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The Times They Are a - Changin'

They lyrics to this classic song penned and recorded by Nobel laureate Bob Dylan in 1963 ring true today. Many interpretations exist but an underlying theme is change. A month after Dylan recorded it, President Kennedy was assassinated. This time also marks among other things, the final NASA Mercury Mission and Russia put up Vostok 6 carrying the first woman to space.

As Quaternary scientists we seek to understand change. Sometimes change is sudden and sometimes it is gradually - all depending, of course, on the clock one uses. Although many today consider our current challenges with the COVID-19 virus to be “forever” we recognize they will be behind us “soon” on geological time scales.

“As the present now will later be past”

What is it about this pandemic, the recognition of it, the reaction to adopt and mitigate measured in months, that makes it fundamentally different from our recognition of and reaction to climate change measured in decades? One might argue that the former is but one of a series of events in the evolution of Homo sapiens health, but that the latter is generated by Homo sapiens with effects across the biological, physical, and chemical systems of the planet likely to remain for millennia. Why is the response of our species to one change rapid, on even news cycle timescales, but the other response is of sufficient duration that it spans election cycles and thus never getting sufficient attention?

Likely the reason lies deep with the psychological makeup of Homo sapiens which remains a mystery to me. But the verses to Dylan’s song are a call to action before it is too late. Let us once again ask how to best use our skills and findings to pick up the pace of society’s reaction to the going climate change.

“Come senators, congressmen, please heed the call
Don’t stand in the doorway, don’t block up the hall
For he that gets hurt will be he who has stalled”

The pandemic has provided AMQUA with an opportunity. We will likely meet face-to-face in June 2021 in Seattle, but plans are afoot to convey some current scientific findings by our invited speakers in June of this year. We will try out those new fangled video conferences format. Please join me in applauding Ben Fitzhugh and the program members for both getting a normal meeting organized, responding in sub news-cycle time frame to make talks and discussions available, and then time-shifting the “regular” meeting a year.

“The line it is drawn, the curse it is cast”

Further AMQUA bylaws require that the Council hold a meeting each year and that we have a general AMQUA business meeting.
This year they will be virtual. Watch for announcements but we are working to have held after the science presentation so we can assess the experiment. Our renewal of governance will not be slowed by social distance. Ever reliable Colin Long will be sending the necessary information as it becomes available. Since this is my last View from the Moraine, I would like to thank the Council for all their efforts to make AMQUA a strong organization. In closing AMQUA and I are indebted to QT Editor Susann Stolze for her labors to keep the membership informed of our happenings.

Who says we cannot both study and effect change?

Tom

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**AMQUA News**

*By Colin Long*

*University of Wisconsin Oshkosh, longco@uwosh.edu*

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**2020 AMQUA COUNCIL AND EXECUTIVE COMMITTEE ELECTION RESULTS**

At the upcoming AMQUA business meeting, planned for late June 2020, the two year terms of the President, President Elect, Secretary, and Treasurer will expire. Also set to expire at this meeting are seven councilors who have served their four-year terms. These councilors are Todd Surovell (Archeology), Kendra McLauchlan (Geochronology, Geophysics, Geochemistry), Randy Schaetzl (Geohistory), Ben Horton (Marine Geoprocesses), Jenn Marlon (Paleobiology), J.J. Shinker (Paleoclimat data), and Andy Breckenridge (Terrestrial Geoprocesses). In addition, Tom Lowell the AMQUA president for the term of 2018–2020 will be succeeded by the current President-Elect Jack Williams, who will serve as President for the 2020–2022 term. The new councilors will serve from 2020 to 2024 and the Executive committee members will serve form 2020 to 2022. Thanks to all those who volunteered to serve on the AMQUA council and those who participated in the 2020 elections.

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2019 AND 2020 DISTINGUISHED CAREER AWARDS

The AMQUA Distinguished Career Award recognizes a living Quaternary scientist who has contributed significantly and continuously to the advancement of Quaternary science in any discipline. This is the highest award made by AMQUA and honors someone with a lifetime commitment to Quaternary science. The AMQUA Council and Executive Committee is happy to announce that the recipient of the 2019 AMQUA Distinguished Career Award is Dr. Vera Markgraf currently at the University of Northern Arizona, and the recipient of the 2020 AMQUA distinguished Career Award is Dr. Julio Betancourt of the United States Geological Survey. Because of the postponement of the 2020 Biennial meeting in Seattle to June 2021, the formal presentation of these awards will have to wait, until we convene in Seattle next year. We hope that you will be there to congratulate them in person. A more extensive description of their research and careers will appear in the Fall 2020 newsletter.

2020 BIENNIAL AMQUA MEETING UPDATE

Based on the current COVID-19 restrictions on travel and gatherings, and the uncertainty surrounding COVID-19 impacts on the near future, the AMQUA 2020 Biennial meeting in Seattle has been postponed until June 2021. It is now tentatively scheduled for June 16-19, 2021 at the University of Washington in Seattle.

However, results from the survey distributed April 8th indicated that many AMQUA members are interested in an online gathering this June and so a virtual meeting is being organized. Details for the rescheduled in-person meeting in June 2021 and the virtual meeting in June 2020 will be forthcoming and shared via our newsletter, the AMQUA listerv, and the AMQUA website www.amqua.org.

Photo: https://sites.uw.edu/amqua50/

Abstract: When and how quickly the Greenland Ice Sheet (GIS) will retreat and raise sea levels is one of the most pressing societal issues. Reconstructing past ice sheet configurations and extent is imperative for predicting how it will respond to future warming. In this dissertation, three studies add new constraints to past configurations of the GIS and the Laurentide Ice Sheet (LIS) of North America. All three studies apply the geochronometer $^{10}$Be cosmogenic nuclide surface exposure dating to calculate a duration of exposure for erratic boulders deposited by the GIS and the LIS. In Chapter 1, cosmogenic exposure dating is applied to 16 boulders on the Arnott Moraine in central Wisconsin to constrain its deposition by the LIS, approximating the age of the moraine to be ~35,000 years old, just before the global Last Glacial Maximum (LGM; 26,000–19,000 years ago). These results indicate that the LIS grew to an extent slightly larger than during the LGM during a period when sea level was thought to be ~30 m higher. This research adds new constrains on past ice sheet size relative to sea level, which is an important connection in the climate system. This research also applies a landscape diffusion model to the modern moraine relief and predicts that permafrost conditions during the LGM contributed to the moraine’s diffuse morphology. In Chapter 2, the timing of deglaciation of the northwestern sector of GIS is investigated by applying cosmogenic surface exposure dating to erratic boulders across Washington Land in northwest Greenland. 71 exposure dates suggest that the GIS retreated ~8,500 years ago, which is ~2,000 years later than regional warming seen in ice core records. The GIS gradually thinned, with higher elevation areas experiencing the latest retreat. Samples that are part of this work are also located proximal to the Petermann Glacier, which is predicted to have retreated within its fjord 8,500 years ago. The work presented in Chapter 3 uses a subset of the exposure dates from Chapter 2, those that contained cosmogenic isotopes inherited from periods of prior exposure, and applies an additional cosmogenic isotope, $^{26}$Al. The paired isotope analysis suggests that erratic boulders in Washington Land record burial and exposure durations spanning 0.2–1.8 million years. This research suggests that the GIS experienced greatly reduced configurations relative to today’s during the late Pleistocene.


Abstract: Paleoclimate reconstruction relies on both unbiased proxy observations and competent climate models, as well as appropriate data assimilation methods that utilize both the model and observation. This dissertation, with the objective of mitigating the model-data gap in paleoclimate and better state estimation of the past climate, addresses the issue of post-deposition mixing on marine proxy observations and cross-validation of two popular data assimilation methods for paleoclimate reconstruction.
Chapter 3 tries to solve for the best data assimilation method for paleoclimate application that has high skill reconstructing both the local temperature and regionally averaged temperature given a very sparse observation network and limited computation power. It is found that Ensemble Kalman Filter (EAKF) outperforms particle filter (PF-SIR) with only one third of the computation cost. The key to the success of EAKF is a large localization radius and availability of observations in regions that have large-scale co-variability. Chapter 4 comes from the data perspective: how do we remove the postdeposition mixing effects, namely bioturbation, from the existing marine climate proxy records? What is the actual amplitude and phase of events recorded in proxy time series? The bioturbation process is modeled as a linear time-invariant filter. We found that it is impossible to preserve the centennial scale variability even when the sedimentation rate is above 15 cm/kyr and the mixing layer depth is at the lowest value 5 cm. For ice ages of scale $10^4$–$10^5$ years, bioturbation effects are almost negligible considering the event scale. For millennial scale events, the signal attenuation depends on the event scale and specific bioturbation parameters. To remove the bioturbation effect on a given proxy series, a deconvolution method is proposed and applied to two benthic oxygen isotope records in the LR04 collection for the last interglacial (MIS 5e). We found that the amplitude of the recovered millennial scale variability for the global stack can be approximately 0.5–1 ‰ larger when the mixing layer depth is 10 cm, which can translate into 50–100 m sea level variation globally. The recovered signal at individual site GeoB1117 from LR04 collection is more volatile compared to that from the global stack, potentially due to higher noise level in a single record. The lower bound of the recovered $^{18}$O is about 1 ‰ less compared to the value in LR04. As an independent project from Chapters 3 and 4, Chapter 2 evaluates the quality of ocean state estimation in a coupled data assimilation system when the atmospheric observations are replaced with atmospheric reanalysis. The experiments are conducted in a coupled Lorenz 96 model to mimic a coupled general circulation model (CGCM). Pseudo observations and atmospheric reanalysis are generated from this simple model and four different assimilation schemes are designed. It is found that when the atmospheric observations are replaced with atmospheric reanalysis in setting up a coupled data assimilation system, the ocean analysis quality (RMSE) is degraded by about 16 % when there is no model bias and is less than 22 % when model bias exists. Different assimilation schemes highlight the importance of 1) accurate representation of the error covariance of the reanalysis and 2) the temporal coherence along each ensemble member.

New Publications


Graham, R.W., Eshelman, R.E., eds. (2019) Late Quaternary Environments: landscapes, biota, humans. Quaternary International 530-531, 1-156. (This volume is dedicated to the career of Dr. Holmes A. Semken, Jr., an interdisciplinary scientist, teacher, and mentor.)


By James C. Hartley, contract archaeologist
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The extinction of the Pleistocene megafauna in North America is one of the more hotly debated subjects in archaeology and paleontology. Hypotheses for the cause of the extinction range from overkill to climate change to other fringe hypotheses (comet impact, disease, solar radiation, etc.). Besides the megafauna, many smaller taxa also went extinct in North America during the Pleistocene. This study focuses on the Pleistocene vertebrates in the American Southwest (Fig. 1) and their last appearance dates in the local fossil record. This study is a review of previously published data by others (e.g., Harris, 2016; Morgan and Lucas, 2005; Morgan and White, 2005).

More than just megafauna went extinct over the course of the Pleistocene Epoch (2.6–0.011 Ma). Extinct megafauna (mammoths, bison, camels, horses, tapirs, etc.) are present at archaeological and paleontological fossil sites across the Southwest and all through the Pleistocene. Only a few taxa (such as mammoths or bison) coexisted or had any association with humans. Other smaller extinct mammals (rabbits, rodents, shrews, etc.) and various extinct birds and reptiles are also present in the local Pleistocene fossil record. Only a few smaller taxa (such as Aztlan rabbits or Stock’s vampire bats) lived at or near the same time as humans in the Southwest, and direct associations are limited.

Based on last appearance dates, most smaller mammals (especially rodents and rabbits) disappeared from the Southwest fossil record during the Late Blancan (ending at 1.8 Ma) and Irvingtonian (1.8–0.26 Ma) Land Mammal Ages (Fig. 2). Many larger mammals survived through the Rancholabrean (260–11 ka) Land Mammal Age, but few coexisted with humans (beginning with the Clovis people at ~13.4 ka, based on calibrated radiocarbon dates). Last appearance dates of birds and reptiles (with few extinct taxa in the latter class) are later in the Pleistocene, regardless of size. Most last appearance dates are from sites within or roughly adjacent to the southern deserts (i.e., Sonoran and Chihuahuan Deserts) as opposed to the more northern deserts (i.e., Colorado Plateau, southern Great Basin, and Mojave Desert).

Figure 1. Approximate locations of desert regions in the American Southwest.
This could suggest that conditions in these southern deserts were more favorable to more taxa than in other areas later in the Pleistocene.

Overall, the Pleistocene extinction (at least in the Southwest) seems more temporally dispersed than would be expected for a sudden extinction event. Many smaller taxa (especially smaller mammals) went extinct early in the Pleistocene. Larger mammals and birds survived later, but few of them survived up to or beyond the arrival of humans. These patterns could be the result of biases in preservation and/or recovery (as shown in Hartley, 2018). More detailed research on extinct taxa (as well as extant taxa no longer present in the Southwest) is recommended.

References


Paleoindian archaeology and geoarchaeology in south-central New Mexico

By Vance T. Holliday
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Most of my research in the past few years has focused on Paleoindian archaeology and geoarchaeology in south-central New Mexico, largely in the northern Tularosa Basin and, just north, in the southern Jornada del Muerto Basin. Like other parts of the Basin and Range country of western North America, some basin floors contained paleo-lakes during the Terminal Pleistocene (~20,000 to ~11,000 cal yrs B.P.). Both basins in our field area contain paleo-lakes: Otero in the Tularosa Basin and Trinity in the Jornada del Muerto Basin. Our field work has included visiting recorded Paleoindian sites to assess paleo-landscape setting and stratigraphic work to reconstruct the histories of the two paleo-lakes. Both paleo-lakes Otero and Trinity filled with gypsum. Radiocarbon dating shows that sediment was accumulating in both basins during the terminal Pleistocene and early Holocene.

Dozens of Paleoindian sites are recorded across public lands in the two basins (Bureau of Land Management, White Sands National Monument, White Sands Missile Range, and Holloman Air Force Base). Most of our research has been in the northern Tularosa Basin (Holliday et al., 2019). A few recorded sites are located on alluvial fans adjacent to the mountain ranges that flank the basins. These sites are situated along drainages from the mountains. Most recorded sites are on the floor of the Tularosa Basin. A fundamental research question is how or whether the early sites on the basin floor were linked to Paleo-Lake Otero. Hampering our approach to this question is the wide-spread wind erosion of the lake basin plus the related eolian deposition immediately downwind (forming the White Sands dune system). A few late Paleoindian sites have been exposed on the windward side of the dunes in proximity to what might be a paleo-shoreline.

One consideration regarding Paleoindians and paleo-lakes in the area is water quality. The paleo-lakes would have provided some resources, but massive, extensive gypsum deposits indicate that lake waters were unpotable. On the basin floors the highest concentrations of Paleoindian sites appear to be clustered in proximity to numerous small depressions that we call “playas” (based on their similarity to playa basins on the High Plains to the east), most located several kilometers to the south and southeast of the paleo-lake. These playa basins, and at least one drainage that crosses the basin floor, contain muddy fills with little gypsum.
These muds span the terminal Pleistocene and the Holocene, and are indicative of fresher water at least seasonally. Presence of fresher water in the playa basins could be a factor in explaining the presence of nearby Paleoindian sites and their relative paucity near Paleo-Lake Otero.

In the Jornada del Muerto Basin archaeological survey crews discovered two Folsom sites buried beneath stratified eolian sheet sands. Buried Paleoindian sites in stratified contexts are rarely reported in New Mexico west of the Pecos River. As a result, test excavations were carried out at one of the site (Double Flute) by Missile Range and UA personnel followed by a crew from Southern Methodist University (Cross and Parfitt, 2018).

Like many Paleoindian sites in the region, the Folsom occupation rests on an old, red late Pleistocene soil formed in a sand sheet. More unusually, it is buried by up to four thin sand sheets (totaling <1.0 m thickness), two of which exhibit moderate soil development (A-Bw profiles).

Of particular significance in the recent research at White Sands National Monument is the documentation, by park personnel, of trackways of Terminal Pleistocene megafauna in exposed sediments of ancient Lake Otero. These dated trackways are at least 20,000 years old and comprise the most extensive sets of such trackways known in North America.

Megafauna genera include mammoth, giant ground sloth, dire wolf, and camel. Recent work by park service scientists, track specialists, and my student Brendan Fenerty (UA Geosciences) and I produced evidence of human tracks in and parallel to sloth tracks (Bustos et al., 2018). The age of the tracks is unknown, but human association with giant ground sloth has never been demonstrated in the North American archaeological record.

The research in New Mexico is supported by the Aragonaut Archaeological Research Fund (University of Arizona Foundation; established by the late Joe and Ruth Cramer of Denver, CO) and the National Park Service, with assistance from David Bustos (National Park Service), Jim Bowman and Matt Cuba (White Sands Missile Range), and Allison Harvey (formerly of Holloman Air Force Base).
References


Evaluating archaeological site burial potential by late Quaternary eolian sedimentation: The Eastern U.S. Eolian Geoarchaeology Project (EUSEGP)

*By Matthew P. Purtill*

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Interior, non-coastal eolian dunes and interdunal sand sheets blanket portions of high alluvial terraces, paleochannels, and upland outwash and till plains throughout the eastern United States. Traditionally, eolian sedimentation and dune development were thought to have ceased soon after the Last Glacial Maximum (~21 ka) and prior to initial human colonization of eastern North America, typically placed at 13.5 ka. Accordingly, archaeologists rarely consider the potential that Late Quaternary eolian deposits cover and preserve Native American archaeological sites in continental interiors. A growing absolute date inventory makes clear that sporadic eolian sedimentation and reactivation events were common during the late Pleistocene and Holocene, synchronous with Native American occupation. This suggests the potential that archaeological sites are underrepresented in state inventories and that Quaternary scientists have an incomplete view of the precontact record.

The nascent *Eastern U.S. Eolian Geoarchaeology Project (EUSEGP)* evaluates the degree to which <14.5 ka eolian units obscure undocumented archaeological sites in interior settings with emphasis on the Ohio River, Lake Erie, and Lake Michigan catchments. A cursory literature review by the author (Purtill, 2018) identifies 101 published optically stimulated luminescence (OSL) and $^{14}$C assays from eolian contexts dating between ~14.5 and 0.22 ka in Indiana, Illinois, Michigan, Ohio, and Wisconsin (e.g., Arbogast et al., 2017; Miao et al., 2010; Purtill et al., 2019; Rawling et al., 2008). Assays primarily reflect now-relict, transgressive dune fields, interdunal sand sheets, and cover sands that blanket pre-existing elevated landforms (Purtill, 2018; Purtill et al., 2019).

Summing the frequency of 50-year binned segments of reported OSL ages in the eastern US suggests correlation between increased eolian deposition and paleoclimate events such as the Younger Dryas Chronozone, the 8.2 ka event, the climatic optimal, and perhaps the 4.2 ka event (Alley et al., 1997; Bond et al., 1997; Booth et al., 2005; Fig. 1).
Dune reactivations likely occurred during periods of decreased vegetation cover, groundwater drawdown, or increased transport capacity of colder winds. OSL ages also demonstrate a south-to-north latitudinal trend of increasing thickness for <14.5 ka eolian units with assays recovered as deep as ~13 m (Fig. 2). Importantly, most <14.5 ka eolian units are at depths below those typically reached during archaeological survey or excavation projects, thus increasing the potential of undocumented buried archaeological resources.

Members of the EUSEGP continue to inventory available <14.5 ka absolute age assays from eolian sediments across portions of the eastern United States. Geochronological, archaeological, and sedimentological fieldwork is planned to document the nature of eolian deposition and archaeological potential at study sites.

Figure 1. Summed frequencies of 50-year bin ranges of <14.5 ka OSL ages from eolian contexts (n=97) referenced to NGRIP2 oxygen isotope data (North Greenland Ice Core Project members, 2004) and paleoclimate events. Periods of high summed bin frequencies indicate increased eolian activity.
Funded by a small seed grant awarded by SUNY Fredonia, initial field and geochronological research are planned for the upcoming two summers. Additional funding will be sought in the next 2–3 years. If anyone has additional absolute age information for eastern United States eolian deposits, or wish to discuss aspects of this project, contact me at matthew.purtill@fredonia.edu. Finally, EUSEGP news and results are reported on the Purtill Quaternary Geology and Geoarchaeology Laboratory website at https://sites.google.com/fredonia.edu/purtill-geology-geoarchaeology/home under the Research tab.

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Rawling, J.E., Hanson, P.R., Young, A.R., Attig, J.W. (2008) Late Pleistocene dune construction in the Central Sand Plain of Wisconsin, USA. Geomorphology 100, 494-505.
What secrets lurk beneath Geneva Lake?

By Yarrow Axford¹, Peter Puleo¹, Magdalena Osburn¹, Jamie McFarlin², Mitchell Barklage³, Brandon Curry³

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Geneva Lake, Wisconsin’s second-deepest natural inland lake, sits within LGM moraines from the Lake Michigan lobe of the Laurentide Ice Sheet above Paleozoic dolomite and shale. Occurring in the state’s deepest tunnel valley, the lake (42.57°N, -88.50°W) is surrounded by fascinating glacial geomorphological features, including drumlins, a huge ice-marginal alluvial fan that extends southward more than 10 km into Illinois, and ice-walled lake plains (Fig. 1). Previous research there has focused on water quality, and to a lesser extent on the sedimentary record of the last two hundred years. Little is known about the lake’s longer-term history, except for knowledge of the surrounding glacial geology. To address that gap and take advantage of Geneva Lake’s exceptional sedimentary record, we are pursuing paleolimnological investigations that so far examine the past 14,500 years of climate and environmental history there.

Regional relationships indicate that the lacustrine record at Geneva Lake likely began by at least 20.5 cal ka (based on minimum radiocarbon ages associated with the Woodstock Moraine in northernmost Illinois (Fig. 1; Curry et al., 2018). Other regional chronological data hint at an older age.

Figure 1. Geneva Lake and environs on hillshade map of Li-DAR data of parts of Walworth County, Wisconsin¹ and northern McHenry County, Illinois².

²Quantum Spatial, Inc. (formerly AeroMetric, Inc.), 2014, classified LAS USGS contract G10PC0025, task order G13PD00753, flown April 16, 2008.)
Northward projection of the prominent Marengo Moraine (Fig. 1), with its association with deep tunnel valleys in northern Illinois (similar to the valley containing Geneva Lake), hints at lacustrine sediment as old as about 29 cal ka (Curry et al., 1997, 2018). Carson et al. (2020) indicate that the nearby Green Bay lobe approached its local LGM by about 25 ka. Planned investigations of fossils contained in ice-walled lake plains festooning the Darien Moraine west of Geneva Lake may secure a minimum age of glaciation on its western side, and analysis of the stratigraphic succession underlying the prominent alluvial fan immediately west of Geneva Lake (Fig. 1) may offer further clues. A buried bedrock valley, a tributary of the Troy Bedrock Valley, passes below western Geneva Lake, and its presence holds the possibility of a pre-Wisconsin Episode record.

Axford first visited the lake in 2017 to test her new acoustic sub-bottom profiler, hoping the lake’s large size, depth, and oligotrophic status would mean low-organic sediments and thus negligible acoustic interference from methane gas. Previous profiling in smaller nearby lakes was inhibited by scattering of seismic energy by methane bubbles, resulting in an uninterpretable reflection coefficient series of the subsurface. Indeed, acoustic profiling worked very well at Geneva Lake and revealed that the lake contains a 30+ m-thick package of lacustrine sediments with numerous reflective density transitions that are traceable across large areas (Fig. 2).

Figure 2. Cross-section of sub-bottom sediments imaged at Geneva Lake, WI. The red box shows the approximate location of ~4 m sediment core obtained during the seismic survey. The dashed blue line shows the contact with either dense glacial sediment or bedrock. Geneva Lake bathymetry from dnr.wi.gov.
Given the potential for Geneva Lake’s thick package of sediments to yield long, detailed paleoenvironmental reconstructions and to add to our understanding of the local glacial (Laurentide Ice Sheet) history, as well as the richness and complexity of Geneva Lake’s seismic stratigraphy, we have begun a collaboration among Quaternary geolopaleolimnologists (Axford, Curry, McFarlin, and undergraduate Puleo), a geobiologist (Osburn), and a geophysicist with expertise in interpreting seismic reflection data (Barklage). Preliminary research is underway to determine, among other things, the stratigraphic and chronologic framework of Geneva Lake’s sediments and surrounding glacial geologic features, which biological and geochemical/isotopic proxies from the lake’s sediments will yield useful paleoenvironmental reconstructions, and the origin and significance of faulting and gas migration evidenced in the lake’s seismic stratigraphy.

We returned to the lake in 2018 for additional seismic surveys and recovered several sediment cores, including surface cores and a piston core in 31.5 m of water near the mouth of Williams Bay (Figs. 1, 2). Our sediment cores recovered the upper 4.5 m of record. On the west side of the lake, where water is as deep as 45 m, we found primarily horizontal to gently dipping reflectors. On the east side, the sediment is thinner, more faulted, and impacted by methane migration. The location and depth of future coring efforts will be informed by the seismic data, as will investigation of the origin of the faulting and gas migration. The composite sediment core was the subject of an honors thesis project by Peter Puleo, formerly an undergraduate (and now a Ph.D. student) at Northwestern University. Puleo is lead author on a forthcoming paper in *Quaternary Science Reviews* that presents results from the 2018 cores. Analyses of the 14,500-year-long sediment record included leaf wax abundances and hydrogen isotopes, oxygen isotopes and trace element abundances in ostracodes, and characterization of bulk sediment composition based on scanning x-ray fluorescence, x-ray diffraction, magnetic susceptibility, particle size, and elemental analysis for carbon and nitrogen. Results included evidence for changes in groundwater inputs to the lake over time, stepwise landscape stabilization through the late glacial and early Holocene, and a unique possible eolian event ~8.2 ka.
By combining leaf wax and ostracode isotopic analyses, we characterized precipitation and lakewater isotopes through the Holocene. We inferred that climate at Geneva Lake became increasingly wetter through the middle to late Holocene, whereas precipitation source and condensation temperature were relatively stable throughout the Holocene.

Ongoing collection of pilot data from sediment cores, analyses of seismic data, and planned preliminary on-land geophysical surveys adjacent to the lake should help us to pinpoint the scientific potential of, and identify ideal sites for, coring deeper into the late Pleistocene lake sediments someday soon—a goal that will require external funding and access to equipment that can recover 30 m of sediments from beneath 45 m of water. Geneva Lake could yield an exceptionally long and detailed record of paleoenvironmental changes in the midcontinental portion of North America. And notably, in 1892 the Chicago Tribune allegedly ran a story about multiple sightings of a massive, shrieking serpent in the lake. Then, on September 29, 1902, The Janesville Gazette reported the sighting of a snake-like creature 65 feet long and from 8 inches to 10 inches in diameter. Townspeople even named the odd lake inhabitant “Jenny” (Lewis, 2016). Given this history, who knows what else we will find?

Acknowledgments

Thanks to all who have helped us with coring, seismic imaging, and logistics: Ted Axford, Melissa Chipman, Laura Larocca, G. Everett Lasher, Ted Peters (Geneva Lake Environmental Agency), members of the Northwestern University Environmental and Applied Geophysics class, George Williams College, and Gordy’s Marina. The Northwestern Alumnae Association provided funding for course development and field logistics, and a Northwestern Undergraduate Research Grant supported Puleo’s research.

References


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Cambridge University Press (CUP) publisher of Quaternary Research, the nominally "official" journal of AMQUA, has signed an agreement with the UC Libraries to continue providing full access to all CUP journals for campus-affiliated users, and to cover all open-access publication charges for any article published in a Cambridge journal with a UC-affiliated corresponding author. This reflects the acknowledgment that as more articles are being published open-access, libraries are (in effect) paying the same amount for a shrinking inventory of "restricted" content. However, publishers (even non-profit publishers like Cambridge) still need a revenue stream to continue operating. Instead of shifting the financial burden from libraries onto authors, in the form of open-access fees, the university will offset their reduced subscription payment to the publisher by subsidizing the open-access article fee to ensure open access for all new articles. Although UC Libraries will gladly accept author contributions if the underlying research funding has such a provision, there is no minimum or cost-share required of the authors if no such funding source is available.

At present, this applies only to a few institutions, world-wide; but UC Libraries is one of the largest, and the first such agreement in North America. This approach will surely expand over time, insofar as it appears to be the coming trend in academic publishing, and Cambridge is unlikely to be the only publisher making such agreements. But, for the moment, it's one of the very few and prospective authors should check with their home institution for any such agreements before making a final decision on where to submit their pending manuscript. At the moment, it appears to be one of the better-kept secrets in the world of academic publishing, but AMQUA members should be sure to discover, and to take advantage of, these agreements as they begin to become more common.

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