

Alberta

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ALBERTA PALAEOLOGICAL SOCIETY

OFFICERS

President

Cory Gross president1@albertapaleo.org (403) 617-2079

Vice-President

Open: To volunteer contact the President

Treasurer

Mona Marsovsky giftshop@albertapaleo.org (403) 547-0182

Secretary

Vaclav Marsovsky (403) 547-0182

Past-President

Wayne Braunberger pastpres@albertapaleo.org (403) 278-5154

DIRECTORS

Editor

Howard Allen editor2@albertapaleo.org (403) 274-1858

Membership

Howard Allen membership@albertapaleo.org (403) 274-1858

Programs

Harold Whittaker programs1@albertapaleo.org (403) 286-0349

Field Trips

Wayne Braunberger fieldtrips@albertapaleo.org (403) 278-5154

COMMITTEES

Fossil Collection

Howard Allen editor2@albertapaleo.org (403) 274-1858

Library

Reg Spratley spratleyreg@gmail.com (403) 263-0556

Public Outreach

Cory Gross president1@albertapaleo.org (403) 617-2079

Social

Dan Quinsey dinodan@shaw.ca (403) 247-3022

Symposium

Mona Marsovsky giftshop@albertapaleo.org (403) 547-0182

Website

Vaclav Marsovsky (403) 547-0182

THE SOCIETY WAS INCORPORATED IN 1986

as a non-profit organization formed to:

1. Promote the science of palaeontology through study and education.
2. Make contributions to the science by: discovery; responsible collection; curation and display; education of the general public; preservation of palaeontological material for study and future generations.
3. Work with the professional and academic communities to aid in the preservation and understanding of Alberta's heritage.

MEMBERSHIP: Any person with a sincere interest in palaeontology is eligible to present their application for membership in the Society. Please enclose membership dues with your request for application.

Single membership \$20.00 annually

Family or Institution \$25.00 annually

SOCIETY MAILING ADDRESS:

Alberta Palaeontological Society
P.O. Box 35111, Sarcee Postal Outlet
Calgary, AB, Canada T3E 7C7
www.albertapaleo.org

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Howard Allen, Editor, APS
7828 Hunterslea Crescent, NW
Calgary, AB, Canada T2K 4M2
editor2@albertapaleo.org

Requests for missing *Bulletin* issues should be directed to the Editor. Send changes of contact information to the Membership Director.

NOTICE: Readers are advised that opinions expressed in the articles are those of the authors and do not necessarily reflect the viewpoint of the Society. Except for articles marked "Copyright ©," reprinting of articles by exchange newsletters is permitted, as long as credit is given.

Upcoming APS Meetings

Meetings take place at 7:30 P.M. in **Room B108,**
Mount Royal University, 4825 Mount Royal Gate SW, Calgary, Alberta.

Friday, April 15, 2016—Christian Barron-Ortiz, Royal Alberta Museum.
Dental wear of late Pleistocene horses and bison from North America and its implication for the late Pleistocene extinction. See Page 5.

Friday, May 13, 2016—Tasha S. Cammidge, University of Calgary.
Dietary reconstructions using dental mesowear and microwear of Mammuthus, Mammut and Loxodonta, and implications for the end-Pleistocene extinction. See Page 5.

Watch the APS website for updates.

ON THE COVER: Alberta fossils! Fragments from the oral pavement of a ray fish, *Myledaphus bipartitus* Cope, with teeth in place. Dinosaur Park Formation, Upper Cretaceous, southern Alberta. APS collection, catalogue no. APS.1999.35. Length of largest specimen is 15.4 mm. APS file photo.

2016 Elections

By Wayne Braunberger, Past President

Election of Officers and Directors to the Board of the Alberta Palaeontological Society will be held at the Annual General Meeting which is scheduled for 7:30 P.M., May 13, 2016 in Room B108 at Mount Royal University. All Single, Family and Life Members 18 years and older are entitled to vote. Executive positions are one-year terms and directorships are two-year terms. Nominations are being solicited for the following positions:

Officers

President
Vice-President
Secretary
Treasurer

Directors

Editor
Membership

Continuing directorships are Program Co-ordinator (**Harold Whittaker**) and Field Trip Co-ordinator (**Wayne Braunberger**). Both positions are entering the second year of a two-year term.

In addition to the elected positions the APS has a number of committee chairs which are appointed by the Board:

Committee	Chairperson	Term
Fossil Collection	Howard Allen	Unlimited
Library	Reg Spratley	Unlimited
Public Outreach	Cory Gross	Unlimited
Social	Dan Quinsey	Unlimited
Website	Vaclav Marsofsky	Unlimited

Terms begin September 1. If you would like more information about Board positions or are interested in chairing or participating on a committee, please contact Past President **Wayne Braunberger** at (403) 278-5154 or by e-mail: pastpres@albertapaleo.org. All inquiries will be kept confidential if requested.

Notice of Motion

Alberta Palaeontological Society (APS) Annual General Meeting May 13, 2016

Notice of Motion is submitted to the Alberta Palaeontological Society membership for consideration in compliance with Sections 4.1 Annual General

Meeting, 4.4 Notice and 8.2 Spending of the Alberta Palaeontological Society Bylaws.

The APS Annual General Meeting will be held on May 13, 2016 at 7:30 P.M. in Room B108, Mount Royal University, 425 Mount Royal Gate SW, Calgary, Alberta. Proposed actions on the Agenda will include the election of Officers and Directors and a Motion to donate \$1000 towards the proposed Phase 2 of Mount Royal University's East Gate Entrance Fossil Display: *Terrestrial Fossils from the Cretaceous of Western North America*. All eligible voting Members are requested to attend!

East Gate Entrance Fossil Display: Mount Royal University's *Cretaceous Land* Exhibit

Overview

The Alberta Palaeontological Society donated \$1000 in 2013 to MRU toward Phase 1 of this project which focussed on marine fossils from the Cretaceous of western North America. This motion is for another \$1000 toward Phase 2 of the project which has a focus on terrestrial vertebrates.

It is the intent of the display to provide both students and the general public the opportunity to view life-size specimens of extinct terrestrial vertebrate animals that lived on land during the Cretaceous in Western North America.

Cretaceous Land will complete the collection of the major groups of vertebrates that lived during the Cretaceous Period in Western North America, currently on display on Mount Royal's campus. In combination with the *Cretaceous Seas*, a terrestrial reptile (dinosaur) and a small primitive mammal (marsupial) would be installed. Like the models in *Cretaceous Seas*, the *Cretaceous Land* specimens will be fossil casts constructed from molds produced from bones of the dinosaur and marsupial.

The exhibit will illustrate the dominance of the dinosaurs, specifically *Nanotyrannus lancensis*. The addition of a small mammal, *Didelphodon*, is to illustrate that both mammals and dinosaurs were cohabitants, and that marsupials were the next major vertebrate group to evolve.

The East Gate entrance is the primary entry into the main building on campus. Most people coming to the University pass through this area every day as they go to classes, the bookstore, food services, the library and most administrative offices. The display will be viewed daily by thousands of people.

Cretaceous Land will provide Mount Royal students, visiting students and the surrounding commu-

nity the opportunity to closely examine the skeleton casts of an authentic dinosaur and early mammal. The cost of the *Cretaceous Land* Exhibit is expected to be \$80,000.

The Alberta Palaeontological Society is sincerely grateful to Mount Royal University for providing space for our Board Meetings, General Meetings, Annual General Meeting, Annual Symposium (including workshops) and microfossil sorting events. We would like to show our appreciation by contributing \$1000 toward the *Cretaceous Land* exhibit. To read more about the project, visit the APS website: www.albertapaleo.org/mrufossildisplayproposal.pdf.

The Alberta Palaeontological Society Board of Directors voted unanimously during the Executive Board Meeting held January 6, 2016 to bring the following motion to the Membership during the May 13, 2016 Annual General Meeting.

Motion

To donate \$1000 from Alberta Palaeontological Society excess revenues accumulated during the 2015 year to Mount Royal University to be used towards the proposed *Cretaceous Land* exhibit near the MRU East Gate Entrance.

Related Bylaw Articles

4.1 Annual General Meeting

The Annual General Meeting of the Society shall be held during the month of May in each calendar year. This meeting shall be held for the election of Officers and Directors; the modification of Bylaws; and for such other business as may be placed before the Society by the Board.

4.4 Notice

Notice of the date, time, place, purpose, and proposed actions to be taken during any General Meeting, Annual General Meeting, or Special Meeting shall be given in writing to all Members at least twenty-one days in advance. The Board shall notify Members of changes in meeting dates, time, or place by publishing the changes at least three days in advance in the Society newsletter; by telephone (local telephone exchange Members only); and/or by acknowledged electronic mail.

8.2 Spending

Extraordinary expenditures in the amount of \$100.00 or more must be prior approved by the Voting Members at a properly Constituted General Meeting. Extraordinary expenditures are expenditures for items other than normal operating expenses, budgeted projects, and items supported by designated grants or donations. □

Bulletin back issues available on the Web

A complete archive of *Bulletin* back issues from 1986 to 2014 is available to download as PDF files.

www.albertapaleo.org/bulletinarchive.htm

In Memoriam

It is with heavy hearts that we must report the untimely passing of former APS member **Paul Dugan** on December 23, 2015, at the age of 60.

Paul and his son Garren were members from 2003 to 2010. Paul and Garren were both active volunteers, Paul serving as Social Committee chair for three years and Garren as Secretary and Librarian, both giving exemplary service. Both gentlemen were also faithful attendees of meetings, field trips and other events, in spite of the fact that they resided outside of Calgary.

Our sincere sympathy is extended to Garren and to all of Paul's family and friends. He will be remembered fondly by those of us who knew him.

An obituary was published in the *Calgary Herald*, January 6–8, 2016. □



Paul Dugan (right) and son Garren having some fun at the 2006 APS Symposium workshop. Photo by Vaclav Marsovsky.

Library Donations

A big thanks to APS member **Georgia Hoffman**, who has generously donated two new books to the Society library. The titles are:

Van Romondt Verschoor, K. 1974. Paleobotany of the Tertiary (early middle Eocene) McAbee beds, British Columbia. Unpublished Master's thesis, University of Calgary.

University of Alberta Palaeontological Society. 2016. Biennial Symposium, abstracts volume.

Both titles will be available in the APS library, accessible during our monthly general meetings. □

Upcoming Events

May

April

Christian Barron-Ortiz

Royal Alberta Museum

Dental wear of late Pleistocene horses and bison from North America and its implication for the late Pleistocene extinction

Friday, April 15, 2016 7:30 P.M.

Mount Royal University, Room B108

Approximately 50,000–11,000 years ago, many species around the world became extinct or were extirpated at a continental scale. The causes for the late Pleistocene extinctions have been extensively debated, but continue to be poorly understood.

As part of my dissertation research, I studied dental wear of horses and bison from different North American localities, in order to infer changes in diet during the late Pleistocene in these two ungulate groups. I specifically focused on testing two nutritionally-based extinction models that have been previously proposed: coevolutionary disequilibrium and mosaic-nutrient models. The results of my study revealed changes in dental wear patterns that are consistent with the coevolutionary disequilibrium model, but not with the mosaic-nutrient model. These results, in addition to other lines of evidence, suggest that environmental changes might have played an important role in the extinction of horses and perhaps other Pleistocene ungulates.

Biography

Christian's interest in Quaternary palaeontology originated when he discovered the fossil remains of horses, mammoths, and other Ice Age mammals at his uncle's farm near the city of Zacatecas, Mexico, where he grew up. He holds a Ph.D. in evolutionary biology from the University of Calgary and recently joined the Royal Alberta Museum as Assistant Curator of Quaternary Palaeontology. His research centres on understanding the palaeoecology, palaeobiology, and systematics of Quaternary ungulate mammals across the breadth of their North American range, from Mexico to the Canadian High Arctic.

Tasha S. Cammidge

University of Calgary

Dietary reconstructions using dental mesowear and microwear of Mammuthus, Mammot and Loxodonta, and implications for the end-Pleistocene extinction

Friday, May 13, 2016 7:30 P.M.

Mount Royal University, Room B108

Climate change is an ever-growing issue in modern times. Anthropogenic climate change is causing rapid alterations to the Earth in a way not seen since the end of the Pleistocene (~11,000 years ago). The effects of climate change can be investigated through dietary reconstructions of large-bodied mammals during the end-Pleistocene extinction and may allow us to predict how modern mammals will deal with similar changes. Mammoth (*Mammuthus*) and mastodon (*Mammot*) are abundant in the North American fossil record and have closely-related extant counterparts (*Loxodonta*), making them an ideal model for these studies.

To investigate if, and how, climate change contributed to the extinction of large-bodied end-Pleistocene mammals, two different dietary reconstruction techniques will be utilized. The first of these, dental mesowear analysis, involves measuring the angles between cusps on the tooth, which indicates the abrasiveness of the diet over an animal's lifetime. Preliminary results have indicated that *Mammuthus* diet was the same before and after the end-Pleistocene extinction. However, the resolution of mesowear may be too low to detect a difference between pre- and post-glacial time periods, and thus will need to be combined with other techniques. The second method utilized is dental microwear analysis, which compares the number of microscopic pits and scratches on enamel, and indicates the diet during the last few weeks of an animal's life. Combined, these techniques will allow us to make inferences about the end-Pleistocene extinction, as well as to predict how modern large-bodied mammals may deal with climate change.

Biography

Tasha received two undergraduate degrees from

the University of Calgary, one in archaeology and the other in zoology. During this time a fascination with the past developed and two undergraduate research projects ensued to pursue this interest. Tasha has so far completed a year and a half of a master's degree in palaeontology at the University of Calgary under **Dr. Jessica Theodor** and **Dr. Brian Kooyman**. This project has primarily focused on dietary reconstructions of mammoth and mastodon, in order to investigate the cause of their extinction more thoroughly. Following her Master's, Tasha plans to continue research in palaeontology. □

Results of the Xmas 2015 Palaeo-Trivia Challenge!

Quizmaster **Arnold Ingelson** treated (and humbled) us with the first of what we hope will be an annual Christmas Palaeo-Trivia Challenge at our December 11 general meeting. Topped off with comestible goodies shared by our attendees, much merriment was enjoyed by all. Results were amazingly even and break down as follows:

Team: *The Feathered Tyrannosaurs*

Gareth, Risa, Daegan, Harold

Score: **39** out of 50.

Team: *The Ammonites*

Mona, Pete, Georgia, Michelle

Score: **39.5** out of 50.

Team: *The Boneheads*

Wayne, Harvey, Graham, Jamie

Score: **40** out of 50

Team: *The Calcareous Archaeopteryxes*

Val, Dan, Howard

Score: **42** out of 50

Thanks to Arnold for putting together and hosting the quiz! Plan to take part in next year's challenge! □

Calgary Rock and Lapidary Club 56th Annual Gem, Mineral and Fossil Show

Friday, April 29 – Sunday, May 1, 2016

**Vivo (formerly Cardel Place) East Arena
11959 Country Village Link NE, Calgary**

www.crlc.ca/crlcshow.htm

2016 Field Trips

Planning is underway for this year's trips. For more information please contact **Wayne Braunberger** at (403) 278-5154 or by email at **fieldtrips@albertapaleo.org**. The field trip registration form is included with this issue of the *Bulletin* and is available on the APS website, **www.albertapaleo.org/fieldtrips.html**. Information will also be available at the monthly meetings.

Please note that all fees are due at the time of registration. Fees for trips are \$10.00. This is to cover increased costs as guides will be featuring more colour photographs and diagrams. Unfortunately guides are only produced in small numbers and volume discounts are not available.

Non-members and unaccompanied minors will not be allowed to attend field trips. All participants are required to have their membership in good standing. Any membership applications received after May 4, 2016 will not be reviewed and voted on by the Board of Directors until September, 2015. Therefore, if you are a non-member and would like to join be sure your application is received prior to May 4, 2016. All participants will be required to read and sign a release form (waiver). Detailed information will be provided to all those registered shortly after the registration deadline. **After the registration deadline no refunds will be given; however, you will receive the printed guide for the trip. No late registrations will be accepted.** Registrations are accepted on a first-come-first-served basis. Sign up early to avoid disappointment.

For the 2016 field trips I will be sending you the waiver and medical forms along with the trip information. This information will be sent to you via e-mail or Canada Post. Please ensure that your address is correct and legible when sending in registration forms. When you arrive at the meeting place please have the forms completed. **All participants are required to have fully completed all waiver and medical forms in order to attend the trip. There will be no exceptions.** All personal information is held in confidence and ultimately destroyed.

Field Trip Participant Responsibilities

It is understood that risk is inherent to some degree in outdoor activities. Before registering for a trip please ensure you understand the risks involved and are prepared to accept them.

- As a participant you are responsible for your own safety and equipment at all times.
- Inform the trip leader of any medical conditions they should be aware of in an emergency.
- Ensure that your previous experience, ability and fitness level are adequate for the trip.

**Trip 2016-1, June 11, 2016
Nose Hill, Calgary, Alberta**

APS President Cory Gross will lead an Ice Age Tour of Nose Hill on Saturday, June 11. Cory is well versed in the ice age geology, palaeontology and archaeology of Nose Hill. Created in 1980, Nose Hill Park is a natural environment park located in north-west Calgary and covers approximately 11.27 square kilometers (4.35 square miles) and is surrounded by twelve residential communities. At its highest point Nose Hill is 1,230 m (4,035 ft) in elevation. Cory will cover such topics as what ice ages are and what causes them, wildlife species that were in the area at the end of the most recent ice age and what happened to them while we examine bedrock outcrops, glacial erratics and gravel pits. The tour will be on foot on the pathways in the park but be warned most of the walk (although not difficult) is uphill.

Registration deadline is May 27, 2016

**Trip 2016-2, July 16 and 17, 2016
Southeastern British Columbia**

Our trip will focus on the Cambrian geology and trilobites in the Hughes Range northeast of Cranbrook. Recent discoveries and re-examination of previously known sites have resulted in new genera and species of Upper Cambrian trilobites being discovered. We will be collecting on privately held mineral claims and as such all instructions of the claim holder must be followed. Any significant specimens will not be kept by individuals but will be donated to the appropriate research institute/museum for curation and study.

Access to the area is via poorly maintained forestry roads and trails. Properly equipped vehicles with high clearance are necessary. To limit our impact and to take as few vehicles as possible, car pooling will be enforced.

Registration deadline is July 1, 2016

**Trip 2015-3, August 13 and 14, 2016
Southeastern Alberta (S. Saskatchewan River)**

This trip will focus on Cretaceous vertebrate localities along the South Saskatchewan River north of Medicine Hat.

Access to sites is along poorly maintained wellsite access roads and prairie trails. For safety reasons we will be restricted to high clearance vehicles. If there has been significant rain in the area access will be limited. Please note that the area is prime rattlesnake habitat.

Registration deadline is July 29, 2016. □

**The Archaeological Society of Alberta
41st Annual Archaeological Conference**

Open to the public

Posters, talks, field trip, dinner banquet

Banquet speaker Dr. Marty Magne, Parks Canada
"The Search for Franklin's Lost Ships
and the Discovery of *HMS Erebus*"

**Friday, April 29 – Sunday, May 1, 2016
Highwood Golf and Country Club, High River, AB
Early-bird registration fee \$65 (deadline April 15)**

www.arkyalberta.com/annual_conference.html

2016 Rocky Mountain House Knap-in

**Flint knapping lessons and demonstrations,
knapping tools, Aboriginal skills, archery,
competitions, campfire music,
pot-luck dinner, auction,
on-site camping (limited)**

**Friday, July 15 – Monday, July 18, 2016
Rocky Mountain House Heritage Site, AB**

For information and registration contact
**Russell Thornberry, 1-403-872-4866
russellthornberry@gmail.com**

Fossil News back in publication

The quarterly magazine that calls itself "The Journal of Avocational Paleontology" is returning to publication after folding in 2010. Under new editorship, the magazine is to start circulation this March.

<http://fourcatspress.com/fossilnews>. □

RTMP Speaker Series available online

The Royal Tyrrell Museum of Palaeontology (RTMP) in Drumheller, hosts free public lectures most Thursdays at 11:00 A.M. in the Museum auditorium. Better yet, you can watch the lectures any time you want, from the comfort of your own home, thanks to the Museum's YouTube channel. Talks cover all topics in palaeontology and range in length from about 30 minutes to over an hour (typically about 45–50 minutes).

Visit www.tyrrellmuseum.com/speaker_series.htm and www.youtube.com/playlist?list=PLE5C051E20D553713&feature=plcp

University of Alberta *Coursera* palaeo courses offered online

By Vaclav Marsovsky

Three new *Coursera* palaeontology courses are available online. The courses include:

- *Theropod Dinosaurs and the Origin of Birds*.
- *Ancient Marine Reptiles*.
- *Early Vertebrate Evolution*.

All three courses are spearheaded by the University of Alberta and APS members will recognize the instructors involved. Courses involve some written text and watching videos which have embedded multiple choice questions that need to be answered before the video continues. There is a graded exam at the end of each lesson for those who have paid a tuition fee. The courses are free if you don't want a certificate, but if you do, then the cost is \$90.

A list of FAQs about the *Coursera* program (computer/browser requirements, enrollment, payments, etc.) is available here:

<https://learner.coursera.help/hc/en-us?var=2>

A list of the courses offered by the University of Alberta is here: <https://www.coursera.org/ualberta>

[Thanks to Daegan Kovacs for the heads-up] □

FOUR FOSSILS

By Howard Allen, APS Collection Curator

In the last installment of this column (*Bulletin*, September 2015) I speculated on the locality of a small fragment of Jurassic ammonite from British Columbia. APS member **Jake Jakielaszek** of Morinville, AB, once again stepped up to the plate with some valuable information on this locality. Not only was he able to confirm its existence, he has personally visited the locality, more than once!

Jake writes:

The area that particular specimen comes from is well known for producing spectacular ammonite fossils, among others. I have collected at this particular spot on numerous occasions while traveling to Haida Gwaii. I paid a visit to the site this past July. The amount of fossil material is overwhelming. There are many different kinds of bivalves, turban snails, belemnites, wood and the odd bone found in the limestone. The ammonites found here are three dimensional and well preserved in many shapes and sizes. The matrix crumbles easily and fossils can be found lying loose all over the site. The sites (there are a couple of them—could be more) are easily accessed. The Copper River road east of Terrace, BC is a logging road so one has to be cautious of logging trucks (who *do* own the road) and idiots (who think the road belongs to them!) It's a bit rough in spots but the going is easy. You are paralleling the Zymoetz (Copper) River for much of the trip.

At 47 km the road heads into the trees. There is a sign pointing to the fossil beds on the side of the river. It requires a bit of walking through the bush. The second site is at the 50 km marker. About 0.5 km before you get to this site, the road cuts through a massive fossil oyster bed. Large chunks of oysters can be found all over the ditch on both sides of the road. The oysters are compacted so tightly you cannot remove individual specimens. At the 50 km marker is another road cut that continues for about 400 m. This is the fossil area. The matrix is a greenish black, weathered limestone, easily broken up. The fossils are so tightly packed together it's hard to break out individual specimens. There is no layering of the matrix: think of conglomerate with the fossils mixed up in it. Sometimes luck is with you. On one trip I found a large chunk of matrix; as I rolled it down the hill smaller pieces came off and when it came to a stop it split in two and a perfect ammonite, 80 mm in diameter by 34 mm thick rolled out—time to go home! The best thing about this site is that you drive right up to it. Hardly any walking is required, other than back and forth from your vehicle to look for more fossils.

Hopefully this site remains accessible due to the fact that it's a service access road for BC Hydro and the gas pipeline company. In the early '90s we were cut off by a rock slide on our way out, due to heavy rains—fortunately there was an alternate route through the bush. So be careful!

Great stuff—definitely an intriguing locality, and good advice at the end—thanks for the details, Jake!

APS.2004.20



2 cm

Déjà vu all over again! I laughed when my random fossil picker chose this specimen and I looked at the locality data: “2 miles E of Sparwood, BC, south side of Highway 3.” It’s the very same locality that gave me so much trouble in the June, 2015 edition. At least this time, thanks to **Guy Santucci**, I know exactly where it came from, and can fix the catalogue record for this and several other specimens from the same locality.

Evidently fossil leaves aren’t the only things that this exposure produces. Here we have a number of small, freshwater bivalves (clams) mixed with fragmentary plant leaves, in a matrix of dark brown mudstone. Together with the fact that at least one of the little clams has its valves still clasped together, the mud matrix suggests that this specimen originated in a quiet setting, perhaps the bottom of a small pond or lake. This is a fossil from the Lower Cretaceous Kootenay Formation, the source of all of the coal that drives the economy of the Crowsnest Pass area.

APS.1986.18

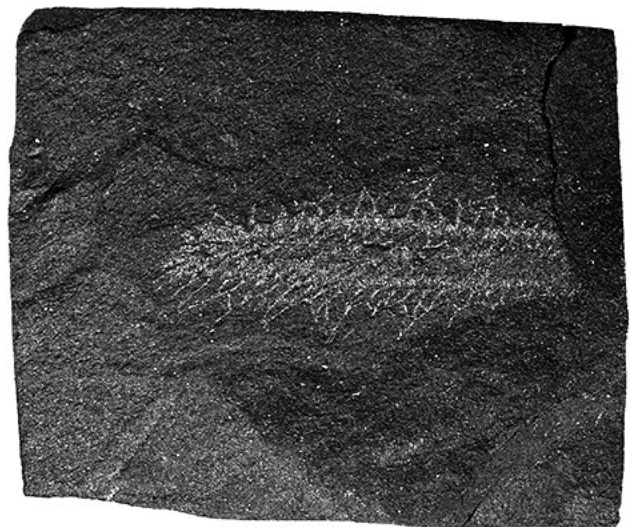
This strange-looking object might be a head-scratcher for those who are accustomed to thinking of dinosaurs and woolly mammoths as extinct animals. It’s a graptolite: one of an extinct group of colonial animals that made their living in the seas of middle Cambrian to early Carboniferous times. They are characteristic fossils of Ordovician and Silurian black marine shales and their abundance, worldwide distribution and rapid evolution have made them the most important index fossils for biostratigraphers

studying that stretch of time. Their most common mode of preservation is as silvery, thin films of carbon. In the hand they look for all the world like someone drew them on the surface of the shale with an ordinary graphite pencil. Graptolites are occasionally found in limestones. When they are, these fossils are very important because they tend to be preserved in three-dimensions and can be extracted from the rock with acid, giving palaeontologists a rare look at the animals in their original form, rather than as the two-dimensional “images” that are most common.

Graptolites are less familiar to Alberta fossil hunters because Ordovician and Silurian rocks are rare to non-existent in our province: some Ordovician rocks (mostly limestones and dolostones, not shales) are exposed in remote areas of Banff National Park, where fossil hunting is verboten; Silurian rocks are completely absent from the rock record in Alberta, and the graptolites were already in decline by the time our Devonian rocks were being deposited (again, mostly limestones and dolostones are exposed here, not ideal for graptolite fossils).

So to find graptolites, we have to travel to our neighbouring province of British Columbia, which is where this fossil and a number of other specimens in the collection came from.

The type area of the Ordovician Glenogle Formation is along the CPR mainline near the railroad siding of Glenogle, east of Golden, BC. It was the venue of one of the first APS field trips, back in 1986, when a number of good specimens were collected (including two gut-busting slabs currently stored in the Curator’s garage!) Slaty black shales exposed here



1 cm

are full of graptolites and have yielded well-preserved specimens of many species. The Glenogle graptolites have been the subject of several scientific papers since their discovery by R.G. McConnell in 1886.

Our specimen was collected and donated by Life Member **Les Adler**. It is identified in the catalogue as *Paraglossograptus typicalis*. A figure of the species in Larson and Jackson (1966) is a good match for our specimen, which would date it to the earliest part of the Middle Ordovician Epoch, about 470 million years ago.

Larson, M.L. and Jackson, D.E. 1966. Biostratigraphy of the Glenogle Formation (Ordovician) near Glenogle, British Columbia. *Bulletin of Canadian Petroleum Geology*, Vol. 14, No. 4, pp. 486-503.

APS.1984.11

Our next specimen will look familiar to some members, as a similar specimen was featured on the front cover of the September, 2003 *Bulletin*. A short article was published in that issue, so I won't repeat the details here; readers can download it from our website: www.albertapaleo.org/bulletin183.pdf.

To briefly recap, the spidery-looking fossils are called *Macgowanella* (named for the MacGowans, husband-and-wife rockhounds from Calgary). They are interpreted to be holdfasts of bryozoa ("moss animals"), structures that anchored the colonial animals to the sea floor. The net-like film that covers much



of this specimen may have been a "frond" of *Macgowanella*, or it may belong to a different bryozoan.

The APS collection catalogue lists five specimens of *Macgowanella* (one went missing sometime prior to 1997). All were collected and donated by Life Member **Geoff Barrett** or by former member **Brenda Bakarich**, back in the mid-1980s, from exposures of



Macgowanella close-up, detail of APS.1984.11. Field of view is 24.3 mm wide.

the Carboniferous Mount Head Formation, in the Kananaskis area of the Alberta Rockies.

APS.2008.27

At first glance, this specimen looks like a candidate for the rubbish bin: it's a mere fragment—there aren't even any leaf margins remaining that might help identify it—a dozen similar specimens could be picked up in half an hour at any bedrock exposure in the Calgary area. It's yet another orphan on the doorstep: no locality data, no donor identified. The matrix is a very fine sandstone with a lot of mica and it could have come from many places in Alberta.

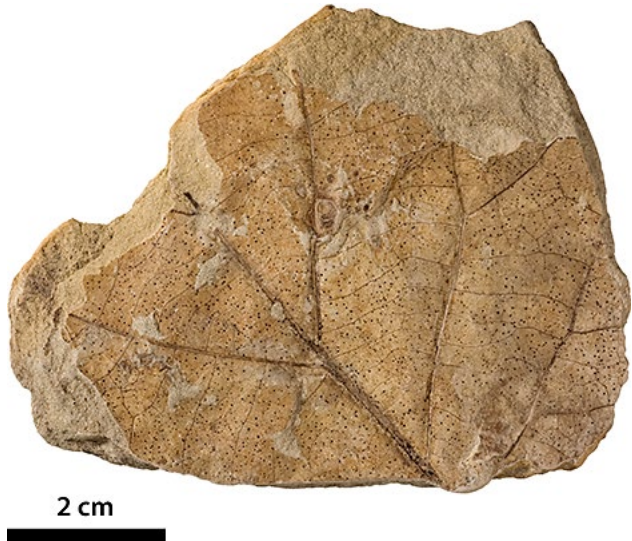
But it's often a second glance that brings discoveries in palaeontology. A closer inspection reveals that the surface of the leaf is peppered with a multitude of tiny, dark brown to black spots. What are these? Several possibilities come to mind. The first question that needs to be addressed is whether the spots were a feature of the living plant, or if they are an artifact of preservation—something in the sediment matrix, or a secondary mineral deposit that formed on the surface of the fossil as it lay buried in the rock (a *diagenetic* feature, in the geological lingo). Under careful examination with a microscope, a few observations can be made:

- 1) The spots are remarkably uniform in size; while some are a little smaller than others, there is a maximum size that is never exceeded.
- 2) The spots are fairly evenly distributed across the leaf surface; they don't bunch up and there are no large areas on the leaf where the spots are absent.
- 3) They seem to be almost deliberately spaced apart, as if they didn't want to be too close together.
- 4) The spots are almost perfectly circular.

- 5) They're slightly impressed into the leaf surface.
- 6) They seem somewhat selectively placed on the smooth leaf areas between veins; few fall directly on a vein.

Most of these observations argue against the spots being diagenetic features: minerals just don't typically distribute themselves evenly, in particular places on a surface, form perfect circles or conform to certain sizes (there are, of course, exceptions to each of these arguments; that just proves the rule!)

If we accept the interpretation that the spots were a feature of the living leaf, then we have to decide whether they are something that the leaf naturally produced, or if they were the result of a disease or other pathology. Here's where "the present is the key to the past" kicks in. Modern leaves have large pores on their surfaces, called *stomata*, that they can open and close to regulate the diffusion of water vapour and other gases. Clearly, this is a physiological function that's necessary to the plant's very existence, so



we can be sure that ancestors of modern plants also needed stomata. Most of our six observations would probably be consistent with stomata: a plant would want to transpire gases evenly across its leaves, for the sake of efficiency; stomata would tend to be uniform in size and shape; and they would be confined to the flatter areas between veins.

Are there any arguments against the spots being stomata? Well, yes. First, the spots seem a little too big to be stomata (compared to those on modern leaves). Second, stomata tend to be more oval-shaped; these are perfectly circular. Third, they are strongly coloured and are the only visible features (other than the veins) on the surface of the fossil. Stomata are constructed of plant cells: mostly cel-



Leaf spots: animal, vegetable or mineral? Close-up detail of APS.2008.27. Field of view is 5.9 mm wide.

lulose and water, like all the other cells; why are no other cells preserved on the fossil, and why would these be so strongly blackened? Clearly, they were made of something other than regular leaf cells—something tough and preservable.

What else could the spots be? A quick Internet search for "black spots on leaves" turns up several possibilities, all related to diseases or insect infestations. Several fungal and bacterial diseases of modern plants cause black spots on leaves. Many of these leave spots that are irregular, blotchy, or clumpy. But some create spots that look compellingly similar—at least superficially—to those on our fossil.

Some insect damage also creates spots. The website of the Missouri Botanical Garden has a page on lace bugs, which are sap-sucking insects related to aphids (www.missouribotanicalgarden.org/ search "lace bugs"). The bugs pierce the leaf surface and suck juice from the plant, leaving little black spots of "black tarry feces" or "dark, varnish-like excrement." Some of the photos on the web page bear a striking resemblance to the spots on our fossil.

Would this sort of thing be consistent with the six points we observed? Maybe. Bugs of a certain size are likely to leave spots of a certain size; a heavy infestation might cover an entire leaf surface; bugs might be territorial to some extent and space themselves apart as they feed on the leaf; a spot of liquid excrement would tend to form a perfect circle when dropped on a waxy leaf surface (the same way raindrops do); hard, varnish-like spots might be impressed into the soft leaf tissue on burial and compression; sucking bugs might prefer the tender parts of the leaf blade and avoid the tougher veins.

Have we solved the puzzle? I dunno. But you'll have to admit that looking closely at a crummy fossil can lead to a lot of thinking and self-education! □

APS Balance Sheet for 2015 For January 1, 2015 to December 31, 2015

Revenues		Expenses	
Memberships	2055.00	Bulletin Printing	167.52
US\$ Exchange	13.90	Bulletin Postage	180.92
T-shirts	375.00	Speaker Expenses	216.90
Pins	0.00	PO Box Rental	321.30
Field Trip Guides	0.00	Membership Printing	0.00
Old Abstract Volumes	10.00	Membership Postage	3.36
APS Book	450.00	Field Trip Expenses	492.50
Shipping and Handling	85.00	Workshop Expenses	21.41
Misc. Sales	13.00	Symposium Speaker	925.41
Refreshments	71.50	Symposium Abstract Printing	198.81
Field Trip Fees	520.00	Postage for Sales	80.23
Workshop Fees	470.00	T-shirt purchase	728.70
Donations	50.00	Refreshments	226.09
Symposium Abstract Sales	287.00	Bank Charges	0.00
Symposium Donations	676.95	Miscellaneous	84.84
Bank account interest	1.03	APS Book printing	0.00
Public Outreach income	135.50	Public Outreach	39.65

* Subtotal Revenues	5213.88	Subtotal Expenses	3687.64
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- Excludes GIC Interest of 157.56

Plus Revenue Received in 2014 for 2015

2015 Membership Fees	410.00
2015 Workshop Fees	60.00
Savings for 2015 Symposium	3220.00
Savings for Library	497.25
Savings for Public Outreach	504.81
Savings for Refreshments	91.41
Savings for T-shirt purchase	2000.00

Plus Expenses paid in 2013 for 2015

Website domain and hosting fee	108.04
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Minus Expenses paid 2015 for 2016

2016 PO Box rental	163.80
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Subtract Revenue Received in 2015 for 2016

2016 Memberships Fees	310.00
Savings for 2016 Symposium	3551.00
2016 Workshop fees	10.00
Savings for 2016 Library	497.25
Savings for 2016 Refreshments	136.82
Savings for 2016 Public Outreach	600.66
Savings for future T-shirts	1271.30

Total Revenues	5620.32	Total Expenses	3631.88
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Excess of Revenues over Expenses = \$1988.44

Total Fund Raising Proceeds	1,855.23	GICs due Jan 19, 2016	15,157.50
Inventory Cost	\$922.52	Dec 31, 2015 Bank Account	12,162.59

Values Current to Date: 01-Jan-16

Audited by APS Members as per the APS Bylaws:

Printed Name: Todd Ashton

Signature: Todd Ashton Date: Jan 24/2016

Printed Name: DON QUINSEY

Signature: Dan Quinsey Date: Feb 02/2016

RC - Re calculated

** - Agreed to Supporting Document 1/24/2016*

2015 Audited Financial Statement. Treasurer Mona Marsovsky thanks auditors Todd Ashton, Lisa Bohach and Dan Quinsey.