AMQUA Quaternary Times

The View from the Moraine: the President's Message

By Sheri Fritz, University of Nebraska – Lincoln

The biennial meeting is a centerpiece of AMQUA activities, and the 24th biennial meeting this past summer in Santa Fe "Retooling the Quaternary to Manage the Anthropocene" was superb. Julio Betancourt, as chair of the Program Committee, brought together a great roster of speakers, and Felisa Smith and colleagues from the University of New Mexico on the Local Organizing Committee put together a flawlessly run meeting in a beautiful venue. The meeting brought together over 150 Quaternary scientists and featured a diverse array of plenary presentations, as well as "lightening talks" and posters. Articles based on some of the plenary talks will be featured in an upcoming special issue of *Quaternary Research* that Julio Betancourt is editing. The meeting was generously supported by the University of New Mexico and the US Geological Survey. To continue our great meeting tradition, AMQUA recently sent out a call for bids to host the next meeting in 2018; we hope to be able to provide an update by the start of 2017 on what you can look forward to for our 25th anniversary meeting.

AMQUA meetings are the time for the changing of the guard, and we are grateful to the outgoing members of the AMQUA Council who have provided us with guidance over the past four years and welcome the newly elected councilors, as well as our President Elect, Tom Lowell. Two critical members of the AMQUA Executive Committee are Secretary Colin Long and Treasurer Chris Hill, who do much of the work to keep the group moving forward and who provide a collective long-term memory, and we are very lucky that they have both agreed to continue in these roles. In addition, Susann Stolze has graciously agreed to take over the AMQUA newsletter, which is produced in fall and spring, so please share relevant news and activities with her when you get the call.

At the Santa Fe meeting, several early career scientists expressed an interest in having AMQUA develop additional activities and opportunities to enhance their skills and career development, such as a networking group. The Council will explore this in coming months; if you have ideas and an interest in getting involved, please be in touch with me (sfritz2@unl.edu).

AMQUA and the journal *Quaternary Research* were founded at the same time in about 1970, both

out of the Quaternary Research Center at University of Washington, and the two have maintained a close partnership over the years. Starting in January 2017, publication of *Quaternary Research* will move to Cambridge University Press. We very much value the journal and our long-term relationship, so please check out the new home for *Quaternary Research* and consider submitting your upcoming manuscripts to the journal.

AMQUA has a long legacy of being a fun and interactive community of scientists across a diverse array of disciplines, so we hope you'll stay involved, sharing your ideas and news via our website and in the newsletter and by planning to attend the next meeting. And as we approach the new year, please remember to update your membership via the AMQUA website!

AMQUA Awards

Each year AMQUA selects a member of our community for the *AMQUA Distinguished Career Award*, which recognizes a Quaternary scientist who has contributed significantly and continuously to the advancement of Quaternary science in any discipline. These awards are presented at the AMQUA Biennial Meeting. We congratulate Eric Grimm, who received the 2015 Distinguished Career Award, and Pat Bartlein, who received the 2016 Distinguished Career Award.

The *Denise Gaudreau Award* was established in 1993 in recognition of Denise Gaudreau, a promising young Quaternary scientist who tragically died at an early age. The award supports the early career development of a female scientist within two years of the PhD, who has excellent scientific accomplishments and has shown evidence of original thinking and exceptional promise. We congratulate Alexis Mychajliw, who was awarded the 2016 Denise Gaudreau Award.

At the 24th Biennial Meeting in Santa Fe, *Best Student Poster Awards* were conveyed to Jeremiah Marsicek, Marie Westover, Nicollette Buckle, and Alyssa Rose Hynes, with Nicollette and Alyssa sharing the third place. Congratulations!

2015 Distinguished Career Award Recipient Eric Grimm, University of Minnesota

By Brandon Curry, Illinois State Geological Survey

My apologies to Eric Grimm and those in attendance at the 2016 AMQUA business lunch/awards reception for my stage fright. I did not intend to belittle the person I was honoring with a too-short introduction. In my imaging of reciting what will follow, I had thought there would be a podium, a place I could count on to hide from, and quietly read the following heart-felt script.

When announcements for nominations for honors such as these (in this case, AMQUA's Distinguished Career Award), I think of the many colleagues worthy of such attention. Most have led a normal life, with an initial upward professional tra-

jectory that levels out somewhere in mid-career, and then, gently heads back to earth. With Eric's commitment for seeing Neotoma through its infancy and now, young adulthood, Eric has guaranteed many more years of productivity, and a ripple-effect of increased meaningful productivity and discovery. Eric would be the first to say that he could not have done all this by himself, but the 48 colleagues now participating in Neotoma would collectively respond "Neotoma would not be where it is today without Eric."

Eric was born in Rapid City, South Dakota. Although Eric is known for his pollen savvy, he initially majored in geology at the South Dakota School of Mines & Technology. He switched to biology and graduated in 1971 with highest honors from South Dakota State University with a degree in biology with minors in mathematics and chemistry. Later came his advanced degrees from the University of Minnesota-Twin Cities, a Master's of Science, and PhD, in 1975 and 1981, respectively, majoring in ecology. I know Eric recalls with much fondness his NSF post-doc fellowship at Cambridge, England. He then joined the teaching faculty at the University of Minnesota-Twin Cities until 1986 when he was lured to Springfield, Illinois, to become a research associate at the Illinois State Museum. He rose through the ranks at the ISM to Curator of Biology and Director of Science until his retirement last year, after more than 29 years of service to the Illinois Department of Natural Resources, and the citizens of Illinois. I'll refrain from a discussion of Eric's feelings towards the present state government and segue to his professional accomplishments.

Eric is perhaps the best palynologist in North America. Trained by Ed Cushing at Minnesota, he sets the highest standards of excellence in all of his work and has produced some of our best records of vegetation and climate history in North America including Lake Tulane, Florida; Moon Lake, North Dakota; Crystal Lake, Illinois; and Big Woods, Minnesota. Each of these records remains the gold standards in their regions and each has provided fundamental new insights into the ecological and climatic drivers and millennial and centennial timescales. And how can I forget TILIA? The paper that introduced the world to it was published in 1987 in *Computers and Mathematics*, and accounts for about one third of Eric's citations as counted in Google Scholar (about 1,500 out of 5,000).

But back to Neotoma. Along with his predecessors such as Tom Webb and Russ Graham, Eric has been the visionary responsible for the North American Pollen Database and its successor the Neotoma Paleoecology Database. In terms of impact within our discipline and, most of all, for the impact of our discipline on others, Neotoma is perhaps the single most important advance over the past 20 years. It provides a standard cyberinfrastructure in which paleoecologists can archive the data and make their data available to others. It is entirely due to Eric's leadership, vision, and untiring efforts that Neotoma is what it is today. He is the perfect combination of technologist (doing his own coding), scientist, and unselfish leader. International collaborators describe him as gentle, generous, fun-loving, and meticulous. Few scientists enjoy the respect, trust, and admiration that Eric has earned. Thank you for your contributions, Eric.

As a parting tribute to Eric, I would like to relate a recent, personal experience in, of all things, an awards committee. I was put on the subcommittee for the Interdisciplinary Award, and was astounded to find out that in some fields "multidisciplinary" has what I think of as a negative connotation. In this paradigm, a multidisciplinary effort in which each subfield conducts and reports their research completely independent of one other. Apparently, some people like it that way. I blame Eric for not teaching me the trendier word "transdisciplinary" in which various experts work side by side appreci-

ating and involving the results of collaborators, inching towards a holistic approximation of truth. Or, the best story. So, in the spirit of Neotoma, let us go forth approaching paleoecology as Eric and colleagues have envisioned, as transdisciplinarians.

2016 Distinguished Career Award Recipient Pat Bartlein, University of Oregon

By Cary Mock, University of South Carolina

Pat Bartlein accepting his Distinguished Career Award from Cary Mock in Santa Fe

Pat Bartlein (Bart) has a diverse and highly productive career carrying out research that integrates a variety of types of paleoenvironmental data to build and validate environmental models from local to global scales. His unique interdisciplinary perspectives on Quaternary paleoclimatology make him stand out even among the most highly-accomplished peers in his field. He has published over 150 publications, including the most highly respected journals such as *Science, Proceedings of the National Academy of Sciences, Nature, Geology, Geophysical Research Letters,* and *Ecology*. Bart's earlier work from the late 1970s involved researching the hydrologic cycle and short-timescale streamflow anomalies for the Mississippi River Valley as well as for the contiguous United States. Subsequently, and starting in the early 1980s, his research focused more on synthesizing pollen-climate relationships of the late Pleistocene and Holocene for eastern North America, on which he worked closely with Tom Webb and expanded it to conduct climate model/fossil data comparisons. This work became one of the cornerstone themes of the interdisciplinary COHMAP (Cooperative Holocene Mapping Project) and led to similar later programs that synthesize paleoenvironmental data (e.g., PALE, TEMPO, PMIP, LIGA) that included collaborations with Sandy Harrison. Bart's research interests starting in the mid 1990s took a turn towards paleofire, and his innovative methods led to the primary quantitative data analysis methods for studying "background charcoal" with "charcoal peaks" that many utilize today. Bart was also active in paleohydrology, such as studying lake-level variations and mesoscale modeling of Lake Bonneville and Lake Agassiz. Also since the mid 1990s, he was in the forefront in "geographic visualization" – and he has also contributed greatly on providing sound guidelines on cartographic color schemes used by many today, including NASA.

Bart has been very active in professional service, including well-recognized national and international activities outside the University of Oregon related to Quaternary science. His paleoscience-related activities include service with AMQUA, NSF, AGU, the US Climate Change Research Program, and the IPCC. Bart's international reputation was recognized in 2009 as an inducted fellow in the American Association for the Advancement of Sci-

ence (AAAS). Bart has also been a magnificent teacher and mentor, having graciously shared all of his vast experience in research, service, and teaching to his 18 graduate students (includes 10 PhDs). Bart's mentoring also goes well beyond his students, as he has served as a valuable mentor for many once "junior" level colleagues. In summary, our current understanding of Quaternary paleoclimatology and paleoenvironmental change would not have been nearly as successful if not for Bart's many unique contributions and involvement.

2016 The Denise Gaudreau Award for Excellence in Quaternary Studies Recipient Alexis Mychajliw, Stanford University

By Sheri Fritz, University of Nebraska – Lincoln

Alexis Mychajliw is a PhD candidate in Liz Hadley's research group at Stanford University. Her research integrates a variety of paleontological tools, including fossils, stable isotope and genomic analyses, and modeling and applies studies of past mammal communities to issues in conservation biology. Her dissertation research investigates the dynamics of island extinctions in the Dominican Republic, including issues related to extinction and body size, dietary flexibility, and prehistoric human-animal interactions. In developing and carrying out her PhD research in one of the Dominican Republic's national parks, she has trained local students and engaged local conservation groups, as well as worked to establish paleontological collections at the Museo Nacional de Historia Natural. She has received independent research funding, including several small awards and a NSF DDIG grant; has received several awards at Stanford for excellence in teaching; and has published papers on paleontology, as well as on science education, communication, and policy.

2016 Best Student Poster Awards

THE SPATIAL AND TEMPORAL EVOLUTION OF HOLOCENE TEMPERATURES IN NORTH AMERICA AND EUROPE

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By reconstructing temperatures from fossil pollen data over the Holocene we can place recent and future warming in a long-term context and evaluate the patterns of past trends, variability, and abrupt changes. To do so, we apply the modern analog technique to systematically reconstruct seasonal temperature changes during the Holocene from 1605 fossil pollen records from Europe and North America. Our uniform application of the approach ensures comparability of results among sites and regions. We use the best available calibrated radiocarbon chronologies for each site, and then minimize spatial biases and local-level ecological influences in the dataset by calculating mean reconstructions for 2° x 2° geographic windows.

In doing so, we only averaged reconstructions that were significantly different from reconstructions of random dummy variables.

Average annual temperatures derived from the gridded mean reconstructions show >3°C warming from 11 ka to 5.5 ka. The annual temperatures reached their Holocene maximum at 5.5 ka before then declining by ~0.3°C to present. Orbital and ice sheet changes best explain the long term trends, but substantial deviations from the trends also exist in three intervals: 1) a ~0.25°C cooling from 9.3 – 8.5 ka, 2) a ~0.5°C warming from 5.7 – 5.3 ka, and 3) a ~0.3°C cooling from 1.9 ka – present. The reconstructions also contain evidence of meaningful millennial-scale variability represented by quasi-periodic, autoregressive fluctuations with a period of ~2400 years. Bootstrap re-sampling and comparison with marine geochemical records indicates that the deviations represent robust changes.

DIETARY VARIATION OF PIKAS (OCHOTONA PRINCEPS) ACROSS A LATITUDINAL GRADIENT AND A CENTURY OF ANTHROPOGENIC CLIMATE CHANGE

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Over the past 100 years, average temperatures in NA have increased 1.5°C, with another 1.5-5°C expected in the next century. These shifts in climate have already driven changes in the range boundaries of taxa globally, and it may have also altered life history traits/ecology of many animals. The American pika (*Ochotona princeps*) is a threatened alpine mammal considered to be highly sensitive to climate. In previous work, we have demonstrated upslope elevation shifts over the Holocene, with the rate of range contraction increasing over historic time. However, recent work implicates forage availability and quality, rather than temperature, as the primary driver of pika response. Here, we investigate the interaction between anthropogenic climate change and pika foraging strategies over historic time. Specifically we ask: how much do individual *O. princeps* and population dietary niches vary across their range and across historical time? We characterize the isotopic dietary niche and nutritional quality of pika diet over three time periods using bulk carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) stable isotope analysis (SIA) derived from fur and bone of museum specimens. We focus on six populations along a latitudinal transect spanning the central and southern Rocky Mountains. We find remarkable congruence of the $\delta^{13}C$ values along the geographic gradient; despite variation in both elevation and habitat values mostly cluster between -25 and -23‰. Interestingly, we do find variation in $\delta^{15}N$ values, which are related to variation in temperature and precipitation across sites. Our results strongly suggest that historic and ongoing changes in climate influence aspects of *O. princeps* diet.

A VEGETATION AND FIRE HISTORY RECORD OF REDDEN SPRINGS PROPER, BONNEVILLE BASIN, UTAH, USA

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Up until ~12 ka, Redden Springs Proper, Utah was covered by prehistoric pluvial Lake Bonneville. After 12 ka, Lake Bonneville entered a rapid regressive phase as its hydrologic input was outpaced by its evaporative output. By 11.5 ^{14}C ka B.P., Redden Springs Proper was exposed, as the lake had fallen to levels comparable to the modern Great Salt Lake. Paleoenvironmental studies of a 4.72-meter- long sediment core collected from this area (4430444 m N, 269654 m E, elevation 1288 m) will contribute to the emerging body of work detailing environmental changes in the Bonneville basin, including the vegetation and fire history record of North Redden Springs (Howard, 2015).

500 YEARS OF HYDROCLIMATE IN THE AMAZON, THE SPECTER OF MULTI-YEAR DROUGHT, AND A NEW THREAT TO ECOSYSTEM MANAGEMENT

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The Amazon Rainforest is a global carbon sink and a center of great biodiversity, and as such plays a critical role in the global climatological and ecological systems. In the last decade, two widespread regional droughts alerted us to sensitivity of the Amazonian ecosystem. Both droughts were deemed once in a century events that exposed the limited perspective of the 30-year satellite record, paucity of ground-based measurements, and the need for longer records. We have analyzed sediments from Lake Ayauchi, a permanent, closed basin lake located in the Western Amazon basin, to improve understanding of past hydrology. Using precipitation sensitive proxies including grain size, elemental concentration, magnetic susceptibility, and biomarker measurements, we have identified several multiyear hydrological events that occurred during the past ~500 years. Identifying and characterizing these events extends the climatological baseline of observations, quantifies historical variability in the Amazon Basin, and will help us to understand hydrological changes that may occur in a warming world. Our results highlight the possibility that multi-year drought events can occur in the Amazon, and thus such events need to be taken into consideration in carbon management and biodiversity conservation efforts.

More Awards …

At this year's Annual Meeting of the Geological Society of America's in Denver, John T. Andrews received the highest honor, the *Penrose Medal*, and William Ruddiman was awarded the *Award for Career Excellence* from the GSA Quaternary Geology and Geomorphology division.

2016 Penrose Medal Recipient John T. Andrews, University of Colorado

By Gifford Miller, University of Colorado Boulder, and Peter Clark, Oregon State University

University of Colorado Emeritus Professor John T. Andrews, a former AMQUA Chair, has been awarded the Geological Society of America's highest honor, the Penrose Medal, conveyed at the annual meeting in Denver, September 2016. In collaboration with a long list of graduate students and professional collaborators, John expanded our view of the Laurentide Ice Sheet and its interaction with adjacent oceans, applying novel geochronological methods and sediment tracers to demonstrate a dynamic ice sheet that repeatedly collapsed during the last glaciation. He was involved in developing the first 3D numerical ice-sheet model, the basic components of which remain the standard for many ice-sheet models today, and his records glacial-isostatic recovery led to collaborations with geophysicists to derive the rheology of the solid Earth and develop a forward model to predict relative sea level histories around the globe. His analysis of the energy budget required to remove the Laurentide Ice Sheet showed a substantial energy deficit, identifying, for the first time, the importance of ice-sheet instabilities and feedbacks in causing the rapid deglaciation. His legacy is apparent in the many former students and postdocs who populate the academic family involved in Quaternary research.

2016 Award for Career Excellence Recipient William Ruddiman, University of Virginia

By Maureen Raymo, Columbia University

William F. Ruddiman is one of the most accomplished Quaternary palaeoclimate scientists living