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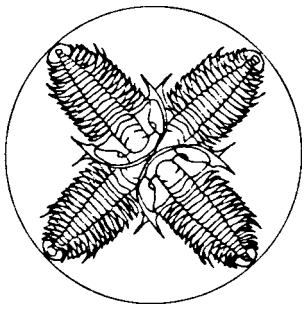

CANADIAN PALEONTOLOGY AND BIOSTRATIGRAPHY SEMINAR ABSTRACTS

The annual meeting of the Canadian Paleontology and Biostratigraphy Seminar, attended by forty participants, was held in Fredericton on Sept. 27th, 1980. Thirteen papers were presented at the meeting on a variety of topics ranging from dinoflagellates to trace fossils. Following the seminar, a three day field trip was held in northern New Brunswick led by P.A. Bourque, J.P.A. Noble, W.H. Forbes and R.K. Pickerill. Copies of the guidebook are available from R.K. Pickerill, Geology Department, University of New Brunswick, Fredericton, N.B. Canada. Details of the meeting have been published in Geolog (vol. 10, no. 1, pp. 13-17, 1981) and the following represent abstracts of the papers presented.

A Middle Lower Cambrian cavity-dwelling biota from Nevada compared to a late Lower Cambrian cavity biota from Labrador

David R. Kobluk - University of Toronto

Cavities are an important part of the structure of modern reefs, amounting to up to 40% of the volume of a reef in some cases. Reefs throughout their Phanerozoic record have been porous, but only recently has it been realized that cavity-dwelling organisms (coelobionts), which are very common and important in modern reef cavity systems, have a fossil record almost as old as the earliest record of metazoan skeletal reefs.

Lower Cambrian archaeocyathid mounds and patch reefs, which foreshadowed later Phanerozoic skeletal reefs, contain the oldest known cavity biotas. At present 2 Lower Cambrian reef localities are known to contain preserved coelobionts. One of these, from the upper Lower Cambrian (upper *Bonnia - Olenellus* zone) Forteau Fm. of southern Labrador, contains a diverse coelobiontic community dominated by algae, in particular *Renalcis*, and a *Renalcis* - like alga, with minor *Epiphyton*; also present are coelobiontic *Girvanella, Serligia, Bija,* fungi, archaeocyathids, ostracodes (?), foraminifera, trilobites, *Archaeotrypa,* brachiopods, and a diverse ichnofauna of deposit feeders (burrows) and surface traces in the cavity floor sediments. The structure of this community is surprisingly modern; this indicates that as early as the late Lower Cambrian the basic structure and organization of the reef coelobiontic community was established. The other occurrence of Lower Cambrian coelobionts is in the lower Poleta Fm. of the middle Lower Cambrian of western Nevada (boundary between the *Nevadella* and *Bonnia-Olenellus* zones). This community is of lower diversity than that from the Forteau Fm. Algae dominate, but in the Poleta Fm. cavities, *Renalcis* is rare, and *Epiphyton* is dominant, *Archaeotrypa* and coelobiontic archaeocyathids are also present as in the Forteau Fm. cavities, together with mammilary encrusting algae, soft sponges, and a low diversity ichnofauna in the cavity sediments.

In both the Forteau Fm. and Poleta Fm. cavities, the communities may be subdivided into vagrant, firmly encrusting, attached, and infaunal groups, just as in modern reef cavities. However, endolithic coelobionts which are so common in modern cavities, are absent in the Poleta Fm. cavities but are represented in Forteau Fm. cavities by the endolithic (boring) sponges. Therefore, the community preserved in the Poleta Fm. reef cavities differs significantly from that in the Forteau Fm. cavities. This may indicate that coelobiontic communities which appear to have been well-established and essentially modern in organization by the end of the Lower Cambrian, were still in the process of exploitation and expansion into the reef cavity habitat in the middle Lower Cambrian.

Trilobites and associated trace fossils from the Georgian Bay Formation (Upper Ordovician), Toronto Region

David M. Rudkin - Royal Ontario Museum

The Georgian Bay Formation comprises an approximately 200 m thick sequence of alternating shales and minor carbonates extending from the Toronto region in the south to Owen Sound in the north. The unit represents a dominantly regressive marine clastic facies deposited in a high energy, shallow shelf environment.

Early palaeontologic and biostratigraphic studies on the lower member of the Georgian Bay Formation in and around Toronto resulted in publications containing lengthy faunal lists dominated by bryozoans, molluscs, and brachiopods; three genera of trilobites, *Isotelus*, *Flexicalymene*, and *Cryptolithus*, were recognized. Trace fossils, treated under the general heading "Markings", and including "fucoids, tracks, rill marks, etc", were limited to nine described forms.

Preliminary reinvestigation indicates that the ichnofauna of the lower member of the Georgian Bay Formation in the Toronto region is far more diverse than previously recognized, and is comparable in many respects with the well documented ichnoassemblages from the Upper Ordovician of the Cincinnati area. Two additional trilobite genera are now known to occur in the same interval.

The following trace forms, attributable to the activity of trilobites, have so far been recognized: *Rusophycus carleyi*, *R. pudicum*, *R. cryptolithi*, and *Cruziana* spp.; it is possible in each case to refer these forms, on the basis of size and morphology, to one of the three described trilobite genera. Traces referable to the two new trilobite taxa are as yet unknown.

In general the ichnofauna, which also includes *Diplocraterion*, *Lockeia*, *Trichophycus*, *Palaeophycus*, *Chondrites*, *Phycodes* and *?Isopodichnus*, is assignable to the *Cruziana* ichnofacies.

Diagenesis in relation to bathymetry in the Silurian of northern New Brunswick

James P.A. Noble - University of New Brunswick

Using a bathymetric model based on biofacies and depositional characteristics of the sediments in a platform sequence consisting of two transgressive-regressive cycles, and known basinal and slope sediments of the same age, an attempt has been made to relate diagenetic facies to bathymetry or sea-level changes.

Very early diagenetic fabrics include micrite nodule - forming cements and fibrous Fe-rich calcite cements in generally deeper water sediments, and scalenohedral cements and syntaxial cements in shallower water sediments. Slightly later burial diagenesis includes Fe-rich scalenohedral calcite cements, pyrite and various modes of silicification.

Later in diagenesis and follow-

ing the development of load fractures occurred in a stage of Fe-rich fracture filling cement, neomorphic spar and poikilotopic cement and dolomites as cement, and replacement material. The dolomite probably formed in the subsurface during times of regression when meteoric waters mixed with marine waters, and appears to be dependent on fractures or other types of permeability channels. Pressure solution postdates most other diagenetic fabrics.

Conodont biostratigraphy of the Windsor Group (Lower Carboniferous), Les Iles de la Madeleine, Quebec

H.A. Plint-Geberl and P.H. von Bitter*
Royal Ontario Museum

The stratigraphy of the Windsor Group on les Iles de la Madeleine, Quebec, is complicated by folding, faulting, and volcanism, as well as salt and gypsum flowage. The lack of a diagnostic subzonal macrofauna in most carbonates and the presence of only one relatively continuous exposure of the Windsor Group also hinders biostratigraphic correlations.

Four successive conodont faunas have been recognized by von Bitter and Plint-Gerberl in the Codroy Group of southwestern Newfoundland (⇒Windsor Group of the Maritime Provinces and Quebec). These are correlated as follows: the *Diplograthodus*, *Taphrognathus*, and *Cavusgnathus* Faunas with the A, lower B, and upper B subzones, respectively, and the *Gnathodus* Faunas with the undivided C, D, and E subzones (Upper Windsor Group). This faunal succession provides a useful tool in Windsor Group subzone identification and correlation.

Ninety-two samples collected from Windsor Group strata of les Iles de la Madeleine have been processed for conodonts. The conodont fauna of the Islands is dominated by *Cavusgnathus windsorensis* Globensky, a species suspected of being tolerant to conditions of high to variable salinity. This species is probably more ecologically sensitive, than it is biostratigraphically. To date, the A subzone has not been recognized either macro or microfaunally in the Islands. The *Taphrognathus* Fauna has been recognized from Ile Alright and correlates with the lower B subzone of the Lower Windsor Group. *Hindeodus cristulus*, *Spathognathodus scitulus*, *Ozarkodina laevipostica*, and *Apatognathus sp.* have been identified in samples from Ile de l'Entree and correlate with the undifferentiated Upper Windsor subzones.

It appears likely that conodonts will be useful for subzone determination and correlation within les Iles de la Madeleine using the conodont faunal succession recognized and defined in southwestern Newfoundland by von Bitter and Plint-Geberl.

Lower Carboniferous ostracodes of western Newfoundland

C.P. Dewey and L.E. Fahraeus - Memorial University of Newfoundland*

Preliminary investigations into the Codroy Lower Carboniferous ostracodes of western Newfoundland have yielded several new .species which, however, must await more processed material before formal identification can be concluded. Collection of material this season has centred upon the grey shales of the Codroy and Robinsons area successions, as well as the Boswarlos section and erosional infills of the Port au Port Peninsula.

The faunule is dominantly marine, since the red shale sequences, where sampled, have proved apparently barren. Genera include: *Shishaella, Shivaella* and *Camishaella,* which constitute about 50% of the faunule. Other genera include *Aechmina, Bairdia, Orthobairdia* and *Rectobairdia; Bythocypris, Moorites,* and *Amphissites,* as well as *?Macrocypris, ?Fabaliacypris,* and *?Basslerellia.* At this stage, however, lack of processed material, coupled with poor preservation, hampers the lucid evaluation of specific taxonomic status in many cases.

This study is the first of its kind in Newfoundland and is aimed at palaeoecological and taxonomic understanding of the faunule. However, due to their position in space and time, the west coast ostracodes may add to our knowledge of palaeogeographic distributions and intercontinental correlations during the Lower Carboniferous.

A Middle Eocene pine cone and twigs from northwestern British Columbia and its bearing on evolution within the genus Pinus

Ruth A. Stockey - University of Alberta

A pinaceous cone with associated leaves and twigs has been found in a small lens of chert in the Driftwood Creek Beds near Smithers, B.C. Studies of freshwater fishes and insects in the surrounding sediments from the Ootsa Lake Group indicate a Middle Eocene age for these remains. The fossil was studied using a modified cellulose acetate peel technique. The cone specimen represents the apical portion, 3 cm long x 2.7 cm in diameter. Externally it has knobby cone scales and a prominent umbo lacking a spine. The pith of the cone axis is parenchymatous and tapers near the apex. The vascular cylinder is composed mostly of secondary xylem lacking growth increments and containing up to 70 resin canals in a ring. Extraxylary tissues are of 16-20 resin canals that dilate to four times their size as they enter the scales. A trace of the cone-scale complex arises as a single unit with a circular outline in transverse section as in cones of *Pinus* and some fossil species of *Pityostrobus.* The ovuliferous scale traces are accompanied by an abaxially directed resin canal system. There are two seeds per scale with well-developed integuments but little internal tissue preservation. Anatomy and morphology of the leaves and wood combined with cone characters allow close comparisons to the genus *Pinus,* sub-genus *Pinus* of the family Pinaceae.

The evolution of dinoflagellates

G.L. Williams - Bedford Institue of Oceanography

Recent work on modern dinoflagellates indicates that these organisms occupy a critical position in the evolution of life, being intermediate between prokaryotes (without nuclei) and eukaryotes (having nuclei). It further shows that the photosynthetic dinoflagellates acquired plastids through a symbiotic relationship with ingested organisms such as diatoms. Two models have been proposed to explain the subsequent development of the cellulosic theca in the Dinophyceae. The first, the plate increase model, is based primarily on observations of living algae, while the second, the plate reduction model, relies mainly on paleontological evidence. However, neither satisfactorily reconcile the biological and paleontological evidence and so we propose the mosaic model as a possible solution. This model suggests that dinoflagellates with two anterior flagella and a wall consisting of two large valves were successful through much of the Paleozoic. A major evolutionary breakthrough occurred in the Triassic with the development of a transverse-longitudinal flagellar arrangement and change in swimming direction. Associated with these modifications was a fragmentation of the valves into numerous polygonal plates. We suggest these changes were related to the initial breakup of the supercontinent Pangaea which was accompanied by changing circulation patterns and an increase in continental shelf area. Subsequent evolution emphasized the influence of the two flagellar furrows over the number and arrangement of thecal plates. This led to decrease in number and stabilization of the thecal plates as seen in living dinoflagellates.

Solitary rugose corals of the Selkirk Member, Red River Formation (Upper Middle or Upper Ordovician), Southern Manitoba

Robert J. Elias - University of Manitoba

Solitary corals of the Selkirk Member often occur in graded lenses and are abraded, suggesting that they were transported in turbulent conditions possibly caused by storms. Most were deposited on their sides with the cardinal-counter plane within 45 degrees of horizontal in transverse sections and the cardinal and counter sides tilted upward with approximately equal frequency.

The corals rarely have areas of attachment, indicating that almost all were free during life. The predominance of algal and annelid borings and epizoic colonial corals and stromatoporoids on the concave counter side suggest that they became associated with living hosts oriented with the convex cardinal side in the sediment and the exposed counter side facing upward. The low fre-

quency of annelid borings in straight corals would be expected if they were oriented vertically in the sediment with only the uppermost portion exposed during life.

The planar cardinal-counter surface of these corals suggests that they remained in a stable position during life. They did not reorient themselves by growing upward after being overturned, and such an event may have killed them. Polyps of some taxa were able to improve their stability during life. Septal dilation in early stages of three species was often greatest on the cardinal side, adding weight to the lower part of the coral. The elongate and angulate cardinal side of *Deiracorallium* and the triangulate to trilobate transverse shapes developed in species of *Grewingkia* would have provided greater stability than the circular form of most solitary Rugosa.

The concept that evolution within the *Grewingkia-Lobocorallium* group involved a progressive change in shape from circular to triangulate to trilobate through time has been used to recognize lower Red River, upper Red River, and Stony Mountain deposits, respectively. However, the presence of all these shapes in the middle of the Red River Formation and the complete range from circular to triangulate to slightly trilobate corals within two Selkirk Member species of *Grewingkia* suggest that evolution involved selection of trilobate varieties within initially highly variable populations. Large samples identified to the specific level are necessary for accurate biostratigraphic correlations.

Nine species of solitary Rugosa representing *Grewingkia, Helicelasma, Deiracorallium, Bighornia,* and a new genus are recognized in the Selkirk Member. Red River corals of Hudson Bay Lowland, Northwest Territories, and northwestern Greenland are similar, but there are some differences at the specific level from region to region. Correlations with the North American type Ordovician sections in the eastern United States are not possible because the solitary corals belong to different biogeographic provinces.

Elphidium Excavatum (Terquem): Part I. Ecophenotypic versus subspecific variation

Ann A.L. Miller - Dalhousie University

Large sympatric populations of the highly variable foraminiferal species, *Elphidium excavatum* (Terquem) are examined from seven widely spaced locations. Employing the concept of an intergradational series (which requires a sympatric population) specimens within these populations can be linked to one another. Here five formae (ecophenotypes) are delineated: *Elphidium excavatum* forma *excavata* (Terquem), *Elphidium excavatum* forma *selseyensis* (Heron-Allen and Earland), *Elphidium excavatum* forma *clavata* Cushman, *Elphidium excavatum* forma *lideonsis* Cushman, and *Elphidium excavatum* forma *magna* new forma. These formae are synonymous with those of Feyling-Hanssen except for *E. excavatum* forma *selseyensis* sensu Feyling-Hanssen (here *E. excavatum* forma *excavata*). *Elphidium excavatum* forma *selseyensis* (Heron-Allen and Earland) is delineated as distinct from forms illustrated by Feyling-Hanssen.

Elphidium excavatum forma *alba* Feyling-Hanssen is regarded here as synonymous with *E. excavatum* forma *clavata*, the opaque white test being diagenetic in origin. Feyling-Hanssen suggested that these formae were part of one highly variable species; since then, it has been suggested that a subspecific classification should be retained and a geographical division of subspecies was indicated. Here it is shown that up to five subspecies occur in an uninterrupted intergradational series at one location, hence they cannot be subspecies but must be ecophenotypes (formae). Although it is shown that taxonomically these forms are identical, the distinction between formae should be retained, as suggested by Feyling-Hanssen, because it appears that the diversity of formae as well as individual formae indicate specific environmental conditions. It is hoped that with the verification of ecophenotypic expression in the species *Elphidium excavatum*, this species will become a more valuable tool in paleoecological studies of Pleistocene marine sediments.

Biostratigraphic correlation by means of sea-level curves: the Lower Silurian of northern Michigan and Central Ontario

Markes E. Johnson - Williams College, Massachusetts

A new approach to the correlation of Lower Silurian carbonate strata from the Michigan Upper Peninsula and Ontario's Manitoulin Island, Bruce Peninsula, and Lake Temiskaming districts involves the comparison of regional sea-level curves. An amalgamation of the traditional methods of biostratigraphy and paleoecology with the concept of "event stratigraphy" is the key to this approach. Interpretation of a regional sea-level curve requires: 1) thorough coverage of thick stratigraphic sections geographically widespread in location. 2) preservation of depth-associated communities which can be readily differentiated, and 3) some degree of first order time control provided by evolutionary lineages.

Section localities in northern Michigan and Manitoulin Island are broadly dispersed and many are between 20 - 60 m thick, exposures in the Bruce Peninsula and Lake Temiskaming districts are generally less adequate. Three distinctive communities are well represented in all regions. A low diversity, fucoid-ostracode community is usually associated with laminations and mudcracks. A coral-algal community comprised of large, disc-shaped tabulate corals, stromatoporoids, and stromatolites suggests intermediate conditions of water depth. Pentamerid communities dominated by *Virgiana*, *Pentamerus*, or *Pentameroides* (but often including corals and/or stricklandiid brachiopods) are indicative of a deeper water environment. Members of the *Eocoelia*, stricklandiid, and pentamerid lineages help to date the community changeovers.

Three peaks in sea-level fluctuation are widely recognized in equivalent C_{1-2}, C_{4-5}, and C_6-Lower Wenlockian rocks, as marked by a pair of *Pentamerus* communities and a lone *Pentameroides* community. These are common to the Michigan, Manitoulin, and Lake Temiskaming regions, but the *Pentameroides* community is absent on the Bruce

Peninsula. This is apparently due to an erosional disconformity between the Amabel and Fossil Hill Formations. The age and extent of an older *Virgiana* community is poorly defined outside Michigan and Manitoulin Island. Sea-level curves previously interpreted for the Lower Silurian of Iowa and New York, although deep-water peaks are not always represented by the same type of community. Thus the curves reflect not only the synchronism of Early Silurian sea-level changes, but also the low topography of the flooded North American platform.

Stratigraphy and conodont faunas of the Lower and Middle Ordovician Romaine and Mingan Formations, Mingan Islands, Quebec

Godfrey S. Nowlan - Geological Survey of Canada, Ottawa

The Mingan Islands extend for about 85 km along the north coast of the Gulf of St. Lawrence centred off the town of Harve St. Pierre. The archipelago comprises approximately twenty islands and they expose principally flat lying Ordovician strata of the northern margin of the Anticosti Basin. Twenty sections were measured and 255 samples were collected for conodonts; 85% of the samples were productive, yielding almost 13,000 specimens. The Romaine Formation (60m) rests unconformably on Grenvillian basement with a basal sandstone. The formation is predominantly composed of thin to medium bedded laminated or mottled dololutite and dolosiltite, with thick units of massive, porous dolarenite. The basal sandstone has yielded elements of conodont Fauna D, and abundant drepanodan and scolopodan elements are present in the overlying part of the formation. The fauna includes: *"Scolopodus" quadraplicatus, "S." gracilis* and *"Drepanodus" parallelus* as well as specimens referrable to *"Acodus", Juanognathus* and *Ulrichodina*. As little as 15m above the base of the formation *Oepilodus communis* and other elements characteristic of Fauna E appear, indicating that much of the Romaine Fm. is of late Canadian age. At two localities an anomalous limestone occurs at the top of the formation. The limestone has yielded conodonts of probable Whiterockian age, including *Oistodus* cf. *O. multicorrugatus* and *Plectodina* n. sp. A. This is the first report of Whiterockian faunas from the Mingan Islands.

The succeeding Mingan Formation (45 m) disconformably overlies the Romaine Fm. and comprises a basal clastic unit characterized by clean quartz sandstone, green shale and minor siltstone. This is overlain by a variety of limestones including bioclastic calcarenite, calcisiltite and lithographic limestone which are all lateral facies equivalents. The basal sandstone has yielded *Phragmodus flexuosus* indicative of a Chazyan age. The faunas of the Mingan Fm. is essentially the same throughout the unit and the most common species are: *Panderodus* cf. *P. gracilis*, and other species of *Panderodus, Phragmodus flexuosus, Plectodina* n. sp. B, *Belodina* cf. *B.monitorensis, Belodella nevadensis* and several fibrous conodonts, especially representatives of *Erismodus* and *Ptiloconus*. At the top of the formation elements of the *Polyplacognathus friendsvillensis-P. sweeti* transition occur suggesting a mid to late Chazyan upper age for the formation.

Marsh foraminifers of Prince Edward Island: their Recent distribution and application for former sea level Studies

Mark A. Williamson - Dalhousie University

A detailed survey of all marsh areas in Prince Edward Island was undertaken and the information derived was used to determine four optimal areas (i.e., thickest marsh deposits) for sea level studies. Surface distributions of marsh foraminifera were determined in four areas and comparison of those from Nova Scotia suggested some differences, possibly linked to the mixed tidal system that occurs in the Gulf of St. Lawrence. It was also shown that plant distributions are less useful than marsh foraminiferal zones for determining former sea levels.

Using marsh foraminiferal zonations in subsurface sediments, 4 sea level curves were determined. These curves encompass the last 3000 years of submergence on Prince Edward Island. Rates of relative sea level rise in the east (14-19 cm/century) were almost twice that observed in the west (8 cm/century). This contrasts with previous work that suggested the island had been subsiding at a uniform rate for the last 3000 years. The data obtained here helps to calibrate recently derived geophysical models of the earth's response following deglaciation.

Taxonomically, a new genus of marsh foraminifers *(Pseudothuramina* n. gen. Scott, Medioli and Williamson) has been proposed with the type species being *Thurammina limnetis* (Scott and Medioli) described from marsh sediments in Nova Scotia.

Lower Devonian brachiopods of the Blue Fiord Formation (Devonian), southwestern Ellesmere Island, Arctic Canada

Douglas A. Smith, Colin W. Stearn and Gary P. Smith - McGill University*

The lower member of the Blue Fiord Formation in the area of Eids Fiord, southwest Ellesmere Island, yields a brachiopod fauna of late Early Devonian (Emsian) age. Sixteen brachiopod species have been identified: *Atrypa* sp., *Carinagypa aseptata, Cortezorthis maclareni, Costocranaena marlenae, Cymostrophia* sp., *Cyrtina* sp., *"Fimbrispirifer" scheii, Howellella?* sp., *Lissostrophia* sp., *Parapholidostrophia* sp. aff. *P. sorensis, Phragmastrophia* sp., *Phragmastrophia* sp. aff. *P. merriami, Schizophoria nevadensis, Strophodonta?* sp., *Trigonirhynchia* sp. aff. *T. occidens,* and a strophеodontid (genus unknown).

The Blue Fiord brachiopod community is similar to other Early Devonian communities, particularly to those of the *Eurekaspirifer pinyonensis* Zone of Nevada. The dominance of *Carinagypa, Atrypa,* and *Schizophoria* (approximately 75% of the total brachiopod population) suggests an affinity to the *Gypidula- Atrypa- Schizophoria* biofacies of Johnson (1974).

The community in which the Blue

Fiord brachiopods lived was of high diversity and trophic structure complexity relative to those of other facies represented in the formation, e.g. deep water facies. Community members included various species of trilobites, bryozoans, crinoids, and burrowing invertebrates.

The sudden appearance and subsequent disappearance of the brachiopod community appears to have been controlled by physically induced changes in the environment.

ANNOUNCEMENTS

AUGUST 24-29
CANADIAN QUATERNARY ASSOCIATION (CANQUA) international field workshop on "Weathering Zones and the Problem of Glacier Limits around the North Atlantic", Gaspésie, Quebec, Canada (J. T. Gray, Département de Geographie, Université de Montréal, C. P. 6128, Succ. A, Montreal, Quebec H3J 3J7 Canada).