Quaternary Times

Newsletter
November 2017
Volume 39, Number 2

Published biannually by the American Quaternary Association, Inc.

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www.amqua.org

…devoted to studying all aspects of the Quaternary Period since 1970

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Cover: Mammoth Hot Springs, Yellowstone National Park. Photo taken by Susann Stolze, summer 2015.

The View from the Moraine: the President's Message

By Sheri Fritz, University of Nebraska – Lincoln
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There's a lot going on in the global scientific community these days, including the recent open nomination period for individuals to serve as authors and reviewers for working groups as part of IPCC AR6. In this Assessment, apparently paleoscience will be integrated into individual chapters, rather than included as a separate chapter as in prior times; we have to hope that a paleoscience perspective is well-represented in the teams and is an active voice. One interesting and very recent substantive change to international science is the vote this month to combine the International Council for Science and the International Social Science Council into a single global entity, called the International Science Council. This historic vote represents an opportunity for the multi-disciplinary global science community to come together and speak with a strong and unified voice on the vital role that science plays in the future of humanity.

At a smaller scale, AMQUA is a bottom-up scientific society intended to serve the interests of the broad Quaternary community. One way that community members can share ideas and their energies is by serving on the **AMQUA Council**, and AMQUA is now seeking nominations for new members of the Council to start in summer 2018. The Council is made up of 14 councilors (two from each of seven sub-disciplines) that serve four-year terms, and every two years a cohort of seven new councilors is elected, one from each sub-discipline:

1) Terrestrial Geoprocesses; 2) Marine Geoprocesses; 3) Geohistory; 4) Paleobiology; 5) Paleoclimatology; 6) Archaeology; and 7) Geochronology-Geochemistry-Geophysics. Please consider nominating a colleague or yourself. Nominations should be sent to Colin Long, AMQUA Secretary (longco@uwosh.edu) by December 3, 2017 and include the individual's name, contact information, and the disciplinary group. Ballots will be available online by early December, and the results announced in January 2018. To be eligible for office, or to vote, membership must be current.

Plans are moving forward for the joint meeting of **AMQUA and CANQUA (Crossing Borders in the Quaternary)**, scheduled for **August 7-11, 2018 in Ottawa** at the University of Ottawa. Tom Lowell and Kendra McLaughlin are the AMQUA representatives on the program committee. The call for session proposals has just finished, so a more detailed program should emerge soon. The meeting is designed to marry some of the favorite features of each organization's style and will have multiple plenary speakers, extended poster sessions, multiple sessions for submitted oral presentations, and a mid-meeting fieldtrip. Ottawa is a beautiful city, and the University of Ottawa can easily accommodate the combined group, including inexpensive lodging on campus and in nearby hotels, as well as easy access to a range of restaurants. Ottawa has an excellent public transportation system that has bike sharing and a new light rail system, and the city should be lovely in August. The meeting will undoubtedly be a great venue for interacting and sharing ideas, so please plan to attend! Registration likely will open in December 2017; for more information, see the meeting website:

https://www.quaternary2018.com

Finally, it's the time of year to pay your **annual membership dues**, and you can renew online. Dues are only $20 per year ($10 for students or retired individuals) or $50 for three years, so please continue to support AMQUA and to participate in AMQUA activities. And, don't hesitate to contact us with any ideas about ways we can most effectively serve the Quaternary community and support each other and our science. Meanwhile enjoy the autumn and winter months, whatever they bring!

Editor's Note

By Susann Stolze, Colorado School of Mines
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Thank you to all who contributed to this issue of the AMQUA newsletter! This issue features the View from the Moraine, information about the upcoming AMQUA elections, musings about mammoths during the Younger Dryas, updates on research projects, employment opportunities, and information on upcoming events.

I would like to take the opportunity to introduce Brendan Fenerty who recently joined the editorial board as a student representative to report on student-relevant topics. Brendan is a PhD student in the Department of Geosciences at the University of Arizona. He works on the evolution of landforms in arid environments and collaborates with archaeologists to resolve how surface processes effect the formation, distribution and preservation of terminal Pleistocene archaeological sites in the Americas.

If you have items for the Spring 2018 issue of the *Quaternary Times* (Volume 40, 1), please send your contributions to sstolze@mines.edu.

Happy reading!

2018 AMQUA Elections

By Colin Long, University of Wisconsin Oshkosh
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Call for Nominations

Nominations are being solicited for individuals to serve on the AMQUA Council and Executive Committee. Selfnominations for all positions are welcome. Each Councilor represents one of seven disciplinary groups and serves a four-year term. The disciplinary groups are: 1.Terrestrial Geoprocesses; 2. Marine Geoprocesses; 3. Geohistory; 4. Paleobiology; 5.Paleoclimatology; 6. Archaeology; and 7. Geochronology-Geochemistry-Geophysics.

The Executive Committee offices up for election are President-Elect, Secretary, and Treasurer. The President - Elect stands for two years and then succeeds to the office of President upon completion of the president's term. The role of President includes presiding at all meetings of AMQUA, overseeing AMQUA's mission, and acting as the official representative of AMQUA. The Secretary records the proceedings of AMQUA meetings and conducts or coordinates all correspondence of the Association. The Treasurer is responsible for the collection, disbursement, and accounting of funds. The Treasurer submits financial reports to the AMQUA Council at each Council meeting and conducts all financial correspondence of the AMQUA.

Please send nominations by December 3, 2017 to Colin Long, AMQUA Secretary, at longco@uwosh.edu Please note the disciplinary group with Councilor nominations. Ballots will be available online by early December and the results announced by early January 2018. To be eligible for office, or to vote, your membership must be current.

Were Herds of Mammoths in the Northeastern to Midwestern USA Bombarded by Massive Ice Ejecta at the Onset of the Younger Dryas?

By Joanne P. Ballard, Knoxville, TN
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Woolly mammoth and American mastodon remains are found in ponds throughout the northeast to midwestern USA. Some have broken bones. The prevailing explanation for these skeletal finds is that mammoths and mastodons walked out on frozen ponds and crashed through the ice, sinking to the bottom for future farmers, road builders, and paleontologists to find.

Firestone et al. (2007) hypothesized that a bolide struck the Laurentide Ice sheet (LIS) around 12,900 years ago, triggering the Younger Dryas cold event and setting off massive wildfires. A huge volume of meltwater would have been released, along with ice shatter. Much of the LIS would have been destroyed. I hypothesize that massive blocks of ice from this impact event were flung across the Northeast and upper Midwest, crashing down upon the hapless proboscideans, pinning and crushing them beneath their weight. These agents of death would then have melted away, leaving the skeletons at the bottom of mini-ice-impact craters. Today a large distribution of kettle lakes exist in states peripheral to where the LIS used to be. The serenity of these ponds is in stark contrast to the hypothesized drama of that Younger Dryas event.

How would we test the ice-bombardment hypothesis? If mammoths and mastodons were killed by deadly incoming ice boulders, they would have sustained blunt force trauma, and should exhibit evidence of green bone breaks. Statistically, if there is a high percentage of skeletons with green bone breaks, then it is likely that this hypothesis is correct.

Neotoma (https://apps.neotomadb.org/explorer/) shows 22 results for *Mammuthus primigenius* and 204 results for *Mammut americanum*. Hartnagel and Bishop (1922) reported 115 mammoth and mastodon remains in New York state, but only 3 are shown on the Neotoma map. The first step in testing the hypothesis would be to locate all known finds of mammoth and mastodon remains. The next step would be to survey the literature to see if there are descriptions of the skeletons, but researchers may not have been systematically noting green bone breaks. The third part of the research would be to examine the bones with the assistance of a paleopathologist.

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Ongoing Research Projects

Investigating Quaternary fault history through tectonic geomorphology and ^{10}Be surface exposure geochronology: Is block rotation still happening along the Southern San Andreas Fault system?

By Katherine Guns, PhD candidate
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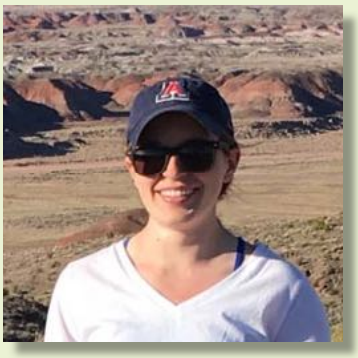

The Southern San Andreas Fault (SSAF) through the Coachella Valley in southern California has accommodated significant geological displacements since its inception as a through going fault and today it plays a pivotal role in accommodating Pacific-North America plate boundary motion as measured through space geodetic techniques. Despite its documented significance in the long- and short-term regional fault geometry, it has not experienced a large magnitude earthquake in over 300 years, almost 1.5 times its estimated recurrence interval. Just to the east of this section of the fault, three M6+ earthquakes have occurred along faults of the Eastern California Shear Zone (ECSZ), leading to an active discourse in the active tectonics community about how to explain this enigmatic behavior.

We hypothesize that while strain is still accumulating along the SSAF, some of that accumulating strain is being transferred away from the SSAF towards the ECSZ, thereby partially relieving the SSAF and increasing time between large earthquakes. This strain transfer may be accomplished by block rotation through the east trending, left lateral faults of the Eastern Transverse Ranges (ETR) in Joshua Tree National Park.

Our first step in testing this hypothesis is to determine the most recent fault slip histories of these smaller peripheral left-lateral faults within Joshua Tree National Park (Figure 1). If these faults are inactive, or slowing down, that would imply that block rotation has ceased or is slowing to a stop and is no longer a possible mechanism of strain transfer. To do this, we are employing geomorphic field mapping, LiDAR elevation data analysis, and ^{10}Be cosmogenic radionuclide surface exposure dating to determine Holocene slip rates on the Blue Cut and Smoke Tree Wash faults.

Figure 1. View facing east of the Pinto Basin from Cholla Gardens within Joshua Tree National Park, near one of our study sites; The Blue Cut Fault runs straight through this basin at the base of the Hexie mountains to the right in this image. Photo by K. Guns.

Fieldwork to characterize our first study site on the Blue Cut Fault took place in January and May of 2017, and involved detailed field mapping of landforms and geomorphic surface characterization utilizing surface color, degree of desert varnish, degree of desert pavement formation, clast size and lithology, level of clast weathering and grusification, and overall surface topography and texture (bar and swale, hummocky, flat, etc.) (Figure 2). Through this process of mapping, collaborator Assistant Professor Kimberly Blisniuk (San José State University) and I identified at least three sets of offset geomorphological features. To test this mapping interpretation, we have collected and processed ten ^{10}Be surface exposure dating samples which have come from both the top 5 cm of the largest boulders on pertinent surfaces, as well as a handful of amalgamated pebble samples. Processing took place this summer at Arizona State University under the guidance of Professor Arjun Heimsath, and final AMS analysis is currently underway at Lawrence Livermore National Laboratory, as of this writing.

Surface age dating results will inform our mapping interpretation, and will help us confirm how best to sample at our three future sites. For the moment, further fieldwork is underway at our other sites. We hope to get a three slip rate estimates for three sites along the Blue Cut Fault and one slip rate estimate for one site along the Smoke Tree Wash Fault.

In addition, I am working with Professor Richard Bennett (University of Arizona) to collect updated campaign GPS data to measure modern day motion within these Eastern Transverse Ranges, with the hope of comparing fault slip rates at multiple time-scales in the future. For now, field evidence it pointing to the possibility that block rotation is still occurring in the Eastern Transverse Ranges, and that these faults are still actively accommodating motion.

Additional information about ongoing work will be presented at this year's GSA and AGU annual meetings.

Figure 2. View from one of the preserved surfaces at one of our study sites along the Blue Cut Fault; This looks slightly east of north across the Pinto Basin towards the Pinto Mountains. Notice the flattened, orange-colored, and well-"paved" surface morphology of the preserved surface in the foreground, compared to the active channel deposits just beyond. Photo by K. Guns.

Exploring the Utility of Coprophilous Fungal Spores as Indicators of Pleistocene Magaherbivore Abundance

By Angelina Perrotti, PhD Candidate
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Non-pollen palynomorphs (such as fungal spores) are often overlooked in traditional palynological analyses, but can be indicators of various environmental changes such as fluctuations in plant and animal communities, erosion and fire events. In particular, the use of coprophilous (dung inhabiting) fungal spores as indicators of megaherbivore abundance (and their disappearance as evidence of megaherbivore extinction), has been gaining traction over the past few decades. I have been using this proxy evidence alongside pollen to infer patterns in terminal Pleistocene vegetation change and megaherbivore extinction in the Southeastern United States.

I recently concluded a project looking at pollen and the coprophilous fungus *Sporormiella* at the underwater Page-Ladson archaeological site in northwestern Florida. These analyses revealed that *Sporormiella* disappeared in sediments dated younger than 12,700 cal BP, which is consistent with the timing of the Rancholabrean termination elsewhere in North America. However, a resurgence of *Sporormiella* between ~10,750–10,200 cal BP suggests an Early Holocene incursion of extant megaherbivores. At present, it is not clear which megaherbivore may have been responsible for this Early Holocene resurgence of *Sporormiella*, or why *Sporormiella* disappears from the record in sediments dated younger than 10,200 cal BP. Future research will address these questions.

Presently, I am working on a high-resolution palynological study of terminal Pleistocene–early Holocene sediments from White Pond, South Carolina. This study will include a comprehensive analysis of both pollen and non-pollen palynomorphs, including fungal indicators of herbivore abundance, erosion, and fire events. Furthermore, I am currently working with Eline van Asperen (Newcastle University) to better understand the formation and interpretation of fossil coprophilous fungi records. We are also investigating various laboratory techniques for the recovery of these fungal spores.

My future research will include the application of mechanistic vegetation models to better understand the relationships between plants, animals, people, and climate during the terminal Pleistocene in the Southeast, using the data that has been collected from Page-Ladson and White Pond. I hope to extend similar studies to various sites elsewhere in the Southeast to increase the spatial resolution of these models. Ultimately, these analyses will contribute to an improved understanding of the environmental context of the initial peopling of southeastern North America.

Picture modified from Burney et al. (2003). http://www.pnas.org/content/100/19/10800.figures-only