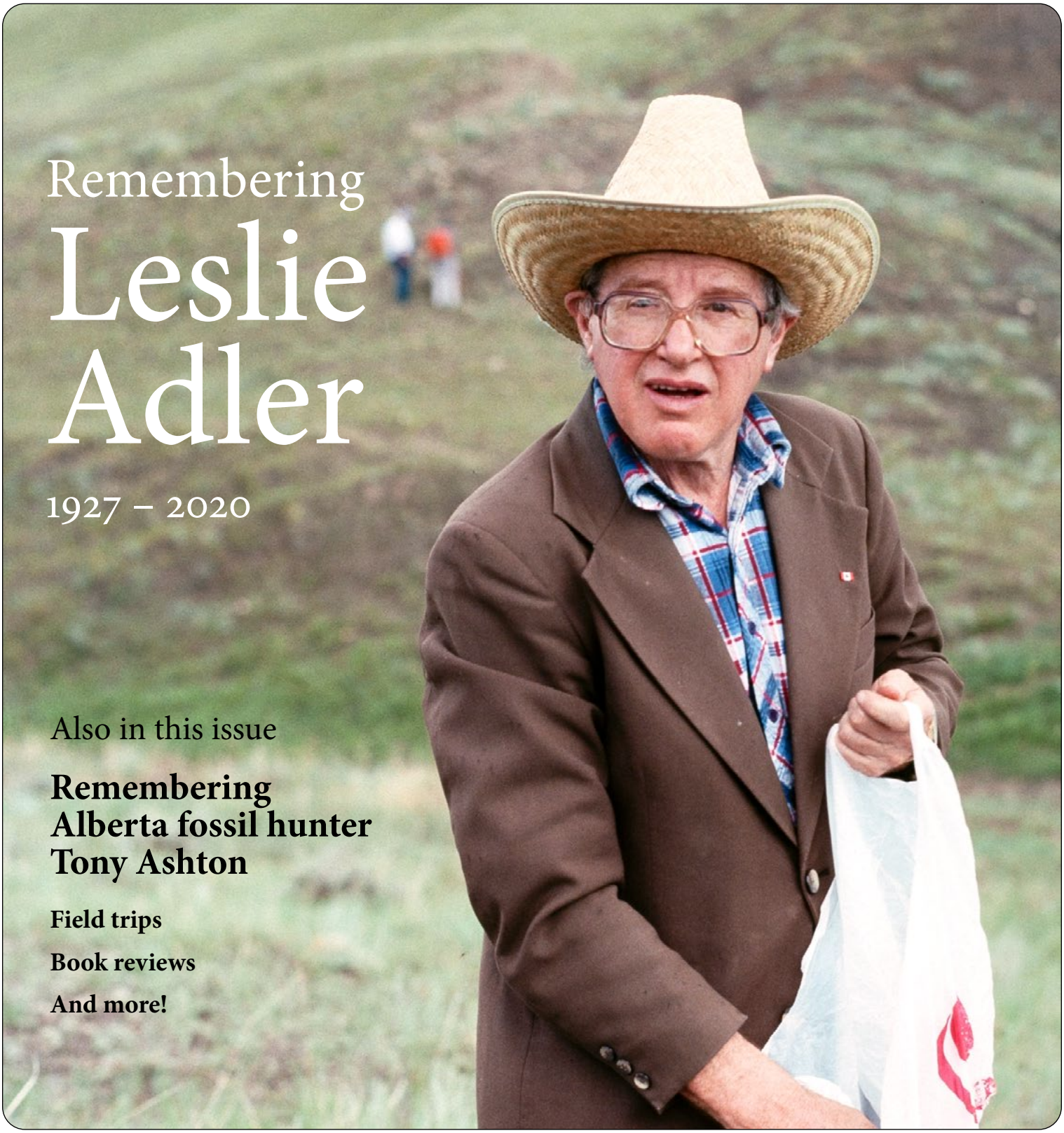
Palæontological
Alberta
Society
Bulletin

VOLUME 36 • NUMBER 1 www.albertapaleo.org MARCH 2021



Remembering Leslie Adler

1927 – 2020

Also in this issue

Remembering Alberta fossil hunter Tony Ashton

Field trips

Book reviews

And more!

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
PO Box 68024, Crowfoot PO
Calgary, AB, Canada T3G 3N8
www.albertapaleo.org

THE BULLETIN WILL BE PUBLISHED QUARTERLY: March, June, September and December. Deadline for submissions is the 15th of the month prior to publication. Material for the *Bulletin* should be sent to:

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.

Upcoming APS Meetings

Held in webinar format until further notice.

March 19, 2021—Dr. Corwin Sullivan, University of Alberta.
The Upper Cretaceous Wapiti Formation of northern Alberta, Canada, as a unique window into the continental vertebrate fauna of boreal Laramidia during Bearpaw times. See Page 5.

April 16, 2021—Dr. Stan Stancliffe, Professional Geologist.
History of waste and how it has changed the world over the past ~3.5 billion years. See Page 8.

May 14, 2021—Dr. Emily Bamforth, Royal Saskatchewan Museum.
Thunder beasts, hellbenders and tiny horses: A safari through the Cypress Hills Formation of Saskatchewan. See Page 8.

COVID-19 has affected our operations. Watch the APS website for updates!

ON THE COVER: Les Adler on an APS field trip to Late Cretaceous Bearpaw Formation exposures on the Bow River near Bassano, Alberta in 1995. Photo by Howard Allen.

Leslie Adler

Life Member, 1927 – 2020

Les at the May 2012 Calgary Rock and Lapidary Club show. Photo from the Adler collection.

We received the sad news of Les' passing on December 26, 2020 from his friend and fellow APS member **Peter Meyer**. Les was 93 years old. A lifelong bachelor, he is survived by two brothers in Australia.

His passing truly marks the end of an era for APS. The word "iconic" is overused these days, but in Les' case it's entirely fitting. No other member is so strongly associated with the Society in people's minds. He was such a ubiquitous presence that I'm sure many will have a hard time believing he's gone.

Les was a charter member at the Society's first meeting in January, 1986. He began serving immediately, authoring the second article, "Labelling fossils," in the very first issue of the *Bulletin* and regularly contributed articles and reviews over the next twenty-eight years. He was elected the Society's first Treasurer by acclamation in January 1987, a position he held until his election as President in May, 1992. He served three consecutive terms until May, 1995, then as Past President until May, 1999. For his long and continuing service to APS, Les was awarded Life Membership in January, 2002.

It was only due to extraordinary circumstances that Les was absent from any APS events, especially prior to reaching his 90s, when wear-and-tear inevitably began to limit his activities. It would be a hopeless exercise to list examples of his participation: he was everywhere, all the time.

One of the qualities that Les was famous for was his generosity. Most of us have been recipients of his envelopes stuffed with small fossil or mineral specimens and 3″ × 5″ index cards with glued-on fossil fragments, often annotated in typewritten text with the entire Linnean taxonomic hierarchy, from kingdom down to species. The APS fossil collection includes no less than thirty-eight specimens donated by Les over the years. The Royal Tyrrell Museum of Palaeontology (TMP) was a major beneficiary, having received three truckloads of fossils when Les downsized his personal collection a few years ago. **Dr. Don Brinkman**, Emeritus Scientist of the TMP, wrote in an email message:

> I first knew of Les from seeing his name on a partial mosasaur skull in a nodule from the Manyberries area in collections that he donated. I showed him the specimen on a trip the APS did to the Tyrrell in the late 90s, and remember how pleased he was to see it. The specimen was included in a study of *Prognathodon* that **Takuya Konishi** did some years ago. It is the only specimen of that genus from the Manyberries area and the only one that is preserved in 3-D. There are other specimens in collections that Les donated, but that is the one I will always remember him by.

In addition to the mosasaur skull, Les will be remembered by APS members for other discoveries, including an occurrence of early plant macrofossils in the Carboniferous Mount Head Formation at Canyon Creek (Hoffman, 2006; Quinsey, 2011; unfortunately the exposure has since been buried by flood deposits: Quinsey, 2013). A nearby fossiliferous exposure of the Lower Carboniferous Exshaw Formation (Mundy *et al.*, 1997) is colloquially referred to by APS members as "Les' Bluff" for his promotion of it as a collecting site.

An enthusiastic and prolific photographer, Les donated his collection of some 120 photo albums to APS in a final gesture of generosity (see *Bulletin*, December 2020, p. 5).

Being an ardent promoter of the Society and palaeontology in general, Les was responsible for recruiting a number of important people to APS. Past-President **Dan Quinsey** writes: "Les was a dear friend. He was the one who first approached [and] recruited me into the APS. He was also an ambassador for the APS and related organizations." From **Harold Whittaker**, current Programs Director, "Les

was also the one who recruited me for the APS."

My own experience with Les dates back to 1977 when, as a first-year geology student at the University of Calgary, I marvelled at the audacity of a strange little old guy (he would have been only 50 at the time, but to 18-year-old undergrads he was "a little old guy") who sat in the front row of our geology lectures and, in an Australian accent, harassed the professors for every spelling error or uncrossed "t" on the blackboard. I recall one of the profs, in exasperation, chalking a stick figure hanging from a gallows, then pointing a finger at Les, along with a withering glare—to gales of laughter from the theatre. Apparently Les had been auditing introductory courses for a semester or two, because he disappeared sometime after my first year.

I joined APS a dozen years later and instantly recognized Les (admittedly with some alarm) when he introduced himself at the first meeting I attended. After that I got to know Les fairly well. I had many long and entertaining conversations with him while driving him to and from meetings and field trips. My knowledge of his early years is sketchy and I stand to be corrected on any inaccuracies; there was no obituary published in the newspapers.

Les grew up in Melbourne, Australia and emigrated to Canada sometime in the 1950s or 1960s. He related that he had served late in World War II in the Australian government meteorological service, compiling weather data from stations in Antarctica which was where, he said—with typical self-effacing humour—"I could do the least possible damage to the war effort." He delighted in recounting how he would be chauffeured in his brother's Rolls-Royce on fossil collecting trips during visits back to Australia.

In Canada he taught school for some years in such places as Empress, Alberta (on the Saskatchewan boundary) and Fort Macleod. Les was a great traveller, jetting to many places around the globe. A longtime member of the Society of Vertebrate Paleontology (SVP), he attended many of their annual conferences and field trips, held at locations around the United States, some in Canada and even in Bristol, England. APS Past-President **Vaclav Marsovsky** recalls: "One of my earliest memories was going to a Subway joint with Les, in Chicago of all places. He was so proud of receiving his Life Membership in the Society of Vertebrate Paleontology; there weren't many at the time."

Les' eccentricities are legendary and will be the stuff of stories long into the future; it is impossible that anyone who met him will ever forget him, and that in itself is a stronger legacy than many of us can hope for.

I got the job of going through the literally thousands of snapshots that Les had accumulated in albums over a period from 1991 to 2015, a task—and privilege—that took weeks. Les photographed *everything*. APS events. Calgary Rock and Lapidary Club events. Every float in every annual Calgary Stampede Parade. The Mayor's Open House. Countless Calgary art and cultural festivals. The Governor-General's official visit. Field trips. SVP conventions. Dinotours. City construction projects. Seasonal displays in shopping malls. Kitschy roadside attractions. Birthday cakes. Children's art displays. Dandelions. Halloween decorations on neighbourhood lawns. Snowfalls. The weeping birch tree across the street in its fall colours (every year). The Nanking cherry bush, roses and lilacs in their spring blooms (every year). Workmen repairing an underground pipe. Thunderstorms. Posters. Animals at the zoo. Visits to friends' homes. Rocks. Dinosaur bones (of course). *Everything*.

When I finished, the overall feeling I came away with was that Les had an irrepressible, undying love of life. I'm glad he was able to experience so much of it. And if we can take a lesson from that, in making the most of our own lives, Les will have left us the best legacy possible.

—Howard Allen ❑

References

Hoffman, G.L. 2006. Lepidodendrid plant remains from the Mt. Head Formation (Mississippian) at Canyon Creek, Alberta. Alberta Palaeontological Society, Tenth Annual Symposium, Abstracts, p. 19.

Mundy, D., Widdowson, R. and Sabo, D. 1997. Stratigraphy, sedimentology, structural history and exploration history of the Mississippian at Moose Mountain southwestern Alberta foothills. Canadian Society of Petroleum Geologists-Society of Economic Paleontologists and Mineralogists Joint Convention, June 1–6, 1997, field trip guidebook, 92 pp. **http://www.albertapaleo.org/mundy.pdf**

Quinsey, D. 2011. Moose Mountain, Alberta: Exploring the natural history of Canyon Creek and area. Self published, pp. 74–76.

____ 2013. June flooding brings big changes to foothills. Alberta Palaeontological Society Bulletin, **28**(3): 6–10. **http://www.albertapaleo.org/bulletin283.pdf**

Thank you!

We thank APS member **Peter Meyer** for keeping us updated on Les Adler's final days, for assisting with the photo albums and for a monetary donation to help defray *Bulletin* production costs. ❑

Upcoming Events

March

Friday, March 19, 2021, 7:30 P.M.

WEBINAR—APS members will be notified by email how to register. Or visit **cspg.org**, navigate to ***Upcoming Events/Division E-talks/Palaeontology/*** and follow the instructions. **REGISTER EARLY! Registration ends at noon Wednesday, March 17.** APS and CSPG members may register for free. Non-members will be charged $10.00. There are NO meetings at Mount Royal University until further notice.

Dr. Corwin Sullivan

University of Alberta

The Upper Cretaceous Wapiti Formation of northern Alberta, Canada, as a unique window into the continental vertebrate fauna of boreal Laramidia during Bearpaw times

The Campanian to early Maastrichtian Wapiti Formation of northern Alberta has received increasing attention from palaeontologists since the 1980s. This has resulted in an improving picture of a succession of faunas situated well north (at palaeolatitude ~60° N) of the classic sites of southern Alberta and the western United States, extending previous knowledge of the Campanian biogeography of Laramidia.

The Wapiti Formation comprises five numbered units, of which the oldest (Unit 1) correlates approximately with the Foremost Formation of southern Alberta and the youngest (Unit 5) correlates approximately with the upper part of the Horseshoe Canyon Formation.

Especially important is Unit 3, which formed during a part of the Campanian (~73–74 Ma) when terrestrial deposition in southern Alberta was interrupted by a transgression of Cretaceous North America's Western Interior Seaway. As a result of this event, marine shales of the Bearpaw Formation underlie the Horseshoe Canyon Formation and overlie the somewhat older Dinosaur Park Formation. However, Unit 3 of the Wapiti Formation is clearly terrestrial, and preserves a unique record of land life in boreal Laramidia at the time of the Bearpaw transgression.

Unit 3 includes the Pipestone Creek Bonebed, source of the otherwise unknown dinosaurs *Pachyrhinosaurus lakustai* and *Boreonykus certekorum*. Two other Unit 3 sites, Kleskun Hill and the recently discovered DC Bonebed, preserve small, disarticulated bones and teeth. A sample of over 200 vertebrate specimens from the DC Bonebed includes many elements that are common in the pre-Bearpaw Dinosaur Park Formation of southern Alberta, such as champsosaurs, trionychid turtles, and baenid turtles including *Plesiobaena antiqua*.

However, the DC Bonebed assemblage differs from that of the Dinosaur Park Formation in that acipenserid fish, chelydrid turtle and thescelosaurid ornithischian elements are relatively abundant, while crocodylians are known from only one or two teeth. A caenagnathid theropod mandible from the DC Bonebed resembles *Chirostenotes* from the Dinosaur Park Formation, but is very small, and the site has also produced a caenagnathid ilium and pubis of roughly proportionate size. These caenagnathid bones could conceivably have come from a single juvenile individual, but the DC Bonebed champsosaurs are also small, and large turtles such as *Adocus* are absent. A juvenile lambeosaurine found near the DC Bonebed is comparable to *Corythosaurus*, but may be a new taxon given its trident-like nasal. A monstersaurian lizard frontal bone from the DC Bonebed could be referrable to *Labrodioctes* or *Palaeosaniwa*, both known from the Dinosaur Park Formation, or even to the Maastrichian *Paraderma*. The Kleskun Hill fauna likewise resembles that of the DPF but shows a few novelties, notably the presence of abundant troodontid teeth, the unique scincomorphan lizard *Kleskunsaurus*, and a partial lizard mandible that resembles specimens of *Chamops segnis* from the Maastrichtian of the western United States. The mandible was in fact the first fossil vertebrate specimen from the Wapiti Formation to be formally described, by Charles M. Sternberg in 1951.

The Unit 3 fauna does not differ in general composition from slightly older, more southerly Campanian ones, but is notable for including some distinctive species and displaying high abundances of some groups that are comparatively rare in the southern assemblages. However, the fact that Unit 3 coincides with a gap in the southern Alberta terrestrial record implies that some oddities of the Unit 3 fauna may result from sampling an otherwise poorly represented time, rather than from sampling a higher

palaeolatitude. The near-absence of crocodylians and the small size of the turtles and champsosaurs are perhaps most likely to reflect a true latitudinal signal, given latitudinal constraints on the size and distribution of ectotherms today.

Biography

Corwin Sullivan is the Philip J. Currie Professor of Vertebrate Palaeontology in the Department of Biological Sciences, University of Alberta and Palaeontologist with the Philip J. Currie Dinosaur Museum. After completing a BSc at the University of Victoria, an MSc at the University of Toronto Mississauga and a PhD at Harvard University, Corwin moved to Beijing in 2007 to take up a postdoctoral position at the Institute of Vertebrate Paleontology and Paleoanthropology (IVPP). He subsequently accepted an invitation to join the IVPP as a faculty member and remained in China until 2017, when he relocated to Alberta. Corwin's research focusses on documenting the diversity of fossil vertebrates, particularly dinosaurs and their relatives, and on understanding the evolution of their form and function. He is especially interested in the Cretaceous vertebrates of northern Alberta and in the changes in locomotion and respiration that took place on the evolutionary line to birds. Corwin is the author or coauthor of more than sixty scientific papers and book chapters, and of the book *From Fish to Human: The March of Vertebrate Life in China*. ❑

April

Friday, April 16, 2021, 7:30 P.M.

WEBINAR—APS members will be notified by email how to register. Or visit **cspg.org**, navigate to ***Upcoming Events/Division E-talks/Palaeontology/*** and follow the instructions. **REGISTER EARLY! Registration ends at noon Wednesday, April 14.** APS and CSPG members may register for free. Non-members will be charged $10.00. There are NO meetings at Mount Royal University until further notice.

Tako Koning and John Koning

Geological Consultant (TK) and Retired Geologist (JK)

Visiting Middle Cambrian stromatolites near Helen Lake, Banff National Park

[*This 15-minute presentation will precede our main speaker,* ***Dr. Stan Stancliffe****.*]

Last autumn we organized a small group to visit the little-known Middle Cambrian stromatolites near Helen Lake in Banff National Park. The incentive for this informal field trip was information in the highly informative book *Go Take a Hike: The Geology of Trails in the Canadian Rockies and Surrounding Areas* published in 2019 by the Canadian Society of Petroleum Geologists (CSPG). This book of almost 300 pages was produced by the Cindy Riediger Memorial Book Committee chaired by APS Life Member **Philip Benham**. The only other relevant literature we could find on the Helen Lake stromatolites was by David Gibson and Jim Dolph in the proceedings of the CSPG-CSEG-CWLS Convention held in 2008. That brief article describes their 2004 discovery of an area 800 m by 10 m, near Helen Lake, covered by stromatolites.

We embarked on our field trip on October 5, 2020 which was almost too late since the hike is in alpine habitat so winter conditions could have impacted on the hike. But reasonable weather prevailed and we were able to reach Helen Lake in about 3.5 hours. The stromatolitic strata occur approximately 700 m southwest and upslope from Helen Lake and required some persistent searching. When the stromatolites were located, they provided an outstanding opportunity to view these ancient and fascinating fossils. The stromatolites occur in the Middle Cambrian Pika Formation. They are about 30 cm to 40 cm in both height and diameter. Despite being aged approximately 510 million years, the stromatolites are exquisitely preserved and can be viewed in three dimensions (sectional and bedding plane). They are elliptical in shape which reflects the dominant palaeocurrent at the time of deposition.

Also along the trail to the stromatolites are many opportunities to view outcrops of the Lower Cambrian Gog Group. The Gog sediments were deposited in a shallow sea on the subsiding margin of the North American craton. A useful reference for anyone hiking in this area is Dale Leckie's very informative book *Rocks, Ridges and Rivers—Geological Wonders of Banff, Yoho, and Jasper National Parks* published in 2017. He describes the Gog Group as a silica-cemented, pebbly quartz sandstone that is extremely resistant to erosion, also referred to as a quartzite. The red colour on some of the cliffs is due to weathering of sediments. The Gog also includes formations consisting of mudstones, siltstones, limestones and dolomites. It forms many of the high

Figure 1. Bedding surface exposure of the Helen Lake stromatolites. Photo: Tako Koning.

ranges and mountain peaks in the Main Ranges. According to Leckie there is about 1.4 km of Gog quartzite on Mount Edith Cavell in Jasper National Park, the type section for the Gog Group.

Also very interesting in the Helen Lake area is the extensive evidence of the advance and retreat of the Pleistocene glaciation, including an outstanding example of a lengthy lateral moraine. Part of the hike is within a classic, glacially eroded U-shaped valley which provides more evidence of the glaciation that has occurred in this area.

The hike, including time to view the Helen Lake stromatolites, was about 8 hours (two-way). Distance is approximately 16 km, round trip, with an elevation gain of 650 m. Stunning scenery is everywhere.

Biography

Tako Koning is a semi-retired geological consultant who graduated from the University of Alberta in 1971 with a B.Sc. in Geology and with a B.A. in Economics in 1981 from the University of Calgary. He began his career working for two years as a mudlogger on the offshore drilling rigs on the Grand Banks of Newfoundland. He worked for Texaco in Calgary, 1974 – 1979 and 1987 – 1991 exploring for oil and gas in Western Canada. He also lived and worked as a geologist for a total of thirty years in Indonesia, Nigeria and Angola. He joined APS in 2015 when he returned back to Calgary from Angola.

John Koning is a retired petroleum geologist with over thirty years working in Calgary on Western Canada oil and gas exploration and production. He graduated from the University of Alberta in 1973 with a B.Sc. in Geology. He was employed by General American Oils, Westburne Petroleum & Minerals, Atcor Resources, Southward Energy, and Starboard Gas. John continues to explore rocks, formations and fossils in Alberta and Arizona where he usually spends his winters—but this year due to the ongoing pandemic he will be exploring mostly in the local area. He joined APS in 2020.

April Program continues, next page.

Figure 2. Cross-section of a stromatolite dome showing the characteristic laminated structure. Photo: Tako Koning.

April

Dr. Stan Stancliffe

Professional Geologist

History of waste and how it has changed the world over the past ~3.5 billion years

Palaeontology has always been interested in the front end of animals as there are often teeth and bones which are preserved in the fossil record. However, studying the organism's waste can produce many interesting observations that help with the understanding of how life has changed the Earth. This talk will highlight the ways waste has altered the planet over the past ~3.5 billion years.

To understand how the world has been changed by life, it is necessary to look at what organisms are changing and even controlling on the world today. Life alters the land by many ways, including the production of soil, landforms, the distribution of nutrients and even the spreading of seeds. At the interaction between land and the oceans, life makes carbonate beaches, cements sand grains, and stops the erosion of coastlines. In the ocean, marine organisms create feces that sink down and fertilise the marine sediments. In the air the balance of oxygen is controlled by plant waste and flying organisms can distribute chemicals far from their source. With these observations in mind, it is possible to look back at the history of the planet and show how life's evolution has altered the world.

It is thought that life may have begun approximately 600 million years after the formation of Earth, in the form of organisms called Archaea. These simple cells lived in the sea and produced waste products probably containing carbon dioxide, hydrogen sulphide and later perhaps methane gases. By ~3.5 billion years ago, stromatolites in Australia have been found to be associated with sulphur isotopes related to life processes. It is not until ~2.4 billion years ago that cyanobacteria produced waste oxygen in significant quantities, perhaps causing the Great Oxygenation Event. Eukaryotes appear around 1.8 billion years ago but *Vernanimalcula guizhouena* (the first fossils with bilateral symmetry and a separate anus, are found in rocks of 600 million years of age). Coprolites have been found in the Cambrian though it is speculated that they should be present significantly earlier in the Earth's history.

In the Palaeozoic complex life forms evolved first in the sea and then onto the land and finally into the air. Waste was therefore distributed much further away from the source, which led to the changing of continents as well as the oceans. The land animals grew larger, till the Mesozoic dinosaurs became the largest purveyors of organic waste ever. In the Tertiary mammals became dominant but gigantism returned as did the power to change the Earth into what it is today.

Biography

Stan Stancliffe earned his Ph.D. in Jurassic marine palynology from the University of Saskatchewan. He has since spent twenty-five years as a researcher, oil and gas geoscientist and mentor. His publications cover many diverse subjects and he has presented numerous talks on aspects of geology in North America and Europe. A special interest is the history of organic mudstones and how/when they were formed. Life is a major source of mud and this talk is an outcome of his research. ❑

May

Friday, May 14, 2021, 7:30 P.M.

WEBINAR—APS members will be notified by email how to register. Or visit **cspg.org**, navigate to ***Upcoming Events/Division E-talks/Palaeontology/*** and follow the instructions. **REGISTER EARLY! Registration ends at noon Wednesday, May 12.** APS and CSPG members may register for free. Non-members will be charged $10.00. There are NO meetings at Mount Royal University until further notice.

Dr. Emily Bamforth

Royal Saskatchewan Museum, T. rex Discovery Centre, Eastend

Thunder beasts, hellbenders and tiny horses: A safari through the Cypress Hills Formation of Saskatchewan

Vertebrate palaeontology in Saskatchewan today is inextricably linked to charismatic dinosaurs like *Triceratops* and *T. rex* (the provincial fossil emblem), and to the province's impressive array of endemic marine reptiles. However, it was not Mesozoic mania that first drew palaeontologists to the province

in the twentieth century. It was the Cenozoic mammals.

The oldest diverse fossil mammal assemblages in Saskatchewan are found in the Late Cretaceous; the small—and sometimes not-so-small—furry critters that shared their landscape with *T. rex* and *Triceratops*. The province is also well known for its early Paleocene mammals, sometimes found just centimetres above the K-Pg Boundary. Many of these survivors of the dinosaur mass extinction gave rise to linages from which modern North American mammal faunas stem. These taxa are known primarily from tiny teeth and/or jaws, as mammal teeth preserve better and are easier to identify than postcrania. It is generally not until the Eocene that some mammals and their fossil remains get big, heralding in the age of Cenozoic giants.

Some of the earliest discoveries of vertebrate fossils in western Canada were of Paleogene (Paleocene – Miocene) mammals in the Cypress Hills region of western Saskatchewan, from what is now known as the Cypress Hills Formation (CHF). The first record of a CHF fossil assemblage was made by **R. G. McConnell** in 1883, less than a decade after **George M. Dawson** reported Canada's first dinosaur fossils in Saskatchewan. It is now recognized that the CHF contains fossils from a time period not represented anywhere else in Canada, but which are a northern extension of fossil mammal-bearing units in the Great Plains of America.

Since the discovery of dense microvertebrate mammal sites in the CHF, collections from this formation have grown almost exponentially. In Canada, hundreds of thousands of fossils from the CHF are housed at the Royal Saskatchewan Museum (Regina and Eastend, SK), Royal Ontario Museum (Toronto, ON), Canadian Museum of Nature (Ottawa, ON), and other institutions across the country. The formation is now known to contain a mix of extant mammal groups, including artiodactyls (even-toed ungulates), rodents, marsupials, lagomorphs (rabbits and their allies), early primates, camelids and early candids. It also contains an array of now extinct groups like multituberculates, mesonychids and the bizarre condylarths.

Arguably, the CHF taxa that have generated the most public attention are the perissodactyls, or odd-toed ungulates. These included rhinos, the small leaf-eating early horses *Hyracotherium* (*Eohippus*) and *Mesohippus*, and the elephant-sized brontothere (Latin for "thunder beast") *Megacerops*. In addition to the mammals, fossils of other vertebrates including snakes, lizards, turtles, crocodiles, birds, amphibians (including a metre-long hellbender salamander) and a diversity of fish are also well represented in the CHF.

Despite the vast collections of fossils from the formation, the CHF was for decades thought to be comprised of a single biostratigraphic unit from the early Oligocene. We now know that the formation spans a time period from the mid-Eocene, though the Oligocene, and into the earliest Miocene. The formation encompasses a major floral and faunal turnover event across the Eocene-Oligocene (E-OG) boundary, which is suggested to be related to climate cooling. As the climate cooled, the forests began to disappear and were replaced by grasslands. It was during the E-OG event that many browsing mammals (*e.g.* brontotheres) went extinct and grazing mammals (*e.g.* horses) became more prevalent. No other geological formation in Canada, and few others in North America, offer such a unique opportunity to study this continuous sequence of evolutionary and ecological transitions.

Biography

Dr. Emily Bamforth is a vertebrate palaeontologist with the Royal Saskatchewan Museum (RSM), working out of the RSM's *T. rex* Discovery Centre in Eastend, SK. Dr. Bamforth's research in Eastend focuses mainly on palaeoecology, involving the study of fossil plants and animals, as well as sedimentology and palaeoclimatology, to understand ancient ecosystems. Dr. Bamforth received a B.Sc. in evolutionary biology from the University of Alberta in 2005, with an undergraduate thesis on 38 million-year-old fossil snake hibernacula from Wyoming. She went on to do a M.Sc. in Precambrian invertebrate palaeontology at Queens University with **Dr. Guy Narbonne**, exploring Ediacaran taphonomy and palaeoecology at Mistaken Point in Newfoundland. In 2008, she began her Ph.D. at McGill University under the supervision of **Dr. Hans Larsson**, exploring pre-extinction biodiversity trends immediately prior to the K-Pg extinction in Saskatchewan. She received her doctorate in 2014, the same year she began working for the Royal Saskatchewan Museum. Dr. Bamforth has published numerous papers and conference abstracts of Ediacaran and Cretaceous palaeontology. She is the recipient of several academic, teaching and community engagement awards, including the Regina YWCA's 2019 Women of Distinction Award for Science. ❑

Notice of Annual General Meeting of Members

To the Members of the Alberta Palaeontological Society:

Take notice that the Annual General Meeting (AGM) of the Members of the Alberta Palaeontological Society (hereinafter called "The Society") **will be held by webinar**, following the main guest presentation on **Friday the 14th day of May**, 2021, at the hour of 7:30 o'clock in the evening, local time, to deal with the following business to be brought before the Meeting:

1. **Adoption of agenda.**
2. **Minutes of 2019 AGM.**

Members will be asked to adopt the minutes of the 2019 AGM, which may be reviewed at the APS website: **http://www.albertapaleo.org/agm.html** (note that there was no AGM held in 2020, due to the pandemic, so the 2019 minutes will be adopted).

3. **Treasurer's presentation of the audited statement of the financial position of The Society.**
4. **Appointment of the auditors.**

Auditors nominated by the Treasurer for appointment are **Gilles Fournier** and **Anita Reilander**.

5. **Election of Officers and Directors to the Board of The Society.**

All APS members 18 years and older are entitled to vote. Executive positions are 1 year terms and directorships are 2 year terms. Nominations are being solicited for the following positions:

Officers	**Directors**
President	Editor
Vice-President	Membership
Secretary	
Treasurer	

Continuing directorships are Program Coordinator (**Harold Whittaker**) and Field Trips Coordinator (**Keith Mychaluk**). Both positions are entering the 3nd year of a 3 year term.

In addition to the elected positions the APS has a number of committee chairs which are appointed by the board. Terms for these chairs are unlimited:

Committee	**Current Chairperson**
Fossil Collection	Howard Allen
Library	Georgia Hoffman
Public Outreach	Cory Gross
Social	Virginia Goodman
Website	Vaclav Marsovsky

Terms for all positions 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.

6. **New Business.**

If you have any items of New Business to be brought forward contact Society President **Cory Gross** at **(403) 617-2079** or by e-mail, **president1@albertapaleo.org**.

WEBINAR—APS members will be notified by email how to register. Or visit **cspg.org**, navigate to ***Upcoming Events/Division E-talks/Palaeontology/*** and follow the instructions. **REGISTER EARLY! Registration ends at noon Wednesday, May 12.** APS members may register for free. There are no meetings at Mount Royal University until further notice. ❑

2021 Field Trips

By Keith Mychaluk

Planning is underway for this year's trips. A tentative outline is detailed below. We are as excited as you are about getting back and safely viewing fossils in the field. We feel the following trips can be safely conducted obeying current physical distancing guidelines. Please note we are going to postpone the Kemmerer, Wyoming and Devil's Coulee, Alberta trips until 2022 when we hope the COVID-19 pandemic restrictions are finally behind us. Please watch the *Bulletin* and website for further updates as the plans outlined here may change. Remember, you must be a member to attend a Society field trip.

Trip 2021-1, June 12, 2021
Tyndall building stone tour, Calgary, Alberta

Once again, **Tako Koning** has agreed to conduct his popular tour of Calgary buildings adorned in Ordovician age Tyndall limestone, quarried near Tyndall, Manitoba. See impressively preserved fossils of corals, gastropods, nautiloids and "weird wonders" at Calgary's historic landmarks (see *Bulletin*,

December 2020, p. 27). There will be two dates to pick from—June 12 and September 11, which will bookend our summer field trip season. This will be a walking tour of several buildings in downtown Calgary, the community of Kensington and the SAIT campus. **Registration deadline is June 1.**

Trip 2021-2, June 26 and 27, 2021
Manyberries area, southeastern Alberta

As mentioned earlier, the COVID-19 pandemic is making field trip arrangements challenging. We have decided to return to the Manyberries area (south of Medicine Hat) due to its wide open spaces which will make physical distancing easy. Expansive outcrops of the Late Cretaceous marine Bearpaw Formation provide opportunities to find ammonites, bivalves and possibly even marine reptile remains. Exposures of the underlying terrestrial Dinosaur Park Formation will also be visited in the vicinity. Manyberries is a 4 hour drive from Calgary so it is best to plan for an overnight excursion. Camping is available in Foremost, AB and in the nearby Cypress Hills Interprovincial Park. **Registration deadline is June 1.**

Trip 2021-3, July 10, 2021
Albertosaurus quarry near Huxley, Alberta

Back in 1910, Barnum Brown of the American Museum of Natural History discovered remains of the carnivore *Albertosaurus* in what is now Dry Island Buffalo Jump Provincial Park. Interestingly the collected material showed evidence of more than one individual which is very rare for a carnivore bonebed. After Brown's initial work the site essentially went unnoted for almost 90 years until **Dr. Phil Currie** and team from the Royal Tyrrell Museum "rediscovered" the site and conducted extensive excavations from 1998 to 2010. The subsequent study of this unique bonebed greatly enhanced our knowledge of Cretaceous theropods. This trip requires a long hike through rugged badlands. Dry Island is about a 2 hour drive from Calgary. **Registration deadline is July 1.**

Trip 2021-4, August 21, 2021
Stanley Glacier, Kootenay National Park, BC

This hike will take us to a recently identified site with soft-bodied preservation of Cambrian biota similar to the Walcott Quarry and nearby "Marble Canyon" localities of the Burgess Shale. Join us to learn about the geological conditions that created this unique deposit while traversing breathtaking scenery. Be aware that this is a long and strenuous climb (10 km, 450 m elevation gain) taking approximately 8 hours (round trip) depending on your conditioning. This is bear country, too and don't forget that weather conditions, even in August, can change very rapidly so be prepared. Children under 8 years old are not recommended to attend. Stanley Glacier is about a 2 hour drive from Calgary and the **registration deadline is August 1**.

Trip 2021-5, September 11, 2021
Tyndall building stone tour, Calgary, Alberta

See the description for the June 12 trip. **Registration deadline is September 1.**

For more information please contact Keith Mychaluk at **(403) 809-3211** or by email **fieldtrips@albertapaleo.org**. A field trip registration form is included with this issue of the *Bulletin* and is available on the APS website (**www.albertapaleo.org/fieldtrips.html**). All fees are due at the time of registration. Fees for trips are $10.00. **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 1, 2021 will not be reviewed and voted on by the Board of Directors until September, 2021. Therefore, if you are a non-member and would like to join be sure your application is received prior to May 1, 2021. 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 guide for the trip. **No late registrations will be accepted.** Registrations are accepted on a first-come-first-served basis so sign up early to avoid disappointment.

For the 2021 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 email or Canada Post. Please ensure that your addresses are correct and legible when sending in registration forms. When you arrive at the meeting place please have all forms completed. All participants are required to have fully completed all waiver and

Continued on Page 22 . . .

Remember Me

Michael Anthony "Tony" Ashton (1935 – 2018)

From small footprints to big dinosaurs

By Darren H. Tanke[1] and Peter Hews[2]

Photo courtesy of the Ashton family

Michael Anthony "Tony" Ashton's name is largely unknown in Albertan vertebrate palaeontology and probably unknown to most readers, but he played an important role beginning in 1995 until his passing in early 2018. He also made some discoveries in Utah, USA.

Tony was born in Glossop, Derbyshire, England on May 19, 1935. His father was a civil engineer and Borough Surveyor in Nuneaton, Warwickshire, England. Tony studied at Manchester University, earning a B.Sc. in Geology. After graduating, he emigrated to Canada in 1958 and married Pamela (*née* Moorhouse). Tony and Pam had two children, Janet and Jeff.

Tony worked as a geologist in the Alberta oil and gas industry for forty-five years, eventually rising to the position of President of Canada Southern Petroleum Ltd. He was a self-taught carpenter and over the years took a couple of sabbaticals from the oil industry to build a beautiful two-story home in Bragg Creek, AB, where the family lived for seventeen years; and a cabin for his son on Pender Island in the British Columbia Gulf Islands.

He was always looking for fossils. Early on Tony and his young family looked at rocks. They travelled to Drumheller and around Alberta looking for fossils and learning about the Burgess Shale or the differences between sedimentary, igneous and metamorphic rocks.

Something Tony read got him interested in Late Cretaceous strata exposed on the Oldman River 180 km south of Calgary in the Maycroft/Waldron Flats district where Highway 22 crosses the Oldman River. There were plenty of Upper Cretaceous outcrops there, exposed on both sides of the river, the beds tilted to varying degrees, some nearly vertical. After several visits to the area, alone and with his family, Tony found what he thought might be a raised dinosaur footprint centred on a slab of loose, light-coloured sandstone along the river's edge (Figure 1).

In 1989 Tony first met Peter Hews, then a 40-year-old geologist from Calgary, who also worked in the oil and gas industry. Tony wanted to get Peter's opinion on his earlier footprint find so in 1995 he offered to take the Hews family on a hike to the Oldman River area, near Maycroft. Peter and his then eight-year-old son, Stephen (Figure 2) were interested in dinosaurs and Tony loved taking others on adven-

1. Royal Tyrrell Museum of Palaeontology, P.O. Box 7500, Drumheller, AB T0J 0Y0
2. Hara Consulting Ltd., Calgary, AB

Figure 1. TMP 1995.152.0005, a subadult tyrannosaur ichnite discovered by Tony Ashton and collected by the senior author. This specimen was the first one that led to the Waldron Flats area on the Oldman River being recognized as an important fossil locality. The slab is 47 cm wide. Photo by D.H. Tanke.

tures. From this first outing, a cascade of events followed which benefitted the men, the son, the Royal Tyrrell Museum of Palaeontology (hereinafter TMP) and the science of vertebrate palaeontology. It amply shows how a simple act by an amateur fossil collector can have important repercussions for science.

In September 1995 the group hiked the rocky banks of the Oldman River. The strata here comprise hard, slab-forming sandstones and interbedded soft shales which are highly faulted and tilted due to mountain building to the west (see Dawson, 1884; Douglas, 1950; Stockmal, 1996; Chao *et al.*, 2005 and McMechan and Stockmal, 2013 for regional and geological maps). Scrambling to the presumed dinosaur footprint (later confirmed as made by a subadult tyrannosaur, TMP 1995.152.0005), Stephen found a large block of sandstone that had fallen out of the cliffs nearby and tumbled down to the river's edge, not far from the Highway 22 bridge. On a skyward-facing bedding surface were about seven clearly defined ichnites of ornithomimid dinosaurs. Peter photographed Stephen's find and sent the photos with a letter to the TMP. About two weeks later author Tanke led a museum team to examine and confirm the find. More dinosaur ichnites were found, both up and down the river from Stephen's footprint block.

Another trip was soon arranged, this time with an industrial-scale rented crane and flat-deck trailer from Calgary, to transport all the specimens back to the museum. With the landowner's permission a barbed wire fence was cut to allow the crane truck to be driven as close to the river's edge as safely possible. A telescoping boom was extended out over the large fossil (ex TMP 1995.152.0001) and it was lifted out along with smaller dinosaur footprint-bearing slabs located in the riverbed nearby. The biggest block weighed about 9 tonnes. At the senior author's urging for a popular human-interest story—"Boy Finds Important Fossil"—the TMP arranged to have some Calgary and area media present for the recovery operation. This resulted in a number of newspaper articles (Anonymous, 1995b; Connoly, 1995; Drew, 1995; Lowey, 1995; Sepkowski, 1995) along with CTV Calgary and CBC National News television coverage. Stephen's discovery was later mentioned in a children's book (Tejada *et al.*, 2003) and National Geographic World (Waldman, 1996).

This was just one instance of children making significant fossil finds (*e.g.* Richards, 2003; Helm, 2004; Zielinski, 2014; Chung, 2016; Stephenson, 2018) and the second such example in Alberta that year (Anonymous, 1995a). The large size and weight of the sandstone block made it awkward to exhibit at the museum, so a latex peel of two closely-spaced ornithomimid ichnites was made by the senior author. From that, a durable cast (TMP 2006.000.0057; Figure 3) was produced as a touchable, interactive exhibit in the museum's "Extreme Theropod" gallery (now replaced). Over the decade or so it was

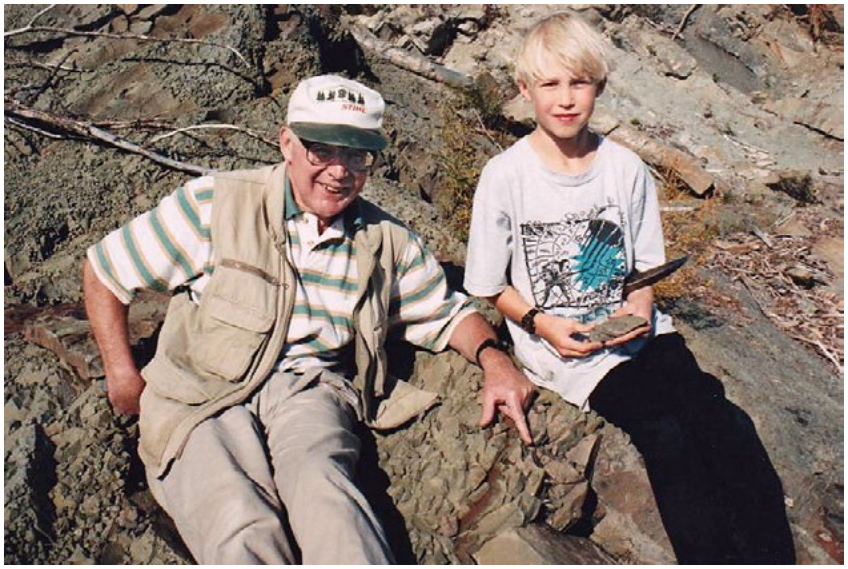


Figure 2. Tony Ashton and 9-year-old Stephen Hews in 1996, fossil hunting along the Oldman River south of Longview, AB. Photo by P. Hews.

Figure 3. (Left) Field photo of Stephen Hews, then 8 years old, posing on a sandstone block with three ornithomimid ichnites. (Right) a cast, TMP 2006.000.0057, made from the block found by Stephen. Photos by P. Hews.

displayed, potentially millions of people saw the cast, touched and learned from it. The original block, now deaccessioned, is placed close to the children's outdoor play area at the museum. It is readily available for research purposes if needed.

Over subsequent years Tony Ashton and Peter Hews, together or alone and sometimes with various family members, continued exploring and re-examining the riverbanks and exposures along that same stretch of the Oldman River. Re-exploring was important as the area experiences high erosion rates—including bank collapses—so the chances of finding something new on each trip were good.

The pair also explored further afield, around Chain Lakes and at

Figure 4. Tony around 1999 with an unmistakable *in situ* large three-toed theropod ichnite found in an abandoned coal mine, Grassy Mountain, near Blairmore, AB. Geologist co-author Peter Hews believes this may be the oldest dinosaur ichnite in the province. Photo by P. Hews.

abandoned coal mines in the Crowsnest Pass area. They found more footprints, including one (Figure 4) that may be the oldest currently-known dinosaur evidence in Alberta. Co-author geologist Peter Hews believes this ichnite is located stratigraphically just above the main Kootenay coal seam, placing it in the Lower Cretaceous Elk Formation. The exact age of the Elk Formation is uncertain because of a general lack of zone fossils. Palynomorph microfossils indicate much of the Elk Formation is Berriasian in age (earliest Cretaceous, 145 to 140 mya; White and Leckie, 1999; Gibson, 1985; Anonymous, 2021), but the lowest part may be latest Jurassic, as old as 150 million years. Tony's ichnite is therefore from 140 to 150 million years old: significantly older than recently described dinosaur bones from the slightly younger Cadomin Formation, some 140 mya (Nagesan *et al.*, 2020) and an ichnite described from the even younger Gladstone Formation, about 125 mya (Henderson, 2017).

Figure 5. The skull of *Regaliceratops peterhewsi* (type specimen, TMP 2005.055.0001) on display at the TMP in early June, 2015. Part of the bridge of the nose and the tip of the nasal horncore (both reconstructed) were protruding from the river bank at time of discovery. Length of the skull is 1.57 m. Photos by D.H. Tanke.

More blocks with footprints were found along the Oldman River. These were recovered on day-trips led by Tanke. For example, a small ichnites slab, TMP 1995.152.0002; and a subadult ceratopsian right scapula, TMP 1998.005.0018. Tony and Peter became more interested in finding other things too, such as large dinosaur bones. Initially there was not much obvious bone material observed along the Oldman River; it was not really expected, since traditional dinosaur footprint localities typically lack bone fossils and vice versa. The senior author did find a few scraps of bone to show them what it looked like.

Tony and Peter eventually found some dinosaur bone but it consisted of small fragments, was inaccessible under steep cliff faces of hard rock, or was only suitable as voucher specimens, such as an adult hadrosaur distal right tibia (TMP 1998.005.0015). But their luck would eventually change. As the years passed, Stephen grew up and lost his interest in dinosaurs, but Tony and Peter continued exploring further downstream. Now and then the senior author, with assistants, would examine their finds and recover some for the museum. One of these finds was parts of a large, associated tyrannosaur skeleton found in a unionid clam-dominated, hard siltstone unit in the riverbed. It was situated in standing water or under flowing water much of the time. The pair collected pieces of it (now TMP 2001.031.0001) on September 28, 2001 when water levels were low. The specimen still needs to be reassessed for future

collection. Tony visited the TMP's *Albertosaurus* bonebed excavations in Dry Island Buffalo Jump Provincial Park (see various authors, 2010) on at least one occasion.

Then, in 2005, Peter Hews made an unusual find. On the south bank of the river, close to the water, he found two strange, *in situ* bones exposed in hard, concretionary rock. He took a photograph and sent it to the senior author who immediately recognized it as a symmetrical cross-section through the premaxillae of an upright-oriented horned dinosaur skull (the cross-section seen at the 1:02 – 1:04 minute mark in Hudes, 2015) and positioned close to the tip of the nose.

A partial nasal horncore was also exposed, but the tip was missing. In life, the premaxilla bones were loosely articulated (*i.e.* not fused)[3] in the skull. So to find them in life position indicated something anatomical must be holding them together deeper inside the hard rock. And that something could only be the rest of the skull. A trip to the site was arranged and some rock was removed, revealing more of the nasal horncore going down into the bedrock and confirming the presence of a skull.

Eventually, in three short expeditions, conducted over two years, the skull was collected. Owing to the fact that the river is a prime spawning and living habitat for Bull Trout (*Salvelinus confluentus*; see Hurkett *et al.*, 2011)—Alberta's provincial fish and an endangered species—work on the site was allowed by

3. Sometimes in Albertan adult non-pachyrhinosaurine ceratopsian skulls undergoing decay and fluvial erosion, the nasal region is disarticulated and lost (*e.g. Styracosaurus*, TMP 1986.26.0001, TMP 1989.097.0001; and possibly the unprepared *Centrosaurus*, TMP 1994.164.0001) or are found nearby in the same quarry (*e.g. Centrosaurus*, TMP 1994.181.0001). Or, nasal regions (articulated nasals and premaxillae) are found as isolated specimens (*e.g. Centrosaurus*, TMP 1993.036.0117 and *Centrosaurus*, TMP 1994.012.0168; see Tanke, 2010: figs. 255 and 257).

Figure 6. Tony viewing the site of the Callum Creek ceratopsian skull and jaws (TMP 2014.022.0022) quarry (circled) in early October, 2015. The skull was found in the white sandstone layer; see animated graphic in Anonymous, 2016b. Plaster jackets awaiting a helicopter lift (which occurred October 15) can be seen just below the quarry and laid out in a line along the stream bank (arrow). Another visit to the site three years later showed it had been completely infilled by scree accumulating from above. The scene here looks roughly WNW. Photo by P. Hews.

various provincial and federal government agencies only for short periods of time. It was decided early on to remove the skull in pieces along pre-existing breaks as much as was possible. Pieces were marked for orientation, numbered and mapped for reassembly. Only the centre region of the skull (minus the skull roof and orbital horns) was plaster jacketed in a traditional manner. The skull was finally prepared by the senior author during a seventeen month-long and very technically challenging project that proved well worth the effort. It was later determined to be a genus and species new to science and became the type specimen of *Regaliceratops peterhewsi* (Brown and Henderson, 2015; Royal Tyrrell Museum, 2016; Figure 5), affectionately known as "Hellboy." The skull went on display at the TMP and was unveiled to great fanfare on June 4, 2015 (*e.g.* Anonymous, 2015a-b; Chamary, 2015; Hudes, 2015; Mortillaro, 2015). It was on temporary display for a while, then a permanent case was built for it and the skull was reinstalled in the TMP's ceratopsian gallery for the long-term, beginning March 5, 2018. Tony lived to see the *Regaliceratops* project from start to finish.

Severe spring flooding in southern Alberta in June 2013 (Anonymous, 2019; MNP, 2015; Pomeroy, 2016) not only took lives, devastated property and infrastructure, but it also caused extensive erosion along watercourses (Pearson, 2018), damaging, destroying and exposing new fossil and archaeological resources (*e.g.* Anonymous, 2013; Franklin, 2014).

Beginning in 2014 a three-year Palaeontology Flood Mitigation program was funded by the Alberta Government (Alberta Culture and Tourism) for a two-man team from the TMP to conduct extensive exploration for fossils by boat and on foot, along many kilometres of southern Alberta's rivers and creeks, salvaging any fossils they found uncovered by flooding or endangered by future flood events (Anonymous, 2016a-b; Sanchez and Borkovic, 2016a-b; Sanchez *et al.*, 2017).

The Archaeological Survey dealt with archaeological matters (see Marvin, 2016; flood mitigation results published in Peck, 2017; see also Vivian *et al.*, 2017a, b, among others). The project resumed in 2017 with TMP support, exploring watercourses in west-central and southern Alberta.

In September 2014 the Oldman River in the Waldron Flats region was re-explored by the TMP crew, covering areas that had first been viewed by TMP staff with Ashton and Hews in 1995 and further downstream to the area that yielded the *Regaliceratops* skull and other fossils. Exploring even further downstream, they examined outcrops on a tributary called Callum Creek. There, they found a nearly complete ceratopsian skull (TMP 2014.022.0022; Figure 6) just emerging from the rock. It was collected by TMP staff in the fall of 2015 and after a six-month COVID-19 delay, its preparation is nearing completion, while research continues at the TMP.

Tony and his wife Pam also generously contributed seed money toward the development of a surprise *festschrift* book honouring Dr. Philip J. Currie on the occasion of the 25th anniversary of his vertebrate palaeontology career in Alberta (Tanke and Carpenter, 2001, p. xvii). Tony and Peter were guests at Phil's presentation party in Patricia, Alberta on July 6, 2001 (Crowson, 2001; Dawson, 2001).

Figure 7. Tony at Leprechaun Canyon, Utah. Undated photograph courtesy of the Ashton family.

Tony and Pam moved to Kelowna, BC on a part-time basis in 2005, then fully in 2007. He was passionate about hiking, biking, tennis, family, friends and fossil hunting. Tony made several trips to the Red Rocks area of Utah (Figure 7 and Page 12)—for him a geologist's paradise, where he hiked the canyons with his wife and son. He made some significant fossil discoveries there, too.

On a solo walk in mid-April 2010, in a coulee at Warner Ridge near St. George, Utah, Tony discovered a slab of rock with ichnites and trackways (Figure 8). University of California (Davis) palaeontologist Tracy J. Thomson identified it as *Procolophonichnium* and presented a poster on the find at the 2013 Society of Vertebrate Paleontology meeting in Los Angeles, CA (Thomson, 2013). On loan from the Natural History Museum of Utah (NHMU) in Salt Lake City, it is now on display at the St. George Dinosaur Discovery Site in St. George, Utah. Tony also reported his discovery of a sauropod trackway.

Figure 8. Left: Tony (at right) with St. George Dinosaur Discovery Site vertebrate palaeontologist Andrew R.C. Milner and his small *Procolophonichnium* trackway slab. Right: the fossil slab, NHMU VP 23752 under accession #NHMU.A.2010.45; Utah Geological Survey database locality number Ws529T (field number AM10-02). Low angle lighting reveals the distinctive ichnites. Length of the slab is 38.5 cm. Left photo courtesy of the Ashton family; right photo courtesy of T. J. Thomson.

Tony passed away suddenly at his home in Kelowna on February 18, 2018 of heart failure, aged 82. He was very fit for his age but had some heart issues and in a final charitable act he donated his body to the University of British Columbia Medical School for medical research. He left behind his wife of 59 years, Pamela, daughter Janet (Eric), son Jeff, and grand pups Risk and Rory.

Tony is a prime example of a successful relationship between an avocational palaeontologist and professional vertebrate palaeontologists. He collected or co-collected nine fossil specimens now curated in the TMP. While not a large number of specimens, this is, more importantly, the story of how a simple act of kindness to author Hews and his family, twenty-five years ago, was a benefit to Albertan vertebrate palaeontology continuing to this day. His name appears in only a couple of palaeontology publications (Tanke and Carpenter, 2001, p. xvii; Thomson, 2013 poster). His obituary (Anonymous, 2018; written by his daughter) in the *Calgary Herald* ran February 23 to 25 and was brief, so the authors felt a need to write this article to better illuminate his life story, especially his contributions to science, and thus preserve his legacy.

Looking back we can see that Tony's invitation to an eight-year-old boy and his family in 1995 had subsequent positive benefits for the science of vertebrate palaeontology. First, he was instrumental in the discovery of dinosaur footprints and bone in the Oldman River at the Waldron Flats area. His act of reporting Stephen Hews' track find opened a rich, new field area for the TMP to explore. The museum had worked the Oldman River sometime earlier, but this particular stretch of outcrops was really overlooked and, for some staff, completely unknown as a potential collecting area. It had been known to others as a geological field trip stop (*e.g.* McCulloch and Gallup, 1953) and as a dinosaur ichnite locality (see Currie *et al.*, 1991; Nadon, 1993 and footnote 4). The TMP visiting this site ultimately encouraged Ashton and Hews and led to the discovery of more dinosaur footprints; several ceratopsian skulls (Hews' *Regaliceratops*, TMP 2005.055.0001); another partial, unnamed and yet to be described ceratopsian skull (TMP 2005.055.0005) and assorted ceratopsian bonebed materials (*e.g.* a frill section, TMP 2008.069.0003); yet another ceratopsian skull (TMP 2014.022.0022); dinosaur eggshell; and other fossil vertebrate material. Had Tony not taken the Hews family to the Oldman River in 1995 it is quite likely the *Regaliceratops* skull, discovered just metres from the river's edge and already beginning to erode away, would have been further compromised or destroyed altogether by future flooding events. The Callum Creek skull may have been similarly compromised since the site, had it not been recognized, could have been missed by the TMP's Palaeontology Flood Mitigation Project.

4. The senior author has seen an early 1920s letter, penned by amateur fossil collector William E. Cutler, bearing a Maycroft, AB postage stamp cancellation mark. This former post office was just a few kilometers west of the field areas described here, so we can deduce that Cutler likely hunted for fossils in this region. What, if anything, he found and collected here is unknown.

Tony has often been overlooked by the palaeontological community and is one of those people who, with the passage of time, would be lost to history. We feel this article honouring his contributions to Alberta and Utah vertebrate palaeontology will acknowledge him and record his legacy. In the words of his daughter Janet, "Sometimes when we followed him, I would say, 'I think I'm going to regret this,' but really—look where he led us!"

Acknowledgements

Thanks to Heather Feeney (Collections, TMP) and APS *Bulletin* editor Howard Allen. Pamela Ashton and Janet Schulz provided more biographical data and reviewed earlier drafts of this paper. Mathew Wedel, Robert J. Gay and Nancy Engelhardt-Moore helped identify the location of the Page 12 photo.

References

[*Unknown page numbers are marked "XX".*]

Anonymous. 1995a. Dino-mite find. The Calgary Herald, March 18: 2.

____ 1995b. Boy finds dinosaur tracks. The Calgary Mirror, October 28: XX. (Not seen.)

____ 2013. Alberta floods unearth bones, bombs. **https://www.cbc.ca/** [search "Alberta floods unearth bones"]

____ 2015a. Hellboy dinosaur species unveiled by Royal Tyrrell Museum. **https://www.cbc.ca/** [search "Hellboy unveiled"]

____ 2015b. New dinosaur species found in Alberta a "royal" wonder of evolution. **https://www.ctvnews.ca/** [search "Hellboy dinosaur"]

____ 2016a. A "staggering" bounty of fossils was uncovered by the 2013 flood, and paleontologists are having a field day. The Calgary Herald, March 17: XX. **https://calgaryherald.com/** [search "bounty of fossils 2013 flood"]

____ 2016b. Massive 2013 Alberta flood uncovered "staggering" bounty of dinosaur fossils—"Everyone knows Alberta and dinosaurs, you think. I was pretty stunned by how much fossil material is spread across all these river systems." The National Post, March 17: XX. **https://nationalpost.com/** [search "staggering bounty of dinosaur fossils"]

____ 2018. Michael Anthony (Tony) Ashton – Obituary. **http://www.legacy.com/guestbooks/calgaryherald/michael-anthony-ashton-tony-condolences/188268312?cid=full**

____ 2019. 2013 Alberta floods. **https://en.wikipedia.org/wiki/2013_Alberta_floods**

Anonymous. 2021. Elk Formation. **https://en.wikipedia.org/wiki/Elk_Formation**

Brown, C.M. and Henderson, D.M. 2015. A new horned dinosaur reveals convergent evolution in cranial ornamentation in Ceratopsidae. Current Biology, **25**(12): 1641–1648. **http://www.cell.com/current-biology/fulltext/S0960-9822(15)00492-3**

Chamary, V.J. 2015. Hellboy the dinosaur, and the real reason *Triceratops* had horns. **https://www.forbes.com/sites/jvchamary/2015/06/04/horned-dinosaurs/#77fae9c74d78**

Chao, D.K., Richardson, R.J.H., and Fietz, D.W. 2005. Southern Alberta NATMAP Project, Maycroft, Alberta - NTS 82G/16. Map 230. **https://ags.aer.ca/document/MAP/Map_230.pdf**

Chung, E. 2016. Amazing fossils found by ordinary people thrill scientists. **https://www.cbc.ca/news/technology/amateur-fossil-discoveries-1.3591930**

Connoly, D. 1995. Boy makes dinosaur discovery. The Calgary Sun, October 14: 7.

Crowson, S. 2001. Doctor receives dino-mite surprise. The Calgary Herald, July 8: C2.

Currie, P.J., Nadon, G.C., and Lockley, M.G. 1991. Dinosaur footprints with skin impressions from the Cretaceous of Alberta and Colorado. Canadian Journal of Earth Sciences, **28**: 102–115.

Dawson, G.M. 1884. Report on the region in the vicinity of the Bow and Belly Rivers, North-West Territory. Geological Survey of Canada, Report of Progress, 1882-83-84. Part C, pp. 1–169.

Dawson, L. 2001. Currie honored with special book. The Valley Times (Drumheller, AB), July 24: B5.

Douglas, R.J.W. 1950. Callum Creek, Langford Creek, and Gap map-areas, Alberta. Geological Survey of Canada, Memoir 255, 124 pp.

Drew, M. 1995. On the trail of dinosaurs. The Calgary Sunday Sun, October 22: S2.

Franklin, M. 2014. 2013 flood uncovers never-before-seen dinosaur fossil. CTV News, November 12. **https://calgary.ctvnews.ca/2013-flood-uncovers-never-before-seen-dinosaur-fossil-1.2098745**

Gibson, D.W. 1985. Stratigraphy, sedimentology and depositional environments of the coal-bearing Jurassic-Cretaceous Kootenay Group, Alberta and British Columbia. Geological Survey of Canada, Bulletin 357, 108 pp.

Helm, C. 2004. Daniel's Dinosaurs: A True Story of Discovery. Maple Tree Press: Toronto. 32 pp.

Henderson, D.M. 2017. The first evidence of iguanodontids (Dinosauria: Ornithischia) in Alberta, Canada—A fossil footprint from the Early Cretaceous. Cretaceous Research, **76**: 28–33.

Hudes, S. 2015. Royal Tyrrell Museum unveils "Hellboy": a new horned dinosaur species. **https://calgaryherald.com/technology/royal-tyrrell-museum-unveils-hellboy-a-new-horned-dinosaur-species**

Hurkett, B., Blackburn, J., and Council, T. 2011. Abundance and distribution of migratory bull trout in the upper Oldman River drainage, 2007 - 2010. Technical Report, T-2011-002, produced by the Alberta Conservation Association, Lethbridge, Alberta, Canada. 34 pp + appendix. **https://www.ab-conservation.com/downloads/report_series/Abundance_and_Distribution_of_Migratory_Bull_Trout_in_the_Upper_Oldman_River_Drainage_2007-2010.pdf**

Lowey, M. 1995. Ostrich-like dinosaur focus of fossil hunt – Experts to recover footprints found in Longview region. The Calgary Herald, October 15: 2.

Marvin, J.-A. 2016. Archaeology and the June 2013 floods in southern Alberta. **https://albertashistoricplaces.wordpress.com/2016/04/27/archaeology-and-the-june-2013-floods-in-southern-alberta/**

McCulloch, R.B. and Gallup, W.B. 1953. Field trip log. pp. 213-225. *In* Alberta Society of Petroleum Geologists, Third Annual Field Conference and Symposium, *Edited by* J.C. Sproule. 230 pp.

McMechan, M. E. and Stockmal, G.S. 2013. Geology, Maycroft, Alberta. **https://doi.org/10.4095/289711**

MNP, 2015. Review and analysis of the Government of Alberta's response to and recovery from 2013 floods. MNP, Toronto, ON. 131 pp. **https://open.alberta.ca/publications/review-and-analysis-of-the-government-of-albertas-response-to-and-recovery-from-2013-floods**

Mortillaro, H. 2015. New species of dinosaur called "Hellboy" discovered in Alberta. **https://globalnews.ca/news/2033195/new-species-of-dinosaur-discovered-in-alberta/**

Nadon, G.C. 1993. The association of anastomosed fluvial deposits and dinosaur tracks, eggs, and nests: Implications for the interpretation of floodplain environments and a possible survival strategy for ornithopods. Palaios, **8**: 31–44.

Nagesan, R.S., Campbell, J.A., Pardo, J.D., Lennie, K.I., Vavrek, M.J. and Anderson, J.S. 2020. An Early Cretaceous (Berriasian) fossil-bearing locality from the Rocky Mountains of Alberta, yielding the oldest dinosaur skeletal remains from western Canada. Canadian Journal of Earth Sciences, **57**(4): 542–552.

Pearson, H. 2018. Calgary flood 5 years later—Nature's power and the long-lasting impacts on southern Alberta rivers. Global News: **https://globalnews.ca/news/4258048/2013-flood-then-and-now-southern-alberta-rivers/**

Peck, T.R. (editor) 2017. After the Flood: Investigations of Impacts to Archaeological Resources from the 2013 Flood in Southern Alberta. Archaeological Survey of Alberta, Occasional Paper No. 37: 208 pp. **https://open.alberta.ca/dataset/e0b0ee25-e021-4e65-823a-74a93a6ec221/resource/cbaeedd7-bbca-4b4f-9035-60f483305d20/download/after-the-flood-2017-full-updated.pdf**

Pomeroy, J.W., Stewart, R.E. and Whitfield, P.H. 2016. The 2013 flood event in the South Saskatchewan and Elk River basins: Causes, assessment and damages. Canadian Water Resources Journal, **41**: 105-117.

Richards, G. 2003. Dinosaur footprints show town the way. The Globe and Mail (Toronto, ON), July 26: XX. **https://www.theglobeandmail.com/news/national/dinosaur-footprints-show-town-the-way/article25288017/**

Royal Tyrrell Museum, 2016. 2016 specimen fact sheet—*Regaliceratops peterhewsi*.

Sanchez, J. and Borkovic, B. 2016a. The Palaeontology Flood Mitigation Project: The impact of flooding on fossils in southern Alberta rivers. Alberta Palaeontological Society, 20th Annual Symposium, abstracts and short papers. Mount Royal University, Calgary, AB. March 19–20, 2016, pp. 18–19.

____ and ____ 2016b. Wading through history: Fossil hunting along rivers affected by the 2013 southern Alberta flood. p. 43. *In* The Association for Materials and Methods in Paleontology, 9th Annual Fossil Preparation and Collections Symposium. April 20–23, 2016. Colorado Springs, Colorado. [See also an informative 45:15-minute video presentation on this topic here: **https://www.youtube.com/watch?v=yAXNUfH2Cf4**]

____, ____, and Scott, C. 2017. Rivers and recovery: Mitigative paleontology as a result of flooding in southern Alberta. *In* Society of Vertebrate Paleontology, 77th Annual Meeting Program and abstracts. August 23–26, 2017. Calgary, Alberta, p. 189.

Sepkowski, S. 1995. Youth discovers dinosaur tracks. The Okotoks Western Wheel, October 25: 1.

Stephenson, K. 2018. Kid makes history after discovering fossil of unknown dinosaur species in Chile. **http://www.guinnessworldrecords.com/news/2018/1/kid-makes-history-after-discovering-fossil-of-unknown-dinosaur-species-in-chile-512385**

Stockmal, G.S. 1996. Geology, Maycroft (East Half), Alberta. Geological Survey of Canada, Open File 3275. **https://doi.org/10.4095/208495**

Tanke, D.H. 2010. Ceratopsian discoveries and work in Alberta, Canada: Historical review and census. CD-ROM. (*Enclosure in* New perspectives on horned dinosaurs: The Royal Tyrrell Museum Ceratopsian Symposium). *Edited by* M.J. Ryan, B.J. Chinnery-Allgeier, and D.A. Eberth). Indiana University Press: Bloomington, 486 pp.

____ and Carpenter, K. (editors) 2001. Acknowledgments. *In* Mesozoic Vertebrate Life—New Research Inspired by the Paleontology of Philip J. Currie. Indiana University Press: Bloomington, pp. xvii–xviii.

Thomson, T.J. 2013. First occurrence of reptile tracks (*Procolophonichnium*) from the lower Triassic Moenkopi formation (Shnabkaib Member) of southwestern Utah with paleoenvironmental implications. Society of Vertebrate Paleontology, 73rd Annual Meeting, Los Angeles, CA, Program and Abstracts: 225.

Tejada, S., Seymour, S., and French, E. 2003. Dig It! How to Collect Rocks and Minerals. Reader's Digest Explorer Guides. ebook.

Various authors, 2010. *Albertosaurus* special issue. Canadian Journal of Earth Sciences, **47**(9):1111–1289. **https://www.nrcresearchpress.com/toc/cjes/47/9**

Vivian, B., Wilson, M.C. and Amundsen-Meyer, L. 2017a. The Bow River flood study: A tale of past, present, and future. Archaeological Survey of Alberta, Occasional Paper, No. 37: 12–18. **https://open.alberta.ca/dataset/18ec30dc-b945-4664-b9c6-02a779e2f02d/resource/8c676fb4-c8d7-4f98-aea2-a3639a6ef017/download/after-the-flood-2017-003.pdf**

____, ____, and ____ 2017b. Post-2013 flood historic assessments of the Sheep, Highwood, and Bow rivers and their contribution to the regional understanding of the precontact landscape. Archaeological Survey of Alberta, Occasional Paper, No. 37: 140–155. **https://open.alberta.ca/dataset/0e32af47-f58e-4e66-8e02-aafb00499f41/resource/c6996490-bd5b-490a-920c-715f0e70a13a/download/After-the-flood-2017-015.pdf**

Waldman, D. 1996. Dino detective. National Geographic World, August 1996, p. 28.

White, J.M. and Leckie, D.A. 1999. Palynological age constraints on the Cadomin and Dalhousie formations in SW Alberta. Bulletin of Canadian Petroleum Geology, **47**(3): 199–222.

Zielinski, S. 2014. Fossil hunting can start as child's play—Paleontology isn't just for professionals, as many kids learn. **https://www.sciencenewsforstudents.org/article/fossil-hunting-can-start-childs-play**

❑

www.albertapaleo.org

Book Reviews

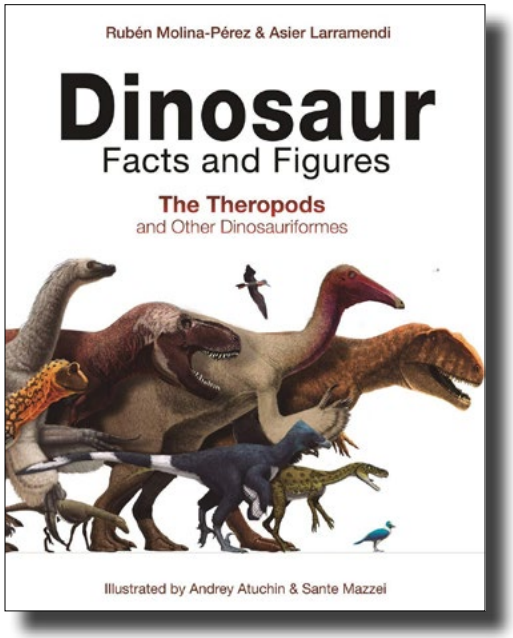
By Dan Quinsey

***Dinosaur Facts and Figures: The Theropods and Other Dinosauriformes* (2019, 288 pp. ISBN 978-0-691-18331-1).**

***Dinosaur Facts and Figures: The Sauropods and Other Sauropodomorphs* (2020, 272 pp. ISBN 978-0-691-19069-3).**

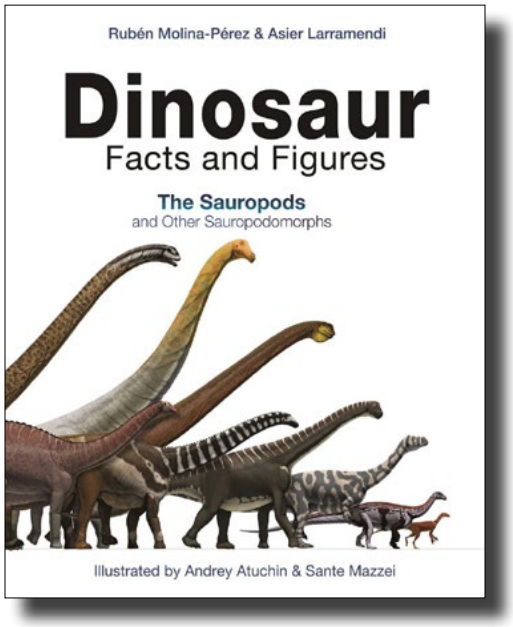
Both books by Rubén Molina-Pérez and Asier Larramendi, illustrated by Andrey Atuchin and Sante Mazzie. Princeton University Press (priced less than CAD$40.00 each from www.chapters.indigo.ca or www.amazon.ca).

Authors Rubén Molina-Pérez and Asier Larramendi are the founders and scientific directors of Eofauna, a company that produces scientifically accurate representations of prehistoric fauna using the most current research available. More information about Eofauna can be found at **www.eofauna.com**.



Dinosaur Facts and Figures: The Theropods and Other Dinosauriformes is a stunningly illustrated book of records for these marvelous creatures—such as the biggest and smallest, to the fastest, and the ones with the most powerful bite. This volume features more than 3,000 records, covers some 750 theropod species, and includes a wealth of illustrations ranging from diagrams and technical drawings to full-colour reconstructions of specimens.

Dinosaur Facts and Figures: The Sauropods and Other Sauropodomorphs is an equally essential compendium of sauropod facts and figures, from the biggest and oldest to the smallest and rarest. It includes more than 2,000 diagrams and technical drawings along with hundreds of full-colour reconstructions of specimens.



Both books are divided into sections that put amazing facts at your fingertips. "Comparing Species" is organized by taxonomic group and gives comparisons of the size of species, how long ago they lived, and when they were discovered. "Mesozoic Calendar" includes spreads showing the positions of the continents at different geological time periods and reconstructions of creatures from each period. "Prehistoric Puzzle" compares bones, teeth, and (theropod) feathers while "Theropod Life" and "Sauropod Life" uses vivid, user-friendly graphics to answer questions such as which dinosaur was the smallest, which had the most powerful bite, what did they eat and which was the most intelligent. Other sections chart theropod and sauropod distribution on the contemporary world map, provide comprehensive illustrated listings of footprints and compile the physical specifications of all known theropods, sauropods and Mesozoic birds.

Additional sections include "Testimony in Stone," an in-depth look at footprints; "Chronicle and Dinomania," the history and culture of these dino-

saurs; "Theropod List," a complete list of valid dinosauromorphs and theropods; and "Sauropod List," a complete list of primitive sauropodomorphs and sauropods. The books end with a glossary, taxonomic index, bibliography and online appendices of statistics and other data (for theropods: **www.eofauna.com/book/** for sauropods: **www.eofauna.com/en/appendix/**).

It should be noted that the identification of footprints is part of an unpublished study (Molina-Pérez *et al.*, manuscript in preparation).

When comparing species, two pages will show: taxonomic information; a reconstruction of the dinosaur; a modern human (dressed as a palaeontologist) for comparison; classification into a size class by weight; a footprint section showing the largest and smallest footprint (with silhouettes of the largest and smallest dinosaurs found by footprint, compared to the largest and smallest dinosaurs found by bone); seals indicating if the specimen is the largest or smallest specimen of each type of record; the estimated size reliability (ESR); relevant graphs; information on different types of records; the genus and the species of the record specimen; author who described the species and many other little tidbits.

All types of records, information and curiosities are followed by "See more" from which the reader can obtain relevant bibliographical information based on the most up-to-date information available at the time of publication.

Dinosaur Facts and Figures are refreshing books with an incredible amount of information, illustrations, charts and more. I found them both to be very informative and fun to peruse. It was exciting to find up-to-date encyclopedic publications such as these and I would definitely recommend them to any dinosaur enthusiast.

To see sample pages from the *Dinosaur Facts and Figures* books, go to **books.google.ca/** and search "dinosaur facts and figures". ❑

Field Trips (continued from Page 11)

medical forms in order to attend the trip. There will be no exceptions. All personal information is held in confidence and ultimately destroyed.

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. ❑

Fossils in the News

First preserved dinosaur butthole is "perfect" and "unique," paleontologist says. Predictable sophomoric media excitement over a Chinese *Psittacosaurus* specimen with well-preserved cloacal anatomy. **https://www.livescience.com/first-dinosaur-butthole-found.html**

U of A student involved in first discovery of baby tyrannosaur fossils. Greg Funston, formerly of U of A and Mark Powers, a U of A Ph.D. student, head a team studying small fossils found at Morrin, AB and in Montana. **https://edmonton.ctvnews.ca/u-of-a-student-involved-in-first-discovery-of-baby-tyrannosaur-fossils-1.5281220**

Massive dinosaur uncovered in Argentina may be largest ever found. *Patagontitan*, a titanosaur sauropod is the latest "world's biggest." **https://www.tvnz.co.nz/one-news/world/massive-dinosaur-uncovered-in-argentina-may-largest-ever-found**

Paleontologists discover new insect group after solving 150-year-old mystery. New suborder of damselfly-like insects recognized from McAbee, BC material. **https://www.sfu.ca/** [search "okanagrion"]

World's oldest DNA sequenced from a mammoth that lived more than a million years ago. Siberian mammoth tooth yields DNA > 1.2 million years old. **https://www.cnn.com/** [search "world's oldest dna"]

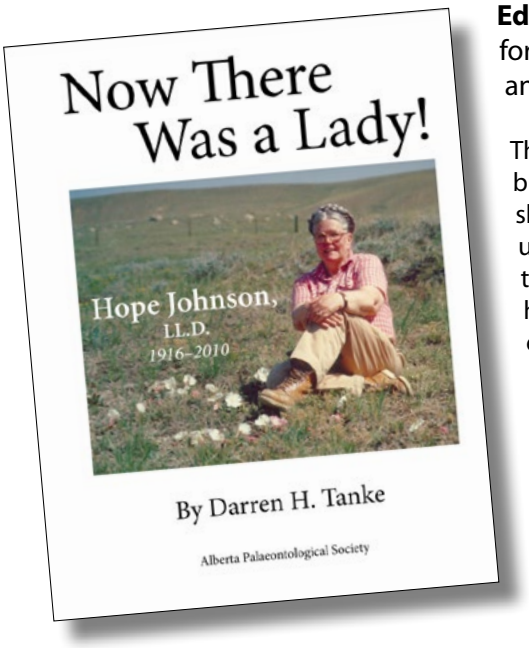
Cretaceous-era coelacanths grew as big as great white sharks. Giant ossified lung found in Morocco attributed to a coelacanth. **http://www.sci-news.com/** [search "coelacanths morocco"]

[*Thanks to Phil Benham, Vaclav Marsovsky, Dan Quinsey and Mona Trick.*] ❑

Now There Was a Lady!

Hope Johnson, LL.D. 1916–2010

By Darren H. Tanke



Edited and published by the Alberta Palaeontological Society with forewords by palaeontologist Dr. Philip J. Currie, artist Allan C.J. Jensen and geologist, museologist, naturalist and writer, David A.E. Spalding.

The 2010 passing of Hope Johnson marked the end of an era for Alberta's vertebrate palaeontology communities. Her death affected other disciplines, too, as she travelled in many circles within the province for 65 years. How many among us can truly say they never knew her personally, saw her art work, or learned to identify Alberta prairie plants, or Late Cretaceous bones and teeth through her fossil identification books? During much of her middle and later life, and especially during the late 1950s to 1980s, Hope was a well-known and respected powerhouse in the Albertan amateur and professional vertebrate palaeontological communities. She was also heavily involved in the naturalist and visual arts communities as well as charitable organizations. This book focuses on her extensive activities in Alberta vertebrate palaeontology and provides examples of some of her fossil and botanical drawings and paintings.

Coil bound, 283 pages; extensively illustrated in black and white, with 30-page colour section showcasing Hope Johnson's art. Includes index.
ISBN 978-0-9811101-1-0

APS Members: $30.00 Non-Members: $35.00

Shipping and handling $20.00 in Canada (flat rate) or contact **giftshop@albertapaleo.org** with your postal code for a quote. Outside Canada or for quantity sales please contact for a quote.

Order Form

Now There Was a Lady! Hope Johnson, LL.D. 1916–2010

☐ **Cheque or money order** in Canadian funds payable to **Alberta Palaeontological Society**

Mailing Address: PO Box 68024 Crowfoot PO
Calgary, AB, Canada T3G 3N8

☐ ***Interac* E-transfer** (Canada only). Follow directions on your bank's online banking site or mobile app. Bank fees may apply. Payee is **giftshop@albertapaleo.org** Please state the items for payment in the message field (example "2 copies of H. Johnson book for John Doe"). Email a scan or photo of this completed order form to **giftshop@albertapaleo.org**.

Name _____

Address _____

City _____

Province / State _____

Postal / Zip Code _____

E-mail _____

Phone _____

☐ **I am an APS Member.** Please send me _____ copies @ $30.00 each _____

☐ **I am NOT an APS Member.** Please send me _____ copies @ $35.00 each _____

Shipping and handling: $20.00 per copy flat rate (Canada) or as quoted (see above) _____

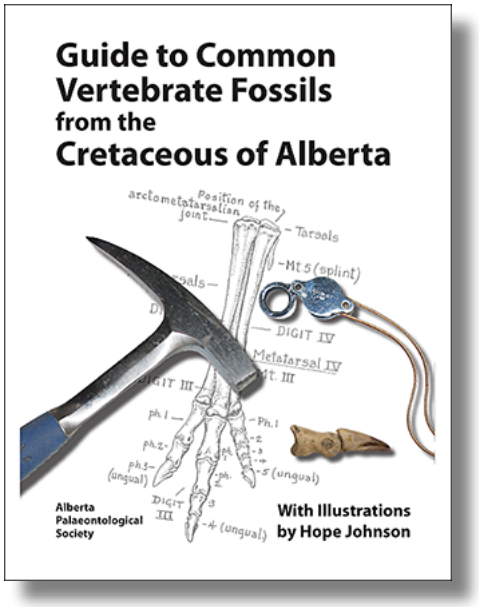
TOTAL ENCLOSED $ _____

Rev 20191027

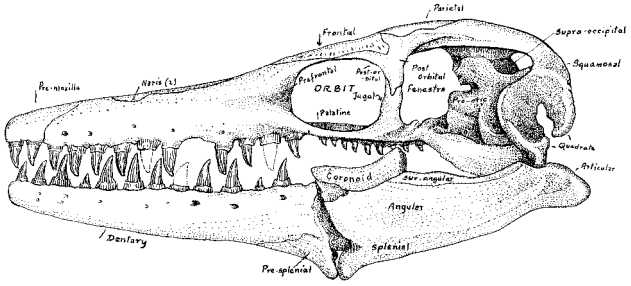
Guide to Common Vertebrate Fossils from the Cretaceous of Alberta

By the **Alberta Palaeontological Society** with illustrations by naturalist and artist **Hope Johnson, LL.D.**
Foreword by Dr. Donald Brinkman, Royal Tyrrell Museum of Palaeontology.

Contents include: Geology of the vertebrate fossil bearing formations in Alberta • Collecting regulations • Curation • Skeleton terminology • Fishes • Amphibians • Turtles • Champsosaurs • Crocodiles • Lizards • Mosasaurs • Plesiosaurs • Tyrannosaurs • Ornithomimids • Hadrosaurs • Ceratopsians • Ankylosaurs • Pachycephalosaurs • Mammals • And much more!



Hope Johnson's illustrations are the inspiration for this publication. Her passion for nature and contributions to the science of palaeontology have brought Alberta's natural history to life.



Coil bound with 234 pages; 144 illustrations, photographs, tables, and index.
This guide is a must-have for amateur and professional palaeontologists.
ISBN 978-0-9811101-0-3

APS Members: $25.00 Non-Members: $30.00

Shipping and handling $20.00 in Canada (flat rate) or contact **giftshop@albertapaleo.org** with your postal code for a quote. Outside Canada or for quantity sales please contact for a quote.

Order Form

Guide to Common Vertebrate Fossils from the Cretaceous of Alberta

☐ **Cheque or money order** in Canadian funds payable to **Alberta Palaeontological Society**

Mailing Address: PO Box 68024 Crowfoot PO
Calgary, AB, Canada T3G 3N8

☐ ***Interac* E-transfer** (Canada only). Follow directions on your bank's online banking site or mobile app. Bank fees may apply. Payee is **giftshop@albertapaleo.org**
Please state the items for payment in the message field (example "2 copies of APS book for John Doe").
Email a scan or photo of this completed order form to **giftshop@albertapaleo.org**.

Name _____

Address _____

City _____

Province / State _____

Postal / Zip Code _____

E-mail _____

Phone _____

☐ **I am an APS Member.** Please send me _____ copies @ $25.00 each _____

☐ **I am NOT an APS Member.** Please send me _____ copies @ $30.00 each _____

Shipping and handling: $20.00 per copy flat rate (Canada) or as quoted (see above) _____

TOTAL ENCLOSED $ _____

Rev 20190205