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ABSTRACTS OF OTHER SYMPOSIUM PAPERS

NOTES ON LATE CAMBRIAN AND EARLY ORDOVICIAN BIOSTRATIGRAPHY OF SOUTHEAST BRITISH COLUMBIA[1]

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ABSTRACT

Investigations by Shell Canada field parties in the White River Area, southeastern British Columbia in 1963, and in related areas of Alberta and British Columbia, have made it possible to demonstrate a biostratigraphic zonation for the McKay-Glenogle-Skoki succession. The McKay, which is subdivided physically into six units, comprises the (Franconian) *Elvinia*, *Conaspis*, *Ptychaspis-Prosaukia*, and the (Trempealeauan) *Saukia* Zones, as well as Lower Ordovician Zones A, B, D, E and G, of the Cordilleran Standard succession set up by Rueben J. Ross Jr. (1952) in the Garden City Formation of eastern Utah.

Five discrete graptolite zones and subzones are recognized in the Glenogle Shale succession.

The graptolitic shales containing the *Isograptus forcipiformis* assemblage were found to intertongue with shelly limestones bearing the fauna of Zone L of the Utah sequence, which constitutes the lowest zone of the Whiterock Stage of Cooper (1956). Occurring together in the Zone L equivalent in the lower part of the Skoki Formation are the diagnostic brachiopods *Orthidiella* and *Paucicostella* along with the trilobite *Ectenonotus westoni* (Billings). The assemblage is designated the *"Orthidiella-Ectenonotus* Zone."

Above the *Orthidiella-Ectenonotus* Zone and at the top of the Skoki are Zone M-h equivalent faunas, designated the *"Kanoskia-Palliseria* Zone."

The problem of the relationship of such controversial "stages" as Whiterockian Table Headian to the Canadian (Beekmantown) and Chazyan of the standard succession is discussed. The writers conclude that the Whiterockian as modified by Ross (1964) is older than the type Chazy, and younger than the Cassinian, defined by Flower (1964) as the youngest stage of the Canadian. They recommend recognition of the Whiterockian (amended) as a closing, post-Cassinian stage of the Canadian Series, an interpretation supported by the presence of the Zone M brachiopod *Anomalorthis* in the latest Beekmantown Providence Island Formation of New York.

ORDOVICIAN AND SILURIAN STRATIGRAPHY OF SOUTHERN ROCKY MOUNTAINS OF CANADA[1]

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ABSTRACT

Stratigraphic nomenclature is revised for Middle Ordovician, Upper Ordovician, and Silurian rocks of the southern Rocky Mountains of Canada. Lower Ordovician stratigraphy is briefly reviewed. The names Glenogle Shales, Mount Wilson Quartzite, and Skoki Formation are retained. Coverage of the Beaverfoot Formation is restricted to carbonate rocks and includes both Upper Ordovician and Lower Silurian strata. The terms Wonah Quartzite and Brisco Formation are considered obsolete. Four new rock units are proposed.

The common lithotopes suggest platform carbonate fringing the Canadian Shield in Late Ordovician and Early Silurian time and covering the whole of the southern Rocky Mountains. The eastern part of the mountains was the site of similar deposits in Middle Ordovician time, but miogeosynclinal shales and limestones accumulated farther southwest. The locus of facies change trends northwest and lies just west of the British Columbia-Alberta boundary.

Middle and Upper Silurian rocks are absent from the southern Rockies, and the basal Devonian rocks rest unconformably on Precambrian to Lower Silurian strata.

Faunal studies allow recognition of four brachiopod-coral-trilobite zones within the Beaverfoot Formation and a conodont zone in the basal Beaverfoot and the uppermost Mount Wilson. Three brachiopod zones are present within the Skoki Formation. Of these, the *Anomalorthis* and *Orthidiella* zones correlate with Whiterock zones in the Antelope Valley Limestone of Nevada. A new brachiopod zone can be recognized near the base of the Skoki and is considered uppermost Canadian and may be in part equivalent to the *Pseudocybele* trilobite zone of Utah and Nevada.

LITHOLOGIC AND FAUNAL ASPECTS OF THE LOWER PALEOZOIC AT ROYAL CREEK, YUKON TERRITORY[1]

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ABSTRACT

In stratigraphically ascending order, the Early Paleozoic sequence consists of Lower Cambrian clastics with minor carbonates, recessive Upper Cambrian mudstones, and resistant Lower Ordovician cherty dolomites, and Upper Ordovician carbonates. The latter are well dated in all sections by the "Arctic Coral fauna." The former sequences are very poorly fossiliferous and dating is based on sparse collections of *Olenellus*, Dresbachian brachiopods, and trilobites of the *Leiostegium-Kainella* Zone. Major facies variations are absent within this basal sedimentary package.

A gradual carbonate-shale transition occurs within the Lower, as well as Upper, Silurian Series. The former displays a lateral change from mainly restricted carbonates with a sparse ostracod-brachiopod fauna to open marine limestones and shales with a rich and varied trilobite-brachiopod-graptolite assemblage. Upper Silurian sediments range from restricted ostracod-bearing carbonates to open marine limestones and shales with the *Atrypella scheii* fauna. Apparently, most of the Middle Silurian is absent.

An abrupt carbonate-shale transition is assigned to the earliest Devonian.

Extensive faunal collections, from closely-spaced measured outcrop sections straddling these transitions, indicate conformable relations from Late Middle Silurian into Early Devonian and contribute to the definition of the Siluro-Devonian boundary. Intercalations of shelly and graptolitic sequences render the area particularly interesting.

The various carbonate facies indicate a progression from restricted shelf to normal marine basinal deposits.

LATE PROTEROZOIC AND EARLY PALEOZOIC GEOSYNCLINES AND CRATONS IN CANADA[1]

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ABSTRACT

Some aspects of the nature and configuration of the major tectonic elements of the northern North American craton and bordering geosynclines that developed and evolved in late Proterozoic and early Paleozoic times are presented.

PROTEROZOIC THROUGH DEVONIAN STRATIGRAPHY, CENTRAL ELLESMERE ISLAND, N.W.T.

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ABSTRACT

History of the Franklin miogeosyncline and adjacent Central Stable Region between Proterozoic and Late Devonian is well displayed on Ellesmere Island. Three long persistent sedimentary regimes displayed in these rocks are broadly similar to rocks in eastern and western belts of North America. The mildly positive Bache Peninsula arch projects westward from the Shield, across the Central Stable Region and miogeosyncline; it was active at least from Early Cambrian through Late Silurian time. Formational names shown as (new) will be proposed in forthcoming Geological Survey of Canada publications.

Proterozoic rocks include fine-grained clastics of the Kennedy Channel Formation (new) and unconformable younger dolomites of the Ella Bay Formation (new). They are confined to the geosyncline and total 6,000 feet. Lower Lower Cambrian rocks of the geosyncline include the Ellesmere Group (new) and its four contained new formations. This group reaches 3,500 feet of fine-grained clastic rocks of mainly cratonic source, that are mainly quartz sandstone grading upward and basinward to dark grey shale. It encroached onto the Central Stable Region, where its equivalent is the thin Rensselaer Bay Formation. In the geosyncline, the upper Lower Cambrian Scoresby Bay Formation (new) is up to 2,825 feet of dolomite, and in the northwest is locally unconformable. Its shelf equivalent is about 300 feet of predominantly dolomite that includes the Cape Leiper, Cape Ingersoll, Police Post and Cape Kent Formations. Middle Cambrian rocks are mainly limestones, represented in the geosyncline by the Parrish Glacier Formation (maximum thickness, 2,000 feet) and on the shelf by the Cape Wood Formation (thickness about 140 feet). Middle Cambrian and Lower Ordovician formations on Ellesmere Island are separated by a regional disconformity that may coincide with a widespread Late Cambrian hiatus in the Arctic.

Lower and Middle Ordovician formations, whose total thickness reaches 10,500 feet, are predominantly carbonate and/or evaporite. Most units have maximum thicknesses in the central miogeosyncline, and thin toward both the Central Stable Region, and eugeosyncline. The lower Lower Ordovician Copes Bay Formation is thin-bedded limestones and minor gypsum, everywhere resting with regional disconformity on older strata. The Lower Ordovician Baumann Fiord Formation (new) is gypsum-anhydrite, lens-shaped and ranging from 0 to 2,560 feet thick. The Eleanor River Formation is upper Lower to lower Middle Ordovician limestone, 500 to 3,000 feet thick. The Lower and Middle Ordovician Corn-

wallis Group (new) has been elevated from a formation, and includes the Bay Fiord (new), Thumb Mountain (new), and Irene Bay (new) Formations. In ascending order these correspond to three units recognized in the type section of the Cornwallis Formation of Cornwallis Island.

A marked change in the sedimentary pattern occurred in Late Ordovician (Ashgillian) time and persisted through Late Devonian time; during this period sedimentation was typified by extreme and rapid facies changes. Late Ordovician through Silurian is represented on the east and south by the thick Allen Bay and Read Bay carbonate Formations, which grade westward into considerably thinner black, graptolitic shales and siltstones of the Cape Phillips Formation. The facies boundary is sinuous and carbonates project westward on the Bache Peninsula arch. An Early Devonian emergence of the Central Stable Region and the Bache Peninsula arch resulted in the local westward spread of varicoloured quartz sandstones of the Verdom Fiord Formation (new). In Middle Devonian, biostromal reef development on the eastern edge of the miogeosyncline occurred within the Blue Fiord Formation, which is mainly thin-bedded limestones and some dolomite. The lower Blue Fiord grades basinward into shaly limestones of the Eids Formation. The upper part grades into, and is progressively overlapped by, northwesterly-derived varicoloured quartz sandstones of the Okse Bay Formation. All Upper Ordovician (Ashgillian) through Upper Devonian formations finally grade westward and northwestward into the Cape Rawson Group. This group is an enormous wedge of fine-grained clastic rocks of northwesterly provenance, reaching 15,000 feet in thickness, that spread progressively farther and farther southward and eastward.

Southeasterly-directed folds of Late Devonian to Middle Pennsylvanian age transformed the Franklin miogeosyncline of Ellesmere Island into the Central Ellesmere fold belt, and were deformed again in Tertiary time.

LOWER PALEOZOIC ROCKS OF ALASKA[1]

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ABSTRACT

Cambrian rocks are presently known only from east-central Alaska where a succession of shelly fossils, ranging in age from Early through Late Cambrian, occurs in a thin (300 feet) carbonate section that grades downward into the Tindir Group, a thick (10,000+ feet) sedimentary series of Precambrian age.

Ordovician rocks occur in a few separated areas and are widely different in facies. Thousands of feet of graywacke, shale, chert, and volcanic rocks in southeast Alaska contrast with thinner, predominantly carbonate sections in the Alaska Range, Seward Peninsula, and Porcupine River. The Road River Formation, a graptolitic shale less than 900 feet thick, seems to represent an intermediate facies in east-central Alaska that spans most of Ordovician and Silurian time.

Silurian and Devonian rocks are generally similar in facies to the Ordovician rocks. In the Brooks Range, however, there is a thick (5,000 feet) succession of predominantly argillaceous rocks of Devonian age, and in southeast Alaska there are Silurian and Devonian limestones thousands of feet thick in an otherwise volcanic and detrital sequence. Coarse clastic rocks of Late Devonian age in the Brooks Range (Kanayut Conglomerate) and east-central Alaska (Nation River Formation) indicate uplift of the earlier geosynclinal deposits.

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[1]Reprinted, with permission, from *Oilweek*, v. 17, no. 14, p. 23-24.