Canadian Association of Palynologists
Association Canadienne des Palynologues

# NEWSLETTER

Volume 41 Number 2 December 2018

## PRESIDENT'S MESSAGE

In early August, many members of CAP participated in the 51st Annual Meeting AASP-The Palynological Society conference in Calgary, Alberta. It is during this conference that the 2018 Annual General Meeting (AGM) took place and a happy group of 10 palynologists discussed the priorities and goals of the association for the near future. An important point that was raised, was to increase CAP's visibility in order to increase connections within the community. CAP has since joined twitter, a – as you surely know – social platform that can encourage day to day exchanges on research results and upcoming conferences, and increase the diversity of one's network. We encourage all members to have a look and contribute to our new page. Of course, our website is also still up and running and both platforms can be used to connect with colleagues.

What is better than meeting in person? It has been proposed that the next AGM would be held during the GAC-MAC Annual Meeting in Quebec City (May 13-15). We would like to invite all members to save the date and come enjoy early spring in Quebec. The theme of the conference is "Where geosciences converge".

I would also like to take the opportunity to highlight the imminent release of a special issue of the journal *Palynology* on the taxonomy and ecology of the dinoflagellate cyst genera *Spiniferites* and *Achomosphaera.* This volume will be the result of an enormous effort by a large international group of palynologists building on the fruitful discussions held during two workshops, in Montreal and Ostend. It will surely become an important resource for new and experienced dinocyst workers worldwide!

Finally, special thanks to Francine McCarthy who was nominated for, and kindly accepted to take up the role of CAP Councillor to IFPS. Welcome back on the executive committee Francine!

Sincerely,

Audrey Limoges,
Department of Earth Sciences,
University of New Brunswick



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# Editor's Notes

I would like to use this opportunity to thank my fellow members of the CAP executive, in particular, Manuel and Jessie. The jobs of website and newsletter editor as well as that of secretary-treasurer take a considerable amount of time and energy. I would also like to thank all who contributed to this edition: K. Bell, M. Bringué, M. Chaput, K. Gajewski, A. Limoges, V. Pospelova, P. Richard, S. Stolze, M. Vetter, J. Vincent. Special thanks to Francine McCarthy for her multiple and generous contributions.

# Deadline for Next CAP Newsletter

Please submit items for the next issue of the *CAP Newsletter* (Volume 41, Number 2, May 2019) by April 15, 2019. Conference reports, announcements, field trip reports, notices of new books, dissertation abstracts, book reviews, news, and essays on topics relevant to Canadian palynology are all welcome. Please send contributions to:

**Florin Pendea**
*CAP Newsletter* Editor
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# Featured article

## Palynology in Canada (I):

## Freshwater Dinoflagellates and Their Cysts

By Francine McCarthy
Brock University

Canada has a rich palynological history, with researchers studying a variety of non-pollen palynomorphs as well as pollen and embryophyte spores. As part of the *CAP Special Session: From Land to Sea,* I spoke on "Canadian research into freshwater dinoflagellates and their cysts", illustrating the extraordinary contribution of Canadians – and of others working in Canada – to this admittedly small field. This article stems from that presentation.

Alfred Traverse, originally from New Brunswick, published the first record of a fossil dinoflagellate from silts above an Oligocene freshwater lignite (Traverse, 1955). He assigned it to the ubiquitous freshwater genus *Peridinium* Ehrenberg 1980 but Graham Williams (with Judy Lentin) reassigned it to the common Cretaceous- Paleogene genus *Palaeoperidinium* (Figure 1).

A guest lecture given by Graham Williams in the micropaleontology course I took at Dalhousie University was my first exposure to dinoflagellates and their cysts; his men-

tion of dinoflagellates in lacustrine environments caught my attention since my honours project was on Holocene sediments from a small lake in Newfoundland. Graham was a driving force behind the 1978 Penrose Conference on Modern and Fossil Dinoflagellates (together with Bill Evitt and Lew Stover), the first of a series of "DINO" conferences intended to bring together phycologists and palynologists involved in dinoflagellate research (Figure 2). A subset of these delegates studied freshwater dinoflagellates (e.g., F.J.R "Max" Taylor) and their cysts (among the latter were Geoff Norris and Peta Mudie who influenced me while I was a grad student studying pollen at the University of Toronto and marine dinocysts at Dalhousie University).

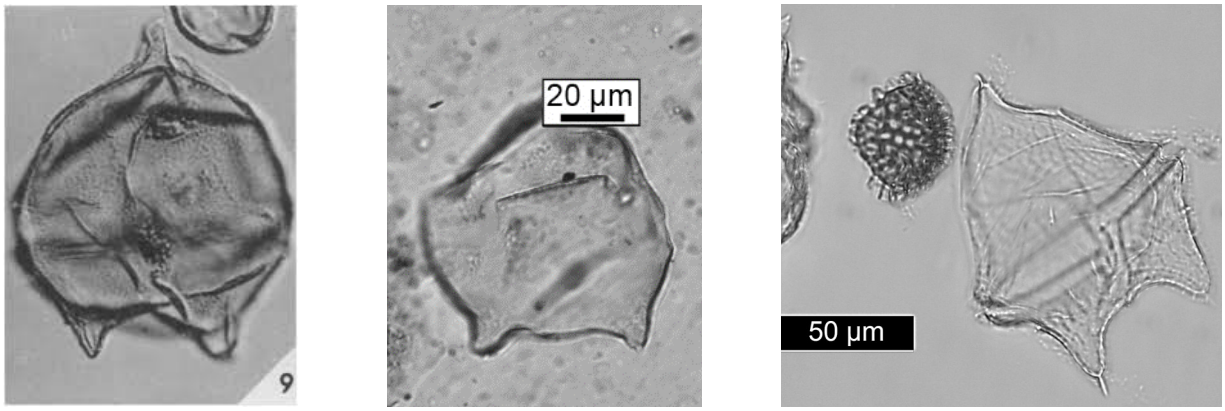


Figure 1. *Left: Palaeoperidinium hansonianum* (Traverse) Lentin and Williams, reproduced from Plate I in Evitt, W.R. (1974). These cysts were reported from silts above the Brandon Lignite by Traverse (1955) and Evitt (1974) illustrated their similarity to cysts (*centre*) and thecae (*right*) of *Peridinium limbatum* (Stokes) Lemmermann (light micrographs of *P. limbatum* from Plastic Lake, courtesy Andrea Krueger).

Like many other dinocyst researchers most of Peta Mudie's work has been on marine sediments, but freshwater dinocysts (and other algal palynomorphs) have featured heavily in her work on the Black Sea Corridor (e.g., Mudie et al. 2010, 2011) and contributed to the sea level history of Bedford Basin (Miller et al., 1982). Several other Canadian palynologists who primarily work on nearshore marine environments also occasionally report the occurrence of freshwater taxa (e.g., Pospelova et al., 2005).

I crossed paths with Pierre Zippi, Martin Head and Rob Fensome in Geoff Norris' lab in the Mining Building at U of T while working on pollen in Jock McAndrews' lab at the Royal Ontario Museum in the mid-1980s. I became aware of the cysts that were common in Holocene muds from Minnesota lakes (Norris and McAndrews, 1970) and of the MSc research of Elliot Burden recording Wendat settlement in Awenda Provincial Park (Burden et al., 1986). Pierre's work relating lakebed dinocyst assemblages with limnological characteristics of lakes in the Dorset region of Ontario

(Zippi et al., 1990) influenced my research on Holocene sediments from Georgian Bay (McCarthy et al., 2007, 2011). He also published on various algal palynomorphs in Albian sediments (Zippi, 1998), including the cysts of dinoflagellates whose transition to freshwater by the Early Cretaceous was documented in several papers by David Batten, who also has a Canadian link (e.g., Batten and Lister, 1988). Geoff Norris (with R.W. Hedlund, 1972) suggested that cysts with transapical archeopyles represent a lineage that diverged from marine Cretaceous peridiniacean ancestors in the Early Cretaceous, subsequently invading freshwater environments and becoming completely non-marine by the Quaternary.

Figure 2. "Canadian content" at DINO1 (the Penrose Conference on Modern and Fossil Dinoflagellates, Colorado Springs, April 1978) included Geoff Norris, Jon Bujak, Peta Mudie, Satish Srivastava, Bill Sarjeant, Max Taylor, and Dave McIntyre.

The abundance of dinocysts in lake sediments initially processed primarily for pollen analysis led to thesis projects for several of my students at Brock.

Their paleoenvironmental interpretations relied primarily on comparison of cyst assemblages with better-understood proxies like pollen, green algal palynomorphs and thecamoebians (Danesh et al., 2013; Volik, 2014; Drljepan, 2014). Our phycological research began with the unanticipated excystment from nearly 200-year-old varves (Krueger and McCarthy, 2016) when Andrea Krueger processed her MSc samples from Crawford Lake (Figures 3, 4a); this, together with my subsequent collaboration with Kenneth Mertens (Figure 4b) who was working in Vera Pospelova's lab at the University of Victoria (another Canadian connection!) allowed us to conclusively deter-

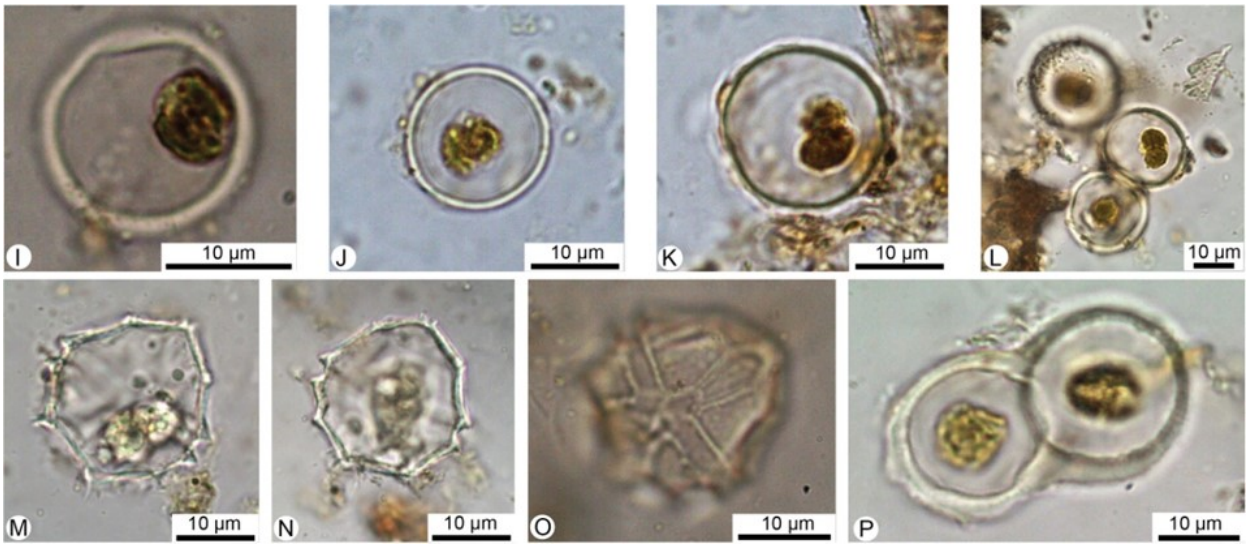


Figure 3. *Parvodinium inconspicuum* (Lemmermann) Carty. Abundant tiny spherical cysts with a prominent coloured body in palynological preparations from Crawford Lake (I-L); tiny cellulosic thecae, abundant in preparations that underwent unplanned excystment/ germination, with bright nuclei (M,N) and empty thecae occasionally present in sediments deposited under anoxic conditions (O), and a spongy-walled hypnozygote undergoing mitotic division (P). Reproduced in part from Plate 4.1 in Krueger (2012).

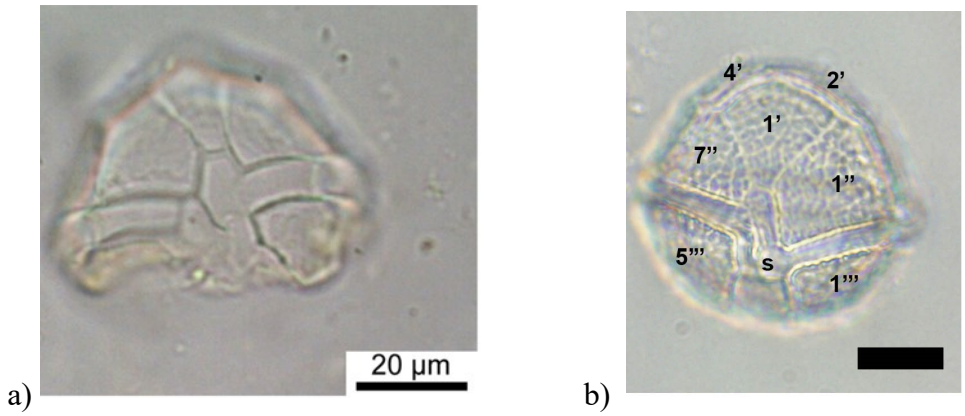


Figure 4. Light micrographs of ventral view of thecae of motile cells germinated from cysts in lakebed sediments. a) *Peridinium volzii* Lemmerman from Crawford Lake (reproduced from McCarthy and Krueger, 2013) smaller, more finely textured and with a considerably smaller first apical plate than b) *Peridinium willei* Huitfeld-Kaas from Honey Harbour (Georgian Bay, Lake Huron), showing tabulation and characteristic wide first apical plate (1') (scale bar =20 µm; reproduced from McCarthy et al., 2011).

mine cyst-theca relationships for several common cysts in Holocene sediments.

Increased collaboration with phycologists like Haifeng Gu, Zhaohe Luo, Na Wang, Kazumi Matsuoka, and Yoshi Takano led to the discovery of a new gymnodinioid dinoflagellate that produces fossilizable cysts (Figure 5). Surprisingly, phylogenetic analysis showed that the cells with distinctive thecae with a prominent apical and apical

horn that form readily-preservable cysts in many North American lakes are only distantly related to the genus *Peridinium* – and much more closely related to the marine *Scrippsiella* lineage (Luo et al., 2016; *um* lineage (Evitt et al., 1998) – are being investigated in collaboration with Rob Fensome, Kenneth Mertens and others.

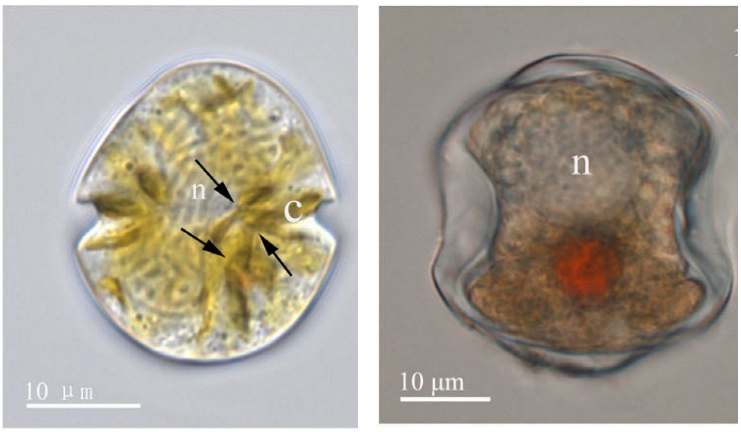


Figure 5. Light microscopy (LM) of a vegetative cell (left) and a cyst (right) of *Gymnodinium plasticum* N. Wang, Z. Luo, K. N. Mertens, F.M.G. McCarthy & H. Gu, named after Plastic Lake, Ontario. n= nucleus, c= chloroplasts, note distinctive red body in cyst (Reproduced from Wang et al., 2017).

McCarthy et al., 2018). *Fusiperidinium wisconsinense* (Eddy) McCarthy, Gu, Mertens, & Carbonell-Moore comb nov. was thus assigned to the family Thoracosphaeraceae Schiller 1930 emend. Tangen in Tangen et al. 1982 (Figure 6).

Andrea Krueger is currently working on her dissertation in my lab at Brock, combining phycological and palynological methods. We are relating lakebed cyst assemblages in several eastern North American lakes to assemblages recovered from the water column using plankton tows, with sediment traps providing taphonomic insights. Unexpected findings, such as the relative scarcity of easily identifiable cysts of *Peridinium limbatum* even in lakes where they dominate the plankton (Figure 7) – in contrast with the long geologic history of the *Palaeoperidini-*

I am especially happy to see that young palynologists in other labs are identifying and recognizing the value of dinoflagellate cysts in their "pollen" slides. CAP member Kristin Michels recently defended her dissertation that interpreted paleolimnological changes in response to disturbance events in old-growth forest in Michigan using dinocyst assemblages (Michels, 2018*)*. Donya Danesh's dissertation in progress in Brian Cumming's lab at Queen's University, relating lakebed cyst assemblages with environmental parameters in >30 lakes in the Experimental Lakes Area of NW Ontario, is greatly improving the utility of cysts as paleolimnological proxies. We know so much more than we did even 10 years ago, and I hope that Canadians contribute as much to this field in the coming decades.

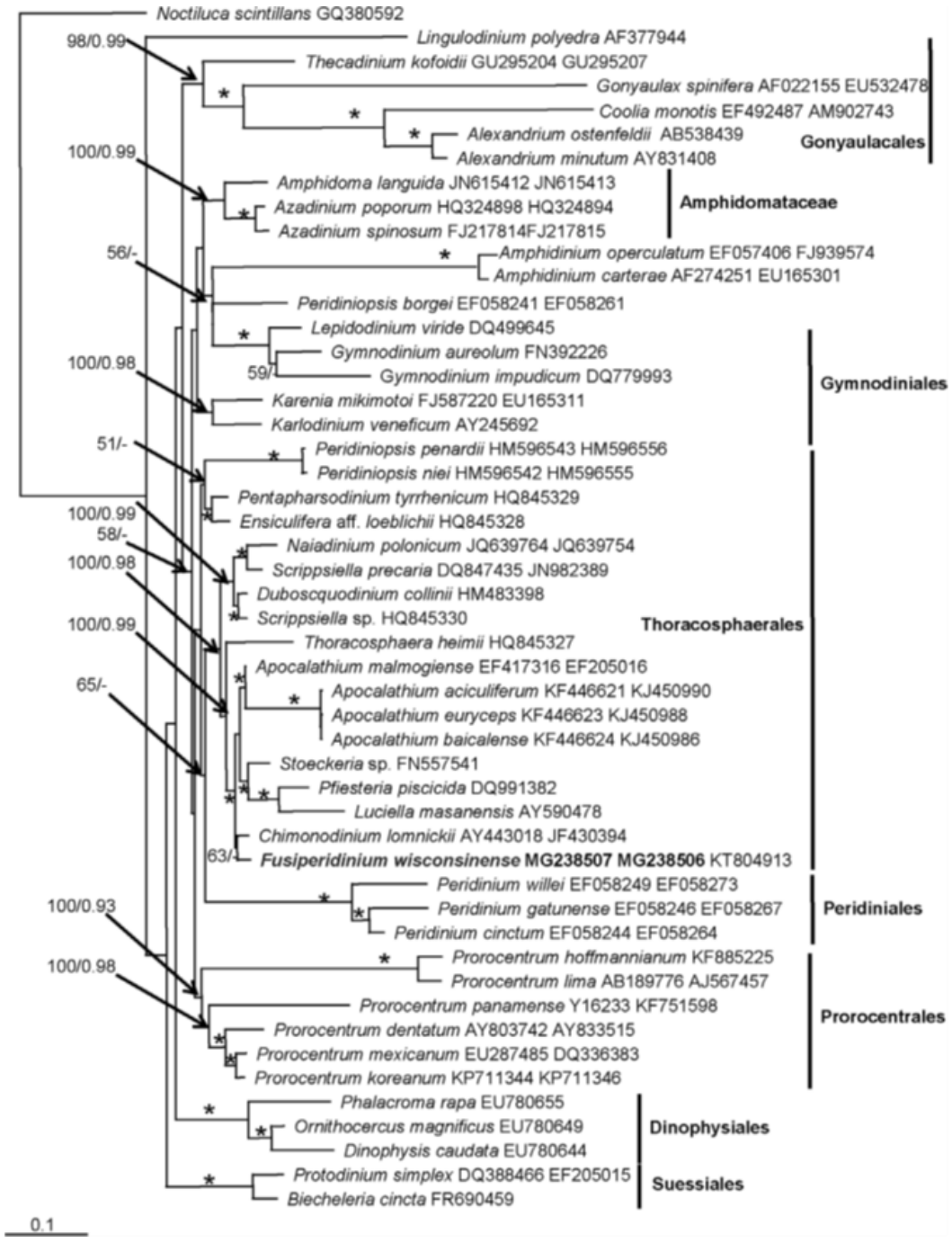


Figure 6. Molecular phylogeny of *Fusiperidinium wisconsinense* (Eddy) McCarthy, Gu, Mertens & Carbonell-Moore comb. nov. showing a distant relationship with *Peridinium* spp. but close relationship with primarily marine, calcareous thoracosphaeracean dinoflagellates (McCarthy et al., 2018).

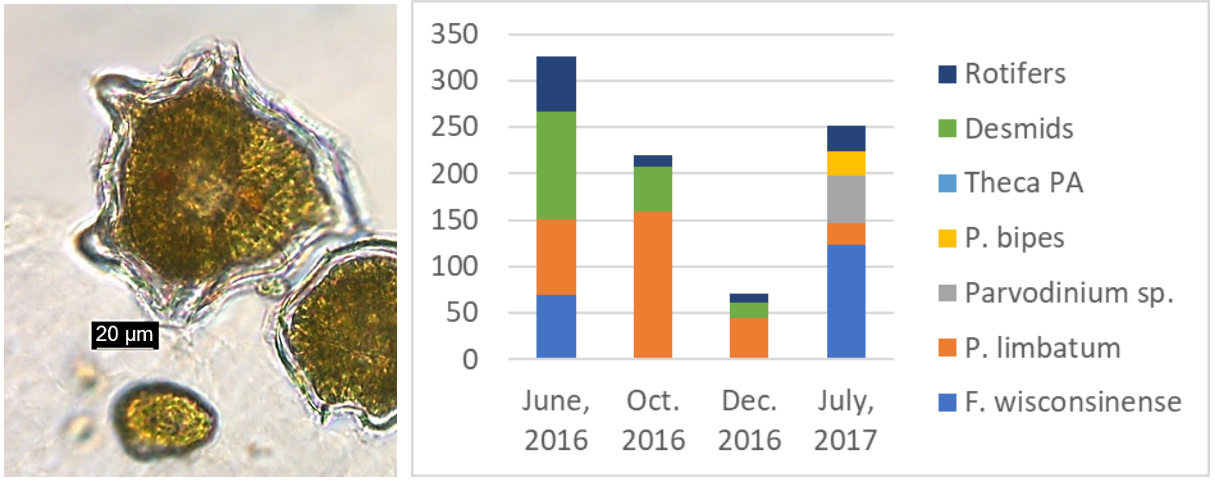


Figure 7. Cysts of *Peridinium limbatum* make up <1% of the dinocyst assemblage in lakebed sediments even though it dominates the plankton assemblage in Plastic Lake, particularly in spring and fall. Cysts of *Parvodinium umbonatum* (Stein) Carty make up >90% of the cyst assemblage but they are relatively rare in the water column, only blooming in summer (Krueger, in prep.; images courtesy of Andrea Krueger).

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# Message from the IFPS Councillor

CAP was well represented at the joint meeting with AASP- The Palynological Society (their 51st Annual Meeting) in Calgary last August. Despite conflicting with the CANQUA/ AMQUA meeting that was held in Ottawa that same week, several Canadian palynologists / CAP members gave oral or poster presentations, mainly in the CAP Special Session "From Land to Sea: Innovative Research by Canadian Palynologists" (chaired by Vera Pospelova and Manuel Bringué) and in the Special Session in Honour of Leonard (Len) Hills and Arthur (Art) Sweet on Western Canadian Palynology and the Cretaceous/ Paleogene Western Interior of North America (chaired by Thomas Demchuk and Kimberly Bell).

Rob Fensome gave the keynote talk at the CAP session (coauthored with Graham Williams, Andrew MacRae and Henrik Nøhr-Hansen) entitled "On the edge: almost 50 years of Mesozoic-Cenozoic palynology in eastern Canada", focused on marine palynology (primarily dinoflagellate cysts) of the eastern Canadian margin. Manuel Bringué and Vera Pospelova both spoke about sediment trap studies of organic-walled dinoflagellate cyst formation in the Cariaco Basin and Beaufort Sea, respectively, Anna Pienkowski spoke about the utility of various non-pollen palynomorphs in Quaternary sediments from the Canadian Arctic, and my talk on the history of Canadian research on freshwater dinoflagellates and their cysts rounded out the CAP session.

Dennis Braman gave the keynote talk in the special session in honour of Len Hills and Art Sweet, entitled: "Overview of Late Cretaceous palynomorph biostratigraphy of the Western Interior Basin with Emphasis on southern Alberta and Montana". Other speakers included CAP members Kimberly Bell who named a species of *Pulcheripollenites* in honour of Art Sweet, Thomas Demchuk who spoke about the PETM in the U.S. Gulf Coast, and Sandy McLachlan who discussed palynological insights into Late Cretaceous environments in British Columbia.

Presentations in other sessions by CAP members included talks by Sandy McLachlan determining the age of the Oyster Bay Formation, and in the Environmental Science session, talks by Jennifer Galloway on ecohydrological dynamics of a subarctic peatland and another by me examining the potential of pollen and non-pollen palynomorphs as bioindicators.

Other highlights included a touching presentation of a lifetime award to David Batten by AASP- The Palynological Society, accepted by his daughter on his behalf since health issues prevented him from traveling from Britain to accept the award, as well as a brief moment of silence in memory of Lanny Fisk, former AASP President during the slot when his talk had been scheduled. The CAP Annual General Meeting was also held at lunchtime on the last day of the conference.

We are indebted to the conference organizers, Kimberly Bell and Thomas Demchuk for putting together a great program of social activities and filed trips in addition to the technical sessions!

**Francine McCarthy**
IFPS Councillor
Brock Univeristy

# 2018 CAP Annual General Meeting Agenda and Minutes

## Calgary, Alberta
## August 7, 2018

1. Acceptance of agenda
2. Reading of the minutes of the 2017 Annual General Meeting, Victoria, BC
3. Business arising from Minutes
4. President's report, Audrey Limoges
5. Secretary/Treasurer report, Jessie Holst Vincent
6. Auditor's Statement, Mary A. Vetter
7. Newsletter Editor's report, Florin Pendea
8. Website Editor's report, Manuel Bringué
9. CAP Councillor to IFPS's report, Simon Goring
10. Appointment of auditor
11. Location for 2019 AGM
12. Priorities and Goals
13. Other Business
14. Adjournment

**Members present:** Anna Pieńkowski (Chair), Manuel Bringué (Recording Secretary), Kimberley (Kim) Bell, Thomas Demchuk, Robert (Rob) Fensome, Jennifer (Jen) Galloway, Francine McCarthy, Sandy McLachlan, Vera Pospelova, Diana Tirlea. Quorum reached.

Meeting called to order by Anna Pieńkowski, 12:00 pm MDT

**1. Acceptance of agenda**
Manuel B. provided paper copies to members present. Anna P. asked for additions to the agenda, none were proposed. Francine M. moved to accept the agenda, seconded by Manuel B. Agenda accepted.
Agenda and all reports from the Executive are appended to the Minutes.

**2. Reading of the minutes of the 2017 Annual General Meeting, Victoria, BC**
Minutes accepted unanimously.

**3. Business arising from Minutes**
No new business arising.

**4. President's report, Audrey Limoges**
Anna P. read out loud CAP President Audrey Limoges' report *in absentia.* In her report (appended), Audrey L. thanked several CAP members for their contributions and discussed this years' CAP Student Research Award success and challenges. In particular, "the difficulty of comparing students from different levels and the mandate of the award" were issues raised again by the evaluation committee. Audrey L. proposes a new evaluation scheme where the "proposed use of funds and impact of the award on the student's project or training be worth 30 %."
The following discussion around the CAP Student Award can be resumed as follows:

Anna P. mentioned that comparing applicants' CVs of very different formatting proved challenging. Francine M. suggested to use the Tri-Council CV format as a template, and members

present agreed that it could be encouraged, though not imposed.

Vera P. reiterated that the evaluation committee should have the option to split the award between two applicants of different levels if their applications are ranked equally. Diana T. highlighted that a higher award amount is necessary to attract applicants. It was agreed that the wording (on announcements and the website) should be changed to "between $200 and $500", and leaves the possibility of splitting the award, which still helps strengthen the students' CVs. Manuel B. accepted to emend the wording on the website.

Manuel B., on behalf of the CAP Student Award evaluation committee, congratulated Sandy McLachlan (present) for being the recipient of the award.

Motion to accept the President's report by Vera P., seconded by Manuel B. Report accepted.

**5. Secretary/Treasurer report: Jessie Holst Vincent**

Anna P. read out loud CAP Secretary/ Treasurer Jessie Vincent's report *in absentia.* In terms of membership, our numbers are stable but low (40 members in good standing). The financial report indicates that the association is running at a loss, which is no pressing matter but will continue to be the case with the increased amount of the CAP Student Award. Jessie V. also highlighted that e-transfers were successfully used to pay membership dues without difficulty from Canada, but American and overseas members continue to experience problems, an inconvenience that PayPal may help to offset at a minimum cost.

Members present discussed the following:

Rob F. suggested to send annual emails to members encouraging donations. Francine M. added that the email should include some positive message about the association and the potential impact of their donations.

Regarding the use of PayPal, Vera P. proposed to increase annual membership dues to $15, which is still very low. This would cover any PayPal charge and help the association balance the books. The idea was well received and resulted in the following proposition:

Francine M. formally proposed <u>to increase annual membership dues to $15 (only applicable upon renewal, not for members who have already paid up to three years of membership), or $40 for three years, effective Jan. 2019</u>, seconded by Vera. All present voted in favour; the motion passed unanimously. Announcements should be made in the December Newsletter and on the website.

Motion to accept the Secretary/Treasurer report by Vera P., seconded by Manuel B. Motion passed unanimously.

**6. Auditor's Statement, Mary A. Vetter**

Auditor's Statement was accepted unanimously; Mary V. was thanked for her review. Rob F. moved to accept the Auditor's Statement, seconded by Jen G. Report accepted.

**7. Newsletter Editor's report, Florin Pendea**

Anna P. read CAP Newsletter Editor Florin Pendea's report *in absentia.* The report highlights the content of the last two Newsletters and reminds members that contributions for the December issue will be accepted until November 15, 2018.

Vera P. thanked Florin P. for doing such a fantastic job on editing and distributing all CAP Newsletters on time.

Manuel B. accepted to provide a brief summary of the 51st Annual Meeting of AASP-The Palynological Society joint with CAP (Calgary, AB), with picture(s) provided by Kim B, for the next issue of the Newsletter.

Motion to accept the Newsletter Editor's report by Manuel B., seconded by Vera P. Motion passed unanimously.

**8. Website Editor's report, Manuel Bringué**

Manuel B. reported steady views of the CAP website and slightly increased traffic in February, likely in preparation for the CAP Student Award which deadline is on March 1st of each year. Most views are from Canada but the website is also accessed from abroad, in particular from the US, UK, and India. Manuel B. encouraged members to contribute with pictures of palynomorphs and opportunities to populate the 'Opportunities' page.

Jen G. suggested to add a link to the Geological Survey of Canada's palynology lab (Jen G. and Manuel B.).

The 'Opportunities' page was discussed and little relevance was found. Vera P. moved to delete the page from the website, seconded by Jen G. Motion passed.

It was pointed out that it would be best to indicate on Alwynne Beaudoin's old CAP website that it is not the current, active website for the association. Manuel agreed to contact Alwynne with that request.

Diana T. suggested to encourage donations more actively on the website. Kim B. proposed to suggest CAP membership and/or donations as Christmas gifts during the end-of-year season on the website. Manuel B. agreed to display such a message in December.

Sandy M. raised the issue of copyright when sharing a picture for the website. Manuel B. reassured that the names of the picture's author would be embedded before being displayed on the website, but the possibility of copyright infringement with illustrations also included in journal publications remains. While there is little concern over this, Vera P. suggested to simply submit a slightly different image.

**9. CAP Councillor to IFPS's report, Simon Goring**

Unfortunately, no report was provided and Simon G. could not be reached despite multiple attempts.

Vera P. suggested to nominate Francine McCarthy (present) for the role of CAP Councillor to IFPS, highlighting Francine's extended experience of CAP Executive duties and her ability to represent CAP at the next IFPS meeting that she will attend. Thus:

Manuel B. moved to nominate Francine McCarthy (present) as CAP Councillor to IFPS, seconded by Jen G. All present members were in favour and the motion was passed unanimously. Francine M. was welcomed back on the CAP Executive!

**10. Appointment of Auditor**

Members present suggested Sarah Finkelstein and Terri Lacourse as potential auditors for future reviews of CAP membership and financial statements.

Motion to appoint Sarah Finkelstein or Terri Lacourse as future auditors by Francine M., seconded by Rob F. Motion passed unanimously.

**11. Location for 2019 AGM**

The GAC-MAC Annual Meeting 2019 in Quebec City (May 13–15) was identified as a good venue to hold the next CAP Annual General Meeting, since it is likely to draw many CAP members, especially from the eastern part of the country, after several AGMs held in more western locations.

Motion to hold the 2019 CAP AGM at the GAC-MAC Annual Meeting 2019 by Francine M., seconded by Jen G. Motion passed unanimously.

**12. Priorities and goals**

The following points were discussed:

CAP President's suggestions to emend the CAP Student Award evaluation

scheme was well received and supported.

Anna P. volunteered to use Twitter to enhance CAP's visibility. Concerns were raised over unapproved content (pictures and text); permission should be sought before posting anything.

It was suggested to include pictures of the Executive on the website to make it more personable. Manuel B. will include such pictures, pending individual consent.

Contributions to the CAP Newsletter (pictures, biographies, etc.) were encouraged again.

**13. Other Business**

It was discussed whether the By-laws should be amended with limited term positions for members of the Executive, but the idea raised some concerns and no motion was put forth at this AGM. It was suggested that this point be discussed at the next AGM, possibly with more members of the Executive present.

**14. Adjournment**

Kim B. moved to adjourn the AGM, seconded by Anna P. Meeting adjourned at ~ 1:30 pm MDT.

## CAP President's Report

This is my first report as president of CAP since my mandate started on January 1 of this year. I would like to thank Vera and Jessie for having contributed to a smooth transition. The following consists of a brief report on CAP activities since the last AGM in Victoria, BC (October 10, 2017).

This year's CAP student research award attracted many excellent candidates. We received 7 applications, which is a good indication of interest from the young generation. The award consisted of $500 and a three-year membership. Although the evaluation committee was in unanimous agreement about this year's awardee, the difficulty of comparing students from different levels and the mandate of the award (weight attributed to academic excellence *versus* proposed use of funds and potential impact of the award on the student's academic course) were raised again this year. I suggest that the proposed use of funds and impact of the award on the student's project or training be worth 30% of the evaluation, while also keeping the respective weights of the Research Potential and Academic Excellence of the candidates relatively high (both 20%). I have attached the evaluation scheme to this report. I believe this evaluation scheme would allow the CAP award to have a mandate that is slightly different from other academic awards.

While the CAP research award attracted new student members, CAP memberships remain relatively low for this year (N=40). Improving this number will be a priority for the next year.

Finally, I would like to thank Vera, Manuel and Kimberley for organizing and chairing the CAP special session, and AASP-CAP joint conference. Five members of CAP planned to present their work during our session titled: *From land to sea - innovative research by Canadian palynologists*. I hope the presentations raised interesting discussions. I am looking forward to hearing feedback on the conference.

Respectfully submitted,
Audrey Limoges
CAP President
July 17, 2018

## CAP Secretary/Treasurer's Report

1. *Membership*

As of 21 July 2018, CAP has 40 members in good standing.

We would like to welcome our newest members Amanda Lagacé, Jeannine-Marie St. Jacques, and Nicholas Van Nieuwenhove.

Membership is steady since 2017, but our numbers are the lowest since 2005.

2. **Financial Report**
The 21 July 2018 balance in the CAP account is $6710.43 (vs. 7113.27 in 2017). This number reflects the withdrawal of two CAP student awards in one year (student was very late cashing the award cheque). The IFPS dues remain unpaid, as we have been unsuccessful contacting the treasurer to arrange payment.

We continue to run at a loss, especially given the increase in CAP student award value. However, we can continue for several years before our account drops below $5000. Monthly banking fees are waived when the balance remains above $5000.

The email transfers have been successful and we have not encountered any difficulties with this system of payment.

**Recommendations**
1. I suggest we allow some time for word to get out that we offer a high-value student award to improve our membership numbers.

2. There are still problems for our American and overseas members trying to pay fees. One member mailed a cheque from the US and it never arrived. I include this member in emails, although payment has not yet been received, until we can find a simpler method of payment. Several other members pay intermittently when they bump into our members at international conferences. We might want to consider PayPal for the foreign members. Bank fees for foreign currency are very high ($5 to cash a $10 cheque). PayPal would remove this expense and simplify registration.

Respectfully submitted,

Jessie Vincent
CAP Secretary-Treasurer
21 July 2018

**Financial Statement**
**(10 October 2017 – 21 July 2018)**

| | Income | Expenses | Balance |
|---|---|---|---|
| Opening Balance | | | 7163.27 |
| Memberships | $347.16 | | |
| Donation to CAP Student Award | $ 25.00 | | |
| CAP Student Awards 2017 ($300) and 2018 ($500) | | $800.00 | |
| Corporations Canada Filing fee 2018 | | $20.00 | |
| Bank fees for US cheques | | $5.00 | |
| Closing Balance | | | 6710.43 |

The balance includes a $25 donation to the student award and $130 worth of advance memberships.

Respectfully submitted by
Jessie Vincent
CAP Secretary – Treasurer
21 July 2018

**CAP Newsletter Editor's Report**

Since my last report, two issues of the CAP Newsletter have been produced. The December 2017 Newsletter (Vol. 40, No. 2) had 22 pages and was distributed to CAP members on December 29, 2017. Most notably, the December 2017 newsletter featured news about a new partnership between the Paleoclimatology and Climatology Lab (U Ottawa) and CAN GEO as well as a compte-rendu of the DINO11 conference in Bordeaux, France. As per CAP Bylaws, this issue also included minutes of the 2017 CAP Annual General Meeting held at the University of Victoria, BC.

The May 2018 Newsletter (Vol. 41, No. 1) was distributed to members on May 31st,

2018. It consisted of 20 pages and included a very interesting editorial by John Smol with advice for early career researchers. The President's Message and Members in the News sections brought up-to-date information to the Canadian palynological community. This issue also offered information on the 51st Joint Annual Meeting of AASP-CAP which will take place between August 5 and 10 in Calgary, Alta.

I would like to remind our members that our past Newsletters are available in electronic format on the CAP website. Contributions for the next issue of the Newsletter will be accepted until November 15, 2018
.
Respectfully submitted,
Florin Pendea
Orillia, July 17, 2018

## CAP Website Editor's Report

I am happy to report that CAP's website, now hosted by WordPress (capacp.wordpress.com), is doing well. The new site has maintained the association's online presence for its second year, with a total of 1390 views since the last report (October 2017 – July 11, 2018). Monthly views (Fig. 1) are typically above 100, with slightly increased traffic in February, most likely related to the CAP Student Research Award which deadline is on March 1 every year.

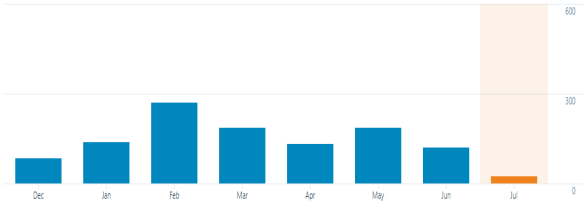


**Fig. 1.** Total monthly views (all pages combined) from December 2017 to July 11, 2018.

Most viewers accessed the site from Canada, but the site also attracted viewers from the US, UK, India and several other countries spread over all continents (Fig. 2). It is still unclear how many of those visits are from 'bots'.

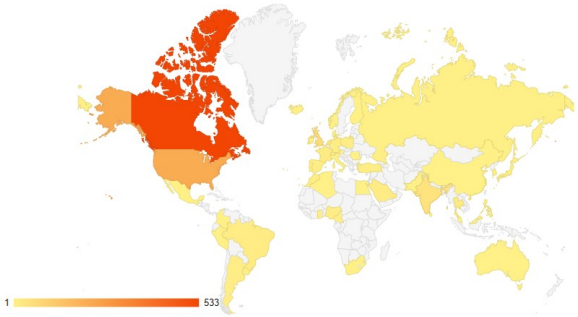


**Fig. 2.** Website views per country since January 2018. Out of a total of 1031 views, Canada had 533, the US 215, the UK 56, India had 41, and all other countries identified on the map had less than 16 views.

An 'Opportunities' page was created (under the 'Library and Resources' tab) as suggested by CAP members at the 2017 AGM in Victoria (BC), but the page was almost only populated by the few job opportunities that I became aware of through alerts from job search engines and my network. I strongly encourage members who are looking for students or contracts or are aware of hiring opportunities that may be of interest to the palynological community (as broadly defined as possible!) to contact me for posting on the website's Opportunities page.

I also invite members to send me some pictures of palynomorphs to help enhance the appearance of the website. As always, I welcome suggestions on ways to improve the content, outreach and look of the website!

Respectfully submitted,
Manuel Bringué
July 11, 2018

**CAP Auditor's Report**

21 July 2018

Jessie H. Vincent
CAP Secretary/Treasurer
81 Blake Street
Hamilton, ON L8M 2S7

Dear Jessie:
I have reviewed the annual return, financial statements, bank statements, dues payments and membership documents for the Canadian Association of Palynologists (CAP). These documents and the Secretary/ Treasurer's and Financial Reports provide a full and fair account of the financial affairs of CAP for the period from 10 October 2017 – 21 July 2018. I consider the financial affairs of CAP to be in good order.

Sincerely,
Mary A.Vetter
Professor Emerita

# Recent Publications

* denotes a CAP member


*Bringué, M., Thunell, R.C., *Pospelova, V., Pinckney, J.L., Romero, O. and Tappa, E.J. 2018. Physico-chemical and biological factors influencing dinoflagellate cyst production in the Cariaco Basin. *Biogeosciences*, 15(8):2325–2348.

Chapdelaine, C. and Richard, P.J.H. 2017. Middle and Late Paleoindian Adaptation to the Landscapes of Southeastern Québec, *PaleoAmerica*, 3 (4) : 299-312.

Dillon, J.S., Stolze, S., Larsen A.K. 2018 Late Pleistocene Pollen and Plant Macrofossils from a Buried Wetland Deposit in the Platte River Valley, South-Central Nebraska. *Great Plains Research* 28, 173-183.

Dranga, S, Hayles, S. and Gajewski, K. 2018. Synthesis of limnological data from lakes and ponds across Arctic and Boreal Canada. *Arctic Science* 4: 167-185 10.1139/AS-2017-0039.

Fréchette, B., Richard, P.J.H., Grondin, P., Lavoie, M. and Larouche, A.C. 2018. Histoire postglaciaire de la végétation et du climat des pessières et des sapinières de l'ouest du Québec. Gouvernement du Québec, ministère des Forêts, de la Faune et des Parcs, Direction de la recherche forestière, Mémoire de recherche forestière No 179, xvii+165 pages. Suppléments: 84 pages.

Fréchette, B., Richard, P.J.H., Grondin, P., Lavoie, M. and Larouche, A.C. (forthcoming) Histoire postglaciaire de la végétation et du climat des pessières et des sapinières de l'est du Québec. Gouvernement du Québec, ministère des Forêts, de la Faune et des Parcs, Direction de la recherche forestière, Mémoire de recherche forestière No xxx, xxx pages. Suppléments: xx pages.

Fréchette, B., Richard, P.J.H., Grondin, P., Lavoie, M. and Larouche, A.C. (forthcoming) Histoire postglaciaire de la végétation et du climat des érablières du Sud du Québec. Gouvernement du Québec, ministère des Forêts, de la Faune et des Parcs, Direction de la recherche forestière, Mémoire de recherche forestière No xxx, xxx pages. Suppléments: xx pages.

García-Moreiras, I., *Pospelova, V., García-Gil, S., Muñoz Sobrino, C. 2018. Climatic and anthropogenic impacts on the Ría de Vigo (NW Iberia) over the last two centuries: a high-resolution dinoflagellate cyst sedimentary record. *Palaeogeography, Palaeoclimatology*, *Palaeoecology*, 504:201-218.

Gurdebeke, P.R., *Pospelova, V., Mertens, K.N., Dallimore, A., Chana, J., Louwye, S. 2018. Diversity and distribution of dinoflag-

ellate cysts in surface sediments from fjords of western Vancouver Island (British Columbia, Canada). *Marine Micropaleontology*, 143:12-29.

Hodgkins, S.B., Richardson, C.J., Dommain, R., Wang, H., Glaser, P.H., Verbeke, B., Winkler, B.R., Cobb, A.R., Rich, V.I., Missilmani, M., Flanagan, N., Ho, M., Hoyt, A.M., Harvey, C.F., Vining, S.R., Hough, M.A., Moore, T.R., Richard, P.J.H., De La Cruz, F.B., Toufaily, J., Hamdan, R., Cooper W.T., and Chanton, J.P., 2018. Tropical peatland carbon storage linked to global latitudinal trends in peat recalcitrance. *Nature Communications*,

Lavoie, M. and Richard, P.J.H., 2017. The 8200-year vegetation history of an urban woodland as reconstructed from pollen and plant remains. *Botany*, 95: 163-172.

*Li., Z., *Pospelova, V., Lin, H.-L., Liu, L., Song, B., Gong, W. 2018. Seasonal dinoflagellate cyst production and terrestrial palynomorph deposition in the monsoon influenced South China Sea: A sediment trap study from the Southwest Taiwan waters. *Review of Palaeobotany and Palynology*. 257:117-139.

*McLachlan, S.M.S., *Pospelova, V., *Hebda, R.J. 2018. Dinoflagellate cysts from the upper Campanian (Upper Cretaceous) of Hornby Island, British Columbia (Canada), with implications for Nanaimo Group biostratigraphy and paleoenvironmental reconstructions. *Marine Micropaleontology*, 145:1-20.

Mertens, K.N., Carbonell-Moore, C., *Pospelova, V., *Head, M.J. 2018. *Ceratocorys mariaovidiorum* P. Salgado, S. Fraga, F. Rodríguez, P. Riobó & I. Bravo is a junior synonym of *Pentaplacodinium saltonense* K.N.Mertens, M.C. Carbonell-Moore, V. Pospelova & M.J. Head. *Notulae algarum*, 45:1-2. ISSN 2009-8987.

Mertens, K.N., Carbonell-Moore, C., *Pospelova, V., *Head, M.J., Highfield, A. Schroeder,D., Gu, G., Andree, K.B., Fernandez, M., Yamaguchi, A., Yoshihito, T., Matsuoka, K., Nézan, E., Bilien, G., Okolodkov, Y., Koike, K., Hoppenrath, M., Pfaff, M., Pitcher, G., Al-Muftah, A., *Rochon, A., Teen Lim, P., Pin Leaw, C., Fei Lim, Z., Ellegaard, M. 2018. *Pentaplacodinium saltonense* gen. et sp. nov. (Dinophyceae), and its relationship to the cyst-defined *Operculodinium psilatum* and the yessotoxin-producing *Protoceratium reticulatum*. *Harmful Algae*, 71:57-77.

Neil, K and Gajewski. K. 2018. A high-resolution paleolimnological study of climate and human impacts on Lac Noir, Québec over the past 1000 years. *Quaternary Research* doi:10.1017/qua.2018.99

Neil, K and Gajewski. K. 2018. An 11,000 year record of diatom community responses to climate and terrestrial vegetation changes, southwestern Quebec. *Ecosphere* 9 (11):e02505

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Ouellet, J.-C. and Richard, P.J.H., 2017. Un Archaïque ancien (8500 - 8000 ans AA) en Moyenne-Côte-Nord : l'apport des sites EbCx-65 et EbCx-66 en Minganie. Chapitre 1, pp. 15-56, *in* Burke, Adrian L. et Claude Chapdelaine, *L'Archaïque au Québec : six millénaires d'histoire amérindienne. Collection Paléo-Québec* no 36, Recherches amérindiennes au Québec, Montréal, 335 pages.

Richard, P.J.H., 2016. *Le Grand Témoin ou La genèse du paysage laurentien*, Épilogue, pp. 278-291, *in* : Balac A.-M. *et al*., « *Lumières sous la ville – Quand l'archéologie raconte Montréal* » sous la direction d'Éric Chalifoux, Recherches amérindiennes au Québec, éditeur. 300 pages.

# Conference Report

## ON THE 51ST ANNUAL MEETING OF AASP-THE PALYNOLOGICAL SOCIETY AND ANNUAL GENERAL MEETING OF THE CANADIAN ASSOCIATION OF PALYNOLOGISTS (CAP)

Calgary, AB, Canada

**by Kimberley Bell and Manuel Bringué**

The 2018 annual meetings of AASP – The Palynological Society and CAP were held jointly at the Marriott Hotel, downtown Calgary August 5-10, 2018. The two palynological associations, representing a wide diversity of participants, successfully joined forces for a conference that was marked by fascinating keynote presentations, two highly anticipated field trips, technical sessions of state-of-the-art research presentations and poignant homages to palynological personalities.

Forty participants from nine countries registered for the meeting and represented highly diverse cultural and professional backgrounds, including academia, industry and government agencies. Our hosts were Kimberley Bell (Geological Survey of Canada) and Thomas Demchuk (RPS Group). The meeting was blessed with beautiful weather under Calgary's bright blue sky, up until the last few days when smoke from wildfires raging in British Columbia somewhat clouded the views. Participants enjoyed excellent catering for breakfast, coffee breaks, the ice-breaker, and the poster session, while many conveniently located restaurants provided excellent opportunities to meet with acquaintances – old and new – over lunch or dinner and to discover the surroundings over informal gatherings.

On Sunday, the pre-meeting field trip to the

*Behind the Scenes Tour of the preparation lab at the Royal Tyrrell Museum (photo by Stephen Stukins)*

**Alberta Badlands and Royal Tyrrell Museum** (Drumheller, AB) kicked off the meeting. Participants spent the morning at the Royal Tyrrell Museum of Paleontology where they first enjoyed an informative Behind the Scenes Tour, led by Lorna O'Brien (head technician), followed by time to explore the extensive public galleries. The amount of unprepared and prepared fossil material that the group observed behind-the-scenes was staggering!

*Behind the Scenes Tour of unprepared fossil collection storage, Royal Tyrrell Museum (photo by Stephen Stukins).*

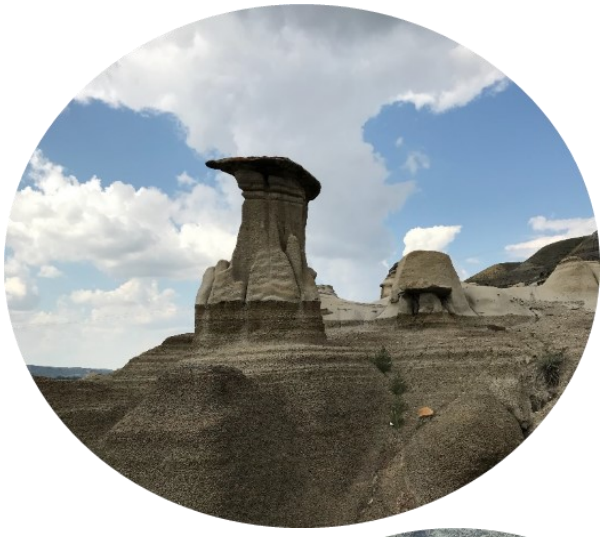
A BBQ lunch was provided at the quaint Last Chance Saloon, in Wayne, giving participants a flavour of small town Alberta and its coal mining history. Dennis Braman joined the group after lunch and shared his extensive knowledge on the stratigraphy and palynology of the Upper Cretaceous succession exposed in the Drumheller area of the Alberta Badlands. With Dennis' guidance, the group explored the upper Cretaceous marine Bearpaw Formation and overlying estuarine to nonmarine Horseshoe Canyon Formation at Willow Creek, and the upper Horseshoe Canyon Formation, Battle Formation, and lower Scollard Formation at Horseshoe Canyon. The pre-meeting field trip arrived back in Calgary in time for the Outgoing board meeting, held in the private dining room at One18 Empire restaurant at the Marriott Hotel.

*Delegates on the rooftop patio at the Marriott Hotel (photo provided by Julia Gravendyck).*

Technical sessions kicked off on Monday, August 6 with a **Special Session in Honour of Leonard (Len) V. Hills and Arthur (Art) R. Sweet on Western Canadian Palynology and the Cretaceous/ Paleogene Western Interior of North America**. These two palynologists touched many lives and Thomas Demchuk's homage resonated deeply with the audience, especially with two family members of the late Art Sweet in attendance. The technical session kicked off with a fascinating Keynote by Dennis Braman (Royal Tyrrell Museum) on *Late Cretaceous palynomorph*

*Top: Group enjoying the pre-meeting field trip at the Willow Creek Hoodoos. Middle: Group at Horseshoe Canyon (from left to right), top row: Graeme Martin, Alex Cullum, Iain Price, Rob Fensome, Gunn Mangerud, Stephen Stukins, Jennifer Cooling, Wei-Ming Wang, Julia Gravendyck, Dennis Braman; middle row: Joyce Lucas-Clark, Daniel Michoux, Jun-Wu Shu; bottom row: Kimberley Bell and Gilda Lopes.*

*biostratigraphy of the Western Interior Basin with emphasis on southern Alberta and Montana*. The afternoon consisted of several talks as part the **General Palynology Session**, transporting the audience to different countries (e.g., Norway and its islands, North-central US, NW Australia) over different time intervals, and also included some interesting, new imaging techniques. The day concluded with the icebreaker on the Marriott's roof top patio, where drinks (including tasty local beer and spirits) and many delicious appetizers and desserts were enjoyed under the sunny skies.



*Willow Creek Hoodoos displaying sharp contact between the marine Bearpaw Formation and overlying estuarine to non-marine Horseshoe Canyon Formation.*

*Examples of Burgess Shale fossils (from left to right): Olenoides serratus, Anomalocaris canadensis (fragment), hyolithids, and sponges. Photos by Stephen Stukins and Kimberley Bell.*

The second day of the technical session (Tuesday, August 7) started with the **CAP Special Session: From Land to Sea - Innovative Research by Canadian Palynologists**, which discussed topics such as non-pollen palynomorphs at high latitudes, sediment trap studies and freshwater dinoflagellates, and concluded with a brilliant Keynote presentation by Rob Fensome (Geologic Survey of Canada) entitled *On the edge: almost 50 years of Mesozoic–Cenozoic palynology in eastern Canada*. The CAP Annual General Meeting took place during lunch at the One18 Empire (Marriott);

*Members present at the 2018 CAP Annual General Meeting: From left to right: Manuel Bringué, Rob Fensome, Jen Galloway, Francine McCarthy, Thomas Demchuk, Kimberley Bell, Diana Tirlea, Anna Pieńkowski, Vera Pospelova and Sandy McLachlan.*

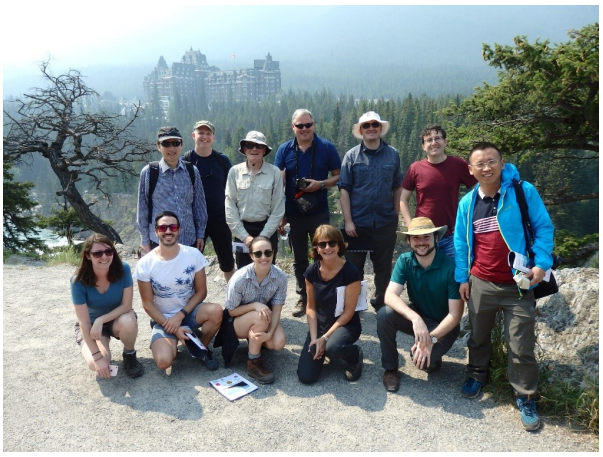
*Martin Farley and Gunn Mangerud present Alexander Wheeler with the L.R. Wilson Award for*

Presentations from the General Palynology Sessions ensued in the afternoon, tackling key palynological disciplines such as taxonomy and biostratigraphy, with some 'industry flavours'. All participants were delighted to see David Batten awarded the AASP Medal of Scientific Excellence, as a recognition for his immense contribution to palynology throughout his prolific career; David's daughter, Sarah McNair, travelled from Vancouver (British Columbia) to accept the Medal on her father's behalf. The Poster reception – also accompanied by a bar and food service – concluded the presentations for the day. Participants then gathered for the Business & Beer Bash at the Last Best Brewing & Distilling, downtown Calgary, which took the place of the traditional Business Luncheon. On the morning of the third and last day of presentations (Wednesday, August 8), the General Palynology Session was marked by the absence of past AASP President Lanny Fisk, who passed away days

*Sarah McNair accepts the AASP Medal of Scientific Excellence on behalf of her father,*

*David Batten.*

before the conference. In lieu of his scheduled presentation, Thomas Demchuk and Joyce Lucas-Clark gave a touching tribute highlighting Lanny's prolific career, his passion for palynology and his contagious joie de vivre. Last but not the least, the **Theme session: Applications of palynology to environmental science** concluded the scientific presentations with talks covering a wide variety of topics, from melissopalynology to environmental tracers of anthropogenic impacts, through paleoecology. Additionally, Stephen Louwye made a presentation advertising the 52nd AASP meeting in Ghent, Belgium, July 1-3, 2019. Before the meeting



*Views of the iconic Banff Spring Hotel from viewpoint located just (stratigraphically) below the P-T boundary. Back row (from left to right): Wei-Ming Wang, Alex Cullum, Daniel Michoux, Iain Prince, Stephen Stukins, Manuel Casas-Gallego, Jun-Wu Shu; front row (from left to right): Kimberley Bell, Manuel Vieira, Vera Korasidis, Gunn Mangerud, Chad Morgan (photo provided by Stephen Stukins).*

officially closed, the AASP Awards Committee, chaired by Martin Farley, announced Alexander Wheeler as the recipient of the **L.R. Wilson Best Student Presentation Award** for his outstanding presentation on the *Palynology and palynofacies of the Late Permian Galilee Basin: Implications for the end-Permian palaeoenvironment* – Congratulations, Alex! The AASP-The Palynological Society Incoming Board Meeting took place during the late afternoon and early evening, after the conclusion of the technical session.

To top off an already outstanding meeting, a group of thirteen adventurers embarked on a two day (Thursday, August 9 and Friday, August 10) post-meeting field trip to the **Canadian Rocky Mountains and world-famous Burgess Shale at the Walcott Quarry** near Field, British Columbia. Chad Morgan, a PhD candidate from the University of Calgary, generously shared his expertise on Paleozoic (especially Cambrian) stratigraphy and paleontology as field trip co-leader. The first day of the excursion covered a transect from the plains, through the foothills and front ranges, ending in the main ranges of the Canadian Rocky Mountains. Strata, fossils (palynomorphs, trace fossils, sponge spicules, stromatoporoids and Burgess Shale fossil *Margaretia dorus*, to name a few) and structures, ranging in age from the Cretaceous through Proterozoic were explored en route, and helped set the scene for the next day. The modern flora and fauna were also a major point of interest, with the Rocky Mountain Big Horned Sheep proving a major highlight. After a notably hot (highest ever recorded temperature in Calgary) and smoky first day, the group enjoyed a special

*Rocky Mountain Bighorn Sheep – Ovis canadensis in Banff National Park (photo by Steve Stukins)*

menu and relaxing evening at Truffle Pigs Lodge in Field, BC, in preparation for the next day's strenuous hike up to the Walcott Quarry.

*Adventurous group on the final ascent to the Walcott Quarry, Mount Field, Yoho National Park.*

The heat and smoke stuck around for the second day of the post-meeting excursion, but did not deter this determined bunch, who hiked the 22 km round trip with 825 m elevation gain to the world famous Walcott Quarry without a single complaint! David, a most excellent guide from the Burgess Shale Geoscience Foundation, who delighted the group with an interesting and very informative narrative, accompanied us to this UNESCO World Heritage Site. These 508 million year old fossils of soft-bodies marine animals, known for their exquisite preservation, proved every bit as amazing as expected! Participants left commenting about the high quality of the technical sessions, intimate atmosphere of the meeting, fun social events, and superb field trips. See you at the next meeting in Ghent, Belgium!

*Surrounded by world famous Burgess Shale fossils at the Walcott Quarry. Back row (from left to right): Alex Cullum, Stephen Stukins, Wei-Ming Wang, Darcy Bell, Manuel Casas-Gallego, Manuel Vieira, Chad Morgan, Daniel Michoux; front row (from left to right): Jun-Wu Shu, Gunn Mangerud, Kimberley Bell, Vera Korasidis (photo provided by Stephen Stukins).*

# Dissertations

**Doctoral thesis:**

**Environmental Change and Population History of North America from the Late Pleistocene to the Anthropocene**

**Michelle A. Chaput**
University of Ottawa, Department of Geography, Environment and Geomatics
Supervisor: Dr. Konrad Gajewski

**Abstract:** The assumption that prehistoric Native American land use practices had little impact on the North American landscape persists in the literature. However, recent research suggests the effects of prehistoric burning, deforestation and agriculture may potentially have been greater than previously considered. To resolve this discrepancy, quantitative estimates of changes in human population size and forest structure and composition over the course of the Holocene are needed. This thesis addresses this need by providing radiocarbon-based paleodemographic reconstructions and pollen-inferred estimates of vegetation change, as well as analyses of associations between the two at both continental and regional scales, from the late Pleistocene to the Anthropocene.

One way to estimate paleodemographic change is to use the number of radiocarbon (14C) dates from a given area to study patterns of human occupation through time. A review of the literature and compilation of existing databases relevant to this method showed there is now sufficient data to study the paleodemographic history of many regions around the world. An analysis of 14C datasets from North America and Australia compared well with model-based reconstructions of past demographic growth, and provided higher frequency fluctuations in population densities that will be important for future research. Using a kernel density estimation approach, the first estimates of prehistoric population density for North America were obtained and synthesized into a series of continental-scale maps showing the distribution and frequency of 14C dates in the Canadian Archaeological Radiocarbon Database (CARD). The maps illustrated the space-time evolution of population and migration patterns, which were corroborated by independent sources of evidence. A methodology based on the statistical evaluation of cross-correlations between population and plant abundance was then developed to analyze the associations between these population estimates and plant communities derived from pollen databases. Periods of high spatial cross-correlation (positive and negative) between population and plant abundance were irregular and did not improve over time, suggesting that ancient human impacts are not discernable at a continental scale, either due to low populations or varying human land use practices.

To further examine the relationship between pollen data and human land use at a regional scale, estimates of plant density and landscape openness are needed. The REVEALS (Regional Estimates of VEgetation Abundance from Large Sites) model corrects for the non-linear relationship between pollen production and plant abundance and can therefore be used to map histories of land use and land cover change. The model was applied to pollen records from lake sediments in the deciduous forest of southeastern Quebec. A preliminary analysis comparing these results to population density revealed low population during times of high Populus abundance and high population following the appearance of the mixed temper-

ate forest suggesting a discernable human-environment association at regional scales.

Overall, the results of thesis support the growing body of literature that suggests prehistoric Native Americans impacted their environments and that these impacts can be detected and quantified by integrating archaeological and paleoecological information. However, the timing, location, and intensity of human land use has changed in both space and time, suggesting regional- to local-scale analyses of human-environment interactions are most appropriate for continental North America. The methodology presented here can be used to study additional North American regions for the purpose of developing a continental history of human-environment interaction.

The thesis is available at: https://ruor.uottawa.ca/handle/10393/38082

**Doctoral thesis:**

**Ecosystem Responses to Holocene Climate Variability Through the Analysis of High-resolution Lake Sediment Cores from Southwestern Québec, Canada**

**Karen Neil**
University of Ottawa, Department of Geography, Environment and Geomatics
Supervisor: Dr. Konrad Gajewski

**Abstract:** Lake biotic responses to natural climate variability, fire disturbances, and human impacts over the Holocene were studied at two proximate sites in southwestern Québec. Sediments from Lac Noir and Lac Brûlé had annually deposited laminations (varves), enabling for the precise dating of continuous time-series and high-resolution analysis of subfossil diatom assemblages. The Lac Noir (45°46'31"N, 75° 8'23"W, 176 m a.s.l.) record spanned ~11000 years of the Holocene. Stratigraphic changes in diatom assemblages of the lake could be divided into early, mid-, and late periods, broadly paralleling Milankovitch-scale climate intervals and vegetation changes inferred from regional palynological records. The early Holocene (11.1-8.0 ka) climate was cooler and dry, vegetation in the region was comprised of Picea-dominated woodlands, and the lake diatom flora included primarily benthic taxa. Warming in the mid-Holocene (8.0-3.6 ka) allowed for stabilization of soils and forests in the catchment, stronger thermal stratification in the lake, and resultant increases in oligo-mesotrophic diatom taxa such as *Discostella stelligera.* During the late Holocene (3.6 ka to present), an increase in the abundance of deciduous trees (e.g. *Betula* and *Alnus*) in response to cooling led to nutrient-enrichment and higher overall lake productivity. The record from Lac Brûlé (45°43'09"N, 75°26'32"W, 270 m a.s.l.) encompassed the last ~1200 years of the late Holocene. Generalized additive models (GAM) revealed a tight coupling between diatoms and catchment-mediated processes (e.g. vegetation and disturbances), which were closely aligned with climate variations. During the Medieval Warm Period (800-1300 CE), pollen-based inferences of warmer summer temperatures were associated with high abundances of *Cyclotella bodanica var. intermedia* and *Cyclotella rossii*; this signalled oligotrophic lake conditions and prolonged thermal stratification. The onset of the Little Ice Age (1450-1850 CE) marked a cooling in the region, and a decline in *Tabellaria flocculosa* str. IIIp indicated increased nutrient loading from the catchment area. Situated less than 300m from Lac Brûlé are remnants of the Wallingford-Back Mine, which ran from 1924-1972 CE; activities at the mine resulted in local changes to nutrient availability and primary productivity at this site. In previous studies of both Lac Noir and Lac Brûlé, pollen records had indicated overall similarities in the vegetation histories in response to climate variability during the late Holocene. Diatom assemblages were influenced by individual lake conditions and were thus unique to each site; nevertheless, they were closely linked with local

and regional patterns of vegetation composition. A main point of difference in the paleorecords from both lakes was attributed to a local fire in the Lac Brûlé catchment at 1345 CE, which caused an early decline in hemlock (Tsuga). The decrease in hemlock was seen at Lac Noir only centuries later, and diatoms in each lake responded according to vegetation changes within their own respective catchments. This research shows that high-resolution sampling of lake sediments is able to detect diatom responses to both long-term and abrupt changes in the environment. Individual sites show similarly timed responses of other proxy-indicators, such as pollen and cladocera, to climate and land-use changes. However, distinct differences in the aquatic biota of well-dated proximate sites can be used to identify influences of regional climate variations, which are sometimes masked by localized, non-climatic processes. The thesis is available at: https://ruor.uottawa.ca/handle/10393/38120

**Masters of Science Thesis:**

**The Impact of the 1989 Exxon Valdez Oil Spill on Phytoplankton as Seen Through the Dinoflagellate Cyst Record.**

**Maximilien Genest**
University of Victoria, SEOS
Supervisor: Dr. Vera Pospelova

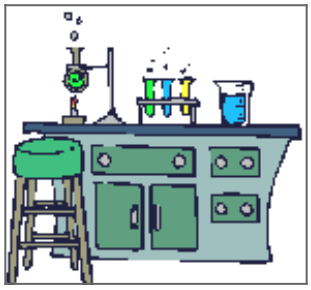
**Abstract:** Our knowledge of how oil spills affect coastal environments is severely limited by the shortage of research that addresses the impact of these events on phytoplankton, the single most important group of organisms in the marine ecosystem. This scarcity of knowledge is mainly attributed to the absence of baseline data, preventing the comparison of pre- and post-spill populations. This unique study aims to identify how dinoflagellates and diatoms, the two major groups of phytoplankton in coastal marine environments, have been affected by the 1989 Exxon Valdez oil spill in Prince William Sound (PWS), Alaska.

To do this, sedimentary records of dinoflagellate cysts, produced during a dinoflagellate's life cycle and preserved in the sediment, and biogenic silica, a proxy for diatom abundance, were analyzed prior to, during and after the oil spill. The analysis of two well-dated cores in PWS reveals marked increases during the oil spill in the concentrations of total cysts of the species *Operculodinium centrocarpum* sensu Wall and Dale, (1966) and *Dubridinium* spp. *Dubridinium* spp. showed a five and sevenfold increase in concentrations in cores P-10 and P-12, respectively, while *O. centrocarpum* sensu Wall and Dale (1966) doubled in concentrations in the two cores. Biogenic silica values did not show significant changes throughout the cores. The dinoflagellate cyst signals seen in this study are comparable to those seen as a result of nutrient enrichment in estuarine systems, suggesting that the 1989 Exxon Valdez oil spill and its remediation had a stimulatory effect on some taxa of cyst producing dinoflagellates. The lack of change in diatom abundance, on the other hand, suggests that diatom abundance remained relatively constant during the entirety of the sample period.

# PALYNFO

**New Lab at UNB**

I am thrilled to announce that a new CFI-funded laboratory just opened at University of New Brunswick, Fredericton. The *Past Primary production and Environmental Reconstruction* (PaPER) lab is equipped with state-of-the-art equipment for the extraction of biogenic proxies (e.g. dinoflagellate cysts, diatoms, foraminifers, etc.) from the sediment and a cutting-edge microscopy room for advanced microfossil observations. We accept external contracts!
Email: alimoges@unb.ca



# LAB NEWS

## The Laboratory for Paleoclimatology and Climatology (University of Ottawa)

### LPC Anniversary Open House

The joint meeting of the Canadian and American Quaternary Associations (CANQUA/AMQUA 2018) was held in Ottawa at Carleton University from August 7th to 11th 2018. This meeting was a tremendous success. Quaternarists from multiple world regions came together to discuss the advancement of important research topics ranging from island biogeography to wildfires, paleoenvironmental modelling, and societal issues. Field trip participants enjoyed the chance to visit unique geological formations in the National Capital Region and those who attended the banquet had the opportunity to hear some insightful stories from the conference organizers and award winners. All in all, a great time was had by all those in attendance.

This meeting coincided with the 25th anniversary of the Laboratory for Paleoclimatology and Climatology (LPC) at the University of Ottawa. Established by Dr. Konrad Gajewski, the LPC has been a keystone in the Department of Geography, Environment and Geomatics, and has been like a second home to dozens of undergraduate, graduate students and postdocs with a passion for Quaternary Science.

An anniversary celebration took place on August 9th, 2018, in the form of an open house. Guests, many of whom were past students excited about showing their old work spaces to friends and family, were invited to walk through the rooms of the LPC. This sparked discussions of comparisons between the original lab facilities and the rooms and resources that make up the LPC today. Twenty-five years ago, the LPC began in an un-used seminar room in the basement of Simard Hall with a microscope, a refrigerator, a desktop computer, and space for roughly 4 students.

Today, LPC members are proud to work in a space occupying a larger part of the lower level of Simard Hall, with a large networked computer lab / student office for 10-15 people, three state-of-the-art microscopes in the microfossil lab, a macrofossil room with stereoscopes and a herbarium, a tree ring analysis room, and facilities for networking and collaboration. The LPC shares a wet lab for processing and a sedimentology lab with other members of the department and access to a walk-in cooler/freezer of the Cryloab for Arctic, Antarctic and Planetary Studies. There is an extensive library of texts and reference material for microfossil identification, especially for Arctic pollen. There is also an legacy paper reprint collection of the older literature, based on the late Jim Ritchie's and Gajewski's reprint collection.

Over the years, the LPC has welcomed visiting researchers from various

countries, international students, representatives from various scientific institutions and organizations and trained over 50 graduate and undergraduate students. Research in the LPC has revolved around important areas of study including the spatial analysis of climate and paleoclimate data, vegetation modelling, analyses of past populations using archaeological databases, high-resolution paleoenvironmental reconstructions, and the impacts of climate change in the North. Long-standing field programs have produced many paleoenvironmental records, especially from northern Canada. The LPC was a pioneer in open access, and the lab webpage (which dates to the mid 1990s) contains the data produced by the students and staff of the lab. Important contributions have been made to top-ranking journals including *Science*, *PNAS*, *Quaternary Science Reviews, Quaternary Research, JGR,* and *Climate Dynamics*. Members of the LPC have also earned several awards in the Quaternary sciences including the Natural Sciences and Engineering Research Council of Canada award for post-graduates, AMQUA's Denise Gaudreau award, CAP's student research award, and Gajewski has been the recipient of the Faculty of Arts Professor of the Year award.

Gajewski would like to take this opportunity to thank everyone, including students, faculty, staff and friends, who have played a part in making the LPC the special place that it is today. The organizers of anniversary party would also like to extend their thanks to all those who attended – it was a pleasure to see you all and hear your stories about your time at the LPC and share our facilities with visitors.

For more information on the LPC, you are invited to visit www.lpc.uottawa.ca or email Dr. Gajewski at gajewski@uottawa.ca.


*Many of the guests at the anniversary party were past students or postdocs who completed their graduate thesis or undergraduate honours project in the LPC.*

# 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 $10 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. To join, please fill out the membership form, by hand or in Adobe Reader®, and send it with a cheque (drawn on a Canadian or US bank) or money order payable to CAP to:

Dr. Jessie Holst Vincent, CAP Secretary-Treasurer, c/o Prof. Francine McCarthy,
Dept. of Earth Sciences, Brock University, St Catharines, ON, L2S 3A1, CANADA

Name: _____

Affiliation: _____

Address: _____

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Tel: _____ FAX: _____

E-mail: _____

Web page URL: _____

Research interests: _____

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New membership ☐ Renewal ☐ Amount enclosed: _____

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" in the CAP World Wide Web page? 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 ☐