to create a dynamic online resource that will help foster community discussion, identify or highlight scientific discrepancies, warehouse the knowledge of experts in our community, and centralize online data resources. The diatom wiki currently provides community-driven content, such as illustrated dictionary of terminology with over 500 terms and descriptions of over 100 diatom genera. *P-36 POSTER PRESENTATION*

LATE-PLEISTOCENE DIATOM PALEOECOLOGY OF LAKE MALAWI: EVIDENCE OF EXTREME SHIFTS IN DEPTH AND MIXING REGIME

Jeffery R. Stone[1, 2] and Andrew S. Cohen[2]

[1]Department of Geosciences, University of Nebraska, Lincoln, NE 68588 USA
[2]Department of Geosciences University of Arizona, Tucson, Arizona 85721 USA

A high-resolution lake level reconstruction (10,000 to 144,000 years BP) was generated by a principle component analysis of fossil diatoms and additional fossil and mineralogical residues from sediments recovered from the central basin of Lake Malawi. Lake-level fluctuations on the order of hundreds of meters were inferred from dramatic changes in the fossil and sedimentary archives and supported by seismic evidence of ancient shorelines. Significant paleohydrographic

variability, including changes in lake stratification, nutrient cycling, and water chemistry, were also inferred from the diatom paleoecology. Prior to 70 ka, fossil assemblages suggest that the central basin was periodically a much shallower, more saline and/or alkaline, well-mixed environment. This contrasts starkly with the deep, dilute, dysaerobic environments of the modern central basin. After 70 ka, our reconstruction indicates sustained deeper-water environments were common, marked by a few brief, but significant, lowstands. Many of the diatom taxa we observed are endemic to Lake Malawi or commonly confined to deep East African lakes. In many cases the fossil assemblages have no modern analog in Lake Malawi; hence, our paleoecological inferences rely on diatom autecology and other indicators of ancient depth and lake setting. Assemblages found in the open waters of the central basin today are associated with deep-water indicators and are minor components during inferred shallow intervals. Similarly, diatom species which are only observed in the shallow southern basin today are typically associated with shallow-water indicators. Interestingly, the standard interpretation of shifts in tychoplankton and periphyton (i.e., increased relative abundances suggest shallower conditions) is often not congruent with our interpretation of past lake levels. For example, while both groups are abundant in some diatom zones interpreted to be shallow, they are present in relatively low abundances throughout an unambiguous prolonged lowstand. Also, when deeper lake environments are indicated by other lines of evidence, tychoplankton and periphyton often have relatively high values. A substantial change in diatom flux rates across zones might produce a similar pattern, but our estimates of diatom productivity do not support this explanation. A more probable explanation is that flooding of the southern basin and increases in nepheloid flows from river flooding results in a greater contribution of nearshore silt to the central basin during deeper lake settings. During prolonged lowstands, the basin configuration, or perhaps greater turbidity, may have resulted in a proportional loss of benthic habitat area near the coring site. *Friday 10:40 AM ORAL PRESENTATION*

THE DIATOM PHYLOGENY: STATUS AND PROSPECTS

Edward C. Theriot[1], Matt P. Ashworth[2], Robert K. Jansen[2], Teofil Nakov[2], and Elizabeth C. Ruck[2]

[1]Texas Natural Science Center, University of Texas at Austin, Austin, TX 78705, USA
[2]Section of Integrative Biology, University of Texas at Austin, Austin, TX 78712, USA

Nuclear SSU gene data have predominately returned a result in which radially organized centric diatoms graded into bipolar or multipolar organized centrics which themselves graded into pennate diatoms. Recent hypotheses, however, have proposed that each of these groups was monophyletic. In fact, SSU does not robustly resolve any of these competing ideas. Organellar and developmental anatomy of the diatoms remains unknown for the vast majority of diatoms, but seems to align taxa in much the same way as the SSU data. The greatest amount of existing molecular data besides SSU has been gathered from the *rbc*L gene. Most *rbc*L data has been gathered in studies of ordinal and lower taxa. Our lab has added *rbc*L and *psb*C data (chloroplast genes), seeking to fill in obvious gaps. Results are promising, although the trees returned to date do not reflect either traditional classifications or the SSU trees, possibly simply due to low signal to noise in the chloroplast data rather than some fundamental bias. This low signal to noise may be overcome by the addition of genes and taxa. There is broad congruence between biostratigraphic distributions of diatoms and molecular phylogenies, but long ghost lineagaes are implied both by molecular phylogenies and traditional classifications. Some of the gaps may reflect large gaps in taxon sampling. The next century will see the use of entire genomes in phylogenetic inference. There are already examples in higher animals of the use of these data to infer large scale phylogenies, and already cautionary tales that such data are themselves not a panacea. In particular, taxon sampling remains an issue. A major challenge to diatomists of the 21st century will be to integrate these new technologies with traditional explorations of diatom diversity, and to formally integrate the apparent high number of extinct taxa that would appear to occupy the basal and middle of the diatom tree. *Friday 3:10 PM ORAL PRESENTATION*

NOT JUST CURVATA, ANYMORE – INTERESTING RHOICOSPHENIA GRUNOW OF CALIFORNIA, USA

Evan W. Thomas and J. Patrick Kociolek

Department of Ecology and Evolutionary Biology, University of Colorado at Boulder, Boulder, CO
Museum of Natural History, University of Colorado at Boulder, Boulder, CO

The genus Rhoicosphenia is best known for the two species R. curvata (Kützing) Grunow and R. abbreviata (C. Agardh) Lange-Bertalot, which are now thought to be synonyms (Lange-Bertalot), and these are the most frequently reported species in ecological studies. However, under closer investigation the genus seems to be more diverse, The California Academy of Sciences on-line database currently lists 22 species and many intraspecific taxa. The current NADED taxa list only includes R. curvata and R. abbreviata – not even “sps” or “cfs”, as are common with other genera, are present in this list for Rhoicosphenia – this is surprising due to the quantity and variety of samples that have been examined to compile this list. In the 2005 Checklist of U.S. diatoms, Kociolek reports five Rhoicosphenia taxa, R. curvata and four varieties of that species (gracilis, major, minor, and subacuta) - two have citations from the Great Lakes, one from Pennsylvania, and two from Oregon. R. curvata as well as three other interesting taxa from this genus are present in samples from the state of California taken in 2007 and 2008. For the purposes of diatom diversity, these are exciting species finds and remind us that Rhoicosphenia is not a monospecific genus. Preliminary comparisons to species in Schmidt’s Atlas indicate that they may not all be new to science, however, being that Rhoicosphenia are not being reported in current diatom studies, it is important to show that other species do exist. From an ecological perspective, it will be interesting to see if there are any patterns of distribution based on geography or water chemistry. Light and scanning electron micrographs are presented in this work to better understand the diversity of this genus in California streams. *Thursday 4:10 PM ORAL PRESENTATION*

THE BUCKLING OF DIATOM VALVES

Mary Ann Tiffany[1], Stephen S. Nagy[2] and Richard Gordon[3]

[1]Center for Inland Waters, San Diego State University, San Diego CA 92182 USA
[2]Montana Diatoms, Helena MT 59604 USA
[3]Richard Gordon, Department of Radiology, University of Manitoba, Winnipeg MB R3A 1R9 Canada

The valves of many centric and pennate diatoms have undulations that may be attributable to buckling of the

silicalemma and/or its contents during valve morphogenesis (Gordon & Drum, 1994). This is supported by the notion that valve morphogenesis occurs in two stages: rapid two dimensional silica growth taking minutes, followed by 3D valve thickening taking hours (Gordon & Drum, 1994; Hildebrand et al., 2006; Hildebrand, 2008; Gordon et al., 2009). The thin 2D nascent valve may be very flexible and thus readily susceptible to buckling forces. We quantitate buckling where possible in terms of sine waves or Bessell functions, and show the variety of buckling patterns exhibited via SEM and light microscopy, with quantitative comparisons of wavelengths and amplitudes measured by both methods. *Saturday 1:50 PM ORAL PRESENTATION*

ALLEGED UNCONFORMITY AT THE HUEYATLACO ARCHAEOLOGICAL SITE (PUEBLA, MEXICO) ADVOCATED BY THE CENTER FOR THE STUDY OF THE FIRST AMERICANS IS NEGATED BY 37 LINES OF DIATOM CORRELATION

Sam L. VanLandingham

Consulting Environmentalist/Geologist, 1205 West Washington, Midland, Texas 79701 USA

No other archaeological site in the world is known to be associated with such a vast variety of age and paleoecologically diagnostic diatom fossils as Hueyatlaco: 37 lines of correlation demonstrate this. In the present work, 33 additional lines of diatom correlation are added to the four previously published by the author, all of which discredit this alleged unconformity: 7 of these lines pass directly through and the remaining 26 pass within 3 m of the supposed unconformity at the Hueyatlaco site. No proof of the postulated unconformity has been presented, because it is a vacant hypothesis: it cannot be proven, since the so called evidence has been destroyed (eroded away). At no other location in the world would one be likely to find any non-marine diatomaceous sequence with as many as 22 distinct beds with a total thickness < 30 m which would result in so many lines of correlation between samples based on the six criteria (i.e., taxonomic percentage correlation, pennate to centric ratios, extinct taxa, earliest known first occurrences, paleoecology, and dominance/subdominance associations of taxa) for diatom correlation within a spherical area with a diameter of < 3 m. All but 2 of the 37 lines of correlation link to samples within the artifact-bearing B, C, E, and I Units of C. Irwin-Williams. And all of these 35 lines of correlation corroborate a minimum age of Last Interglacial (Sangamonian) for all of the artifact beds connected with them. In the 37 lines of correlation, total diatom taxa extinct at the end of the Sangamonian range from 5 in lines 9 and 36 to 17 in lines 1 and 30. Six of the lines of correlation have the *Cocconeis - Navicula - Synedra* generic dominance / subdominance association which is otherwise known in the fossil record only from the Last Interglacial of Europe and in the Western Hemisphere only in the six correlation lines (4 of which pass directly through the "unconformity"). Line 4 (which passes straight through the supposed unconformity) links two samples (in the centric paucity zone) both of which have the *Cocconeis-Navicula-Nitzschia-Synedra* dominance/subdominance association, the only such occurrence of this association known in the Western Hemisphere. *Friday 2:10 PM ORAL PRESENTATION*

LEARNING FROM FOSSIL DIATOM RECORDS ABOUT PAST ENVIRONMENTAL CONDITIONS IN TWO SUBTROPICAL SOUTH FLORIDA ESTUARIES

Wachnicka, A.[1], Gaiser, E.[1] and Collins, L.[2]

[1]Southeast Environmental Research Center, Florida International University, Miami, FL, USA
[2]Department of Earth and Environment, Florida International University, Miami, FL, USA

The ecology of South Florida estuaries has been greatly affected in the last century by the intensive urban development in South Florida. Construction of flood-protection structures and expansion of agricultural areas caused changes of quantity and quality of water that is being delivered into adjacent estuaries. These changes have been superimposed on long-term climate-driven changes and sea level rise. Due to the planned water management changes related to the Comprehensive Everglades Restoration Project, which aims to increase freshwater flow to the adjacent bays, it is important to determine the impact that these changes had on the bays' environment and establish the pre-impact salinity and water quality conditions in order to aid selection of appropriate restoration targets for South Florida estuaries. In order to accomplish these goals we developed salinity, phosphorus and nitrogen transfer functions since they will most likely be affected by the aforementioned changes the most, and applied them to ~ 150 years old fossil diatom records in seven sediment cores collected in Florida Bay and Biscayne Bay. Additionally, we established the amount of change in diatom species composition in those cores to determine the impact that the modified water quality conditions had on diatom communities. Stratigraphically constrained cluster analysis of diatom data revealed that major compositional changes at coring locations situated near the coast occurred ~ 1960 A.D., which corresponds to the construction of large water conservation areas south of Lake Okeechobee. Major alterations of diatom communities in areas located further away occurred in different periods of time. Reconstructions of past salinity and nutrient conditions showed that the post-1900 salinity increased at some nearshore locations in Florida Bay and northern Biscayne Bay, while at the same time phosphorus and nitrogen concentration in the water decreased. These findings imply that modifications of the amount of surface water flow into the estuaries affected salinity conditions at those locations, while decrease influx of nutrient-rich ground water influenced nutrients concentration. Lack of significant differences between pre- and post-impact salinity and nutrient conditions at off-shore locations imply that environmental conditions in those areas are mostly influenced by natural drivers. Although environmental changes were not always significant at the study sites, the compositional changes in diatom communities were very distinct, especially at nearshore locations. This implies that even small environmental disturbances affect composition of diatom assemblages, which can be interpreted as an early warning sign of Florida Bay and Biscayne Bay ecosystems degradation. *Saturday 9:20 AM ORAL PRESENTATION*

REFINING MARINE DIATOM PALEOPRODUCTIVITY ESTIMATES FOR THE SOUTHERN OCEAN

Jonathan Warnock[1] and Reed Scherer[1]

[1]Department of Geology and Environmental Geosciences, Northern Illinois University, DeKalb, Illinois 60115 USA

Potential remediation of increasing atmospheric pCO_2 levels is a topic of great interest to science and society. Researchers are looking to enhanced marine diatom productivity as a potentially viable mechanism of sequestering excess carbon, through artificial fertilization of oligotrophic surface waters. Although most organic matter associated with

diatoms is rapidly degraded, some carbon is bound within the siliceous frustules, providing silica-linked carbon flux. Understanding how diatoms, notably of the Southern Ocean, have responded to and affected past pCO_2 levels is an important part of development, planning, and justifying further fertilization experiments. It is well-known that the fossil record of marine diatoms reflects only a small percentage of primary productivity, with syndepositional taphonomic loss resulting from both dissolution and fragmentation by zooplankton grazing, and postdepositional fragmentation largely from compaction. Stratigraphic records of paleoproductivity will provide an understanding of how diatoms responded to changing climates and pCO_2 concentrations, but improving paleoproductivity proxies requires a better understanding of diatom taphonomy. Here we present the initial results of a morphologically based diatom serial dissolution experiment. Seven Southern Ocean diatom species grown in culture (*Chaetoceros dicheata, Eucampia antarctica, Fragilariopsis kerguelensis, F. nana, Proboscia alata, Pseudo-nitzschia subcurvata,* and *P.-n. turgiduloides*) have been exposed to caustic conditions, and allowed to completely dissolve. Samples of the dissolving diatoms and the dissolution medium were taken throughout the process at scheduled intervals and analyzed via scanning electron microscopy for changes in morphology, e.g. areolae expansion, surface area loss, and frustule thinning. The dissolution medium was analyzed to determine the level of silica in solution, thus linking quantified morphological changes to quantified losses of silica. By using standard Battarbee chambers, the number of frustules completely dissolved was monitored throughout the process. Thus, the data generated include quantified morphological change associated with each level of dissolution, and the relative susceptibility of diatoms grown under identical conditions to dissolution. Additionally, atomic force microscopy was utilized to measure changes in roughness of the valve surface as dissolution progresses as well as the amount of force required to break a valve. The ultimate goal of the project is to link dissolution-induced changes in morphology from core material to the numbers of diatoms lost to solution, thus removing the preservational bias from accumulation records and deriving paleoproductivity. *Saturday 9:00 AM ORAL PRESENTATION*

A HIGH-RESOLUTION DIATOM-INFERRED CLIMATE RECONSTRUCTION FROM A DEEP ALPINE LAKE

Karlyn S. Westover[1, 2] and Christian Bigler[1]

[1]Department of Ecology and Environmental Science, Umeå University, Umeå 90187 Sweden
[2]Department of Geosciences, University of Nebraska, Lincoln, NE 68506 USA

We have analyzed diatoms from the glacially-varved sediments of Lake Silvaplana (Upper Engadine Valley, Switzerland) to produce a sub-decadally resolved record of temperature variability for the last 1000 years. An inference model for mean July air temperature was developed from a regional training set of 110 lakes using weighted-averaging partial least squares regression and calibration. Although temperature was shown to independently explain significant variance in the training set, total phosphorus (TP) was significantly correlated to temperature (r=0.59) and the influence of TP on the diatom assemblage is retained in the final inference model. Consequently, inferred shifts in temperature may actually represent independent changes in TP. This can be seen clearly in our record between 1950 and 1982, when cultural eutrophication strongly impacted the lake and inferred temperatures do not match the instrumental record. However, excluding this period, diatom-inferred temperatures are significantly correlated to the instrumental record. Prior to 1820 the diatom record shows little variability and therefore the reconstructed variables indicate stable conditions. However, other aquatic proxies (chrysophytes and chironomids) show evidence of climate variability at this time. We also examined the record of diatom accumulation rates in Lake Silvaplana. Factors such as turbulence, stratification, turbidity and nutrient availability, which influence the productivity of planktonic diatoms, are ultimately controlled by climate. Unlike the training-set based reconstructions, diatom flux rates show variability throughout the last millennium. Lake sediments provide an integrated record of diatom production that obscures seasonal patterns. Therefore, we have analyzed sediment trap data to better understand the climatic factors that locally control diatom production and succession. *Cyclotella* species, typically the dominant species on an annual basis, are associated with the period of summer stratification although they also may bloom in autumn. *Stephanodiscus* species bloom in the spring, when mixing increases the supply of phosphorus to the water column. *Asterionella formosa* blooms in the autumn and/or spring. *Tabellaria flocculosa* production was significant in the winter months of 2002 and 2003. High diatom production appears associated with warmer temperatures. However, production during 2003 (the warmest summer) was slightly less than that of 2002, when temperatures were above normal persistently from January to June. Productivity was low in the fall of 2003 and was also low during the summer of 2004 and early 2005. Precipitation variability may have also influenced the supply of nutrients; 1999-2002 were wet years, while 2003-2005 were dry. *Thursday 2:10 PM ORAL PRESENTATION*

NEAR-SHORE *THALASSIOSIRA* SPECIES FROM THE PLIOCENE SECTION OF THE ANDRILL AND-1B DRILLCORE, MCMURDO SOUND, ANTARCTICA

Diane Winter[1], Charlotte Sjunneskog[2] and Juan Chow[3]

[1]Rhithron Associates, Inc., 29 Fort Missoula Road, Missoula, Montana 59804
[2]Antarctic Core Facility, Florida State University, Tallahassee FL
[3]Department of Geology and Geophysics, Louisiana State University, Baton Rouge, LA

Modern *Thalassiosira* species in the Southern Ocean are a diverse and varied group characterized by species usually associated with the open water primary productivity occurring at the sea ice edge. One species though, *T. antarctica*, occurs in coastal waters with great sea ice influence. Assemblages in the newly recovered ANDRILL AND-1B drillcore contain several extinct species of this genus; *T. fasciculata*, *T. kolbei*, *T. striata, T. torokina* and the new species *T. teres*. This new species is associated with different interpreted environmental conditions in chronostratigraphically separate intervals of the core. In the older early to mid-Pliocene interval this species occurs in higher numbers in association with species indicative of cool water with limited sea-ice influence. Whereas in the late Pliocene this species co-occurs with *Shionodiscus tetraoestrupii*; the modern descendant of which, *S. oestrupii*, occurs today only in waters north of the Polar Frontal Zone. The overall morphology of this new species shares some features in common with the modern *T. antarctica*, such as the general areaolation pattern on the valve face and the presence of external extensions of the marginal strutted processes but is lacking the central group of strutted processes present in this species today. Of the two forms commonly observed in Antarctic waters today *T. teres* is most similar to the *T. antarctica* T1 form which is interpreted to be

strongly associated with the presence of sea ice. This smaller form is lacking external extensions of the marginal strutted processes which are present in *T. teres*, yet shares the finer areolation observed in the T1 form. The early forms of *T. teres* would seem to indicate an ecological preference for environments similar to that occupied by *T. antarctica* T1 today, yet the late Pliocene examples indicate a preference for marine conditions similar to those existing today near the modern Polar Front. Further SEM study is needed to determine whether this species is representing several similar forms with differing habitat preferences. The lack of *T. antarctica* in the AND-1B record would indicate it evolved subsequent to *T. teres*, perhaps suggesting the latter species could be an evolutionary predecessor to the first. Environmental conditions present during deposition of diatomite and diatom-rich sediment in the AND-1B core appear to have been entirely different than those observed today in any coastal region of Antarctica, which would play a role in determining the evolutionary trends of species within this genus. *P-37 POSTER PRESENTATION*

DIATOM QUALITY ASSURANCE PROTOCOLS: METHODS, DIFFICULTIES AND SUGGESTIONS FOR IMPROVEMENT

Diane Winter, **Dennis Vander Meer** and Wease Bollman

Rhithron Associates, Inc., 29 Fort Missoula Road, Missoula, Montana 59804

Biological monitoring using freshwater diatoms can provide a baseline for a sampling location, allowing comparison with subsequent sampling intervals, or it can determine the current status and 'health' of a location through comparison with data from previous sampling intervals and/or ideal, unimpaired conditions. Current diatom analytical methods of such studies should ideally involve regular quality assurance (QA) checks to ensure consistency and reliability of taxonomic data. The large diversity of diatom species allows detailed representation of assemblages present in differing environments as well as provides the potential for analytical error or inconsistency. This issue is often addressed by two or more analysts counting designated transects and comparing the outcome. Maintaining consistency in identification through comparative counts is hindered by differing species concepts as well as morphologically similar species. Comparative similarity between analyses is determined through application of the Bray-Curtis similarity index, calculating the inclusive percentage of similar taxa observed in each count, acceptable levels falling between 60-75%, dependant on sample diversity. Our comparisons note a range of 56.5-93.68% similarity for samples analyzed during 2006-2009, with a 79.6% average. Four analysts were employed in this work during this time, one responsible for the original counts and three external QA analysts. Application of a variety versus a nominate form, such as *Achnanthidium minutissimum* and *A. minutissimum* var. *gracillima*, is a common source of irregularity between counts. Other species, such as *Rossithidium pusillum* and *Achnanthidium biasolettianum*, represent morphologically similar species that could be identified interchangeably by different analysts. Commonly interchanged species in our QA data include *Amphora inariensis* vs. *A. pediculus*, *Encyonema minutum* vs. *E. silesiacum*, and *Staurosira construens* var. *venter* vs. *Staurosirella pinnata* vs. *Pseudostaurosira brevistriata*. Incorrect identification of some, such as *Nitzschia palea* vs. *N. paleacea*, can result in ecological misinterpretation (see Lange-Bertalot, 1979). Using a shared-image database(s) and an accepted list of species has been used successfully in previous projects involving several different labs (e.g. PIRLA, SWAP and NAWQA). Additionally, defining specific publications and illustrations that best show critical characteristics for species presented with a range of morphological variation in the literature would be useful. Definition of criteria used to draw morphological boundaries between different species (and varieties) is an essential step in maintaining consistency. We suggest a further step would be to promote external QA between several labs, seeking to ensure consistency in taxonomy and analytical methods, which would be of benefit to all. *P-38 POSTER PRESENTATION*

DEVELOPMENT OF A MULTIMETRIC LAKE DIATOM CONDITION INDEX FOR THE CONTINENTAL UNITED STATES

Jason T. Zalack[1], Julie A. Wolin[2], and R. Jan Stevenson[1]

[1]Department of Zoology, Michigan State University, East Lansing
[2]Department of Biological, Geological, and Environmental Sciences, Cleveland State University, Cleveland

Diatoms are powerful indicators of water quality and are often used in biological assessments of aquatic systems. Much work has gone into development of multimetric indices for assessing the condition of rivers and streams. Less work has gone into index development of broadly applicable indices for lake condition. This study, based on the EPA National Lake Assessment, aims to build a nationally applicable diatom-based lake condition index. Lakes were selected using a probability based design. 1030 lakes were sampled for surface sediments, as well as other biological, chemical and physical properties. Sediment samples were processed for diatoms and a minimum of 500 diatom valves were identified and enumerated for each sample. Lakes were then grouped based on similarities in physical and chemical attributes, such as depth, alkalinity, and climate to help refine definitions of reference condition. Lakes within each of these groups with lowest indication of human alteration were then selected as reference lakes. Candidate metrics were calculated from the diatom data based on taxonomic and morphological groups, growth forms, community attributes, and the presence and abundance of indicator species. Final metrics were then selected from each category of metrics for their ability to separate reference from impaired lakes, lack of correlation with other metrics, and for low signal/noise ratio. A model was developed to predict natural variation in LDCI at reference sites based on lake attributes that were not affected by human activities. Expected LDCI could then be calculated for all lakes based on this model. Deviation between expected LDCI after accounting for natural variation and actual measured LDCI was used to assess lake condition. Adjusted LDCI values in the best 75th percent of reference lakes were considered good, while values in the range of the 5th to 25th percent were considered fair, and lakes below the 5th percentile of the reference distribution were considered poor. Nationally, based on the LDCI, the percentage of lakes in good biological condition is 47%, while the percentage of lakes in poor condition is 22%. The Eastern Highlands displays the largest proportion of lakes in good condition (>60%), while the Plains and Lowlands display the highest proportions of lakes of fair or poor condition (54%). The West is characterized by the lowest proportions of lakes in poor condition and a higher proportion of unassessed lakes. *P-39 POSTER PRESENTATION*

PARTICIPANTS

Frank Acker
Academy of Natural Sciences
139 S. State Rd. 3B
Upper Darby, PA 19082-3000
acker@ansp.org

Meagan Aliff
Bowling Green State University
922E Offenhauer
Bowling Green, OH 43403
meagana@bgsu.edu

John Anderson
Loughborough University
4 Walnut Grove
Nottingham NG12 2AD
gynja@lboro.ac.uk

Norman Andresen
5742 Princeton Pl.
Ypsilanti, MI 48197-7123
normanandresen@sbcglobal.net

Matt Ashworth
3625 Duval Rd. 1335
Austin, TX 78759
mashworth@mail.utexas.edu

Nicholas Bach
N56W34822
Oconomowoc, WI 53066
bachn61@uwosh.edu

Loren Bahls
Montana Diatom Collection
1032 12th Ave.
Helena, MT 59601
Hannaea@montana.com

Tisza Bell
1560 30th St.
Boulder, CO 80303
tisza.bell@colorado.edu

Mary Ellen Benson
University of Colorado - Boulder
10 S. Dover St.
Lakewood, CO 80226-1248
maryellen.benson@colorado.edu

Elizabeth Bergey
University of Oklahoma
111 E. Chesapeake St.
Norman, OK 73019
lbergey@ou.edu

Ruchi Bhattacharya
University of Arkansas
920 N. Leverett Ave. 828
Fayetteville, AR 72701
rbhattac@uark.edu

Becky Bixby
1513 Calle Del Ranchero NE
Albuquerque, NM 87106
bbixby@unm.edu

Jessica Black
University of Arkansas
113 Ozark Hall
Fayetteville, AR 72701
Jessica.L.Black@gmail.com

Janice Brahney
University of Colorardo
810 37th St.
Boulder, CO 80303
janice.brahney@colorado.edu

Lynn Brant
521 W. 12th St.
Cedar Falls, IA 50613
lynn.brant@uni.edu

Kari Burr
151 W. Cleveland St.
Stockton, CA 95204
kburr@pacific.edu

Cecilia Carboni
Northeastern Illinois University
3407 W. Bryn Mawr
Chicago, IL 60659
uberzwitter67@yahoo.com

Virginia Card
3005 E. 25th St.
Minneapolis, MN 55406
virginia.card@metrostate.edu

Hunter Carrick
Penn State University
University Park, PA
hjc11@psu.edu

Set Castro
12-6410 134 Ave.
Edmonton, AB T5AOA1
sicastro@ualberta.ca

Donald Charles
Academy of Natural Sciences
1868 Bertram Rd.
Huntingdon Valley, PA 19006
charles@ansp.org

Joshua Cooper
University of Oklahoma
111 Chesapeake St.
Norman, OK 73019
jtcooper@ou.edu

Ryan Drum
Island Herbs
PO Box 25
Waldron, WA 98297
ryandrum2020@yahoo.com

Mark Edlund
St. Croix Watershed Res. Stn.
Marine on St. Croix, MN 55423
mbedlund@smm.org

Julia Eichman
EcoAnalysts, Ind.
7226 Impala Dr.
Neosho, MO 64850
jeichman@ecoanalysts.com

Ryan Farmer
211 Carolina Dr.
Cherryville, NC
rf70478@gmail.com

Sherilyn Fritz
University of Nebraska
3200 S. 29th St.
Lincoln, NE 68502
sfritz2@unl.edu

Paula Furey
University of California Berkeley
Department of Integrative Biology
Berkeley, CA 94720
pcfurey@hotmail.com

Evelyn Gaiser
Florida International University
18735 SW 93 Ct.
Miami, FL 33157
gaisere@fiu.edu

Paul Garrison
2801 Progress Rd.
Madison, WI 53716
paul.garrison@wisconsin.gov

Ille Gebeshuber
Inst. Of Microengineering and Nanoelectronics (IMEN)
Universiti Kebangsaan Malaysia
43600 UKM, Bangi, Selangor Malaysia
ille.gebeshuber@ukm.my

Richard Gordon
University of Manitoba
350 Inkster Blvd.
Winnipeg, MB R2W 0K3
DickGordonCan@gmail.com

Kurt Haberyan
Northwest Missouri State University
27119 Southridge Dr.
Maryville, MO 64468-8272
khaber@nwmissouri.edu

Sarah Hamsher
5-15A Waggoners Ln.
Fredericton, NB E3B2L2
eunotia.sarah@gmail.com

David Harwood
University of Nebraska-Lincoln
126 Bessey Hall
Lincoln, NE 68588-0341
dharwood1@unl.edu

Adam Heathcote
Iowa State University
253 Bessey Hall
Ames, IA 50011
aheathco@iastate.edu

Michael Hein
Water & Air Research
3210 SW 101 Terrace
Gainesville, FL 32608
hein@waterandair.com

William Hobbs
University of Nebraska-Lincoln
206 Bessey Hall
Lincoln, NE 68588
whobbs2@unl.edu

David Jewson
University of Ulster 96 Desermartin Road
Magherafelt, County Derry BT45 5HE
Northern Ireland
d.jewson@btinternet.com

Matt Julius
St. Cloud State University
720 4th Ave. S. WSB-225
St. Cloud, MN 56301
mljulius@stcloudstate.edu

Miriam Kannan
Northern Kentucky University
Department of Biological Sciences
Highland Heights, KY 41099
Kannan@nku.edu

Raymond Keveren
729 W. Cleveland St. 13
Fayetteville, AR 72701
rkeveren@uark.edu

Vicki Kier
Northern Kentucky University
7 Belknap Pl.
Cincinnati, OH 45218
kierv1@nku.edu

Sarah Kingston
Kingston Properties, Inc.
13675 Deer Rd.
Ely, MN 55731
skinnyski@gmail.com

Amy Kireta
U of MN Duluth NRRI
215 W. Chapman St.
Ely, MN 55731
amykireta@yahoo.com

Hedy Kling
Algal Taxonomy and Ecology Inc.
31 Laval Dr.
Winnipeg, MB R3T2X8
hkling@mts.net

Pat Kociolek
University of Colorado
Boulder CO 80309
patrick.kociolek@colorado.edu

Lisa Kunza
1566 Wyoming Ave.
Laramie, WY 82070
lisa@uwyo.edu

Gina LaLiberte
Wisconsin Department of Natural Resources
3541 Sargent St.
Madison, WI 53714
Gina.LaLiberte@wisconsin.gov

Sylvia Lee
2540 W. Balmoral Ave.
Chicago, IL 60625
sylv.s.lee@gmail.com

Lora Loope
National Park Service
E9460 Orchard St.
Munising, MI 49862
lora_loope@nps.gov

Rex Lowe
1001 Napoleon Rd.
Bowling Green, OH 43402
lowe@bgsu.edu

Mark Luttenton
Grand Valley State University
14421 96th Ave.
Coopersville, MI 49404
luttentm@gvsu.edu

Stephen Main
505 4th St. SE
Waverly, IA 50677
stephen.main@wartburg.edu

John Manier
1714 Ferry St.
La Crosse, WI 54601
lheartfishin@netscape.net

Kalina Manoylov
Georgia College and State University
PO Box 081 Biology GCSU
Milledgeville, GA 31061
kalina.manoylov@gcsu.edu

Shigeki Mayama
Tokyo Gakugei University
Koganei-shi
Tokyo 184-8501
mayama@u-gakugei.ac.jp

Kevin McCartney
University of Maine at Presque Isle
155 High St.
Caribou, ME 04736
kevin.mccartney@umpi.edu

Anthony Menicucci
University of Nevada, Reno
2590 Sharon Way
Reno, NV 89509
anthonymenicucci@yahoo.com

Jay Munyon
3279 East Mozart Rd.
Woodlawn, IL 62898
jmuny001@fiu.edu

Teofil Nakov
University of Texas at Austin
1 University Station - A6700
Austin, TX 78713
teofil.nakov@mail.utexas.edu

Harry Nelson
Fluid Imaging Technologies
65 Forest Falls Dr.
Yarmouth, ME 04096
harry@fluidimaging.com

Paula Noble
University of Nevada
DGSE MS 172
Reno, NV 89557
noblepj@unr.edu

Amanda Pappas
North Dupont Highway
Dover, DE 19901
bimdred@gmail.com

Frank Pickett
3630 Columbus Ave.
Butte, MT 59701
frankanddonna@bresnan.net

Robert Pillsbury
University of Wisconsin, Oshkosh
800 Algoma Blvd.
Oshkosh, WI 54901
pillsbur@uwosh.edu

Marina Potapova
ANSP
512 St. Albans Rd.
Havertown, PA 19083
potapova@ansp.org

Marcie Purkey
University of Nevada
Department of Geology Science
Engineering MS 172
Reno, NV 89557
purkdogg63b@hotmail.com

Joy Ramstack
Science Museum of MN-St. Croix
Watershed Research Station
16910 152nd St. N.
Marine on St. Croix, MN 55047
jramstack@smm.org

Euan Reavie
University of Minnesota Duluth
Center for Water and the Environment
1900 E. Camp St.
Ely, MN 55731
ereavie@urri.umn.edu

Jackie Reimer
Media, PA 19103
Philadelphia, PA 19103

Ling Ren
1900 Ben Franklin Pkwy.
ren@ansp.org

Jennifer Ress
Bowling Green State University
318 S. Grove St.
Bowling Green, OH 43402
jar569@hotmail.com

Sam Rushforth
Utah Valley University
452 N. Palisade
Orem, UT 84097
sam.rushforth@uvu.edu

Ashley Sanders
Loyola University New Orleans
520 Fairfield Ave.
Gretna, LA 70056
afsander@loyno.edu

Jane Sawyers
102 Oakdale Hall-H101
Iowa City, IA 52242
jane-sawyers@uiowa.edu

Gerald Sgro
2587 Kingston Rd.
Cleveland Hts, OH 44118
jsgro@jcu.edu

Avery Cook Shinneman
4228 32nd Ave. S.
Minneapolis, MN 55406
cook0311@umn.edu

Jennifer Slate
Northeastern Illinois University
5500 N. St. Louis Ave.
Chicago, IL 60625
J-Slate@neiu.edu

Marka Smith
Georgia College and State University
PO Box 081 Biology GCSU
Milledgeville, GA 31061
kalina.manoylov@gcsu.edu

Nathan Smucker
Ohio University
Porter Hall Room 315
Athens, OH 45701
ns218005@ohio.edu

Trisha Spanbauer
University of Nebraska - Lincoln
5210 Leighton Ave.
Lincoln, NE 68504
tspanbauer2@unl.edu

Sarah Spaulding
USGS/Fort Collins Science Center
INSTAAR1560 30th St.
Boulder, CO 80303
sarah.spaulding@usgs.gov

Charles Stapleton
2654 Halls Mill Rd.
Mobile, AL 36606
castap@jaguar1.usouthal.edu

Joshua Stepanek
262 Wick Science Bldg.
720 4th Ave. S.
St. Cloud, MN 56301
stjo0508@stcloudstate.edu

Gene Stoermer
University of Michigan
4392 Dexter Rd.
Ann Arbor, MI 48103
stoermer@umich.edu

Jeffery Stone
University of Nebraska-Lincoln
3531 S. 38th
Lincoln, NE 68506
jefferyrstone@gmail.com

Edward Theriot
Texas Memorial Museum
2400 Trinity St.
Austin, TX 78705
etheriot@mail.utexas.edu

Evan Thomas
1009 Collyer St.
Longmont, CO 80501
evan_w_thomas@yahoo.com

Jo Ann Thompson
U.S. EPA
6201 Congdon Blvd.
Duluth, MN 55804
thompson.jo@epa.gov

Dennis Vander Meer
Rhithron Associates, Inc.
29 Ft. Missoula Rd.
Missoula, MT 59804
dvandermeer@rhithron.com

Samuel VanLandingham
1205 W. Washington
Midland, TX 79701
sambrero@suddenlink.net

Anna Wachnicka
Florida International University
11200 SW 8th St.
University Park, OE 148
Miami, FL 33199
wachnick@fiu.edu

Jonathan Warnock
Northern Illinois University
1121 W. Hillcrest 2A
DeKalb, IL 60115
jonw@imsa.edu

James Wee
Loyola University New Orleans
6363 St. Charles Ave.
New Orleans, LA 70118
wee@loyno.edu

Nancy Wehr
617 Seven Lakes N.
West End, NC 27376
nwehr@rr.nc.com

Michele Weilbacher
Georgia College and State University
PO Box 081 Biology GCSU
Milledgeville, GA 31061
kalina.manoylov@gcsu.edu

Karlyn Westover
Umeå University
3531 S. 38th
Lincoln, NE 68506
karlyn.westover@gmail.com

Diane Winter
Rhithron Associates, Inc.
29 Ft. Missoula Rd.
Missoula, MT 59804
dwinter@rhithron.com

Julie Wolin
Cleveland State University
3009 E. Derbyshire
Cleveland Heights, OH 44118
j.wolin@csuohio.edu

Kevin Wyatt
203 Natural Science Bldg.
East Lansing, MI 48824
wyattkev@msu.edu

Jason Zalack
Michigan State University
203 Natural Science
East Lansing, MI 48823
zalackja@msu.edu

INDEX TO PARTICIPANTS AND THEIR PRESENTATIONS

NOTES

NOTES