two directions. Analysis of slides by point-counting can be done at an arbitrary point in the center of the two inch circle inscribed on the frosted screen and, at the same time, allows inspection of a wide area surrounding the point. A plastic measuring device attached by an arm allowing movement in all directions across the screen is divided into 100 units of 1 mm. The divisions are calibrated for each magnification. A coarse-motion lever raises the rotating nosepiece for rapid slide changing, and thick specimens can be accommodated on the stage. However, the working distance at high magnification is small and only slides with thin (or no) cover slips can be viewed. The instrument has outside dimensions of 9 x 9 x 17 inches and the weight is about 6 pounds including the separate low voltage transformer so that it can be easily moved. An expanded polystyrene container is available for rugged transport and gives protection against breakage, dust and humidity. A plastic cover gives protection in the office. Viewing is best in a darkened room. The instrument is ideal for demonstration and teaching small groups. Lack of polarizing system does cause occasional frustration when an extraordinary mineral is crossed, but minerals which are affected by stains such as alarzin red on carbonates, can be identified. Viewing with the Visopan is almost as relaxing as watching the modern electronic cyclops.

ABSTRACTS

THE CHEMISTRY OF THE CLAY-SIZE FRACTION ACROSS THE OLDMAN-BEARPAW CONTACT OF THE ST. MARY RIVER SECTION

R. N. FARVOLDEN

1958, M.Sc., University of Alberta

The clay-sized fraction of samples collected across the Oldman-Bearpaw contact of the St. Mary River section were analysed. The Na_2O, K_2O, P_2O_5 and total iron analyses show a break at the contact between the non-marine and marine beds. Other predicted clay chemistry changes do not occur in this section because the normal clay diagenesis was masked and the system was upset by fall-out of volcanic ash.

The investigation shows that the method of rapid silicate analysis can be used for certain geologic studies but the results are not as reliable as those obtained by conventional methods.

PERMO-CARBONIFEROUS STRATIGRAPHY OF THE BANFF-JASPER AREA, ALBERTA

H. R. RUDY

1958, M.Sc., University of Alberta

Permo-Carboniferous strata of the Rocky Mountain Front Ranges between Banff and Jasper, Alberta, are described and correlated to the Mount Greenock section at Jasper and the type sections at Banff. Four conformable formations are recognized. In ascending order, these are the Exshaw, Banff, Rundle and Tunnel Mountain. The history and development of Permo-Carboniferous nomenclature of the Canadian Rockies is summarized.

The Upper Devonian or Lower Mississippian Exshaw Formation consists of approximately 35 feet of black shale. The Banff Formation, an argillaceous unit ranging from 900 to 1500 feet in thickness, contains four easily-recognizable members. Member A, composed of calcareous shales, is equivalent to type Lower Banff; Member B of interbedded limestones and shales is equivalent to type Middle Banff; Member C, a crinoidal limestone unit, is not present in type Banff and may be equivalent to the Pekisko Formation of southern Alberta; and Member D consists of argillaceous limestones equivalent to both type Shunda

and to most of type Upper Banff. Members A and B are considered to be Kinderhookian, and C and D Osagean in age. The Rundle Formation consists of from 800 to 2200 feet of carbonates. Two members are recognized: a lower member of light-coloured crinoidal limestones equivalent to the Osagean Livingstone formation, and an upper member of dark-coloured limestones equivalent to the Meramecian Mount Head Formation. The Tunnel Mountain Formation, the uppermost unit, consists of from 200 to 600 feet of silty dolomites ranging from Chesterian to Pennsylvanian in age.

Significant conclusions resulting from this study are that type Shunda is equivalent to most of type Upper Banff; and that the Tunnel Mountain Formation is a facies of the Rundle, becoming older north of Banff.

THE SPINNEY HAND HILL SAND OF WEST CENTRAL SASKATCHEWAN

R. G. EDWARDS

1959, M.Sc., University of Saskatchewan

The Lower Cretaceous Spinney Hill Member is a sandstone facies developed within the lower beds of the Joli Fou Formation in west central Saskatchewan. The member is composed of interbedded marine shales and fine grained, well sorted glauconitic sandstones, and has a maximum thickness of 110 feet. It has a tongue-like pattern and represents the offshort, marine phase of deltaic sedimentation. Source of the Spinney Hill sands was the Precambrian Shield, north and east of the area that the member now occupies.

THE LLOYDMINSTER OIL AND GAS FIELD, ALBERTA

D. M. KENT

1959, M.Sc., University of Saskatchewan

In the Lloydminster area, oil and gas are produced from the deltaic sands of the Lower Cretaceous Mannville Group, which has been subdivided into three formations: Dina, Silverdale and Colony, respectively. The subdivisions were based on slight lithological variations reflecting minor changes in the environment of deposition and the source of sediments. The deposits of the Dina Formation are non-marine beach sands, having little economic importance. They are overlain by mostly marine sediments of the Silverdale Formation, which contains the main oil producing horizons, the Sparky and General Petroleum Sand Members. Most of the gas is produced from the upper sands of the non-marine Colony Formation.

The oil was formed "in situ" and accumulated in two types of traps, i.e., a number of simple convex traps resulting from differential thickness and permeability pinch-out traps. The development of channel systems on the delta front by tidal action formed the trap conditions. The oil was probably produced by the chemical transformation of the humic acid, transported by streams from the marginal alluvial plains of Lower Cretaceous times to the delta front. There the acid was precipitated out and settled in the bottom sands and bars of the channel system. When the strata of the Mannville were tilted towards the Rocky Mountain Geosyncline during the Laramide and later orogenies, some of the oil from the area southwest of Lloydminster probably migrated up dip and gathered in the traps in the Lloydminster region, thus adding to the reserves of this area.

THE NIKANASSIN FORMATION OF THE TYPE AREA, NEAR CADOMIN, ALBERTA

A. A. W. KRYCZKA

1959, M.Sc., University of Alberta

Four sections of type late Jurassic Nikanassin Formation from the central foothills of Alberta are presented.

Mechanical analyses of seven samples are given on histograms and cumulative frequency curves. A depauperate foraminiferal assemblage is listed. Heavy mineral descriptions are given throughout a complete section and eighty-two thin sections are analyzed.

The Nakanassin Formation belongs to the upper part of the Oxfordian Stage

and subsequent Jurassic stages. The Nikanassin is partially marine and partially continental; deposition may have taken place in shallow embayments connected to the open sea by narrow chanel-ways. The Nikanassin was largely derived from pre-existing sediments.

SEDIMENTARY PETROLOGY OF THE CARDIUM FORMATION, WEST-CENTRAL ALBERTA

R. M. McMULLEN

1959, M.Sc., University of Alberta

Samples of the Cardium Formation from the Pembina area and the Central Foothills belt of Alberta were examined in hand specimen and thin section. They were also analysed for clay mineral and heavy mineral content, and particle size distribution.

The main source of the clastic material was Mesozoic sedimentary rocks lying to the west of the Foothills belt in the vicinity of the present central and western Rocky Mountains. A relatively minor uplift in that area caused the retreat of the sea and produced the coarser clastic material. A secondary source was the metasedimentary and igneous rocks lying to the west of the present Rocky Mountain Trench in the vicinity of the Selkirk Mountains. A much more minor source was volcanism. The Pembina area may have had an additional source, probably to the north in the Peace River area.

Of special interest was the discovery of what is considered to be naturally etched, detrital spessartite garnet.

The Cardium Formation at Pembina was deposited under relatively shallow water, wholly marine conditions, at times subject to wave action. This is shown by the excellent sorting (sorting coefficient of about 1.24) and the very fine grained nature of the deposit.

Subsequent to deposition, there was some circulation of intrastratal solutions which etched the garnet, deposited the silica cement and may have removed some accessory heavy minerals from the Foothills Cardium. Involvement in the Rocky Mountain uplift caused reversal of the original dip.

ORDOVICIAN BENTONITES FROM ONTARIO

J. B. B. ORR

1959, M.Sc.,University of Alberta

Five samples of Ontario Ordovician bentonite were examined by using the techniques of heavy and light mineral separation, X-ray diffraction patterns, zircon studies, and base exchange analysis. The clay fraction of the bentonite consists of a mixed-layer aggregate dominated by illite but with some montmorillonite present. In addition, small amounts of chlorite were noted.

The mineral assemblage indicates that the clay altered from a volcanic glass with the composition of a latite. Similar bentonites in Ordovician strata throughout the eastern United States can be traced along with the Ontario horizons to a volcanic vent in the crystalline region of North Carolina.

Potassium-argon age dating yielded tentative ages of 656 and 654 m.y. on feldspars, and 260 m.y. on volcanic glass. This suggests contamination of feldspar and leakage of argon from the volcanic glass. It is felt that future runs on the remaining extracted argon samples may produce more satisfactory results.

GEOLOGY OF THE WASOOTCH CREEK MAP-AREA, ALBERTA

D. L. SCOTT

1959, M.Sc., University of British Columbia

The Wasootch Creek area is representative of the Rocky Mountain Front Range of southern Alberta. It is underlain by rocks of the Middle Cambrian, Upper Devonian, Mississippian, Permian and Lower Triassic, of which carbonates constitute the largest part. The Cambrian formations are correlated with the Eldon, Pika and Arctomys of the Bow Valley region. The Ghost River or Arctomys Formation has been removed on one fault block by pre-Devonian erosion.

The area is bounded on the west by the Cascade Coal Basin and on the east by the McConnell fault. Between these two structures are several high angle, westward dipping, reverse faults named from west to east Lac des Arcs, Exshaw, Porcupine, and West McConnell. Mature disection of the fault blocks has produced excellent correlation of rock hardness with topography. The McConnell fault consists of two thrusts which merge at Kananaskis Gap. South of Kananaskis Gap the two thrusts are designated McConnell and West McConnell.

A STUDY OF SOME CAMBRIAN SEDIMENTS FROM JASPER PARK, ALBERTA

P. C. WALLER

1959, M.Sc., University of Alberta

Cambrian sediments from the Nigel Pass and Sunset Peak Areas of Jasper Park, Alberta, are the subject of this study. Twenty-six thin sections and three suites of heavy minerals are described.

Cambrian sediments were deposited on a shallow, slowly subsiding shelf area flanking the craton. Lower Cambrian sediments were derived from the craton and Precambrian Beltian sediments.

The presence of glauconite in the Sunset Peak calcareous quartzitic sediments indicates slow deposition in a nearly neutral environment. X-ray and chemical analysis of this glauconite indicate it is ordered and rich in potassium. It has the chemical formula $K_{1.63}(Na,Rb,Ca)_{.03}(Al_{2.44}Fe^{+3}_{.67}Fe^{+2}_{.22}Mg_{.60})(Si_{7.00}Al_{1.00})O_{20}(OH)_4$. The chemical composition shows this glauconite to be a representative of the aluminum-rich glauconites, which are rare.

Potassium-argon dating of this authigenic glauconite and what appears to be a detrital microcline feldspar from these Lower Cambrian sediments yielded ages of 359, 413 and 344 m.y. respectively. The glauconite age is slightly low because of argon leakage; the feldspar (probably Precambrian) age is close to the 360 million year figure obtained at the University of Alberta for a biotite from the Ice River Complex of the Rocky Mountains and Yukon granites intruded at the time of the Cariboo orogeny. There is a distinct possibility that this feldspar age may reflect in some way the influence of the Cariboo orogeny which White (1959) postulates to have taken place from Late Ordovician through Devonian time.

PETROLOGY AND HEAVY MINERALS OF THE VIKING FORMATION, WEST CENTRAL ALBERTA

H. R. YOUNG

1959, M.Sc., University of Alberta

Petrology, heavy minerals and mechanical analyses were utilized in the study of the Viking Sandstone from three wells in west central Alberta.

The heavy mineral assemblage indicates that pre-existing sedimentary rocks were the major source of the Viking sediments, but igneous and metamorphic rocks have also made some contribution.

Mechanical analyses indicate a bimodal size distribution in the Viking Sandstone, for which two explanations are proposed.

A slight uplift in the highland to the southwest and the ensuing erosion of pre-existing sedimentary rocks contributed detritus to the rather shallow Viking sea. The presence of glauconitic and siderite associated with bands of black pyritic shales suggest slightly reducing conditions and a slow rate of sedimentary influx.

Potassium-argon dating on glauconite yielded a date of 78 m.y. This figure is thought to be low because of radiogenic argon loss under conditions of mild thermal metamorphism.

GEOLOGY OF THE FRASER RIVER VALLEY BETWEEN LILLOOET AND BIG BAR CREEK

H. P. TRETTIN

1960, Ph.D., University of British Columbia

An area of 550 square miles between Lillooet and Big Bar, B.C., was mapped by the author using the scale of one mile to the inch.

In the southern part of the Bowman Range four members are recognized in the Middle (?) and Upper Permian Marble Canyon Formation which is partly composed of reefal limestone. This formation forms a northwesterly trending anticlinorium overturned to the northeast. The cherts, argillites, limestones, and volcanic rocks west of the Bowman Range, originally referred to the Permo-Pennsylvanian Cache Creek Group are shown to be Permo-Triassic and are here assigned to the Pavilion Group, a new group which is made up of two divisions. Microscopic and stratigraphic evidence is given that the cherts of this group are of radiolarian origin.

The Lower Cretaceous Lillooet Group here is subdivided into three units. Divisions A and B are shown to form a northwesterly trending anticline.

Three members are now recognized in Division A of the Lower Cretaceous Jackass Mountain Group.

The Lower Cretaceous Spences Bridge Group is subdivided into several local and stratigraphic units. Two units previously assigned to the Spences Bridge Group are correlated with the Kingsvale Group on the basis of new fossil collections.

Some volcanic and sedimentary rocks originally referred to the Miocene Kamplos Group are here correlated with Miocene to Pleistocene rocks of the Quesnel map-area.

West of Lillooet a belt of serpentinite was mapped that has structural and lithological similarities to the Upper Triassic ultrabasic intrusions of the Shulaps Range. Granitic rocks of three ages are recognized and range from early Lower Cretaceous or older to mid-Lower Cretaceous.

It had earlier been shown that the Fraser River fault zone consists of several normal faults with relative downward movement to the east. East of these faults the author recognizes another fault with relative downward movement to the west. Lower Cretaceous and early Tertiary rocks thus occupy a graben between Permo-Triassic units to the northeast and to the southwest. This graben probably controlled the deposition of divisions B and C of the Jackass Mountain Group. The faulting may be related to the isostatic rise of adjacent granitic masses. Evidence is given that the latest movement on one of the faults took place in mid-Tertiary time.

BULLETIN
of
CANADIAN PETROLEUM GEOLOGY

INDEX OF VOLUME 12, 1964[1]

PUBLISHED QUARTERLY BY

The Alberta Society of Petroleum Geologists

[1]Compiled by R. L. Zell, Amerada Petroleum Corporation, Calgary, Alberta.