



# Quaternary Times



Newsletter

November 2019

Volume 41, Number 2

Published biannually by the American Quaternary Association, Inc.



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The American Quaternary Association Newsletter

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[www.amqua.org](http://www.amqua.org)

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

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**Cover:** Dust devil near the Quelccaya Ice Cap, Peru. Photo by Tom Lowell (2009).

## The View from the Moraine: the President's Message

*By Tom Lowell*

*University of Cincinnati, [lowelltv@ucmail.uc.edu](mailto:lowelltv@ucmail.uc.edu)*



Shortly after I started at the University of Cincinnati, back in the 1980s, I was invited to the Cincinnati Museum of Natural History to consult as they developed an Ice Age exhibit. The museum was moving to larger facilities and wanted to build on the success of an immersion experience called the limestone cave. Museum planners envision another immersion experience, this time with a glacier cave and walk-through of the Ice Age landscape in Cincinnati.

I was asked to help re-create the glacier in as much detail as possible. Subsequently, I took some of the museum staff, ranging from the project director to educators to sculptors who would craft the fiberglass glacier, to Iceland with me on my Glacial Field methods trip.

As a result the staff was able to craft a rather realistic glacier and landscape. The glacier had details like basal ice, striated stones, flutes etc. etc. To support this immersion format, panels explaining the orbital theory of the ice age, a grindstone to simulate glacial erosion, an ice-core section from Greenland, numerous photographs of glaciers, and a host of life-sized ice age mammals were added. All nice examples for show and tell. The original intent was to show the museum visitor how “scientists are like detectives, they use clues from the past”. Looking at this collection of items several years later convinced me that a wonderful set of individual exhibits had emerged, but was the overarching message delivered to the visitor? Probably not.

Over time the staff moved on, administrations changed, and eventually plans to revitalize the now called Cincinnati Museum Center were generated and a multi-year face lift is underway. The reconstructed glacier and landscape were retained because of the large infrastructure investment. All other supporting materials were removed to allow a fresh take. Recently, I was asked again to help hone the staff's message that climate is a major player for change. Just how can a reconstructed landscape from the last ice age be used to deliver that message? It is safe to say more discussions, testing of visitor reactions are needed.

The advertising industry has shown us a message needs to be simple, focused on one point, and repeated over and over. As scientists we have many opportunities to engage the public and it may be worth asking ourselves what message it is we wish to deliver. The details are key to our collaborators and colleagues. To the layperson? What is the primary message you want to convey about your work?

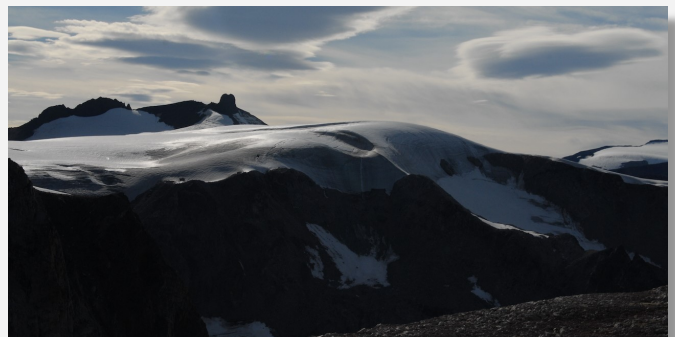


Photo: T. Lowell

## 2020 Biennial AMQUA Meeting - News -

*By Ben Fitzhugh*

*University of Washington, [fitzhugh@uw.edu](mailto:fitzhugh@uw.edu)*

AMQUA 2020 - the AMQUA 50<sup>th</sup> Anniversary Bi-annual Meeting will be held **June 17-20, 2020** on the campus of the **University of Washington in Seattle** on the theme of “*Quaternary Futures*.” We will honor the 50 year history of the Association and explore promising expansions and new directions poised to carry Quaternary research into our second half century. Educational field excursions are being planned for the day or two following the meeting. The Banquet and Awards ceremony will be held the evening of June 19<sup>th</sup>. **Registration** will open by December 1, 2019 at <https://sites.uw.edu/amqua50/>.

Poster abstracts can be submitted anytime to [qrc@uw.edu](mailto:qrc@uw.edu), with a priority deadline of March 1, 2020. With a focus on the future of Quaternary science, we especially want to **encourage student and early career researcher participation**. Early registration and student discounts will be available, and students who wish to volunteer a few hours during the meeting in exchange for free registration should contact Erin Williamson ([qrc@uw.edu](mailto:qrc@uw.edu)) to get placed

on the list while spaces remain. Discounted hotel rooms have been reserved near campus at the University Inn, Watertown, and Graduate Seattle Hotels (see below). We also hope to be able to provide a "couch-matching" service to connect visiting students to local students and faculty with room to share.

I look forward to seeing you in Seattle!

**Ben Fitzhugh**

Director of the Quaternary Research Center, UW & chair of the AMQUA 2020 organizing committee

To book at **University Inn** (\$219/night), enter the conference code, AMQUAUI, at their website. To book at **The Watertown Hotel** (\$219/night), enter the conference code: AMQUAWT, at their website. To book at the **Graduate Seattle Hotel** (\$199/night), use the Group Code: 06172020AMQU and call 206-634-2000 *before May 18, 2020* or visit their website to book online.

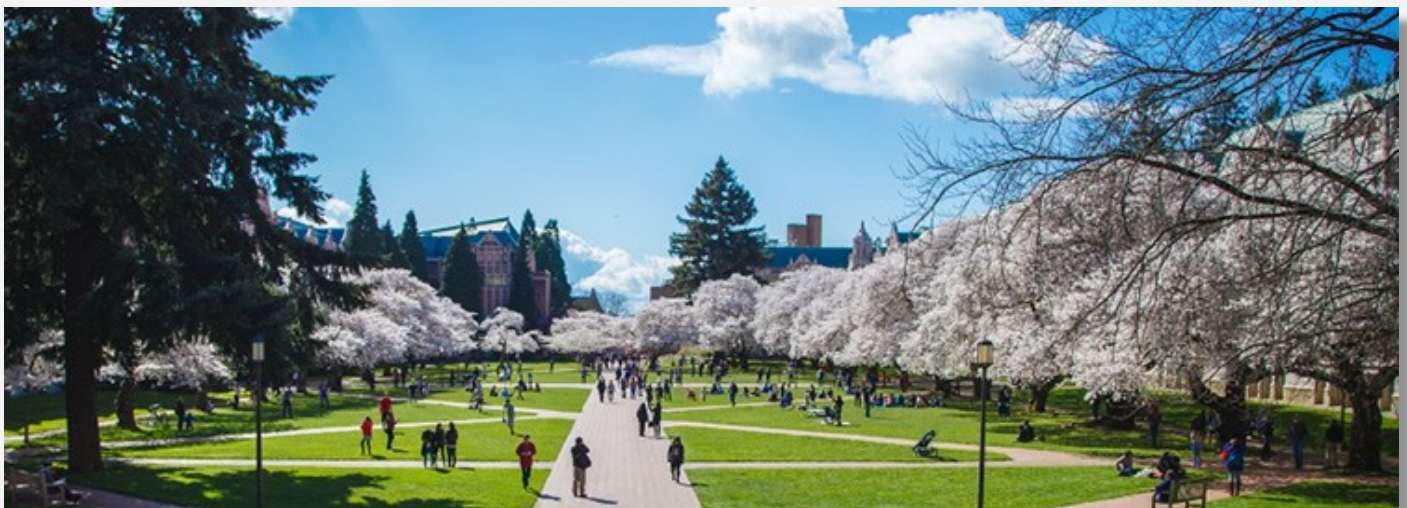


Photo: <https://www.mha.uw.edu/about/uw-seattle/>



## Other AMQUA News

*By Colin Long*

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

# 2020 AMQUA COUNCIL AND EXECUTIVE COMMITTEE ELECTIONS

It is election season. In order to inform you regarding nominations, I have provided an overview of AMQUA governance. Which is followed by the official Call for Nominations for AMQUA Council and Executive Committee positions.

The American Quaternary Association (AMQUA) Council and Executive Committee comprise the governing body of AMQUA. The Council is made up of 14 councilors (two from each of seven sub-disciplines) that serve four-year terms. Each two years a cohort of seven (one from each sub-discipline) are elected. The Executive Committee consists of the AMQUA President, President-Elect, Secretary, and Treasurer. Each two years a President-Elect, Secretary, and Treasurer are elected. The President-Elect becomes President after a two year stand. Nominations are collected and a ballot is generated by the Nominating Committee comprised of the standing President-Elect and two other members. The Secretary and Treasurer are eligible for re-election without limitation. The President, President-Elect, or Councilors may not serve consecutive terms. The current roster of Councilors and Executive Committee can be found under the 'About' tab on the AMQUA website: <http://www.amqua.org/>

## 2020 AMQUA Elections — Call for Nominations

Nominations are being solicited for individuals to

serve on the AMQUA Council and Executive Committee. Self-nominations 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 AMQUA.

Please send nominations by November 29, 2019 to Colin Long, AMQUA Secretary, at [longco@uwosh.edu](mailto:longco@uwosh.edu). Please note the disciplinary group with Councilor nominations. Ballots will be available online by mid-December and the results announced by mid-January 2020.

To be eligible for office, or to vote, your membership must be current. Contact Chris Hill at [amquatreasurer@gmail.com](mailto:amquatreasurer@gmail.com) or Colin Long at [longco@uwosh.edu](mailto:longco@uwosh.edu) with inquiries regarding your

membership status. To pay AMQUA's modest membership dues see <http://www.amqua.org/index.php?id=13>

## 2019 AND 2020 DISTINGUISHED CAREER AWARDS

Nominations are being solicited for the 2019 and 2020 AMQUA Distinguished Career Award. The award recognizes a Quaternary scientist who has contributed significantly and continuously to the advancement of Quaternary science in any discipline. This award is the highest one made by AMQUA and truly honors someone with a lifetime commitment to Quaternary science. We encourage everyone to consider and nominate those senior scientists who have contributed significantly to their field. The award is for scientists who have worked on North American Quaternary issues for a substantial part of their career. The nominee must be alive at the time of nomi-

nation but does not have to be a member of AMQUA. The award recipients will be recognized at the 2020 Biennial Meeting to be held June 17-20, 2020 in Seattle. The award will be announced prior to the Biennial Meeting on the AMQUA web site and listserve. To nominate a scientist, please send a letter outlining why the nominee is qualified for the Distinguished Career Award and forward her/his current CV. All nominees are retained as candidates for five years. Please send your nominations by December 2, 2019 to Tom Lowell, AMQUA President at [thomas.lowell@uc.edu](mailto:thomas.lowell@uc.edu). If you have any questions please feel free to contact me at [longco@uwosh.edu](mailto:longco@uwosh.edu)



## The XX<sup>th</sup> INQUA Congress Dublin, Ireland, 25<sup>th</sup>-31<sup>st</sup> July 2019

By Pete Coxon<sup>1</sup>, Keith Bennett<sup>2</sup>, Catherine Dalton<sup>3</sup>, Fraser Mitchell<sup>1</sup>, Stephen McCarron<sup>4</sup>  
<sup>1</sup>Trinity College Dublin, <sup>2</sup>University of St. Andrews, <sup>3</sup>Mary Immaculate College, <sup>4</sup>Maynooth University

*This article has been previously published in the Quaternary Newsletter Number 149, October 2019, pages 39-46. The publisher provided written permission to reproduce this article.*

INQUA 2019 was the largest INQUA congress to date with 2305 (56% male, 44% female) delegates from 75 countries. The Congress was held at the Convention Centre, Dublin and the professional conference organiser employed to assist with the organisation and hosting of the event was Keynote Ltd, a Dublin based specialist company. There were 139 sessions convened including 1185 oral presentations and 1476 posters. In addition, there were 6 plenary lectures by invited guests and a set of lunchtime presentations given by the INQUA medal winners with a well-received special presentation on 'Quaternary Mars' taking place on the final day. The flawless timetabling and organisation of this volume of presentations took a lot of care and patience by a number of people in IQUA and Keynote Ltd staff working in close collaboration in the months before and during the Congress.

There was an extremely good take-up for the fieldtrip programme which ran in tandem with the Congress meeting. 585 delegates attended 22 pre-, mid- and post Congress fieldtrips to all corners of the island of Ireland and several locations in Britain thanks to the excellent support of the QRA.

### **Background**

On 24th January 2014 the Irish Quaternary Association (IQUA) held an executive meeting in Kennedy's pub on Lincoln Place in central Dublin. One item that came up under AOB was that we should bid for the 20th INQUA congress to be held in 2019. After some uproarious laughter a semi-sane

case was made and a small group was tasked to think about an approach. Within seven days (!) representatives of the Convention Centre Dublin (CCD) and Tourism Ireland appeared in Trinity College to outline possibilities and to offer available funding to support a bid. With experience of being the Science Programme Chair for the 18th Congress in Bern, having been the Secretary-General of INQUA for two intercongress periods (2003-2015-2011) and having been the Irish International Council (IC) representative for Ireland 4 times in the past and at that time about to be the QRA President (and hence the UK IC representative) Pete Coxon took the Chair of the Local Organising Committee (LOC) and we (IQUA) all sought volunteers and support.

The original LOC (Figure 1) meetings and membership were large at about 30 members with the advantage that a large list showed a firm Irish commitment of a range of well-known Quaternary scientists that could be presented in a bid document – the later meetings required the identification of individual chairs of critical subcommittees.

During 2014 IQUA and the LOC had to make a number of important decisions including choosing a Chair for the Science Programme Committee (SPC) and interviewing potential professional conference organisers (PCO). Both of these actions were essential to success as the potential scale of an INQUA Congress is so large. In July 2014 Keith Bennett agreed to Chair the SPC, INQUA were told of our



**Figure 1.** The Local Organising Committee (A) during a committee meeting in March 2016. From left to right: Steve Davies, Gayle McGlynn, Robin Edwards (obscured) Michael Sheehy (looking at noticeboard), Catherine Dalton, Catherine Delaney, Gill Scott, Noel Mitchell (Keynote PCO), Siobhan O'Hare (Keynote PCO), Margaret Brown and Bettina Stefanini (back to camera), (B) after the March 2018 meeting. From left to right: Gayle McGlynn, [Portrait of Frank Mitchell watching over events], Bettina Stefanini, Kieran Craven, Keith Bennett, Pete Coxon, Fraser Mitchell, Catherine Dalton and Rachel O'Hare (Keynote PCO).

intention to bid also in July 2014 and 4 PCOs were interviewed at the CCD in November 2014.

The choice of Keynote as PCO and Keith as Chair of the SPC with Catherine Dalton as Vice Chair proved to be pivotal to the success of the Congress as firm commitment and serious engagement by a relatively small number of people soon became a key part of the whole exercise.

An important milestone was reporting the idea and what had subsequently transpired to the IQUA membership at the AGM in Maynooth in April 2015 where support for the plan and permission to present the bid in Nagoya was obtained and IQUA agreed to assist in what would eventually become essential administrative and practical support.

The bid document, including a detailed budget, had to be professionally prepared by Keynote (the PCO) and the LOC and the bid document was sent to the

INQUA Executive in April of 2015. The financial margins were so tight that only the exact number of copies of the bid could be printed to cover the IC membership. Keynote (Noel Mitchell) accompanied the Irish delegation to Nagoya to make the bid and the bid itself was presented by Fraser Mitchell, as the Irish representative to the International Council, and we won on the first count against Italy and Spain.

After celebrating the vote of confidence in the Irish bid and IQUA, the reality of the immense task ahead soon hit home, and there followed a number of meetings that identified key areas we needed to concentrate on, including: the scientific programme; fieldtrips; support for early career researchers; outreach events; promotion, marketing and local media; sponsorships and exhibition; social events and the overall management of tasks and the LOC.



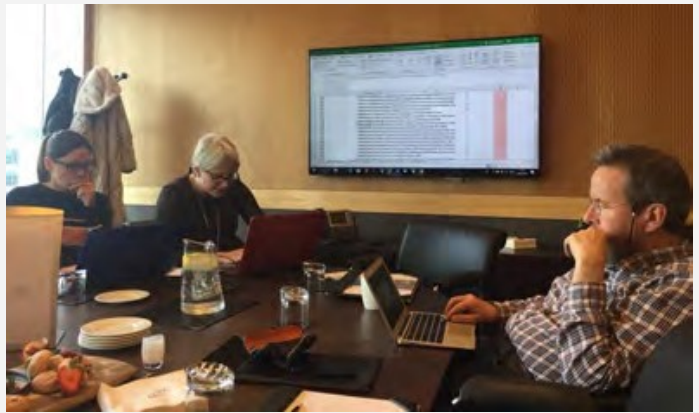
### *Science Programme*

Keith Bennett, with help from an international Scientific Programme Committee, led the monumental task of dealing with INQUA Commissions, choosing the six plenary speakers to represent the breadth of modern, relevant and Quaternary science, calling for the session topics, sorting the session suggestions, launching the abstract system and finalising the programme (Figure 2). Keynote had the experience of managing such a large body of abstracts and, in particular, Leone Mitchell of the PCO provided expert knowledge and spreadsheet wizardry at critical junctures.

The Congress opened with a wonderful address by Mary Robinson (Figure 3) who served as President of Ireland from 1990-1997 and as the UN High Commissioner for Human Rights from 1997-2002. She is Chair of The Elders and a member of the Club of Madrid and the recipient of numerous honours and awards including the Presidential Medal of Freedom in 2009 from the (then) President of the United States Barack Obama.

### *Fieldtrips*

The organisation of an array of potential fieldtrips of varying duration and timing (Pre- Mid- and Post-Congress) to different locations was a particularly difficult one due to a number of issues. Obtaining insurance was one, and having trips run in July/August when Irish tourism is at a peak was another. The issues raised here would be worth discussing in detail by any group attempting a similar exercise, and the team who worked on coordinating the fieldtrips, led by Stephen McCarron and Bettina Stefanini would be happy to do so. The scale of the enterprise meant that many others from the all-important fieldtrip leaders themselves to all suppliers and the staff of Keynote Ltd were involved too, over a period of several years and intensively in the final year before the Congress.



**Figure 2.** Critical meeting at the CCD to sort the final programme structure 25th February 2019. From left to right: Rachel O'Hare (Keynote PCO), Leone Mitchell (Keynote PCO) and Keith Bennett (Chair SPC).



**Figure 3.** Mrs Mary Robinson giving the opening address at the congress in the main auditorium of the Dublin Convention Centre. Mary is the President of the Mary Robinson Foundation – Climate Justice. She served as President of Ireland from 1990-1997 and was the UN High Commissioner for Human Rights from 1997-2002. She is Chair of The Elders and a member of the Club of Madrid. Mary is the recipient of numerous honours and awards including the Presidential Medal of Freedom from the President of the United States in 2009.



**Figure 4.** A lasting legacy in 15 specially produced fieldguides to accompany some of the many fieldtrips run by INQUA 2019. Design and production: Stephen McCarroll. (There is a Swanscombe handaxe collected by John Wymer's father and a ventifact from the Namib desert for scale).

The production of 15 new guidebooks (Figure 4) to accompany nearly all of the Irish-based trips was a formidable task, carried out by a combination of the fieldtrip leaders and Stephen, with the help of Gayle McGlynn on several guides.

The guides required extensive typesetting, design, editing and print production work, particularly in the weeks and months of 2019 leading up to the Congress. Stephen and IQUA are indebted to the printing company Digital Print Ireland for their ‘beyond the call of duty’ assistance in delivering all guides so professionally produced in time for the Congress. These books will provide a great legacy of the Congress and an unparalleled educational resource for years to come. They are on sale at the IQUA website: <http://iqua.ie>. The trips saw 585 people participating in what turned out to be (mostly) clement or outright stunningly pleasant weather (Figure 5).

### **Early Career Researchers**

Donna Hawthorne led the LOC work with Sabrina Renken helping. Registration numbers suggest that 29% of delegates were early career researchers. A range of events were held across the congress targeted at Early Career Researchers (ECRs). On Monday lunchtime there was an ECR Ice-breaker,

including a Quaternary themed quiz, which was a chance to network and meet fellow ECRs and have a bit of fun. Short talks were held on Academic Networking (Speakers: Nina Kuosmanen and Shilpa Pandey) and the INQUA ECR community (Speaker: Eduardo Alcheron). A series of workshops gave the opportunity for ECRs to enhance their analytical skills, with sessions on Neotoma Paleocology Database (Leaders: Jessica Blois and Simon Goring), Paleofire and the Global Charcoal Database (Leaders: Global Paleofire Working Group), Radiocarbon Dating and Chronology creation (Leader: Maarten Blaauw) and Statistical Analysis on climate time-series (Leaders: Tobias Erhardt and Florian Adolphi). Two splinter meetings were also held during the congress and targeted at ECRs; an INQUA ECR business meeting and a PAGES ECN business meeting, with a focus on how to get more involved in the organisations and participate in the planning of future activities and events. All events were well attended and supported by the ECR community.

### **Outreach events**

Catherine Dalton (as President of IQUA), Martha Coleman, Benjamin Thebaudeau and Kieran Craven organised and ran a great range of outreach events –amongst the most successful were the ‘Ireland and the Ice Age’ event held at the National Botanical Gardens in April 2019 and the accompanying official launch of a new IQUA booklet entitled ‘Giants of Irish Quaternary Science’. The latter booklet had been produced after a fascinating set of talks held at the Hunt Museum in Limerick as IQUA’s spring meeting in 2018 entitled ‘Standing on the shoulders of Giants’. The book and the ‘Giants’ meeting also led to the pull-up banners used at the CCD of famous Irish Quaternarists.





**Figure 5.** Some highlights from fieldtrips. (A) 'Wicklow in the Grip of an Ice Age' - one of the Mid Congress trips on Sunday 28th July 2019 - co-led by Pete Coxon (with corer, Chair of the Local Organising Committee) and Fraser Mitchell (holding guidebook) on the Liffey Head Bog, (B) Lunchtime stop planned as a picnic on the grass for the 64 participants on the 'Wicklow in the Grip of an Ice Age' trip. Luckily the weather was perfect. (C) Post Congress fieldtrip to Clare Island off the coast of Mayo. Summit of Knockmore (462m) in perfect weather.

A novel and hardy outreach event was Sam Roberson's 'Irish Quaternary Cycle' along the length (1000km) of much of the western coast of Ireland. Sam was joined along the way by like-minded cyclists including Michael Sheehy and Catherine Dalton.

### ***Promotion, Marketing and Social Media***

An early start was required here with a Facebook launch by Gayle McGlynn on 13th March 2015 quickly followed by a St. Patrick's Day card on Facebook and information in 5 languages sent out to Quaternary lists. Gayle and Cathy Delaney kept up disseminating information through Facebook and

Twitter right through the important pre-bid period and after to generate interest in Congress attendance. A wide range of people participated in posts and the Congress trended every day on Twitter.

### ***Sponsorship and exhibition***

The important work on garnering sponsorship was spearheaded by Fraser Mitchell and Keynote. The task of getting commercial sponsorship of any amount was very important in enabling the success of the Congress as the registration fee would not have provided the level of comfort required during a seven day event.

### ***Social Events***

The social events subcommittee headed by Cathy Delaney and Gayle McGlynn toured several Dublin venues and decided that despite the cost that the Guinness Brewery was by far the best venue. Whilst cheaper venues were good and could accommodate a sizable proportion of the attendees the cost difference was not substantial. Dublin is a busy and prosperous place and it is a sellers' market so we had a great night at Guinness's!

### ***Overall management of tasks and the Local Organising Committee***

Keynote were represented at every LOC meeting and many of the fieldtrip subcommittee meetings as well as organising and liaising meetings and terms with the CCD. Without Keynote's work we could not have run the Congress. It is worth noting that throughout the planning and organisation of all of the INQUA 2019 activities all of the LOC and SPC were volunteers who carried out their everyday duties at Universities, Colleges, in Surveys, in companies and as research students etc. Over the years that INQUA 2019 was conceived and executed, INQUA's officers and members were also running their traditional annual programme including a spring meeting, a fieldtrip and an autumn symposium every year without fail – the commitment of all concerned was immense. This commitment by many to INQUA and the hosting of this major international event in turn was demonstrated by the ability of a relatively small association to host.

The first INQUA fieldtrips in late July and then the opening of the Congress at the CCD venue went as planned and scheduled. Five years of planning had paid off and once started, the single site venue proved a very comfortable and easy to navigate location for the hosting of multiple parallel sessions. The attendees were able to relax into a most enjoya-

ble and fruitful scientific congress and their engagement and efforts to come to Dublin are greatly appreciated by the organisers. INQUA 2019 is now complete and we'd like to thank all those 2000+ delegates that made the journey to Dublin, and made the Congress a resounding success that will hopefully lead to an energised new inter-Congress period.

All in INQUA look forward to attending the next Congress in Rome.



<http://www.inquaroma2023.it/>



## Supporting U.S. Students and Early Career Quaternarists: The 2019 INQUA Congress Travel Fellowship Program

*By Rolfe D. Mandel, Chair, U.S. National Committee for Quaternary Research, University of Kansas  
Ester Sztein, Assistant Director, Board on International Scientific Organizations, The National Academies  
of Sciences, Engineering, and Medicine*

The U.S. National Committee (USNC) for Quaternary Research represents the interests of the U.S. Quaternary community in the International Union for Quaternary Research (INQUA), advances Quaternary research both in the United States and abroad, and formally represents the United States in INQUA through the National Academy of Sciences, the U.S. adhering body to INQUA. INQUA holds a quadrennial International Congress, which represents the foremost opportunity for Quaternary scientists from around the world to present their research and discuss the latest developments in their disciplines. USNC/INQUA organized a Congress Travel Fellowship Program for U.S. graduate students and early career scientists presenting their research at the 20th INQUA International Congress, which was held in Dublin, Ireland, on July 25-31, 2019. This program was supported by NSF award #1927092 with an additional contribution by AMQUA. We, on behalf of the USNC/INQUA, are very grateful to both NSF and AMQUA for their assistance.

The 20th INQUA Congress gave U.S. graduate students and early career scientists the unique opportunity to discuss their original research among their cohort of awardees and with U.S. and international scientists at all career stages. A subcommittee composed by Julio Betancourt (USGS, USNC/INQUA member, subcommittee chair), Tammy Rittenour (Utah State University, USNC/INQUA member), and J.J. Shinker (University of WY, on behalf of AMQUA), evaluated the applications and the USNC competitively awarded 26 fellowships.

In addition to the travel fellowships, the USNC/INQUA organized a mentoring dinner for the awardees and senior scientists at the beginning of the Congress, which was highly rated by the attendees. The goals of this dinner were to create a sense of cohort among the awardees, share with them information about INQUA's, USNC/INQUA's and AMQUA's goals and functions, provide guidance for navigating the Congress, and give them the opportunity of having one-on-one conversations with experienced scientists and with their peers. We also organized a WhatsApp group that facilitated communications within the cohort by providing a space to publicize each other's presentations and to organize outings and other social activities during the Congress. At their return from Dublin, we asked awardees to complete a survey about their experience.

This program's goals were to assist graduate students and early career U.S. Quaternarists to present their original research and interact with many scientists at a variety of career stages and from around the world. About three-quarters of the respondents said that they met with current collaborators and three-quarters said they met with potential new ones. Participants felt a sense of belonging at a big international Quaternary conference and received important feedback about their work from scientists in their same field and/or in very different fields. In some cases, this input already resulted in valuable contributions to the awardees' work. These interactions will likely result in future collaborations among early career scientists and foster strong interdisciplinary research.



*The awardees and experienced scientists joined for a dinner at Quay 16 on Thursday 25<sup>th</sup>, 2019. The restaurant is on board the former tender ship the MV Cill Airne, located on North Wall Quay, Dublin's floating Restaurant & Bar on the River Liffey.*



We really enjoyed organizing this program and sharing the experience with all the awardees. The USNC/INQUA plans to organize a similar program for the 2023 INQUA Congress in Rome, Italy and we hope that AMQUA members and their colleagues will participate!

### List of awardees and their abstract titles

**Kevin Barrett** (University of Wisconsin, Madison): Hawaiian Paleohydrology: Insights from Testate Amoebae and *Cladocera* in Peatland Deposits

**Kevin Burke** (University of Wisconsin, Madison): Testing Possible Climatic Mechanisms of Vegetation Turnover and Novelty in North America and Europe

**Vachel Carter** (University of Utah): Wildfire Risk at Different Elevations: Contextualizing Modern Fire Activity Through a Paleo-perspective; and People, not Climate, Structured Past Fire Regimes in South-central Utah

**Jon Edwards** (Oregon State University): The Imprint of Heinrich Stadials and Dansgaard-Oeschger Cycles on the Latitudinal Distribution of Methane Sources Inferred from Ice-core Gas Records

**Krista Evans** (University of Hawaii, Manoa): Human Reactions and Escaping from an Eruptive Santorini (Thera), Greece

**Elizabeth Fard** (University of California, Los Angeles): High-resolution Geochemical Record of Three Marshes from the San Francisco Bay area

**Jessie George** (University of California, Los Angeles): Reconstructing Pleistocene Plant Community Shifts from the La Brea Tar Pits, California, and Implications for Regional Patterns of Plant Response to Climate Change

**Dulcinea Groff** (Lehigh University): A Multi-proxy Reconstruction of a Terrestrial-marine Linkage in Falkland Islands

**Christopher Halsted** (University of Vermont): Assessing the Erosivity and Deglacial Thinning History of the Southeastern Laurentide Ice Sheet Using in-situ cosmogenic  $^{10}\text{Be}$  and  $^{14}\text{C}$

**David Harning** (University of Colorado, Boulder): Lipid Biomarkers Quantify Holocene Temperature in Icelandic Lakes and Soils *and* Holocene Tephrochronology of West Iceland

**Geoffrey Johnson** (University of Oregon): A Novel Approach to Local and Regional Application of Paleoecological Perspectives in Dry Forest Management and Restoration

**Joshua Kelly** (San Diego State University): Detecting Primary Climate Drivers of Shoreline Change along Southeast Queensland, Australia Using Historical Landsat Imagery

**Phillip Kerr** (University of Iowa): Evidence for Multiple Advances of the Southwestern Laurentide Ice Sheet during MIS 3

**Caroline Kisielinski** (University of Kansas): eDNA Analysis at Mid-latitude Sites for Paleoenvironmental Reconstruction

**Samantha Krause** (University of Texas, Austin): Reconstructing Tropical Wetlands and Maya Agroecosystems in Northwestern Belize

**William (Buzz) Nanavati** (Montana State University): Anthropogenic and Natural Drivers of Vegetation and Fire History Along the Forest-steppe Border

of the Eastern Andes (38-50°S)

**Melissa Pardi** (Vanderbilt University): A Multi-proxy Approach to Advance our Understanding of Niches in Fossil Mammals

**Christopher Schiller** (Montana State University): Quaternary Vegetation Responses to a Range of Volcanic Disturbances in the Northern Rocky Mountains (USA)

**Katarena Shiner** (Baylor University): The Change of  $\delta^{13}\text{C}$  Values in Belizean Soil and its Implications on Maya Agriculture

**Allison Stegner** (Stanford University): Spatial and Temporal Indicators of Resilience Loss in Networks of Paleoecological Records

**Susann Stolze** (Colorado School of Mines): Holocene History of 'Non-native' Tree Taxa in Ireland

**Rebecca Taormina** (Baylor University): Predictive Site Modeling for Pre-Clovis Buried Materials in Central Texas

**Richard Vachula** (Brown University): Constraining Charcoal Source Area to Better Inform Paleofire Interpretations *and* Disentangling the Influences of Climate and Human Management on Fire in the Yosemite

**Greta Wells** (University of Texas, Austin): Geomorphologic and Geochronological Reconstruction of Holocene Jökulhlaups along the Hvítá River and Gullfoss Waterfall, Iceland

**Malte Willmes** (University of California, Davis): Strontium Isotopes Reveal New Insights into the Complex Life History of Modern and Ancient Fish in California

**Davina (Allie) Wyman** (University of Illinois, Urbana-Champaign): Reconstructing Last Millennium Hydroclimate from Kiritimati Sediments Using Lipid Biomarkers



## Neotoma Paleoecology Database: Recent Updates

*By Jack Williams, on behalf of the Neotoma Paleoecology Database Consortium  
University of Wisconsin-Madison, jwwilliams1@wisc.edu*

The mission of the Neotoma Paleoecology Database is to serve the Quaternary community and support global-change research by providing an open, high-quality, sustainable, community-curated repository for multiple kinds of paleoecological data. Since the last Quaternary Times report (May, 2017), Neotoma has continued to grow, in multiple ways: data volume, supported data types and constituent databases, data services, supported science and publications, and, most importantly, in its community of data contributors, data stewards, and leaders.

### **Data Volume**

As of November 3, 2019, Neotoma now holds over 6.9 million individual observations, from 37,732 datasets, distributed among 18,212 sites. The global scope of Neotoma is increasing, particularly with the current data mobilization campaigns for the European Pollen Database and Latin American Pollen Database, both constituent databases in Neotoma. A new campaign has just been launched for the African Pollen Database, with funding from the Belmont Forum (lead PI: Nick McKay) and a workshop in Oct 2019 hosted by the Research Institute for Development (IRD).

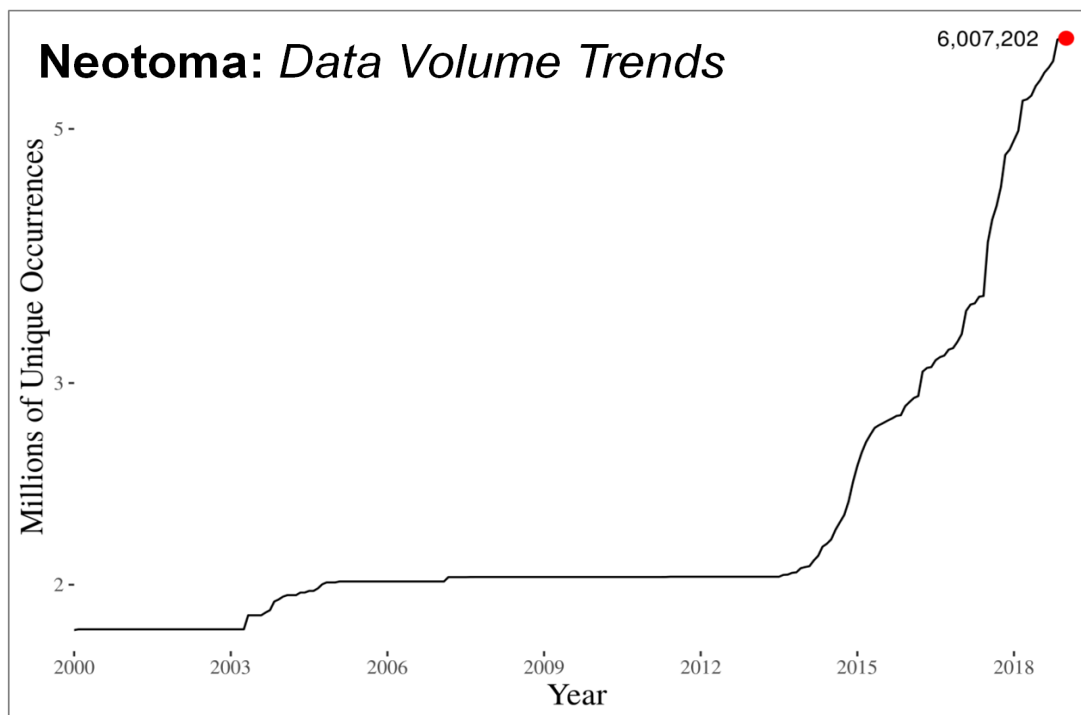


Figure: S. Goring



### ***Supported Data Types and Constituent Databases***

Neotoma now has sizeable holdings in diatoms (1,149 stratigraphic datasets, 1,305 surface samples), insects (210 stratigraphic datasets, 13 surface samples), ostracodes (12 stratigraphic records, 5,057 surface samples), pollen (4,567 stratigraphic datasets, 3,166 surface samples), testate amoebae (85 stratigraphic datasets, 2,393 surface samples), vertebrates (5,028 stratigraphic datasets), and water chemistry (7,655 datasets). Neotoma also stores over 5,700 geochronological datasets, most linked to age-depth models. Other supported data types include biomarkers, chironomids, cladocerans, loss-on-ignition, macroinvertebrates, phytoliths, plant macrofossils, stable isotopes, XRF, and XRD. Each data type is associated with one or more Constituent Databases, each with one or more expert Data Stewards.

### ***Supported Science and Publications***

Neotoma is designed to support broad-scale, multi-site, and multi-proxy research. Current research collaborations include ACCEDE, CLIMATE12K,

ECORE3, HOPE, LANDCOVER6K, and SKOPE. In these partnerships, researchers building large data syntheses benefit from the large curated data resources. In return, macro-scale researchers can improve Neotoma, by mobilizing and uploading new records, catching and fixing errors, adding new age models, and building new software or analytical workflows that directly link to Neotoma data. Examples of these two-way interactions include the HOPE project, which is helping facilitate uploads of data into the EPD and LAPD, and Wang et al. (2019), which has just built over 550 new Bacon age models for North American pollen records. Several papers describe Neotoma itself: 1) Williams et al. (2018) offers an overview of Neotoma, its design philosophies, and key concepts; 2) Grimm et al. (2018) reviews the concepts of constituent databases and data stewards; and 3) Goring et al. (2018) reviews the educational resources associated with Neotoma. And, the PAGES Fall 2018 issue on Building and Harnessing Open Paleodata (<https://doi.org/10.22498/pages.26.2>) provides a survey of community curated and open data resources across the paleosciences.

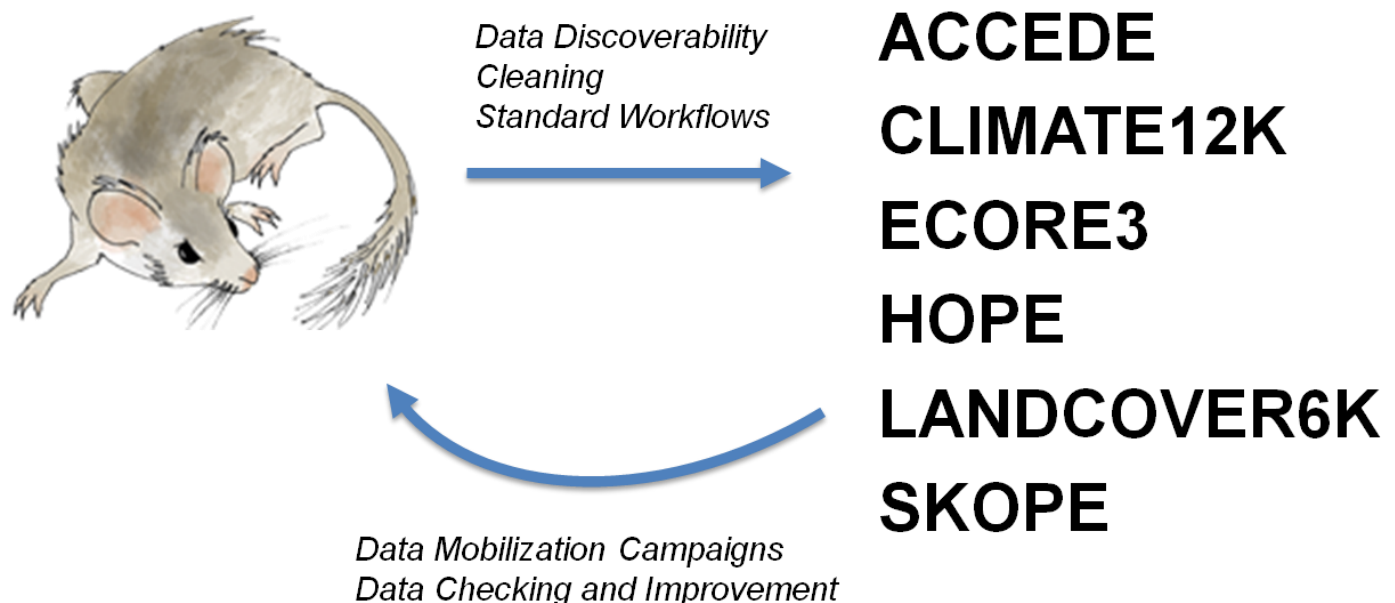


Figure: S. Goring

## Data Services

1) DOIs. All Neotoma datasets are now assigned unique identifiers (DOIs), each associated with a landing page (Example 1: pollen dataset at Ballygisheen Bog: <http://data-dev.neotomadb.org/14194>; Example 2: vertebrate dataset at La Grande: <http://data-dev.neotomadb.org/5900>). These DOIs and landing pages support requirements for FAIR data publication by AGU and other journals (Wilkinson et al., 2016), and they can be readily found and searched by Google Datasets and other search engines. The automatic generation of DOIs is still in the beta stage and for now we generate DOIs in batches on an as-needed basis. We expect full automation by early 2020. 2) Flyover Country. Flyover Country (<https://flyovercountry.io/>) is a phone app designed for travelers interested in learning about the geological world around them. Travelers can enter their start and end locations, and then Flyover Country will provide them information about the geological formations that they see and fossil localities drawn from Neotoma and the Paleobiology Database.

## Community

Neotoma supports and is supported by a large and growing community of data stewards, data contributors, and leaders. Particular shout-outs to Bob Booth (Testate Amoebae, Lehigh), Mona Dombosh (FAUNMAP, Penn State), Don Charles (Diatoms, Drexel), Suzette Flantua (LAPD, Bergen), Thomas Giesecke (EPD, Goettingen), Alison Smith (Ostracodes, Kent State), Alison Stegner (FAUNMAP, Stanford), and many more. And, most of all, Eric Grimm, for his tireless work and leadership as lead steward and Tilia engineer. The Leadership Council for 2019 is: Alan Ashworth, Jessica Blois (Assoc Chair), Phil Buckland, Thomas Giesecke, Simon Goring, Eric Grimm, Claudio Latorre, Suzie Pilaar-Birch, Alison Smith, Hiraku

Takahara, and Jack Williams (Chair). And thanks to Simon Goring (Wisconsin), Mike Stryker (Penn State), and Steve Crawford (Penn State) for keeping the lights on and new features rolling out.

If you're interested in learning more, see [www.neotomadb.org](http://www.neotomadb.org) and its resources page <https://www.neotomadb.org/about/category/resources>. If you'd like to become a member, you can sign up here: <https://tinyurl.com/NeotomaMember>. If you'd like to contribute data or become a steward, you can reach out to Jack Williams ([jwilliams1@wisc.edu](mailto:jwilliams1@wisc.edu)), Jessica Blois ([jblois@ucmerced.edu](mailto:jblois@ucmerced.edu)), Eric Grimm ([eric.c.grimm@outlook.com](mailto:eric.c.grimm@outlook.com)), anyone on the Leadership Council, or the all-purpose Neotoma email: [neotoma-contact@googlegroups.com](mailto:neotoma-contact@googlegroups.com). Neotoma has been supported by NSF's Geoinformatics and EarthCube programs, and the Belmont Forum. Let us know if and how we can help you, your data, and your science.

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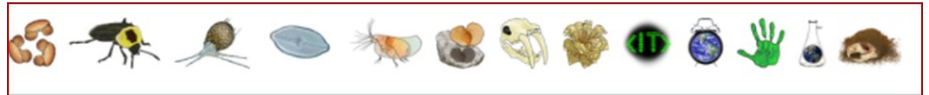
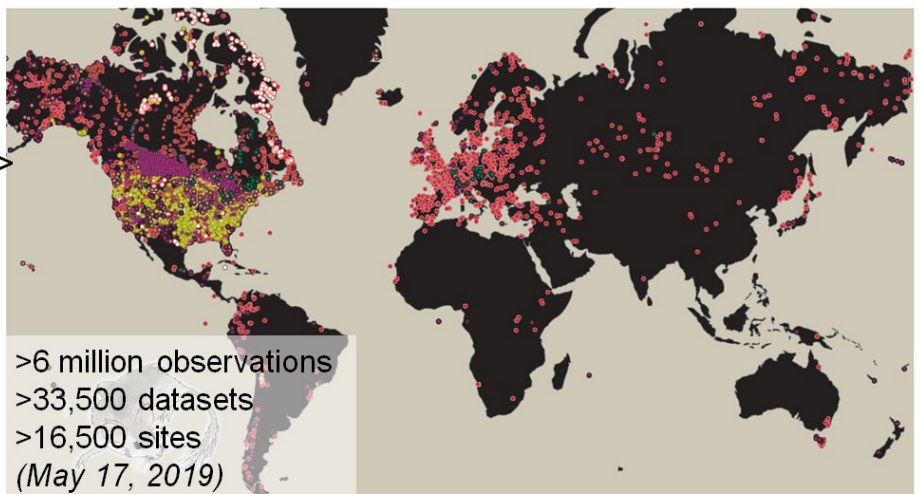
## Neotoma Paleoecology Database



**Mission:** Support global-change research by providing an open, community-curated repository for multiple kinds of paleoecological data

### Key Characteristics

- Open Data
- Curated by Community -> High-Value Data
- Standardized Variable Names & Taxonomy
- Flexible data models for sites, proxies, cores, etc.
- Time: Age Controls and Age Models



Fossil Pollen, Vertebrates, Diatoms, Ostracodes, Testate Amoebae, Stable Isotopes, Plant Macrofossils, Packrat Middens, ...

Williams et al. (2018) *Quaternary Research*

## Research Reports

### Tracking natural climate modes of variability through the use of high-resolution climate records from the top of the Earth

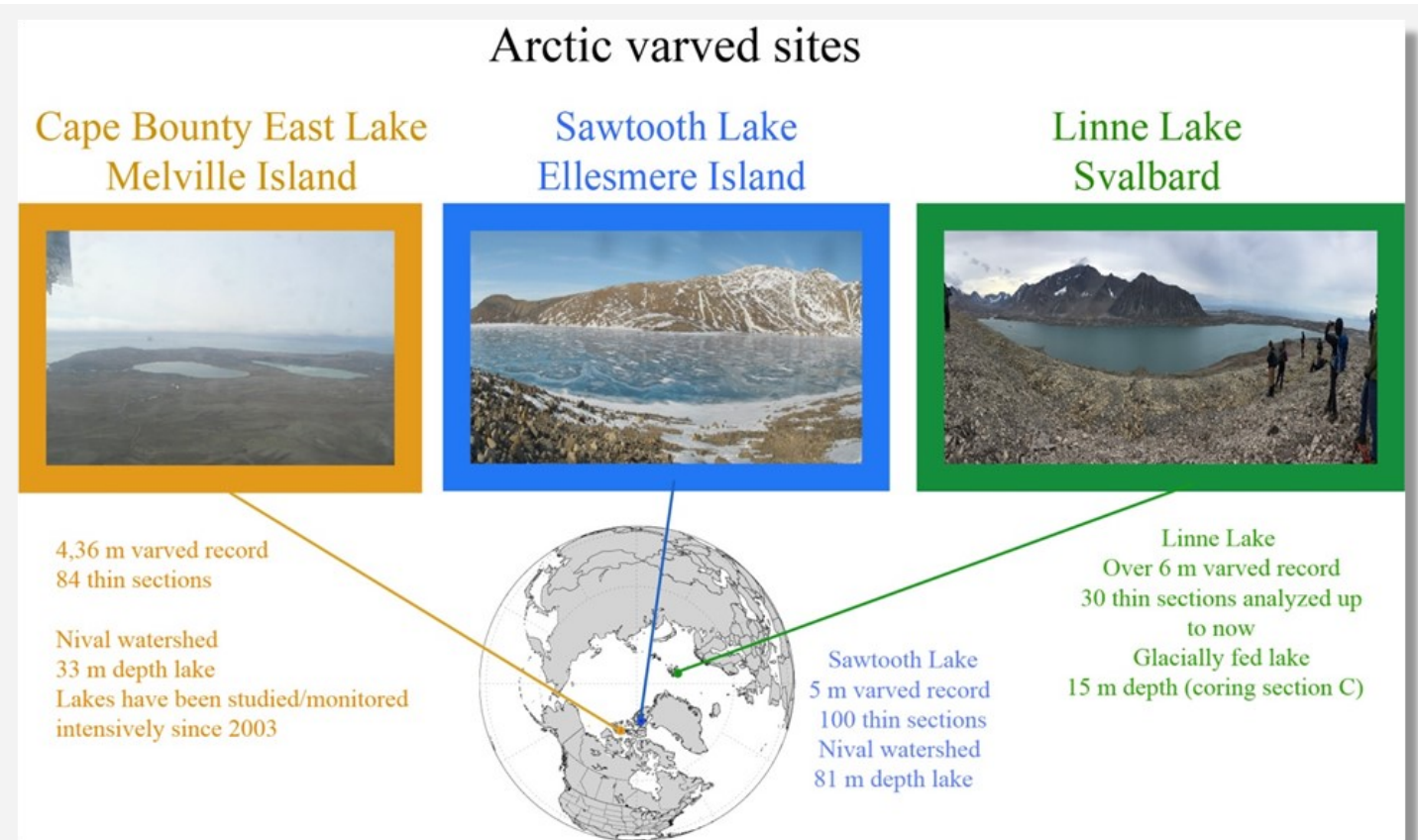
*By Francois Lapointe  
University of Massachusetts, flapointe@umass.edu*

There exist many climate modes of variability on Earth based on instrumental data over the past ~160 years. Few of them contain a long-frequency component, one of the best examples is the Atlantic Multidecadal Oscillation (AMO). The AMO has been ascribed as a 40-80 year cycle and involves large-scale variations in sea-surface temperature (SST) in the North Atlantic region. During its positive phase, SSTs are warmer than usual from the Equator to ~70°N and colder conditions are observed during the negative phase. Among the climate impacts of the AMO, droughts have been reported in the Sahel (Folland et al., 1986; Giannini et al., 2003; Lu and Delworth 2005; Ting et al., 2011) and the USA (McCabe et al., 2004; Ting et al., 2011), precipitation in South America (Seager et al., 2010) and hurricane frequency in the Atlantic (Goldenberg et al., 2001; Sutton and Hodson, 2007). Yet, not much is known about the AMO influences on Arctic regions as meteorological data there generally don't extend prior to the 1950s. Therefore, it is difficult to capture any AMO-signal either in arctic meteorological dataset or instrumental data from lower latitudes that are ~160 years of length (barely capturing two AMO cycles). Future climate projections need to know whether the AMO is a persistent feature of the Earth's climate, and what are the mechanisms driving it. The only way to uncover this is with the use of past high-resolution climate records.

Part of my research is dedicated to the use of annually laminated (varved) sediments from the Arctic

(Figure 1). These sedimentary records typically go ~3000 years back in time, but we hope to get at least ~6000 years at Linne Lake, on Svalbard (Figure 1). Among the goals of working with these fascinating archives is to decipher abrupt climate changes in the past (e.g., changing precipitation regime) but also to extract periodicities in these long-term time series. To do so, fine-scale analysis on thin-sections has to be done for annual data extraction. For example, it is impossible to obtain grain-size distribution (GSD) using classical techniques (e.g., laser diffraction) because the sampling interval (>0.5 cm) is larger than the actual annual varve (generally <0.2 cm in the Arctic). Thus, we use a Scanning Electron Microscope (SEM) to quantify each of the varves in thin sections. These high-resolution images allow to clearly detect thin varves (<0.2 cm) that are hard to distinguish on optical images from thin sections, thus this technique helps substantially with varve chronologies. These SEM images also allow to acquire annual GSD, which gives important information on sedimentary processes. Other proxies in the research involve geochemical variations using  $\mu$ -xrf data and high-resolution density with the Ct-Scan. Taken altogether, these proxies help to disentangle the different signals (snow melt, rainfall, temperature) found in the varves. In Svalbard, recent periods of intense rainfall, associated with warm SSTs and absence of sea-ice cover, now occurs in all seasons with the greatest increases seen in fall and winter.





**Figure 1.** Location of Arctic lakes in the Canadian Arctic (orange and blue) and on Svalbard (green) that contain annually laminated (varved) sediments with specific details.

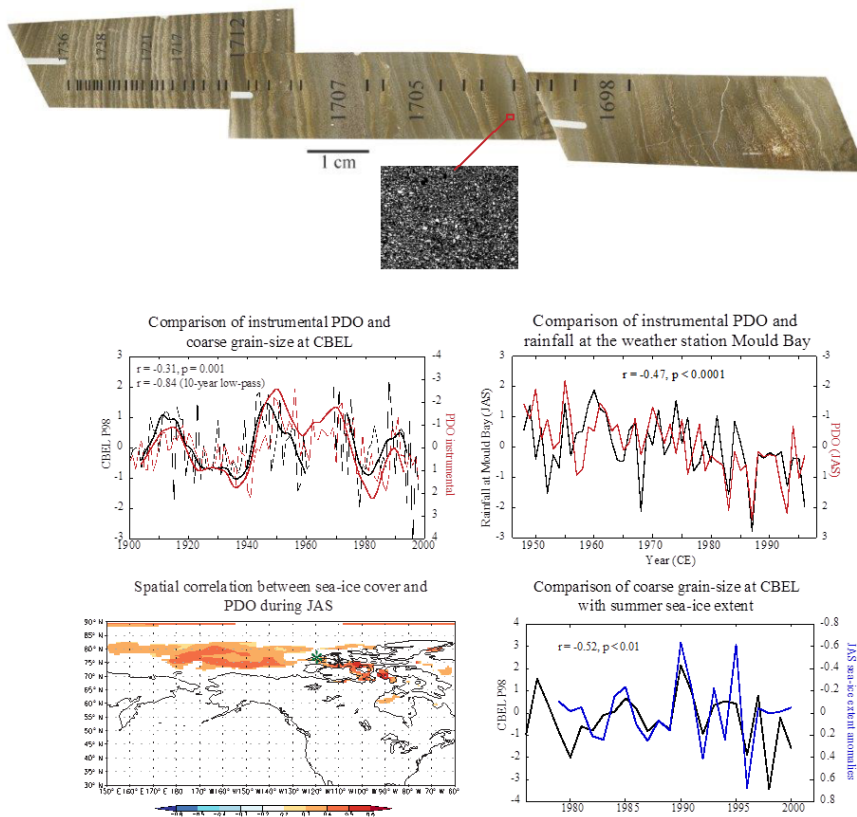
Using the geochemical signature of these rainfall events, we will be able to identify if similar conditions have occurred in the past or if Svalbard has recently experienced a drastic hydrological shift.

An example of how these archives can be precious to uncover the influence of known climate oscillation is shown at Cape Bounty East Lake (Figure 2). The varved record shows periodicities that match closely those found in the instrumental Pacific Decadal Oscillation (PDO) (Lapointe et al., 2017). Results suggest that the negative phase of the PDO is linked with increased precipitations and decreased sea-ice cover in the Western Canadian Arctic as revealed by instrumental and proxies correlations (Figure 2). These observations would probably not have been found without the use of these finely laminated lacustrine sediments.

Our current work at South Sawtooth Lake highlights so far a great influence of the AMO on Ellesmere Island. Colder (warmer) conditions on Ellesmere Island are found during the negative (positive) phases of the AMO ( $r = 0.55$   $p < 0.001$ ). The negative phase is also associated with snow cover that persists later in summer resulting in increased snowmelt intensity that is reflected in the Sawtooth varved record through enhanced Titanium variations.

At Linne Lake, on Svalbard, a remarkable correlation can be found between instrumental AMO and the longest available temperature dataset (Nordli et al., 2014) in region  $>70^{\circ}\text{N}$  (Figure 3a, b). The varve thickness data (and the coarse grain-size) is significantly correlated to the temperature variability (Figure 3c) and the AMO. Thus, this varved record is potentially a great candidate for tracking the AMO in the past.

### Varves at Cape Bounty on Melville Island, Canada



**Figure 2.** Above: three overlapping thin-sections showing varves from the late 17<sup>th</sup> to early 18<sup>th</sup> century. Image acquired at the scanning electron microscope (SEM) in backscattered mode showing coarse silt. Over 7000 images at the SEM were collected to recover the past ~2850 years. Below: correlations showing that the Pacific Decadal Oscillation (PDO) influences significantly the Western Canadian Arctic. The correlation map denotes the varved record at Cape Bounty (black asterisk) and the nearby weather station Mould Bay (green asterisk). Figures from Lapointe et al. (2017).

Finally, the climate of these regions appears to be dominated by the AMO (except Cape Bounty). They thus hold great potential to describe very high temporal variability (annual to seasonal) of this climate oscillation over the past several millennia. We are heading to Svalbard on April 2019 to collect the longest varved record from the area, and hopefully extract an annual (to sub-annual) signal of the AMO for the past ~6000 years.

### Acknowledgements

The project at Svalbard is funded by the National Science Foundation through a grant to Raymond Bradley (University of Massachusetts) and Michael Retelle (Bates College). FL wishes to thank the Polar Continental Shelf Program, Canada Natural Resources, for their great help for field preparations and logistic inputs at Cape Bounty (Melville Island) and Sawtooth Lake (Ellesmere Island). We are grateful to NSERC discovery and northern supplement grants

(grant number RGPIN-2014-05810 and RGPNS-2014-305427 to Pierre Francus).

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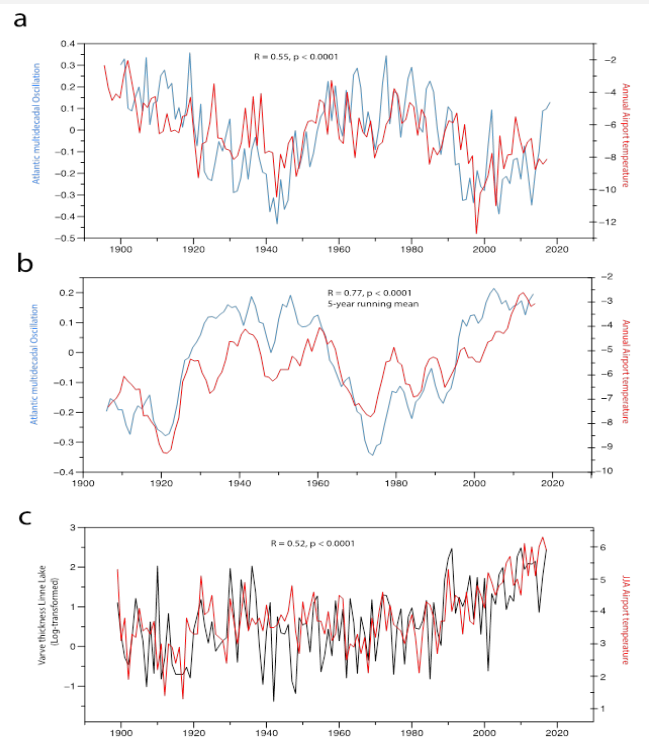
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**Figure 3.** Influence of the AMO on Svalbard summer temperature and the Linne Lake varve record. Airport temperature from Nordli et al. (2014).

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## PACEMAP: Predicting Arctic Change through Ecosystem Molecular Proxies

- With new techniques and old mud we reconstruct past Arctic warmth to anticipate the future -

By Giff Miller

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The Arctic is warming faster than any other region of the planet, and the effects are already apparent. Landscapes that have been continuously ice-covered since the start of the last glacial cycle and now being revealed as cold-based ice recedes under warming summers. Working in the Eastern Canadian Arctic

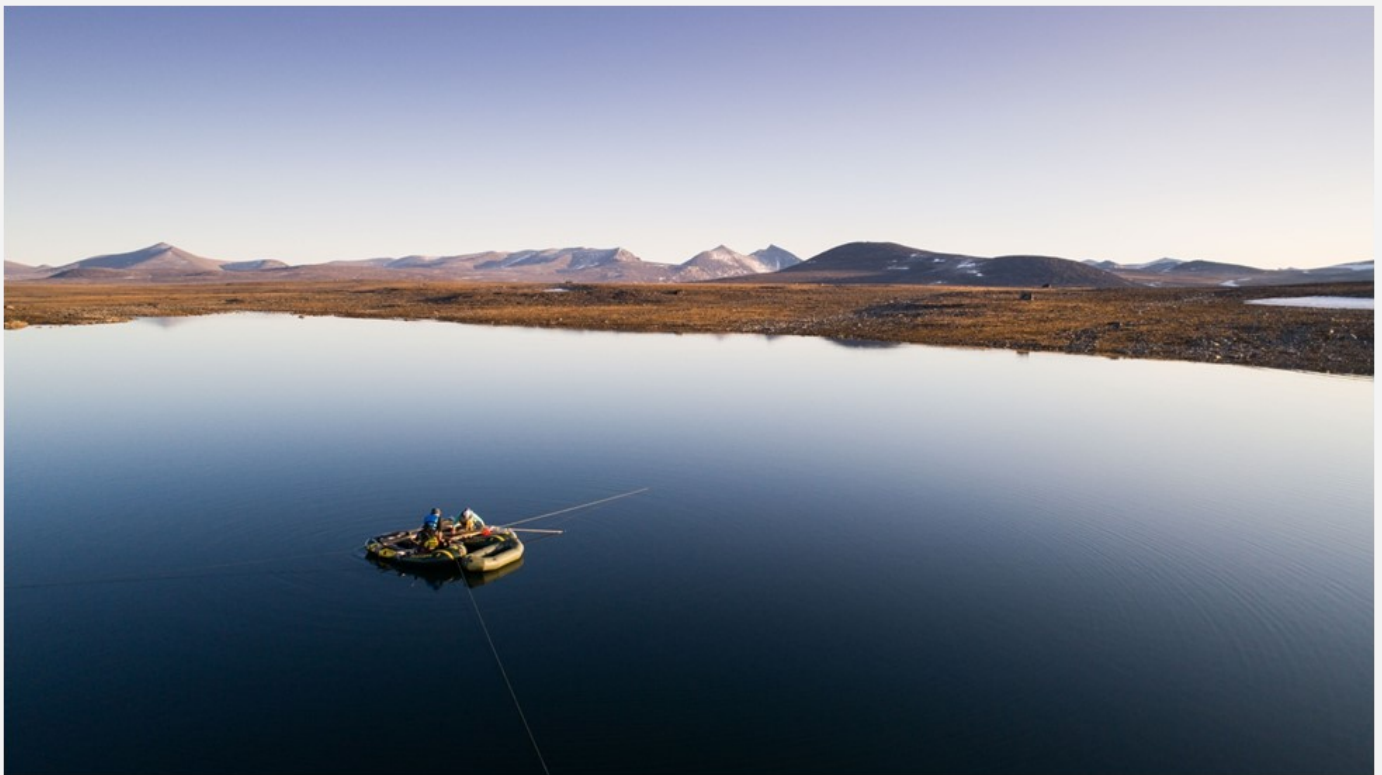
for 50 years Gifford Miller has seen those changes. And traveling to the same small Inuit communities, grey-haired friends, who as children were amazed by his film camera, are now watching movies on smart phones, and hunters are trading their snowmobiles for canoes earlier each spring.

Climate models suggest that over the next century the Arctic will experience twice the warming seen at lower latitudes. What will that mean for the Inuit living there? Already new birds are appearing in summer; how will the vegetation change? When was the last time the Arctic experienced conditions similar to the projected climate in 2100 CE?

Those are some of the questions that Miller and colleagues are trying to answer with PACEMAP, an interdisciplinary project involving scientists from the University of Colorado Boulder, the University at Buffalo, the University of Alaska Fairbanks, and Curtin University in Australia. PACEMAP brings together ecologists, geologists, and paleoclimatologists, with organic geochemists and geneticists, to utilize the past to predict the future. Capitalizing on lake sediment deposited in past warm times on Baffin Island, including the Early Holocene, the Last Interglacial (MIS 5e), and the penultimate interglacial (MIS 7; Figure 1), our field teams will recover

pristine continuous sedimentary records that span earlier warm intervals. Although lacustrine archives from these time periods have been lost from most northern lands, where repeated glaciations usually erase sediment from earlier warm intervals, Baffin Island is one of a handful of locations where pre-last glaciation sediment survived underneath non-erosive, cold-based glacial ice. The PACEMAP project seeks to analyze these unique records using new analytical techniques to provide quantitative evidence of past ecosystems and more tightly constrain summer temperatures during past warm times to predict ecosystem status in 2100 CE.

The team is using molecular approaches to reconstruct changes in climate, hydrology, and vegetation through past warm times. Greg deWet (Post doc) and Jon Raberg (PhD student), working with Julio Sepúlveda at Colorado are using bacterial membrane lipids, called branched glycerol dialkyl tetraethers (brGDGTs), to reconstruct climate back through



**Figure 1.** Lake sediment coring on Baffin Island (photo: Zach Montes, Orijin Media).



time. The distribution of these compounds in modern environments has been empirically shown to relate to environmental temperature, and one of the goals of the project is to create a site-specific calibration for Baffin Island. Elizabeth Thomas and Devon Gorbey (PhD student, Buffalo) are evaluating changes in precipitation source and moisture balance from the hydrogen isotopic composition of leaf waxes ( $d_2H_{wax}$ ) in terrestrial and aquatic plant sources. And Sarah Crump (Postdoc, Colorado) working with Mike Bunce at Curtin University in Australia are using ancient sedimentary DNA extracted from interglacial sediment to provide a more authentic reconstruction of local vegetation communities, where long-distance pollen dispersal compromises pollen records. This approach, relatively untested on such long timescales, also involves modern validation work, where Martha Raynolds and Shawnee Kasanke, ecologists working with Skip Walker at the University of Alaska Fairbanks map the modern vegetation around the study sites to compare with DNA extracted from surface sediments at our coring sites.

PACEMAP is about to enter its third field season, with researchers heading to Baffin Island in May to recover sediment cores using lake ice as a coring platform, followed by a more expansive summer team that will collect modern environmental samples, recover and redeploy sediment traps and temperature loggers, and map vegetation. Data and results from the project will be made publicly available as they are published.

We thank our Inuit guides for their knowledge, support, and hard work in the field, in particular Joshua Akavak, Mina Kunilusie, and Gordie Audlakiak. We also thank the Nunavut Research Institute and Arctic College in Iqaluit for logistical support, and the Inuit of Baffin Island for permission to travel and work on their land. The PACEMAP project is funded by the Office of Polar Programs at NSF to Gifford Miller



and Julio Sepúlveda (Colorado), Skip Walker (Alaska) and Elizabeth Thomas (Buffalo).

## Obituaries

### **Albert M. Swain (1940-2019)**

*By Konrad Gajewski, University of Ottawa, gajewski@uottawa.ca*

Last summer, we heard the news that Dr. Al Swain passed away at the age of 78. He lived his life in Wisconsin and Minnesota, and began his education in a one-room schoolhouse not far from Madison. After university, he taught high school, and while taking a summer workshop for teachers at U Minnesota, met Ed Cushing, and went to do his PhD. While there, he had the dream summer job, as field assistant to Miron Heinselman in his classic study of fire history of the Boundary Waters Canoe Area. This involved a couple of summers canoeing and camping through the region, stopping to core trees and determine the age of the fires along the route. After the PhD, he got a research position at University of Wisconsin-Madison Center for Climatic Research, where he headed one component of the original COHMAP project, concerned with the climate of the past 2000 years. He spent about a decade there, finding and collecting frozen cores from varved sediments on a transect from Maine to Minnesota, as well as a couple from Washington State (the latter never published). He seemed to have a knack for finding these lakes, but finding varved sequences actually involved spending winters poring over maps and lake inventory lists to identify candidate sites, and long field seasons coring dozens of lakes to find an occasional one with varves. Decades later, these cores are still the major source of high-resolution paleoenvironmental information of the past 2ka for the region. After that funding wore out, he entered the public service. His dream was to get a job as a resident scientist at a place such as the Stockden Island Park in Lake

Superior, where he had done some work on a contract. It seems this dream never panned out, but he remained active in a range of activities for over 30 years including volunteering as Park Naturalist at Blue Mounds Park.

Although he published few papers during his scientific career, this work was pioneering and these classic studies are still being cited 10-20 times per year, more than 40 years after they were published! And this doesn't include the many times his cores and surface samples are used in synthesis studies but not cited (an unfortunate but common practice). The Lake of the Clouds study from his PhD thesis, which has been cited over 400 times (Swain, 1973), established the use of charcoal analysis as a fire indicator and demonstrated, contrary to the general opinion at the time, that high-resolution pollen studies from varved sediments could provide useful information about vegetation dynamics. His classic study of Hells Kitchen Lake (Swain, 1978), which showed post-fire succession in a sediment core, has been cited at least 200 times. He was the first to show that eastern and midwestern forests had different fire return intervals although it is not clear if this was ever published or only presented in conferences. In addition to training several people in palynology, tree-ring and paleoenvironmental methodology, and working with others in several projects, he and his associates also contributed hundreds of unpublished surface samples to the North American Modern Pollen Database which are incorporated into NEOTOMA, and these have been the basis of dozens of studies.

**Al Swain publications (partial list)**

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**Marjorie Green Winkler (1934-2019)***By Patricia Sanford and Konrad Gajewski*

Marjorie Winkler passed away last summer at the age of 84. A brilliant student in high school, she did her undergraduate degree at Cornell, then worked for years in various biology labs. Always a political progressive, she would tell stories of what it was like at University during the McCarthy days, where she would encounter colleagues who “didn’t exist”, yet were still working doing their research. Moving around following her hus-

band’s career and having 4 children, as was the norm in those days, she was occupied in various jobs during her 20s and 30s. In her early 40s, when the family moved to Madison, she began volunteering at City School as a natural history teacher and at the University of Wisconsin Arboretum.

After much nagging from her husband Stefan, she enrolled in graduate school and began working on peat bogs with Calvin DeWitt at the UW-Institute for Environmental Studies. In addition she began working in the paleo-lab at University of Wisconsin Center for Climatic Research.

At UW, her work was marked by its creativity, interdisciplinarity and the enthusiasm with which she approached everything. It was also based on her deep knowledge of basic biology and chemistry and long experience in various laboratories. Lakes and bogs were a particular love of hers; she knew all the wetlands in southern Wisconsin and probably cored most of them at some point. An example of Marge's creativity and lateral thinking: at one point, her husband Stefan, a radiologist at the Veteran's Hospital had one of the early 3-D scanners. She proposed to bring the varved sediments from a frozen core to be scanned, to determine if we could see the varves in better detail. How to transport and keep the frozen core intact was a problem; which she solved by placing it in a plastic container to which was added some jello; green as I recall. Late one Friday night, when the machine was free, we took it over to the hospital; apparently this kind of activity happened often, to the consternation of the Department Head. It didn't produce anything as the resolution was insufficient at the time, but still, we couldn't keep up with the constant stream of ideas coming from her.

Marge had a fruitful relationship with the National Park Service, launching paleoecological studies of Cape Cod National Seashore and Everglades National Park and working with Kenneth Cole, Margaret Davis, and others on a series of research efforts at Voyageur's and Isle Royale National Parks and Apostle Islands and Pictured Rocks National Lakeshores. These resulted in several publications and numerous Reports to the Park

Service.

The 1990's were a particularly fruitful time for Marge. She produced paleoecological studies of a number of lakes on Lac du Flambeau (Lake Superior Chippewa Indian Nation) tribal lands to provide prehistoric background for acidification and mercury studies as related to the fisheries of these lakes and for heavy metal contamination of lakes bounded by commercial cranberry operations' pesticide use. Together with Pao K. Wang she pulled together a monumental compendium of all that was then known about the Late Quaternary vegetation and climate of China for the COHMAP project subsequently published in the 1993 volume *Global Climates since the Last Glacial Maximum*. One of her long-term goals, to core the sediments of Walden Pond (made famous by Henry David Thoreau's book *Walden*, 1854), was at least partially accomplished by obtaining a short core of its sediments for pollen and charcoal analysis of the most recent 600 years. This research was highlighted in a science article by William K. Stevens, "History of Walden Emerges from its Mud" in the New York Times, October 8, 1991.

Throughout her years at the Center for Climatic Research Marge mentored many students and guided masters and doctoral thesis research. She was also involved in early efforts at involving underserved minority high school students in STEM research. As a service to the larger professional paleoecology-paleoclimatology community she reviewed numerous pre-publication manuscripts and many National Science Foundation grant applications. Throughout her life and career she remained a kind and humble person always concerned about friends, colleagues, and people everywhere.



**Marjorie G. Winkler publications (partial list)**

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