Hobart, Henry M., Jr., Tulsa, Okla.
(Jack R. Huffmyer, David E. Reed, Stanley D. Smith)
McCallum, John Stewart, Roswell, N. Mex.
(Mark D. Wilson, Willard R. Green, W. J. Turney)
Moore, Richard Vernon, Billings, Mont.
(Wallace E. Lumb, Marvin A. Heany, Max W. Dix)
Morrison, John Augustus, Durango, Colo.
(Robert R. Smart, L. J. Wanek, John P. Lockridge)
Parks, William Scott, University, Miss.
(Richard R. Priddy, Paul H. Dunn, Tracy W. Lusk)
Rawlinson, George Harmon, Billings, Mont.
(Solon W. Stone, L. T. Hart, H. M. Buchner)
Rowlinson, Norman Richard, Bogota, Colombia, S. A.
(W. C. Hatfield, C. T. Spalding, Dan Bozanic)
Rush, Rufus Rayburn, Caracas, Venezuela, S. A.
(John Reid Black, G. R. Pierce, Hugh B. Patrick)
Salisbury, Gerald P., Midland, Tex.
(Don William Reynolds, David N. Grimes, S. C. Giesey)
Sandberg, Joseph Theodore, Wichita, Kan.
(George N. Mueller, Edward E. Pugh, Jr. J. Robert Berg)
Scott, Ralph La Moyne, Wichita, Kan.
(J. K. Wetherill, David E. Reed, Stanley D. Smith)
Strunk, Paul Milton, Corpus Christi, Tex.
(Henry V. Beck, Charles P. Walter, J. R. Chelikowsky)
Talley, Bobby Jack, Lubbock, Tex.
(John J. Gill, Richard C. Linden, Dick Teel)
Williams, Robert Lee, Manila, P. I.
(T. Ranneft, Robert L. Bates, C. H. Summerson)
Ziemba, Eugene Anthony, Denver, Colo.
(Roger A. Matuszczak, Henry A. Sakowski, E. Keith Droullard)

ROCKY MOUNTAIN SECTION ANNUAL MEETING, BILLINGS, MONTANA, FEBRUARY 7–10

ABSTRACTS

ALLEN F. AGNEW and JOHN PAUL GRIES, South Dakota State Geological Survey, Vermillion, S. D., and South Dakota School of Mines and Technology, Rapid City, South Dakota

South Dakota Oil—Past, Present, and Future

Of the approximately 350 oil and gas tests drilled in South Dakota before July 1, 1959, only 56 per cent reached the Pennsylvanian rocks. Less than 17 per cent of the total penetrated all of the formations and thus reached the Precambrian.

Twenty-two per cent of all holes reported shows of oil or gas; however, in the Williston Basin area and its fringes, the percentage of shows has been twice as great.

The Buffalo field in the southwestern part of the Williston Basin is experiencing a boom, with 12 holes completed as producers in the Ordovician Red River dolomite at a depth of approximately 8,500 feet, in the six months between May 20, 1959, and November 20, 1959. Daily production is more than 1,500 bbl. oil, with a small amount of gas. The only other oil production in the state is from the Pennsylvanian Leo sands at a depth of 1,400 feet in a well in the southern Black Hills.

Future exploration will be directed toward stratigraphic-structural traps in the Williston Basin portion of South Dakota, where increased activity is expected in 1960. The oil possibilities of the Cretaceous, Jurassic, and Pennsylvanian sands merit further systematic work. The Kennedy Basin area will probably be tested by wildcatters who are attempting to corroborate the Pennsylvanian shows in nearby parts of Nebraska, as will the Forest City Basin in the extreme southeastern corner of the state.

B. W. BEEBE, Consulting Geologist, Boulder, Colorado

Crisis in the Earth Sciences. Legal or Self-Regulation?

The earth sciences need some system of regulation and accreditation. Such action will not *immediately* provide one more job; nor will it raise our stature or increase our income at once. Our chief concern is how this regulation should be accomplished. Hence, the AGI Committee for Study of Professional Standards. AGI is the only *vehicle* which can represent all branches of earth science and through which a profession-wide study can be made! The Committee *is not constituted to force legal regulation or accreditation* on either the profession or colleges and universities.

It is proposed to reorganize AGI as the one and only *professional* organization; a federation representing all earth scientists and their scientific organizations. Within this new federation, creation of a "Professional Institute" for self-regulation and accreditation is proposed. Far more stringent professional requirements can be made than can be written into any acceptable law. Surveys indicate industry supports and individually rewards real attempts to raise professional standards and competence. Self-regulation is a step in the right direction, but *may or may not* take the place of legal regulation. Only those of us in the profession can decide how we want it regulated.

FRED A. F. BERRY, Petroleum Research Corporation, Denver, Colorado

Geologic Field Evidence Suggesting Membrane Properties of Shales

Some anomalous pressure and salinity data observed within oil- and water-bearing reservoir rocks can not be explained by prior theories in hydrodynamics and geochemistry. Laboratory evidence has shown that compacted clay minerals act as semipermeable membranes and thereby exhibit osmotic-pressure and salt-filtration effects. Osmotically induced pressure and salt filtering occur in reservoir rocks adjacent to shales presumably serving as semipermeable membranes. Osmotic conditions might result from differences across a shale of salt concentration. Pressure would tend to increase in the reservoir rock on the emergent side of the shale membrane and decrease on the influx side under osmotic conditions. Cross-formational flow through a shale membrane may also cause salt filtering and thereby increase the salinity on the influx side of the membrane.

Three widely separated areas in North America (central Alberta, Canada; San Juan Basin, New Mexico and Colorado; and Wheeler Ridge anticline, San Joaquin Valley, California) have anomalous potentials and salinities that may be explained by the movement of water cross-formationally through shales acting as semi-permeable membranes. Pressure and salinity anomalies from other areas possibly may be explained by shale-membrane phenomena.

ARDEN F. BLAIR, Consulting Geologist, Billings, Montana

Richey Field, Montana

The Richey field was discovered in July, 1951, by the Shell Oil Company No. 1 Northern Pacific, SE. NW. NW. Sec. 19, T. 23 N., R. 50 E., Dawson County, Montana, with completion in the Charles formation of Mississippian age. Subsequent wells also established production in the Mississippian Mission Canyon formation. This was the first commercial oil discovery in the Montana portion of the Williston Basin.

Regionally, the Richey field is situated on the west flank of the Williston Basin paralleling the Calf Creek-Weldon lineament and is believed to be tectonically related to it. The local structure is a northeasterly trending anticline with a normal fault parallel with the northwest flank, and a transverse fault across its south end. A structural closure of approximately 100 feet is indicated. The oil accumulation is controlled primarily by structure, but modified by a decrease in porosity along the southeast flank.

The Charles reservoirs contain the bulk of the oil reserves at Richey and consist of three zones of fractured limestone and dolomite with intercrystalline porosity having an aggregate average net pay thickness of about 35 feet. The Mission Canyon reservoir consists of very finely crystalline to dense limestone in which porosity occurs exclusively as fractures. There is an average net pay thickness of 15 feet in this unit. An effective water drive is present in all reservoirs.

In general, the production has been characterized by a high initial potential, followed by an early and abnormally high water cut. It is indicated that with the established practice of commingling the Charles and Mission Canyon reservoirs, the highly vertically fractured Mission Canyon zone is produced beyond its maximum efficient rate of flow, resulting in a rapid water coning which suppresses oil production from the Charles zone. It is indicated the ultimate oil recovery will be considerably greater if the reservoirs are produced separately, and the Mission Canyon at a low rate.

Development is on an 80-acre pattern. There are presently 12 producing wells in the field. Cumulative production to December 1, 1959, was 1,239,000 barrels of oil. Current monthly production is about 20,000 barrels of oil. Approximately 1,700 acres are considered proved productive with an estimated recoverable reserve of 5,000,000 barrels of oil.

G. J. BLUNDUN, Home Oil Company, Limited, Calgary, Alberta

Mississippian in Alberta Plains and the Reflection Seismograph

The eroded Mississippian surface is the major unconformity in the Province of Alberta. To map its erosional highs and lows is most important, because the Mississippian may be productive of hydrocarbons or may cloak the attitude of deeper sediments from which production is sought. This paper deals with the methods of presentation of reflection seismic data to that end, together with a suggested recording instrument technique. Some of the interpretive problems, and the possible significance of Mississippian porosity on the acoustic impedance of its reflection are mentioned.

Maps of similar data, one geological and the other reflection seismic, are presented for comparison. The former is obtained from drilled wells and the latter from reflection shooting performed prior to drilling.

JOHN A. BURGER, Texaco, Salt Lake City, Utah

Mesaverde Group in Adjoining Areas of Utah, Colorado, and Wyoming

The mixed marine and nonmarine Mesaverde group (Late Cretaceous) overlies and intertongues with the marine Mancos shale or its equivalents and underlies and intertongues with the marine Lewis shale or underlies continental rocks of latest Cretaceous or Paleocene age. The area studied is approximately 200 miles square on both sides of the Wyoming and Utah-Colorado state line.

Formations and members in 7 smaller geographic subdivisions are described and related in terms of Lee's (1915) genetic units to a standard four-fold section in the Rock Springs uplift consisting from oldest to youngest of the Blair, Rock Springs, Ericson, and Almond formations.

Data from 14 measured surface sections and more than 120 wells were used to make isopach maps of individual formations, members and tongues. These maps show that basins and relative arches of Late Cretaceous time correspond fairly well with those of Tertiary time and that the maximum thickness of a genetic unit is at the zone of transition from continental to marine sedimentation.

Numerous minor transgressions and regressions of the sea are imposed on a general eastward regression during Mesaverde time followed by a major transgression during Lewis time and a complete withdrawal of the sea after Lewis time.

There are numerous cyclothems consisting of gray marine shale, tan marine siltstone and sandstone, gray and white beach sandstone, coal, brown carbonaceous shale, and gray to brown carbonaceous siltstone. Both transgressive and regressive deposits are present.

Two probable controls of intertonguing are recognized: (1) intermittent delivery of sand and mud by streams along a subsiding delta front and reworking by marine currents; (2) several rather rapid changes of sealevel or landlevel, either tectonic or eustatic.

Most of the sediments were derived from areas west of the "Wasatch line." Toward the close of Mesaverde deposition, local uplifts in the site of the present Uinta Mountains and possibly the Wind River Mountain provided a source for sediments.

Short-ranging fossils are scarce in the Mesaverde group in this area. The marine shale tongues generally contain long-ranging arenaceous foraminifera and the marine sandstones contain *Ostrea sp.*, *Inoceramus sp.*, *Halymenites major* and worm tubes; the faunas are useful as indicators of paleoenvironments, but are not useful for stratigraphic correlations.

No new formation names are proposed. Several unnamed sequences should be mapped and traced laterally before they are named. The Lazeart sandstone is raised from member to formational rank. The Rimrock sandstone and the Asphalt Ridge sandstone of Walton (1944) are considered members of the Iles formation.

M. B. B. CROCKFORD, J. C. Sproule & Associates, Calgary, Alberta

Dodsland Field, Saskatchewan

The Dodsland field is situated in southwestern Sas-