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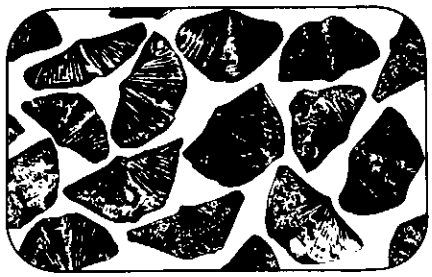

Paleontology and Biostratigraphy Seminar 1976

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The annual meeting of the Paleontology and Biostratigraphy Seminar was held on October 22 and 23 at the University of Windsor. This meeting marks the 10th anniversary of this Seminar which was originally organized by Colin Stearn at McGill University. The title of the meetings has changed from time to time and the format has varied considerably during the roughly triangular range of its past locations encompassed by Windsor, Sudbury and Montreal, with one rare meeting at St. John's, Newfoundland. Following the decision during the 1975 meeting at the Royal Ontario Museum, (see G. Norris, 1976, Geosci. Canada, v. 3, p. 116-118) the Seminars are now associated with the Paleontology Division of the GAC.

Approximately 125 paleontologists, stratigraphers and students attended the Windsor meeting to hear 12 talks delivered during the first day of the session. The second day was devoted to a field trip to a quarry exposing the Middle Devonian Silica Formation near Sylvania, Ohio.

James Brower (Syracuse Univ.) presented the opening address with a stimulating talk on his proposals for a quantified method of biostratigraphic correlation. He outlined five stages of analysis. The first is to quantify the attributes of an index or guide fossil - its geographic range, diversity of occurrence in sedimentary environments and vertical range. The second stage represents assessment between these three attributes by means of factor analysis of a correlation matrix. Plots of factor scores show pertinent groups of index versus other fossils. The third stage is to define species utility with respect to the particular correlation problem at hand and this is expressed as a relative biostratigraphic value (RBV). The RBV is usually measured by one or both of two indices and the two indices are scaled to range from 1.0 (ideal index fossil) to 0.0 (taxon with no information). One index, (the RBV) of McCammon (1970), assigns equal weight to widespread facies distribution (f), geographic persistence (g), and short vertical range (v), this correlates both time-stratigraphic and biofacies attributes of a species. The other index, RBV_1, places double weight for v over f and g and is thus mainly time-stratigraphic in emphasis; it is designed to isolate time planes within one or more biofacies. At the end of this stage, the RBV's for all species are plotted and faunal lists for each sample throughout the area and time interval to be correlated are compiled showing presence/absence of all species concerned. The last stage of the analysis is to determine which samples lie along time planes and which belong to the same biofacies by means of a matrix of similarity coefficients; basic data consist of presence/absence of the various species which are weighted proportionally to the RBV's of the taxa involved. Taxa with larger RBV's will contribute more to similarity coefficients than those with smaller values. The most similar samples can be extracted by cluster analysis, factor analysis and principal coordinates, and these clusters will hopefully depict the desired correlations between samples. Lastly, species are 'filtered' according to their RBV indices and the minimum number of species necessary to present satisfactory correlations is ascertained. This technique was demonstrated by means of examples from the New York Middle Devonian and Gulf Coast Eocene-Oligocene.

David Scott (Dalhousie Univ.) then talked on the relationship between intertidal foraminifera and environmental paramenters. He noted that nearshore and intertidal species are less sensitive to environmental changes than planktonic and deep sea benthic forms. His studies include salt marshes in Nova Scotia and California wherein three distinct foraminiferal zones can be determined; the zones are correlated with salinity changes but pH of the sediments and diurnal variations of O_2 may also be important factors. Although temperatures do not appear to be a limiting parameter within the zones, it may influence overall populations in an area.

The following discussion by Jim Noble (Univ. New Brunswick) involved examination of the time - environment model in paleoenvironmental analysis and Paleozoic communities using Silurian communities in New Brunswick as a model. Within a single faunal province, substrate, depth and evolutionary parameters are the most important controlling factors. The relative significance between the depth and substrate characters was assessed by means of two principles. Firstly, the difference in composition between two communities is more easily measurable than the assessment of the composition of a single community. Secondly, the major factors controlling composition represent events with significantly different frequencies of change; evolutionary changes and depth changes are much less frequent than substrate changes. A pair-wise comparison was made of contemporaneous samples from the Silurian of New Brunswick with respect to faunal composition and various measures of substrate characters. Results show that depth is the most important environmental factor in these communities.

William Harmon (Univ. Cincinnati) presented an illustrated talk showing an array of phosphatic and other insoluble faunal residues from selected Upper Ordovician and Devonian horizons in Ohio and Kentucky. Microfaunal and fine macrofaunal elements included steinkerns of mollusks, ectoprocts and brachiopods, along with a wide array of other groups. The point was made that these elements are often overlooked during biostratigraphic, environmental and diagenetic studies of rock units.

Bruce Liberty (Brock Univ.) ranged in his talk across the stratigraphic framework of Middle and Upper Ordovician rocks in Ontario. He highlighted some of the more obvious major problems which require resolution, pointing out the unnecessary proliferation of names, especially substage names, and the poorly

understood boundaries and faunal/lithologic characters of units. He completed his discussion with the suggestion that a stratigraphic committee might be established which would endeavour to resolve some of the problems.

It was a great disappointment that Bud Cumming (GSC) was unable to deliver his address on the biostratigraphy of Ordovician strata in the Hudson Bay region. However, he left copies of his report on the area along with his slides and charts for examination by those who wished it.

Following lunch, Loris Russell (ROM) described his studies of the Ardley Beds at the Cretaceous - Tertiary transition in Alberta. The critical zone in the discussion is a 100 foot sequence of strata which lies above the uppermost (Ardley) coal seam and bears molluscan and vertebrate fossils but lacks dinosaur remains. It lies between the Upper Cretaceous (Lancian) Scollard Formation and the Paleocene Paskapoo Formation. His studies of the fauna in this 100 foot sequence has indicated a Paleocene age for the unit, and he proposes that the strata between the base of the Ardley coal seam and the base of the Paskapoo Formation be designated the Ardley Member of the Scollard Formation, with the Cretaceous - Tertiary boundary lying at the base of this Member. The placing of this important boundary within a formation has been done elsewhere in Alberta, Colorado and Utah.

Brian Jones (Univ. Calgary) delivered a talk on the use of primary growth indices for the identification of brachiopod species. He noted that relative ontogenetic development of any two size parameters of a brachiopod can be related by a reduced major axis (growth axis). However, study of 41 assemblages of *Atrypella* Kozlowski and 17 assemblages of *Protathyris* Kozlowski from the Upper Silurian of Arctic Canada shows that there is considerable inter-assemblage variation in the attitude of the growth axes. Regarding one bivariant graph, as for example length versus height, variation in the attitude of the axes from the different assemblages can be depicted by constructing another bivariant graph with the Y axis representing the constant and the X axis representing the gradient of the axes, respectively. Such a graph for all *Protathyris* assemblages shows that the gradients and constants have an inverse linear relationship, such that the constant decreases as the gradient increases. This relationship can only exist if all axes on the original length/height graph passed through or close to a common point. These relationships also exist if the axes being compared relate length to width, or width to height. Similar graphical studies of the 41 assemblages of *Atrypella* show that three main groups of assemblages exist, the groupings being consistent from one graph to another. Each group, which displays the inverse relationship between axis gradient and constant, probably represents a distinct species or subspecies. The co-ordinates of the intersection point of the growth axes, which can be calculated from the graph relating the gradients and constants of a particular set of growth axes, are taken to be the primary growth indices of the two parameters being considered. This biometrical method is useful since it allows the division of a brachiopod genus into various groups on the basis of the brachiopod's growth characteristics.

Jim Sorauf (State Univ. New York, Binghamton) described his discovery of a *Pachyphyllum* (colonial rugose coral) fauna from Upper Devonian (Frasnian) rocks in New York. Hitherto, only a single colony of this genus had been found in New York and earlier work had speculated that the specimen had floated eastward after death from the region of Iowa. Sorauf's discovery of arenaceous rocks bearing some 50 colonies near the town of Avoca in Steuben County, New York, establishes for the first time a biocoenosis of the genus in eastern North America. Three species are present, two of which were first described from the Lime Creek Formation of Iowa. Comparative illustrations of material from the two areas demonstrated that they are morphologically essentially identical between the two areas.

The following discussion by Jim Conkin (Univ. Louisville), involved a review of his ideas on some correlations of the Middle Devonian in northeastern United States and Ontario. He emphasized the value of bone beds and also of bentonite beds for such correlations and he illustrated his talk with a series of slides showing elements of the mineralogy which he has isolated from the bentonites. His concluding remarks dwelt with the need for placing boundaries at easily recognizable levels even if such boundaries should fall at disconformities and other such physical phenomena. A large collection of his papers were made available for distribution to those wishing them.

David Kobluk (McMaster Univ.) presented a talk resulting from a joint project with three other collaborators at McMaster (S. G. Pemberton, M. J. Risk and M. Karoly) studying a bored hardground and paleokarst at the Silurian - Devonian disconformable boundary in southern Ontario. The particular area of study is in the Hagersville - Port Colborne region along eastern Lake Erie. Comparative illustrations of modern and other ancient features in various localities in the Caribbean, Ireland, Newfoundland were used to display such features as solution widened joints (two stages) in the Bertie dolomite, along with leaching, vug and cavern porosity. Microkarren are present as well as two types of pitted surfaces indicative of solution activity and nearshore moss, lichen, algal cover, or soil cover. Macroboring were also discussed in both pre- and post-Oriskany disconformities in an intertidal or very low supratidal setting. These boring belong to ichnogenus *Trypanites* and are probably the result of cirriped, polychaete or siphunculid activity. Epiphytes were present at or near the migrating shoreline (moss, algal or lichen cover) and etched impressions on the disconformity surface suggest rhizomes or root systems of land plants.

Fred Ziegler (Univ. Chicago) presented a summary of his and his colleagues' work assembling data from as many sources as possible for the purpose of constructing paleogeographic and paleoenvironmental maps of the world with work concentrated at present on the Silurian. Both paleoclimatic and paleomagnetic data are used in establishing orientations of paleocontinents in the Silurian. With widespread epieric seas and sedimentation which was dominantly autochthonous (evaporites, carbonates, reefs, authigenic minerals), the influence of climate on lithology is particularly marked and therefore useful as paleoclimatic indicators. It was observed that Silurian climatic belts in the northern hemisphere where there was little significant land influence, can

be modelled on present-day climatic belts in the southern hemisphere. Sediment distributions on the paleocontinents Laurentia, Baltica and Siberia are as follows: wet-hot zone (10°N to 10°S) contains thick clastics and reefs associated with leading plate margins, and carbonates and reefs in epeiric seas; dry-warm zone (10° to 30°) has evaporites, carbonates and reefs; wet-cool zone (30° to 60°) contains clastics, coals and tillites; dry-cold zone (60° to pole) has mostly tillites. The above lithologic associations together with plate movements can be used to orient the other paleocontinents (Kazakhstania, North China, South China, Gondwana) and all these continents were in low latitudes with the exception of Gondwana which lay over the South Pole. In contrast to the Southern hemisphere, the large north polar ocean must have had a moderating effect upon the climate of that hemisphere. The extensive epeiric seas and low latitudes of most paleocontinents accounts for the cosmopolitan nature of Silurian seas; only Gondwana in the south and Mongolia in the north has provincialism and low faunal diversities. This is in contrast to the Devonian when the collision of Laurentia and Baltica resulted in land barriers and marked provincialism

Following Ziegler's address, a short film made by Chris Scotese was shown. This depicts on a mercator scale Phanerozoic continental movements photographed from a computer readout.

The Middle Devonian Silica Formation was the subject of the final talk. Steven Mitchell (Mt Holyoke College) described the regional extent, lithologies, and faunal zones and constituents of the formation. The discussion was an excellent preamble for the field trip on the following day to examine exposures of the formation.

Prior to the conclusion of the afternoon session, it was agreed by those present to accept the offer by Chris Barnes to host the 1977 meeting at the University of Waterloo. In the usual tradition of these Seminars, an evening of discussion over drinks was held at the Faculty Club lounge. Midway through the evening, the recently produced Japanese film 'Marine Flowers-Biosphere of the Coelenterates' was screened.

Steven Mitchell led the field trip to the Silica Formation at Sylvania in northern Ohio. It was originally intended that Mitchell would lead a liesurely Cook's tour through the section, but the lure of the diverse and magnificently preserved faunas proved too much for those on the trip, and the tour disintegrated into a concentrated session of collecting through some of the more exotic units yielding fine examples of trilobites and beautifully pyritized spiriferid brachiopods. A chilling wind and threat of rain drove us from the quarry in time to stop briefly *en route* home to collect from the quarry dumps at an abandoned quarry near Milan, Michigan and so concluded this year's session of the Seminar. I am grateful to Alf Lenz (Univ. Western Ontario) for reading the manuscript prior to its submission for publication.

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