Alberta Palæontological Society Bulletin

VOLUME 14 • NUMBER 2 JUNE 1999

ALBERTA PALÆONTOLOGICAL SOCIETY

The Society was incorporated in 1986, as a non-profit organization formed to:

a. Promote the science of palaeontology through study and education.
b. Make contributions to the science by:

   1) discovery
   2) collection
   3) description
   4) education of the general public
   5) preservation of material for study and the future

c. Provide information and expertise to other collectors.
d. Work with professionals at museums and universities to add to the palaeontological collections of the province (preserve 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	$15.00 annually
Family or Institution	$20.00 annually

THE *BULLETIN* WILL BE PUBLISHED QUARTERLY: March, June, September and December. Deadline for submitting material for publication is the 15th of the month prior to publication.

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UPCOMING APS MEETINGS

Meetings take place at **7:30** p.m., in Room **B108**,
Mount Royal College: 4825 Richard Road SW, Calgary, Alberta

June, July, August, 1999—No meetings. See field trip announcements, Page 2.
September 17, 1999—Topic to be announced. Bring your finds and photos from your summer adventures!

ON THE COVER: Lower Jurassic ammonites; Black Ven Marls, Charmouth, Dorset, England. Mainly *Promicroceras planicosta* (coarse ribbed specimens); also *Cymbites* sp., cf. *C. (Paracymbites) obsoletus* (smooth sided specimens) and two unidentified specimens (bottom left, and fragment at top centre). All magnified 2.7x. Photo by Howard Allen.

1999 Field Trips

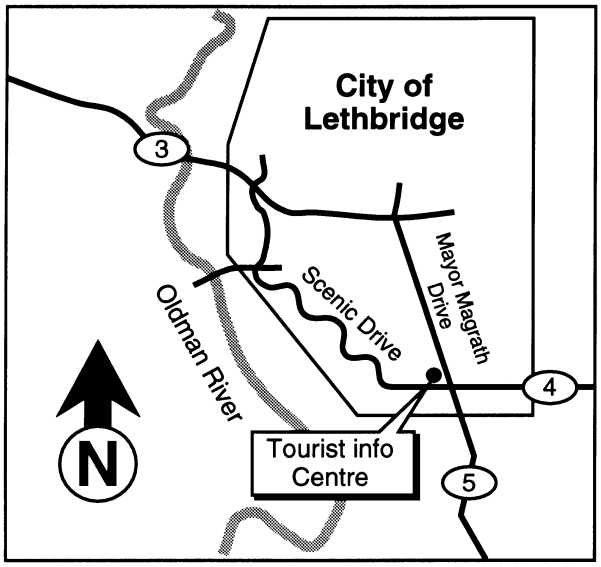
NOTE: Non-members and unaccompanied minors will NOT be allowed to attend field trips. A $5.00 charge (per single or family membership, except for the Burgess Shale trip) will be collected, to offset the cost of printing field guides. For further information on all trips, contact Keith Mychaluk (403) 228-3211.

Field Trip 99-1: Saturday & Sunday, June 19 & 20, Princess & Wolf Coulee, AB

There are currently 40 people signed up for this trip. Details of the trip were published in the March *Bulletin*. If you need an update, please call Keith.

Field Trip 99-2: Saturday & Sunday, July 17 & 18, Korite ammonite quarry, AB

Meeting time and place: Tourist information centre parking lot at the corner of Mayor Magrath Drive and Scenic Drive, in south Lethbridge, at 9:30 A.M. **sharp** on Saturday. This will be a staging area only, as we will continue down to the quarry site along several unmarked gravel roads.



Car Pooling: Due to rough road conditions and limited space, Korite Ltd. requests that the APS use as few vehicles as possible. We are aiming for only 10–15 vehicles, and we currently have over 40 people signed up for the trip. Only vehicles with good clearance will be allowed by Korite at the quarry site—therefore, only trucks, SUVs and vans are recommended. Keith will be in contact with participants to help organize the car pooling.

Itinerary: The APS will be one of the first public groups to tour Korite Ltd.'s quarry near the St. Mary River. Korite's operation excavates Ammolite-bearing rocks from the Bearpaw Formation (Late Cretaceous). Ammolite is a gemstone, originally formed as ammonite shell. Opportunities to collect will likely be limited and will certainly be screened by Korite staff. On Sunday, we will explore other nearby sites that may allow for collecting of bivalves, gastropods and maybe ammonites.

What to bring: Food, lots of water, sunscreen and good footwear.

Accommodations: Lots of motels in Lethbridge. Campgrounds in Lethbridge, Magrath, St. Mary Reservoir Provincial Recreation Area and Milk River Ridge Park near Warner.

Field Trip 99-3: Saturday, August 21, Burgess Shale, Yoho National Park, BC

NOTE: Attendance for this field trip is limited by Parks Canada to 15 persons. There are currently 13 people signed up. If you wish to attend, please contact Keith immediately. Also be aware that the $45 fee is non-refundable.

Meeting Time & Place: Saturday, August 21 at 8:00 A.M. MST (*not* Pacific time!) at Yoho Brothers' Trading Post, in Field, BC (TransCanada Highway & Field intersection). It is highly recommended that participants arrive on Friday and stay overnight. **Driving time from Calgary is about three hours.**

Itinerary: Hike starts at 8:30 A.M. and returns to Field at 6:30 P.M. Our destination is the Walcott Quarry within the Burgess Shale. Discovered in 1909, the Walcott Quarry exposes Cambrian rocks that host a variety of rare soft and hard-bodied fossils. Our tour will be provided by Parks Canada, whose knowledgeable guides assisted a total of 1014 hikers to both the Burgess Shale and Mount Stephen trilobite beds in 1998. The Royal Ontario Museum has been actively quarrying the site for over 16 field seasons and is expected to be working on the day of our trip. Dr. Desmond Collins, a prominent Burgess Shale researcher, is also expected to be present.

Are You Ready? The round trip hike is 20 km (12 mi.) and includes a 980 m (3215 ft.) elevation gain. Remember, after climbing up 1000 m, you must descend 1000 m. At these altitudes there is considerably less oxygen than at sea level, therefore you may experience exaggerated fatigue while climbing

or descending. You will not enjoy the trip unless you are fit and acclimatized to the altitude. Remember, you are also in bear country.

What to bring: Though our hike is in August, snow and wet-weather conditions are not uncommon at the quarry. Be prepared for any type of weather (windproof/waterproof jacket and long pants, extra socks, gloves, etc.). You will also need to pack a lunch and plenty of water. **Good footwear is essential**!

No Collecting! UNESCO has designated the Burgess Shale as one of Canada's ten World Heritage Sites, and it is within Yoho National Park. As such, **collecting is strictly prohibited**.

Accommodations: There are several motels in Field. Reservations are strongly recommended, well in advance of our trip. Parks Canada also maintains campgrounds in the Field area. The Monarch and Kicking Horse campgrounds are off the TransCanada highway, east of Field. (Note! these campgrounds fill up by mid-afternoon in July and August.) The Hoodoo Creek and Chancellor Peak campgrounds are in the western part of the park. Detailed motel and camping information can be found, through links, on the Burgess Shale Foundation's web-site (www.burgess-shale.bc.ca).

Cost: The cost of the guided hike is $45 per person. Each participant will receive a year's membership to the Burgess Shale Foundation (expires in June 2000 and can be renewed for $20 per year). You will also receive three issues of their newsletter, entitled *Marrella*. Expect your first issue this fall, with others in the winter and spring. ❑

Welcome New Members!

Michael Collins, Calgary
Keith Gordos, Calgary
Eric Gosselin, Calgary
Kathy J. Higgins, Calgary
Dr. Paul Johnston, Drumheller, AB
Les Krogel, Calgary
Jason Lavigne, Calgary
Amanda Lockhart, Calgary
Michelle Milton, Calgary
Wendy Morrison, Calgary
Dr. Elizabeth (Betsy) Nicholls, Drumheller, AB
Darrell Nordby, Calgary
Paul Piovoso, Calgary
Carl Savage, Grande Prairie, AB
Darcy Schoff, Calgary
Robin Sweeten, c/o Pensacola, FL
Dr. Mark V.H. Wilson, Edmonton, AB

Program Summary

by Howard Allen

March 19, 1999
Understanding fossil ammonites: from medieval myth to current concepts, with Dr. Russell Hall, University of Calgary

Russell Hall completed his early university education in Australia, where he worked on Early Palaeozoic fossil corals. He then came to McMaster University (Ontario) to complete a Ph.D., where he was first introduced to Jurassic ammonites. He studied fossil faunas from the Queen Charlotte Islands off the west coast of Canada, trying to determine their genders and geological age. Since his arrival at the University of Calgary in 1978, Dr. Hall's main research has continued to focus on Jurassic and Cretaceous ammonites from Alberta and British Columbia as tools for dating and correlating rock strata, but occasionally he has been diverted to studying fossil sea stars, crinoids, and squids.

[*Biographical notes provided by R. Hall.*]

Dr. Hall opened his presentation with a humorous illustration of the fact that little progress has been made in the public understanding of cephalopod molluscs in the past few hundred years. In the town of Whitby, England—birthplace of Captain Cook—the abundant local ammonite fossils were explained by the legend of 7th-century abbess St. Hilda, who miraculously turned the area's snake population into stones. Ammonites with carved snake heads were once popular souvenirs in Whitby [*member Les Adler brought one to the proceedings –ed.*] and the town's coat of arms still bears three snake-headed ammonites. To dash any smugness we might feel about our modern scientific insights, Dr. Hall then showed us the front page of a supermarket tabloid, displaying an excellent photograph of a swimming *Nautilus*, topped by the screaming headline:

ALIENS INVADE EARTH!

The cephalopods, which include the extinct ammonites, as well as the modern squids, octopi and chambered *Nautilus*, were much more abundant in the past. Their origins have been traced back to the Cambrian, when a group of molluscs developed tiny, cap-shaped, buoyant shells. From these humble beginnings, the cephalopods diversified rapidly into a myriad of forms, ranging from tiny coiled

shells only a few millimetres in diameter, to monsters with straight shells up to 10 metres long.

Dr. Hall's slides showed the anatomy of the modern chambered *Nautilus* shell, which expands in an outward spiral, adding calcareous chamber walls (septa) at periodic intervals, as the animal grows. Achieving neutral buoyancy is a crucial step in allowing the *Nautilus* (and by analogy, the ammonites) to move through its environment. The weight of the shell must be balanced by carefully regulating gas volume in the shell's chambers. This is accomplished by means of the siphuncle, a tube that runs the entire length of the shell, and allows the contents (fluid and gas) of each chamber to be regulated individually. The animal employs osmotic pressure to drain or fill the chambers with fluid, maintaining neutral buoyancy as the shell and body grow.

A short video clip of live squids showed details of the cephalopods' method of jet propulsion, as well as mating behaviour—huge swarms of squids that come together to mate and then die soon afterward may suggest a reason why ammonites of a single species are often found packed together in fossil beds.

Comparison of the modern *Nautilus* to extinct ammonites (named for the ram-horned Egyptian god, Ammon) is a matter of contention. Cladistic studies suggest that the ammonites were more closely related to the squids and octopi than to the nautiloids; thus the *Nautilus* may not be such a good model for comparison with the extinct forms.

Sexual dimorphism in ammonites has been recognized only relatively recently. Many fossil beds contain ammonite shells of two types, formerly assigned to different species. Studies of many of these shell specimens show that the innermost whorls of both shell types are indistinguishable, and become more and more different as the shell becomes larger. It was eventually recognized that the two forms probably represent male and female individuals. Female shells ("macroconchs") are usually bigger than the male "microconchs," and the latter often have modified shell apertures, with lateral extensions called "lappets." Careful stratigraphic studies have also shown that the macro- and microconch shells underwent evolutionary changes in lock-step, further evidence that the two forms belong to a single species. This recognition of male and female shells has thrown ammonite taxonomy into some disrepair, and reinterpretation of both species and genus names is ongoing.

Ammonite fossils are an invaluable stratigraphic tool. They were the first time-markers geologists used for subdividing the Mesozoic era, and they are still the best, for at least three important reasons: 1) Ammonites underwent very rapid evolution during the Mesozoic, resulting in distinct shell forms that existed for relatively brief periods of time. By carefully recording the sequence of ammonite species, rocks in some parts of Europe can be subdivided into units representing time periods as short as 10,000 years. 2) Ammonite species are often widespread, allowing correlations to be made over wide geographical areas. 3) Fossils of ammonites are often very abundant, allowing for good statistical sample sizes.

In recent years ammonites have been put to work in reconstructing the tectonic positions of continents and seas through geologic history. Ammonite faunas were often restricted by climate and other factors, to broad "realms"; for example, the Jurassic "boreal realm" hosted a fauna that lived in the northern seas, and was distinct from a more southerly/equatorial "Tethyan realm." The boundaries between these realms are characterized by narrowly overlapping margins, where faunas of the two realms mixed. One such realm boundary, in Early Jurassic time, existed just to the north of Calgary. Dr. Hall and his colleagues have found a mixed boreal/Tethyan fauna in the rocks west of Sundre. This same boundary has been pinpointed in a number of the "accreted terranes" that make up much of British Columbia, Yukon and the western US. From the position of the boundary in each terrane block, the arrangement of the terranes in Jurassic time can be reconstructed. It shows that the terranes progressively moved into position from the south and west, prior to colliding with the western edge of the North American plate.

April 16, 1999
Horned dinosaurs from the North American Western Interior: new research and taxa, with Michael Ryan, University of Calgary

Michael Ryan is a native of Ottawa, Ontario. This allowed him to spend his formative years wandering the famous Dinosaur Hall at the Canadian Museum of Nature before moving to Alberta to study dinosaurs. He holds undergraduate degrees in both biology (Carleton) and Education (Alberta), a Masters degree in zoology (Calgary) specializing in vertebrate palaeontology, and is currently a Ph.D. student in Calgary working on the biogeography of ceratopsids from the Campanian of Alberta and Montana. At various times he has taught junior and high school science; built dinosaurs with Prehistoric Animal Structures (PAST) in East Coulee, Alberta (most notably the Brachiosaurus *on display in the*

Field Museum of Natural History, Chicago); run expeditions to locate the "lost" Star Wars localities for Lucasfilm; and held positions at the Royal Tyrrell Museum of Palaeontology, including: Coordinator of Public Programs, Head of Public Excavations, and Scientific Advisor to the Department of Education. His research interests include Late Cretaceous ecosystems with an emphasis on ceratopsian (horned) dinosaurs, which he has been digging up since the early 1980s.

[*Biographical notes provided by M. Ryan*]

Michael Ryan outlined the four main groups of horned, or ceratopsian dinosaurs recognized by palaeontologists:

• Chasmosaurs— "long-frilled"

• Centrosaurs— "short-frilled," with a large nose horn.

• Protoceratopsians— an early group, with a small neck frill and no horns.

• Psittacosaurs— the probable precursor group of the ceratopsians: bipedal, with no frill, but a characteristic beak common to all ceratopsians.

The geographical origin of the ceratopsians is currently a topic of debate. The earliest forms in Asia have been found in the Turonian rocks (early Late Cretaceous age) of Uzbekistan; however, another Turonian animal, *Zuniceratops*, has been found in the southern United States. Later forms lived in both Asia and North America, right up to the end of the Cretaceous Period, and the extinction of the dinosaurs.

In North America, ceratopsians appear to have lived in the relatively narrow strip of land that existed from Alaska to Texas, between the emerging Rocky Mountains and the inland sea that occupied the centre of North America.

With few exceptions, the horned dinosaurs seem to have been very endemic to local areas: fossils of a particular species are seldom found outside of a restricted geographical range. They apparently did not migrate very much. Even *Pachyrhinosaurus*, which occurs in both Alaska and Alberta, is represented by different species in each region. Some ceratopsian species probably lived in upland areas, where fossils are only rarely preserved. For example, the protoceratopsian *Leptoceratops* is very rare in Alberta and Montana, where lowland deposits are preserved; but in the Gobi Desert, a preserved upland/desert environment, *Leptoceratops* is much more common.

Many genera are known from only a handful of specimens. Only one complete skull of *Styracosaurus*, from Dinosaur Park in Alberta, has been found to date. This patchy fossil record, combined with recently-recognized variation in skull shape from juvenile to adult individuals, has kept ceratopsian taxonomy in a state of flux. For example, the genus *Monoclonius*, known from a single skull (also from Alberta), may represent the juvenile form of some other genus, possibly *Styracosaurus* or *Centrosaurus*.

Though restricted geographically, some ceratopsians were extremely abundant locally. One *Centrosaurus* bone bed in Dinosaur Park is estimated to contain the remains of 25,000 individual animals—and there are some 30 known *Centrosaurus* bone beds in the Park. These mass graves were probably the result of drowning of herds of animals trying to cross rivers at flood stage.

Recent work by Michael Ryan and his colleagues has resulted in a number of interesting developments. Study of bone textures has revealed that some ceratopsian bones have an extensive pattern of radiating lines on their surface. It is now thought that this pattern is diagnostic of juvenile bone material, and probably applies to all types of ceratopsians. As previously noted, ceratopsian skulls were apparently subject to much variation throughout the life of an individual animal. Juveniles of some genera had orbital (over the eye) horns which were gradually reduced with maturity, often disappearing entirely in adults, or replaced by pits in the surface of the skull. Other changes in skull shape include modification of the frill margins in some of the frilled ceratopsians (e.g. *Chasmosaurus, Centrosaurus*). The margins of juvenile frills are studded with bumps that grew into the variously-shaped spikes or hooks characteristic of adult frills.

Recent discoveries in the Judith River Group of Alberta include a new chasmosaur (found by Wendy Sloboda) having a frill margin that curves forward; this is probably a new species, and possibly a new genus. Another new form resembles typical *Chasmosaurus*, but the frill spikes are replaced with spiky clusters, like maces. Two other possible new species are represented by fragmentary material. As well, a possible new species has been recovered from the older Foremost Formation. ❑

Reporters wanted!

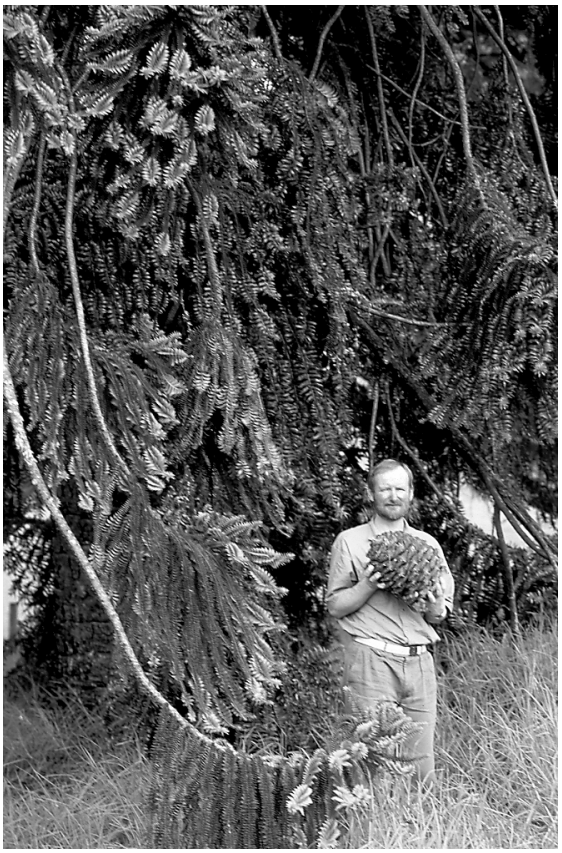
The editor would like one or two "contingency volunteers" to take notes and write a few paragraphs about any programs, lectures or field trips that the editor is unable to attend. Talk to me at a meeting, or email **HowieAllen@compuserve.com** or phone 274-1858. —*Howard Allen, editor*

The Wollemi Pine: "Dinosaur Tree"

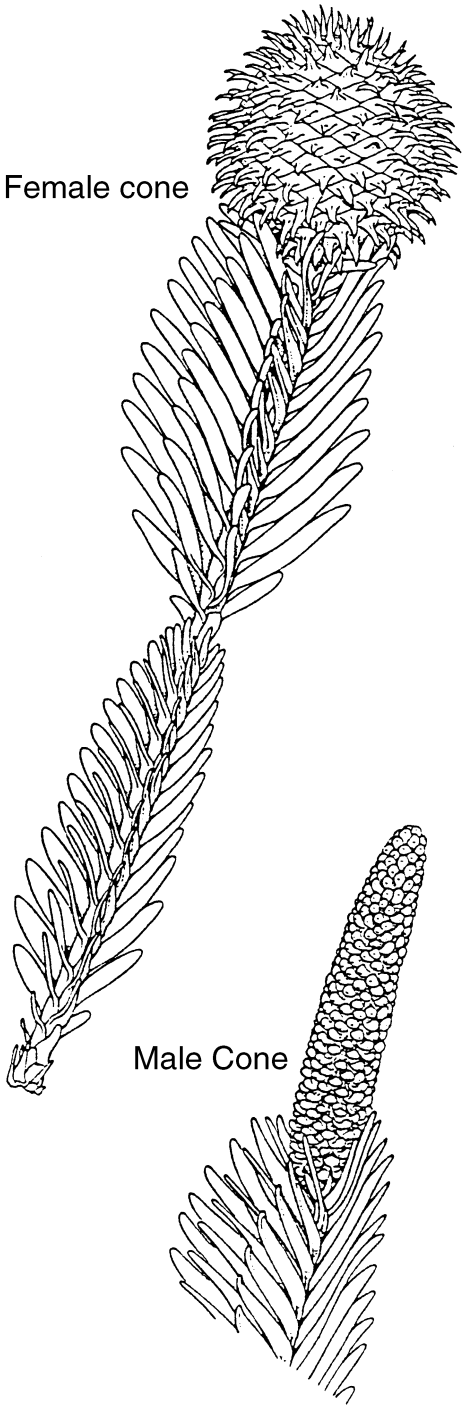
by Vaclav Marsovsky

In 1994 a new tree was discovered in a remote area of Wollemi National Park, 150 kilometres northwest of Sydney, Australia. [Bulletin, *March 1995, p. 6.*] The Wollemi pine, *Wollemia nobilis*, is a new genus and species in the ancient conifer family Araucariaceae. This "living fossil" is being compared to Wollemi pine-type fossil leaf imprints found in New South Wales, Australia, which date to the Early Cretaceous. The location of the trees is kept secret.

Thirty-eight adult individuals of this tree survive in two groves. New South Wales National Parks and Wildlife Service have implemented a species management plan and a commercial nursery has been assigned to propagate the species for worldwide distribution. The little pines are expected to go on the market in 2004 and are expected to cost about CDN$20 each.



The author, "Gulliver" Marsovsky, with a Brobdingnagian Bunya-Bunya pine cone. Photo by Mona Marsovsky.



Wollemi pine cones. Copyright © Royal Botanic Gardens, Sydney. Reproduced with permission.

The araucarias are native to the southern hemisphere and tropical islands. The bark of the Wollemi pine has a ball-bearing (bubbly) texture and the pine needles are blade-like, very similar to those of the Bunya-Bunya pine. Two other araucaria pines are native to Australia, the hoop pine (*Araucaria cunninghamii*) and the Bunya-Bunya pine (*Araucaria bidwillii*), the latter bearing cones the size of watermelons every three years. ❑

Fossils in the News

The National Post, February 23, 1999

Fossils prove to be a new species of sabretooth cat

KANSAS—Fossils uncovered a decade ago, by amateurs in Florida, have provided evidence of a previously undocumented group of sabre-toothed cats. University of Kansas palaeontologist Larry Martin made the discovery after examining a skeleton owned by a private collector in Arizona. At first glance, Martin thought the skull was mismatched to the rest of the skeleton; but a closer look revealed that the skeleton belonged to a new genus of sabre-tooths, which he has tentatively called "*Xenosmilus.*" Prior to this discovery, two groups of sabre-toothed cats were recognized: the "dirk-tooths" (e.g. *Smilodon*), with narrow sabres up to 17 cm long, and a short-legged, bear-like body; and the "scimitar-tooths" (e.g. *Homotherium*), with shorter, wide canines and a long-legged body like a cheetah. The new type of cat had short, broad canines, like the "scimitar-tooths," but a stocky, powerful body, like the "dirk-tooths." These features were combined in a large, powerful animal which, according to Martin, "at the time it was living [about a million years ago]…kicked *Smilodon* anywhere it wanted to."

The National Post, March 3, 1999

French find relative of first identified dinosaur

PARIS—The mayor of Conteville, Normandy, has found the remains of a dinosaur that may help to resolve a 160-year-old controversy. Four years ago, while walking in a field, André Dubreuil found a stone containing teeth of a carnivorous dinosaur. Palaeontologists from the French Natural History Museum subsequently excavated the well-preserved remains of the large, Jurassic (165 ma) theropod. "The cranium, above all, is half complete and that's very rare because most European dinosaur skeletons have no heads," says museum palaeontologist Ronan Allain.

The newly discovered bones belong to a close relative of *Megalosaurus*, the first-ever described dinosaur from southern England. A similar set of bones found in France in 1835 caused a difference of opinion between William Buckland—who named *Megalosaurus*, and assigned the French bones to that genus—and their discover, Jacques Eudes-Deslongchamps who erected a new genus and species, *Poekilopleuron bucklandii*. Unfortunately, the original French bones were destroyed in World War II, and only casts remain.

Allain is currently comparing the new bones with the French casts, and the English *Megalosaurus*. Says Allain: "If [the new specimen is] the same as the others, for the first time, Europe will have a nearly complete carnivorous dinosaur."

The Calgary Sun, March 25, 1999

Feds to up security near fossil site

FIELD, B.C.—Dr. Desmond Collins, palaeontologist at the Royal Ontario Museum, and one of the foremost authorities on the Burgess Shale fossils, reports that Burgess fossils have appeared recently on the U.S. collectors' market. This news has prompted Parks Canada to increase vigilance at the UNESCO World Heritage Site. Although Dr. Collins isn't certain the commercial material has been poached, he thinks that the recent appearance of Burgess fossils suggests that they may not just come from the sale of an old collection.

Calgary Herald, April 17, 1999

Mass extinctions linked to enormous cosmic blasts

CHICAGO—Astronomers with Northwestern University and the University of Illinois have announced evidence of a stupendously powerful type of explosion, dubbed a "hypernova," which, they say, may be related to extinction events on Earth. Though the cause of these explosions is open to speculation, some ideas include the collision of a super-dense neutron star and a black hole, or the collapse of a very large and rapidly spinning star. These hypernovas are about 100 times bigger than the relatively common supernovas, which occur when a large star collapses into itself. The effects on anything in the galactic vicinity would be catastrophic: a hypernova occurring within 3000 light-years of Earth would produce radiation 100 times greater than the lethal dose for humans. "You'd be roasted," says Illinois U. researcher You-Hua Chu. It is estimated that hypernovas might occur in our own galaxy perhaps once in a million years.

Calgary Herald, May 2, 1999

Hey, T-rex, move over

BUENOS AIRES—Another enormous meat-eating dinosaur has been unearthed in Argentina, this one (as yet unnamed) touted as being bigger than either the North American *Tyrannosaurus rex*

or the South American *Giganotosaurus*. The remains of at least five individuals were found by a goatherd, in Cretaceous rocks (90 ma) in the Patagonian desert. Palaeontologist Rodolfo Coria surmises that the cluster of bones, deposited on an ancient sand bar, provides evidence that the enormous predators hunted in packs—possibly preying on the giant sauropod *Argentinosaurus*, whose remains have been found nearby.

Calgary Herald, May 8, 1999

Fossils surface in lakebed

CARDSTON, ALBERTA—Draining of the nearby St. Mary Reservoir for dam construction has resulted in the discovery of a rich trove of fossils, footprints and native artifacts. Cardston school teacher Shayne Tolman found the site and reported it. Researchers from the University of Calgary (including geologist Dr. Len Hills and archaeologist Dr. Brian Kooyman) and the Provincial Museum have been scouring the lake bed before water levels rise again.

Finds include bones of extinct horses, muskoxen and bison, and more amazingly, tracks of muskoxen, camels and woolly mammoths. Along with the animal remains have been found spear and arrow points, including Clovis points— tools made by people of the oldest undisputed culture in North America, dated to about 11,000 years ago. Other human artifacts include scrapers, knives, flakes and a stone-lined fire pit.

Scouting and excavation of the site was to end in early May, when water levels were expected to rise, and funds to dry up. Further dam construction in the fall will require re-draining of the reservoir, by which time Drs. Kooyman and Hills hope to have secured funding to resume excavation.❑

Thinking about Evolution

by Cory Gross

All areas of science are fraught with misunderstanding and error. Physics, astronomy and palaeontology, amongst the countless many disciplines are the victims of misinterpretation and misrepresentation. Most people know what they know about science not from what they remember from any formal education, but from the media, popular works, and the spectre of "common knowledge." In my experience, I have found "common knowledge" could be more accurately described and labelled as a "common lack of knowledge"; "common knowledge" is almost invariably wrong.

A hot-button topic and one of the greater victims of the popular misunderstanding is the theory of evolution. Even from the use of the term "theory"—whose colloquial definition and scientific definition differ greatly (the popular use of the term equates to a derogatively biased version of "hypothesis")—on down, evolution is one of the least understood and appreciated discoveries of science.

The "common knowledge" version of evolution is an odd monster indeed. Many complaints centre around the false notions that evolution happens to individuals within a generation, and that the descendants aren't exactly the same as their ancestors; not to mention the misconception that evolution is simply about "getting better."

Evolution, as it is understood by scientists today, never affects the individual. Individual animals will not suddenly sprout wings if they want to fly or fur if they move to colder climes, and certainly not grow extra appendages as they may need them for answering the phone, typing on a computer, and sipping a cup of coffee. Once a being is born, its genome (i.e. the set of genes it was born with) is fixed—save from the effects of radioactive mutation or whatever. It cannot do anything or sprout any appendages that its genes aren't prepared to do or sprout. Again, with the exception of mutation or disease which may affect the genes, what happens to an individual in its lifetime, such as physical injury, will not be passed down to its descendants. Scars will not be passed down, nor

will artificially clipped tails, but as can be seen with the children of Hiroshima or AIDS babies, some things can. What is passed down are those features which enabled the parents to survive and breed. Lets look at a hypothetical "trees down" model of how birds evolved from dinosaurs: no amount of physical scale-fraying or learning how to flap its wings will be passed genetically to our imaginary dinosaur's children. However, if this same dinosaur was born with a larger and thicker covering of hair-like proto-feathers and stronger "flapping" muscles, it may be less likely to die when it falls out of a tree than its bald, weak neighbour. This imaginary dinosaur proceeds to breed with another hairy muscle-bound dinosaur and produces even hairier offspring who can flap even better, and the process continues.

That the descendants of certain creatures aren't exactly the same as their ancestors is an answer to its own quandary. I was once asked that if elephants evolved from roughly the same or similar ancestors as woolly mammoths, why didn't they have thick heavy coats of hair too. The answer to this is obvious: because elephants evolved and aren't mammoths. If elephants were exactly the same as mammoths, then they would be mammoths and not elephants. It may seem academic and even silly to point this out, but it is a concept that escapes some people.

The previous point also touches upon a basic human misinterpretation, of not only palaeontology and evolution, but of the natural world in its entirety. The apparent differences between elephants and mammoths, which may seem obvious, are actually false. The differences between any species' ancestors and descendants are false. Human classifications of nature are exactly that: human. Our distinctions of kingdoms, phyla, genera, and species are attempts by humans to place nature into handy, manageable little boxes. These classifications do not truly exist in nature. Someone may be able to point to a *T. rex* and say "that's a *T. rex*," or point to a *Homo erectus* and say "that's a *Homo erectus*," but those designations are based on anything from one to a handful of specimens from specific times. Every specimen that is found is labelled, categorized, and made distinct from its relatives, but really, these are false distinctions. Each organism we find is not a distinct individual with genuinely clear features that make it distinct; it is part of a continuity of life where the line between different species is as clear as the line between night and day. You can easily tell the difference between night and day, but can you clearly pinpoint where night ends and day begins? This is the myth of the "missing link." Looking at our friend and forefather *Homo erectus*, it has been asked where the "missing link" between it and *Homo habilis* or between it and *Homo sapiens neandertalensis* is. What is not realized is that *Homo erectus* itself is a "missing link"; it is part of a continuity between what came before it and what came after it. There is no distinct line between modern humans (*Homo sapiens sapiens*) and all our ancestors where each one suddenly came into being. It is all a process.

Even so, if humans evolved from chimps, then why are chimps still around? Isn't evolution about getting better? First of all, humans didn't evolve from chimps, we evolved from the same ancestor, but that's beside the point. By what stick is "better" measured? Who can objectively define this "better" destiny awaiting the animal which evolves the fastest? Previously, naturalists believed that humanity was the pinnacle of evolution to which all life was aiming, and this is still the popular misunderstanding about what scientists think. This view had been challenged by the fact that some of the most successful forms of life to have ever existed on earth are at the simplest level of biological organization (this is, was, and always will be the "Age of Bacteria"). Ever since Stephen Jay Gould co-proposed the model of punctuated equilibrium and gave us his thoughts on the contingent nature of evolution and the fortuitous events which allowed us to evolve, evolution has been seen less as having an ultimate goal, and simply as survival. Of course, this part of the discussion begins to delve into theology, be it saying that "the human soul is the aim of God," or that "there is no such aim." What "better" is, whether you think it exists or not, is religion, but it cannot be denied that evolution is about surviving. Chimps and bacteria are still around because they are surviving adequately without being human.

Isn't evolution about getting better?

Evolution, like any aspect of science, can be a difficult subject to fully comprehend and appreciate. This goes double for me because I'm the fool who has no idea what he's talking about but who insists on writing stuff anyway. However, for all of us, there is little excuse not to take it upon ourselves to learn what evolution is about from as many sources as close to the original one as possible. Taking any information, be it scientific, religious, economic, or political, from "common knowledge" is a dangerous game and destined only to obfuscate instead of clarify. ❑

How I Spent My Winter Vacation

Searching for Sunshine, Warm Temperatures…and Fossils

by Robin Sweeten

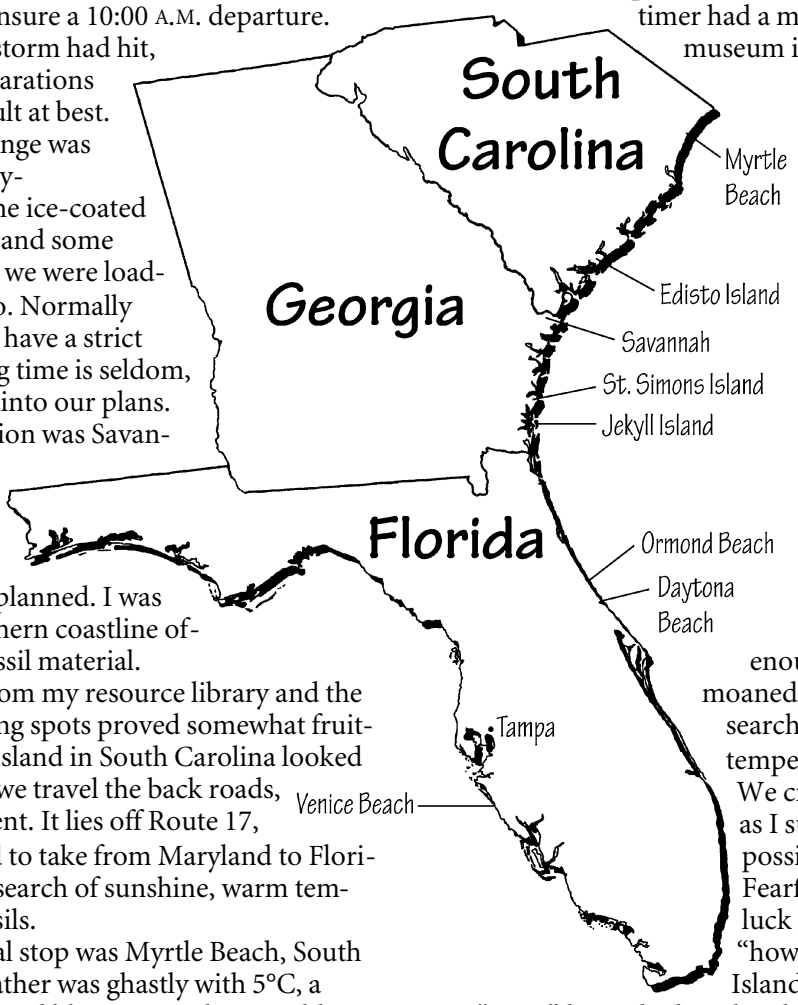
December 24, 1998 was our start date. Getting our motor home (which we live in permanently) road-ready is a difficult task but I was on schedule. The alarm was set to ensure a 10:00 A.M. departure. Overnight an ice storm had hit, making final preparations for take-off difficult at best. The biggest challenge was loading our Harley-Davidsons onto the ice-coated trailer. With time and some neighbourly help, we were loaded and ready to go. Normally (per husband) we have a strict itinerary. Fossiling time is seldom, if ever, scheduled into our plans. Our final destination was Savannah, Georgia and we weren't expected until December 29. A leisurely trip was planned. I was ecstatic! The southern coastline offers a wealth of fossil material.

Information from my resource library and the internet for hunting spots proved somewhat fruitless. Only Edisto Island in South Carolina looked promising. Since we travel the back roads, Edisto is convenient. It lies off Route 17, which we planned to take from Maryland to Florida. We set out in search of sunshine, warm temperatures and fossils.

Our first official stop was Myrtle Beach, South Carolina. The weather was ghastly with 5°C, a steady downpour and blustery winds. I would not be deterred. As my husband and cat leisurely watched TV in the motor home, I braved the elements. My numbing hands managed to pick up three nice *Carcharias* sp. teeth and some pretty seashells including *Anadara* sp., *Argopecten* sp., and beautifully coloured pieces of various other clam, scallop, and cockle shells. There was also some fossilized sediment and two pieces of bone. The bone turned out to be asphalt.

Willie drove, I thawed.

Our next stop was Edisto Island, South Carolina. It was still raining and although the temperature had risen to 11°C, the wind chill made it considerably colder. The first beach turned up no fossils, but beautiful shells littered the sand. I quickly gathered a bucketful. Approaching a small store, I inquired about where one could find fossils. A local flatly answered, "anywhere." The beach seemed too open; perhaps a more sheltered spot would be better. With the sweetest smile possible, I approached another equally tight-lipped local, obtaining two bits of information: there was indeed a more sheltered spot down the road; and an old-timer had a makeshift fossil museum in his home, that was open in the afternoon. Unfortunately our stay was too brief to make the museum, but we did head for the second beach. My luck was no better —plus it had begun to pour again. Trudging back to the motor home, my husband unhappily eyed yet another bucket of seashells. "Don't you have enough of those?" he moaned. Off we went, in search of sunshine, warm temperatures and fossils. We crossed into Georgia as I surveyed the map for possible target sites. Fearful of pushing my luck I sheepishly asked, "how about Jekyll Island?"



"Sure," he replied, and with no sign of irritation! Next stop, Jekyll Island, Georgia!

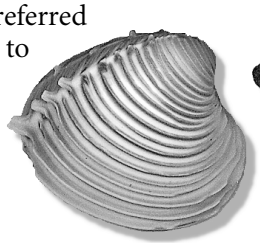
A group of wealthy families purchased the island as an exclusive retreat in 1886. They called it —appropriately—The Jekyll Island Club. The members included the Rockefellers, Vanderbilts and Morgans, representing over one-sixth of the

world's wealth. The club closed in 1942 and the State of Georgia purchased it in 1947.

The lady in the Visitor Centre said she had found some shark teeth a little further north at St. Simons Island. That didn't help; we were headed south.

The rain finally ceased as we approached Jekyll Beach. There were moons and other brightly coloured pieces of shell but no fossils. With my pockets bulging, we returned to the motor home and headed inland toward Tampa, Florida. Would we find sunshine, warm temperatures and fossils?

The next day was sunny and 22°C . We unloaded the Harleys and did some riding. The low bridges offered sightings of dolphins, flocks of both brown and white pelicans and numerous other waterfowl. However, while waiting to go to the beach, I discovered I had made a major strategic error: Tampa lies approximately forty miles north of the shark tooth capital of the world, Venice Florida! Why hadn't I referred to a map? We could have gone to Venice!



Surely there would be shark teeth near Tampa. In the afternoon my friends suggested hunting at Indian Rock Beach. Shells were in abundance—*Glycymeris pectinata*, *Argopecten gibbus*, *Plicatula gibbosa*, and *Donax variabilis* to name a few. Sadly, no one found a shark tooth, ancient or otherwise. Desperation was setting in. What about my article for APS?

The next day we drove back across Florida to Daytona Beach. The weather had deteriorated again but riding our motorcycles in Daytona is mandatory. Donning leathers, we ignored the chilly drizzle, riding a good five miles on the sand. After warming our shivering bodies, we loaded the motorcycles and headed for Savannah, Georgia.

One final Florida stop was allowed at Ormond Beach. I picked up more shells, which by now were taking over our living space. We drove along the ocean for a while and then headed inland. Still lacking sunshine, warm temperatures and fossils.

As we passed Jekyll Island, I remembered St. Simons. My request for a fossil stop was granted and one tiny tooth, a *Myliobatis* sp. dental plate and two pieces of bone turned up. A meagre take, but by this time it was like finding a treasure. Fossils at last!

The remainder of the trip to Savannah was uneventful so I began fantasizing about fossiling at the Moon River. My last article told about the tidal pool, which is a popular fossiling spot. With such bad luck thus far, perhaps this outing would yield a monster *Carcharodon megalodon* tooth.

Surprisingly, large pieces of fossilized bone were lying in the riverbed. Gathering a box full was easy work. With chilly weather abbreviating my visit, I was anxious to return the next day.

The evening tide exposed more bone in a circumference of approximately four feet by six feet. Possibly the fragments all derived from the same animal, perhaps a whale or a large terrestrial mammal. Currently, I have no means of identification, but some of the pieces may reveal their origin.

Along with bone, *Pogonias* sp. tooth plates, ten tiny shark teeth, and stingray dental plates turned up. I also found the partial crown and various other pieces of what once were large *Carcharodon megalodon* teeth. The best was yet to come.

Arranging the pieces for cleaning, I noticed one bone fragment contained something un-usual. Across the width were markings made by an ancient hatchet. The Savannah area is Quaternary in age and it is not unusual to find artifacts. This type of artifact is rare.

Our last day in Savannah included our annual "Let's-Go-Look-At-Alligators" ride. The chilly weather lingered and we saw only two. Then, regretfully, it was time to leave.

We made the twelve-hour trek back to Maryland without incident. By evening, husband, cat, hundreds of shells, numerous boxes of bone and I were deposited back in the campground we temporarily call home. The trip was wonderful. Fossils were sparse, but the Moon River once again proved a lucky hunting ground.

One final note. If you read my last article, you will recall I spoke of carrying long sticks to ward off snakes and alligators at Moon River. Since I have never seen either at the Moon River, I made my recent excursions without a stick. It was only later that I learned about the large 'gator that has taken up residence near the fossiling site. Enough said.

If you are interested in corresponding with me or trading fossils, you can reach me at **gsussaves@worldnet.att.net**, or write me at my mail forwarding address: **MSC#6843, P.O. Box 2428, Pensacola, Fl. 32513**. I would love to hear from you! ❑

Bookmark the APS web page!
www.geocities.com/SoHo/9094/aps.html

A Reminder to Collectors

As the collecting season is already well underway, the APS executive thought it timely to remind collectors of our responsibility to adhere to the laws of Alberta, in particular the **Historical Resources Act**.

The following notes are mainly from the brochure *Finding Fossils*, a publication of the Royal Tyrrell Museum and the Alberta Ministry of Culture and Multiculturalism:

Definitions…

Surface collecting—gathering isolated fossils which are clearly on the surface of the ground.

Excavating—digging, prying or somehow extracting a fossil buried or embedded in the ground or rock face.

Keeping Fossils…

Surface collecting is permitted on Crown land, and on private land with the landowner's permission. You may keep surface finds as a custodian, but **ownership resides with the province of Alberta, making it illegal to sell or take such fossils out of the province** without an approved Disposition Certificate. **Excavating fossils requires a permit**. Application forms are processed through Resource Planning at the Royal Tyrrell Museum of Palaeontology. Procedures outlined in the Historical Resources Act must also be followed before any part of the collection can be retained. All applications are reviewed by the Alberta Palaeontological Advisory Committee to the Minister of Culture and Multiculturalism. **It is illegal to remove fossils from provincial and federal parks in Alberta.**

Owning Fossils

All fossils collected in Alberta since July 5, 1978, and all fossils still in or on the ground, are owned by the province. The province may transfer ownership of fossils identified by a Control List established in 1987 to private parties. This list allows for responsible trade of certain fossils that are abundant within the province and thus have limited research and display value.

For more information, contact the Royal Tyrrell Museum, (403) 823-7707, or see their web site: www.tyrrellmuseum.com/hrahome.html ❑

Review

by Les Adler

On Embryos and Ancestors by Stephen Jay Gould. *Natural History*, July/August 1998, pages 20–22, 58–65

Before the 1950s fossils more than 2 billion years old had not been found because palaeontologists had been looking in the wrong places, in conventional sediments that rarely preserve the remains of single-celled bacterial organisms without hard parts. It was not realized that life had remained simple for over a billion years or that ordinary sites for good fossil records could not preserve such organisms.

Elso Barghoorn and Stanley Tyler searched chert deposits and found a rich fossil record of early life 3.5 to 3.6 billion years old in rocks from Australia and South Africa, which had not been sufficiently altered by subsequent heat and pressure to destroy all anatomical evidence of life.

Two charts are provided, one of which shows a time period of 3.5 billion years to the present, with the oldest bacterial fossil life, then to algae and then to animals. The other chart, 600 million to 520 million years ago, shows the Ediacaran fauna, embryos of tripoblast animals at 568 million years ago, the Manakayan small shelly fauna at 543 million years ago and the Tommotian and Atdabanian stages, 530 to 520 million years ago, representing the Cambrian explosion of life.

Fossils are found in many modes and styles, such as bones, shells, or casts and moulds. Original organic materials may be replaced by percolating minerals (petrifaction). Phosphatization works in detail only for tiny objects up to 2 mm in length. Klaus J. Müller and Dieter Walossek found tiny arthropods (mostly larvae of crustaceans) in Upper Cambrian Orsten beds in Sweden.

Walossek and Müller's techniques have led to finds in 1994 by Xi-guang Zhang and Brian R. Pratt of presumably embryonic cells measuring 0.30 to 0.35 mm in diameter, of possibly the earliest stages of adult trilobites, in the same Orsten beds. Even earlier phosphatized embryos from basal Cambrian strata in China and Siberia trace probable growth series from embryos to adults of conulariids and a probable segmented worm. Yun Zhang of Beijing and Andrew H. Knoll have reported the oldest tripoblastic animals of southern

China at 570 million years ago, of phosphatized multicellular complex algae.

It may now be possible to reconstruct the earliest history of modern animals before the Cambrian explosion; thus palaeontology will shake hands with evolutionary theory in the finest merger of talents ever applied to the resolution of a historical enigma. G.A. Wray, J.S. Levinton and L.H. Shapiro used differences in the molecular sequences of seven genes in living representatives of major phyla to derive an estimate of roughly 1.2 billion years for the divergence time between chordates and arthropods, annelids and molluscs, and 1 billion years for the later divergence of chordates from echinoderms.

Gould discusses the examples of mammals waiting for 100 million years for dinosaurs to become extinct and tripoblasts waiting for the Ediacaran fauna to become extinct by stating that incumbency offers powerful advantages to a competent group waiting for an external stroke of good luck to pick up the reigns of power, versus the myth of the inevitability of its necessary rise to power by gradually improving every day and in every way. ❑

Coming Events

June 5–August 15, 1999
China's Feathered Dinosaurs on display at the Royal Tyrrell Museum

Less than a year ago, Dr. Philip Currie, together with scientists from China and the US, announced a landmark discovery: dinosaur fossils with feathers had been found in northeastern China. Now, China's Feathered Dinosaurs are coming to the Royal Tyrrell Museum. Opening June 5, this exhibition of rare specimens and artists' models depicts a critical period in dinosaur evolution.

The Royal Tyrrell Museum is the final stop on the exhibit's North American tour, organized by the National Geographic Society, and will be the only place in Canada where these amazing fossils can be seen. **Also check out the new Ice Age Mammals exhibit**, which should be open by the time you read this.

For more information: **www.tyrrellmuseum.com** or phone (403) 823-7707.

June 12–13, 1999
Southern Alberta Rockhounds Show and Sale

Soccer Building, Lethbridge Exhibition Grounds, Lethbridge, AB.
Displays will include fossils, minerals, etc.
Admission: Adults $3, Students $2, Children under 8 free if accompanied by an adult. Free parking.

July 25–31, 1999
"Great Norman Wells Fossil Hunt"

Norman Wells, a small town located in Canada's Northwest Territories (65° 17' N, 126° 51'W) has a rich and varied geology. In the canyons located just outside town fossils can be found in their hundreds, just lying in the wilderness, undisturbed. Mammoth bones have been found close to town; and along the banks of the great Mackenzie River prospectors have found gold and emeralds. Other minerals and interesting geological specimens, such as perfectly spherical geodes can be found around the town. Norman Wells is an undiscovered Rock Hound Heaven.

Between July 25 and July 31, 1999 the Town of Norman Wells would like to extend a warm welcome to Rock Hounds wherever they may be, and invite one and all to the Great Norman Wells Fossil Hunt. Throughout the week participants will have the chance to contribute to the mapping of our fossil and mineral heritage; hunting for fossils and minerals to their heart's content under the midnight sun. The event will culminate in a great outdoor community barbecue, at which the Rock Hound who has contributed the most, will be honoured by the award of the coveted, engraved, Norman Wells Rock Hound Hammer.

For more information, contact **info@normanwells.com**, or check out our Web site at **www.town.normanwells.nt.ca** or write to: Town of Norman Wells, Box 5, Norman Wells, NT, X0E 0V0.

Sept 10–12, 1999
B.C. Gem and Mineral Show

Ag-Rec Building, CFV Fairgrounds, 32470 Haida Drive, Abbotsford, BC.
Show will feature elasmosaur and other displays from the Courtenay Museum and Paleontology Centre.
Admission: Adults $5, Children & students $2, children under 5 years free. ❑