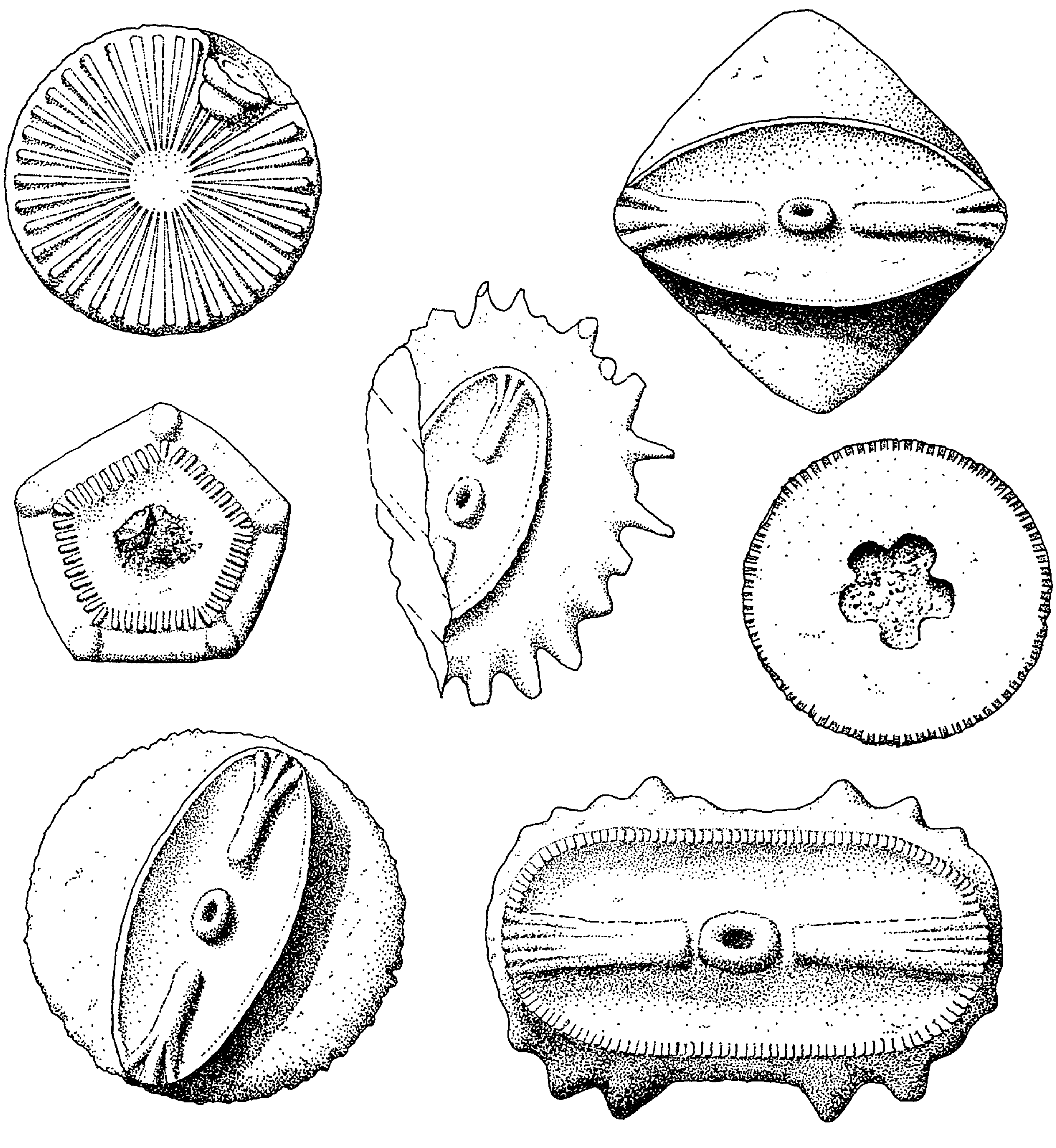
A L B E R T A • P A L A E O N T O L O G I C A L • S O C I E T Y

BULLETIN

VOLUME 7 NUMBER 2 JUNE 1992



ALBERTA PALAEONTOLOGICAL 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.

Single membership	$10.00 annually
Family or Institution	$15.00 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.

Mailing Address: **Alberta Palaeontological Society**
P.O. Box 35111, Sarcee Postal Outlet
Calgary, Alberta, Canada T3E 7C7

Requests for missing issues of the Bulletin should be addressed to the editor.

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DATES FOR APS MEETINGS

Meetings take place in Room **B108**, Mount Royal College, at **7:30** p.m.

1992: September 18*, October 16, November 20, December 18*

*Bulletins will (hopefully) be distributed to members in attendance.

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ON THE COVER: Detroit's new-car lineup for A.D. 2393? The Girl Guide cookie selection from Hell? None of the above! …crinoid columnals from the Banff Formation (Lower Mississippian), Canyon Creek, Alberta—see page 11. (by Howard Allen—all figures approximately x10)

ABOUT THIS ISSUE… FROM THE MEMBERSHIP DIRECTOR
by Peter Meyer

For this issue, we are sending complimentary copies to our former members, who for one reason or another have let their memberships lapse. We sincerely regret if we have let you down, and wish to convey that we have valued your membership in our Society.

To our Calgary members, past and present, who cannot always attend monthly meetings, I wish to say that you can still make a significant contribution by way of submitting technical articles, anecdotes and news items to our *Bulletin*; you are free to donate your time and skills to the APS identification booth at the annual Calgary Rock and Lapidary Club show in early May; and contributions to our growing fossil collection are always welcome.

To our out-of-town members (Canada and foreign), past and present: we are trying to improve our lifeline—the *Bulletin*, to serve your needs. We are presently attempting to establish regional committees which we hope will evolve into chapters that will be self-sustaining and relatively autonomous. If you are interested in spearheading a regional committee of members from your area, please contact the Board of Directors (listed on page 1). We have replied to enquiries from Grande Prairie and Edmonton regarding the formation of chapters and hope to take positive action toward their establishment.

As our *Bulletin* contains articles of mainly local interest and reprinted material, we welcome submissions of a wider interest from our out-of-town, out-of-province and foreign members. Please don't be shy—we want to hear about your local fossil and geological assemblages, news, and reviews of books you have read.

FROM THE EDITOR
by Howard Allen

When W. Somerset Maugham's long-suffering hero, Philip Carey, in the 1915 novel *Of Human Bondage* begins to question his future as an art student, reality looms in the form of his latest painting:

> He began to wonder whether he had anything more than a superficial cleverness of the hand which enabled him to copy objects with accuracy.

As the editor of a palaeontological newsletter, this sort of reflection doesn't bother me. Superficial cleverness of the hand is all that appears on this issue's cover. Last March's *Bulletin* cover featured actual art. What's the difference? The crinoid ossicles featured on this month's cover were reproduced with a drafting pen, while I peered down a microscope at some specimens.

The key word here is *reproduced.* I could no sooner compose an underwater scene with waving crinoids and bobbing jellyfish than many of you could. Hope Johnson, and other artists, are able to *represent* living, fleshed-out creatures and situations that no one ever laced eyes on, thanks to an artistic gift, which allows them to see, and to represent things that aren't sitting in front of them.

The point of all this is, I don't expect all of our *Bulletin* contributors to be artists, or even brilliant writers like Somerset Maugham. If you can sketch some specimen from your collection, or write a diary of your next collecting trip to Winnemucca, Nevada, please do, and send it in to the *Bulletin.*

Did you find some rare or otherwise weird fossil six years ago, that was identified by an expert? Why not write a paragraph or two about it? Another member might be helped by your description. Maybe you came up with a gadget or an unusual solvent that works wonders at extracting Middle Miocene marsupial coprolites from claystone nodules—let's hear about it! Get together with someone…your neighbour, say…and write a joint article on those leaf fossils you found this summer. You write about the leaves, your neighbour sketches them. How about that new coffee-table book you picked up on the fossils of Petrified Stinkbug National Monument—did you like it? Hate it? Tell us why! Did you clip that news item about Robert Bourassa (the premier of Quebec for you US citizens) being bruised on the shin by a trilobite-hurling anti-federalist on Jean Baptiste Day? I never heard about it! Let's print it!

Enough already. I think you get the picture. There are literally millions of things to write about and to draw pictures of. Anything you can contribute will be more than welcome (but please go easy on those reprints of reprints of reprints of articles from the January 1985 *Dino Digest*).

Last December I ran an ad appealing to **ARTISTS!** This month my appeal will be to **SUPERFICIALLY CLEVER HANDS!** (You artists aren't off the hook either…I know who you are!)

I hope you all have a happy, safe, and productive summer, and I look forward to seeing you in September (if not on the field trips).

PROGRAM SUMMARIES

March 20, 1992: Wayne Braunberger, APS member and past-president: *Maps and Map Reading for Fossil Collectors.*

Two types of maps can be important resources for fossil collectors, both for pinpointing the geographic position of known fossil localities, and for finding potential new sites:

Topographic maps use contour lines to represent 3-dimensional surfaces on a 2-dimensional sheet of paper. These maps are available in several scales. The most useful scale for our purposes is the 1:50,000 scale, which is available for almost all of the Canadian land area (similar maps are available in the USA and other countries). At this scale, one mile on the map is about 1.25 inches (1 km. = 2 cm.). Useful information printed on these maps includes:

• North arrows—show the three "norths" on a map. *Magnetic north* is where your compass points. This varies from area to area and from year to year—a legend on the map margin tells how to correct for these variations. *Grid north* is measured on a uniform, right-angle grid (usually blue) covering the entire map area. This is the "north" you use to set compass bearings, after correcting for magnetic north. *True north* is represented by the lines of longitude, which converge toward the poles. Surveyed lines (township and section boundaries—normally grey—and grid-roads common in the prairie provinces) are generally parallel to true north, but must make correction 'jags' to compensate for the curvature of the earth.

• Contour interval—marked on the bottom of the map, tells the vertical distance represented between adjacent contour lines. Later Canadian maps are printed in metric, so be careful when comparing contours on adjacent map sheets, which may have been printed in different years.

• Legend—various symbols and colours represent landmarks and geographic features, both natural and manmade.

Several grid systems are used to pinpoint and communicate locations on the map. Each has its own advantages for different applications:

• The National Topographic System (NTS) is used to index entire map sheets, whose boundaries are parallel to lines of latitude and longitude. A typical NTS reference such as **83 H/12** refers to a particular 1:50,000 map sheet, and is the number to quote when ordering maps. Map indexes are available at sales offices for this purpose.

• Latitude and longitude are expressed in degrees, minutes and seconds, and marked as alternating black and white lines along the map's margin. Because of the large size of the units, the lack of a detailed grid on NTS maps, and the small but significant curvature of these lines, references to this system are often imprecise. The system is sometimes used in geological publications to refer to fossil sites, but a reference such as **N52°13', W114°22'** may be 'out-of-whack' by several miles in any direction.

• The township and range system is used in surveying and legal land descriptions. It is used in surveyed areas of the Canadian prairie provinces and in the western US. An advantage of this system is that the grid lines are often represented by physical features—grid roads, fence lines, survey stakes—thus sites may often be relocated quickly on the ground. Unfortunately, wilderness areas and regions outside of the prairie provinces, where the system isn't used, cannot be referenced. As well, the grid system is coarse enough that pinpointing localities is relatively imprecise—a legal subdivision (Lsd), the smallest grid unit of this system, is a quarter-mile on a side.

• The Universal Transverse Mercator grid (UTM) system is the most precise method of locating sites on a map. The system uses a uniform, square grid (see *grid north*, above) of light blue lines, which covers the entire map area (over all of Canada). Each square is one kilometre (1000m) on a side, and can be subdivided ten times, for a precision of 100 metres. A legend on the map margin shows the proper method of pinpointing localities with the UTM system.

Topographic maps are available at commercial map dealers and Provincial Government sales offices (the GSC sales office in Calgary no longer sells topo maps; the same may be true for other GSC offices). A related map series, the provincial government *resource base maps*, are updated more frequently, showing all roads, logging areas, etc., but do not show elevation contours.

Geological maps show the bedrock geology of an area. Different formations are represented either by colours or by code numbers, and are projected onto a topographic base map, with contour lines and other topographic symbols. A few different map series may be encountered:

• The Geological Survey of Canada (GSC) "old" A-series maps (identified by a letter A after the map's index number) were printed in colour, often using odd scales, such as 1:253,440 which translates to 1 inch = 4 miles. These older maps were produced by geologists working on foot or horseback, and often show many more data points than newer maps. Fossil localities are marked on these maps by a circled capital F.

• GSC "new" A-series maps are also in colour, but use more conventional scales such as 1:250,000 or 1:50:000. Since much of the data is derived from air-photos, fewer data points are plotted, and few if any fossil localities are marked.

• GSC “Preliminary series” maps are in black and white, with formations identified by code numbers. Most of these maps were produced prior to the 1970s, especially during war years, when rapid exploration for resources was a priority. As a result of the often hasty work, errors sometimes show up on these maps. Fossils sites, as in the “old A-series”, are marked with a circled F.

Other map series are produced by provincial and state geological surveys and resource ministries.

Geological maps are notorious for going out of print, without being replaced by newer editions. Coloured maps are almost never reprinted, due to the high cost. The best place to find these out-of print maps is in map libraries, such as those in universities. Formation boundaries and fossil localities can be traced from these library maps onto conventional topographic maps for personal use. Geological maps are often included in Geological Survey reports, which occasionally appear in used book sales. If you see an old geological map for sale, grab it—you are unlikely to see another one for a long time.

Maps currently in print are available at the Geological Survey sales offices.

– Howard Allen

March 20, 1992: Les Adler, APS treasurer and incoming president: ***Cataloguing Your Specimens.***

Les Adler followed Wayne’s presentation on maps with some pointers on cataloguing the specimens in your collection.

Necessary equipment can be very basic, or very elaborate, as you see fit:

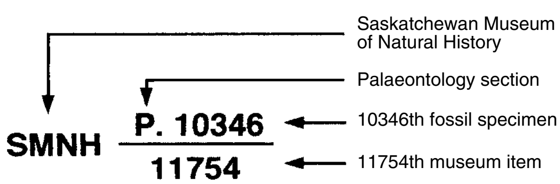
• A 3-ring binder or index card file for a hand-written catalogue, or a computer with database software for a computerized catalogue.

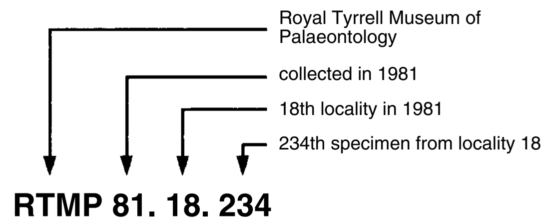
• Paper or filing cards; floppy discs for a computer.

• A 3-hole punch (or use pre-punched paper).

• A pen or typewriter.

Methodology involves assembling the necessary equipment and specimens, and developing a numbering system. Examine the systems used by museums and by other collectors:





Decide what types of information you want to include on your page, card or database record. For example:

• Scientific name—genus and species

• Common name, if there is one

• Scientific classification—phylum, class, order, family

• Location—map reference, physiography, property owner, landmarks, stratigraphic level, rock type, distinguishing features

• Name of finder or donor

• Date of collection or purchase

Set your priorities—don’t neglect your physical and mental health by obsessively working on a large collection. Set aside an hour or two a week for cataloguing. How about finances? Can you really afford to spend a lot of money on a computer and all the associated paraphernalia just to catalogue your fossil collection? Finally, remember this axiom: **Plan your work—Work your plan.**

– Howard Allen
(with notes from Les Adler)

April 24, 1992: Wayne Haglund, Instructor, Mount Royal College: ***Preparation of Fossils from Shales and Limestones.***

Preparation of fossil specimens has evolved over the years from basic picking and chipping techniques, thanks to technology. *Patience*, however, remains the key to successful fossil preparation, regardless of the technique used.

Before work is started, it is important to know some of the properties of the rocks and fossils you are dealing with. Clastic sedimentary rocks (sandstones, siltstones, shales) consist of three components:

• Mineral grains—quartz, feldspar, rock fragments, fossil fragments, other minerals.

• Matrix material—very fine sedimentary material filling the spaces between grains—usually clay minerals.

• Cementing materials—chemical precipitates that fill additional pore space, and hold the grains together—generally silica, calcite, dolomite or iron-based minerals.

Rock texture is also an important property;

porosity of the rock—that is, void spaces left between grains that weren't filled by matrix or cement—may indicate how easily preparatory chemicals (including water) will penetrate the rock. As well, bedding planes may allow the rock to split or chip more easily in a particular direction.

Preparatory techniques may be divided into two general categories—physical and chemical.

Physical techniques include the use of such tools as:

- Hand-held pressure point tools—dental picks, needles, knives
- Vibrating tools—electric engravers with pick or chisel points, preferably interchangeable.
- Grinding discs—electric drill attachments, hobby grinding tools with flexible shafts, etc.
- Sandblasting—small, hand-held sandblasting tools are available, with abrasive grits of different hardnesses.
- Freezing and heating—water expands when frozen: water in the pore spaces of a rock may cause the rock to crumble if subjected to repeated freezing in a home deep-freeze. This technique works especially well with coarse-grained rocks; applying a wetting agent (detergent) to the water will allow it to penetrate the rock more deeply. Heating may also be tried, although with caution, as some rocks may explode.
- Ultrasonic units for cleaning jewellry and dentures work well at removing fine clays and silts from pores and crevices.
- Brushes—including toothbrushes, with the addition of lapidary grit or even toothpaste.

Chemical Techniques involve the use of acids, bases and various solvents:

- Hydrochloric (Muriatic) acid—dissolves calcite and, when heated, dolomite—good for removing siliceous fossils from limestone.
- Oxalic acid—good for removal of iron minerals, such as limonite.
- Acetic acid (Glacial acetic acid)—also dissolves calcite, but more slowly and gently; vinegar is weak acetic acid, and works well, especially when warm.
- Household lye (potassium hydroxide) is good for decomposing clays.
- Organic solvents, such as Varsol™ or kerosene remove oily or tarry residues.
- Water (distilled) is called the 'universal solvent'—soaking may soften poorly consolidated rocks; rainwater is a mild acid. Wetting agents such as detergent improve the penetrating and cleaning power of water.
- Industrial detergents—Quaternary O™ is an excellent agent for breaking down shales and cleaning clay from specimens; unfortunately, this product may no longer be available, but substitutes probably exist.

Some of the chemicals used in fossil preparation are potentially dangerous if handled improperly. Follow common-sense safety rules: wear gloves and goggles where appropriate, keep organic solvents away from open flames and sparks, and **A**lways **A**dd **A**cid to water when mixing.

Fossil preparation need not be expensive. Many of the tools and chemicals described can be obtained locally from hardware stores and tool suppliers.

Mr. Haglund concluded his presentation with the advice that "Given enough **TIME** any fossil can be cleaned/prepared to perfection".

– Howard Allen
(with lecture notes provided by Wayne Haglund)

May 22, 1992; Les Adler, APS Treasurer and incoming President: *A Visit to the La Brea Tar Pits, Los Angeles, California.*

Following the annual reshuffling of APS executive positions at the May meeting, Les Adler presented a short but entertaining talk and slide show on his trip to Los Angeles to view the famous Rancho La Brea tar pits.

As fossil sites go, the La Brea tar pits represent a relatively recent deposit, having formed in the Rancholabrean Stage of the Pleistocene Epoch, between 40,000 and 8,000 years ago.

Created by petroleum seeping upward from underground deposits into a low-lying pond area, the tar pits have, over the past 40,000 years, been a death-trap to thousands of birds and mammals. Represented in the accumulation of bones are the remains of over 500 species, many of which are extinct. One of Les's slides shows a display of dozens of skulls of the extinct dire wolf, *Canis dirus*, just a few of over 1000 skulls of this animal recovered to date. Other species recovered from the deposit range from mastodons and mammoths to ground sloths, horses, American lions, sabre-toothed cats, condors, eagles and small birds.

In his inimitable style, Les related highlights of his trip to Los Angeles with many humorous anecdotes. Included in the talk were details on the best routes to take from the Los Angeles airport (LAX) to the site of the tar pits, and comments on various features of the grounds and museum at the Rancho La Brea site. As well, Les reviewed the modern history of the locality, from its discovery and early use as a commercial quarry for tar, to the present conservation and research carried on at the site.

– Howard Allen

CALGARY ROCK AND LAPIDARY CLUB SHOW, May 2 & 3, 1992
by Les Adler

This show has been held for several consecutive years during the first weekend of May, at the West Hillhurst Community Centre, 1940 6th Ave. NW. Attendance was lower than in previous years, possibly due to the current economic conditions. The number of display cases was smaller, as was the number of special displays. However, there was a large increase in the number of competition entries, including those in the fossil category.

Some confusion arose, as one competitor dropped out due to a last-minute disaster. The judges mistakenly assessed another case in its place and docked this entry severely, as the labelling didn't conform to competition rules. Also, one entry may have been wrongly assigned to another subcategory.

Despite these problems, APS member Don Sabo's entry "Predation of Dinosaurs", consisting of seven individually mounted specimens showing tooth puncture marks, tooth serration marks and groove marks scored in the high 90s out of a possible 100 points. Jean Wallace, a Texas APS member, entered a case of 31 invertebrate fossils, covering many geologic periods, phyla and classes.

Dave Langevin, a member of the Thompson Valley Rock Club, displayed a case of fine fossils (age about 40 million years) collected west of Savona, British Columbia. The specimens included a fish, a spider, and a bird skeleton; leaves, pods, seeds and flowers from a variety of deciduous and evergreen trees. The displayed specimens had been split into 19 pairs of parts and counterparts.

L. and C. Dwyer of Pincher Creek displayed more than 20 pieces of polished petrified wood. Wayne Braunberger, a past-president of the APS, displayed "Cretaceous Invertebrate Fossils from Alberta", including ammonites, pelecypods, gastropods and crayfish. The Ingelson family (APS members) display, which won the award for the best non-competitive fossil display, consisted of ammonites, pelecypods and crayfish from the Cretaceous Bearpaw Formation near Bow City, Alberta. Les Adler's display of "Western Canadian Fossils" ranged from Precambrian to Cretaceous in age and included stromatolites, trilobites, pelecypods, ammonites and hadrosaur pieces. The Barker Estate supplied a display of bookends made from polished petrified wood.

Dan McLafferty and Karen Siedel displayed 22 pieces of cut and polished fossilized coral cross-sections from Florida. Jean and Emmette Wallace of Texas displayed Pliocene fossil shells collected at the DeSoto Shell Pit, near Arcadia, Florida, and a variety of other fossils including coral, worm shells and 14 shark teeth from the same location.

At the identification booth, volunteer members of the APS answered queries, provided free specimens, and assembled displays to fill space vacated by the late Mr. Halmrast's dinosaur display and the Friends of the Tyrrell Museum display of previous years. The organizing committee of Dinotour 1992 were on hand with literature and maps relating to tours of dinosaur quarries and trackways in Utah and Colorado.

The APS effort comprised about one tenth of the show. Other displays, exhibitions and demonstrations covered carving, opal work, faceting, cutting, polishing, tumbling, silver-smithing, scrimshaw, and mineral displays. Fossils available for sale by commercial exhibitors ranged in price from 25 cents to $2,000.

KIDS' ACTIVITY BOOKS COINCIDE WITH LA BREA TAR-PITS EXHIBIT

Treasures of the Tar Pits, an exhibit featuring fossils from one of the world's largest animal graveyards—California's Rancho La Brea Tar Pits— is on display at the Royal Tyrrell Museum of Palaeontology in Drumheller, through July 18.

To mark the occasion, "Bare Bones Productions" (headed by APS member Linda Reynolds) has joined forces with the museum to produce some fun, educational activity books for children. Linda and her colleague, Louise Gauthier, who also has a background in palaeontology, have made sure the facts about the fossils are accurate as well as interesting. Illustrations by local artist Joyce Harris bring the subjects to life.

Trapped in Tar, a 16-page book for 7 to 12 year-olds, will 'suck' readers into the world of tar pits through its absorbing activities. *Ice Age Animal Masks* is a book of punch-out masks of seven ferocious beasts for kids to colour and wear. Printed on the back of each mask are interesting facts about the animal depicted. The books are reasonably priced at $3.50 and $4.95, respectively, and are expected to be popular with young fossil-hungry bone hunters.

For more information about the books, or to obtain copies for your kids (at a 10% discount), contact Linda Reynolds at "Bare Bones Productions"—phone (403) 247-4099; fax 247-6630.

[*Excerpts from a news-release provided by Linda Reynolds. A third kids' book, on dinosaurs, is to be published in May. See Linda for details. – ed.*]

FOSSILS IN THE NEWS

Dinny's Doin's , Fossils for Fun Society, Inc., from PBS *Nova* via *Osage Hills Gems* and others, Feb. 1992:

Future petrified forest at Mount St. Helens?

"A future petrified forest with a great number of trees standing has been started at the site of Mt. St. Helens. Trees were blown into lake water with enough material in their roots to sink them so they are upright but under water. Scientists believe they might be a petrified forest in 10 or 20 million years".

Western News (University of Western Ontario, London), Mar. 5, 1992:

Fossil may be evolutionary link

The article attached to this goofy headline is an account of a Middle Silurian (420 million years old) eurypterid (sea scorpion) unearthed by a landscaping firm near Wiarton, Ontario. The specimen, which apparently has affinities to *Eurypterus remipes lacustris*, was recovered from a tile quarry in the Eramosa Member of the Amabel Formation. An accompanying photo shows the fossil, with University of Western Ontario geology curator David Dillon, who remarks"This fossil is one of at least four eurypterid species found in the Eramosa Member…" An expedition to search for more specimens was being considered. The fossil, on loan from the landscaping company, is being displayed in the University's Biological-Geological Building.

The Calgary Herald, Mar. 14, 1992:

Mammoth bone unearthed

Prince George, B.C. (CP)—The second documented find of mammoth remains from British Columbia was reported last September. The specimen, a fragment of pelvic bone, was discovered in gravel near the Fraser River north of Prince George, by area resident Brian Kulchinski. Archeologists at the Royal British Columbia Museum in Victoria confirmed its identity. College of New Caledonia zoologist Judith Johnson estimated the mammoth would have stood about three metres tall at the shoulder, "…about the size of a large bull elephant".

The Calgary Sun, April 21, 1992:

Rare fossil found

The skeleton of a 113 million-year-old ichthyosaur was discovered in early April at the Syncrude Canada Ltd. oil sands plant at Fort McMurray, Alberta. Dr. Betsy Nicholls of the Royal Tyrrell Museum reports that the skeleton "…is in good condition", and that it is only the second ichthyosaur recovered in Alberta. The fossil will be displayed at the Royal Tyrrell Museum after cleaning and preparation.

MAPS Digest, Nov. 1991
MWF Newsletter, Jan. 1992
Trilobite Trails, Jan. 1992
Earth Science News, Feb. 1992
Paleo Newsletter, Mar. 1992

Status of fossil collecting on US Federal Lands—updates

Several palaeontological society journals in the United States have been printing a flurry of reports on changing regulations regarding the collection of fossils, rocks, artifacts and other materials on federal lands. Many of these reports are under the byline of John Boland, a member of the Middle America Paleontological Society, and take the form of appeals to lobby various US senators and congressmen for support or opposition to proposed legislative amendments. The APS receives many of these journals as exchange bulletins, and members interested in the details of this ongoing battle should check the APS library.

A summary of some of the current collecting rules:

- No collecting (of anything) is allowed on National Park System lands, National Landmarks lands, Wilderness lands and "other designated areas".
- Collecting on Fish and Wildlife lands requires a permit.
- Bureau of Land Management lands and Forest Service lands have similar rules:
  - Petrified wood may be collected from these lands up to a limit of 250 pounds per year.
  - Pooling of quotas to remove specimens greater than 250 pounds is not allowed.
  - Use of explosives or heavy equipment to excavate petrified wood is prohibited.
  - Petrified wood may not be sold or bartered to commercial dealers.
  - Except where posted or otherwise prohibited, rocks, minerals, "common invertebrate fossils" and semiprecious gems may be collected in "reasonable amounts", for non-commercial uses.
  - Commercial sale of material collected on these lands requires a federal contract* or permit.

The January, 1992 edition of *Trilobite Trails* contains a reprinted summary of collecting regulations for the states of Colorado, Kansas, New Mexico, Utah and Wyoming. This summary quotes passages from legislation and lists addresses of state agencies to contact for more information. See *Trilobite Trails* in the APS library.

* See Mark Twain's short story *The Facts in the Great Beef Contract* (1870) – ed.

REVIEWS
from Les Adler

Return of the Flying Dragons: The Illustrated Encyclopedia of Pterosaurs by Dr. Peter Wellnhofer, Salamander Books; $25.00

The following review has been collated from Mike Taylor's review in *New Scientist* (14 September 1991, page 51); from the information on the slip cover; and from my own perusal of the book —*LA*

If you already own *The Illustrated Encyclopedia of Dinosaurs* by Dr. David Norman ("the best dinosaur book on the market"—*Journal of Vertebrate Palaeontology*) you will find that *Pterosaurs* is an excellent companion volume.

Wellnhofer begins with the history of pterosaur research since the 18th century and a general description and introduction to the anatomy of pterosaurs, followed by a chronological account (Triassic, Jurassic, Cretaceous) of all known kinds, mostly from Germany and Brazil [Locally, *Quetzalcoatlus* with a wingspan of 12 metres has been found at Dinosaur Provincial Park]. He concludes with a look at other flying vertebrates and a reassessment of the major problems of pterosaur biology: the exact nature and size of the wing membrane (seemingly stiffened with horny rods); and the manner of movement on land (probably quadrupedal). The cause of their extinction is uncertain.

There are more than 600 pictures, including 255 photographs, more than 250 detailed line drawings and 100 explanatory diagrams, mostly in colour, showing specimens, palaeoenvironments, scientists, museums, family trees and time charts.

John Sibback is the artist who has provided 16 double-page-spread colour restorations featuring all the best-known pterosaurs. This is a book you can keep coming back to and always thoroughly enjoy doing so.

This View of Life: The Reversal of *Hallucigenia*, by Stephen Jay Gould, *Natural History*, January 1992, pp. 12–20.

In reading this article, you will have to be prepared to study onychophorans. Biologists realize that there are some creatures whose body parts are similar to those of different groups of animals. Into what classification do you shoehorn these invertebrates? Perhaps onychophorans belong to a phylum which could be inserted between the Arthropoda (creatures with segmented limbs) and the Annelida (segmented worms). Arthropod legs are truly segmented, while onychophoran legs, or 'lobopods' are constructed on an entirely different pattern. To solve this problem, palaeontologists look to the fossil record.

Due to fortunate circumstances of discovery and of preservation, several types of fossils are now being identified as onychophorans: *Aysheaia,* of the Burgess Shale; *Xenusion,* of Europe; *Microdictyon,* a plated creature of the Chinese Chengjiang fauna—a Burgess Shale equivalent; and possibly another onychophoran with plates, *Luolishania.*

In 1977, Simon Conway Morris described *Hallucigenia,* a bizarre-looking creature apparently having stiff spines for legs and a row of tubes on its back. Scientists couldn't see how it could function. In 1991, Swedish palaeontologist L. Ramskold and his Chinese colleague published "New Early Cambrian Animal and Onychophoran Affinities of Enigmatic Metazoans" in the journal *Nature* (Vol. 351, pp. 225-228). In this report, *Hallucigenia* is turned upside down and fitted in with other possible onychophorans.

Taking these findings, together with fossils from slabs of Burgess Shale in the American Museum of Natural History and other specimens from Greenland, Gould concludes that the onychophorans were once a widespread group. Other phyla ,such as priapulid worms and polychaete worms were also much more widespread, but their fossils are scarce or non-existent.

Scientists have a model for the evolution of life forms—the cone of increasing diversity, which Gould says is wrong and that scientists have things backwards. By turning *Hallucigenia* upside down, scientists have probably taken a large step toward getting the history of life right side up.

Luck of the Draw, by Neil H. Landman, *Natural History,* December 1991, pp. 68–71.

This article is a review of the book *On Methuselah's Trail: Living Fossils and the Giant Extinctions*, by Douglas Ward (212 pp., illus., US$19). Ward deals with *Lingula* (a brachiopod), coelacanths, mass extinctions, the rise of multicellular animals and land plants, ammonites, sea levels, and asteroids. Ward's specialty is ammonites; consequently the book places a heavy emphasis on the evolution of the cephalopods. Ward indicates that a species' survival depends on the gaining of a competitive edge, with an element of luck thrown in as well.

REVIEWS
from Les Adler (continued)

End of the Proterozoic Era by Andrew H. Knoll, *Scientific American*, October 1991, pp. 64-73.

Professor Knoll of Harvard University is the recipient of the Charles Schuchert Award of the Paleontological Society of America and of the Charles Doolittle Walcott Medal of the National Academy of Sciences. His main interest is in the evolution of life, which he pursues in remote areas of the high arctic (Spitzbergen), the Australian outback, and the African Namib desert.

The questions asked herein are: why did animals appear so late in the evolutionary "day"? Why, once the basic blueprint of life was drawn, did animals not emerge for more than three billion years? Is the fossil record misleading? Is it possible that animals are far older than the record suggests? The ancestors of modern trees and terrestrial animals first colonized land about 450 million years ago. Macroscopic animals did not appear in the oceans until about 580 million years ago– 85% of the way through life's history.

Earth history is divided into 3 eons—the oldest is the Archaean, earth history from its origin until 2.5 billion years ago; the most recent is the Phanerozoic, which began with the expansion of skeleton-forming organisms 540 million years ago. Separating them is the Proterozoic eon which lasted 2.1 billion years.

Knoll and Swett have examined a thickness of 7,000 metres of essentially unmetamorphosed sedimentary rocks at Spitzbergen in the high Arctic. These rocks reflect shallow ocean conditions about 600 to 850 million years ago that predate the well documented Ediacaran fauna. The Spitzbergen fossils represent a variety of habitats and also belong to morphologically and taxonomically diverse taxa. In addition, prokaryotes—simple organisms whose cells lack nuclei and other organelles—are represented by bacteria including cyanobacteria virtually indistinguishable from those of today, and eukaryotes which include single-celled protozoans and algae, as well as multicellular plants, animal and fungi. The single-celled eukaryotes underwent marked diversification, evolutionary turnover and extinction more like those of Phanerozoic plants, animals and microplankton. Butterfield found multicellular algae (seaweeds) in strata about 800 million years old, but there are no indications of animal life.

On page 66-67 a chart is presented which indicates the evolution of representatives of 27 phyla through 4300 million years including Archaebacteria, Eubacteria and Eukaryotes. There are photographs of specimens and diagrams of photosynthesis, oxygen production and sinks, and radioactive carbon ratio graphs. One diagram indicates a major environmental change 800 to 600 million years ago, Knoll suggests that the Spitzbergen results reflect results worldwide and gives reasons. The conclusions are backed up by worldwide occurrences of Late Proterozoic iron formations and glacial tillites, which indicate four major ice ages. Knoll correlates radioactive carbon ratios with these periods and also of low radioactive strontium readings in seaweed. A lengthy discussion leads to the idea that the end of the Proterozoic was beset by change. Strong hydrothermal activity related to continental breakup and mountain building occurred, while the oceans underwent episodic stagnation accompanied by oxygen depletion. At the same time there was considerable climatic change. The Ediacaran radiation is related to an increase in atmospheric oxygen.

From this scenario, answers may be found to the questions posed earlier. Knoll's hypothesis is that the modern world arose when biogeochemical cycles linked the physical and biological earth in profound change at the end of the long Proterozoic eon.

An Octopus Garden, by Richard B. Aronson *Natural History*, February 1991, pp. 30-37; with 5 photographs and 2 reconstructions.

Aronson describes the situation at Gregory Town on Eleuthera Island in the Bahamas. This location is a cultural anachronism relative to many other parts of the world in the late 20th century. He then details an apparent biological anachronism at nearby Sweetings Pond. Aronson describes biological investigations in several areas, and draws conclusions relative to the past.

The composition of the marine fauna at the pond seems to be comparable to the shallow seas of the Paleozoic era—there are tens of thousands of brittle stars (*Ophiothrix oerstedi*) with a density of at least a hundred times that seen at other locations. The population density of octopuses (*Octopus briareus*) is also 100 times greater here than elsewhere. The lack of natural predators allows the presence of octopuses in large numbers, so that Aronson could study them.

Aronson suggests that the octopuses occupy a niche similar to that of cephalopods of the past. He also examines Permian and Cretaceous extinctions. He states that ecological anachronisms like the one at Sweetings Pond and also at Bay Stacka in the Irish Sea illuminate the role predators have played in shaping communities over geological time. While mass extinctions precipitated enormous and rapid changes in ancient marine communities, the evolution of fishes and crustaceans has had equally dramatic effects. The highly efficient feeding innovations that arose during the Mesozoic marine revolution were not lost at the end of the Cretaceous. Many of the new predators survived the mass extinction. Today, their descendants dominate life in shallow waters, relegating the masters of the Paleozoic seas to relative obscurity.

Review of *The Dinosauria* by Kevin Padian, *Journal of Vertebrate Paleontology*, Vol. 11, No. 2, June 20, 1991, pp. 263–266.

[to prevent any confusion on the part of readers: the following is, in effect, a "review of a review" –ed.]

The Dinosauria, edited by David B. Weishampel, Peter Dodson and Halszka Osmolska (1990; ISBN-0-520-06726-6, CDN$104) is a 745 page compendium with a list of abbreviations, a foreword, an introduction, a bibliography, two indices and 29 chapters, featuring the work of 23 dinosaur specialists including virtually all recent contributors to the literature, which should be clear to any scientifically literate person from advanced undergraduates on up. This book is an instant classic because there is simply no book like it for depth and breadth of coverage, nor is there likely to be for a great many years to come. The book was thoroughly planned and this initial plan has been adhered to. The text is neatly laid out, the chapters are well written and the illustrations for the most part clear and helpful, and usually large enough to be of use, although the scale is sometimes left out.

The contents include an introductory chapter on the origin and interrelationships of dinosaurs, the advances in systematics of the key features of archosaurian evolution and of the contrasts between dinosaurs and other forms. Dinosaur taxa are listed but one must realize that the list will soon be out of date. Dinosaur paleobiology is discussed, and also extinctions. The book is comprehensive, well written, expert in coverage and beautifully designed. It is suggested because of the price that a nearby library be asked to obtain a copy.

Each taxonomic chapter is organized in topic order: Diagnosis, Anatomy, Evolution/Phylogeny/Systematics, Taphonomy, and Palaeoecology/Biogeography/Behaviour.

A cladogram is a graph of synamorphies across taxa that share them, usually arranged according to some criterion of parsimony or other operative principle. To make a cladogram you need a character matrix. Unfortunately this volume does not provide the necessary matrices.

Padian's review discusses the patterns of cladograms as hypotheses of relationships, impaired by convergences and reversals, which guide palaeontologists to the investigation of biological processes. There are no pat cook-book methods to do this. There are also problems in defining families. The challenge to palaeontologists is, where are they to go from here, and how do they proceed?

Kevin Padian congratulates the authors and editors for an historically unparalleled compendium of information and well thought-out interpretations of the dinosaur fossil record, and for a volume that will stimulate new work for years to come.

Murder and Mayhem in the Miocene, by Kenneth J. McNamara, *Natural History*, August 1991, pp. 40–47.

McNamara focused his studies on the three species of the genus *Lovenia*, an extinct heart-shaped sea urchin which existed in the Miocene Epoch, 25 to 10 million years ago. The area of study ranges from the Nullarbor Plain in South Australia to the Murray River Basin, to the cliffs of the western Victoria coastline in Australia.

Sea urchins are preyed upon by many biological species (including man). The animals have spines which allow them to burrow into sediment to evade predators, and tube feet which allow the sea urchin to obtain food from the sediment and to sense the environment.

About 30% of the fossil sea urchins from the Murray Cliffs have circular holes 2–3 mm. in diameter, almost certainly made by marine snails of the family Cassidae. *Lovenia forbesi* became extinct at the end of the early Miocene and was replaced by another form. This form from the Victoria cliffs shows a 20% rate of 'murder' by the cassids and a change to deeper water sediments. McNamara claims that, based on fossil evidence, the sea urchins migrated to deeper water to escape the predation of the snails. Also, as the sea urchins became larger and flatter, the cassids also became larger. The heart shape also developed to help the sea urchin escape predation.

While the urchin-bearing fossil deposits of Australia attest to the extent of murder and mayhem in the Miocene, they also provide a vivid insight into the important role that predation plays in directing the course of evolution.

[*Some APS members were lucky enough to receive specimens of* Lovenia forbesi *from Les—check your specimens for snail drill-holes! –ed.*]

FOSSILS UNDER GLASS

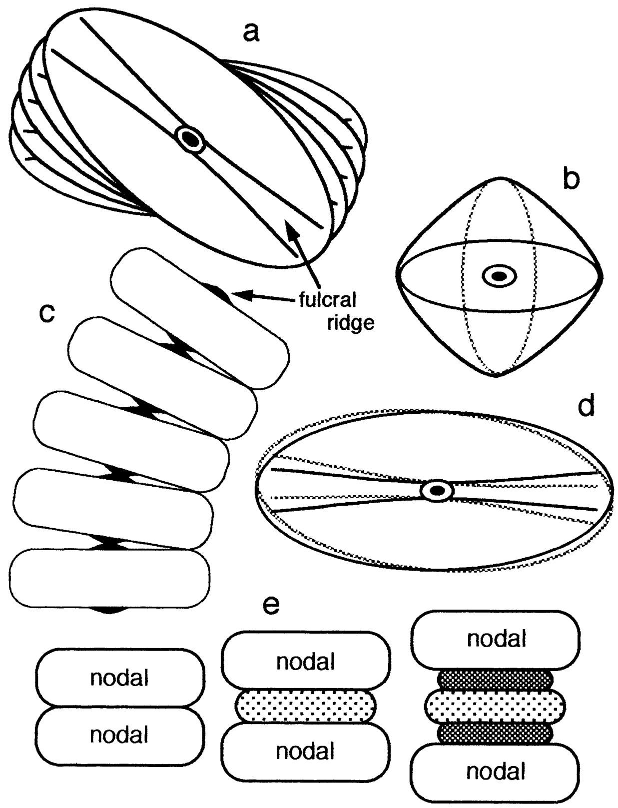
by Howard Allen

Trampled underfoot in the scramble to get to the bigger and more glamourous brachiopods and trilobites are the neglected but no less fascinating crinoid columnals—fascinating in the variety of their elegant geometric shapes, as well as in the functional utility these shapes reveal.

Columnals, or ossicles, are the building-blocks of the crinoid stem. Each columnal is composed of a single crystal of calcite, a fact which is obvious when observing a broken columnal: breaks occur along flat, crystallographic cleavage planes. New columnals develop near the base of the calyx. In *homeomorphic* stems, the columnals are more or less identical in size and shape, being simply added consecutively at the top of the stem. *Heteromorphic* stems are often characterized by *cirri*, thin arms or branches attached at intervals to the columnals. Columnals bearing cirri are referred to as *nodals,* and bear small sockets where the cirri once attached (the circular columnal with long, radiating rays shown on the cover is a nodal). In heteromorphic stems, the nodals develop at the top of the stem, and intervening columnals (*internodals*) are inserted between the nodals (figure e). Insertion of internodals proceeds in this manner until a new nodal is formed at the top of the stem, then the cycle repeats.

The ossicles shown on the cover can be divided into two groups based on their surface markings, which control the type of articulation between adjacent columnals. The first group, including the pentagonal and two circular ossicles with radiating ridges and grooves (*crenulae*) are articulated by interlocking the crenulae on adjacent faces. The columnals are glued together in life by a thin layer of ligamental fibres. This interlocking arrangement obviously allows very little flexibility, and would result in a relatively stiff stem, capable of bending only a small amount in any direction.

The second group of ossicles is recognized by an elevated elliptical region, bearing a longitudinal bar called the *fulcral ridge.* As the name implies, this ridge acts as a fulcrum, allowing adjacent columnals to rock back and forth teeter-totter fashion, while being held in place by the ligamental fibres attached inside the ellipse. This type of articulation is designed for flexibility (fig. c). Crinoids with this sort of stem were likely adapted to living in strong currents, where flexibility would allow the crinoid to be buffeted without breaking.



An interesting aspect to this type of columnal is the fact that the articular facets (ellipses) are often skewed slightly on opposite faces (fig. d), causing the stem to spiral upward (fig. a), like a twisted ribbon. In the extreme case, the articular facets are skewed by 90° (fig. b, and the lozenge-shaped ossicle on the cover), allowing the stem to bend equally in all directions, like the universal joint in a car's drive-shaft.

Crinoid columnals are preserved in Paleozoic formations by the countless trillions. Indeed, they often constitute a considerable bulk of formations such as the Banff, Pekisko, Livingstone, and other carbonate rocks throughout the world. It is therefore not surprising that they are often taken for granted. These little gems deserve more than just the sole of your boot. The *Treatise* has nearly 30 pages dealing with features of crinoid stems alone. If this whets your appetite for things crinoidal, the *Treatise* offers an excellent introduction to the mind-numbing complexity and variation of these animals—but be warned—learning the Crinoidea may be on a par with learning Japanese.

Reference:

Ubaghs, G., 1978. *Skeletal Morphology of Fossil Crinoids,* pp. T58–T229 in Moore,R.C. and Teichert, C., eds.*Treatise on Invertebrate Paleontology*, Part T, Echinodermata 2, Vol. 1. Geological Society of America and The University of Kansas.

DINO SAUR 恐龍 ™

DINOSAUR PROJECT EXHIBITION SET TO OPEN MAY OF 1993

The Ex Terra Foundation's travelling Canada/China dinosaur exhibit, to be called "The Greatest Show Unearthed", is scheduled to open in Edmonton in May of next year, after a year's delay. Although still in the 'design development phase' (letter from Jack P. Wojcicki to Betty Quon, dated April 30, 1992), the show is set to run May 14 through July 25, 1993 on a site above the North Saskatchewan River, near the Edmonton Convention Centre.

The show, expected to draw 500,000 visitors during its Edmonton run, will highlight the results of five years of field work in China, the Alberta badlands and the Canadian Arctic. Included in the exhibition will be the remains of 11 new dinosaur species, ranging in age from Jurassic to Late Cretaceous.

Along with a package of promotional material, Betty received a tentative list of museum specimens to be displayed at the show. Part of this list includes:

Specimens	Type
Troodon	partial skull cast
Velociraptor (partial)	original
Sinornithoides	original
Mamenchisaurus (3 cervicals + skull)	original
Arctic hadrosaur material	original
New large theropod (*Sinraptor)*	original + cast
Oviraptor (partial skeleton)	original
Protoceratops (3 skulls, incl. baby)	original
Segnosaurid—new species, China	original + models
Embryonic *Pinacosaurus*	original
Dinosaur eggs (4 types)	original
Nests (2)	original
Champsosaur	original
Crocodile (skeleton + skull)	original
Armoured lizard	original
Turtles (4)	original
Mammal fossils	original
Tree stump	original + cast
Tracks—Grande Cache, Alberta	original
Bellosaurus—juvenile sauropod skel.	original
Hypacrosaurus babies + adults	originals + casts
Tyrannosaurus rex	original + cast
Pachyrhinosaurus—juvenile material	original + cast
Amber with insects	original
Microvertebrate material	original
Plants	original

See articles in the December 1990 and June 1991 editions of the *Bulletin* for earlier articles on the Dinosaur Project. More information will probably be forthcoming.

FIELD TRIPS 1992

This is an update on the announcement in the last *Bulletin.* Three field trips are planned for this summer; all dates may be considered **firm**. Les Fazekas will be contacting those who have signed-up about one week prior to each field trip, to confirm your attendance, and to provide details on where to meet, etc. If you have any concerns that require more urgent attention, or if you still wish to sign-up for any trips, please contact Les at 248-7245. Happy hunting!

TRIP 92-1: June 20–21, 1992 Ravenscrag Butte, Saskatchewan

Well-preserved Early Paleocene plant fossils occur in the Ravenscrag Formation at this locality in southwestern Saskatchewan.

TRIP 92-2: July 18, 1992 Scabby Butte, Alberta

Site of one of the earliest dinosaur discoveries in western Canada, a wide variety of vertebrate fossils, including various fish teeth, crocodile and turtle remains and dinosaur bones and teeth have been recovered from this isolated exposure of the St. Mary River Formation (Maastrichtian) north of Lethbridge, Alberta.

TRIP 92-3: August 15, 1992 Huxley, Alberta

A magnificent specimen of the Tyrannosaur *Dynamosaurus imperiosus* (on display at the Royal Tyrrell Museum of Palaeontology) was excavated from the Upper Cretaceous Scollard Formation at this locality in the Red Deer River badlands. Northeast of Three Hills, Alberta, this site also has an important exposure of the Cretaceous/Tertiary boundary.

As in previous years, you are advised that most of these visits may involve a fair amount of walking and/or scrambling over hot, dry terrain: bring proper footwear, hats, sunscreen, lunch, and lots of water (in order to guarantee a nice day, bring lots of rain-gear as well!).

For more information, contact Les Fazekas at 248-7245.