Canadian Association of Palynologists
Association Canadienne des Palynologues
NEWSLETTER
Volume 45 Number 2 December 2022

President's Message

I would like to begin by thanking all CAP members for their valuable contributions to our organisation. Special thanks to our Executive members: Francine McCarthy, for her long-standing dedication to our association and for her diligence in overseeing the Secretary-Treasurer's work, Manuel Bringué, for his hard work as Website Editor, Estelle Allan for putting together beautiful and informative Newsletters, and Terri Lacourse for representing us as IFPS councillor. We are also indebted to our wonderful outreach team – Diana Tirlea and Nick Riddick who led the effort to expand our social media presence and improve our ability to attract new members.

As the year draws to a close, I am grateful for the many accomplishments we had in 2022. During our well-attended AGM in Montreal, we brought forth a series of wonderful ideas that will no doubt strengthen our organization in the future all while honoring our prestigious past. Important developments include the adoption of a new director position – the Outreach Officer - who will engage in outreach activities on behalf of the association and oversee the official social media accounts (Twitter® and Instagram®), change of official address to better reflect our current management geography, and updates to the Website that will make it more appealing and professional. Some of this work sets the stage for a formal by-law update at our next AGM.

The Montreal gathering in August was special in more than one way. Some years ago, Francine and I hoped that our association would begin a series of celebrations of "nos grandes/grands", people who have left their unique mark on Canadian palynology and who, through their outstanding work and dedicated mentorship, have made us all better. This year, we had our inaugural celebration with a special event honoring the life and work of a special guy. Known to most of us as Monsieur Le Professeur, Pierre Richard has left a mark on nearly all of us and the gathering had an opportunity to say a heartfelt "merci" and joyously going down the memory lane with him over a pint at the Mckibbins Pub on Saint-Laurent.

At our last Executive meeting on December 16th, we have also made the decision to move forward a potential bid to hold the 2028 IPC/IOPC meeting in Canada. This push is in its early stages, and we hope to firm up the details during our next AGM with the help of the rest of the membership. In the meantime, please let me know if you have ideas or suggestions regarding venues, special sessions or any other initiatives that could help make our bid successful.

Lastly, I would like to take this opportunity to wish you all a happy and safe holiday season and many successes in the year to come.

Florin Pendea
CAP President
ifpendea@lakeheadu.ca

CAP EXECUTIVE 2022

President: Florin Pendea
President-elect: Jennifer Galloway
Newsletter Editor: Estelle Allan
Secretary-Treasurer: Francine McCarthy
Website Editor: Manuel Bringué
IFPS Councillor: Terri Lacourse
Outreach team: Diana Tirlea & Nick Riddick

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Editor's Notes

Thanks a lot to all who contributed material for this edition of the CAP Newsletter: J. & A. Bujak, J. Falardeau, F. McCarthy, M.-M. Ouellet-Bernier, D. Tirlea and C. A. Vera Florez.

Deadline for NextCAP Newsletter

Please submit items for the next issue of the CAP Newsletter (Volume 46, Number 1, May 2023) by April 15, 2023. Conference reports, announcements, field trip reports, notices of new books, dissertation abstracts, book reviews, news, unidentified palynomorphs and essays on topics relevant to Canadian palynology are all welcome. Please send contributions to:

Estelle Allan
CAP *Newsletter* Editor
estelle.allan@mcgill.ca

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CAP on Instagram / L'ACP sur Instagram

In August 2022, CAP launched an Instagram account. Check us out or follow us to learn more about palynology and related fields in Canada (https://www.instagram.com/canadianpaly/).

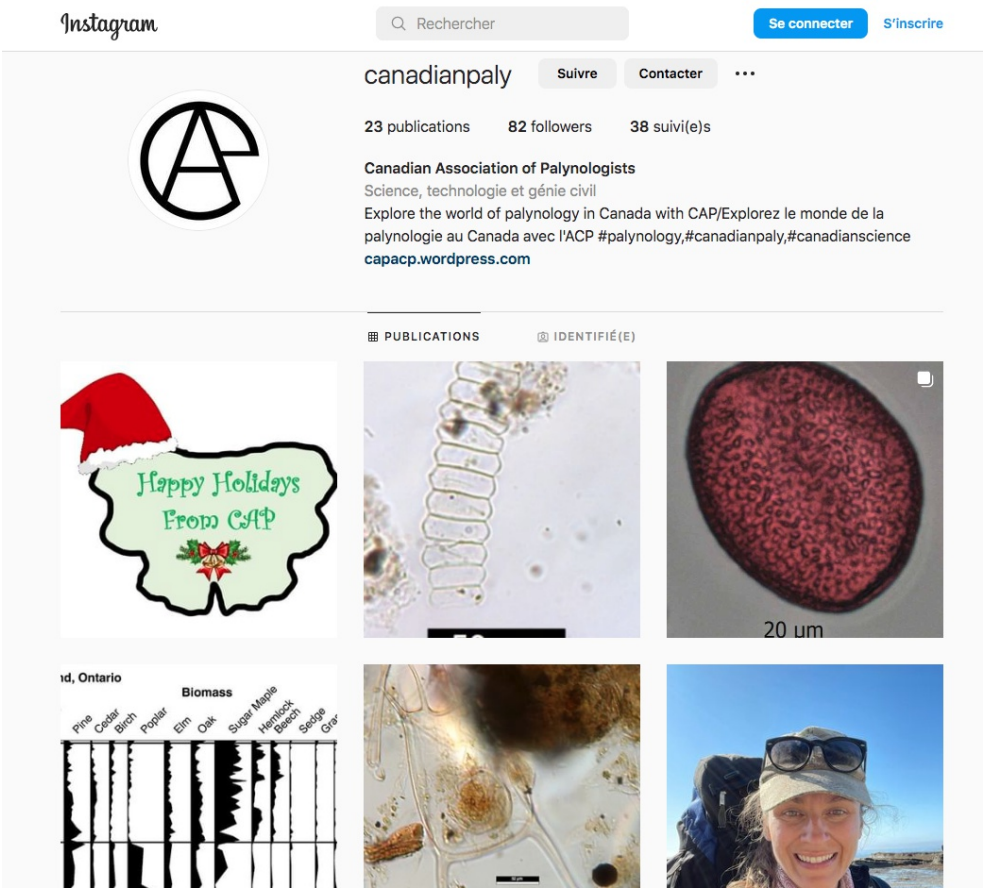
If you or a colleague would like to post on IG via CAP, please send photo(s) and a short description to Canapaly@hotmail.com (Subject: Attention: Diana Nick - IG Post). Types of posts you can send includes images of palynomorphs and related material (e.g., plant macrofossils), mystery palynomorphs, field and lab images, researcher bios and other related topics. You can find an IG post template on the CAP website, for an example and further details. See you on IG!

https://capacp.wordpress.com/library-resources/cap-on-social-media/

En août 2022, l'ACP a lancé un compte Instagram. Consultez-le ou suivez-nous pour en savoir plus sur la palynologie et les domaines connexes au Canada (https://www.instagram.com/canadianpaly/).

Si vous ou un collègue souhaitez publier un message sur IG par l'intermédiaire de l'ACP, merci de nous envoyer une ou plusieurs photos ainsi qu'une courte description à Canapaly@hotmail.com (Objet : À l'attention de Diana Nick - Message IG). Les types de messages que vous pouvez poster comprennent des images de palynomorphes et du matériel connexe (par exemple, des macrofossiles végétaux), des palynomorphes mystères, des images de terrain et de laboratoire, des biographies de chercheurs et d'autres sujets équivalents. Vous trouverez un gabarit IG sur le site internet de l'ACP, un exemple et de plus amples détails. À bientôt sur IG!

https://capacp.wordpress.com/library-resources/cap-on-social-media/



Minutes, Annual General Meeting of the Canadian Association of Palynologists
August 16, 2022 – Hybrid Meeting

Room PK-6610, Université du Québec à Montréal (UQAM), 201 rue President Kennedy, and on Zoom.

In attendance, in person: Florin Pendea (Meeting Chair and President), Francine McCarthy (Meeting Secretary and Secretary-Treasurer), Estelle Allan (Newsletter Editor), Hans Asnong, Anne de Vernal, Michelle Garneau, Elisabeth Levac, Pierre Richard, Gaelle Turcotte;
In attendance, online: Manuel Bringué (Website Editor), Terri Lacourse (IFPS Councillor), Alwynne Beaudoin, Bianca Frechette, Konrad Gajewski, Julie Loisel, Diana Tirlea; see screen capture images below.

Quorum reached. 4:08 PM meeting called to order (F. Pendea)

1. Acceptance of agenda
Motion to accept carried (P. Richard/ E. Allan)

2. Approval of the minutes of the 2021 Annual General Meeting – correct version posted on the website
Motion to accept carried (F. McCarthy/ E. Allan)

3. Business arising from Minutes – none

4. President's report – F. Pendea (posted); no questions

5. Secretary-Treasurer's report – F. McCarthy (posted)- summary/ highlights brought up (mainly engagement)

6. By-Law update: Change of address
Motion to change bylaws to reflect change of address to F. McCarthy's home address; passes with no opposition (F. McCarthy/ T. Lacourse)

7. Auditor's statement – D. Tirlea (posted); no

questions
Motion to accept carried (F. Pendea/ A. Beaudoin)

8. Newsletter Editor's report – E. Allan- items needed especially for May issue; requests for feedback/type of material covered; M. Bringué suggested biopics of students/young professionals; F. Pendea suggested continuing the Lab visits; T. Lacourse suggested featuring new members

9. Website Editor's report – M. Bringué - Statistics show that we are maintaining a healthy presence but not higher than last year… see if increased membership leads to more traffic; WordPress ads- should we investigate the cost of sites without pop-ups or having an institution host it; Former member/ meeting guest H. Asnong suggested *Linked In* as well as Instagram, Facebook; alternate domain suggestion shared

10. Engagement Team's report – D. Tirlea with N. Riddick & in consultation with the Executive – most recent initiative is Instagram account; looking for new members and content

F. Pendea suggested that *Membership and Engagement Officer* become a formal Executive position; M. Bringué cautioned against using term Engagement and T. Lacourse suggested *Membership and Outreach Officer* instead (details to be decided by next AGM)
Motion to add Membership and Outreach Officer to the CAP Executive (P. Richard/ M. Bringué)

11. Appointment of Auditor – S. Finkelstein is typically willing to act as auditor, so she will be approached ahead of next year's meeting

12. Vacant position: President Elect: nominee Jennifer Galloway; M. Bringué summarized her qualifications as a highly competent candidate, and following a very brief discussion:
Motion to appoint J. Galloway January 1, 2023 for a 2-year term (F. Pendea/ F. McCarthy)

13. Location for 2023 AGM – Several possible locations were suggested for the next AGM: GAC MAC? CANQUA? AASP? GAC MAC, which continues to be 'hard-rock'-dominated, is an unlikely venue, given its location in Sudbury in 2023 but Brandon in 2024 may be a possibility, since David Greenwood's lab is there (although IPC is in Prague then, another option). Since CANQUA was unable to meet in 2022, we will contact M. Peros re. possibilities for 2023. No information on a venue for AASP in 2023- can contact S. Stukins for details. ISTA (testate amoeba conference) is tentatively planned for fall 2023 in Niagara, and several CAP members have been on the organizing committee of the often re-scheduled (!) event – could be a very small-scale preamble for IPC 2028?

14. Priorities & Goals – 2028 IPC? Toronto or Montreal? Crawford Lake/ Niagara outings vs. Lac au Castors on Mont Royal, etc.

15. Other Business – suggestions for future consideration: funds for 'Membership and Outreach'? (D. Tirlea); best student presentation funds (A. de Vernal).
Executive agreed to meet online for an interim meeting in December that would include President-Elect J. Galloway to discuss the location of the next AGM, Membership & Outreach initiatives, plans for the IPC bid, and suggestions brought up in other business.

16. Adjournment
6 PM motion to adjourn; celebration of Pierre J.H. Richard's career and contribution to CAP/ APC begins, to follow at the pub!

CAP President's Report

Orillia, ON
August 8, 2022

This is my first report since I became CAP president on January 1, 2022. I would like to begin my report by thanking Anna Pieńkowski, our previous president, for leading our Association between 2020 and 2021. As I moved into this new role, the position of President-Elect became vacant. I am glad to report that Jennifer Galloway from the Geological Survey of Canada was nominated for the position. Jennifer brings in great passion and commitment to Canadian palynology and many years of experience as a researcher and educator. Please join me in thanking Jennifer for her willingness to serve.

The work of our association since the last Annual General Meeting focused on four major goals: to increase our membership, which has declined over the past several years, to expand our social media presence, the organisation of this year's AGM in conjunction with the Ecological Society of America annual meeting (Montréal, August 14-18), and the adjudication of our annual CAP Student Award.

For this year's CAP Student Award, we received several excellent applications which allowed us to select two winners. It is my great pleasure to congratulate Kelsey Koerner, PhD candidate at the Institute of Marine Sciences in Rimouski (ISMER) and Nidhi Patel, MSc candidate from Brandon University.

For our AGM, we chose to meet in Montreal in conjunction with the Ecological Society of America annual meeting, partly because of timing and partly because this year's gathering is dedicated to the celebration of Pierre Richard, one of the most influential Canadian palynologists, and a dear friend and long-standing member of CAP. I am very much looking forward to spending some quality time with Pierre and the rest of our CAP family as we celebrate his lifelong accomplishments.

Since our last AGM, we have focused on drafting and launching a strategy to increase our membership by actively seeking out new members through an expanded social media presence as well as targeting former members who have not renewed their membership to CAP. This effort was led by Diana Tirlea and Nick Riddick, our dedicated Engagement Team, who worked tirelessly to achieve this goal. Diana and Nick drafted a detailed Social Media Strategy, which focussed on ramping up our Twitter presence and launching a new Instagram account on August 10, 2022. Please join me in thanking our dynamic duo, Diana and Nick, for their excellent work, which is already paying off.

Last but not least, I would like to take this opportunity to thank all our members for their support and for their hard work in promoting the Canadian palynology through their research and teaching. I particularly would like to thank our Executive members, Francine McCarthy, for her hard work as Secretary-Treasurer, Manuel Bringué, for his dedication to updating and improving our association's website, Estelle Allan for her passion and hard work as Newsletter Editor, and Terri Lacourse for representing us on the international stage as IFPS councillor.

Respectfully submitted,
Florin Pendea
Lakehead University

Report – Secretary- Treasurer

During this relatively short interval since the last Annual General Meeting (November 1, 2021, held virtually through Zoom from my hotel room in London, Ontario) we have received $239.16 in donations in addition to 15 membership payments, of which 4 were new memberships – welcome to Nidhi Patel (Brandon U.), Cesar Arturo Vera Florez (U. Sherbrooke), Natasha Roy (UQAM), and Joshua Moraal (Brock U.). Notably, we received several renewals for members who had lapsed some time ago – thank you! As a result, we are in the black by a healthy $367.16, and I would like to acknowledge the efforts of Diana Tirlea who has enthusiastically taken on the role of Engagement Officer, reporting to the CAP Executive. Together with Nick Riddick, the Outreach Team has just launched CAP's Instagram account which we hope will increase our visibility and provide an additional platform to allow our members to engage as a community and communicate with the public – thank you Diana and Nick!

Our membership has increased slightly since the last AGM, now standing at 35 members in good standing. This includes 4 memberships renewed just prior to our last AGM, when several members of the Executive (including me!) realised we were not in good standing (and needed to be prior to the meeting) – this illustrates how easy it is to lose track of memberships. The Outreach Team will play a key role in maintaining and growing our membership base, but more importantly, it will help us foster the sense of community, which otherwise largely relies on our always-excellent biannual newsletter (now produced by Estelle Allan). This has particularly been the case since our AGMs were forced to be entirely virtual during the pandemic, so it is a pleasure to meet with in person with members in Montreal as well as on Zoom, and to have the opportunity to recognize one of our longest-standing members and his contributions to Canadian palynology – Pierre Richard. Because our expenses are minimal beyond the $500 set aside for the CAP Award, we should focus on strengthening our sense of community. To attempt to do this, the Executive voted to subsidize the costs of the meals for our student and young professional members at the dinner in honour of Pierre following the AGM, to allow them to get to know him and mingle with other CAP members.

I have not received a request for transfer of fees to IFPS for 2021 or 2022, but we will send these if/when we receive the invoice. We will also need to change the official mailing address of CAP from Mary Vetter's home in Saskatchewan to mine (at Brock University) which was not done when the account was first moved to Ontario – as which I discovered while attempting to update the list of officers of the association requires formal action since it involves interprovincial transfer. A formal motion will be put forward at the meeting to allow this change to be made.

Sincerely,
Francine M.G. McCarthy

Summary of Financial Transactions Since Last AGM (Nov. 1, 2012), as at midnight August11, 2022

Account Balance October 31, 2021 **$6864.28**

Revenue:	
Membership dues 15* $40 (3-yr)	$600.00
Membership dues 3* $15 (1-yr)	$45.00
Membership dues (1 catchup year)	$15.00
Donations	$239.16
TOTAL REVENUE	*$899.16*

Expenditures	
Corporations Canada Filing (2021)	($12.00)
CAP Award	($500.00)
TOTAL EXPENDITURES	*($512.00)*

NET Revenue $367.16

Account Balance August 11, 2022 **$7251.44**

CAP Financial Audit

Auditor's Financial Report for the Canadian Association of Palynologists (CAP)
Review Period: October 15, 2021 until August 3, 2022
August 12, 2022

Dear Executive Board and Members:For auditing purposes, Francine McCarthy (Executive, Secretary-Treasurer, CAP), provided me, Diana Tirlea (Member, Engagement Officer, CAP), with three documents on August 10, 2022: a bank statement dated August 3, 2022 (BMO, Stoney Creek, CAN ASS P ITH 2726-8068-583 31Oct21), a spreadsheet with financial transactions up to August 3, 2022, and a CAP membership spreadsheet listing all former and current members. Upon review of the financial documents, all appear complete, fair, and a transparent representation of the CAP financial records to date. The membership spreadsheet has been updated to reflect deposited funds received to date. For the 2021-2022 audit period, the provided bank statement and financial transactions indicates CAP is in good and secure financial standing to support the upcoming annual expenditures.

Sincerely,
Diana Tirlea, MSc (she/her)
Quaternary Environments, Royal Alberta Museum
t (lab) 825 468 6050 (office) 825 468 6164
e diana.tirlea@gov.ab.ca
w https://royalalbertamuseum.ca/

Newsletter Editor's Report

I edited the last two issues of the CAP Newsletters. December 2021, Newsletter (Volume 44, Number 2, December 2021) and May 2022 Newsletter (Volume 45, Number 1, May 2022).

The December issue was the larger issue with 22 pages and was distributed to CAP members for Christmas, on the 24th of December. This edition had very nice articles: among them thanks to Joan Vallerand, who told us a story about how palynological tracers from the marine and terrestrial record can allow reconstructions of climate oscillations over the last 3300 years in Hudson Bay, to Bianca Fréchette and her "mémoire de l'Est", which give us a complete picture of the postglacial history of the vegetation and climate in eastern Quebec and southern Labrador, to Konrad Gajewski and his tips about charcoal on pollen slides, and to Sandy McLachlan and Léonie Perrier who successfully finished their PhD and MSc degree.

The May issue was shorter with 11 pages and was distributed to CAP members on the 27th of April. Congratulations to our two students award Kelsey Koerner and Nidhi Patel, who gave us a nice overview of their research and thanks to Anne de Vernal and Jade Falardeau for their mystery palynomorphs.

It is always a pleasure to receive nice items relevant to Canadian palynologists, thanks for all your contributions. Do not hesitate to send me your ideas of what you would like to see in our Newsletters.

Contributions (en français ou en anglais) for the next issue of the CAP Newsletter (Volume 45, Number 2, December 2021) will be accepted until December 15th, 2021.

Bien à vous,
Estelle Allan

Website Editor's Report

This report summarizes CAP website activity for the past year, from August 11, 2021 to August 10, 2022. This period overlaps with the previous report as the last AGM was held in October 2021, but the intent is to form a basis for comparison for the whole year preceding the release of the new CAP Instagram.

Online activity for the CAP website (capacp.wordpress.com) remains healthy. It has been hosted by WordPress for 6 years now, which continues to provide a free and user-friendly interface for the association. Figure 1 below shows monthly views since (the now infamous) March 2020; the period reported on here is indicated by the red rectangle, and the period since the last AGM is shown with the green rectangle.

Similar to last year, the website was accessed 2,349 times, with an average of almost 200 monthly views. As usual, most viewers accessed the site from Canada, but many viewers also accessed the site from the US, the UK, Nigeria, India and several other countries (Fig. 2).

Overall, the most viewed pages over the last year were the Home page (387 views), Equipment and Laboratory Supplies (232 views), Opportunities (225 views) and Membership (209 views). Most downloaded files are issues of the CAP Newsletter (four with > 200 downloads) and the Lycopodium batch information (156 downloads). As last year,

Fig. 1. Total monthly views (all pages combined) from March 2020 to August 10, 2022. Current reporting period indicated with red rectangle; period since the last AGM shown with green rectangle.

Fig. 2. CAP website views per country over the last 365 days (ending on Aug. 10, 2022). Out of a total of 2,349 views, Canada accounted for 945, the US 656, the UK 84, Nigeria 63 and India 54; all other countries identified on the map had less than 39.

most "clicks" to external content were related to links on the Opportunities page.

The statistics in this year's report are remarkably similar to last year, meaning the CAP website presence remains healthy but steady. I look forward to working with our membership Engagement Committee (Diana Tirlea, Nicholas Riddick) towards harmonizing the association's presence on the website and in social media. I am particularly excited to see what impact the new CAP Instagram will have on website activity.

Respectfully submitted,

Manuel Bringué
CAP Website Editor
August 10, 2022

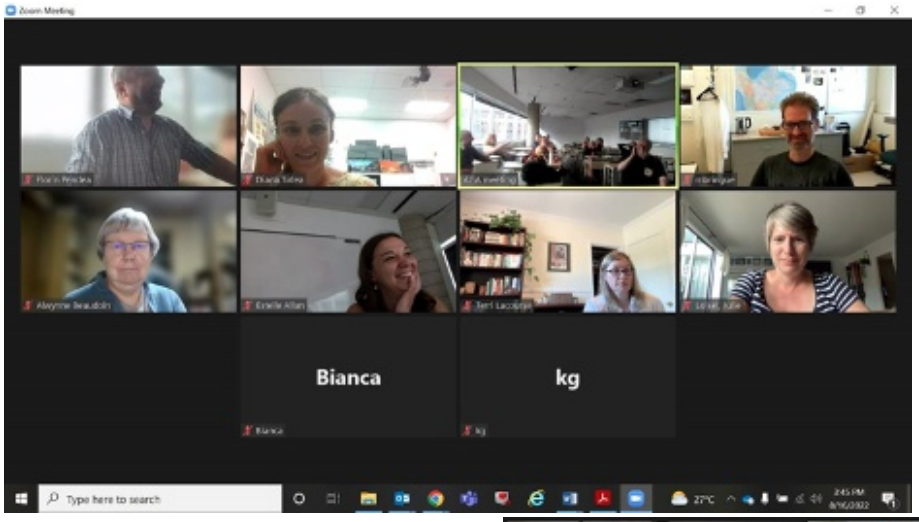
CAP Proposal to Host the International Palynological Congress in 2028

Most of you will recall that CAP was poised to present a bid at the IPC in Prague in 2020 to host the next meeting – but, of course, the 2020 meeting did not run, nor did it run the following year, and the IPC will now be held in 2024. The CAP Executive voted unanimously in favour of preparing a bid to host the IPC (hopefully jointly with the paleobotanists - the IOPC).

Please consider whether there is a group of palynologists in your area willing to put a bid together in a suitable venue (Montreal? Halifax?) and contact me by April 15, 2023... otherwise I am happy to continue championing the bid, and to present in in Prague in 2024, and to revive the Toronto bid – forming a Local Organizing Committee with Florin and other palynologists in the area.

I would be happy to assist any other group is interested in putting a bid together, having learned a few things while preparing the last bid.

Francine McCarthy



Annual General Meeting, August 16, 2022 – Hybrid Meeting
Photo courtesy D. Tirlea

Annual General Meeting, August 16, 2022 – Hybrid Meeting
Photo courtesy M. Bringué

CAP and the Quest for the Golden Spike

Although the title sounds like another Harry Potter book, the number of CAP members on the authorship of our paper accepted for the special issue of the Anthropocene Review on the search for the Anthropocene GSSP is impressive (see **bold** type below), and several other current and past CAP members are also members of 'Team Crawford: Roslin Chen, Scott Cocker, Ben O'Reilly, John Smol, Charlie Turton. If the varved sediments of Crawford Lake are selected as the GSSP candidate to put forward to the Subcommission on Quaternary Science of the International Commission on Stratigraphy, CAP will have played a critical role, beginning with the work of Jock McAndrews and his students over 50 years ago!

McCarthy FMG, Patterson RT, **Head MJ**, **Riddick NL**, **Cumming BF**, Hamilton PB, **Pisaric MFJ**, **Gushulak AC**, Leavitt PR, Lafond KM, Llew-Williams B, Marshall M, Heyde A, **Pilkington PM**, **Moraal J**, Boyce JI, Nasser NA, Walsh C, Garvie M, Roberts S, Rose NL, Cundy AB, Gaca P, Milton JA, Hajdas I, Crann CA, Boom A, **Finkelstein SA**, **McAndrews JH**, *and other members of Team Crawford* (in press). The varved succession of Crawford Lake, Milton, Ontario, Canada as a candidate Global boundary Stratotype Section and Point for the Anthropocene series. Accepted for publication in *The Anthropocene Review* Dec. 2, 2022.

If you are interested in learning more about this 5-year initiative, a 17-minute piece that aired on *Quirks and Quarks* at the end of the episode on Dec. 3 is available at Home | Quirks & Quarks with Bob McDonald | CBC Radio

Francine McCarthy

Coring expedition to Crawford Lake on February 20, 2022, when freeze cores archived at the Canadian Museum of Nature and Royal Ontario Museum were retrieved as potential GSSP and paratype for the proposed Anthropocene Epoch. PhD candidate Monica Garvie (Queen's U) assisted Wyandot Elder Catherine Tammaro in conducting the research in a manner respectful of the cultural/ spiritual significance of the site. Photo credit: Conservation Halton.

Team Crawford's work on the Anthropocene also made the front page of the New York Times on Sunday, December 18!

"All the News That's Fit to Print"

The New York Times

NATIONAL EDITION

Lake-effect snow showers will continue in the Midwest and upstate New York. Mountain snowfall will move into the Pacific Northwest. Weather map appears on Page 38.

VOL. CLXXII .... No. 59,641 ©2022 The New York Times Company SUNDAY, DECEMBER 18, 2022 Prices in Canada may be higher $6.00

Major Chains For Child Care Earn Big Profit

During a Shortage, the High End Thrives

By DANA GOLDSTEIN

The prices can rival college tuition: Bright Horizons charges up to $44,000 a year for child care in Seattle; at KinderCare in Manhattan, it is up to $40,000.

And the services can be attentive. Parents often receive hourly updates: the exact time a baby dirtied a diaper, the number of raspberries a toddler ate at snack time, photos of 3-year-olds at the playground.

Millions of American families are coping with a child care shortage brought on by the coronavirus pandemic. But one end of the business is thriving: national chains, some charging silver-spoon prices.

That split reality is another marker of how income inequality shapes access to basic necessities like child care, and how it has become harder for lower- and middle-income parents, usually women, to get back into the work force after pandemic disruptions.

And in the debate over how to fix the country's threadbare child care system, the big chains have lobbied and donated to politicians to assert their own interests in Washington. Through a lobbying consortium, they were particularly aggressive in negotiations over President Biden's Build Back Better bill, which ultimately did not pass. The consortium said publicly that it supported the bill's child care proposals, which would have lowered costs for many families. But in lobbying meetings, it argued to policymakers that the bill's numbers did not add up.

The expansion of the chain child care sector as the rest of the industry shrinks means, "You're going to increasingly have the haves and have-nots — child care operating more as a luxury good and less as a public good," said Elliot Haspel, a child care expert at Capita, a family policy group.

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MASSACRE Russian soldiers in hospitals described the slaughter of their comrades in Pavlivka, Ukraine.

PUTIN'S WAR

By Michael Schwirtz, Anton Troianovski, Yousur Al-Hlou, Masha Froliak, Adam Entous and Thomas Gibbons-Neff

Russian soldiers go into battle with little food, few bullets and instructions grabbed off the internet for weapons they barely know how to use. They plod through Ukraine with decades-old maps, or no maps at all. They speak on open cellphone lines, revealing their positions and exposing the incompetence and disarray in their ranks. They have trained at dilapidated bases in Russia, hollowed out by corruption. They are given wildly unrealistic timetables for taking Ukrainian territory and complain of being sent into a "meat grinder."

This is the inside story of historic Russian failures. Interviews, intercepts, documents and secret battle plans show how a "walk in the park" became a catastrophe for Russia.

A NEW YORK TIMES INVESTIGATION | SPECIAL SECTION

COLLAPSING FRONT Thousands of poorly trained, underequipped men were asked to defend a huge swath of northeastern Ukraine. One soldier carried printouts from Wikipedia to use his gun.

INTERNAL ROT Russia's military has been gutted by years of corruption and theft. One contractor described frantically disguising decrepit conditions at a major Russian tank base when top brass visited.

SHODDY INTELLIGENCE Soldiers have been using maps like this 1980s-era one found on the battlefield.

DIVIDED RANKS Russia's fractured armies, including mercenary groups and foreign troops, answer to President Vladimir V. Putin but are soaring openly as intercepted phone calls show.

MISSION DELUSION Soldiers are given fanciful timetables. Commanders expected tanks to roll into Kyiv within days of the initial invasion, but it took soaring openly, as intercepted phone calls show. about that long just to cross the border into Ukraine.

Continued on Page 6

Bonanza for Arms Makers As Military Budget Surges

Amid Ukraine War and Growing Threats, U.S. Plans $858 Billion in Spending

This article is by ***Eric Lipton, Michael Crowley and John Ismay.***

WASHINGTON — The prospect of growing military threats from both China and Russia is driving bipartisan support for a surge in Pentagon spending, setting up another potential boom for weapons makers that is likely to extend beyond the war in Ukraine.

Congress is on track in the coming week to give final approval to a national military budget for the current fiscal year that is expected to reach approximately $858 billion — or $45 billion above what President Biden had requested.

If approved at this level, the Pentagon budget will have grown at 4.3 percent per year over the last two years — even after inflation — compared with an average of less than 1 percent a year in real dollars between 2015 and 2021, according to an analysis by Center for Strategic and Budgetary Assessments for The New York Times.

Spending on procurement would rise sharply next year, including a 55 percent jump in Army funding to buy new missiles and a 47 percent jump for the Navy's weapons purchases.

On Friday, Jake Sullivan, Mr. Biden's national security adviser, put the buildup in strategic terms, saying the war in Ukraine had exposed shortfalls in the nation's military industrial base that needed to be addressed to ensure the United States is "able to support Ukraine and to be able to deal with contingencies elsewhere in the world."

Lockheed Martin, the nation's largest military contractor, had booked more than $950 million worth of its own missile military orders from the Pentagon in part to refill stockpiles being used in Ukraine. The Army has awarded Raytheon Technologies more than $2 billion in contracts to deliver missile systems to expand or replenish weapons used to help Ukraine.

"We went through six years of Stingers in 15 months," Gregory J. Hayes, Raytheon's chief executive, said in an interview earlier this month, referring to 1,600 of the company's shoulder-fired antiaircraft missiles sent by the U.S. government to Ukraine. "So it will take us multiple years to restock and replenish."

But those contracts are just the leading edge of what is shaping up to be a big new defense buildup.

DOUG MILLS/THE NEW YORK TIMES

An assembly site for Javelin missiles, which the U.S. has been supplying to Ukraine.

Military spending next year is on track to reach its highest level in inflation-adjusted terms since the peaks in the costs of the Iraq and Afghanistan wars between 2008 and 2011, and the second highest in inflation-adjusted terms since World War II — a level that is more than the budgets for the next 10 largest cabinet agencies combined.

Even more orders are coming in to military contractors from U.S. allies in Europe and Asia, as they

Continued on Page 8

All Ye Faithful May Not Come, As Christmas Falls on a Sunday

By RUTH GRAHAM

StoneBridge Christian Church in eastern Nebraska is known locally for hosting a big annual fireworks event, which this fall included 15 food trucks and portable firepits for making s'mores. But it's the Christmas season that is "our Super Bowl," said the church's executive pastor, Mitch Chitwood. This year, the church's four locations in the Omaha area will host four "Jingle Jam" family parties in December and nine services on Christmas Eve, complete with classic carols, Christmas-themed coffee drinks and a festive photo booth in the lobby.

What they will not have is church on Sunday, Dec. 25. On Christmas Day, StoneBridge will offer a simple community breakfast, but no religious services.

"We still believe in the Sunday morning experience, but we have to meet people where they are," Mr. Chitwood said.

And where they are on Christmas Day is usually at home, in their pajamas. This year, church leaders are grappling with what may seem like an odd dilemma: Christmas Day falls on a Sunday for the first time since 2016, and that's a problem.

Christmas is considered by most Christians to be the second-

JOANNA ROTHKOPF FOR THE NEW YORK TIMES

King of Glory Lutheran Church in suburban Denver cancelled its Sunday service.

nest significant religious holiday of the year, behind Easter. But most Protestants do not attend church services on Christmas Day when it falls on a weekday. If everyone from the pews to the pulpit would rather stay home, what is a practical house of worship to do? This year, some Protestant churches are deciding to skip Sunday services completely.

Six years ago, the last time Christmas fell on a Sunday, practically no one showed up for ser-

Continued on Page 20

The Next Epoch Of Planet Earth Might Be Today

By RAYMOND ZHONG

The official timeline of Earth's history — from the oldest rocks to the dinosaurs to the rise of primates, from the Paleozoic to the Jurassic and all points before and since — could soon include the age of nuclear weapons, human-caused climate change and the proliferation of plastics, garbage and concrete across the planet.

In short, the present.

Ten thousand years after our species began forming primitive agrarian societies, a panel of scientists on Saturday took a big step toward declaring a new interval of geologic time: the Anthropocene, the age of humans.

Our current geologic epoch, the Holocene, began 11,700 years ago with the end of the last big ice age. The panel's roughly three dozen scholars appear close to recommending that, actually, we have spent the past few decades in a brand-new time unit, one characterized by human-induced, planetary-scale changes that are profoundly but very much underway.

"If you were around in 1920, your attitude would have been, 'Nature's too big for humans to influence,'" said Colin N. Waters, a

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Five Boroughs, Many Faiths
Take a tour through some of the most spiritually and culturally diverse areas in the world as the city's faithful celebrate their beliefs and heritage. PAGE 32

SUNDAY BUSINESS

The Emptiest Downtown
San Francisco has perhaps the most deserted major downtown in America. Office buildings are at about 40 percent of their prepandemic occupancy. PAGE 1

SUNDAY STYLES

Not Taking This Anymore
2022 turned out to be the year rage took over, even in previously civilized corners of society like the Oscars, the U.S. Open and Slack. What now? PAGE 12

SPECIAL SECTION

Puzzle Mania Is Back
The Super Mega crossword is bigger than ever. You'll need extra time to solve the dozens of other puzzles. And don't forget to enter to win $1,000.

SUNDAY OPINION

Thomas L. Friedman PAGE 4

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The Next Epoch in Planet Earth's History May Already Be Upon Us

From Page 1

geologist and chair of the Anthropocene Working Group, the panel that has been deliberating on the issue since 2009. The past century has upended that thinking, Dr. Waters said. "It's been a shock event, a bit like an asteroid hitting the planet."

The working group's members on Saturday completed the first in a series of internal votes on details including when exactly they believe the Anthropocene began. Once these votes are finished, which could be by spring, the panel will submit its final proposal to three other committees of geologists whose votes will either make the Anthropocene official or reject it.

Sixty percent of each committee will need to approve the group's proposal for it to advance to the next. If it fails in any of them, the Anthropocene might not have another chance to be ratified for years.

If it makes it all the way, though, geology's amended timeline would officially recognize that humankind's effects on the planet had been so consequential as to bring the previous chapter of Earth's history to a close. It would acknowledge that these effects

CARL FRANK/SCIENCE SOURCE

Late-Holocene footprints, at least 2,000 years old, left in ash and mud in Nicaragua.

will be discernible in the rocks for millenniums.

"I teach the history of science — you know, Copernicus, Kepler, Galileo," said Francine McCarthy, an earth scientist at Brock University in Canada and member of the working group. "We're actually doing it," she said. "We're living the history of science."

Still, the knives are out for the Anthropocene, even though, or maybe because, we all have such firsthand familiarity with it.

Stanley C. Finney, the secretary general of the International Union of Geological Sciences, fears the Anthropocene has become a way for geologists to make a "political statement."

Within the vast expanse of geologic time, he notes, the Anthropocene would be a blip of a blip of a blip. Other geologic time units are useful because they orient scientists in stretches of deep time that left no written records and sparse scientific observations. The Anthropocene, by contrast, would be a time in Earth's history that humans have already been documenting extensively.

"For the human transformation, we don't need those terminologies — we have exact years," said Dr. Finney, whose committee would be the last to vote on the working group's proposal if it gets that far.

Martin J. Head, a working group member and an earth scientist at Brock University, argues that declining to recognize the Anthropocene would have political reverberations, too.

"People would say, 'Well, does that then mean the geological community is denying that we have changed the planet drastically?'" he said. "We would have to justify our decision either way."

Philip L. Gibbard, a geologist at the University of Cambridge, is secretary general of another of the committees that will vote on the working group's proposal. He has serious concerns about how the proposal is shaping up, concerns he believes the wider geological community shares.

"It won't get an easy ride," he said.

'Messy and Disputatious Business'

Like the zoologists who regulate the names of animal species or the astronomers who decide what counts as a planet, geology's timekeepers work conservatively, by design. They ask qualifications that will be reflected in academic studies, museums and textbooks for generations to come.

"Everybody picks on the Anthropocene Working Group because they've taken so long," said Lucy E. Edwards, a retired scientist with the United States Geological Survey. "In geologic time, this isn't long."

The geologic time scale divides Earth's 4.6 billion-year story into grandly named chapters. Like nesting dolls, the chapters contain sub-chapters, which themselves contain sub-sub-chapters. From largest to smallest, the chapters are called eons, eras, periods, epochs and ages.

Right now, according to the current timeline, we are in — deep breath — the Meghalayan Age of the Holocene Epoch of the Quaternary Period of the Cenozoic Era of the Phanerozoic Eon, and have been for 4,200 years.

Drawing lines in Earth time has never been easy. The rock record is full of gaps, "a jigsaw puzzle with many of the parts missing," as Dr. Gibbard puts it. And most global-scale changes happen gradually, making it tricky to pinpoint when one chapter ended and the next one began. There haven't been many moments when the entire planet changed at once.

"If a meteor hits the Yucatán Peninsula, that's a pretty good marker," Dr. Edwards said. "But other than that, there's practically nothing out there in the geologic world that's the best line."

The early Cambrian Period, around 540 million years ago, saw Earth explode with an astonishing diversity of animal life, but its precise starting point has been contested for decades. A long controversy led to the redrawing of our current geologic period, the Quaternary, in 2009.

"It's a messy and disputatious business," said Jan A. Zalasiewicz, a geologist at the University of Leicester. "And of course, the Anthropocene brings a whole new range of dimensions to the messiness and disputatiousness."

Humanity's Fingerprint

It took a decade of debate — in emails, academic articles and meetings in London, Berlin, Oslo and beyond — for the Anthropocene Working Group to nail down a key aspect of its proposal.

In a 29-to-4 vote in 2019, the group agreed to recommend that the Anthropocene began in the mid-20th century. That's when human populations, economic activity and greenhouse gas emissions began skyrocketing worldwide, leaving indelible traces: plutonium isotopes from nuclear explosions, nitrogen from fertilizers, ash from power plants.

The Anthropocene, like nearly all other geologic time intervals, needs to be defined by a specific physical site, known as a golden spike, where the rock record clearly sets it off from the interval before it.

After a yearslong hunt, the working group on Saturday finished voting on nine candidate sites for the Anthropocene. They represent the range of environments into which human effects are etched: a peat bog in Poland, the ice of the Antarctic Peninsula, a bay in Japan, a coral reef off the Louisiana coast.

One site — Crawford Lake in Ontario, Canada — is small enough to walk around in 10 minutes. But it is so deep that the bottom layer of water rarely mixes with the upper layers. Whatever sinks to the floor remains undisturbed, gradually accumulating into a tree-ring-like record of geochemical change.

The working group's members also voted this month on what rank the Anthropocene should have in the timeline: an epoch, an age of the Holocene, or something else.

The group isn't disclosing the results of these or the other votes to be held in the coming months until they are all complete and it has finalized its proposal for the next level of timekeepers to ponder. It is then that a far more contentious debate about the Anthropocene could begin.

Many scholars still aren't sure the mid-20th century cutoff makes sense. It is awkwardly recent, especially for archaeologists and anthropologists who would have to start referring to World War II artifacts as "pre-Anthropocene."

And using nuclear bombs to mark a geologic interval strikes some scientists as abhorrent, or at least beside the point. Radionuclides are a convenient global marker, but they say nothing about climate change or other human effects, said Erle C. Ellis, an ecologist at the University of Maryland, Baltimore County.

Using the Industrial Revolution might help. But that definition would still leave out millenniums of planet-warping changes from farming and deforestation.

Call to Attention

Canonizing the Anthropocene is a call to attention, said Naomi Oreskes, a member of the working group. For geology, but also the wider world.

"I was raised in a generation where we were taught that geology ended when people showed up," said Dr. Oreskes, a historian of science at Harvard. The Anthropocene announces that "actually, the human impact is part of geology as a science," she said. It demands we recognize that our influence on the planet is more than surface level.

But Dr. Gibbard of Cambridge fears that, by trying to add the Anthropocene to the geologic time scale, the working group might actually be diminishing the concept's significance. The timeline's strict rules force the group to impose a single starting point on a sprawling story, one that has unspooled over different times in different places.

He and others argue the Anthropocene deserves a looser geologic label: an event. Events don't appear on the timeline; no bureaucracy of scientists regulates them. But they have been transformative for the planet.

The filling of Earth's skies with oxygen, roughly 2.1 to 2.4 billion years ago — geologists call that the Great Oxidation Event. Mass extinctions are events, as is the burst of diversity in marine life 460 to 485 million years ago.

The term Anthropocene is already in such wide use by researchers across scientific disciplines that geologists shouldn't force it into too narrow a definition, said Emlyn Koster, a geologist and former director of the North Carolina Museum of Natural Sciences.

"I always saw it not as an internal geological undertaking," he said of the Anthropocene panel's work, "but rather one that could be greatly beneficial to the world at large."

Geoscientist review of The Azolla Story is live

From Jonathan & Alexandra Bujak

The Azolla Story presents the comprehensive history of azolla, an aqueous green plant that is a symbiotic relationship between a fern and cyanobacteria. Topics covered span the evolution and genetics of azolla, the scientists and farmers involved with azolla, and the politics, benefits to human-kind, and possible future of azolla; there is something for everyone who examines this book. An overarching theme is that humankind is on the edge of a "perfect storm" that threatens our very existence and azolla may play a role in averting disaster.

The book begins in the Middle Eocene (49 million years ago), when Earth evolved from a greenhouse planet to an icehouse setting. Jonathan and Alexandra Bujak suggest that a simple green plant may have ushered in this turning point. How can this happen? Azolla forms a floating mass on water with low salinity a few centimetres thick that can double its mass over several days. Such an environment existed across the Arctic Ocean, near the end of a long period of greenhouse Earth. But oceans are salty, >3% of total dissolved salts – yet geologic evidence suggests that azolla mantled the Arctic Ocean surface, perhaps completely, around the change from greenhouse to icehouse. Could an incredible azolla bloom across the Arctic have sequestered enough CO_2 to generate such a change in Earth's climate? How did a freshwater plant survive in an ocean and assimilate nitrogen? How was the plant fertilized? These and many other questions are addressed.

An interesting approach is used by the authors: flashbacks. For example, the events of the Middle Eocene are interrupted by details of an Arctic expedition. The book jumps from present to past as the complete history of Earth, all 4.5 billion years, is synthesized. One of the shifts to current topics describes a critical meeting in May 2007 in Utrecht, Netherlands, where a diverse group of scientists discussed many of the questions raised above. The book returns to geologic deep time and then back to Utrecht. At first, I was confused by these shifts in time, but, as I caught on, I found this approach to be extremely successful – it formed a nice orchestration between deep time, present time, and the scientists that linked the two.

The detail in which many scientific, political, and philosophical topics are covered can be overwhelming, especially to those not proficient or who lack interest in a given topic. The book contains exhaustive foot notes, references, and glossary, which can lead the reader into even more depth on a topic. In summary, this is an impressive piece of work that should find interest amongst a wide range of readers who are interested in the possible mitigation of our current climate crisis.

Review by Ronald C Blakey

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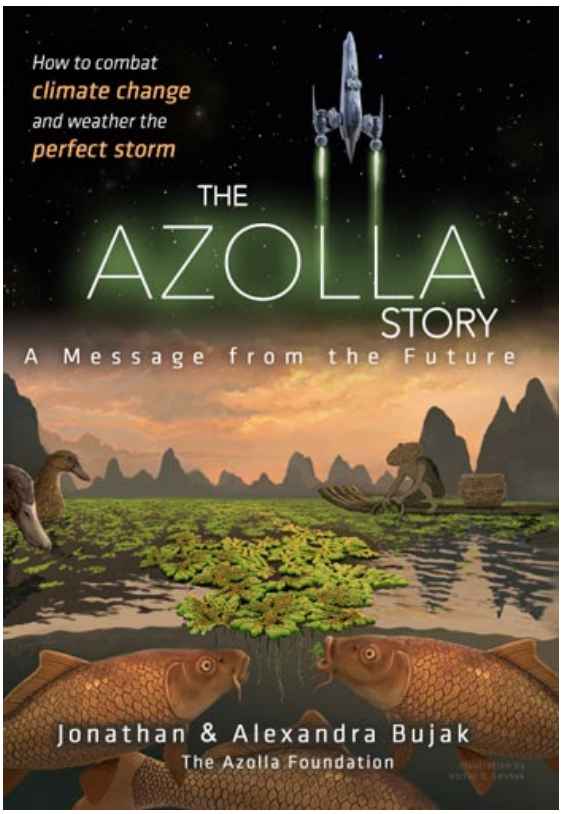

Featured Article

Ceratioid cysts and other rare palynomorphs in the Crawford Konservat-Lagerstätte

by Francine McCarthy

Most fossilizable organic-walled cysts in non-marine sediments have affinities with peridinialean taxa (including the eponymous genus *Peridinium*) that are common in modern freshwater environments, but not known in marine sediments of Quaternary age. Adaptation of the peridinialean lineage to freshwater environments is recorded by the presence of cysts in association with chlorococcalean algae such as *Botryococcus*, *Pediastrum*, *Scenedesmus*, *Tetraedron* beginning in the Late Cretaceous (Batten and Lister, 1988; Batten, 1989) that are very similar (in some cases, morphologically indistinguishable from) those produced by modern peridiniacean and thoracosphaeracean dinoflagellates. In contrast, the family Ceratiaceae appears to disappear at the Cretaceous- Paleogene boundary (Fig. 1) despite the abundance of *Ceratium* spp. in modern lakes. Even when these large, distinctive dinoflagellates are abundant in the water column (Fig. 2), their cysts are almost never reported from the numerous palynological preparations of lake sediments. This is consistent with the observation that modern ceratioid taxa in both marine and freshwater environments produce siliceous/ cellulosic resting cysts with little preservation potential (Chapman et al., 1982; Gómez et al., 2010) rather than resistant dinosporin-based cysts (Wall and Evitt, 1975; Penaud et al., 2018).

Ceratioid cysts that survive maceration (using HF but without acetolysis treatment) have been reported from modern varved sediments the meromictic Crawford Lake (Fig. 3), most commonly in sediments deposited in the late 19th – mid-20th century. Cellulosic thecae of *Parvodinium inconspicuum* and *Peridinium volzii* in palynological preparations previously attested to exceptional preservation over this interval in this *Konservat-Lagerstätte* (Krueger and McCarthy, 2016; McCarthy et al., 2018). Other rarely reported palynomorphs

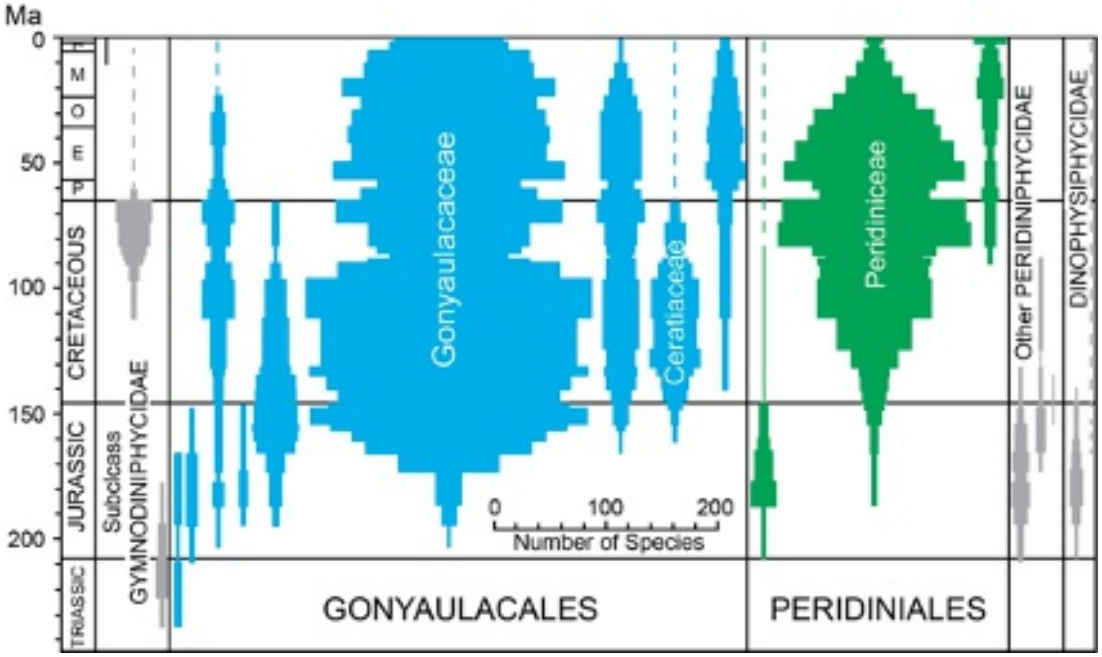

Fig. 1. Spindle plots showing the cyst record of dinoflagellate species per family for each geological stage prior to the Quaternary, modified from Fensome et al. (1993). All peridinialean cysts in Quaternary sediments are from freshwater environments, and the transition of this lineage from marine to continental settings is recorded in sediments of Late Cretaceous through Neogene age. Ceratioid cysts are common in marine sediments of Mesozoic age – the genus *Pseudoceratium*, for instance, ranges from the Early to Middle Cretaceous (Quattrocchio et al., 2006) – but the family Ceratiaceae is virtually unknown in Cenozoic sediments.

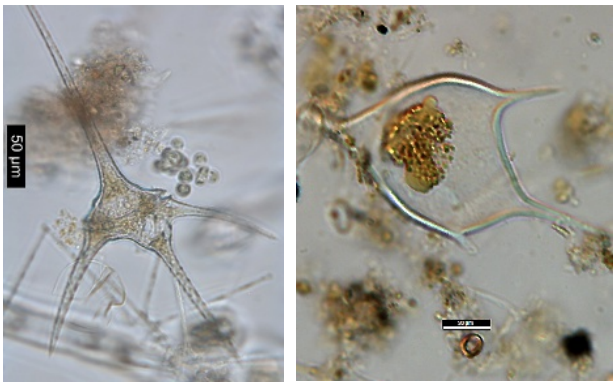

Fig. 2. *Ceratium* spp., like the specimen of *Ceratium hirundinella* (O.F.Müller) Dujardin 1841 from Lake George, NY at left, are common in mid-latitude lakes around the world, but their cysts are almost never reported from palynological preparations of lacustrine sediments. Cysts with clear ceratioid morphology (right) are present in several 'pollen slides' of varved sediments dating to the earliest 20th century in the meromictic Crawford Lake, Ontario, Canada. The image at right was constructed by Olena Volik using several photomicrographic frames using a manual stacking technique.

found in slides from the 'Canadian Zone' of Crawford Lake include rotifer loricae (first reported by Turton and McAndrews, 2006) such as *Keratella quadrata* (Fig. 3a), zygospores of the chlorophyte *Debarya* (Fig. 3b), and possible evidence that a chorate cyst is that of a peridinialean dinoflagellate (Fig. 3c), as well as tiny loricae of the colonial chrysophyte *Dinobryon divergens* in the background of all images in Figure 3.

Additional studies of sediments from meromictic lakes and other *Lagerstätten* (e.g., Messel beds – Lenz et al., 2007) are needed to fill gaps in the stratigraphic record and to get more complete insights into former lake ecosystems (Richter and Baszio, 2001). Processing sediments without acetolysis or other oxidants is recommended to avoid destroying sensitive non-pollen palynomorphs (McCarthy et al., 2021).

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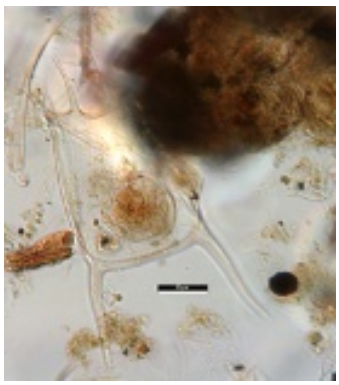

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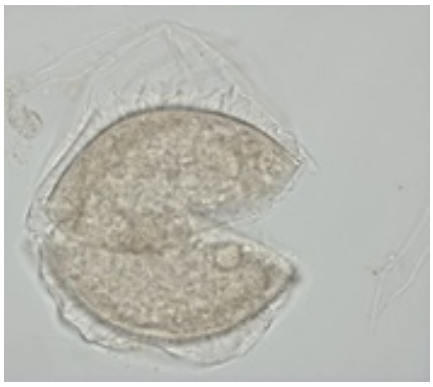

Fig. 3. Varous non-pollen palynomorphs in varved sediments from the 'Canadian Zone' (since 1867 CE) of Crawford Lake, including loricae of *Keratella quadrata* (Fig. 3a), zygospores of the chlorophyte *Debarya* (Fig. 3b), and a chorate cyst within a membrane that shows evidence of an apical and two antapical horns (Fig. 3c), as well as tiny loricae of the colonial chrysophyte *Dinobryon divergens* in the background of all images of palynological preparations without oxidation.

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Palynological Outreach Activity

By Jade Falardeau & Marie-Michèle Ouellet-Bernier

Des histoires du climat : qu'est-ce que les microfossiles nous révèlent sur le passé?

La paléocéanographie est un domaine de recherche qui gagne à être connu. Toutefois, il peut s'avérer ardu d'intéresser les jeunes à cette discipline, surtout si nous plongeons dans des domaines plus complexes et abstraits. Dans cette perspective, nous avons développé un atelier accompagné d'activités pédagogiques ludiques introduisant aux adolescent.es (12 à 16 ans) les différentes méthodes employées pour reconstituer les environnements du passé. Notre atelier intitulé « Des histoires du climat » présente quatre de ces méthodes, dont la micropaléontologie et la sédimentologie. Nous avons développé deux types de matériel éducatif: un cahier d'activités théoriques et pratiques, et une bande dessinée.

Dans le cahier d'activités, chacune des méthodes est abordée d'un point de vue théorique, puis une activité ciblée permet de consolider les connaissances. Dans l'activité concernant la micropaléontologie, nous présentons des palynomorphes provenant de deux échantillons. Sur la base des affinités écologiques de ces palynomorphes, les participant.es doivent déterminer d'où proviennent les échantillons sur une carte parmi différents sites. Cette activité expose la relation qui existe entre un assemblage de microfossiles et les conditions environnementales, permettant éventuellement de tirer des conclusions sur les variations du climat dans le passé.

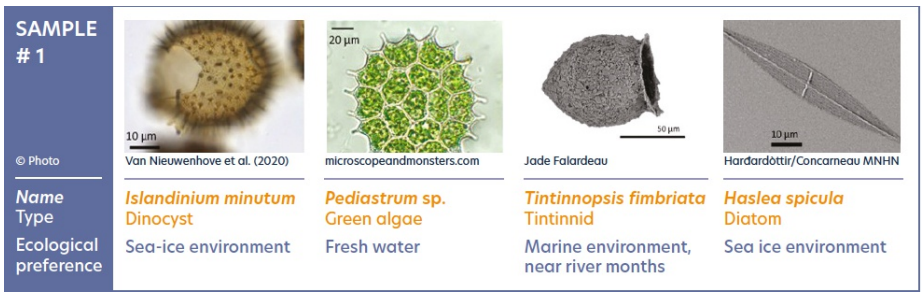


Figure 1

Dans l'exemple ci-dessus (Figure 1), l'échantillon #1 provient de la marge continentale de la Mer de Beaufort à proximité de l'embouchure de de fleuve Mackenzie. Les quatre microfossiles présentés dévoilent la présence de la glace de mer, la proximité des eaux douces et une importante

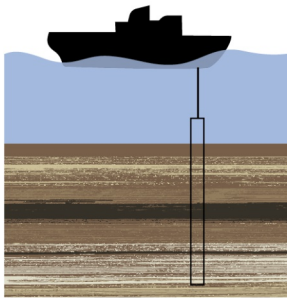


Figure 2

productivité biologique. Un ensemble de caractéristiques associées à des milieux estuariens nordiques.

De plus, dans la partie théorique de l'activité, nous décrivons les processus de sédimentation en présentant les bassins océaniques comme d'excellents puits pour la matière organique et les sédiments. Nous expliquons de quelle manière les carottes sont récupérées des fonds océaniques à partir des navires de recherche (Figure 2).

Finalement, la bande dessinée amène les participant.es dans une quête pour reconstituer le climat des derniers mille ans dans la Région Désignée des Inuvialuit, au nord-ouest du Canada. Au fil des rencontres avec des chercheurs.euses et des détenteurs.rices de connaissance, ils/elles accumulent des indices pour mener à bien leur objectif. Leur aventure les mène entre autres sur le terrain à faire des carottages dans une tourbière ou à bord d'un zodiac (Figure 3), et jusqu'au laboratoire où seront traités et analysés les échantillons récoltés.

Ce projet est financé par le Centre de recherche interuniversitaire Geotop. Cet atelier implique la communauté d'Aklavik (Territoires du Nord-Ouest) et le soutien du groupe de recherche Nunataryuk. Les membres de la communauté ont partagé leur connaissance sur les changements du climat. Ils ont aussi revu et validé le matériel éducatif.

Stories about climate: what do microfossils say about the past?

Communicating science that is accessible to youth can be a challenge, especially if we have to address more complex and less tangible subjects such as paleo-oceanography. Within the framework of an initiative for dissemination of laboratory research we developed an interactive workshop for youth (12-16 years old) on the different methods to reconstruct the climate of the past. The workshop is a blend of short theoretical concepts that are accompanied by practical activities.

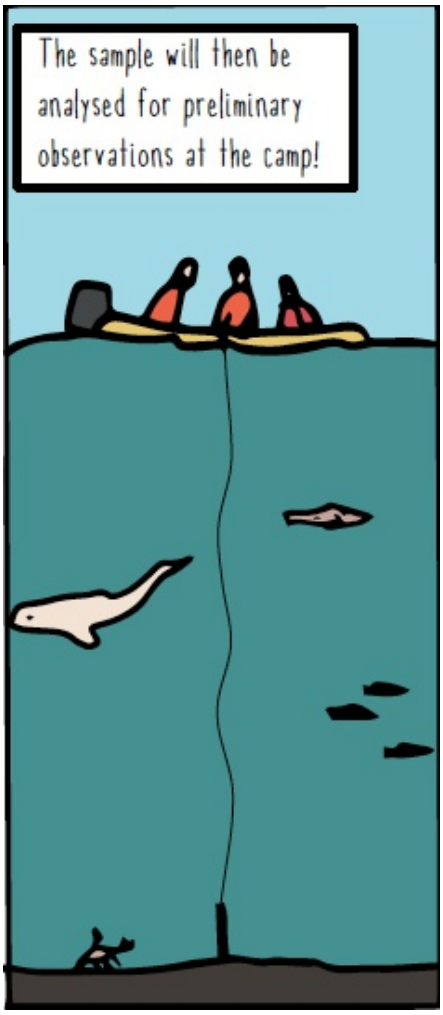


Figure 3

One of the four main themes of the workshop involves sediment cores and micropaleontology. In the associated practical activity, we introduce different palynomorphs with their ecological affinities. With this information, the young participants have to guess where the sample comes from between two locations. This activity helps them to create links between a microfossil samples and the associated environmental/climatic conditions, and ultimately, how micropaleontology can be used as a tool to reconstruct past conditions.

In this example taken from the workshop (Figure 1), the sample #1 represents microfaunal assemblages from the Mackenzie shelf area, in the southern Beaufort Sea. The ecological preferences of the species presented include freshwater, sea ice and near river mouth environments.

As part of the theoretical concepts, we also introduce the process of sedimentation, considering the water bodies as sinks for organic material and sediments. We also explain how sediment cores are retrieved from research vessels (Figure 2).

A comic book that participants can bring home concludes the workshop. It illustrates researchers and local community members in the field collecting sediment cores in peatlands and in coastal areas. For example, on the image we selected, we can see three people on a zodiac coring for sediment (Figure 3).

This project is financed by the interuniversity research group Geotop. The workshop involved the community of Aklavik (Northwest Territories) with support of Nunataryuk research program. Members of the community shared their knowledge of climate change and gave their feedback on the education material.

Student Biopics

By **Cesar Arturo Vera Florez**[1], Matthew Peros[2], Frédéric Bouchard[1], Sydney Moser[3], Andre Viau[3], Jeffrey Donnelly[4]

1– Université de Sherbrooke, Sherbrooke, QC, Canada.
2– Bishops University, Sherbrooke, QC, Canada.
3– University of Ottawa, Ottawa, ON, Canada.
4– Woods Hole Oceanographic Institution, Falmouth, MA, United States of America.

An 8,500 year record of vegetation change, climate, and human impacts from Baie des Baradères, Haiti, using pollen analysis and XRF core scanning.

The insular Caribbean is a region sensitive to multiple climate stressors, including hurricanes, droughts, and sea-level changes. This is particularly the case for Haiti, a country located in the circum-Caribbean region, that has also been affected by extensive anthropogenic land use, rendering much of its landscape devoid of vegetation and increasing its vulnerability to erosion and floods. Despite this, there is limited long-term environmental data from Haiti to provide critical baseline data to assess modern-day and future environmental risk.

To address this, I am undertaking pollen and spore counting and analysis to reconstruct vegetation change from a sediment core collected from Baie des Baradères, a shallow bay adjacent to the delta of the Baradères river, located in southwestern Haiti. I expect to reconstruct vegetation and climate changes, as well as human impacts, and potentially other disturbance events such as hurricanes and droughts in the area during the last 8,500 years. In addition, the sedimentary context of the core was already analyzed by another master's student using high-resolution XRF core scanning to distinguish between inputs of terrestrial and marine-derived materials, the results of which will be integrated with the pollen data. The chronology of the core is established with over 25 AMS dates.

My preliminary results show that at the base of the core (from 8,500 to ~4,000 cal yr BP), mangroves and other coastal plants were dominant, whereas they decrease in abundance towards the core top, possibly representing sea level rise and a migration of the coastline farther from the core site. XRF analysis suggest an abrupt increase in elemental titanium on at least seven different occasions beginning about 2,500 cal yr BP, which may represent an influx of terrestrially-derived sediments into the bay from the nearby Baradères river. While my results are still preliminary, these events may be associated with precipitation from hurricane impacts, and the pollen from these sections is associated with high levels of Asteraceae and ferns, possibly reflecting disturbance to the local landscape. Finally, large quantities of fern spores and herb pollen such as Asteraceae, Amaranthaceae, and *Borreria* are dominant in the upper sediments of the core, and likely reflect extensive human-impacts on the Haitian landscape over the last few hundred years. This project represents one of the few pollen records available from Haiti, and helps fill a large spatial gap in such records from the insular Caribbean.

Dissertations

Master Thesis

Maggie Duncan, Master of Resource Management

Holocene fire and paleoclimate history of a small lake in the Lower Seymour Valley, British Columbia

Supervisors Karen Kohfeld & Marlow Pellatt

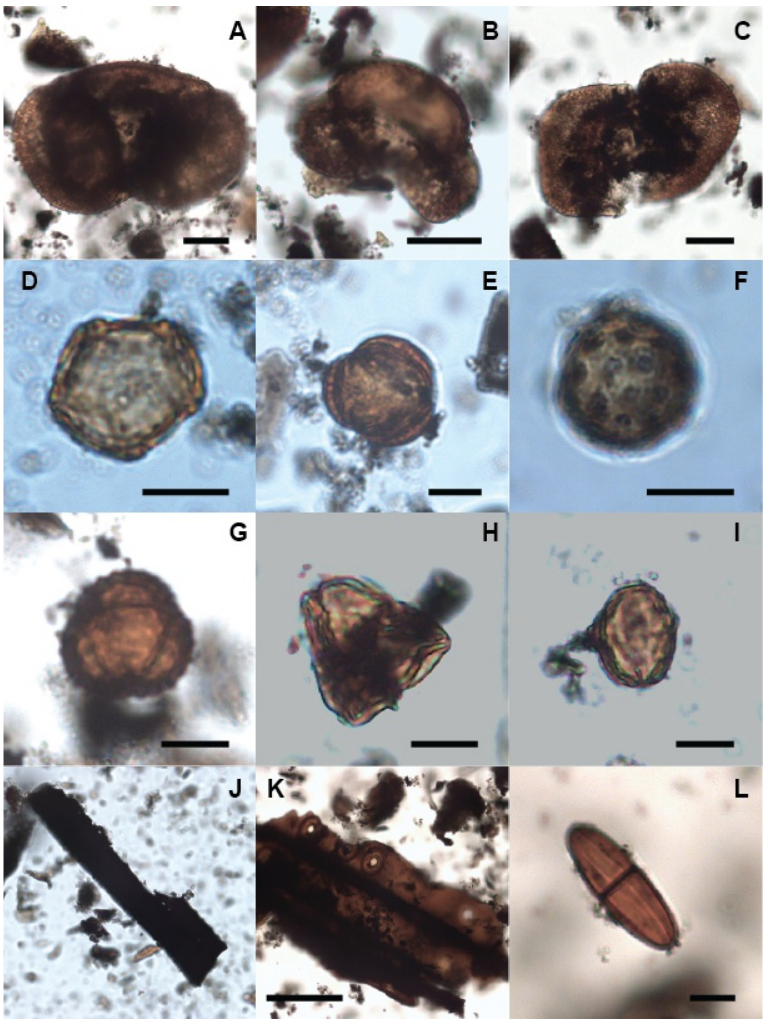
In the coming century climate variability is projected to increase along the Pacific Coast of Canada, increasing the need for land managers to understand how ecosystems change in response to new or enhanced disturbances. Southern British Columbia (BC) is thought to have experienced warm and dry climate conditions with higher than modern fire activity in the past, during the xerothermic interval (9500 - 7000 cal yr BP). In this study, I reconstructed past climate-fire-vegetation changes from a 13,000-year record from Lost Lake in Vancouver's Lower Seymour Conservation Reserve, BC. Contrary to other sites, the moist coastal western hemlock forest at this site remained cool and moist with low fire activity throughout the xerothermic period. Instead, peak fire frequencies were observed during the cool and moist Neoglacial period (4500 cal yr BP - present), when human activity became prevalent. These results have implications for the managed watershed's resilience to fire and response to future warming conditions.

Palynfo

This figure shows representative palynomorphs recovered from a remnant of a glacier in Jasper National Park. This is part of a collaborative project with Parks Canada, the Royal Alberta Museum (RAM), and the Alberta Biodiversity Monitoring Institute. We are looking at sampled overridden organic material from a glacier to determine what remains are preserved in this material, the age of the material, and the relevance of such samples. With rapid melting of many areas of the cryosphere, including glaciers and ice patches, there is a push to determine which features to target for sampling and what information can be gained from such samples. This figure was part of a report (Tirlea et al. QE2015-001) produced by RAM for Parks Canada looking at the preliminary results of these glacial samples. A. Fir (*Abies*), B. Pine (*Pinus*), C. Spruce (*Picea*), D. Alder (*Alnus*), E. Wormwood (*Artemisia*), F. Goosefoot family (*Chenopodium* type), G. Ragweed (*Ambrosia*), H. Heather family (*Ericad* type), I. Strawberry (*Fragaria*), J. Charcoal fragment, K. Conifer tracheid with visible pitting, L. Dyad fungal spore. Scale bars A – C, K = 20 µm; D – I, L = 10 µm; J = >75 µm.

At the Royal Alberta Museum in Edmonton, Alberta, the Quaternary Environments program has various large reference collections, including for pollen, seeds, fruit, plant macrofossils, and aquatic snail shells. If you have any questions or are interested in looking or using these collections, please contact Diana Tirlea (diana.tirlea@gov.ab.ca).

https://www.royalalbertamuseum.ca/collections/earth-sciences/quaternary-environments



Student Award

The Canadian Association of Palynologists **Annual Student Research Award** was established in 2009 to recognize students' contributions to palynological research. The award is open to any undergraduate or graduate student who is a member, in good standing, of CAP, regardless of their nationality or country of residence. The intent of the research award is to support student research with a strong palynological component. The award consists of a three-year membership in the Association and **$200 to $500 CDN**, to be put toward some aspect of the student's research.

The application should consist of: 1) a one-page statement outlining the nature of the research project, its scientific importance, the approximate timeline to completion of the project, and the aspect of the research the funds would be directed toward; (2) a CV; and, (3) a letter of support from the student's supervisor.

Applications may be submitted in French or English and should be submitted by email. Completed applications are **due by March 15**.

Submit applications by e-mail to CAP President Florin Pendea (ifpendea@lakeheadu.ca).

Note: Only one competition will take place every year, and the total amount of the award may be split between two applicants, at the discretion of the evaluation committee. There are no limit to the number of times a student can submit an application

Recent Publications

** denotes a CAP member*

Atasiei, D., Nasser, N.A., Patterson, C.W., Wen, A., Patterson, R.T., Galloway, J.M., Roe, H.M. 2022. Impact of Post-Tropical Storm Arthur (2014) on benthic Arcellinida assemblage dynamics in Harvey Lake, New Brunswick, Canada. *Hydrobiologia 849*, 3041-3059.

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*Bujak, J., *Bringué, M., Goryacheva, A. A., Lebedeva, N. K., Pestchevitskaya, E. B., Riding, J. B., & Smelror, M. (2022). Jurassic palynoevents in the circum-Arctic region. *Atlantic Geoscience, 58*, 055-098.

Byun, E., Cowling, S. A., & *Finkelstein, S. A. (2022). Holocene regional climate change and formation of southern Ontario's largest swamp inferred from a kettle-lake pollen record. *Quaternary Research, 106*, 56-74.

Da Silva, K. A., Snyder, R. A., Packalen, M. S., McLaughlin, J. W., Peteet, D. M., & *Finkelstein, S. A. (2022). Mineral inputs, paleoecological change, and Holocene carbon accumulation at a boreal peatland in the Hudson Bay Lowlands, Canada. Palaeogeography, Palaeoclimatology, *Palaeoecology, 596*, 110996.

Danesh, D. C., *Gushulak, C. A., Moos, M. T., Karmakar, M., & *Cumming, B. F. (2022). Changes in the prairie–forest ecotone in northwest Ontario (Canada) across the Holocene. *Quaternary Research, 106*, 44-55.

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*Gushulak, C. A., Marshall, M., *Cumming, B. F., Llew-Williams, B., Timothy Patterson, R., & *McCarthy, F. M. (2022). Siliceous algae response to the "Great Acceleration" of the mid-20th century in Crawford Lake (Ontario, Canada): A potential candidate for the Anthropocene GSSP. *The Anthropocene Review, 9*(3), 571-590.

Hillaire-Marcel, C., *de Vernal, A., Yufen, R., Roberge, P., & Song, T. (2022). Challenging radiocarbon chronostratigraphies in central Arctic Ocean sediment. *Geophysical Research Letters*, e2022GL100446.

*Mathewes, R. W. (2022). Plant macrofossils as indicators of vegetation and climate change in the Northern Black Forest of Germany during the last millennium-with focus on the Little Ice Age. *Vegetation History and Archaeobotany*, 1-13.

Moir, K. E., Ridal, J. J., & *Cumming, B. F. (2022). Spatiotemporal and teratological analyses of diatom assemblages from sediments contaminated with industrial effluents in the St. Lawrence River near Cornwall (Ontario, Canada). *Hydrobiologia, 849*(6), 1417-1436.

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Mushet, G. R., Reinhardt, E. G., Whitehouse, R., & *Cumming, B. F. (2022). Postglacial hydroclimate in the southern interior of British Columbia (Canada): Lake ecosystem response to the Holocene Thermal Maximum and drivers of mid-to-late Holocene climate variability. *Quaternary Science Reviews, 276*, 107302.

Obrezkova, M. S., *Pospelova, V., & Kolesnik, A. N. (2023). Diatom and dinoflagellate cyst distribution in surface sediments of the Chukchi Sea in relation to the upper water masses. *Marine Micropaleontology, 178*, 102184.

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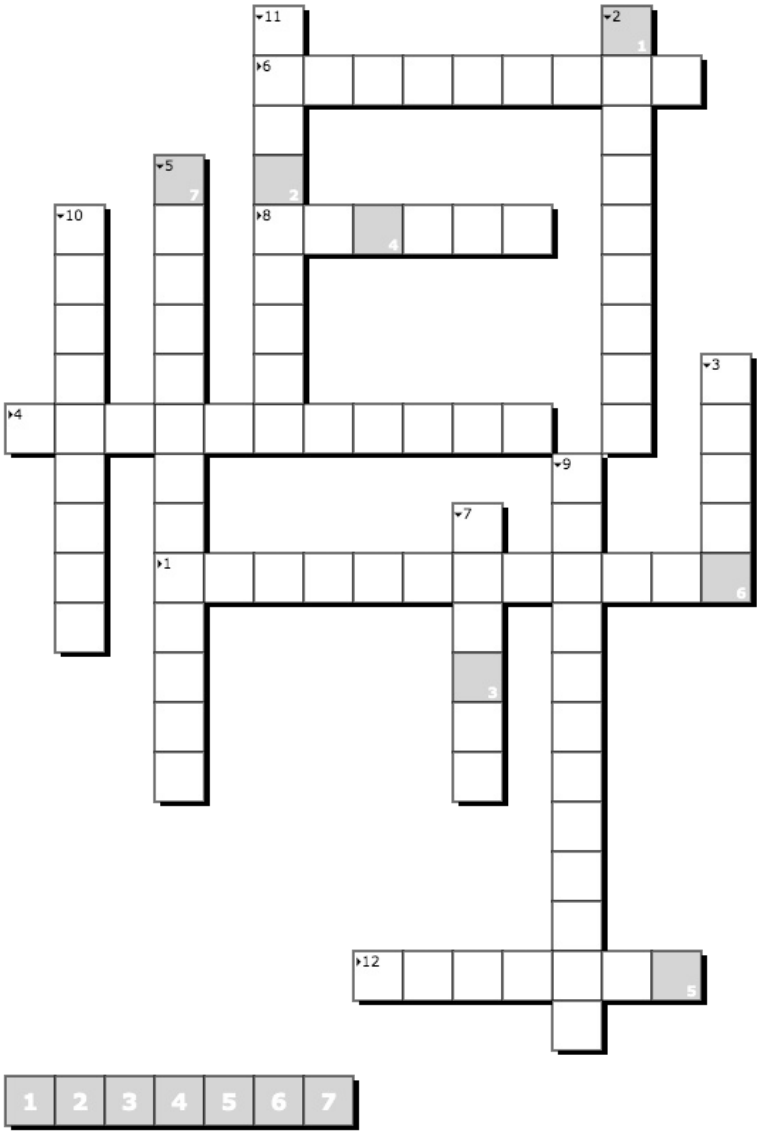
Wiltse, B., Mushet, G. R., Paterson, A. M., & *Cumming, B. F. (2022). Evidence for temporally coherent increases in the abundance of small Discostella (Bacillariophyceae) species over the past 200 years among boreal lakes from the Experimental Lakes Area (Canada). *Journal of Paleolimnology, 67*(3), 273-287.

Wu, X., *de Vernal, A., Fréchette, B., Moros, M., & Perner, K. (2022). The signal of climate changes over the last two millennia in the Gulf of St. Lawrence, eastern Canada. *Quaternary Research, 106*, 28-43.

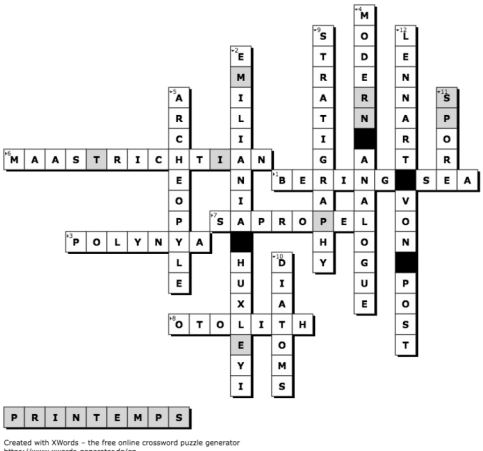
Editor's Game

1. Proposed geological epoch dating from the commencement of significant human impact on Earth's geology and ecosystems.
2. Terrestrial wetland ecosystems in which waterlogged conditions prevent plant material from fully decomposing.
3. Informal term for a large and diverse group of photosynthetic eukaryotic organisms.
4. Sedimentary deposit that exhibits extraordinary fossils with exceptional preservation.
5. Process of particles settling to the bottom of a body of water.
6. The base level for measuring elevation and depth on Earth.
7. Tree of the genus Picea.
8. polar region located at the northernmost part of Earth.
9. Preserved organic remains large enough to be visible without a microscope.
10. Narrow strait that connects the Atlantic Ocean to the Mediterranean Sea.
11. Small crustaceans enclosed in a bivalved carapace.
12. The ninth and youngest of Santa Claus's reindeer.

French word: hemlock forest



May 2022 solutions



CAP Membership Form

Canadian Association of Palynologists / Association Canadienne des Palynologues (CAP) membership is open to all members of the palynological community in Canada and others with an interest in Canadian palynology. The Association is dedicated to the advancement and encouragement of all aspects of palynology in Canada and the promotion of co-operation between palynologists and those engaged in related fields of study. Membership dues include two issues a year of the CAP Newsletter, to which all members are invited to contribute. CAP is affiliated with the International Federation of Palynological Societies (IFPS) and members receive two issues of the IFPS newsletter (PALYNOS) each year.

CAP membership dues are $15 per year in Canadian or US funds payable at the beginning of the year. Lapsed members are removed from the mailing list after one year, following a reminder. Members may, if they wish, pay for up to three years in advance for a reduced amount of $40.
You have two options to join or renew:

(1) fill out the online form at https://capacp.wordpress.com/membership/ and send an e-transfer to CAP Secretary-Treasurer Francine McCarthy (fmccarthy@brocku.ca)

(2) is to complete and print this form and attach a cheque (Canadian bank only) or money order payable to CAP, and mail the form and payment to the following address:

Prof. Francine McCarthy, Dept. of Earth Sciences, Brock University
St Catharines, ON, L2S 3A1, CANADA

Name:
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Do you want to make a donation towards the Annual CAP Student Research Award?
Yes ☐ No ☐ Amount:

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If you are the head of a palynology laboratory in Canada, may we include your name/address/research interests/webpage in the online "Directory of Canadian Palynology labs" on the CAP website? Yes ☐ No ☐

Lab page URL:
Do you permit your name/address/email address to be included in the printed "World Directory of Palynologists" being compiled by IFPS? Yes ☐ No ☐