Canadian Association of Palynologists
Association Canadienne des Palynologues

NEWSLETTER

Volume 23 Number 2 December 2000

Season's Greetings!

President's Message

It was very nice indeed to meet many of you in Calgary earlier this year at Canada's millennial geoscience event, GeoCanada 2000. CAP sponsored a well-attended symposium at this conference, entitled "Palynology and Micropaleontology in Canadian Geoscience: New Frontiers and Applications", convened by Alwynne Beaudoin and myself. Palynology was well represented during the two half days (and poster space) allocated to us, with presentations ranging from Paleocene to the present day and covering marine and terrestrial realms. However we also had contributions on all the other major microfossil groups, and this gave a balanced perspective on the many varied activities being pursued currently on microfossils in Canada. It would have been a pity not to capture some lasting record of the symposium, and I am pleased to say that Elsevier have agreed in principle to publish a special issue of Palaeo-3 focussed loosely around it.

CAP held its Annual General Meeting during GeoCanada 2000 and it is a pleasure to thank the GeoCanada 2000 organizing committee for granting facilities at no cost to CAP. Attendance was predictably low because of a competing social event, a jazz night that was apparently well attended by palynologists.

CAP EXECUTIVE 2000-2001

Martin Head	President
Alwynne Beaudoin	President-Elect
Francine McCarthy	Secretary/Treasurer
Alwynne Beaudoin	Website Editor
Mary Vetter	Newsletter Editor
Gail Chmura	Retiring CAP Councillor to IFPS
Rolf Mathewes	New CAP Councillor to IFPS

Low attendance at our AGMs could suggest a decline in CAP's long-term prospects. But I am convinced it is a mistake to draw such conclusions. CAP has always been primarily a newsletter organization, and it continues to draw the Canadian palynological community together by means of an excellent newsletter and website, at very little cost to its members. CAP still has the critical mass behind it to sponsor successful international symposia, and CAP continues to maintain an international presence though its membership with the IFPS. Nevertheless, one must consider the pros and cons of linking up with a larger national society. At the recent AGM, discussions on this theme identified several possible larger societies to which CAP might consider affiliating. CANQUA represents the interests of Quaternary geoscientists in Canada and already has a probably growing palynological contingent. But pre-Quaternary palynologists would gain little or nothing from such a liaison. The reverse is true of affiliation with the Canadian Society of Petroleum Geologists. Perhaps affiliation with the Paleontology Division of the Geological Association of Canada would strike a more reasonable balance. The Division has an affiliates program whose goal is to promote interaction between Division members and the

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paleontologically-interested public, to communicate common concerns, and promote volunteer work. More about the Paleontology Division can be found at: http://iago.stfx.ca/people/paleodiv/pd.html. Such an affiliation would I suppose increase CAP's exposure within the Canadian geoscience community (notably GAC), although again I have to wonder what would be the benefit to CAP's strong Quaternary contingent. Before any decisions are made, it is important to get feedback from the CAP membership. Do please email me with your thoughts.

I feel it is important that CAP does not lose its autonomy and that it continues to serve Canadian palynology through it's newsletter and website. Mary Vetter and Alwynne Beaudoin work hard throughout the year to make this happen, and they deserve our praise, as does Francine who toils away in the background to keep our books in order, Gail who is our voice in IFPS matters, and past-President Rob Fensome who continues to facilitate CAP from behind the scenes.

CAP's next AGM is at the Geological Association of Canada, Annual Meeting in St. John's, Newfoundland, next May. I hope to see many of you there.

Martin J Head
CAP President
mh300@hermes.cam.ac.uk

Editor's Notes

As I write this it is a 'typical' Regina winter day: clear and cold (-30°). But thoughts of spring will be awakened by two of the essays that have been contributed to this newsletter, one on bees and honey, and the other on gardening for bees. Special thanks to Vaughn Bryant and Jim Cane for reminding us that there is life after winter!

Alwynne Beaudoin always plays a large part in the contribution of ideas and materials for the newsletter, and this issue is no exception. In addition to writing a report on the CAP-sponsored symposium and the GeoCanada 2000 meetings, she sent an essay on macrofossils that generated so much interest as a response to an e-mail enquiry that she kindly agreed to contribute it to the newsletter. Many, many thanks, Alwynne.

This is the second issue in which we feature a lab report from a CAP member. Special thanks to Konrad Gajewski for contributing this article. The purpose of this new section is to get a glimpse of the research projects that our members are involved in, and the capabilities and special expertise of their labs. Please let me know if you could volunteer such a write-up for the next CAP newsletter. Ideally, we would have one or two of these articles in each newsletter, thus rotating through the membership.

The December newsletter often highlights reports from the meetings that were held over the summer, and this issue is no exception. Special thanks to Dennis Braman, Francine McCarthy, Marianne Douglas and Sue Wilson, and Alwynne Beaudoin for those reports.

In the News section, the National Lacustrine Core Repository (LacCore) at the University of Minnesota is extensively described in an article sent by CAP member Linda Shane. Thank you, Linda, for contributing this article. Thank you to Matthew Boyd, for the contribution of the thesis abstract, to Martin Head for the President's Message, to Francine McCarthy for the Secretary/Treasurer's Report, and to the many others who sent in recent publications citations. Last, but certainly not least, thank you to Rob Fensome and Nellie Koziel for printing and mailing the newsletter. Once again I have been impressed by the commitment and interest shown by so many of you in contributing materials. It seems to me that is an important indicator of the continuing viability of an organization such as CAP. May you each have a blessed and relaxing holiday break!

Mary Vetter
Newsletter Editor
mary.vetter@uregina.ca

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FROM THE BUREAUCRAT'S DESK

NEW IFPS COUNCILLOR

Dr. Rolf Mathewes, Department of Biological Sciences, Simon Fraser University, has graciously agreed to serve as CAP's new councillor to IFPS. Thank you very much, Rolf, for taking on this task!

THANK YOU!

A special thank you is sent to Gail Chmura for her past service as IFPS Councillor, and for mailing the December issue of Palynos! Also thank you to Victor Pospelova (CAP member Vera Pospelova's son) for assisting with the mailing of the Palynos newsletter!

ADDRESS CHANGES

Dr. Jean Nicholas Haas
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Jean-Nicolas.Haas@uibk.ac.at

Dr. Michelle Garneau
Balanced Environments Associates
5034 Leitrim Road
Carlsbad Springs, Ontario K0A 1K0

On behalf of CAP, it is a pleasure to welcome Christina Whittmire (University of Regina) as a new member.

Dues Due

If your name appears below, here is a gentle reminder that **your membership subscription became due at the start of 2000**: B. Cumming, S. Douglas, J. Haas, L. Shane, and G. Williams.

If your name appears below, your dues will become due at the **beginning of 2001:** D. Batten, A. Beaudoin, J. Bourgeois, G. Chmura, C. Chinnappa, R. Clarke, M. Dalzell, T. Demchuk, F. dos Santos, J. Fernandes, J. Ford, M. Garneau, K. Gostlin, B. Han, J. Hopkins, R. Kalgutkar, E. Koppelhus, H. Kurita, I. Larocque, J. Legault, J. Macpherson, J. McAndrews, F. McCarthy, C. Morgan, M. Pellatt, P. Richard, J. Ross, W. Sarjeant, J. Smol, R. Stancliffe, S. Tiffin, A. Traverse, B. Van Helden, C. Yansa, S. Yazvenko, and University of Toronto Serials (2). **Thank you!**

Dues Payment

Please note that CAP membership dues are CDN $10 per year, payable annually or up to three years in advance. Please make cheques payable to "CAP". Following a reminder notice, lapsed members are removed from the CAP mailing list after one year. See also the Membership Form on p. 38. Funds should be sent to:

Francine M. G. McCarthy
CAP Secretary/Treasurer
Department of Earth Sciences, Brock University
St. Catharines, Ontario, L2S 3A1, Canada
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CAP 2001 Annual General Meeting
at the GAC/MAC Joint Annual Meeting
May 27 – 30 2001, St John's, Newfoundland

CANADIAN ASSOCIATION OF PALYNOLOGISTS ANNUAL GENERAL MEETING MINUTES

6:00 p.m., June 1, 2000
Scotia Bank Room, Rozsa Centre
University of Calgary, Calgary, AB

Present: M. Head, F. McCarthy, A. Beaudoin, E. Lesac, P. Mudie, C. Sharma, M. Gipp, M. Vetter.

Circulation, discussion, and approval of the minutes of the last AGM, October 28, 1999: F. McCarthy summarized the minutes and noted that the main item of discussion at that meeting was the future of CAP. Since only a few members of CAP were present at that meeting, the matter was referred to this meeting for discussion. It was noted that our membership fees do not cover all of our costs. Rob Fensome, past president and currently responsible for mailing the newsletter, suggested by e-mail that perhaps we should have a membership fee that at least covers our costs and pays for the newsletter production and mailing. Currently newsletter production costs are covered by Luther College at the University of Regina (M. Vetter), while mailing costs (maintenance of the mailing database, photocopying of the newsletter, postage, and envelopes) are covered by the Geological Survey of Canada-Atlantic (R. Fensome). This item was discussed further under the Secretary-Treasurer's report. Approval of the minutes was moved and seconded by M. Head and A. Beaudoin.

President's Report: M. Head welcomed everyone in attendance, and referred to his President's Message in the May, 2000, newsletter. He thanked F. McCarthy for all of her work in putting together the materials for the meeting and for her continuing fine work in the Secretary-Treasurer position, A. Beaudoin for her continuing work in producing an excellent website, and M. Vetter for the newsletter production. The major CAP activity M. Head has been involved in since becoming CAP President is to serve, with A. Beaudoin, as co-convenor of the CAP symposium at the GeoScience 2000 meeting here in Calgary. This symposium has been a great success in integrating aspects of geoscience traditionally kept separate.

Secretary-Treasurer's Report:
i) Membership Report: As of May 30, 2000 CAP had a total of 52 members in good standing. This number is probably slightly low, especially since the meeting is held earlier than usual this year. It is also expected that several long-standing members who have lapsed will eventually send in their dues. CAP's relatively low current membership may be a cause for concern, and should be addressed in our deliberations of the future of CAP. We need to attract new members and to do a better job retaining our members.
ii) Financial Report: The balance in the CAP account was $2711.57, which is an increase of $301.00 over the balance at the last AGM. Our healthy balance is due in part to prepaid memberships (see Financial Statement), but once again, the main reason for CAP's good financial position is the absence of production costs and mailing costs associated with the newsletter. We are grateful to Luther College at the University of Regina, which has underwritten production costs associated with the newsletter, and to the GSC-Atlantic, which has absorbed mailing costs over the past year. One of the agenda items from Rob Fensome, however, requests that CAP consider paying mailing costs if finances permit it; we must keep in mind that the membership fee no longer truly offsets all of the costs without subsidies. Another substantial expenditure is the annual fee which we pay the IFPS, at $1.50 US/"full" member, a fee not helped by our weak dollar. It is thus critical that we avoid sending duplicate copies to members who already receive the IFPS newsletter through their membership in another society. The only other routine fee is to the Registry of Joint Stock Companies, which remains at $25.00. We incurred $14.00 in service charges, which all banks appear to have instituted in the last few years, even on their not-for-profit club accounts. Approval of the Secretary-Treasurer's Report was moved and seconded by F. McCarthy and A. Beaudoin. The financial statement appears on p. 6.

Newsletter Editor's Report: M. Vetter reported that we continue to produce two newsletters per year, in May and December. She thanked the CAP Executive for their continuing support and contributions, and Alwynne in particular for her ongoing help and many suggestions for newsletter items.

Website Manager's Report: A. Beaudoin reported that the website continues to grow and flourish, receiving 250-500 accesses per month. The dictionary section, in particular, is very well used and receives more than 500 accesses per month. The website continues to be mainly text based, and Alwynne would like to change that in the future by adding graphics and other items. However, the University of Alberta, as the current host of the website, allows only 5 MB of space and bumping limits, and therefore we are restricted in what can be done with the website. For that reason Alwynne would like CAP to consider moving the website to the server of another webhoster that could provide more capabilities and better archiving. She suggested a webhoster that could provide much more space for $30 per year. We would need to register the new URL (at a cost of approximate $100), but this would also allow us to choose a URL that is more closely related to our organizational name and therefore would be more accessible and give us higher visibility. It was agreed that, since there was not a quorum at the meeting to allow a vote and since this was not a departure from present practice but rather just a practical decision, we would agree to these changes. If the move is negotiated in time, a notice to this effect will be placed in the December newsletter. Alwynne asked the membership to continue to submit ideas for material to include on the website. It was agreed that book reviews are particularly valuable; since CAP cannot afford to buy books to have reviewed we should seek examination copies from the publishers and put the reviews in both the website and the newsletter to encourage the publishers to provide books.

IFPS Councillor's Report: As G. Chmura was unable to attend the meeting, M. Head presented her report as sent to him by e-mail. Gail reported that she would not be able to attend the IFPS meeting in China, but that councillors are allowed to vote by proxy. Therefore, she asked whether CAP members have a preference for the location of the next IFPS meeting in 2004; it will be held either in Germany or Spain. Martin reminded the meeting that a committee to find a new IFPS Councillor is needed as this position is appointed to run from one IFPS meeting to the following one. Gail's term officially is completed after the IFPS meeting in China.

Future of CAP: There was considerable discussion at the meeting about the future of CAP. Martin described the situation in Britain, where there are specialist groups under the umbrella of the British Micropaleontological Society. Each group has a chair and secretary for individual meetings, and the groups meet during a general annual meeting; dues are managed by the BMS. Discussion followed. It was agreed that CAP was formed to be a Canadian organization. It was pointed out that there are Canadians who are members of AASP but not of CAP; there is a potential constituency which CAP has not accessed. There was considerable agreement that CAP can offer something unique, and perhaps the way to accomplish that is to broaden our scope to include micropaleontologists. This idea raises two issues: should CAP be transformed into a new organization (*e.g.* CAMP: Canadian Association of Micropaleontologists and Palynologists) or perhaps rather should a new micropaleontological society be a separate but affiliated organization with CAP? It was decided that there should be a discussion note on this presented in the December newsletter, seeking feedback from the CAP membership, and also that there should be an effort to solicit feedback from Canadian micropaleontologists. This latter might be accomplished with a short essay/discussion article submitted to GeoScience Canada and Journal of Paleolimnology; Francine volunteered to try to put together such an essay or letter, asking for feedback and help. Alwynne suggested that a webiste, listing everyone involved in Canadian micropaleontology would be very helpful, and Martin volunteered to try to put up a small website listing Canadian micropaleontologists. It was decided that if there was no positive response to the idea of either an expanded CAP organization or a Canadian micropaleontological organization, CAP would continue as it doing now.

Location of the next CAP Annual General Meeting: It was decided that the meeting should be at the GAC/MAC in St. John's, Newfoundland.

Other business: Alwynne Beaudoin and Mary Vetter agreed to volunteer to serve as the search committee for a new IFPS Councillor.

The meeting was declared adjourned by M. Head.

SECRETARY/TREASURER'S REPORT
FINANCIAL STATEMENT
(for the period October 25, 1999- May 30, 2000)

Credits:

Balance forward (October 25, 1999)	$2410.57
Other credits:	
Dues and subscriptions	$340.00
Total credits:	$340.00

Debits:

Registry of Joint Stock Companies	-$25.00
Prepaid subscriptions (2001-2004)(29@$10.00)	-$290.00
Service charges	-$14.00
Total debits:	-$39.00

BALANCE:

On October 25, 1999 funds in the CAP account stood at $2711.57

Respectfully submitted by

Francine M.G. McCarthy
CAP Secretary/Treasurer (May 30, 2000)

Statement by appointed auditor

It is my opinion that the above financial statement represents a full and fair account of the financial affairs of the Canadian Association of Palynologists for the above period.

John H. McAndrews
December 6, 2000

ESSAYS

Resources for the Identification of Plant Macroremains

Introduction

In July 2000, a graduate student posed the following request to the Quaternary discussion list: "I was hoping to get some information on some good texts to begin with for the identification of seeds and fruits recovered from a palaeoecological context." I posted a lengthy reply and reference list. Because the student was working on material from the far northwest of Canada, my discussion focussed specifically on that region. Mary Vetter (*CAP Newsletter* Editor) asked me to fine-tune it a little for this issue of the Newsletter. The following discussion is basically a slightly amended (i.e., the spelling errors corrected!) and expanded version of that reply, hence its very informal and chatty nature. The list of references is by no means complete. I trust, however, that the information may be useful to other Newsletter readers. Many of us working with pollen from Quaternary sites also work with plant macroremains. The identification of these can often be difficult if you are not sure where to start!

Response

The two basic references to start with are Berglund's (1986) book (especially the chapter by Wasylikowa) and Warner's (1990) compilation on *Methods in Quaternary Ecology*.

I'd recommend Warner's book to anyone working in Canadian Quaternary palaeoecological studies. Although ten years' old, the chapters contain useful introductions to the various types of macro- and microremains that are the focus of palaeoecological work. The chapters are not exhaustive, but are good reviews, and offer a place to start for an introduction to the literature. It is still available from the Geological Association of Canada through their on-line ordering system at their website. Go to http://www.esd.mun.ca/~gac/ and look under "Publications". From what I can see here, this volume looks as if it is on sale at the moment.

Your encounter with "macrobotanicals" will undoubtedly involve other macroremains too (e.g., molluscs, ostracodes, and insect remains – especially if you are working with lacustrine, wetland or fluvial sediments). The chapters in Warner's book provide a helpful illustrated guide to some of the other odder critters that you may find. These also may yield valuable palaeoecological information. Hence, I have included in the list below a couple of references to mollusc identification, and one of Delorme's papers on ostracodes (there are a whole series of these). Besides these, there is a short volume produced by Agriculture Canada about ten years ago on macroremains in peatlands (Lévesque *et al.* 1988). This can help you to characterize some macroremains, although I have not found that it gives sufficient detail for precise identifications. However, the volume does show material besides seeds (such as wood fragments, leaf fragments, roots, etc.). These illustrations may often be helpful when you are at the stage of trying to decide whether the thing swimming into focus under the dissecting 'scope is "animal, vegetable, or mineral"! These other macroremains (insects, moss leaves etc.) may often require the assistance of other specialists to identify.

The list below includes several texts that deal with "seed" (*sensu lato*) identifications. The two basic texts for work here are Martin and Barkley (1961) and Montgomery (1977). Additional texts deal with other aspects of the flora, such as weed seeds [e.g., Delorit (1970), and Davis (1993)] and tree seeds (USDA Forest Service 1974). The images in Martin and Barkley are very good and it is still, in my view, the best text around. It's been out of print for years and I was pleased to hear recently that it was being republished. (See http://www.blackburnpress.com/biobook2.html for details and ordering information). The images in Montgomery are not as good, and he has a terminology for describing seed shapes that I find difficult to follow

or apply at times.There are several texts listed below that deal with seeds from other areas in North America and Europe. These may be of valuable, at least as a guide to the range of forms that may be found within a Family or Genus.However, they often don't have the range of species that we encounter in western North America. Beijerinck (1947) and Berggren (1969 and 1981) fall into this group. Beijerinck (1947) consists mainly of line drawings. I also have a faded copy of a publication by Körber-Grohne (1991) dealing mainly with grasses. Much of this literature is out-of-print and unobtainable, except perhaps by inter-library loan, and circulates among the seedy community in a form of samizdat, copies getting progressively more illegible!

Although a bit dated now, Delcourt *et al.* (1979) is also a good starting place for guidance to the (mainly North American) literature on seed identification. Their compilation lists references by Family, so it is especially useful if you have already narrowed down the assignment. This listing also contains references for other types of plant material (e.g., phytoliths, wood, and charcoal).

There are, however, several problems with many of these texts, as follows:

1. For one thing, they usually illustrate "fresh" material, often herbarium specimens. These often bear little relation to the dismal worn material that we work with in the palaeoecological record. For instance, *Carex* species are identified partly on the characteristics of the perigynia. This is rarely present in sub-fossil material, in my experience, even when preservation is good. That is, subfossil material may be missing a few outer layers, making identification difficult. In addition, subfossil material may be different in colour from fresh material.

2. Many of these texts (e.g., Delorit, Flood, and Davis) were produced to help agronomists and similar specialists identify weed seeds. Hence the wetland taxa that are such a prominent focus of palaeoecological work are often not well covered.

3. The geographic focus of these texts is not northwest Canada, and may not be North America. Hence, they do not illustrate many taxa that we find here. There does seem to be a strong geographic variation in the morphological (specifically size) characteristics of seeds even within the same species. For example, seeds that I have measured provide different size ranges from those shown by Montgomery even for the same species. This may relate to geographic (clinal) variation within a taxon, degree of seed maturity, and the method of measurement. In addition, subfossil seeds can vary (usually smaller) in size than fresh material. Hence, be leery of using seed size as a defining criterion.Basically, there isn't a good text for western Canadian seeds in Quaternary palaeoecological context. [Hmmm, maybe I should write one?!! :-)]

Your problems can be compounded if the seeds you are dealing with are fragmentary and carbonized as well. In this case, the archaeobotanical literature can be useful. Pearsall (1989) covers much of this, and I direct your attention especially to her Chapter 3 ("Identification and Interpretation of Macroremains", pp. 107-243). Archaeobotanists are often used to working with poorly preserved material, carbonized samples, or partial remains. However, this field is also not without problems. Archaeobotanical studies often focus on crop or gathered plants (in North America, plants such as *Iva* and *Chenopodium*). Again, these are usually upland terrestrial plants, rather than wetland plants. Hence they do not provide a guide to the range of material that you might find in a deposit accumulated as a result of fluvial, ecological, or geomorphic processes, as opposed to an archaeological site context.As with pollen analysis, or any other identification procedure, there is no substitute for a good reference collection to help you. The texts, illustrations and descriptions can help you narrow down the taxonomic assignment, but to be certain, you really need to compare your samples with reference material. Fresh seeds from the reference collection can also be mistreated in various ways to simulate degradation and give a better match the subfossil material. I curate an extensive Seed Reference Collection at the Provincial Museum, and scholars are welcome to visit and use it in their work. Please contact me (e-mail address below) if you want access to this collection.You should be aware that macroremains are often illustrated in various palaeoecological papers. Many research papers contain good pictures, especially

SEM images, of seeds and other macroremains. Some papers may also concentrate on pollen, thereby using two indicator types for palaeoecological investigation. The papers by John Matthews, many of which are focussed on sites in your field region, often contain good SEM and LM illustrations of macroremains (notably seeds and insects). Other papers R. G. Baker and by B. G. Warner also often incorporate illustrations of macroremains. Sometimes, modern and subfossil specimens are illustrated; this is particularly useful as a guide to the type of degradation that may be encountered. Birks (1980) discusses the pathways by which seeds get into Quaternary lake sediments, and includes drawings of some seeds and macroremains.Finally, many Floras and Field Guides also contain seed illustrations that can be very helpful, although seeds are not their main focus. In some plant taxa, such as the Cyperaceae, seeds may be quite important for plant identification purposes. For example, Hurd *et al.* (1998) contains fine illustrations (both colour photos and drawings) of seeds of 114 *Carex* species as part of the critical identification components. Below, I have listed two monographs by Brayshaw that have beautiful drawings of plants and seeds. Since they focus on wetland taxa from western Canada, I think you'd find them both useful. Also on the wetland theme, Hurd *et al.* (1994) contains generally good photographs, some in colour, of twenty-three *Juncus* species and their seeds. For grasses, Dore and McNeill (1980) includes many photographs of fresh grass seeds. However, the best drawings and illustrations are often found in Floras that may have been published decades ago!And, as an aside, for non-biologists, the terminology associated with "seeds" can be confusing. For instance, what's the difference between a seed, fruit, achene, nut, nutlet, samara, and caryopsis? Often terms are used quite loosely, and palaeoecologists sometimes use "seed" as a shorthand way of referring to a whole gamut of macroremains, only some of which are strictly seeds. Often, we are looking at the structures surrounding the seed, rather than the seed itself. I have found the monograph by Spjut (1994) very helpful for sorting out this terminology. Harris and Harris (1994) contains a brief but useful introduction to fruit terminology (pp. 182-188).

For any seed types that you do identify, I recommend that you do a "taxonomic diagnosis". That is, a detailed description of the morphology of your specimens, comparison with published descriptions and reference material, and summary of the criteria on which you make a taxonomic assignment. This diagnosis could be accompanied by drawings, and LM and SEM photos. This information would be helpful as part of your thesis appendices. (Especially useful if someone questions your taxonomic assignments later!). For an example of this, accompanied by some superb SEM images, see the appendices in Yansa and Basinger (1999).The best way to learn to identify seeds, as with pollen or any other macroremains, is by long hours at the microscope, spent making lots of drawings and descriptions of both your specimens and the comparative reference material. Drawing specimens is very good training in observation; it forces you to examine the specimen really carefully. I have found that drawing and describing each taxon on a 3"x5" file card is a constructive exercise. Even in these days of digital everything, such cards will still be a handy *aide-mémoire*.

There are not many studies focussed on macroremains in palaeoecological context, at least in Canada. Certainly, plant macroremains have received far less attention than pollen. The work of Warner, Baker, and Matthews forms a substantial amount of the literature that is available, especially for western North America. Peter Kuhry has also produced several papers dealing with plant macroremains in boreal Canada. Bob Vance found plant macroremains more useful than pollen for the investigation of changing water levels at Chappice Lake in southern Alberta. Below, as a starting point, I have included a few references to some of this work. Note that this is *not* a complete list by any means; all these researchers have completed many other papers and, of course, there is work by other people too.

Reference list for identifications

Beijerinck, W. 1947 *Zadenatlas der Nederlandsche Flora*. H. Veenman and Zonen, The Netherlands. 316 pp.

Berggren, G. 1981 *Atlas of Seeds and Small Fruits of Northwest European Plant Species Part 3 Salicaceae - Cruciferae*. Swedish Natural Science Research Council. 259 pp.

Berggren, G. 1969 *Atlas of Seeds and Small Fruits of Northwest European Plant Species Part 2 Cyperaceae*. Swedish Natural Science Research Council. 68 pp.

Berglund, B. E. (editor) 1986 *Handbook of Holocene Paleoecology and Palaeohydrology*. John Wiley, New York, U.S.A. xxiv + 869 pp.

Brayshaw, T. C. 1989 *Buttercups, Waterlilies and Their Relatives in British Columbia*. Royal British Columbia Museum Memoir No. 1. Royal British Columbia Museum, Victoria, British Columbia. viii + 253 pp.

Brayshaw, T. C. 1985 *Pondweeds and Bur-reeds, and their Relatives of British Columbia*. Occasional Papers Series No. 26. British Columbia Provincial Museum, Victoria, British Columbia. vi + 167 pp.

Burch, J. B. 1962 *How To Know The Eastern Land Snails*. Pictured-Key Nature Series. Wm. C. Brown, Dubuque, Iowa. 214 pp.

Clarke, A. H. 1981 *The Freshwater Molluscs of Canada*. National Museum of Natural Sciences, National Museums of Canada, Ottawa, Ontario. 446 pp.

Davis, L. W. 1993 *Weed Seeds of the Great Plains: A Handbook for Identification*. Cooperative Extension Service of Kansas State University. University Press of Kansas, Lawrence, Kansas. vi + 145 pp.

Delcourt, P. A., O. K. Davis, and R. C. Bright 1979 *Bibliography of Taxonomic Literature for the Identification of Fruits, Seeds, and Vegetative Plant Fragments*. Environmental Sciences Division, Publication No. 1328. Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA. 84 pp.

Delorit, R. J. 1970 *Illustrated Taxonomy of Weed Seeds*. Agronomy Publications, River Falls, Wisconsin. 175 pp.
Delorit, R. J., and C. R. Gunn 1986 *Seeds of the Continental United States Legumes (Fabaceae)*. Agronomy Publications, River Falls, Wisconsin. 134 pp.
Delorme, L. D. 1970 Freshwater Ostracodes of Canada. Part III. Family Candonidae. *Canadian Journal of Zoology* 48:1099-1127.

Dore, W. G., and J. McNeill 1980 *Grasses of Ontario*. Research Branch, Agriculture Canada, Monograph 26. 566 pp.

Elias, S. A., and O. Pollak 1987 *Photographic Atlas and Key to Windblown Seeds of Alpine Plants from Niwot Ridge, Front Range, Colorado, USA*. Institute of Arctic and Alpine Research, University of Colorado, Occasional Paper No. 45. Institute of Arctic and Alpine Research, Boulder, Colorado, USA. iv + 28 pp.

Flood, R. J. 1986 *Seed Identification Handbook*. National Institute of Agricultural Botany, Cambridge, UK. 72 pp.

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A HONEY OF A STORY

Brief history of bees and honey

Social honey bees (*Apis* spp.) evolved pantropically, and have been producing and storing honey for more than 20 million years (Crane 1980). The earliest confirmed record of bees comes from deposits of the Oligocene (37-24 million years ago) in France and Germany. This early record has been classified as *Apis henshawi* and well-preserved specimens confirm that it is the earliest member of the genus yet found (Engel 1998). One species of honey bee, *A. mellifera*, first evolved during the Pleistocene, adapted to temperate climates, and colonized much of the cooler regions of Europe and Asia.

Our earliest human ancestors undoubtedly learned of the sweet taste of honey and began devising ways to collect it. However, we have no way of determining whether or not our earliest human ancestors consumed honey based on existing archaeological records. Fragile honey comb fragments, dead bees, or even pieces of destroyed bee hives, if present in archaeological sites, may not be recognized, or may not have remained preserved for thousands or millions of years.

One of the earliest visual records of honey collecting comes from caves in Spain dating to about 15,000 years ago and suggest that by the end of the Upper Paleolithic our ancestors collected honey from bee hives in western Europe. According to entomologist Harald Pager, several of these early images painted on the walls of the Altamira caves in northern Spain represent honey combs and ladders that would have been needed to reach bee hives in trees or in rock crevices on cliff faces (Crane, 1980). If Pager is correct, this may be the earliest documented evidence of honey gathering by human societies.

One of the most cited early depictions of early honey gathering comes from a painting in the rock shelter of La Araña located near Valencia in eastern Spain that dates to around 6,000 B.C. (Crane 1992). The rock painting depicts a figure who has climbed up a cliff face on a rope and is removing combs from a hive in a rock crevice. From the wall painting it appears the person is nearly naked but is surrounded by angry bees. One must wonder if bee stings at that time were a problem or if the stings may have become a visible sign of pride for the honey collectors. Other wall paintings of bee collecting found near Singanpur, India, date to approximately 500 B.C. In the Royal Natal National Park region of South Africa there are undated examples of Bushman rock art that show swarms of bees accompanying a mythical elephant-man (Free 1982). Near the Toghwana Dam in the Matopo Hills of Zimbabwe undated rock paintings show a honey collector using smoke to quiet bees before removing honey combs. Even though undated, this is suspected to be the earliest recorded evidence of people using smoke to quiet bees while collecting honey--a practice still used today. What those early Africans discovered is that when bees in a hive smell smoke they rush to the honey combs and fill their honey sacs with honey in an effort to save as much honey as possible, should the hive be destroyed by fire. Once worker bees smell smoke and fill their stomachs, they become lethargic and will rarely sting anyone.

The earliest record of beekeeping in ancient Egypt come from paintings and drawings on the walls of the sun temple of Ne-user-re at Abusir located near Cairo, Egypt, and dates to the time of the Fifth Dynasty about 2,500 B.C. The paintings show some workers blowing smoke into hives made of large clay jars while others are removing honey (Free, 1982). At the rock-cut tomb of Memi located at El-Hawawish, Egypt, and dating to 2,400 B.C., archaeologists found 36 coarse, handmade jars with a small hole in the bottom portion. According to Crane and Graham (1985) those jars are almost identical in shape and size to similar clay jars still used as bee hives in the Mediterranean region. Paintings on the walls of other Egyptian tombs dating to 1,450 B.C. depict well-established methods of bee managing and honey collecting by that time period (Crane 1992). Additional evidence from Egypt, includes a hieroglyphic record from 1,180 B.C. which indicates that Ramses III once offered an Egyptian god a gift of approximately 30,000 pounds of honey (Gould and Gould, 1988).

Bee hives made of hardened, unfired, mud cylinders and woven baskets of various materials were probably used by Neolithic farmers as early as 5,000 B.C. Later, clay cylinders were in wide use as bee hives in Egypt by 3000 B.C. (Crane, 1975; Gould and Gould, 1988). The Greeks copied and improved on the basic design used by the Egyptians for bee hives. The early Greeks began baking the mud hives to harden them and they also developed a new bee hive design that is still in use in some areas of Greece today. The early Greek bee hive looked much like a large, cone or clay amphora with the small conical end pointing downward and the top part of the cone opened entirely at its widest point. Across the open top the Greek beekeepers placed slats of wood leaving small openings between one set for the bees to enter and exit. The horizontal slats and inward-sloping slides of the hive's bottom part encouraged the bees to hang their combs downward from the slats rather than attached to the slopping sides of the hive. Later, the filled honey comb could easily be harvested without significant damage to the whole hive. What the Greeks discovered is that honey bees will rarely construct their combs on an angled surface because it makes the complete filling of each comb nearly impossible (Free 1982).

During Roman times, the honeybee was regarded with much esteem. Varro, Virgil, Columella, and Pliny the Elder each wrote extensive descriptions of beekeeping, hives, and the importance of honey as both food and as a product of trade. Honey was the primary source of sugar during Roman times and was used in cooking, preserving meat, making sweet drinks, and especially for making an alcoholic drink called mead.

The Romans so enjoyed honey that in one battle it became their downfall. In 67 B.C., a Roman army under the command of General Pompey was defeated partly because many of the troops feasted on honey the night before that they gathered from local bee hives. That honey, called "mad honey," was made from the nectar of local rhododendron plants. A compound present in that honey, and still found in some types of honey today comes from the nectar of certain rhododendron flowers and is called *grayanotoxin*. Symptoms of grayanotoxin poisoning include: vomiting, loss of coordination, muscular weakness, and low blood pressure (Root-Bernstein, 1991). Although grayanotoxin poisoning is rarely fatal, the physical effects often last for 24 hours or longer. Perhaps that was the major reason why many of the troops in Pompey's army were helpless to repel their attackers the next morning and thus were defeated.

When the Julius Caesar and his Roman soldiers invaded England in 54 BC, they found the Celts were already accomplished beekeepers and that they made cone-shaped hives of wattle and daub. The frames were made of woven willow or hazel twigs that were then sealed by plastering the outside with cow dung. The tip of the cone structure pointed upward and had a small opening for the bees to enter and exit the hive. That early Celtic technique of hive making and the later Mediaeval use of a dome-shaped bee hive (skeps) made of twisted straw remained in common use throughout many areas of Europe until the late 1800s (Free 1982). The straw skep is still a common symbol for honey and it is often used to represent honey in advertizing and as a logo for beekeeping.

Like honey, beeswax has long been considered an important commercial product. In ancient times beeswax was used to make candles, was used in the making of early writing tablets made of wood with a shallow depressed area filled with beeswax where messages could be written with a stylus and then saved, was used to make signature seals on documents, used as a base material in cosmetics, used as a polish for leather, applied as a sealing agent to porous wood, and was used in the making of various types of medical compounds. So important was the production and use of beeswax during Medieval times that both the ruling kings of that period and the Church took great interest in bee keeping. The Church extolled the virtues of bees pointing out that bees worked hard, rejoiced in the arrival of new offspring, yet as adults remained chaste and virginal. Beeswax was made into wax candles for burning in churches and was much favored because they were cream-colored or white (i.e., representing a state of purity and virginity) and because they burned odorless. Most candles during Medieval times were made of animal fats that produced unpleasant odors when burned. Even beekeeping was influenced by

the Church. In addition to keeping their own large supply of bee hives in monasteries, the Church also decreed that new beekeepers should start with three hives to remind them of the importance of the Holy Trinity, that bees should not be moved or sold on Friday because Christ was crucified on that day, and that new larval bees should be considered Aspirits@ until they are fed honey. Even some traditional meal time prayers during Medieval times thanked the bee (Free 1982):

For Thy creature the Bee,
The Wax and the honey
We thank thee, O Lord,
By the light of all men,
Christ Jesus our King,
May this food now be blessed. Amen

Kings often had their own bee hives and also required local serfs to pay taxes in beeswax. The kings and castle occupants liked beeswax candles for lighting mostly because they were odorless. In addition, many castles used candles to tell time. Special beeswax candles were made to a certain size and shape and then marked on the outside to show the passing of each hour. These early time keepers were especially favored because beeswax burned evenly and were fairly reliable provided the candles were placed in a protected area where drafts would not speed their burning (Free 1982).

Brief history of honey production in the New World with an emphasis on the U.S.

There were no indigenous honey-producing bees of major significance in the New World. American Indians utilized honey from tropical stingless bees (Family Meliponinae), that were indigenous to both South and Central America. When many of the Central American Indians were first contacted by the Spanish during the early and mid 1500s, the Spanish found that beekeeping and bee hunting were well-established traditions in almost every sub-tropical and tropical region of the New World. Pre-colonial bee hives of *Melipona beecheii* were kept by the natives of Central and South America and most consisted of large, dried gourds, hollow logs, or cylindrical earthenware pots that had an entrance hole near the middle but were sealed at both ends. Reports from the first Spanish ships that landed on the island of Cozumel, Mexico , in 1518 note that the island had Amany beehives and much wax and honey@ (Crane and Graham 1985). According to Bishop Fray Diego de Landa, who traveled throughout the Yucatan region of Mexico during the mid 1500s, the area abounded in honey and the honey was used by the Maya as a sweetner and to make a type of fermented, alcoholic drink (mead). He further reports that during the fifth month of their 13-month calendar, the Maya celebrated the festival of the honey god, Ah Mucan Cab. During the celebration the Maya consumed large quantities of honey and alcoholic mead and burned offerings to the Honey God asking for abundant flowers so the bees could produce large quantities of honey (Free 1982). Crane and Graham (1985) reported that although the clay cylinders and hollow wooden logs used by the ancient Maya as bee hives have broken and decayed, the stone closures used to seal the cylinders and logs at each end have been found at a number of Maya sites some of which date from the Late Preclassic nearly 15 centuries before the arrival of the Spanish. They report that as of 1985 archaeologists had identified pairs of these carved, limestone disks that were once used to seal hives from six archaeological sites in Mexico, four sites in Belize, and two sites in Guatemala. At one site in Cozumel, Mexico, Crane and Graham (1985) report that 225 of the stone disks were found in levels at a Maya site dating to about A.D. 1400. Other records from Mexico confirm the importance of honey use by Aztec and Maya cultures. Hernando Cortez reported that when he arrived in Tenochtitian (present day Mexico City) the Aztec markets had large supplies of honey and beeswax that were being sold and traded. He also reported that honey was one of the important tribute items collected annually by the Aztec rulers (Free 1982). Some of the early Spanish reports estimated that about 2 kg of honey could be taken from a stingless bee colony. More recent estimates claim that the annual production of honey from a single hive of tropical stingless bees can yield between 2-15 liters (Dixon 1989).

During the period of world exploration and colonization, European honeybees were introduced into many "newly discovered" regions of the world. Nevertheless, the precise circumstances and date of the first European honeybee introduction to either

North or South America is not clear. In 1616 a ship bound for the Virginia Colony was heavily damaged in a storm and took refuge in Bermuda where it unloaded its cargo, including bees and bee hives. That marked the introduction of bees to Bermuda where they prospered and soon became widespread (Hilburn 1989). On another voyage, European honey bees and hives of *Apis mellifera,* were sent to North America in 1621 by the Council of the Virginia Company. This early confirmed record is in a letter dated December 5, 1621 and sent from London to the Governor and Council of the Virginia Colony in North America (Smith 1977). In that letter is a list of provisions that were being sent to the Virginia Colony aboard two ships, the *Bona Nova* and *Hopewell*. Included in the list are references to various types of seeds, fruit trees, 'pidgeons', beehives and 57 young maids to make wives for the planters. In 1985 Eva Crane, with the help of archaeologists, believes she has found the precise location where those first bee hives touched American soil. She says the probable spot is just north of the present city of Petersburg, Virginia, at the site of the Old City point Wharf on the James River just below the point where it and the Appomattox River join (Crane 1992).

Journals and letters from settlers in Massachusetts dating from the mid 1630s confirm that by then bee keeping was widespread. Those documents report that beehives were thriving throughout that area (Free 1982). How many European bee colonies were sent to the New World aboard early ships and how many of those bee colonies survived the long voyages is not known. Nevertheless, European bees and various species of clover, which was also carried to the New World as a favored foraging source for bees, were soon widespread throughout the early colonies.

Evidence of the absence of honey bees in areas of the New World north of Mexico prior to the Age of Discovery comes from ethnographic records that state many Native American tribes said they had never seen bees. After the introduction of European honeybees, some of the northeastern Indian tribes called them "White Man's flies" and referred to the newly introduced white clover (*Trifolium repens* L.), which often accompanied the spread of honey bees, as "White Man's foot" because those plants seemed to appear suddenly in the places where European pioneers walked and settled. (Crane, 1975). Even Henry Wadsworth Longfellow noted this phenomenon in his poem "ASong of Hiawatha" which he finished writing in November, 1855. One verse of that poem goes:

Whereso'er they move, before them
Swarms of stinging fly, the Ahmo,
Swarms the Bee, the honey-maker;
Whereso'er they tread, beneath them
Springs a flower unknown among us,
Springs the White man's Foot in blossom.

Honey bees, through this initial introduction, and the subsequent importation of other European honey bee races, spread rapidly throughout the temperate and tropical areas of the Western Hemisphere (Oertel, 1976). By the late 17th century, the honey bee had colonized most of the eastern regions of the North American continent but did not reach Alaska until 1809, California until 1830, and British Columbia until the 1840s (Free 1982). So important did the newly introduced honey bee become to the early American colonies that even today the honey bee is still recognized as the official State Insect of six states (Arkansas, Georgia, Nebraska, New Jersey, North Carolina, and Michigan) (Free 1982).

Honey production in the United States during the early 1800s was not a commercial success, partially because early hive designs caused the destruction of much of the honey comb during the honey removal process. In some cases, honey removal caused such a level of hive and comb destruction that the colony could not recover and thus died. In addition, early beekeepers had no way to control activities in the central part of their hives where the queen stayed and the larval bees were raised. One example is seen in a letter written by a beekeeper in 1796 who reports that to get the honey from a hive they would first dig a shallow hole put in the hive and then burn sulfur in the hole until the fumes killed all the bees (Free 1982).

In Europe, during the 1600s and 1700s various people experimented with the development of hives that would allow honey removal without destroying the hive or the lives of the bees. Many people designed various types of hives with wooden bars,

rods, or slats across the top so that the bees could hang honeycombs from them. The intent was to be able to remove these bars without damage to the hive, but that rarely happened. All too often the bees would attach their combs to the bars and also to the sides of the hive so that easy comb removal was impossible. In 1792, a blind Swiss beekeeper, Francois Huber, developed a bee hive which consisted of twelve frames that were hinged together on one side like the pages of a book. Huber's new hive was excellent for opening and observing the bees and the honey comb they produced, but it was not suited to practical bee keeping (Crane 1992).

Between 1650-1850 various types of experimental box hives made of wood were in use. Many of them worked to some degree, but all failed in their intended purpose of proving a safe and easy way to remove honey combs from a hive without injuring the bees or destroying the hive. What most of these experimental hives and early beekeepers failed to note was that the spacing between the frames was the key element in making a hive with removal frames. If the spacing between the frames was not correct, the bees tended to bridge the spaces between frames with combs or attached combs to the walls of the hives. In 1851 the Rev. L. L. Langstroth, a young pastor in Andover, Massachusetts was the amateur beekeeper who invented, and successfully used, the first square-shaped hive with removable vertical comb frames that did not damage the hive. Because all the frames were exactly the same size, empty frames could quickly be inserted to replace full frames without damage to adjacent frames or the hive (Crane, 1992). The key to Langstroth's success was spacing. He noticed that if he left a one-fourth inch gap between frames and at the top and bottom, then the bees would use this space as a passage between the frames and would not fill those spaces with combs. His invention revolutionized beekeeping making the first large-scale production of honey in the United States possible. His success may have stemmed from his fresh approach and keen powers of observation since he admitted he knew nothing about bee keeping when he purchased his first hives. Now, for the first time, beekeepers could open their hives and remove excess honey without damaging the important brood area or the remaining portions of the hive. And, by adding more comb frames to a hive when needed, a beekeeper could prevent swarming and increase his supply of honey from each hive. Langstroth's hive and frame placement soon became the standard throughout the world and it is still in wide use today.

A few years later in 1857, Johannes Mehring of Germany made another breakthrough that would streamline honey production. He found that by impressing the hexagonal pattern of bee comb cells on a thin sheet of wax and then attaching it to the side of a frame, bees would accept it and build new comb cells on the sheet very quickly. This invention enabled beekeepers to produce more combs of even quality. Soon producers discovered that by embedding thin wires in the wax sheets perfected by Mehring the comb remained strong enough to retain their shape while the honey was removed using the centrifugal extractor, invented in Austria by Franz von Hruschka in 1865 (Crane 1992). These three inventions, the removal frames, the wax comb sheets, and the centrifugal extractor opened the way for increased honey production and for the sale of liquid (as opposed to comb) honey. Thus, these inventions in the mid 1800s made beekeeping consistently profitable, paving the way for large commercial enterprises in Europe as well as the United States.

Two other inventions of the late 1800s also aided beekeepers. In 1877, T. F. Bingham of the United States invented the bellows smoker which when lit produced a gentle cloud of smoke rather than an uneven torrent. The bellows smoker enabled beekeepers to apply just enough smoke to a hive they wanted to enter without causing injury to the bees. In 1891, E.C. Porter, also of the United States invented the "bee escape" in hives which allowed bees to pass freely in one direction only. That invention provided an efficient and effective way to temporally remove bees from areas of a hive that was being examined or removed (Free 1982).

Future of honey production in the United States

The United States is unique among the major honey-producing countries of the world. Ironically, even though lagging in its research on the pollen contents of domestic honey types, United States' scientists pioneered studies of the chemical contents of honey. Early research by USDA chemists (White et al., 1962) examined honey samples from all 50 states and

inspired similar tests by foreign scientists on the honey from other countries. The chemical data from many studies of domestic honey in the United States are included in this volume.

The precision of pollen data collected from their own domestic honey sources has enabled many major honey-producing nations to impose strict laws governing the import and export of honey products (Johansson and Johansson, 1969). For the most part, the import/export laws imposed by many of these nations require three types of certification before honey products can be marketed: 1) verification of a honey's floral type, 2) verification of the honey's quality, and 3) verification on the honey's place of origin. The lack of these types of certification requirements in the United States and the lack of these types of data for domestic U.S. produced honey hinders the export of many types of honey produced in the United States. On average, during any fiscal year about 4% of the U.S. produced annual volume of honey is exported. Perhaps with better information about the contents of domestic U.S. honey that percentage of exported honey could be increased. On the other hand, during 1999, over 332 million pounds of honey was consumed in the United States yet nearly 40% of that total represented honey imported from other countries (National Honey Board 2000). The production of honey in the United States has remained fairly constant during the past five years at around 200 million pounds.

In a recent article Carl Shafer (1998) has noted that much has changed for U.S. beekeepers since December, 1996, when the U.S. ended their honey loan and subsidy program. He points out that since then U.S. beekeepers have become part of the world's free market where there are no real shortages or surpluses. Instead, those conditions determine whether the price of honey will be high or low. The future of the honey industry in the U.S. and elsewhere in the world, according to Shafer, will depend on the future prices paid for honey, which in turn will be determined by world wide supply and demand.

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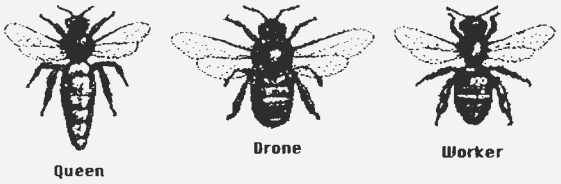

Gardening for Native Bees in North America

Bees need pollen and nectar from flowers. The sugars in sweet nectar power their flight; females also mix some nectar with pollen, the latter providing the protein, oils and minerals needed by their grub-like larvae. In our cities and towns, where most of the native plant communities have been displaced by pavement, buildings and lawns, our flower gardens can become important cafeterias for local populations of native bees. In the countryside, dark forests and many agricultural crops likewise offer our native bees little food. Because bees find their favorite flowers by their color or scent, a native bee garden can be attractive to the gardener too. The purpose of the following tabulation of garden plants for native bees is to help guide home gardeners in North American to genera of flowering plants whose species will please gardener and bee alike. In turn, bees can provide bumper crops in our orchards and vegetable gardens, plus providing hours of pleasant entertainment and distraction as you follow their foraging travels or amorous behaviors at your flowers.

The list consists of plant genera whose species are both attractive to native bees and can be obtained from standard or native seed companies or plant nurseries. In a few cases, particularly attractive native plants have been listed that are not yet available commercially. Twenty of the genera have been highlighted (blue or boldface). These represent broadly available, adaptable and attractive plant genera that can be recommended as more foolproof if beginning your bee garden. Many of the genera in the list will not be universally adaptable to all climates, soils, and irrigation regimes; you will need to make informed decisions from among the genera in the list for your local use. If in doubt as to a species' weediness in you locale, please check with your local extension agent or your state's/province's conservation or agriculture departments. The bachelor's button, for instance, is a lovely well-behaved garden plant across much of the U.S., but in parts of the Pacific Northwest, it has become a naturalized weed. I encourage you to adapt the list to your region's soils, climate and other criteria for use by you and your fellow gardeners.

The list has been alphabetically sorted for you by genus name. You will notice that some popular garden flowers are missing from the list, such as petunias and marigolds. These and some other garden flowers have, though years of artificial breeding and selection, lost whatever attraction they may have had for bees. Some of these are listed in a separate paragraph.

Some people express a fear of being stung by native bees if they attract them to their yard. In my 25 years of watching bees foraging at flowers, I have not yet been stung by any of the 4000 species of bees native to North America. I have been stung handling honey bee and bumble bee colonies, or on rare occasions, handling individual bees in my collection net using my fingers. These social bees are the ones that deliver the most painful stings. But I've never been stung even by these if just watching them at flowers.

The list is a work in progress. If you find errors, oversights or useful refinements, I will be happy to entertain your suggestions for modification so long as it retains its current form. Feel free to disseminate the list or modify your copy of it for local needs or your personal preferences as you see fit. The list will be periodically updated at our web site as well. Happy bee-ing!!

Please note that the information and opinions presented in this bee gardening section are not those of the U.S. Department of Agriculture.

Author's Notes: I expect there to be feedback from the garden plants for native bees table, particularly cultivar and species refinements as well as some genera I've overlooked. I will entertain such updates and then post them anew at our web site. Collective wisdom at work!

I have endeavored to exclude or note on the garden plant list those non-native species that are weedy across the United States and Canada. Some of the listed genera are considered weedy and invasive in some regions (e.g. cornflower in the US Pacific Northwest) but are elsewhere well-behaved garden flowers. Check with your state's or province's departments of agriculture or conservation for local details, or visit one of the web sites listed below for introductory information and lists about US weeds.

http://www.aphis.usda.gov/ppq/weeds/weedhome.html

http://jasper.stanford.edu/GISP/usa.htm

http://piked2.agn.uiuc.edu/wssa/

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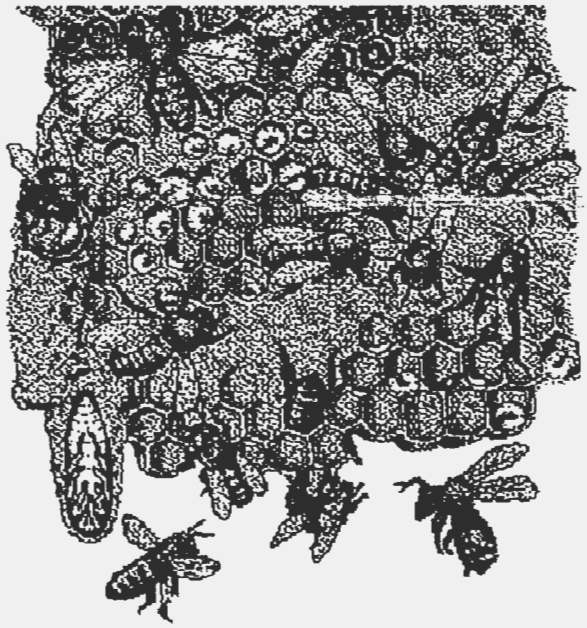
Garden Plants that have been found NOT to be useful to bees (common names)	
lantana	lilac
lily-of-the-valley	marigold
forget-me-not	nicotiana
oriental poppy	ornamental plum
passion vine (most)	peony
periwinkle	petunia
shirley poppy	snapdragon
sweet william	tuberous begonia
tulip	yucca

Editor's note: The list of useful garden plants appears on the next 4 pages.



North American Garden Plants for Native Bees

FAMILY	GENUS	COMMON NAME	Notes
Caprifoliaceae	*Abelia*	abelia	
Fabaceae	*Acacia*	acacia	
Aceraceae	*Acer*	maple	
Asteraceae	***Achillea***	**yarrow**	*A. millefolium* weedy
Ranunculaceae	*Aconitum*	monkshood	
Lamiaceae	*Agastache*	hyssop	
Lamiaceae	*Ajuga*	carpet bugle	
Malvaceae	*Althea*	hollyhock	not doubled
Liliaceae	*Allium*	allium	
Rosaceae	*Amelanchier*	serviceberry	
Boraginaceae	*Anchusa*	wild forget-me-not	
Apiaceae	*Anethum*	dill	
Ranunculaceae	*Aquilegia*	columbine	not doubled
Ericaceae	*Arctostaphylos*	manzanita	
Papaveraceae	*Argemone*	prickly poppy	
Plumbaginaceae	*Armeria*	sea thrift	
Asteraceae	*Aster*	aster	not doubled
Fabaceae	*Astragalus*	locoweed	
Asteraceae	*Baileya*	desert marigold	
Fabaceae	***Baptisia***	**false indigo**	
Berberidaceae	*Berberis*	barberry	
Boraginaceae	*Borago*	borage	
Brassicaceae	*Brassica*	mustard	*B. kaber and B. nigra* weedy
Lamiaceae	*Calamintha*	calamint	
Malvaceae	*Callirhoe*	poppy mallow	
Ericaceae	*Calluna*	heather	
Onagraceae	*Camissonia*	camissonia	
Campanulaceae	*Campanula*	bell flower	
Fabaceae	*Caragena*	Siberian peashrub	
Aizoaceae	*Carpobrotus*	ice plant	some weedy
Asteraceae	*Carthamnus*	safflower	
Lamiaceae	*Caryopteris*	blue mist spirea	
Fabaceae	*Cassia*	senna	
Rhamnaceae	*Ceanothus*	buckbrush	
Asteraceae	***Centaurea***	**bachelor's button, corn flower**	not doubled, some weedy
Caryophyllaceae	*Cerastium*	snow-in-summer	avoid chickweeds
Fabaceae	*Cercidium*	palo verde	
Fabaceae	***Cercis***	**redbud**	
Rosaceae	*Cercocarpus*	mountain mahogany	
Rosaceae	*Chaenomeles*	flowering quince	
Bignoniaceae	*Chilopsis*	desert willow	
Asteraceae	*Chrysanthemum*	chrysanthemum	simple flowered

North American Garden Plants for Native Bees

Asteraceae	*Chrysothamnus*	rabbit brush, chamisa	
Cucurbitaceae	*Citrullus*	watermelon	
Rutaceae	*Citrus*	grapefruit, orange, lemon	
Fabaceae	*Coronilla*	crownvetch	
Cucurbitaceae	***Cucurbita***	**squash, gourd, pumpkin**	
Onagraceae	*Clarkia*	clarkia	not doubled
Asteraceae	*Cosmos*	cosmos	
Apiaceae	*Coriandrum*	coriander	
Asteraceae	*Coreopsis*	coreopsis	
Lythraceae	***Cuphea***	**false heather**	*C. hyssopifolia*
Rosaceae	*Cydonia*	fruiting quince	
Asteraceae	*Cynara*	artichoke, cardoon	
Boraginaceae	*Cynoglossum*	comfrey	
Apiaceae	*Daucus*	carrot	some weedy
Ranunculaceae	*Delphinium*	larkspur	not doubled
Scrophulariaceae	*Digitalis*	foxglove	
Asteraceae	*Echinacea*	cone flower	
Boraginaceae	*Echium*	pride of Madeira	*E. fastuosum*
Asteraceae	*Erigeron*	fleabane	
Hydrophyllaceae	*Eriodictyon*	yerba santa	
Polygonaceae	*Eriogonum*	wild buckwheat	
Apiaceae	*Eryngium*	eryngo, button-celery, coyote-thistle	
Brassicaceae	*Erysimum*	wallflower	
Asteraceae	*Eupatorium*	joe pye weed	not *E. capillifolium*
Euphorbiaceae	*Euphorbia*	spurge	some weedy
Cactaceae	*Ferocactus*	barrel cactus	
Apiaceae	*Foeniculum*	fennel	*F. vulgare*
Rosaceae	*Fragaria*	strawberry	
Sterculiaceae	*Fremontodendron*	flannelbush	
Asteraceae	***Gaillardia***	**blanket flower**	not doubled
Onagraceae	*Gaura*	gaura	
Gentianaceae	*Gentiana*	blue gentian	
Asteraceae	*Geraea*	desert sunflower	
Rosaceae	*Geum*	avens	
Polemoniaceae	*Gilia*	gilia	blue or violet
Fabaceae	*Glycyrrhiza*	licorice	
Asteraceae	*Grindelia*	gumweed	
Boraginaceae	*Hackelia*	wild formet-me-not	
Lamiaceae	*Hedeoma*	sweetscent, mock pennyroyal	
Fabaceae	*Hedysarum*	sweet vetch, french honeysuckle	
Asteraceae	*Helenium*	sneezeweed	
Asteraceae	*Helianthella*	sunflower	
Asteraceae	***Helianthus***	**sunflower**	not doubled
Boraginaceae	*Heliotropium*	heliotrope	

North American Garden Plants for Native Bees

Malvaceae	*Hibiscus*	rose-of-sharon, hollyhock	not doubled
Asteraceae	*Hieracium*	hawkweed	
Rosaceae	*Holodiscus*	cliff spirea, mountainspray	
Asteraceae	*Hymenopappus*	false cosmos	
Asteraceae	*Hymenoxys*	alpine sunflower	
Lamiaceae	*Hyptis*	desert lavendar	
Aquifoliaceae	*Ilex*	holly	
Malvaceae	*Iliamna*	mountain hollyhock	
Zygophyllaceae	*Kallstroemia*	Arizona poppy	
Scrophulariaceae	*Keckiella*	bush penstemon	
Lamiaceae	*Lamium*	dead nettles	incl. *Lamiastrum*
Zygophyllaceae	*Larrea*	creosote bush	
Fabaceae	*Lathyrus*	everlasting pea	
Lamiaceae	*Lavendula*	lavendar	
Asteraceae	*Layia*	tidytips	
Fabaceae	***Lespedeza***	**bush clover**	esp. L. cuneata
Brassicaceae	*Lesquerella*	bladderpod	
Asteraceae	*Liatris*	blazing star	
Limnanthaceae	*Limnanthes*	meadowfoam, fried egg flower	
Polemoniaceae	*Linanthus*	mountain phlox	
Scrophulariaceae	*Linaria*	toadflax	*L. dalmatica & vulgaris* weedy
Linaceae	*Linum*	flax	
Fabaceae	*Lotus*	birdsfoot trefoil, lotus	
Solanaceae	*Lycium*	wolfberry	
Berberidaceae	*Mahonia*	mahonia	
Rosaceae	*Malus*	apple	
Malvaceae	*Malva*	mallow	
Fabaceae	*Medicago*	alfalfa, medic	
Fabaceae	*Melilotus*	sweet clover	can be weedy
Lamiaceae	***Mentha***	**mint**	
Loasaceae	*Mentzelia*	blazing star	
Boraginaceae	*Mertensia*	bluebells	
Scrophulariaceae	*Mimulus*	monkey flower	
Lamiaceae	*Monarda*	bee balm	not red
Myoporaceae	*Myoporum*	myoporum	*M. laetum*
Hydrophyllaceae	*Nemophila*	blue eyes	
Lamiaceae	***Nepeta***	**catmint**	esp. hybrid *N. x faassenii*
Lamiaceae	*Ocimum*	basil	
Onagraceae	*Oenothera*	evening primrose	
Cactaceae	*Opuntia*	pear cactus	
Lamiaceae	*Origanum*	oregano	
Ericaceae	*Oxydendrum*	sourwood	
Fabaceae	*Oxytropis*	locoweed	
Fabaceae	*Parkinsonia*	Mexican palo verde	

North American Garden Plants for Native Bees

Scrophulariaceae	*Pedicularis*	lousewort	
Scrophulariaceae	*Penstemon*	penstemon	not red, consider *P. strictus*
Lamiaceae	***Perovskia***	**Russian sage, filigran**	*P. atriplicifolia*
Fabaceae	*Petalostemon*	prairie clover	
Hydrophyllaceae	***Phacelia***	**bluebells, scorpionweed**	
Ericaceae	*Phyllodoce*	mountain-heath	
Solanaceae	*Physalis*	groundcherry	
Rosaceae	*Physocarpus*	ninebark	
Lamiaceae	*Physostegia*	obedient plant	
Ericaceae	*Pieris*	fetterbush	
Papaveraceae	*Platystemon*	creamcups	
Polemoneaceae	*Polemonium*	Jacob's ladder	
Pontederiaceae	*Pontederia*	pickerelweed	
Fabaceae	*Prosopis*	mesquite	
Lamiaceae	*Prunella*	henbit	
Rosaceae	*Prunus*	cherry, plum	not doubled
Fabaceae	*Psorothamnus*	dalea	
Rosaceae	*Purshia*	cliff rose	
Lamiaceae	*Pycnanthemum*	mountain mint	
Brassicaceae	*Raphanus*	mustard	
Asteraceae	*Ratibida*	Mexican hat	
Rhamnaceae	*Rhamnus*	buckthorn	
Anacardiaceae	*Rhus*	sumac	
Grossulariaceae	*Ribes*	currant	
Fabaceae	*Robinia*	black locust	
Papaveraceae	*Romneya*	Matilija poppy	
Rosaceae	*Rosa*	rugosa-type and wild roses	not doubled, some weedy
Lamiaceae	*Rosmarinus*	rosemary	
Rosaceae	*Rubus*	raspberry, blackberry, brambles	some weedy
Asteraceae	***Rudbeckia***	**black-eyed susan**	
Salicaceae	*Salix*	willow	not weeping willow
Lamiaceae	*Salvia*	salvia	blue or violet
Caprifoliaceae	*Sambucus*	elderberry	
Dipsaceae	*Scabiosa*	pincushion flower	not doubled
Crassulaceae	***Sedum***	**sedum, stonecrop**	
Asteraceae	*Senecio*	senecio	
Malvaceae	*Sidalcea*	checkermallow	
Asteraceae	*Silybum*	milk thistle	
Solanaceae	*Solanum*	nightshade	some weedy
Asteraceae	***Solidago***	**goldenrod**	
Malvaceae	*Sphaeralcea*	globemallow	
Rosaceae	*Spiraea*	spiraea	
Lamiaceae	*Stachys*	lamb's ear	
Brassicaceae	*Stanleya*	prince's plume	

LAB SCENES

The Laboratory of paleoclimatology and climatology / Laboratoire de paléoclimatologie et climatologie (LPC) Département de géographie, University of Ottawa

The LPC of the University of Ottawa is engaged in 2 kinds of research projects: the collection and analysis of new paleoenvironmental data and the synthesis and mapping of large-scale patterns of past climates. Presently there are 2 postdocs, 8 graduate students, and several undergraduates engaged in a variety of paleoenvironmental and environmental projects.

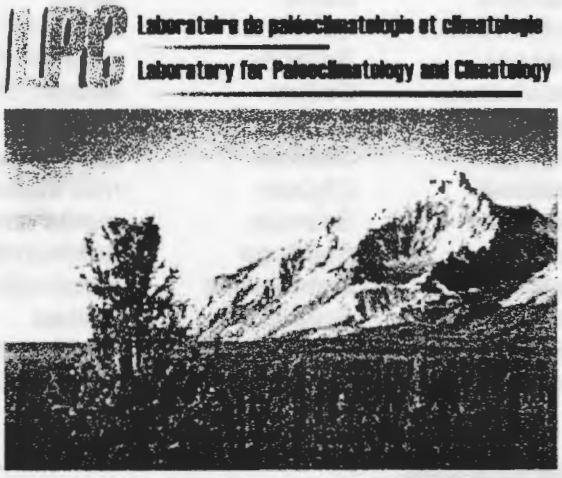
The lab consists of a computer room and several wet and dry labs. The computer lab contains a UNIX workstation and 6 PCs, extensive software for GIS and statistical analysis, and large collections of modern and Quaternary data. Current projects include the quantitative reconstruction and mapping of climates and vegetation since the Last Glacial Maximum, analysis of the modern and postglacial climate of the arctic, and the study of climate impacts in southern Ontario. This research program is part of the CSHD (Climate System History and Dynamics) NSERC Research Network and students wishing to apply the latest GIS and statistical methods to paleoenvironmental questions are welcome.

The lab is equipped for the analysis of sediment cores and tree-ring analysis. Sediment cores are described and sampled in several rooms, where x-rays, magnetic susceptibility and other aspects of sediment stratigraphy are studied. Sub-sampling is done in a clean hood. In addition to a number of identification manuals, the microscope room has an extensive pollen and macrofossil collection emphasizing northern Canada. Collections of wood thin-sections, ostracods and chironomids are under development as is the documentation of northern diatoms. Current projects include the study of the postglacial environmental history of the Canadian Arctic Islands (in collaboration with the Museum of Nature) through diatom, pollen and chironomid analysis, paleolimnology and paleoecology of the Kluane Lake region of the southwest Yukon, tree-ring studies in the Yukon, and treeline studies in northern Québec. Multi-proxy studies, quantitative analyses of ecosystem changes and high resolution studies are emphasized.

Our web site contains information of use to palynologists. Pollen data from the Canadian Pollen Database are available: Excel files containing pollen counts and metadata can be downloaded from the *Special Projects* section. These data will also be incorporated into North American Pollen Database (NAPD) in the usual format. Those wishing to use data from the NAPD, but don't have the time to learn database programming, can download F70 files from the NOAA site, and bring them into Excel using the macro *F7002Excel* (*Freeware/data/LPCReports* section). In that section you can also find various GIS and statistical tools, including the popular spatial autocorrelation programme, ROOKCASE (1999 Bull ESA. 80:231). Copies of recent poster presentations can be downloaded and there is a section of lab and field method descriptions that can supplement class textbooks. A detailed compilation of arctic climate data will soon be available.

Web site:
http://www.uottawa.ca/academic/arts/geographie/lpcweb/index.htm.

For more information, contact K Gajewski: (Dept of Geography and Ottawa-Carleton Geoscience Centre, University of Ottawa, Ottawa, ON K1N 6N5 Canada)
gajewski@aix1.uottawa.ca



Far and Wide

Palynology and Micropaleontology in Canadian Geoscience: New Frontiers and Applications

The GeoCanada 2000 event was Canada's millennium conference of the major geoscience societies, including the Geological Association of Canada, and was held on the University of Calgary campus, during May 29 - June 2 2000. Taking place during glorious spring weather, with the campus looking its best, the meeting was large and diverse. More than 5100 delegates representing thirty countries attended a full slate of more than 1100 presentations, arranged in about fifty sessions (Godfrey Nowlan, pers. comm., November 30 2000). As part of this meeting, CAP sponsored a one-day symposium, featuring both oral and poster presentations, on "Palynology and Micropaleontology in Canadian Geoscience: New Frontiers and Applications". The session spanned the afternoon of June 1 and the morning of June 2. It was co-convened and co-chaired by me, Alwynne B. Beaudoin, and Martin J. Head.

We chose this symposium theme to try to display the diversity of Canadian research in this area. Palynology and micropalaeontology contribute to many branches and aspects of geoscience: biostratigraphy, palaeoecology, vegetational history, maturation studies, evolution, past biodiversity, isotope studies, limnology, oceanography, and many others. Indeed, presentations in the symposium did capture the Canadian scene. Contributions reflected many localities within Canada and overseas and spanned geologic eras from the Paleozoic to the Cenozoic. The CAP symposium featured presentations on many microfossil groups, including conodonts, arcellaceans, dinoflagellates, foraminifera, and pollen. It comprised eighteen presentations, of which four were posters. The oral presentations were arranged in geochronologic order beginning in the Silurian and concluding with several focussed on the Holocene.

Thursday afternoon began back in the Silurian with David Jowett discussing conodonts recovered from the Cape Phillips Formation on Cornwallis Island in the Canadian arctic. He described a thick sequence of deposits recording a transition from off-shore (graptolites abundant) to near-shore (conodonts abundant) conditions. The biostratigraphy provides the opportunity to link marine and littoral sequences at a time of falling sea-levels across the Ordovician-Silurian boundary. Shunxin Zhang then took us forward to the Early Silurian and looked at conodont assemblages from Anticosti Island in the Gulf of St Lawrence. She hypothesized that shifts in the assemblage composition might reflect changing sea levels, perhaps related to glacial events. Both abundance and diversity appear to be influenced by environmental fluctuations. I found this interesting in view of similar arguments that have been advanced for biodiversity changes in the Quaternary.

Being in Calgary, of course, the Western Canadian Sedimentary Basin is a local geological feature of great interest. Sonny Baxter's presentation highlighted this feature by looking at Mississippian conodont stratigraphy. He noted regional similarities and differences between zonation in the Western Canadian Sedimentary Basin and sequences from the mid-continent. In particular, he described the conodont stratigraphy from several sections in southwestern Alberta.

Charles Henderson moved us to the Permian and examined conodont assemblages from south China and arctic Canada. He was interested in the contrasts, including number of biozones, between the assemblages in these two regions. Differences, which

may reflect environmental setting, may have implications for correlation. He continued this theme later at the poster presentation. Niranjala Kottachchi described her work with foraminiferal assemblages recovered from Jurassic strata on the Queen Charlotte Islands, off the west coast of Canada. The focus of the study was to assess palaeolatitudes as the Wrangell terrane, of which the Islands are part, moved north through the Mesozoic.

The final paper of the afternoon featured a "tag team" presentation by Dale Leckie and Claudia Schröder-Adams, which returned us to the local scene in Alberta. They examined the regional expression of the Fish Scales Formation (lower Cenomanian) and what its occurrence, compositional variation, and thickness can tell about palaeogeographic and palaeoenvironmental reconstructions. Their transect from the Crowsnest area (SW Alberta) to Birch Mountains (central NE Alberta) showed a consistent pattern of fining northeastwards, implying a topographic high to the southwest acting as an erosional locus.

Following the seven afternoon presentations, participants adjourned to the Olympic Oval to look at the four posters that also formed part of the symposium. Posters are always interesting because of the opportunity to talk to the presenters and ask additional questions in a more informal setting. One challenge was simply in finding the symposium posters! The Oval was crammed with hundreds of posters and the commercial exhibits associated with the meeting.

At the poster session, Martin Head changed hats from convenor to presenter and showed us dinoflagellates from the Pliocene Coralline Crag and Walton Crag Formations of eastern England. Martin used data from several deep-sea cores in the eastern Atlantic to erect biostratigraphic zonation that he found useful for the chronologic assessment of these shallow marine sediments from the North Sea margin. Charu Sharma showed details on her work from cores obtained from the Mekong delta in the South China Sea, probably the most far-flung study area discussed in the symposium. Her focus was on using the biostratigraphy to infer Late Pleistocene sea-level changes and delta development. I enjoyed discussing with Charu the macroremains retrieved from the cores.

Moving to the Holocene, Konrad Gajewski showed some intriguing data from northern Québec linking changes in lake geochemistry with the arrival of spruce in the watershed. The implication is that acidification of soils as a consequence of spruce arrival is sufficient to affect the lake's water chemistry, and hence produce a distinct geochemical signature. Turning the observation around, this suggests that the geochemical signal might act as a proxy for the local occurrence of spruce, perhaps allowing a more precise chronologic estimate than pollen percentage values can.

The eight presentations on Friday morning were concerned with records from the Cenozoic. The session began with Grace Parsons looking at palynology of Beaufort Sea sediments (Late Cretaceous – Tertiary) exposed in the Caribou Hills, Mackenzie Delta. She discussed both terrestrial indicators, such as pollen and fungal spores, and aquatic indicators, primarily dinoflagellates. These varied assemblages reflect the diverse habitats recorded in the sediments, as conditions changed from marine or littoral, to freshwater, perhaps lacustrine. Arun Kumar highlighted another microfossil group, by outlining the potential of arcellaceans as proxy palaeoenvironmental indicators. He reviewed the biology, taxonomy and occurrence of this group. He noted that the different morphotypes produced as a result of environmental stress make them especially attractive as pollution indicators.

Francine McCarthy discussed the taphonomy of palynomorph assemblages, containing both marine and terrestrial components, recovered from marine sediments. She pointed out that the assemblage could be influenced by preservation factors. Analysts also need to assess exactly what gets into the sediment. The contribution of the terrestrial component, for example, will be influenced by distance from shore. As sea levels change, the relative contribution of the terrestrial component will vary. Models that are attempting to track shoreline position, therefore, need to consider these factors.

Dermot Antoniades turned our attention to diatoms in the High Arctic and their usefulness as indicators of ice cover on lakes. The diatom assemblages change in response to the amount of open water. Hence, changes in diatom assemblages can monitor intra-seasonal changes in ice cover. This also provides a proxy climate indicator. However, because this is an annual cycle, high-resolution (annually laminated) sediments are required.
Topical themes (El Niño, west coast salmon stocks, and commercial fishing) appeared in the next presentation, by Trecia Schell. She discussed how changes in foraminiferal assemblages in Effingham Inlet, southern Vancouver Island, can be used to track palaeoceanographic conditions, and therefore provide surrogate information on fish stocks. Her presentation demonstrated the contribution that micropalaeontology can make to topics that are of immediate public concern.

Taking up a theme advanced in Dermot Antoniades' presentation, Konrad Gajewski drew our attention to the detailed reconstructions that can be made by examination of high-resolution records. In particular, he noted that climatic and environmental perturbations on century or decadal scales are best detected through fine-spaced high-resolution sampling and analysis. Such studies are especially necessary when attempting to assess the frequency of events such as forest fire and are needed for linking climatic events identified from instrumental records and proxy palaeoenvironmental data sources.

Rolf Mathewes took us on a tour of the west coast of British Columbia, exploring Late Quaternary offshore deposits, with a particular eye to the implications for archaeology and human history. He described some fascinating and significant results that are being obtained from sediments of "drowned lakes" retrieved by off-shore drilling programs. These lakes were formerly on shore but have been drowned by rising sea-level and so are now on the continental shelf. Pollen stratigraphy of late glacial sediments from these locales is being compared to equivalent deposits from Vancouver Island and Gwaii Hanaas (Queen Charlotte Islands) to provide a more complete picture of Late Pleistocene environments. He noted that well-vegetated and productive landscapes occupied the continental shelf before submergence, indicating the potential for human occupation. Because of my own interests in human-landscape interactions, this presentation certainly stood out as a highlight for me.

Rolf gave the final presentation of the session too, looking at Late Pleistocene climate events recorded in the Mike Lake core, southern British Columbia. The pollen assemblages and radiocarbon dates suggest two intervals of cooling, the older of which may correlate to the Sumas glacial advance, and the younger of which correlates to the Younger Dryas. If this is the case, then the Younger Dryas cold event cannot be the driving mechanism for the Sumas advance. I found this interesting because it helps clarify the expression and effect of the Younger Dryas cold interval in western North America.

As a convenor, I felt the CAP symposium was a resounding success. The audience was small, about forty people at most, but there were some good questions and discussions after many papers, showing keen interest and enthusiasm. All the speakers did a fine job of presenting their material, and most had abundant and attractive slides. The posters were colourful, well designed, and interesting. I was especially pleased to see several outstanding presentations by graduate students. Each presenter received a bonus from the symposium in the form of a copy of a limited edition print by a local Calgary artist, Dennis Budgen, as a souvenir. Martin and I thank the presenters for their efforts and the audience for their attention in making this a truly memorable session.

Several themes stood out strongly for me from the range of presentations. One pervasive theme was the attempt to reconstruct palaeogeography at a regional scale, whether in the Paleozoic or the Cenozoic. This was reflected in a focus on regional reconstructions and correlations rather than site-specific studies. This integration of data made for some interesting and thought-provoking presentations. Other presenters highlighted the usefulness of multiple indicators in palaeoecological reconstruction. Finally, several presentations showed how high-resolution samples, closely spaced in both time and location, can be used to investigate short-term fluctuations in records. These may be of great regional and stratigraphic

significance, even though they appear only as "blips" in a longer record. When sample variability is at almost the same scale as these small features, closely-spaced and highly analyzed samples are the only way to distinguish a true signal from noise.

The GeoCanada 2000 meeting included several features that I have not encountered in previous meetings, and some innovations reflecting the impact of the Internet and digital technology [see Godfrey Nowlan (2000) "GeoCanada 2000: An Organizers's Personal Perspective", Geolog 29(3): 23-24]. Organizers asked authors to submit their abstracts on-line in PDF (portable document) format. This gave rise to a few technical problems but generally the procedure worked. These abstracts were then included as part of the conference program and abstracts volume that was produced as a CR-ROM. Authors were encouraged to produce "extended" abstracts, which could be up to four pages in length and include diagrams, images, and references. These background statements certainly gave authors an opportunity to provide much more detail of the studies and results than the traditional 200 - 300 word abstract format. They act, indeed, almost as "mini-publications". The abstracts produced for the CAP Symposium are lengthy and informative. My main concern about this format is the availability and longevity of the CD-ROM. On balance, for ease of use and portability, I still prefer the "dead-tree" version!

Besides the CAP Symposium, the GeoCanada 2000 meeting included many other Technical Sessions, Short Courses, and Symposia. Because I was only able to attend the last two days of the meeting, my opportunity to sample the spectrum of events was limited. However, I did find time to wander around the Olympic Oval, looking at the diverse array of posters and displays by corporate entities, government agencies, publishers, and other organizations. My overwhelming impression was that "hard rock" geology, mining, oil and other industrial interests dominated the conference. Other aspects of Canadian geoscience, such as Quaternary science, geomorphology, and environmental geoscience, had a much lower profile. There were some palynological presentations in other technical sessions, but the greatest concentration was in the CAP Symposium.

The Nickle Arts Museum, on the University of Calgary campus, was the venue for several geoscience displays during the meeting. These formed the "GeoTreasures" exhibit, on view from May 26 to June 24. Touring this exhibit was a busman's holiday for me, since I work in a Museum, but I always like to see what other institutions do with their displays! The most striking feature of the GeoTreasures exhibit was a huge mammoth skeleton. Posed as though sinking to the ground in death, this was a cast of the Hebior mammoth, found in 1994 in Wisconsin. The bones were associated with stone tools, suggesting people killed and butchered the mammoth (Hall, 1995, Mammoth Trumpet 10(2):5-8). The exhibit also comprised several fine displays of gemstones and minerals (including some from the Geology Collection at my institution, the Provincial Museum of Alberta). However, I especially enjoyed the display of fossils from the Burgess Shale, mainly because I had never seen these "for real" before. The specimens, from the Royal Ontario Museum collections, included an array of surreal creatures, some with feathery-looking appendages, others with peculiar body morphologies. Truly fascinating. While at the Museum, I explored the other exhibit areas. I was intrigued by a fine exhibit called "Women in Profile" that highlighted women depicted on coinage through the ages. Not a palynologist among them!

Following the success of the CAP symposium and the enthusiasm of the participants, Martin approached the editors of the journal Palaeogeography, Palaeoclimatology, Palaeoecology with a proposal to compile a Special Issue of papers from the meeting. This proposal was accepted, and we are now in the process of receiving papers for inclusion. This issue should stand as a significant statement on the status of Canadian micropalaeontology at the turn of the millennium. We will announce any developments on this initiative in future Newsletters.

List of presentations

David M. Jowett and Christoper R. Barnes "High-Resolution Lower Silurian Conodont Biostratigraphy: Integrating Traditional Paleontological Data"

Shunxin Zhang and Christopher R. Barnes "The Post-

Extinction Evolutionary Radiation, Biofacies Partitioning, And Response To Eustatic Changes Of Early Silurian Conodonts, Anticosti Basin, Quebec"

Sonny Baxter "Conodont Biostratigraphy for Mississippian Rocks of the Western Canada Sedimentary Basin"

Charles M. Henderson and Shilong Mei "Permian Correlation between Equatorial South China and Temperate Northwestern Pangea: Difficulties and Possible Solutions"

Niranjala Kottachchi, Claudia J. Schröder-Adams, James W. Haggart, and Howard W. Tipper "Jurassic Foraminiferal Biostratigraphy and Paleoenvironments of the Queen Charlotte Islands, British Columbia: A New Piece in the Cordilleran Puzzle"

Dale A. Leckie, Claudia J. Schröder-Adams, and John Bloch "Understanding the Fish Scales and Barons Formations - The Efffect of Paleotopography on the Late Albian and Cenomanian Sea-Level Record"

Marion Grace Parsons and Geoffrey Norris "Palynology and Ecostratigraphy of Paleogene Terrestrial, Freshwater and Marine Floral Assemblages from the Caribou Hills, Mackenzie Delta"

Arun Kumar and R. T. Patterson "Arcellaceans (Thecamoebians) As Proxies for Chemical Pollution and Remediation in Lakes"

Francine M. McCarthy, Peta J. Mudie, Andre Rochon, Kevin E. Gostlin, Elisabeth Levac "Taphonomic Problems In Marine Palynology And Possible Solutions"

Dermot M. Antoniades, M. S. V. Douglas, John P.Smol, D. S. S. Lim, and N. Michelutti "Applications of Diatoms To Assessing Paleoenvironmental Change In The Canadian High Arctic"

Trecia M. Schell "Holocene Paleoproductivity in the Northwestern Pacific Determined by Foraminiferal Assemblages in Some Fjords of Vancouver Island, British Columbia"

Konrad Gajewski "High-Resolution Pollen Analysis from Lake Sediments: Review and Current Directions"

Rolf W. Mathewes "Paleoecology of a Lost World: Postglacial Environments and Biogeography of the Continental Shelf of Western Canada"

Marlow G. Pellatt, Rolf W Mathewes, and John J. Clague " Implications of the Mike Lake Pollen Record for the Glacial and Climatic History of the Fraser Lowland, British Columbia"

Alain Grenier and Konrad Gajewski "Comparison Of Lake-Sediment Chemistry and Pollen Analysis at Treeline in Northern Québec" (Poster)

Martin J. Head and Geoffrey Norris "Pliocene Dinoflagellate Cyst Stratigraphy of the Western North Atlantic, and its Applicability to Shallow Marine Deposits Of Eastern England" (Poster)

Charles M. Henderson and Shilong Mei "Permian Correlation Between Equatorial South China and Temperate Northwestern Pangea: Difficulties and Possible Solutions" (Poster)

Charu Sharma "Paleoenvironmental Reconstruction of the Quaternary Mekong-Molengraaff River Deltas on the Sunda Shelf, South China Sea" (Poster)

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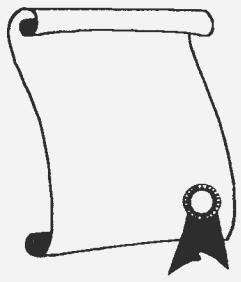

Palynology Well Represented at GSA

The Annual Meeting of the Geological Society of America was held November 9-18 in Reno NV. A theme session organized by the American Association of American Palynologists (AASP), entitled "Frontiers in the Palynological Sciences" was very successful, with 125 posters and 27 oral presentations over 2 days. There were also a few other palynologically-related presentations at other sessions at the GSA meeting. Long-time CAP member Thomas Demchuk was one of the presiders of the AASP theme session. A broad cross-section of palynological applications, paleoenvironments and stratigraphic ages was represented in the session. Applications included forensic science, hydrogeology, archeology, and sequence stratigraphy, in addition to the traditional mainstays of paleoenvironmental and biostratigraphic applications. A wide variety of terrestrial and marine ecosystems was explored, from their origins to the present day, from polar to tropical latitudes.

CAP members were well represented, with the following palynologically-related presentations:
Bryant, V., Mildenhall, D. Forensic palynology: past, present, and future.
Head, M.J., Norris, G. Pliocene of eastern England dated by North Atlantic dinoflagellate cyst stratigraphy.
Hopkins, J.A., McCarthy, F.M.G. Determining the resistance of fossil dinoflagellate cysts to oxidation: a laboratory approach.
Lacourse, T., Matthewes, R.W. Late Pleistocene and Holocene paleoecology of the Queen Charlotte Istands and northern Vancouver Island, Canada.
Matthewes, R.W. Paleoecology of a lost world: pollen analysis and the coastal route for the peopling of the Americas.
McCarthy, F.M.G., Katz, M.E., **Hopkins, J.A.,Tiffin, S.H., Gostlin, K.E.** Palynomorphs, sea level and sequence stratigraphy.
Parsons, M.G., Norris, G. Ecostratigraphy of Paleogene marginal marine palynomorph assemblages from the Caribou Hills, MacKenzie Delta, Northern Canada.
Tiffin, S.H., McCarthy, F.M.G. Palynological character of shallow marine Miocene sequences- data from the Mid-Atlantic Transect, New Jersey (ODP Legs 174 and 174AX).

Submitted by
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JOIDES Ocean Drilling Program

Palynologists don't often sail on the JOIDES Resolution, primarily because palynological preparation is long and uses dangerous reagents. At most Ocean Drilling Program (ODP) sites, calcareous nannofossils and planktonic forams are abundant and provide the relative quick age picks upon which most drilling relies. When the ODP drills in high latitudes (e.g. recent legs in Antarctica) or in shallow water (e.g. Leg 174A to the New Jersey shelf) palynomorphs become virtually the only "players" and palynologists are sought after (although often fellow scientists continue to expect the rapid age picks that the calcareous microfossils permit!).

I sailed on Leg 191 (Yokohama-Guam) where we cored Site 1179, separated by a deep trench from Japan, several hundred kilometers to the west. This site is in the abyssal North Pacific Ocean at 5586.5 m water depth, well below the CCD, so that no calcareous microfossils were expected, at least in the Neogene to Recent sediments I was interested in. I planned to study the transport of pollen and dinocysts to abyssal environments, but this general objective was eclipsed

by some really interesting results came out of the paleo lab. Two short intervals contained relatively abundant, quite well-preserved calcareous microfossils (forams and nannofossils) at Site 1179- in other words, roughly 1 km below the CCD. These intervals, around 2.5 Ma and 900 ka, were also characterised by abundant pollen and dinocysts, abundant diatoms, but relatively few radiolarians. The substantial increases in Northern Hemisphere ice volume previously documented for these intervals suggest a climatically-controlled paleoceanographic explanation for this anomalous calcium carbonate preservation. The mechanism may involve a chemical change in deep ocean waters suppressing the depths of the lysocline and CCD (Hypothesis A in Figure 1) or a dramatic increase in calcium carbonate supply (Hypothesis B in Figure 1).

Before the postcruise meeting in Hawaii in 2002, I will analyse the palynomorphs and the planktonic forams, while fellow shipboard paleontologists (James Arney- nannofossils, and Warna Downey- radiolarians) complete their analyses. We will attempt to determine which of these mechanisms (or a combination of both) was responsible for the presence of calcareous microfossils at Site 1179.

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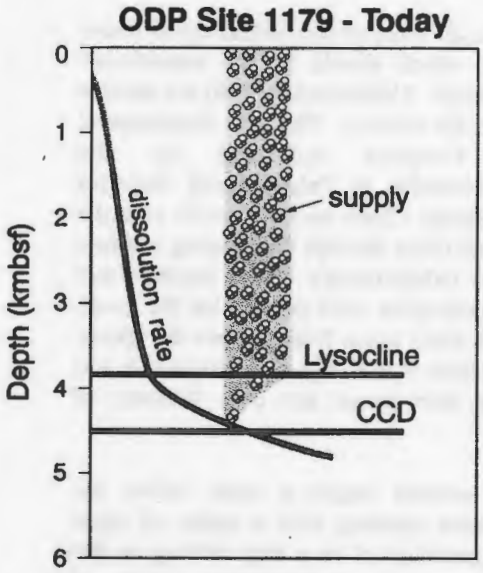
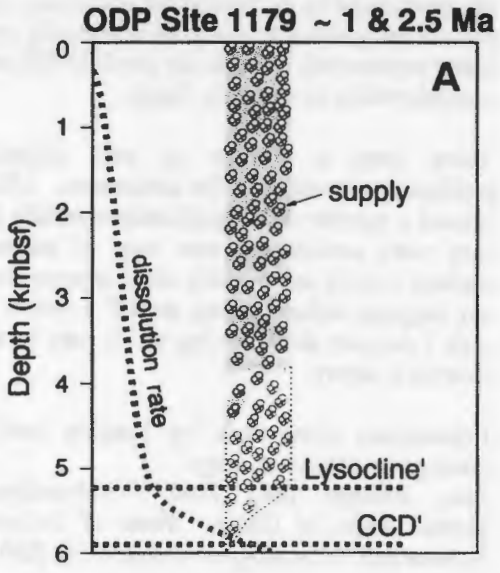
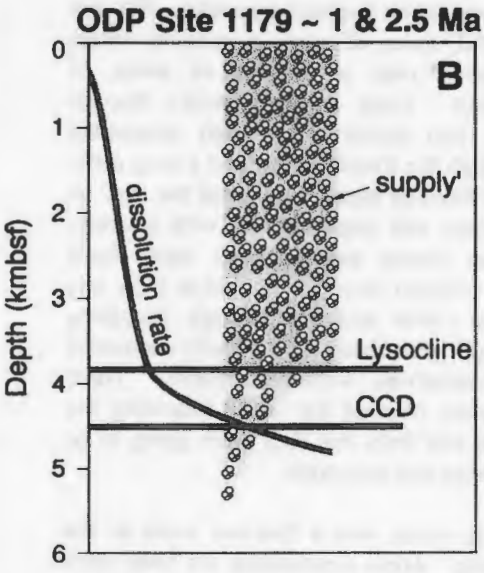
Editor's note: You can read more about the JOIDES (Joint Oceanographic Institutions for Deep Earth Sampling) and ODP at the following websites:
http://www-odp.tamu.edu
http://joides.rsmas.miami.edu







10TH INTERNATIONAL PALYNOLOGICAL CONGRESS NANJING, CHINA, JUNE 24-30, 2000

Every four years, an event on the palynological social calender occurs which should be the penultimate event for the science. Unfortunately, I do not believe it is for many in the science. The 10th International Palynological Congress sponsored by the International Federation of Palynological Societies was held in Nanjing, China on June 24-30 with the local organization being through the Nanjing Institute of Geology and Palaeontology. Two hundred and thirty eight palynologists were present for the group photograph and these came from around the globe. The following report is from my own perspective and includes biases that favour my own interests of course.

The meetings actually began a week before the official conference opening with a series of three field trips. I participated in a trip looking at the vegetation in the tropical Xishuangbana County of Yunnan Province. Leader of the trip was Dr. Zhu Hua, a botanist attached to the Kunming Botanical Garden and an expert on tropical vegetation. The trip was a delightful series of stops at tropical forest reserves scattered over a number of areas of southwest China. Long leisurely walks through dense forests, two strolls along high suspended walkways through the forest canopy and a long cable car ride across forested areas highlighted the trip. A few cultural tours and stops dealing with minority peoples of the region and fabulous local foods completed the pleasant journey. The other trips, one through central China and one through Xingjiang Province of northwest China were equally successful based on conversations with participants. Three further trips were planned for week following the conference and one feels that they were going to be equally interesting and enjoyable.

The conference venue was a five-star hotel in the heart of Nanjing. Areas surrounding the hotel were dedicated to shopping and were always busy and bustling with shoppers. The meeting began with the usual opening ceremonies followed by a multicourse Chinese buffet. The meetings were kicked off with three invited lectures: one by Chen Junyuan who discussed the Cambrian Chenjiang fossil site of Yunnan Province, one by Dr. M. Kedves who discussed new trends in basic and applied palynology and one by Dr. O. Davis who discussed long terrestrial climate and vegetational records from western North America. Owen Davis is the past president of IFPS. General sessions followed for the rest of the week. The greatest number of the presentations were on Quaternary and Recent topics. Considerably fewer of the talks concerned the fossils of the Precambrian, Paleozoic, Mesozoic and Cenozoic. Midway through the week, the conference hosts took all the attendees on a days excursion to historical sites around Nanjing. The closing ceremonies were thankfully relatively brief followed by a final banquet.

The conference was an interesting one, with lots of good times, interesting presentations and opportunities for observing cultural aspects of modern Chinese society. It provided an opportunity for meeting a number of younger palynologists especially a number from Russia. Very few North Americans made the trip to China (4 Americans and one Canadian). I believe this was a major disappointment to the conference organizers. Other parts of the global palynological community were better represented. The site for the 2004 IPC meeting was selected to be Granada, Spain.

There were a number of new palynological publications unveiled at the conference. Although I missed a number of the publications mainly because they were outside my own area of interest or I decided I could not possibly carry anymore books in my luggage without giving myself a severe muscle pull, I did note the following which may be of some interest to others:

Publications being sold by Nanjing Institute of Geology and Palaeontology:
Song Zhichen (ed.) 2000. Palynofloras and palynomorphs of China. Press of University of Science and Technology of China, 233p. ($40 U.S.)

Zhou Shanfu et al. (eds.) 2000. Paleopalynological research and application. The 10th International Congress, Nanjing, 167p. (Price unknown)

Song Zhichen et al. 1999. Fossil spores and pollen of China, v. 1, Upper Cretaceous and Tertiary spores and pollen. Science Press, p. ($60 U.S.; a picture catalogue of palynomorphs with plates)

Song Zhichen, Shang Yuke et al. 2000. Fossil spores and pollen of China, v. 2, the Mesozoic spores and pollen. Science Press, 710p. ($60 U.S.; a picture catalogue of palynomorphs with 167 plates; a third volume is to appear in the future on Paleozoic materials)

Publications being sold by Petroleum Industry Press: Gao Ruiqi; Zhu Zonghao; Zheng Guoguang and Zhao Chuanben (eds.) 2000. Palynology of Petroliferous Basins of China. Petroleum Industry Press, Beijing, 249p. ($40 U.S.)

Zhu Zonghao; Zheng Guoguang and Zhao Chuanben 2000. Symposium on palynology of petroliferous basins in China. Petroleum Industry Press, Beijing, 262p. ($20 U.S.)

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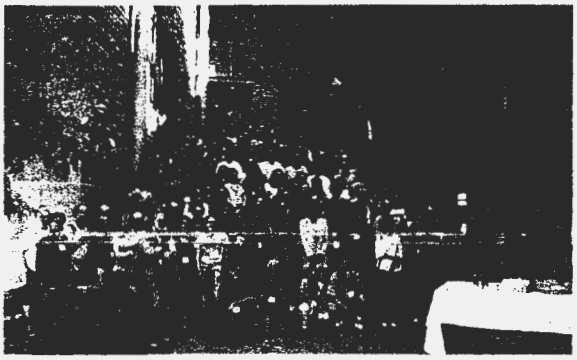
Field trip participants enjoying views along road in Mengla Nature Reserve, located north of Mengla, Xishuangbanna, southwest China.

View of the canopy suspended walkway at Mengla Nature Reserve located north of Mengla, Xishuangbanna, southwest China. Here the trees reach heights of 35-46 m and the walkway winds its way amont the taller forest elements. It was originally installed to aid studies of canpy faunas, but more recently is solely used by reserve visitors.

8th International Paleolimnology Symposium

The 8th International Paleolimnology Symposium was held at Queen's University, Kingston, Ontario from August 20-24, 2000. The conference was preceded and followed by excursions, as well as a series of workshops. Conference co-chairs Drs. John Smol and Brian Cumming along with their colleagues at PEARL (Paleoecological Environmental Assessment and Research Lab) organized and hosted this highly successful meeting. Approximately 250 paleolimnologists from all over the world attended, including delegates from every continent (except Antarctica!). It was heartening to see a significant number of researchers from Europe and Australia

who were able to travel the distance in order to participate in the meetings as well as African, Asian and South American colleagues.



Keynote speakers were featured each day, at the beginning of the morning and/or afternoon sessions, bringing to the forefront some of the recent developments and pressing questions of mainstream paleolimnology. In this report we present *some* of the highlights from the talks as space limitations prevent a comprehensive summary. **Dr. M. Brenner** (University of Florida) opened the meeting with a fascinating summary of late Pleistocene/Holocene environments of the Yucatán Peninsula. Based on paleolimnological reconstructions, he and his colleagues tracked agricultural land clearance practices resulting in deforestation and soil erosion and demonstrated how the 9th century decimation of the Mayan civilization could be strongly attributed to drought during that period.

Mark Brenner and Paul Hamilton

Dr. D. Livingstone (Duke University) instigated much discussion when he challenged paleolimnologists to strive to achieve a better understanding of coring. He emphasized that intermittent sampling can occur if variations in sediment shear strength are encountered along the sediment sequence during coring, resulting in faulty paleoenvironmental interpretations. In his keynote lecture entitled, "Let's clean up our act" he warned the audience that it was all too easy to become complacent and to accept current practices in paleolimnological coring procedures. A better understanding of core tube length : inner diameter as well as a minimization of the tube thickness helps define the maximum core length retrievable with minimum distortion or coring artifacts. Significant improvements could be attained by using larger diameter core barrels and ensuring that the length of drive and the length of retrieved core were comparable.

Dan Livingston and John Glew

Dr. Patrick De Deckker (The Australian National Univeristy) gave an insightful comparative overview of the state of paleolimnology and paleoceanography. Despite similar scientific objectives towards global paleoenvironmental reconstruction, very little collaboration exists between these two research fields. Each uses different techniques to process and analyse cores and they also rely on very different proxies, yet important lessons can be gained from both. He encouraged the use of proxies that can be compared between oceanic and limnological settings, as well as exchange of technologies and more

collaboration. The syntheses provided by the PEP (Pole Equator Pole) studies are timely and he further expanded on the directions that future research should follow. For example, oceanographers have long overcome the challenge of retrieval of long cores from deep waters, however long core retrieval from deep inland lakes has been rare, e.g., Lake Biwa, Japan. **Dr. W. Dean** (USGS) gave a highly informative and entertaining keynote presentation on the recent development of GLAD800 (Global Lake Drilling to 800 meters). Funded by the International Continental Scientific Drilling Program (ICDP) this modular floating platform enables retrieval of long cores in up to 200 m of water. A short "on the scene" video showed the eight, 20 foot long sea/land shipping containers which form the barge supporting the drill rig, as well as some footage of the inaugural core retrieval on Great Salt Lake. Portable laboratory and cold storage facilities on shore allow for the immediate subsampling of core sections as they are retrieved. The modular design of the barge allows for the relatively easy deployment of the system on different continents and indeed future coring assignments are planned for Lake Titicaca and elsewhere. The potential for estuarine and coastal regions is also great.

The final two keynote speakers addressed the importance of multiproxy studies. **Dr. A. Lotter** (University of Bern) described the potential and limits of quantitative inference models in multi-proxy climate reconstructions. Several strong climate inference models (primarily for summer temperature) have now been developed using terrestrial and aquatic proxies (e.g. chironomids, diatoms, cladocera and chrysophyte cysts), however very few downcore applications have been presented so far. Furthermore, few studies have undertaken a multiproxy approach, which provides a better assessment of climate reconstructions. Using examples of multi-proxy reconstructions of late-glacial and Holocene summer temperatures from Swiss lakes, he stressed the importance of looking at the ecotonal boundaries of individual biota as well as sample specific errors. **Dr. H.J.B. Birks** (University of Bergen & University College London) began by identifying the difficult challenges that multiproxy paleolimnological studies present. Although the advantages include a more detailed, holistic view and an increase in the degrees of freedom in interpretations, they are also time-consuming and researchers are often faced with "too much data". Various proxies have different strengths and weaknesses that need to be identified and the storage and interpretation of the data is a major challenge. Project design can bypass disadvantages such as core correlation by using long, wide diameter corers, which allow for multiproxy measurements to be conducted on the same core. The increased advantages are compelling and the value of multiproxy projects was certainly well established by these last two keynote speakers.

John Birks

The conference was organized to maximize the number of oral presentations while maintaining sufficient time for discussion throughout the day. Given the number of participants and the limited time, two concurrent oral sessions were held. The main session themes included: Alpine, Arctic and Antarctic; Climate; Lake Management; New Developments; Rivers and Reservoirs; and Tropical and Subtropical. For those interested in attending talks in both sessions, quick room changes could be effected as the two lecture halls were closely situated.

Three formal poster sessions were scheduled throughout the meeting, during which the 108 posters could be viewed and discussed with authors. Posters were organized in parallel groups to the oral presentation themes: Arctic (11 presentations), Alpine (14), Climate (24), Lake Management (17), New Developments (27), Rivers and Reservoirs (4) and Tropical and Subtropical (11). Posters were displayed in the central atrium of the Biosciences complex for the duration of the meeting. Given that

this was also the venue for coffee breaks, lunches and a late afternoon cash bar, it ensured that posters received a great deal of attention outside the formal sessions. Many fruitful discussions were thus instigated in an informal setting.

Social and informative outings were also organized to complement the symposium. For the most part, the weather held out and provided sunny, cool days on the beautiful limestone campus of Queen's University. Most lunches and dinners were included in the cost of registration and the organizers did their best to ensure that delicious food was served in beautiful settings. An outdoor barbeque held in the courtyard of Ban Righ Hall helped many people relax after the first day of meetings. The banquet meal was eaten in a bright and airy dining hall, to the accompaniment of a gifted classical guitarist. Even the coffee breaks were catered with freshly baked goodies, so that by the end of the meeting many people were loosening their belts. We had cake and icing too!

A pre-conference fieldtrip, led by Dr. Brian Cumming took an interested group of researchers to the Adirondacks to visit the famous New York State lakes of the renowned PIRLA I and II (Paleoecological Assessment of Recent Lake Acidification) projects. Approximately 15 people participated in the opportunity to explore and hike through this high peaks region of Eastern North America. A post-conference excursion throughout Southern Ontario was led by Dr. John Smol and colleagues at PEARL. The busload of participants visited historic sites of the region, e.g., Old Fort Henry and Upper Canada Village before stopping to explore parts of the St. Lawrence River, Cooper Marsh and the Queen's University biological station at Lake Opinicon were several eutrophication related studies have been conducted. Other stops included the meromictic Little Round Lake, as well as an "onsite lecture" by Dr. W. Vreeken (Queen's University) on marl deposition in Southern Ontario Lakes.

Very few paleolimnologists will ever give up a chance to talk about mud and their particular branch of science. Therefore many took this opportunity to organize mini-symposia and workshops while so many of their colleagues were gathered together. The Arctic-Antarctic Diatom Symposium held their 9th informal two-day meeting before the Paleolimnology Symposium began. Organized to ensure taxonomic consistency amongst diatomists, a group of about 20 people gathered to compare and discuss their high latitude diatom assemblages. Presentations by Paul Hamilton (Canadian Museum of Nature) and Hedy Kling (Freshwater Institute, Winnipeg) brought the group up to date on some of the taxonomic advances and characteristics of problem genera such as *Achnanthes*, *Aulacoseira* and *Cyclotella*. Similarly a two-day chironomid (aka dead midges) workshop was held. Other workshops were organized during a free afternoon provided mid-week. During this time the second part of the chironomid workshop was held. Approximately 28 people were in attendance for the first unofficial international dead midges workshop. Suffice it to say that interest in chironomid paleoecology has more than quadrupled in recent years! The workshop was hosted by Dr. Ian Walker of Okanagan University College, Kelowna, and Roberto Quinlan, a Ph.D student at PEARL. The first session (prior to the conference) consisted of a discussion and first-hand viewing of laboratory techniques such as sediment preparation, sieving, sorting and mounting of headcapsules. It was interesting to hear of the diversity of techniques, instruments and mounting media that researchers are using, particularly our European colleagues, and to get some insights on what methods work well. The second session focused on taxonomy, with Steve Brooks (Natural History Museum, London) giving an overview of his new taxonomic guide for the Tanypodinae, soon to be published in Journal of Paleolimnology. Other discussions centered on the difficult Tanytarsini tribe, and attempts were made to identify headcapsule features that might enable us to distinguish the different genera in this group. Anyone interested in learning more about chironomids and their use in paleoecology can visit the chironomid home page at http://www.ouc.bc.ca/eesc/iwalker/intpanis/

Dr. W. Last provided the following synopsis on the Lake Baikal workshop. Dr. Mike Sturm (EWAG, Dubendorf, Switzerland) convened a most successful 2 hr Lake Baikal Workshop on Wednesday afternoon. After a brief summary of the status of past limnogeological and paleolimnological research on

this important lake by Dr. Sturm, the 20-25 participants heard progress reports from several of the key investigators involved in a new international collaborative coring and analytical program. Dr. Hedi Oberhansli (GeoForschungsZentrum, Potsdam, Germany) summarized the on-going lithostratigraphic and biostratigraphic research of the new EU coring project, highlighting many of the emerging high-resolution proxy databases. This cooperative project involves researchers from Belgium, Germany, Poland, Switzerland, UK, and United States. Dr. Anson Mackay (ECRC, University College London, UK) provided a glimpse at the diatom stratigraphy and summarized some of the concepts involved in reconstructing the relatively recent climatic signals in the basin. Dr. Kenji Kashiwaya (Kanazawa Univeristy, Japan) provided a detailed overview of the Japanese efforts on the lake in the vicinity of the Academician Ridge and highlighted the cyclical fluctuations that are apparent in the past 250k yr record. All presentations were informal which afforded excellent exchange of ideas and provided the participants the opportunity to pose questions and discuss the material.

Dr. R. Battarbee briefed all interested persons on the relatively new PAGES (Past Global Changes) initiative called LIMPACS (Human Impact on Lake Ecosystems). Instigated 18 months ago, LIMPACS is based on process-based working groups which combine neolimnology, paleolimnology and modeling in order to better understand anthropogenic impacts. The steering committee met in Windermere, UK in January 2000 and a science plan is to be published shortly. Additional information on this effort can be found at www/geog/ucl.ac.uk/ecrc/limpacs/limpacs.htm.

Many people have made important contributions to the field of paleolimnology, and during the meetings we were very fortunate to be able to spend an afternoon with Dr. S. R. Brown. Emeritus Professor at Queen's University, Ted Brown is responsible for having injected the paleolimnological serum into John Smol and Peter Leavitt amongst others. We have all witnessed the result of that inoculation. Many people took the opportunity to chat with Ted and to remember many shared coring and research experiences.

While there was ample opportunity to enjoy each other's company during the meeting and to catch up on the latest news about colleagues who had not been able to attend these meetings, we also took a moment during the opening of the conference, to remember those colleagues of ours who had died since the last meeting and who were with us in memory. These include: Drs. Frode Berge, Thomas Edmondson and Julian Szeicz. They made important contributions to the science of paleolimnology and they are sorely missed by all.

The International Paleolimnology Symposium was originally held every fourth year; however, a decision to move to every three years was made during the previous meetings (7th International Paleolimnology Symposium) in Germany. During the final business meeting, participants of the 8th symposium voted to accept the invitation made by Drs. V-P. Salonen and A. Korhola to hold the next Paleolimnology Symposium in Helsinki, Finland, in 2003.

In conclusion, the 8th International Paleolimnological Symposium was a huge success. Not only were so many paleolimnolgists, aka mud lovers, able to attend, but the quality of all presentations and posters was extremely high. Abstracts of the oral and poster presentations can be viewed online at the Journal of Paleolimnology web page: http://biology.queensu.ca/~pearl/paleo2000.htm. On behalf of all participants, we'd like to take this opportunity to thank all members of PEARL for their great efforts in coordinating such a highly organized meeting. Thanks to all those who presented their data and participated in the meetings. We all learned something and we all had a good time doing so. Thanks very much.

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LacCore: The National Lacustrine Core Repository

The first National Lacustrine Core Repository (LacCore) in the United States exclusively for housing terrestrial basin sediment cores is now established under the sponsorship of the National Science Foundation, Earth Systems History program in partnership with the University of Minnesota, Limnological Research Center (LRC) and Large Lakes Observatory (LLO). The program will be described more completely in a forthcoming issue of the Journal of Paleolimnology. As a nationally funded facility, LacCore is run by the LRC with direction and input of a national External Advisory Group (EAG).

The physical facility for LacCore, completed in October 2000, is a 20' x 30' walk-in cooler with specially designed wire racking capable of holding up to 17,000 m of core. This sounds large, but it is truly only a small, though essential, part of the concept behind the repository. LacCore is linked tightly with the LRC Core Lab, a training and research facility well equipped with instrumentation to complete both basic core descriptions and more detailed studies (www.lrc.geo.umn.edu). Both the Core Lab and LacCore are inspired by Dr. Kerry Kelts' (recently retired LRC Director) long-held conviction that lake and terrestrial basin cores are integrative archives of environmental change, and thus have huge scientific value. As with ocean cores, this value is maximized when information is shared and when cores are managed and preserved in a framework that fosters value to a variety of researchers and the agencies that fund research. Dr. Emi Ito is the current LRC Acting Director. LacCore Curator is Dr. Douglas Schnurrenberger who is experienced in many aspects of coring, sedimentology, and the technological systems. LRC Core Lab manager is Dr. Linda Shane, responsible for daily operations as well as palynology on the side.

Below is a brief summary of the philosophy, goals, and policies of LacCore. Some aspects are still under discussion, and we invite input and questions at the beginning of this project (laccore@tc.umn.edu).

Philosophy

- Lacustrine cores are valuable environmental archives that should be curated for later study and resampling. Sampling should minimize core disturbance and preserve an archival portion.
- Cores taken with support from national funding agencies are part of the international scientific heritage and should be available for study by other scientists from any nation. Establishing a balance between the needs of an initial research team for sufficient time to publish results and the needs of the community for access to the cores is critical. After a moratorium sampling period (see below), cores become available for other projects. Conflicts over sampling rights will be mediated by the Curator or the EAG.
- Investigators vary widely in their access to instrumentation and ability to carry out sufficient minimal sediment description. LacCore staff will provide this expertise (i.e., will offer training) and assistance as needed

Goals

- To curate/preserve cores as the material documentation of an intellectual study or construct, and as archives of basins from around the world.

- To make curated cores available for future study by qualified scientists or educators because scientific understanding is subject to revision and change based on new technologies and understanding.
- To work with the paleolimnological community towards development of standardized protocols for core retrieval, study and archiving.
- To make openly available, via a web site, scientific information regarding archived cores after the publication of results including shared databases, citations, communications, and data related to descriptions.

Policies

1. LacCore only curates cores that become part of the international scientific heritage. Cores become available for secondary or tertiary sampling after a moratorium period. The duration and definition of the moratorium period is currently under discussion.
2. Cores are split longitudinally into archive and working halves, with sampling initially restricted to the working half. Working and archive halves are stored at 4° C in sealed D-tubes after wrapping in plastic film. They are racked chronologically.
3. Cores for archiving are expected to be accompanied by adequate field documentation of core recovery and by adequate descriptive information, all sufficient to permit future investigators to judge the utility of the sediment for their needs. This implies field logs and a detailed lithologic description of the clastic, biogenic and chemical components of the core. We have termed this procedure an "Initial Core Description" (ICD) and have developed an outline of a suggested methodology (Details are available through the LRC web site (www.lrc.geo.umn.edu/Core_Facility). Investigators and their students are requested to actively participate in the ICD process for maximum scientific understanding because typically lake cores are highly variable over short core distances and this variation can control sampling design. Investigators are also encouraged to do in-person secondary and tertiary sampling.
4. Documentary data are collected and managed with a CD-ROM or web site interface that utilizes a metadata information system for efficient location and retrieval.

In summary, the hope and plan is that LacCore will increase interdisciplinary scientific communication, training, research, and understanding of paleoenvironmental change. Previous experience shows that the most innovative and creative discussions often happen when interdisciplinary research teams bring cores to study and do the ICDs as a group. These interdisciplinary short but intense "core parties" (Fig. 1) generate not only descriptions but also sampling plans for the specifics of each study and reap the benefits of new insights derived from detailed understanding of specific cores and each others' research parameters.

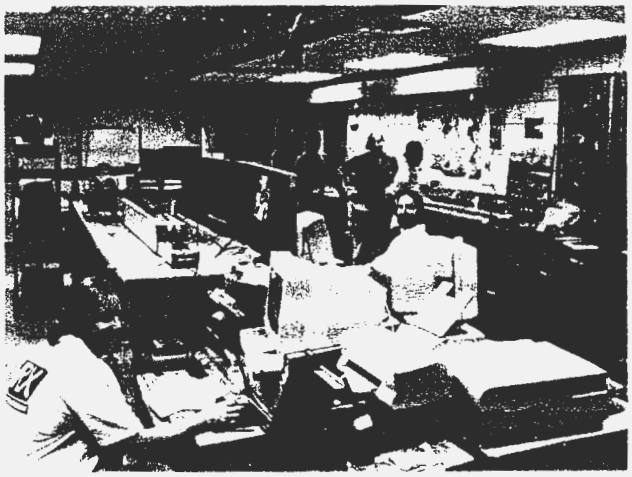

Fig. 1. A "core party" in progress. The team is doing ICDs on the 650 m of core recovered from Great Salt and Bear Lakes in Utah by the new GLAD800 deep drilling rig (www.dosecc.org/GLAD800) during late summer of 2000. Back to front: Dr. Blas Valero-Garces, Pyrenean Institute of Ecology (C.S.I.C.) Spanish Scientific Research Council, Leah Schmitz and Jennifer Gruhn, technicians, Dr. Brian Haskell, LRC, and Chip Heil, graduate student at the University of Rhode Island.

Boyd, Matthew. 2000. *Late Quaternary Geoarchaeology of the Lauder Sandhills, Southwestern Manitoba, Canada.* Ph.D. Thesis, Dept. of Archaeology, University of Calgary. Supervisor: Dr. Brian Kooyman.

This dissertation presents a multi-analytic reconstruction of the late Pleistocene - Holocene history of the south-central glacial Lake Hind basin (Lauder Sandhills region), southwestern Manitoba. Data derived from plant macrofossils and microfossils (pollen, silicophytoliths, and fungal taxa) are interpreted in conjunction with lithostratigraphic descriptions. From these lines of evidence, a 10,500-year model of landscape evolution and biotic change is offered. This model is linked to the archaeological record in order to explain broad land-use patterns in southern Manitoba.

A period of drainage of the southern Hind basin prior to ~10,400 RCYBP is reconstructed from the sedimentological record exposed at a number of cutbank sites adjacent to the Souris River. This process is linked to the final catastrophic flood emanating from glacial Lake Regina. Between ~10,400 and 9300 RCYBP, changes in spruce pollen frequencies record climatic warming up to approximately the 17 (C isotherm, interrupted by a brief and sharp cooling trend at ~10,000 RCYBP. This cooling trend records glacial re-advance during the Emerson Phase of glacial Lake Agassiz. Folsom complex materials within the Hind basin suggest a land-use strategy which included the utilization of recently drained proglacial lake surfaces.

After ~ 9300 RCYBP, but prior to ~ 6700 RCYBP, fining-upward sequences in the study area record the first incision of the Souris River into the central lake basin. Shortly after 6700 RCYBP, thermophilous plant species were present in at least three communities on the edge of the Hind basin. The earliest recorded bur oak populations in the Canadian Prairies appear in the study area. At least one eolian sand sheet was deposited after 6700 RCYBP, followed by a gradually rising water table throughout at least some of the middle Holocene. Between ~ 4500 and 2500 RCYBP, a mixed grass prairie ecosystem extensively colonized the Hind basin. Some time shortly after ~ 2500 RCYBP a peak in fire frequency probably occurred; this trend is linked to the deliberate burning of prairie by Sonota-Besant bison hunters.

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On the shelf

RECENT PUBLICATIONS BY CANADIAN AND OTHER PALYNOLOGISTS – 14

*Beaudoin, A. B., and D. S. Lemmen, with contributions from D. J. Sauchyn, W. M. Last, S. A. Wolfe, W. J. Vreeken, J. A. Burns and I. A. Campbell 2000 Field-trip Guide: Late Quaternary History and Geoarchaeology of Southeastern Alberta and Southwestern Saskatchewan. Post Meeting Field-

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NEW BOOKS

Garneau, M. and Alt, B.T (Eds) (2000) Environmental Response to Climatic Change in the Canadian High Arctic. Bulletin 529, Geological Survey of Canada, Ottawa, Ontario.

The High Arctic IRMA (Integrated Research of Monitoring Area) of the Geological Survey of Canada was established on Fosheim Peninsula (Ellesmere Island) to support interdisciplinary studies related to environmental change under Arctic latitudes. Research carried out between 1989 and 1994, had as primary objective to determine relationships between geomorphic processes and climate in order to help predict the potential geologic impact of global change. Establishment of detailed paleoclimatic records for this region has also been considered essential to provide a context for ongoing change. Paleoecological studies (records of peat cores, lakes cores, ice cores, sea cores and archeological records) in concert with other methodologies have been used to outline climatic variability (short, middle or long-term variabilities) and are a primary research component in the region.

A major compilation of 20 papers has been produced involving 34 participants from government, universities and industry. The document includes the results from studies of modern conditions (climate, flora and fauna), quaternary geology and glacial history, paleoenvironmental records, permafrost dynamics and hydrologic systems. Ten appendix complete the document including a comprehensive bibliography and various data series (climate, vegetation, insects, surficial geology, geophysics, plants and arthropods macrofossiles and radiocarbon dates) to provide background for future project in the area.

Fallu, M-A., N. Allaire, and R. Pienitz. 2000. Freshwater Diatoms from northern Québec and Labrador (Canada). Species - environment relationships in lakes of boreal forest, forest - tundra and tundra regions. (Bibliotheca Diatomologica, 45). 668 photographic figures on 20 plates. VI, 200 p. gr8vo. Paper bd. DM 150.- (US$ 75) [In press. The price is still tentative. Orders will be recorded]

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Diatoms of the European Inland Waters and Comparable Habitats. Edited by Horst Lange - Bertalot. Volume 1: K. Krammer: The genus Pinnularia. 2000. 217 plates. 703 p. Hardcover. DM 380.00 (Approx. US$ 190) ISBN 3-904144-24-3

Contents:
Editor's foreword / Author's foreword / 1. Taxonomic concept of this florra / 2: Pinnularia Ehrenberg / 3. Diagnoses and discussions of the Pinnularia taxa / 4. Keys for the identification of the Pinnularia taxa / 5. From Pinnularia separated genera / 6. Latin descriptions / 7. Literature / 8. Plates / Index

The first volume in this monographic series is a revision and synopsis of the Pinnularia taxa of the temperate zone with some remarks to taxa from the tropics and a large number of new taxa. The revision of the genus Pinnularia by KRAMMER (1992) contained only the European taxa. This new monograph contains in addition many new as well as already known taxa from North America, Asia, New Zealand / Australia, and South Africa. Consequently the geographical area covered by this volume is much broader than the title of this book would make believe.

Research with modern methods and most recent knowledge unsually show plenty of inconsistencies in traditional taxonomy and results in numerous new combinations and new descriptions. This proves to be true for 154 new species and varieties, 3 new genera and 42 new combinations in the present monograph.

The next volume in this series is expected in the second half of 2001. This series is published by Messrs. Gantner / Ruggell and is distributed by Koeltz.

KOELTZ SCIENTIFIC BOOKS
(see above for address)

ANNOUNCEMENTS

SELF-INDICATING SILICA GEL

Health and safety concerns have recently come to light regarding self-indicated silica gel (i.e. silica gel containing cobalt chloride). The following info was taken from
http://www.geejaychemicals.co.uk/cobaltchloride.htm.
If you have to handle self indicating silica gel the advice is to wear a mask and gloves and eventually replace it with a safer form. Users are advised to 'avoid raising dust' and to use 'a suitable, effective dust mask' when handling the material. Please note the following points:
(1) Self-indicating (blue) silica gel is the same as it has been for 60 years - there has been no change in its formulation or composition.
(2) Self-indicating (blue) silica gel has not been banned from use.
(3) These concerns apply to cobalt chloride not silica gel, so they do not apply to non-indicating (white) silica gel.
These concerns have led to the world's main silica gel producers launching new indicating silica gels with 'environmentally friendly' indicators. These use iron compounds as their indicators and change to colourless as they adsorb moisture. Both orange and blue self-indicating silica gels are available loose in bulk packs or packed in sachets.

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CANQUA 2001

The CANQUA 2001 website is online at
http://www.beringia.com/canqua/index.htm

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SUMMER FIELD COURSE: ECOLOGY AND SYSTEMATICS OF DIATOMS

An intensive course will again be offered at Iowa Lakeside Laboratory, June 17 to July 3, 2001. The course will be co-taught by Matthew Julius, University of Michigan, and Sarah Spaulding, California Academy of Sciences. Eugene Stoermer, University of Michigan will be in residence. Ecology and Systematics of Diatoms will engage students in the field and laboratory study of freshwater diatoms. The class will visit diverse aquatic habitats of the Upper Midwest to make live and fossil collections of a large number of freshwater diatom genera. Students will learn techniques in collection, preparation, and identification of diatom samples. Lectures will cover taxonomy, systematics and biogeography of most of the freshwater genera. Students will construct voucher collections using modern curatorial techniques. This is an intensive, field-oriented class appropriate for advanced undergraduate students, graduate students, and post graduate workers in ecology and diatom taxonomy. Students are encouraged to bring individual research materials, and encouraged to discuss the use diatoms of diatoms in ecological and paleoecological applications. Class size is limited to ten students, so early enrollment is encouraged.
Further course description, information concerning Iowa Lakeside Laboratory,
and registration information can be found at:
http://www.ag.iastate.edu/centers/lakeside/diatoms.html

SHORT COURSES IN ENVIRONMENTAL PALAEOECOLOGY ECRC

OSTRACOD ANALYSIS (Dr. J.A. Holmes & D. Horne, University of Greenwich) 15th-19th January 2001 Course Tuition Fee: GBP300

INTRODUCTION TO DIATOM ANALYSIS (Dr. V.J. Jones & Prof. R.W. Battarbee) 22nd January - 2nd February 2001 Course Tuition Fee: GBP600

DIATOM MICROPALAEONTOLOGY (Dr. V.J. Jones , Prof. R.W. Battarbee, Dr. C.E. Stickley) 5th - 9th February 2001 Course Tuition Fee: GBP300

INTRODUCTION TO BENTHIC FORAMINIFERA ANALYSIS (Dr. M. Kaminski, Geological Sciences, UCL) February 2002 Course Tuition Fee: GBP300

INTRODUCTION TO PLANT MACROFOSSIL ANALYSIS (Dr. H.H. Birks) 12th - 16th February 2001 Course Tuition Fee: GBP300

INTRODUCTION TO DENDROCHRONOLOGY & DENDROCLIMATOLOGY (Dr. M. Bridge, Institute of Archaeology) 15th - 16th February 2001 Course Tuition Fee: GBP120

INTRODUCTION TO PALAEOCEANOGRAPHY (Dr. M. Maslin) 19th - 23rd February 2001 Course Tuition Fee: GBP300

CHIRONOMIDS: WATER QUALITY AND CLIMATE CHANGE (S.J. Brooks, Natural History Museum & Dr. L. Ruse, Environment Agency) 19th - 22nd February 2001 Course Tuition Fee: GBP240

NUMERICAL ANALYSIS OF BIOLOGICAL & ENVIRONMENTAL DATA (Prof. H.J.B. Birks & Dr. M. Kernan) 5th - 16th March 2001 Course Tuition Fee: GBP650

STABLE ISOTOPES IN THE LACUSTRINE & MARINE ENVIRONMENT (Dr. M. Leng, NERC Keyworth & Dr. M. Maslin) 19th-22nd March 2001 Course Tuition Fee: GBP180 + Keyworth Visit Costs

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palynobytes

STATISTICAL SOFTWARE

A notice on the DIATOM-L list indicates the release of an update version of the CrimeStat spatial statistics program, distributed by the National Institute of Justice's (NIJ) Crime Mapping Research Center. CrimeStat is a free program for the spatial statistical analysis of crime and other incident locations, developed by Ned Levine & Associates of Annandale, VA.. The program is Windows based and interfaces with most desktop GIS programs. The aim is to provide supplemental statistical tools to aid crime analysts and criminal justice researchers in statistically describing the distribution of crime incidents. However, many of these tools are useful for other types of analyses such as point-pattern analysis and spatial autocorrelation (e.g., describing clusters of taxa; measuring spatial randomness; assessing spatial sampling biases; describing shifts in the spatial distribution of different taxa; describing the distribution of one taxon relative to the underlying distribution of the genera; studies of competition at different spatial scales; describing the spatial correlation of environmental variables like water chemistry, pH, DO or taxon proportions at sample sites). Kernel density techniques can be used for describing spatial sampling distributions as well as sampling distributions in environmental spaces (e.g., climate), and possibly for various modal (unimodal, bimodial) responses of taxa along two-dimensional environmental gradients etc.
Version 1.1 is an update to the first version which was released in November 1999 and fixes some problems associated with 1.0 (e.g., improved performance in Windows 98), adds new database features, (e.g., the ability to handle missing values), makes improvements to some of the existing routines (e.g., edge corrections to Ripley's K statistic), and adds new journey to crime calibration and estimation routines. The latter technique is an adaptation of location/travel behavior theory. It could be used, for example, to identify an optimal location to place a sampling station given the distribution of some environmental/biological variable and assumptions about its movement behavior. The program is fully documented with update notes and a new chapter on journey to crime estimation. There are also sample data sets provided. The new version can be downloaded from either NIJ's Crime Mapping Research Center web site:

www.ojp.usdoj.gov/cmrc

or the web site of the NIJ archivist:
www.icpsr.umich.edu/NACJD/crimestat.html

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SURVEY OF DIATOM COLLECTIONS

A new list of diatom collections is available at
http://home.planet.nl/~wolf0334/
One of the authors (Hein de Wolf) writes "This survey does not pretend to be error-free, let alone "complete" – an enquiry can only be as comprehensive as the information received. We welcome additional information so that this survey may be kept up-to-date. To facilitate this on-going process, we invite you to continue to send us your commetns." Additional information and comments can be sent by e-mail to h.dewolf@planet.nl or h.dewolf@nitg.tno.nl

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NIKON COOLPIX SOFTWARE

Sybille Wunsam and John Bowman have recently posted free software that they have developed for remote control of Nikon Coolpix 950 and 990 digital cameras at the following webiste:
http://www.math.ualberta.ca/~bowman/imaging/
The software is especially designed for photomicroscopy. For details see their paper: Economical digital photomicroscopy, submitted to the Journal of Paleolimnology (2000).

AUSTRALASIAN QUATERNARY ASSOCIATION

For those interested in the Quaternary of Australia, the Australasian Quaternary Association (AQUA) has a new website:
http://rses.anu.edu.au/enproc/AQUADATA/AQUA.html
The site contains information on the organisation, forthcoming meetings, awards, jobs, conferences and publications. There are back issues of the rganisation's journal 'Quaternary Australasia' which acts as a newsletter and publishes short articles. AQUA also maintains the mailing list 'AQUAlist'. AQUAlist is used to notify members of the Quaternary community of job vacancies, upcoming conferences, funding opportunites and new research, especially where pertinent to Australia. More information is available on the webpage.

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Australian Quaternary Data Archive:
http://rses.anu.edu.au/enproc/AQUADATA

NEW GLOBAL LGM MAPS

Nicolas Ray, and Jonathan Adams are currently putting together vegetation/ecosystem maps for the LGM and Holocene for a modelling project to predict gene flow and population flow under glacial and interglacial conditions. Their maps are available at this address:
http://lgb.unige.ch/~ray/lgm_map/lgm.htm
You can click on regional maps to get details of the mapping scheme that are used. The authors state "Of course this is all very rough and ready. No doubt if you look at these you'll find things that should be improved (e.g. coastlines, glacier limits, vegetation boundaries, lakes). If so, please let us know, so we can improve these maps! (if you could send us a printed or electronic version with your changes scrawled on it, that would be ideal). The resulting maps will be kept online and freely available for you and all your collegues to use! Your contribution will also be acknowledged on the Web page."

Jonathan Adams
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Adelaide, South Australia 5005
Australia
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INTERNATIONAL PALAEONTOLOGICAL ASSOCIATION'S ELECTRONIC DIRECTORY OF PALEONTOLOGISTS OF THE WORLD

This Directory is now available at:
http://ipa.geo.ukans.edu/index.htm
"That is the good news. The bad news is that the directory has only a few dozen entries. You can help. Please open the web page and enter your information. Urge your colleagues to do the same. The directory will become increasingly valuable as more and more people enter information. You can complete the entry in only a few minutes. I look forward to seeing the directory grow. Eventually we hope to have information on most of the world's paleontologists. When we do, it will no longer be necessary for anyone to inquire of various lists to try to find e-mail addresses or other such information. Please enter your personal information now and contact me or Dr. Michael Cormack, the web master (paleo@raven.cc.ukans.edu), if you have questions."

Roger L. Kaesler
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121 Lindley Hall
Lawrence, Kansas 66045-2911
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(785) 864-5276 = FAX
http://www.ukans.edu/~paleo/

DEADLINES

Please submit items for the next issue of the *CAP Newsletter* (Volume 24, Number 1, May 2000) by **April 15, 2000**. Laboratory reviews, conference reports, field trip reports, announcements, notices of new books, publications, book reviews, news, and essays on topics relevant to Canadian palynology are all welcome. Submission by disk or e-mail are preferred. Articles may include diagrams and photos; for these you may send a print with good contrast, a 35 mm slide (colour or black-and-white), or digital image files. Please send material for the next issue to

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MEETING CALENDAR

2001

January 10-11 2001. **Fungal Spores and other microfossils in Quaternary Palaeoecology**
Queen Mary College, University of London, UK.
Details: Jeff Blackford (J.J.Blackford@qmw.ac.uk)

January 20, 2001 **Alberta Palaeontological Society**
Mount Royal College, Calgary, Alberta.
Details: Philip Benham (benham@shell.ca)

Feburary 5-9 2001 **Australian Quaternary Association Biennial Conference** Southcombe Lodge, Port Fairy, Victoria, Australia
Details: Simon Haberle
(simon.haberle@arts.monash.edu.au)
http://www.arts.monash.edu.au/ges/research/conference.html

May 27-30 2001. **GAC/MAC Joint Annual Meeting**
St John's, Newfoundland. Details: St. John's 2001, c/o Department of Mines and Energy, Geological Survey Division, Regional Geology Section, P.O. Box 8700, St John's Newfoundland, A1B 4J6, Canada, Tel: (709) 729-2301, Fax: (709) 729-3493, E-mail: dmp@zeppo.geosurv.gov.nf.ca
Includes a CANQUA (Canadian Quaternary Association-sponsored symposium on "Quaternary Geology of the Northern North Atlantic Region"
Also include NAMS (North Atlantic Minerals Symposium). See http://www.gov.nf.ca/nams/
Website: http://www.geosurv.gov.nf.ca/stjohns2001

May 29 - June 2 2001. **Canadian Association of Geographers (CAG) Annual Meeting**
McGill University, Concordia University and Université de Montréal, Montreal, Canada. A joint event arranged by the three Montreal universities in celebration of the 50th anniversary of the founding of the CAG. Details: Tim Moore (moore@felix.geog.mcgill.ca), Patricia Thornton (thorpat@vax2.concordia.ca), André Roy (royandre@ere.umontreal.ca)

April 8-12 2001. **EUG (European Union of Geosciences) conference**
Strasbourg, France. Includes a symposium on 'Late Quaternary floodplains: sedimentary records of environmental change'. For details of this symposium contact: Dr. Philip E.F. Collins, Environmental Change Research Group, Department of Geography & Earth Sciences, Brunel University, Uxbridge UB8 3PH, United Kingdom, E-mail: philip.collins@brunel.ac.uk
Website: http://eost.u-strasbg.fr/EUG/

June 6-8 2001 **Climate change and variability in northern Europe-proxy data, instrumental records, climate models and interactions**
Geographical Society of Finland Turku, Finland
Details: Dr. Jukka Käyhkö (jukka.kayhko@utu.fi)
http://figare.utu.fi & http://www.utu.fi/~jukkay

June 13-18 2001. **Millennial-scale events in the North Atlantic region during Termination 1**
University of Ulster, Northern Ireland. Details: Dr Jasper Knight, Lecturer, Glacial and Coastal

Geomorphology, Glacial Research Group, School of Environmental Studies, University of Ulster, Coleraine, Co Londonderry, Northern Ireland, BT52 1SA, UK Tel +44 (0)28 7032 3179 (direct), Tel +44 (0)28 7032 4428 (Dept. office), Fax +44 (0)28 7032 4911, E-mail: j.knight@ulst.ac.uk
Website: http://www.ulst.ac.uk/termination1.html

June 17-23 2001. **12th Symposium of the International Workgroup for Palaeoethnobotany (IWGP)**
Sheffield, England, UK. Details: IWGP, Department of Archaeology and Prehistory, University of Sheffield, Northgate House, West Street, Sheffield, S1 4ET, England, UK. E-mail: iwgp@sheffield.ac.uk
Website: http://www.shef.ac.uk/uni/academic/A-C/ap/conf/iwgp/iwgpx.html

July 10-13 2001. **Global Change Open Science Conference**
Amsterdam, The Netherlands. Sponsored by the International Geosphere Biosphere Programme, along with the World Climate Research Programme and the International Human Dimensions Programme.
Wbsite: http://www.sciconf.igbp.kva.se

August 5-10 2001 **Ecological Society of America (ESA) 86th Annual Meeting** University of Wisconsin, Madison, Wisconsin
Details: http://esa.sdsc.edu/madison/

August 20-24 2001. **CANQUA (Canadian Quaternary Association) meeting**
Whitehorse, Yukon. Details: John Storer (jstorer@gov.yk.ca)
Website: http://www.mun.ca/CANQUA

August 23-28 2001. **5th International Conference on Geomorphology**
Tokyo, Japan. E-mail: 5icg@c-linkage.ca.jp
Website:
http://wwwsoc.nacsis.ac.jp/jgu/icg_hopa/indexicg.html

September 18-22 2001. **PAGES - PEP III Conference.**
Le Centre de Congres, Aix-en-Provence, France. PAGES - PEPIII is concerned with studies of past climate variability in Europe and Africa. Key aims are to assess variability on different time-scales, to assess the impacts of past climate change on natural ecosystems and human society, and to provide a firm basis for the verification and testing of climate models. There will be a number of plenary lectures from invited speakers plus a series of poster sessions open for all participants, plus a post-conference excursion to the Massif Central, France (subject to interest). Details: Dr Catherine E. Stickley, Environmental Change Research Centre, University College London, 26 Bedford Way, London, WC1H 0AP, England, UK E-mail: C.stickley@ucl.ac.uk
Website: http://www.geog.ucl.ac.uk/ecrc/pep3

September 19-22 2001 **16th North American Diatom Symposium** YMCA Camp du Nord, Ely, Minnesota
Details: John Kingston (jkingsto@nrri.umn.edu)
http://www.nrri.umn.edu/nads/

September 22-24 2001. **11th Canadian Paleontology Conference (CPC-XI)**
London, Ontario. Details: Jisuo Jin, Chair, CPC Organizing Committee, Department of Earth Sciences, University of Western Ontario, London, Ontario, Canada, N6A 5B7, Tel. (519) 661-4061, Fax (519) 661-3198, E-mail: jjin@julian.uwo.ca

November 5-8 2001. **Geological Society of America, Annual Meeting.**
Boston, Massachusetts, U.S.A. Details: GSA HQ, Box 9140, 3300 Penrose Place, Boulder, Colorado 80301, U.S.A. Tel: (303) 447-2020, X133, E-mail: meetings@geosociety.org

2002

May 26-29 2002. **GAC/MAC Meeting**
Saskatoon, Saskatchewan, Canada
Website: http://www.usask.ca/geology/

Date: TBA. **7th International Association for Aerobiology Congress**
Quebec, Canada

August 29 - September 2 2002. **6th European Palaeobotany - Palynology Conference**
Athens, Greece. Details: Prof. D. Evangelos Velitzelos, Organizing Committee, 6th European Palaeobotany-Palynology Conference, Department of

Historical Geology-Palaeontology, Faculty of Geology, University of Athens, Panepistimioupolis, Zografou, 157 84 Athens, Greece. Tel./Fax: +30-1-7274162, E-mail: velitzel@geol.uoa.gr

September 5-7 2002. **CIMP Symposium and Workshops**
Lille, France. Details: Thomas Servais (thomas.servais@univ-lille1.fr) or Ludovic Stricanne (ludovic.stricanne@univ-lille1.fr), University of Lille

September 11-13 2002. (Proposed) **Joint Meeting of AASP, BMS and NAMS (American Association of Stratigraphic Palynologists, British Micropalaeontological Society, North American Micropaleontology Section of SEPM)**
University College London, England, UK. Details: James Powell, Dinsystems, 105 Albert Road, Richmond, Surrey TW10 6DJ,England, UK, Tel: +44 20 8948 6443; Fax: +44 20 8940 5917, E-mail: ajp@dinosystems.co.uk.

October 27-30 2002. **Geological Society of America, Annual Meeting**.
Denver, Colorado, U.S.A. Details: GSA HQ, Box 9140, 3300 Penrose Place, Boulder, Colorado 80301, U.S.A. Tel: (303) 447-2020, X133, E-mail: meetings@geosociety.org

2003
Date: TBA. **GAC/MAC Meeting**
Vancouver, British Columbia, Canada

Date: TBA. **CANQUA Meeting**
Halifax, Nova Scotia, Canada (proposed).

Date: TBA. **INQUA XVI Congress**
Reno, Nevada, USA

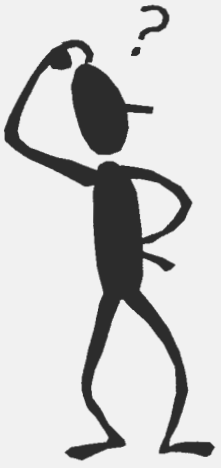
March 29 - April 2 2003. **3rd International Limnogeology Congress**
Tucson, Arizona. Theme session proposals to Andrew Cohen, General Chair of the Congress (acohen@geo.arizona.edu). Field trip proposals to David Dettman, field trip coordinator for the Congress (dettman@geo.arizona.edu).

November 2-5 2003. **Geological Society of America, Annual Meeting**.
Seattle, Washington, U.S.A. Details: GSA HQ, Box 9140, 3300 Penrose Place, Boulder, Colorado 80301, U.S.A. Tel: (303) 447-2020, X133, E-mail: meetings@geosociety.org

2004
Dates: TBA. **XI IPC (International Palynological Congress)**
Granada, Spain
Website: http://www.ugr.es/local/bioveg

2005
Date: TBA. **GAC/MAC Meeting**
Halifax, Nova Scotia, Canada

CAP 2001 Annual General Meeting
at the GAC/MAC Joint Annual Meeting
May 27 – 30 2001
St John's, Newfoundland



Have you paid your dues? Reminder list on page 3. CAP membership dues are CDN $10 per year, payable annually or up to three years in advance. See the membership form on the following page!