ABSTRACTS OF NINTH ANNUAL FIELD CONFERENCE PAPERS

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ALBERTA ENERGY SOURCES, COAL TO HYDROCARBONS; EXPLORATION, SURFACE AND SUBSURFACE

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ABSTRACT

Through the ages of recorded history up to less than 200 years ago, man was dependent on the strength of his hands and back plus the use he could make of domestic animals, wind and waterwheel. In China today we find man moving dirt in baskets on his back, but we in North America would be lost without the energy sources provided by the steam engine, the gasoline and diesel engines and water power.

The same energy sources we enjoy today have been in existence over the ages. It is only in our ability to discover and utilize them that we gain advantages that our ancestors did not have.

Utilization is as important a factor as possession of energy sources, but possession of the sources is not at all evenly distributed and Alberta has within her boundaries just over half of Canadian coal reserves, and five-sixths of Canadian oil and gas reserves. Installed hydo-electric generating capacity is relatively small, a mere 1.6 percent of the Canadian total, but it is very useful and will expand to some extent with demand.

Atomic fuel looms as a future source of energy but present forecasts suggest that uranium is not likely to replace coal, oil and natural gas in parts of the world where they are easily accessible. Alberta has no known uranium that can be mined economically, although deposits at Great Bear Lake and Lake Athabasca are close.

Alberta has been handicapped geographically in utilizing energy sources for manufacturing. Every item we bring to the province costs more because of freight rates and everything we have to sell is less remunerative because of transmission costs. As population grows in the province the handicap lessens. In the meantime Albertans must be efficient in exploiting such natural advantages as they possess.

ALBERTA AND FOSSIL VERTABRATES

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ABSTRACT

The history of the backboned animals is very incompletely documented by the fossil record in Alberta. Yet in point of time encompassed, the Alberta record provides more glimpses of this history than does that of any other province.

Palaeozoic vertebrates in Alberta consist of a handful of fish remains from Devonian and Mississippian rocks. Because of the absence of genetically appropriate sediments, chances of finding terrestrial Palaeozoic vertebrates in Alberta are not good but additional marine fossils can be expected.

Except for the late Cretaceous dinosaur faunas, without parallel elsewhere in the world, much the same must be said for the Mesozoic vertebrate records. Possibility of amplifying the late Jurassic and early Cretaceous records exists in the southwestern part of the province.

Paleocene vertebrates are known from several localities; specimens consist of a few tiny mammal teeth, scraps of fish, reptile, and an amphibian. There is but one bone attributable to a post-Paleocene Tertiary vertebrate from Alberta. Probability of expanding the later Tertiary record is virtually nil, owing to absence of sedimentary deposits of appropriate age and consistency.

Quaternary fossils occur, but as yet are poorly known. Prospects for improving this situation are moderately good, however.

GEOMORPHOLOGY OF THE DRUMHELLER-MORRIN AREA, SOUTH-CENTRAL ALBERTA

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ABSTRACT

The Drumheller-Morrin Area is underlain by Upper Cretaceous and Tertiary marine, brackish-water and continental sediments, dipping very gently to the west into the Alberta syncline. The bedrock is obscured by two till sheets and a disintegration moraine, which includes central-depression prairie mounds, moraine plateaus, and disintegration ridges. Extensive Pleistocene lake deposits accumulated in three lake stages at successively lower levels. The rapid down-cutting by the Red Deer River, probably in post-glacial time, is thought to be the result of an increased discharge due to diversion of the present headwaters of the Red Deer River into the present system north of the town of Red Deer. Rapid erosion of the nonresistant Edmonton formation exposed in the valley walls resulted in the formation of spectacular badlands which are undergoing further erosion at the present time.

GEOLOGY OF THE WESTERN FRONT RANGES SOUTH OF BOW RIVER, ALBERTA

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ABSTRACT

The Front Ranges sub-province of the Rocky Mountains along Bow River Valley is bounded on the east and west respectively by the McConnell and Castle Mountain thrust faults. It comprises, from east to west, the Fairholme, the Cascade-Rundle, the Norquay-Sulphur-Goat, the Sawback-Bourgeau, and the Pilot-Fatigue Ranges. Excepting the latter, each range is underlain by a major thrust fault; the Pilot-Fatigue Range is closely tied to the Sawback-Bourgeau Range, the two being separated by the Brewster Creek syncline, and the Fatigue thrust fault which has variable but not excessive stratigraphic throw. Topographically the two ranges are distinct.

The stratigraphic section includes the Middle and Upper Cambrian, Lower Ordovician, Upper Devonian, Mississippian, Permian, Triassic, and Jurassic. Pre-Devonian rocks are exposed on all ranges except the Norquay-Sulphur-Goat Range; there the Devonian Fairholme group forms the hanging wall of the Sulphur fault, and the foot wall rocks are overturned quartzites of the Rocky Mountain group and not the hitherto reported Ordovician Mt. Wilson quartzite. Middle and Upper Cambrian formations on the Rundle and Sawback Ranges have previously been described; the author recognizes five mappable Upper Cambrian rock units in the Sawback-Bourgeau Range and refers to them by letters A, B, C, D, and E, abeyant to future unravelling of Upper Cambrian stratigraphy and nomenclature in Main Ranges type sections.

Upper Devonian formations increase in thickness westward. The Fairholme group is in carbonate facies in the Cascade-Rundle Range, the Norquay-Sulphur Range, the Sawback Range and in the north end of the Bourgeau Range. South of Mt. Allenby the Fairholme group becomes shaly and the Alexo formation loses a thick middle carbonate member to become a uniform succession of quartzitic siltstones and silty dolomites. A similar succession occurs in the Pilot-Fatigue Range.

The Alexo formation thickens to 400 feet in the west and is composed of dolomite, fine quartzites, and silty dolomites. The Palliser formation thickens to 1,850 feet in the westernmost Front Range.

Mississippian rocks thicken westward; the Exshaw formation may reach 70 feet. The lower Banff formation contains much black shale and chert. Permian and Triassic rocks are present on back slopes of all ranges except the Pilot-Fatigue Range. Jurassic rocks occur in the upper Spray River Valley on the lowest back slope of Goat Range.

CYCLIC CARBONATE SEDIMENTATION IN THE MISSISSIPPIAN AT MOOSE DOME, SOUTHWEST ALBERTA

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ABSTRACT

The Mississippian seas covering Western Canada shallowed northeastwards towards a shoreline on the Canadian Shield and deepened southwestwards to the present Cordilleran area. Various types of limestone, controlled in the main by depth of water and the degree of contamination by terrigenous sediment, were formed in belts across this shelving epicontinental sea. Changes in sea level caused these belts to move back and forth. The genesis and diagenesis of the resulting cyclic sequence of limestones and dolomites are discussed in terms of the typical succession exposed in the Moose Dome inlier of the Foothills of Southern Alberta.

The Banff formation at the base consists predominantly of argillaceous, cherty, pasty limestones formed by the anaerobic rotting of skeletal detrius below wave base. Bioclastic lime-sandstones (Pekisko formation) appeared as the seas shallowed, first with interstitial pasty matrix and then clean-washed as the energy of the depositional environment increased. Thin oolitic beds are the first sign of increased salinities. Continued shallowing segmented the seas into lagoons where lime-muds were precipitated to form the lithographic limestones of the Shundra formation. Associated dolomite muds accumulated in local, more saline lagoons.

A return to open shelf conditions started the second cycle with the deposition of clean-washed lime-sands (Turner Valley formation) composed predominantly of crinoid ossicles and bryozoan fragments. Reservoir rocks of porous and permeable dolomite are common in these sediments, particularly those formed from the more heterogeneous bioclastic detritus. The dolomitization is believed to be epigenetic,—formed during a late phase of diagenesis.

Cryptocrystalline dolomites, brecciated by the solution of associated anhydrite, occur in the overlying Mount Head formation, which represents the evaporitic phase of the second cycle.

STRUCTURAL GEOLOGY OF THE MOOSE MOUNTAIN AREA, ALBERTA

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ABSTRACT

The surface geology of the Moose Mountain area provides excellent illustrations of type structures and fundamental processes in foothills geology. The area consists of a series of fault plates separated by major sole thrusts.

In one instance the upper and lower boundary sole thrusts converge to form a wedge-shaped fault plate, a typical foothills structure. Study of the junction relationships indicates the lower or more easterly sole thrust was formed, and probably folded, before the upper or more westerly sole thrust developed.

All thrusts eventually terminate laterally or vertically. Lateral die-out is illustrated in several cases where it is apparently accomplished by transfer of motion to adjacent faults. Evidence of vertical die-out is provided by the Turner Valley sole fault where motion was dissipated upward in a crumpled zone along the eastern edge of the Foothills.

NISKU LITHOFACIES OF ROCKY MOUNTAINS, ALBERTA

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ABSTRACT

The Nisku formation of the Winterburn group of Upper Devonian age is mapped throughout a portion of the Alberta Rocky Mountains. The area studied extends from the Moose Mountain area in the south to the Smoky River area in the north. Based on lithological similarities to well established lithofacies types of the Plains area, the formation is mapped into approximate areas of five predominant informal rock types as follows: dolomite, porous in part; dolomite, silty and argillaceous; limestone and dolomite, interbedded; limestone; shale and limestone, interbedded. All rock types are

considered to be the same approximate age, but an exception is noted in that the upper part of the Nisku shale and limestone facies, which has previously been included with the Alexo, may be of post-Nisku age in the southeast part of Jasper National Park.

The Nisku lithofacies map is based on 53 measured outcrop sections and 18 well sections. A summary of selected outcrop sections is tabulated.

MIDDLE CAMBRIAN OF THE SOUTHERN ALBERTA PLAINS

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ABSTRACT

The Cambrian of the Plains has been divided into Upper and Middle Cambrian. Correlations leading to this subdivision, which incorporate all conclusive paleontological evidence available to the author, are presented in three profiles, two of which extend into western Saskatchewan where the Middle Cambrian is widespread. Middle Cambrian nomenclature typical of the Banff-Yoho Parks area is extended to the Plains. Maps and profiles emphasize two main lithologic types: carbonates, characteristic of the Rocky Mountains outcrops, in the west; and coarse, mainly rounded clastics, a diachronous eastern facies component that has its source on the Precambrian Shield.

A structure map, and an isopach map with superimposed elementary facies outlines in Plains and Mountains, further illustrate some aspects of the Middle Cambrian. Facies and thicknesses are closely related. Thicknesses increase from east to west. Four facies provinces governed by depth of deposition and distance from the clastic source area of the Precambrian Shield are arranged in belts with roughly northwest-southeast trending boundaries. From east to west these are: (a) Coarse Basal Clastic Belt; (b) Glauconitic Silt-Shale Belt; (c) Submerging Shelf Carbonate Belt, culminating in a section of approximately 4,000 feet containing reefoid rocks in the Rocky Mountains; (d) Western Deeper Water Shale Belt, west of a line from Field, British Columbia, to Blairmore, Alberta, and farther southwest through Cranbrook, British Columbia, where it attains a thickness of over 5,000 feet.

In the Plains a number of positive and negative depositional trends are observed. The negative trends are associated with carbonate deposition; the positive trends are devoid of carbonates.

Oil shows are summarized. Attention is given to the possibility that petroliferous reef-type carbonates, as found in the Eldon formation of the Mountains, may extend into the Foothills and Plains.

ELK POINT GROUP, SOUTHERN AND CENTRAL ALBERTA

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ABSTRACT

The following is a summary of a paper on the Elk Point group in Alberta south of Township 60. The detailed paper will be published by the Geological Survey of Canada.

The Elk Point was introduced as a formation by J. R. McGehee in 1949. It was described from the cores and samples of a number of wells drilled in the Elk Point area and was extended from that area to include homotaxial units in southern Alberta and Saskatchewan. It was given group status by Belyea in 1952 because it includes a number of separately mappable units which are not necessarily co-extensive.

The sediments of the Elk Point group were deposited in a northwesterly trending basin extending from southern Manitoba to the Northwest Territories. A belt in the central part of the basin contains from one to three large salt beds and was designated the 'evaporite basin' by Crickmay (1954). Its western limit in Alberta is shown.

Crickmay in 1954 designated nine informal members in the Elk Point area, where the Elk Point group is near its maximum development. From the top down this sequence is comprised as follows:—Member 1: green and red shales, dolomite, anhydrite; Member 2: the 'first salt'; Member 3: fossiliferous limestone and dolomite, containing an upper zone with reef-type lithology and a lower zone, consisting of argillaceous limestone (correlated by Crickmay with the Winnipegosis); Member 4: orange-red shale, siltstone and dolomite (correlated with the Ashern by van Hees); Member 5: the 'second salt'; Member 6: white anhydrite and limestone with ostracodes; Member 7: grey and red shale; Member 8: the 'third salt'; Member 9: orange-red shales, siltstone, anhydrite with coarse sand grains and glauconite towards the base. van Hees (1956) placed members 1 to 4 in the Upper Elk Point and members 5 to 9 in the Lower Elk Point.

The Lower Elk Point seems to be present only in the northeastern part of the map-area. No positive evidence as to its age has been obtained. The Upper Elk Point, of known Middle Devonian age, is more extensive than the Lower Elk Point. The individual members are not recognizable beyond the limits of the 'evaporite basin', having changed facies southward and westward into anhydritic claystones, shaly limestones and dolomite, shale and interbedded siltstones and sandstones, the latter increasing in abundance westwards; red and green colors are common.

The Elk Point group rests on truncated Cambrian and Ordovician sediments. The subcrop of the Ordovician on the pre-Devonian surface is present in the southeast part of Alberta where it is overlain by three members of the Elk Point group. At California Standard Parkland 4-12 (Lsd. 4, Sec. 12, Twp. 15, Rge. 27, W4M) in southwestern Alberta a thin Elk Point sequence rests on limestones, shown by Raasch and Campau (1957) to be Middle Cambrian. Between these two areas and northward over central Alberta, the Elk Point rests on light grey, calcareous, glauconitic siltstones with interbedded maroon and green shales of the Upper Cambrian. In western Alberta the Elk Point overlies fine to coarse-grained, poorly sorted quartzose sandstones which may in part be correlative with sandy beds included in the Elk Point elsewhere, or sandstones of more than one age may occur in the area. Warren (personal communication) has found lower Ordovician faunal elements in sandstones below the Devonian in Altoba and Canyon Clearwater No. 1 (Lsd. 5, Sec. 31, Twp. 34, Rge. 9, W5M). In the Windfall area of Central Alberta, sandstones present below the Devonian carbonates may also be Devonian in age.

Some inference as to the development of the Elk Point basin of deposition can be made. The Lower Elk Point beds, present only in the northeast part of the map-area, terminate against truncated Ordovician carbonates (Buller, 1958, and van Hees, 1956), or else, they change facies eastward (Walker, 1957). The Upper Elk Point beds, which reach a thickness of about 700 feet within the 'evaporite basin', become thinner to the southwest by rapid pinch-out of the salt member and by wedging out of the marine limestone member, the uppermost member being the most extensive. This combination of events suggests gradual subsidence permitting progressive onlap of Elk Point deposits over a positive area in southern and southwestern Alberta. The southern part of the province may have remained relatively high into Upper Devonian time and some shelf clastics, here included on the basis of lithology with the Elk Point, may in fact be equivalent to the overlying Beaverhill Lake.

There is some evidence that the Elk Point sediments reflect to some extent the topography of the underlying surface. For example in the area northeast of Calgary the Elk Point is thin over Upper Cambrian, but thicker in the Calgary area where it overlies Middle Cambrian. Thick Lower Elk Point sediments are restricted to the area bounded to the southeast by Ordovician carbonates and to the west by dolomites dated as Upper Cambrian by de Mille (1958).

Both northeasterly and northwesterly structural trends seem to have influenced the configuration of the Elk Point basin. The margin of the Lower Elk Point in eastern Alberta has a northeast depositional strike and northeasterly trending isopach thin trends subdivide the positive area of southern Alberta. One thin extends from the latitude of the Bow Valley and one from the southwest corner of the province. On the other hand, a northwesterly trend is apparent in the west margin of the 'evaporite basin'. These trends seem to reflect pre-Elk Point features, in part erosional but possibly indicative of structural weakness or movements which controlled the depositional and erosional patterns of the overlying Devonian sediments. The southern Alberta arch may result from the crossing of these northeasterly and northwesterly trending elements.

Some correlation between the configuration of the Upper Devonian reef chains and the trends of the Elk Point isopachs is evident. For example, the shelf-margin reef complex follows the wedge-edge of the Ordovician carbonates, the basal Beaverhill Lake reefs seem to follow Elk Point isopach trends in southern Alberta; and the Duvernay embayment and flanking Cairn stromatoporoid reefs in southern Alberta seem to follow the Elk Point embayment north of the Princess area. (Belyea, 1957 and 1958).

Tovell (1958) pointed to northeasterly and northwesterly trending structural elements south of the 51st Parallel as having influenced Mesozoic sedimentation. The trends of the structure contours on Tovell's maps are similar to those of the Elk Point in this area. This suggests that early structures, possibly Precambrian, although modified by later epeirogenic movements, have influenced later erosional and depositional patterns.

BASAL UPPER DEVONIAN STRATA BETWEEN DRUMHELLER AND ROCKY MOUNTAINS, ALBERTA

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ABSTRACT

The basal Upper Devonian red bed in the area between Drumheller and the Rocky Mountains commonly is considered a part of the Middle Devonian Elk Point formation. This "correlation" is perpetuated from early considerations (McGehee, 1949; Imperial Oil, 1950) which assigned the red bed interval to the Elk Point on the questionable basis of alleged lithologic similarity and presumed analagous stratigraphic position. These considerations are untenable for the following reasons:

(a) The basal Upper Devonian red bed is not a part of the Elk Point but is naturally separated from it by a notable regional unconformity caused by pre-Upper Devonian erosion of 50 to 800 or more feet of uppermost Elk Point strata in the subsurface of Western Canada. This unconformity is interpreted from evidence in the published cross-sections of Crickmay (1954), Law (1955), and van Hees (1956). Although these authors themselves did not interpret the contact below the red bed interval as an unconformity, the obvious structure in the Elk Point strata, and suggested differential erosion of these, can hardly be interpreted otherwise. This natural and significant break in sedimentation between Upper and Middle Devonian strata has long been known from the lower MacKenzie River area to Great Slave Lake (Cooper, et al, 1942), and has been recognized and agreed upon by many in the region of the Mississippi Valley (Illinois State Survey, 1944).

(b) Thus, the red bed is not the same age as the Elk Point, nor is it the same age everywhere as it is transgressive with successive conformable Upper Devonian (Beaverhill Lake) strata, which rest unconformably upon different Middle Devonian and older rocks. The red bed is, thus, itself an indicator of the unconformity which separates the rocks of the Upper and Middle Devonian epochs.

(c) The red bed is not traceable into Elk Point strata below the unconformity, but rather in different areas it corresponds to the following Upper Devonian formations,—Ghost River formation of Warren, (1927) and Walcott, (1923, 1928) in the frontal Rocky Mountains west of Calgary; Unit C of Sloss and Laird (1947) in northwestern Montana; the Mafeking formation of Crickmay (1954) in outcrops in Manitoba; the Watt Mountain formation of Law (1955) in northern and central Alberta; the 'first red bed' of van Hees (1956) in the subsurface across Saskatchewan, as well as his interval from the top of the 'first red bed' to the base of the 'second red bed' in western Saskatchewan.

The top of the Elk Point is revised herein from the top of the basal transgressive red bed of the Upper Devonian to the bottom of the interval. This boundary coincides with the regional unconformity which in every respect is a more significant horizon for both formational and stratigraphic subdivision and nomenclature. The following points will illustrate this argument:

(a) It is fundamentally unacceptable to consider a 'regional' hiatus within the rocks of one stage, for example: the Givetian stage. Rather it is basically sound, in theory and in practice, that such an unconformity occurs between the Frasnian and Givetian stages. These mark the natural unconformable break in Europe between the Upper and Middle Devonian series (Schindwolf, 1954). It is in fact misleading to include a major unconformity within one formation as it is generally understood! It is therefore unreasonable to use one formational name which hides the fact that both Upper and Middle Devonian strata are present but separated by a regional unconformity.

(b) The top of the red bed represents a transgressive facies boundary and therefore cannot represent a time-marker between strata of the Upper and Middle Devonian epochs. This red bed cannot be considered to represent late Middle Devonian sediments, when, in fact, below the red bed are late and early Middle Devonian strata.

(c) Many notable stratigraphers deliberately include (Woodring, 1953), or unsuspectingly hide, regional unconformities within type or reference sections. An example is the Cedar Valley formation of Iowa (Cooper, 1942) which has led to unceasing arguments that this formation is either Upper or Middle Devonian in age. In fact, the Cedar Valley is Upper and Middle Devonian and the "hidden" unconformity is well known beyond the area of the type section.

This same stratigraphic procedure has been followed in Western Canada, and has been commonly applied to the Devonian succession in the subsurface between Drumheller and the frontal Rocky Mountains. There is every reason to refer to the basal Upper Devonian red bed of this area as basal Beaverhill Lake and not uppermost Elk Point.

DEVONIAN REEF AND OFF-REEF RELATIONSHIPS IN THE DRUMHELLER AREA

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ABSTRACT

Rapid facies changes associated with reef development occur in the Devonian Winterburn and Woodbend sediments of the Drumheller area. To indicate the facies relationships, the "Limy" and "Dolomitic" sediments are divided into several informal rock types. The "Dolomitic" sediments are classified according to their interpreted original or undolomitized rock types.

The Cooking Lake formation, composed of predominantly pelletoidal and fragmental limestones, forms the base of reef development in portions of the Southern Alberta Reef Complex. A line of organic shoals is indicated in the Cooking Lake six to eight miles in front of the Reef Complex.

The Duvernay formation is closely associated with reef development. It is composed predominantly of reef detritus close to the Reef Complex and contains incipient reef developments in a lime mud facies beyond the detrital zone.

The Ireton formation is a lime mud facies with tongues of framental carbonate. The upper portion of the Ireton is dolomitic and contains a dark organic dolomite band which becomes the main constituent of the Ireton interval over the Reef Complex.

The Southern Alberta Reef Complex, an informal term used to designate the Woodbend carbonates of the southern portion of the study area, is composed of fragmental carbonate and reefoid beds. Organic material predominates in a band approximately 3 miles wide along the reef front.

The Nisku interval contains shoals of light organic dolomite with associated fossil fragmental dolomites and pelletoidal dolomites separated by intershoal areas of dark dolomitic muds and bedded dark organic dolomites.

The depositional environment of the sediments indicates a period of almost continuous reef growth modified by cycles of emergence and submergence. The emergence or lowering of the sea level is associated with erosion of the reef while the submergence was probably a period of rapid growth.

FACIES ANALYSIS OF UPPER DEVONIAN WABAMUN GROUP IN WEST CENTRAL ALBERTA

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ABSTRACT

The Wabamun group, consisting mainly of carbonate rocks and anhydrite, increases in thickness westward from less than 500 feet in the Leduc and Stettler areas to approximately 1,800 feet in parts of the Rocky Mountains of Alberta where it is known as the Palliser formation. East of Leduc and north of Stettler the Wabamun has been partially or completely removed by pre-Cretaceous erosion.

For purpose of facies analysis the Wabamun is subdivided into four units that are believed to represent distinct rock sequences in parts of the area. These are basal, lower-middle, upper-middle and upper Wabamun. Because satisfactory marker beds occur only at the base and top, and not within the group, an operational subdivision is employed based on the assumption that thickness variations are primarily the result of differential subsidence during deposition (excluding effects of later solution of evaporites). Thus, within any given time interval the thickness of rocks deposited should exhibit constant proportion to the overall Wabamun thickness. The basal Wabamun includes the lowermost evaporitic interval and lateral marine carbonate equivalents. The lower-middle Wabamun represents the overlying interval to the top of the "Crossfield member" in the Calgary area. The upper middle Wabamun includes post-"Crossfield" and pre-Big Valley beds; the upper Wabamun represents the Big Valley formation and approximate lateral equivalents.

Three main facies provinces are recognized, namely, evaporites and dolomites in the southeastern part of the map-area, limestones in the northwestern part (and locally at the southwest), and fine to coarse crystalline dolomite in the intervening area. The microcrystalline and earthy dolomites are interpreted to be of secondary or diagenetic origin whereas the cryptocrystalline translucent dolomites are considered to be of probable primary origin. The limestones range from calcilutites to calcarenites and exhibit incipient dolomitization that commonly imparts a mottled appearance to the

rock. The carcarenites are generally of the pseudo-oolitic or pelletoid type in most of the Wabamun; bioclastic limestone is characteristic of the uppermost unit and locally of the lower beds.

Evaporites and associated extremely fine-textured dolomites represent the most widespread distribution in the basal Wabamun. The main evaporites extend northwest through Stettler to Leduc whereas the extremely fine-textured dolomites occur farther northwest. In the middle Wabamun, the evaporites terminate a relatively short distance northwest and north of Stettler. Originally these evaporites may have extended north beyond their present limit but were probably removed by solution and pre-Cretaceous erosion. During deposition of the basal and upper Wabamun units, a subsidiary evaporite province occurred in the Foothills belt west of Calgary and may have extended north as far as the Clearwater River.

Beales (1956) originally noted the similarity of Palliser limestones of southwestern Alberta to those presently being deposited on the Bahama Banks. Pelletoid limestones are also characteristic of the Wabamun to the northwest of the Conference area, and although dolomitization has destroyed or obscured the original limestone texture in other sections, relicts of calcarenite texture in some dolomites suggest that widespread bank conditions existed in the Wabamun sea. Sutterlin (1958) described the mechanism by which these rapidly growing banks restricted free circulation of marine waters eastward, causing evaporite precipitation in the Stettler-Drumheller area.

Petroleum has accumulated in two main types of stratigraphically controlled traps within the Wabamun group. Facies change from porous secondary dolomites to relatively non-permeable equivalents approximately up-dip regionally (mainly eastward) is responsible for gas entrapment in the Okotoks-East Calgary-Olds trend of fields. In the Edmonton area, oil and gas are localized in erosional hills made up of porous Wabamun dolomites at the pre-Cretaceous unconformity.

MISSISSIPPIAN OF SOUTH-CENTRAL ALBERTA

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ABSTRACT

Mississippian rocks are truncated in a northeast direction across the map-area. The erosional limits of the various formations are shown.

The Bakken is thickest in the east part and thins northward and westward, where only the lower black shale unit is recognizable.

The Banff thins eastward and changes from a basinal facies in the Foothills to a shelf facies in the Plains. The Banff formation of the type section is not the Banff formation of the Plains. In order to be consistent with established Plains usage, it is proposed that the Banff formation and the Rundle group at the type section be redefined.

The Elkton member of the Turner Valley is the most important oil and gas reservoir in the area. Accumulation occurs at the erosional up-dip edge of the Elkton, in stratigraphic traps controlled by facies changes, channelling, and by the overlying impermeable Mesozoic shales.

Total recoverable reserves from the Turner Valley is 306,364,000 barrels of oil,—88 percent of the total reserves of all producing zones in the area.

FACIES AND POROSITY RELATIONSHIPS IN THE MISSISSIPPIAN ELKTON CARBONATE CYCLE OF SOUTHWESTERN ALBERTA

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ABSTRACT

Major hydrocarbon (oil and gas) reserves have been found in the Mississippian Elkton carbonate cycle, both in the Foothills belt and along the subcrop, in southwestern Alberta. Effective reservoir material of this cycle was found to consist mainly of the dolomitized equivalent of an originally coarse skeletal limestone with a variable amount of generally porous, finely comminuted (granular) skeletal matrix. Primary porosity was very important in the control of dolomitization, which probably began with the replacement of this matrix by euhedral rhombohedrons and finally affected the coarse skeletal material (now generally indicated by leached fossil cast outlines). These porous dolomites grade laterally in a predictable way into tight, relatively undolomitized, well-sorted, coarse skeletal limestones with original high interfragmental

porosity now completely infilled with clear crystalline calcite. This lithification by cementation took place early in the history of carbonate sedimentation of this area and before secondary dolomitization processes took effect.

THE BLAIRMORE GROUP IN THE SUBSURFACE OF ALBERTA

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ABSTRACT

Cross-sections extending through the subsurface from Fort St. John, British Columbia, eastward to the Fifth Meridian in Alberta, thence southward to the International Boundary, show the stratigraphic relationships of the various units of the Blairmore group. Emphasis is placed on the widespread occurence of the Glauconitic sand; it is proposed that it be known hereafter as the Bluesky formation. The subsurface sections are 'tied in' to an outcrop section along Sheep River, southwest of Calgary.

VIKING DEPOSITION IN THE SOUTHERN ALBERTA PLAINS

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ABSTRACT

An examination of Viking cores from wells located between Townships 14 and 34 from the Saskatchewan border to the Foothills belt was used as the basis for this paper. A number of micro-structural features are considered to be evidence of penecontemporaneous hydroplastic deformation. These features contradict the theory that the Viking is a shore or off-shore sediment, deposited during repeated minor transgressions and regressions. Deposition by turbidity currents is offered as an alternative interpretation.

WIMBORNE OIL AND GAS FIELD, ALBERTA

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Mobil Oil of Canada Ltd., Calgary

ABSTRACT

Discovered in 1954, Wimborne oil and gas field lies in southwestern Alberta, fifty miles northeast of the city of Calgary. The main oil and gas accumulation occurs in a dolomitized reef of Devonian Leduc age, with a secondary accumulation occurring at a higher elevation in the biostromal development in the Nisku formation of the Devonian Winterburn group. Nineteen wells have been drilled to the Leduc reef in the field area, of which thirteen are on steady production. No production is presently being taken from the Nisku.

DRUMHELLER OIL FIELDS, ALBERTA

M. R. Roop
The British American Oil Company Ltd., Calgary

ABSTRACT

The Nisku, Leduc and Basal Quartz are the producing zones in the West Drumheller and Drumheller oil fields, which were discovered between 1950 and 1952. The Nisku formation of the Upper Devonian is the primary reservoir. Production is also obtained from the Leduc reef at West Drumheller, and from the Lower Cretaceous Basal Quartz sandstone in Drumheller. The Nisku consists of two units: an upper unit of dense, evaporitic dolomite and anhydrite, and a lower unit of porous crystalline dolomite, which is the reservoir rock. The trap at West Drumheller is due to reef buildup; at Drumheller it is stratigraphic. Reservoir and development data are presented in the text.

EAST CALGARY GAS FIELD

A. D. M. Mason and C. Riddell
Mobil Oil of Canada, Ltd., Calgary

ABSTRACT

The East Calgary gas field in southern Alberta is located at the junction of two trends of stratigraphic traps. The lower reservoir, the Crossfield dolomite member of the Upper Devonian Three Forks formation, contains substantial reserves of highly sulphurous gas trapped by an eastward up-dip porosity pinch-out. The upper reservoir, the Elkton member of the Mississippian Turner Valley formation, contains sizeable wet-gas reserves within a lobe of porous dolomite formed by progressive eastward erosional truncation of the Mississippian surface. Minor gas reserves may be present within Basal Cretaceous sands lying immediately above the Mississippian unconformity. Step-outs and infill drilling is continuing slowly within the field area of approximately two townships.

WAYNE OIL FIELD, ALBERTA

R. H. Erickson and J. S. Crewson
Great Plains Development Company of Canada, Ltd., Calgary

ABSTRACT

The Wayne Oil Field is located in south-central Albetra and, since its discovery in 1954, has produced over 320,000 barrels of 29.5° A.P.I. oil from the Lower Cretaceous Sunburst sandstone. The sandstone is characterized by a clay infilling which reduces production but causes the trap. Of seven wells drilled, six are on pump and one is suspended.

NINTH ANNUAL FIELD CONFERENCE

September 9-12, 1959

The papers whose abstracts are given above will be presented in the Southern Alberta Jubilee Auditorium on Thursday, September 10. Guide Books are now available and may be obtained from R. Frank Buckle, Rotary Engineers of Canada, 415 10th Street N.W., Calgary, by registration in advance. Registration fees are $6.00 for Members, $8.00 for Non-Members.

Registration at the time of the Conference will begin at 3:00 p.m. Wednesday afternoon, September 9, at the Calgary Professional Club. Members are urged to register early.

The reception will begin at 7:30 p.m. at the Calgary Professional Club.

On Thursday evening there will be an opportunity to discuss the papers, or to fill up on coffee and doughnuts, or both.

The trip to the Bad Lands of the Drumheller area is on Friday. There will be consideration of exposed sections, dinosaur remains, oil pools, coal mines, and glacial effects.

On Saturday the Conference goes to the Moose Mountain dome, where the Mississippian section is exposed in grand cliffs and mountains rising from Canyon Creek; to beautiful Elbow Falls; and to outcrops of other rocks from the Cambrian to the Tertiary.

Transportation will be by bus both days, starting from Mewata Stadium at 8:00 a.m.

The Bar-B-Que and Barn Dance will be held at the Bar-K Ranch, near Bragg Creek, Saturday night.

The ladies have a special program of Fashion Show, Tea, Bridge, and the Bar-B-Que and Barn Dance.

Other details are in the June **Journal**.