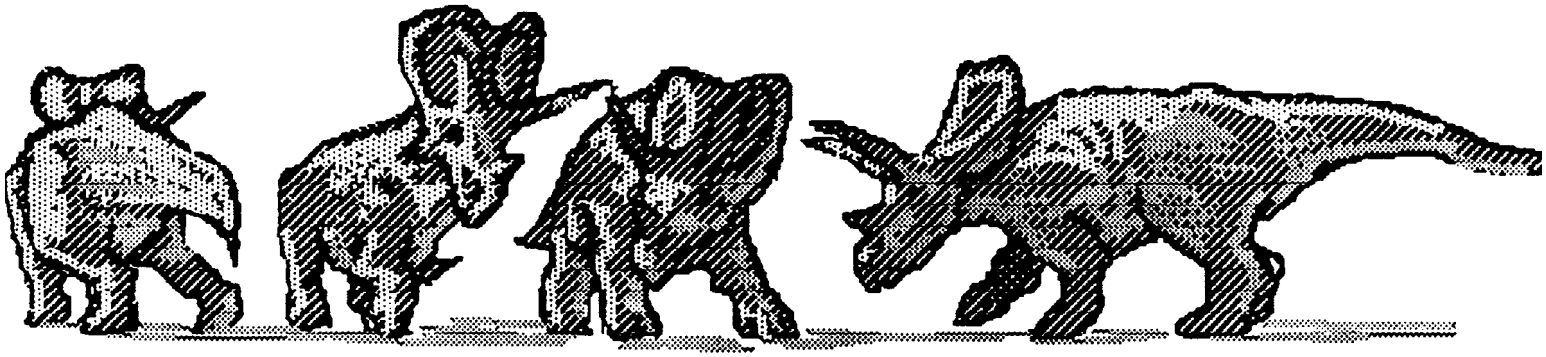
BULLETIN



Jeff Doten '89

ALBERTA PALAEONTOLOGICAL SOCIETY

VOLUME 4, NUMBER 4

DECEMBER 1989

ALBERTA PALAEONTOLOGICAL SOCIETY

The Society was incorporated in 1986, 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) Preserve 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

OUR BULLETIN WILL BE PUBLISHED QUARTERLY: March 1, June 1, September 1, and December 1 annually

DEADLINE FOR SUBMITTING MATERIAL FOR PUBLICATION IS THE 15TH OF THE MONTH PRIOR TO PUBLICATION

Mailing Address:

Alberta Palaeontological Society
P. O. Box 7371, Station E
Calgary, Alberta, Canada
T3C 3M2

BULLETIN BACK ISSUES: Back issues of the Bulletin are available at $2.00 per copy. A limited number are available.

NOTICE: Readers are advised that opinions expressed in the articles are those of the author and do not necessarily reflect the viewpoint of the Society.

PRESIDENT'S MESSAGE

Donald Sabo

With the decade and year fast drawing to a close, it is a time to think back and reminisce about the 1980's for oneself and for the Society. Reading back through my notes and previous Bulletins, I picked out just a few of the many highlights that have taken place within the Society.

-the "Fossil Group" begins meeting informally during the Fall of 1983
-founding of the Alberta Palaeontological Society in January 1986 with the first Executive formed and the first Bulletin published
-the first field trip of APS takes place in the Tolman Bridge area during June 21-22, 1986
-the Societies meetings were moved to Mount Royal College in the Fall of 1986
-Dr. Phil Currie of the Tyrrell Museum gives his first presentation to the Society on February 20, 1987
-Anna Curtis and Mark Rasmussen of Alberta Culture explain the controversial Bill 11 to the Society members at the January 1988 meeting
-during 1989 the Society mebbership grows

As you can see, our Society has come a long ways from those first informal meetings as the "Fossil Group". We are a fast growing Society with members from both the professional and non-professional side of palaeontology joining together to share a common interest in this fascinating subject.

The next decade I'm sure will be even more rewarding for the Society and its members than the last, as we continue to learn and grow together. A new Executive was recently voted into office to help lead us into the 1990's with Percy Strong as our new President. I look forward to continue working with Percy and the new executive as your Past-President and Director of Programs and Education, and wish to thank the past Executive for all their hard work and dedication.

I wish you all a Merry Christmas and a Happy and Prosperous New Year.

*****

DUES

The Dues for 1990 are now payable. If you have not already paid please do so. Dues for 1990 remain the same:

Single membership: $10.00

Family or Institution: $15.00

Please make your cheque or money order payable to the Alberta Palaeontological Society and send to the attention of the Membership Director or the Treasurer. Your dues should be in by February 1, 1990.

*****

NEW MEMBERS

The following people have recently joined the Society.

Names and contact information removed to protect members' privacy.

ADDRESS CHANGE

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ELECTION

The annual election of the Society was held in November. The new officers and directors will take over in January. The following changes were made: Percy Strong becomes President, Don Sabo becomes Past-President and Director of Programs and Education, and Darren Tanke becomes Membership Director. Steffie Negrich did not stand for re-election and we thank her for all her efforts as membership director.

No one was willing to take the position of Vice-President. We could use some new people on the executive as some of the present members would like to step down. It would also be nice to have some new ideas and different points of view.

*****

FOSSILS AND RADIATION

Dale Speirs

These days there is a hue and cry about nuclear powerplants and the problem of radioactive wastes. While not minimizing these problems, it must be said that radiation per se is not necessarily harmful, only the doseage and type of exposure. We are constantly exposed to natural background radiation, against which our species evolved. This radiation has been declining over the last few billion years, as radioactive elements break down and disappear. It follows therefore, that the further back in time we go, the greater the background radiation. Was this radiation a driving force for evolution?

Although it may seem to many that one radioactive element is as dangerous as the next, this is only true in large amounts. In dust specks or single atoms, each radionuclide poses a different risk to lifeforms. Plutonium is not the most hazardous element. Many decaying elements are not poc'erful enough to penetrate very far into the body and damage critical cells. As a result, animals can accumulate radionuclides without too much harm. An example of this is the Devonian armoured fish Homosteus, from the Scottish deposits. The bones of this fossil fish are so radioactive that they can be photographed by an autoradiograph, using only the alpha particles emitted by the fossil to take the picture (Diggle and Saxon 1965). The deposits in which these fossils are found also contain other species of fish which are not radioactive, therefore the radioactive bones are not due to the depositional environment. Homosteus was a bottom scavenger, and it is thought that radioactive particles were ingested while foraging in bottom sediments, then concentrated into the bones and liver. This genus persisted for millions of years, so the radiation could not have been that damaging.

Since radioactive elements were commoner away back when, it should not have been too surprising to French scientists when they discovered a fossil fission reactor in 1972. Located at Oklo, Gabon, this 1.7 billion-year-old natural reactor existed a billion years before life evolved into the more complex animals and plants. At that time, however, algae existed. During this Precambrian age, uranium sediments were washed into a sedimentary basin and concentrated in layers which happened to be free of boron and cadmium. Those two elements absorb neutrons and prevent fission reactions. Without them around, the uranium, more radioactive in those days, could ignite in a fission reaction. Layers of clay deposited over the uranium confined water in the Oklo reactor. The water heated up into steam. For about 70,000 years the Oklo reactor bubbled and boiled like a simmering pot, leaving behind decay products that can only exist via nuclear fission (Brabyn 1972, Drozd et al 1974). Such a natural reactor could not exist today, since radionuclides are not present in the proper amounts.

REFERENCES:

Brabyn, H (1972) A Precambrian nuclear reactor. NEW SCIENTIST 56:342-343

Diggle, WR, and J Saxon (1965) An unusually radioactive fossil fish from Thurso, Scotland. NATURE 208:400

Drozd, RJ, CM Hohenberg, and CJ Morgan (1974) Heavy rare gases from Rabbit Lake (Canada) and the Oklo mine (Gabon): Natural spontaneous chain reactions in old uranium deposits. EARTH AND PLANETARY SCIENCE LETTERS 23:28-33

MEDICINE HAT AND MANYBERRIES
Field Trip
August 19-20,1989
Leaders: Hope Johnson and Harvey Negrich

by
Gerry Morgan

Approximately a dozen members assembled in sunny weather on Saturday morning in the small town of Redcliffe approximately 9 km north-west of Medicine Hat, some having driven down the previous evening while a few early risers had made the approximately 3-hour drive that morning. Those of us who had not met Mrs. Johnson before had the pleasure of being introduced to her at this time. Mrs. Johnson, who has lived in Redcliffe for a number of years, was the illustrator and co-author (with J.E. Storer) of "A Guide to Alberta Vertebrate Fossils from the Age of Dinosaurs", published by the Provincial Museum of Alberta in 1974.

At about 10:15 the group set off for a location on the north side of the South Saskatchewan River about 24 km west of Redcliffe. This site had been selected by Mrs. Johnson who had obtained permission from all the farmers whose land had we had to cross. About half an hour later we parked our vehicles close to the rim of the quite spectacular valley of the South Saskatchewan River which here is about 400 feet deep and less than half a mile wide. At this location the cliff consists of the basal part of the Oldman Formation, making up the upper third of the cliffs, overlying the Foremost Formation.

The Oldman Formation is the same continental unit that occurs in Dinosaur Provincial Park, and Mrs. Johnson, who has been collecting vertebrate fossils at this locality for a number of years, advised us to confine our collecting to this unit. Members spread out in the general vicinity and spent an enthusiastic four or five hours hunting for specimens and examining the local geology, taking a break in the middle of the session to have a picnic lunch and compare finds.

The area yielded quite a variety of specimens, both small and large, and by the end of the day most members had obtained a reasonable collection. Mrs. Johnson in particular showed that she had a very sharp eye for finding the smaller material such as crocodile and hadrosaur teeth, Lepisosteus (garpike) scales and fragments of turtle carapace. Some larger finds were also made, such as hadrosaur vertebrae, a particularly good specimen of which was found by Les Adler, and Roslyn Osztian found an exceptionally well-preserved pedal phalanx (toe bone), also of a hadrosaur.

On Saturday evening Mrs. Johnson kindly invited members to her house after dinner where we spent several pleasant hours examining her collection of fossils and also viewing a number of her paintings and drawings, including the original of the badlands landscape which appears on the front cover of "A Guide to Alberta Vertebrate Fossils ..." mentioned earlier.

That evening most of us, especially those under canvas, were kept awake by the sound of very heavy rain, which appeared to last at least a couple of hours, and an element of doubt about the following day's activities must have crossed many of our minds. The next morning, however, revealed a largely clear sky and a ground which after a dry summer appeared to have soaked up most of the overnight precipitation.

After some discussion it was agreed to spend Sunday at some exposures of the marine Bearpaw Shale in the area to the east of the small town of Manyberries, where numerous intermittent badland-type exposures of the Bearpaw occur over a large area. After the approximately 80 km drive south from Medicine

Hat a couple of hours was spent at each of two localities about 15 and 10 km east of Manyberries respectively. By this time the sun was again shining out of a more or less completely blue sky and there was no evidence in this area of any overnight rain. At both locations members found fairly abundant but usually weathered and incomplete specimens of Baculites and Placenticeras.

At the second locality the writer, who had not previosly been in this region, noticed some rather unusual surface features. They took the form of a number of almost perfectly straight outcrops, typically about 18 inches wide, of what was obviously a rock more resistant to erosion than the surrounding material as they tended to form the highest part of quite prominent straight ridges. They therefore had all the appearances, at least at at distance, of igneous dikes. Close inspection of the actual rocks, however, revealed that they were sandstone! I was aware that "sandstone dikes" have occasionally been described in the literature, but unfortunately by this time (about 2 pm.) most members had already started on the long journey back to Calgary and I did not have the opportunity to discuss these features with anyone else. On returning home I was interested to read in Russell and Landes (Geology of the Southern Alberta Plains, Geological Survey of Canada Memoir 221, 1940) a short discussion of these features, which are indeed sandstone dikes. They are apparently fairly common in the area, but at the time of writing of Memoir 221 their exact mode of origin was uncertain. There may be more recent discussion of these features in the literature if which I am not aware.

Those of us who drove back on route 61 through Pakowki and Foremost enjoyed good views of the prominent masses of the Sweetgrass Hills about 70 km south, just over the border in northern Montana. These hills are composed of igneous rocks called syenites (related to granites) that were intruded in the early Tertiary about 52 million years ago.

I'm sure all of us who took part in this most enjoyable trip would like to thank Mrs. Johnson and Harvey for all the effort they put into planning and organizing this event.

*****

REVIEWS

Program: October 20,1989. Paleopathology in Dinosaurs, presented by Darren Tanke, Tyrrell Museum of Palaeontology Reviewed by Heather Whitehead

Darren gave us a preview of the talk and slide show which he will be giving to the Society of Vertebrate Paleontology. The talk explored the location and frequency of paleopathology (including both injury and disease) in 2 groups of dinosaurs: ceratopsians and hadrosaurs Paleopathology is interesting in its own right, and can be used to indicate behavior. The study of paleopathology has experienced renewed interest, after being dormant since the 1930's.

Ceratopsians: The three well studied monospecific ceratopsian bonebeds in Alberta contain bones from numerous dinosaurs of various ages. These animals, with their horns and frills, are often depicted in fights between members of the same species. Such fights should have resulted in injuries which would be visible in bone, but of 12250 bones so far studied from the Grand Prairie Pachyrhinosaurus bonebed, only 16 showed evidence of injury (this despite a bias for collecting any bones with evidence of possible pathology).

The injuries which are present occur in specific body areas, including frills, ribs, toes, and tails. Tail caudal spine fractures could result from being stepped on by other herd members. Toe stress fractures could occur during running. Rib fractures are mostly seen in lower, rearward ribs, and may have occurred as males engaged in strength contests similar to those engaged in by

modern bison.

The low frequency and the body locations of paleoinjuries suggest that horned dinosaurs were not aggressive fighters, but instead probably used threat and display to intimidate rivals.

Hadrosaurs The paleopathology of duckbill dinosaurs has so far been studied on the basis of individual finds, rather than on an analysis of bonebeds. About 85% of the Tyrrell paleopathology specimens are of hadrosaur origin.

The pattern of injuries can be used to infer behavior. For example, there are few injuries to forelimbs, suggesting that hadrosaurs did not regularly run on all four feet. Articulated specimens with multiple simultaneous rib fractures suggest a kick injury, perhaps during aggressive behavior between rival males. Broken and healed tail vertebrae again suggest tail step injuries from other herd members. By far the most frequent injury site is the base of the tail where caudal spine breaks may have occurred during mating behavior (if, so high spine species should show more of these injuries).

Evidence of disease in both groups of dinosaurs is more difficult to evaluate. Genetic abnormalities, infected injuries, and bone changes due to disease can look similar.

Predation injuries would generally be fatal, and not preserved in the fossil record. Occasional major healed trauma has been seen, with samples from both China and Alberta.

Thanks Darren for a really interesting talk - hope we will hear more after the SVP.

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Program: November 17,1989. Permian Vertebrates and Fossil Sedimentology, presented by Dr. Dave Eberth, Tyrrell Museum of Palaeontology Reviewed by Heather Whitehead

Dr. Eberth's talk explored the relationship between palaeontology and sedimentology, and gave examples from his research showing how the two can yield a predictive, testable model. Clues from sedimentology can indicate whether a fossil assemblage was a fauna co-existing in time and place or a chance accumulation over time.

Lower Permian, Cutler Formation, New Mexico: The rocks are sandstone - mudstone sequences, similar to Alberta badlands formations except for their red colour. The sands and muds were carried by rivers to inland basins between uplifted fault blocks on the Pangean supercontinent.

Vertebrate finds include freshwater fish and sharks, amphibians (the dominant terrestrial land form), transitional amphibian-reptile forms, and reptiles, including Dimetrodon, and more advanced, mammal like reptiles. Vertebrate finds are common in parts of the formation, but extremely rare otherwise. A sedimentological approach was used to determine why.

The whole sandstone package was deposited by braided rivers, but the fossil rich areas had a different geometry, areal extent, and origin. The fossil poor areas represented channel deposits, with extensive reworking, while the fossil rich areas represented between channel flood deposits, which were accumulating rapidly with little reworking. Whereas flood events normally sweep out sediments, in this area there was a topographic rise down channel which caused

the river to back up during flood, slowing its velocity, causing deposition.

Late Cretaceous, Judith River Formation, Dinosaur Provincial Park: These sandstone - mudstone sequences were deposited on the western coastal plain, where rivers flowing east from the rising Rockies entered the Cretaceous seaway. There is a distinct colour change, with overall darker strata deposited above overall lighter strata. Fossil content differs, with most dinosaur macro remains occurring in the upper, darker strata. The lower strata yield vertebrate microfossils, trace fossils, and invertebrates.

Sedimentological analysis indicates the lower, lighter strata were deposited by rivers with straighter channels, seasonal flow, and no tidal influence; the upper, darker strata by rivers with more meandering channels, perennial flow, and a tidal influence. The tidal influence acted like the topographic high in the Permian example, causing the river to back up and deposit its sediment and included fossils. Channel areas would have been reworked, but interchannel flood deposits generally would not, and it is these areas which yield macrofossils

In both study areas, the closest approach to a real faunal assemblage is seen in the flood plain deposits, which represent short term events. Use of sedimentology can help to pinpoint promising areas for future exploration.

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BOOK REVIEWS

Wonderful Life: The Burgess Shale and the Nature of History by Stephen Jay Gould, W.W. Norton and Company, New York, 1989. 347 pages, $27.95.
Reviewed by Howard Allen

Fans of Stephen Jay Gould, the Harvard palaeontologist, evolutionary biologist and science historian (to list but a few of his many intellectual hats) will be pleased with his latest foray into "popular" science, a volume of interest to Canadian palaeontologists in particular.

Some of Gould's later works, particularly Time's Arrow, Time's Cycle, and to a lesser extent, An Urchin In The Storm (both of 1987) seemed to be getting a bit profound and philosophical for general consumption. Happily, Wonderful Life marks a return to the spirit of his lively and entertaining (but no less thought-provoking) essay collections such as The Panda's Thumb (1980) and Hen's Teeth and Horse's Toes (1983), with their wildly eclectic themes ranging from geological catastrophism to the evolution of Mickey Mouse.

Wonderful Life is a tribute to Canada's spectacular but often publicly neglected Burgess Shale fossils. Gould boldly states, on the first page of Chapter 1:

> Without hesitation or ambiguity, and fully mindful of such paleontological wonders as large dinosaurs and African ape-men, I state that the invertebrates of the Burgess Shale, found high in the Canadian Rockies in Yoho National Park, on the eastern border of British Columbia, are the world's most important animal fossils.

Gould's fascination with the Burgess Shale was revealed to his readers in The Flamingo's Smile (1985), wherein the Burgess fossil Hallucigenia is described as the "damned strangest thing I've ever seen in my life". This strangeness which suffuses most of the Burgess animals is the key to the importance of the fossils and to the main theme of Wonderful Life.

Gould begins by showing us how the traditional icons of evolution, the "tree of life" and "ladder of progress" became entrenched in modern thinking. Together, these two metaphors represent multicellular life's beginnings in the early Cambrian with a few simple and primitive forms, gradually branching outward and upward through geological time into greater diversity with steady improvements in design until the ultimate and inevitable pinnacle of success (namely us) was produced. Unfortunately, the Burgess Shale fossils fly in the face of this tradition, as Gould ably demonstrates.

In Chapter 2 we are given a brief background on the discovery of the Burgess Shale by the American geologist C.D. Walcott in the early 1900's. Walcott, being a conservative thinker, had no doubt that the fossils were early precursors of modern arthropods and worms, and so managed to "shoehorn" every last one into existing taxonomic groups. This status-quo was accepted right up until the early 1970s, when a group of British palaeontologists did a routine re-examination of the specimens.

In Chapter 3, Gould takes the reader by the hand and gently guides him through the sticky morass of arthropod anatomy, describing the delicate techniques of fossil preparation needed to reveal the secrets of the Burgess animals. The drama of discovery unfolds as his protagonists, palaeontologists H.B. Whittington, D.E. Briggs and S. Conway Morris (as well as some others, later including the Royal Ontario Museum's Des Collins) come to realize that they are dealing with a group of animals, most of which bear little or no relationship to the classifications they were originally forced into by Walcott. Many belong to no established phylum. Another reality which becomes evident is that these supposed "primitive ancestors" were often not primitive at all, but were beautifully specialized for their respective modes of life.

Using clues distilled from extensive Walcott archives, Gould develops his thesis on why Walcott's personality, responsibilities and societal context prevented him from grasping the significance of his finds.

Finally, Chapter 5 consolidates the conclusion which becomes increasingly plain. The importance of the Burgess Shale is its demonstration that life does not evolve in a constantly expanding "tree", from a lowermost trunk of simplified prototypes on up to the specialized and "superior" organisms represented by the twigs. The Burgess fauna contains a wider diversity of fundamental body plans than any fauna since. History thus records an initial burst of diversity, followed by decimation which reduced , rather than increased the number of basic body plans. The iconography of the tree becomes a rather ragged bush with most of the lower limbs pruned close to the ground by extinction. As well, there is no evidence that the forms which survived were superior designs. A biologist transported back to Burgess time could not tell which forms would survive and which would perish. Survival must have been due in large part to pure luck: the "lottery" of Gould' s argument.

A major theme of this book is that the evolution of life is contingent on events in its history. In one of Gould's favorite metaphors, if we were to rewind the tape of life back to any point in history, then restart the tape recorder, the chances of life developing along the same pathways would be vanishingly small. If, on rerunning the tape from Burgess time, The not-so-special ancestor of the lineage that eventually led to Homo sapiens happened to die out instead of one of the many strange forms that did eventually disappear, we would certainly not be here, and there is no good reason to suppose that anything like human consciousness would ever have developed.

Gould's trademark style of argument is developed using a plethora of examples from the fossil record, ensuring that the reader is not being led along with idle musings. The text is often rather disconnected due to frequent footnotes and parenthetical remarks, but Gould's humor and honest enthusiasm

bouys the reader along from preface to epilogue.

The volume is profusely illustrated, which greatly assists the reader in grasping the many anatomical terms used, and in properly appreciating the incredible delicacy and precision that was required of the various palaeontologists in interpreting these astonishing fossils. My only complaint regards the disappointing muddiness of the several photographs of Walcott's fossil quarry in Yoho Park, possibly a result of the publisher's decision to print them on regular, rather than glossy paper stock. (You'd think, that for 28 bucks..!) This shortcoming is made ironic by a remark about Chinese scientific publications being "notorious for poor photography". Muddy pics aside, this book should be well received by any fossil and/or Gould lover.

*****

An Odyssey In Time: The Dinosaurs of North America by Dale Russell, National Museum of Natural Sciences, Canada, Northwood Press, Inc. 1989. 256 pages, $47.00. Reviewed by Les Adler

The following review has been collated from John A. Livingston's review in the Globe and Mail of Toronto, Monty Reid's review in the Calgary Herald, October 21,1989, the information on the slip cover, and my own perusal of the book.

It looks like a coffee-table book (35cm X 25cm), but it does not read like one! The jacket uses portions of four of Eleanor Kish's paintings of dinosaurs interspersed with gold leaf lettering to give the book a sumptuous appearance. There are an explanatory preface, ten chapters, an extended bibliography and a classification of dinosaurs. The ten chapters are: "Before the Mesozoic", "The Triassic", "The Jurassic", "A Late Jurassic Plain", "The Early Cretaceous", "Cretaceous Seas", "The Late Cretaceous", "The Modern Cretaceous", "The Extinction of the Dinosaurs", and "The Meaning of the Dinosaurs.

Dr. Russell leads his readers through 140 million years of Mesozoic time, using compelling paintings by Eleanor Kish, many photographs of key North American fossil sites and of various types of modern vegetation from many overseas sites to assist in the visualizing of the dinosaurs' environments. Most of the photos are by Harry Foster assisted by several others including Dr. Phil Currie. The maps are by E.W. Hearn. State-of-the-art ideas and concepts from geology, geophysics, botany, zoology, meteorology and ecology are presented to allow conclusions to be drawn about the swimming method of a large sauropod, the speed of a theropod or the hunting technique of a tyrannosaurid.

Dr. Russell is continuing to travel and participate in digs in Argentina, Canada, and China so that the latest findings couldn't be included in this book (which took seven years to produce). The paintings indicate that dinosaurs were slimmer, more mobile, and more grotesque than what you might see in other books. Some of Dr. Russell's theories are in disagreement with those of his colleagues. This is an outdoors book so you will not find mounted skeletons or museums. It is a vibrant Canadian contribution to the world of the dinosaurs, a stunning achievement!

*****

The Fossil Book - A Record of Prehistoric Life by Carroll and Mildred Fenton, Revised and Expanded by Pat and Tom Rich and Mildred Fenton, Doubleday, New York, 1989. 740 pages, $53.00. Reviewed by Les Adler

Both Pat and Tom Rich have a doctorate in vertebrate palaeontology and both are employed at Melbourne, Australia. The format of the 1958 edition has been retained so that the new edition does not look too much different from the old

one. However all sections have been updated so that there are now 37 chapters including a new one on plate tectonics and four appendices. There are 1500 illustrations in sepia and a few colour plates. One progresses in a logical fashion from the Precambrian to Recent and from one to many celled life forms. Whereas in 1958 there were only plants and animals, this book follows the five kingdom classification. This book is easy to read although retaining the use of scientific nomenclature. The book is international covering all continents. The Riches had access to Dr. Carroll's vertebrate notes so that this section is lengthy and recent. There is up-to-date information on brachiopods, trilobites, stromatolites, and stromatoporoids. There are chapters on how to collect and prepare fossils, where to view and read on fossils, a bibliography, a lenghty classification, and a three-page identification chart using symmetry as a basis. There is too much to absorb on one reading, you have to go back to it several times to absorb what has been achieved. A glorious read!

*****

Dinosaurs in 3-D by John Schwartz, Newsweek, October 2, 1989. page 51. Reviewed by Les Adler

This issue of Newsweek has a special section on 25 Americans in Science, Technology, Medicine, Business, Education, Fun and Games, Design and the Arts, whos demonstrate that creativity is still alive in the United States and who are able to use their ideas to create a cash profit. I am only discussing the one American in this section , the one involved with dinosaurs - Chis Mays.

Mays was originally employed as a pilot for T.W.A. but did not like deregulation. He knew of a Japanese company that manufactured dinosaur models for shopping centers and the like and bought the company's American marketing rights. As these models were rather crude a friendly museum director urged Mays to make more authentic creatures. His firm, Dinamation International based at San Juan Capistrano, California draws together scientists, engineers, and artists to make dinosaurs roam the earth once more. Under each beasts rubbery skin lies a steel skeleton and pneumatic motors that follow computerized commands, hidden speakers roar and squeal. Dinamation rents out its herd, some as high as ten meters, to museums around the world. Everywhere the monsters go kids come alive and parents like them too because of the teaching component. This year 18 million people will see a Dinamation exhibit.

Mays has spotted a niche in museums and is producing spectacular looking active creatures and also rents out other exhibits such as underwater fossils to a "future zoo" based on evolutionary speculation. He is pushing ahead in several directions at once, the company is planning new exhibits on endangered species, giant prehistoric insects, and human evolution. As well as making history, he is making prehistory. Congratulations!

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