PACIFIC PETROLEUM GEOLOGIST

NEWS LETTER OF THE PACIFIC SECTION
AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

Volume 16 | January, 1962 | Number 1

ASSOCIATION ACTIVITIES

LOS ANGELES LUNCHEON MEETING

"Tectonics of the Dead Sea Fault" was the subject of an enlightening and beautifully illustrated talk given by Mr. Anthony E. L. Morris, Manager of Exploration, Pauley Petroleum, Inc., at Rodger Young Auditorium, December 7th.

Abstract:

The Dead Sea Fault is a north-south trending flaw in the earth's crust traceable for over 1000 kilometers from the Red Sea to eastern Turkey. It traverses the country of Jordan wherein the greater part of the study was made.

Jordan has three distinct geographic and geomorphic provinces: (1) the Transjordan block, a largely desert area comprising the eastern three-quarters of the country, (2) the Dead Sea Depression, a long linear trough reflecting the prominent Dead Sea fault, and (3) the Judea Hills, a hilly anticlinorium probably resultant upon basement block faulting.

Jordan has been on a hinge line between the Arabian Shield and the Tethys Geosyncline throughout its known geologic history. About 850 meters of terrestrial sediments accumulated on the landward side, 2000 meters of mixed shallow marine, littoral and continental strata at the pivot line and more than 5000 meters of marine beds in the basin side of the hinge. The sediments range from Cambrian to Recent.

The present structural pattern of the country has developed since the Middle Mesozoic and commenced with relatively minor basement block faulting. There is no true geosynclinal folding in the area.

Movement, of two types, began on the Dead Sea fault in Oligocene time and is still active. There is substantial evidence to suggest left-lateral strike-slip movement up to 140 kilometers. Relatively minor contemporaneous vertical movement occurred and has given the present topographic configuration.

Ten points of evidence in ascending order of importance are listed to substantiate this proposition:

(1) The orientation of folds on both sides of the Dead Sea fault is consistent with interpretation as drag folds along a major shear.

(2) Recent fault scarps, showing left-lateral stream offset are visible in the Dead Sea Depression.

(3) A large Quaternary basalt flow in eastern Jordan and southern Syria terminates abruptly at the Dead Sea fault. Identical basalt is found 35 kilometers farther south on the west side of the fault. There are no vents on the west side.

(4) The granitic massif in southern Sinai is similar in petrology and elevation to a granitic massif bordering the northeast shore of the Dead Sea. The Sinai massif is about 140 kilometers south of the projection of the Arabian granitic outcrop.

(5) The straight northeast shoreline of the Red sea is offset between Sinai and the Arabian block on the order of 140 kilometers.

(6) The thickest section of Upper Cretaceous-Eocene rocks east of the rift is just east of the Dead Sea. Across the fault a comparable section is found midway between the Dead Sea and the Gulf of Agaba. The loci of maximum thickness have an approximate horizontal offset of 120 kilometers.

(7) Maestrichtian bituminous chalk 100 meters thick is found in only one locality in northern Jordan east of the Dead Sea fault. West of the rift the greatest development of bituminous chalk (100 meters $\pm$) of identical age is some 112 kilometers south of the first occurrence.

(8) A 70 meter section of Cambrian limestone and shale is present at the southeast corner of the Dead Sea. West of the fault a section identical in thickness and lithology, and of correlative age, is present just north of Agaba. Both sections pinch out southward in identical fashion. The strand lines have 130 kilometers of offset.

(9) A large, basic porphyry dike occurs 45 kilometers south of the Dead Sea on the east side of the fault. It is bounded by faults and is within the Dead Sea fault zone. A similar dike is found 130 kilometers south of this locality on the west side of the fault zone. The two rocks have similar gross petrology and are the only occurrences of rocks of this type in the area.

(10) The Triassic, Upper and Lower Cretaceous all pinch out, east of the fault at or north of the latitude of the Dead Sea. The same strand lines, based on well data, are in southern Israel about 130 kilometers farther south.

LOS ANGELES GEOLOGICAL FORUM

On the evening of December 18th, at Mobil Auditorium, a large gathering of A.A.P.G. members were treated to a subject about which nearly all claim to have at least some first-hand knowledge--the San Andreas Fault. Dr. John C. Crowell, professor of Geology U.C.L.A., began with a most interesting and well illustrated talk on "The San Andreas Fault in Southern California".

Abstract:

Three segments of a former east-west trending belt of terrane in southern California are interpreted as displaced horizontally about 130 miles on the vertical San Andreas fault and 30 miles on its

PACIFIC PETROLEUM GEOLOGIST

Published monthly by the Pacific Section, American Association of Petroleum Geologists. Address communications to the Pacific Petroleum Geologist, P.O. Box 17486, Foy Station, Los Angeles 17, California.

Next Deadline

January 31, 1962

branch, the San Gabriel fault, since the earliest Miocene. The terranes displaced by the San Andreas are characterized by distinctive rocks which range in age from Precambrian (?) to Lower Miocene. Basement types include augen gneiss and blue-quartz gneiss of the amphibolite facies which have been intruded by a complex of gabbro, diorite, anorthosite, and syenite. These rocks were intruded later again by granitic types. Associated distinctive rocks on both sides of the fault include basic dikes and mafic bodies rich in ilmenite and apatite, blue-quartz granite, quartz-bearing syenite, granophyre, and pegmatite. Greenschist, marine Eocene strata, and Oligocene nonmarine beds and volcanics are also displaced. The San Gabriel fault separates similar rocks except for the anorthosite-syenite complex.

This combined displacement of 160 miles appears compatible with other studies along the San Andreas system. Younger and smaller displacements seem geometrically sound but greater displacements of older features rest on arguments of a different order of acceptability. Additional study of the geology along faults for many miles is needed with emphasis on geometric analysis of gross elements and on a search for linear features, such as basin-margin lines and facies-change lines, to establish slip. Separations of low dipping units require study and the possibility that such units have been displaced by trace slip needs more widespread recognition.

Robert Herron and Robert Paschall then presented "Ten Unanswered Questions Regarding the San Andreas Fault." Actually, Herron asked twelve specific questions, and suggested that these were only part of the problem that must be resolved before large-scale strike-slip movement can be considered proven. They stressed that movement of a few miles was not in question, but they challenged the idea of movement of scores or hundreds of miles. They also stressed that they were now offering only questions, not answers--challenges, not solutions. Their unresolved probelems were:

1-A buried granite-Franciscan contact, over 300 miles long, lies under the Great Valley of California. As this contact, if it is a fault, has not suffered movement since pre-Eocene time, must a similiar contact along the San Andreas fault be explained by Tertiary strike-slip movement?

2-The Pelona-type schist is distributed over a wide area along both sides of the San Andreas and Garlock faults and in the Mojave Desert. Does its wide distribution permit employing it as a field criterion for large strike-slip movement?

3-Nine years ago the uniqueness of the San Gabriel Mountains anorthosite occurrence was cited, in offering it as the only possible source for certain conglomerates. Since then, anorthosite-complex rocks have been found in three additional localities. Does this relative ubiquity perhaps invalidate the earlier conclusions drawn concerning the anorthosite? More recently, occurrences of anorthosite on either side of the San Andreas have been employed as criteria for movement on that fault. But do we know about all anorthosite occurrences? And how does one reconcile the fact that one occurrence lies five miles south of the fault, and another eight miles north? "Unfaulting" the San Andreas to the extent of 130 miles would still leave these elements 13 miles apart.

4-Basement rock types have been recorded in the San Bernardino Mountains, apparently similar to those in the Soledad and Orocopia regions. Have the basement rocks of the San Bernardinos been fully considered, relative to the suggested offset of the Soledad and Orocopia areas?

5-The line drawn at the easternmost extent of Upper Cretaceous rocks in California approaches the San Andreas fault from either side, with an area of no information only about 10 miles long. This is, furthermore, a true "line" in the area near the fault on either side, i.e., the eastern Cretaceous limit is marked by an overlap of Eocene sediments onto basement. Can this be reconciled with an earlier suggestion of a Cretaceous offset, which was based in part on an erosional "east" Cretaceous boundary lying west of the San Andreas fault?

6-The Mount Pinos-Frazier Mountain area appears to be, basically, a giant uplift straddling the San Andreas fault. On either side a sequence of Eocene marine, Oligocene nonmarine, Miocene volcanics dips away from the uplift. Has the concept of a dominantly vertical geologic history been fully considered in this area, and is it safe to reject this concept in favor of large strike-slip movement?

7-The above-mentioned sequence of Eocene-Oligocene-Miocene is also found in the Caliente Range, Santa Ynez Mountains, Santa Monica Mountains, Simi Valley, Santa Ana Mountains, and the Soledad and Orocopia areas. This suggests the presence of several areas with similar environment, perhaps analogous with that in the Rocky Mountains basins. Is it, therefore, safe to employ the Soledad and Orocopia sequences as evidence for large movement on the San Andreas?

8-Miocene volcanics in Southern California are confined to two irregular areas adjacent to one another across the San Andreas fault. Has this juxtaposition been resolved with the idea of large-scale Miocene strike-slip movement?

9-An easternmost limit of Upper Miocene beds with Ostrea titan and Pecten raymondi lies in both the western Antelope Valley and in the Castaic district. These are directly opposite one another across the San Andreas fault, with a Plio-Pleistocene basement uplift intervening. Are these eastern limits of marine Upper Miocene rocks consonant with large-scale strike-slip faulting since their deposition?

10-Moody and Hill proposed, in their article on "Wrench-fault Tectonics", that the San Andreas and Garlock-Big Pine faults formed an excellent example of a shear pattern that might be produced by a north-south compressive stress. The San Andreas fulfills their role of a primary shear, and the Garlock-Big Pine faults a secondary shear offset by the primary. The offset is about six miles. Now if Moody's and Hill's suggestion is accepted, and the concept of large movement on the San Andreas is accepted, the Garlock-Big Pine system must have had its inception no earlier than the Pleistocene. Any earlier origin would necessitate correspondingly greater offset. The question here, then, is whether the wrench-fault concept is acceptable, and if so, are age data on the Garlock-Big Pine in agreement with the observable offset?

11-The San Andreas fault passes through the Transverse Ranges at Cajon Pass. It is possible to realign the San Gabriel and San Bernardino Mountains in a manner that yields 12-15 miles of right-lateral movement on the fault. Is it possible, however, to accord much greater movement to the San Andreas, and still account for the presence of the San Bernardino Mountains in alignment with the 200-mile long Transverse Range?

12-Clarence Allen's published map indicates that the San Andreas fault is cut off by the east-west Banning thrust fault, in the area north of San Gorgonio Pass. There is, in any event, considerable disagreement on the course taken by the San Andreas here. This is so critical, relative both to the Transverse Range offset and the nature of the San Andreas (?) fault east of the Salton Sea, that the problem needs resolution before large movement is ascribed to the San Andreas in the San Gorgonio Pass area.

A lively discussion followed the Herron-Paschall "Unanswered Questions", with several well-known students of California tectonics voicing their observations and opinions. It is hoped that with the interest aroused by this discussion that more pertinent information will be brought forth and more detailed studies be made to bring us closer to a solution of the character of California's most unusual structural feature.

SAN JOAQUIN GEOLOGICAL SOCIETY

The following abstracts are taken from a two-part series on Late Mesozoic stratigraphy given before the Society on December 12, 1961. Part I was presented by Stewart Chuber and Part II by William F. Edmondson.

Abstracts:

Part I:

The late Mesozoic stratigraphy and geologic history of the Sacramento Valley is discussed in two parts: 1) Pre-Mesozoic history, basin inception, late Jurassic and Cretaceous deposition up to the end of G-1 time (by Chuber) and 2) F-zone through the end of Late Cretaceous (C-zone) time (by Edmondson). Methods of study include a literature review, field work and subsurface investigation by electric logs.

The Sacramento Valley is the north half of the Great Valley, arbitrarily divided by the Stockton Arch (French Camp or Manteca fault area) from the San Joaquin Valley. It includes roughly five million acres and is geographically bordered by the Southern Cascades and Klamath mountains on the north, by the Sierra Nevadas on the east, and by the Coast Ranges on the west.

A complex pre-Upper Jurassic history is recorded by thick late Paleozoic and Early Mesozoic metasediments exposed in northern California. These rocks are 22,000 and 28,000 feet thick in the Redding and Taylorsville areas. The Late Jurassic was closed with profound compression, folding, crushing and thrusting of the rocks. Regional metamorphism affected the strata, and synorogenic as well as postorogenic batholithic intrusion took place. This event is called the Nevadan orogeny and plutonic rocks associated with it have been dated between 134 and 143 million years by potassium-argon age determinations (Curtis et al, 1958). Most of the Late Jurassic intrusions were emplaced in the Klamath Mountains and northern Sierras, west of the Melones fault zone (Clark, 1960). These areas became land masses at this time. Simultaneously the Sacramento Basin was formed to the southwest and marine deposits began to accumulate in it.

The accompanying chart (Fig. 1) shows the stratigraphic nomenclature used in this report. It includes the common formation names and their equivalent time-rock and time terms.

More than 60,000 feet of marine sediments accumulated in the Sacramento Basin during the Late Jurassic and Cretaceous. For the most part, the beds are dark gray mudstones with interbedded gray and brown sandstones and conglomerates which are laterally discontinuous. They include ± 20,000 feet of "knoxville", ± 20,000 feet of "Shasta", ± 10,000 feet of basal Upper Cretaceous rocks, 6,000 feet of G-zone strata, and 7,000 feet of F-zone beds. Most of the sediments were deposited continuously in a deep marine geosynclinal environment. The litho-and bio-facies of basal Lower Cretaceous (Valanginian) and Basal Upper Cretaceous (Cenomanian) beds reflect a shallowing of the basin. Widespread uplift and erosion initiated Venado deposition and may be synchronous with batholithic emplacement in the High Sierras. The granitic intrusions occurred in early Upper Cretaceous time, 77 to 95 million years ago, during the Santa Lucian orogeny of Curtis, et al. Eastward transgression accompanied Venado deposition and continued until the end of G-zone time, when local uplift and regional regression ended the early marine cycle.

Based on the uniform organic carbon content and relative volatility of the entire late Mesozioc section, the hydrocarbon potential of strata older than the Forbes formation (F-zone) is as good as those presently producing beds provided adequate reservoir rocks can be located.

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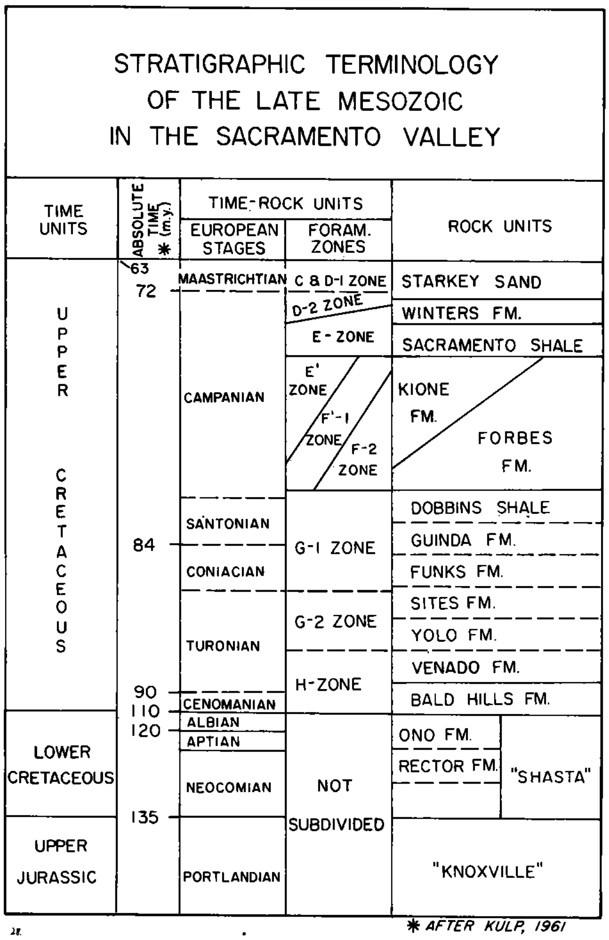

Part II:

Downwarping along the east flank of the northern Sacramento Valley Cretaceous basin and some westward tilting brought a halt to deposition of the Dobbins shale (= G shale) and localized deposition of first F zone sediments to at least 25-30 miles west of the limits of Dobbins shale deposition. More than 7000 feet of F zone section were deposited with progressive eastward onlap onto the Dobbins shale. The uncomformity between the F zone and the Dobbins shale shows little erosion and it can be concluded that the sea remained over the previously deposited Dobbins shale during deposition of the F zone.

The F zone, as the term is used in this paper, includes the Forbes shale and the Kione sand which has the fauna of Goudkoff's E' zone and is a shallow water facies of the Forbes shale. The original designation of this fauna as E' was erroneous as it can now be demonstrated to be a facies of the F fauna.

Three fauna are found in the F zone of the Sacramento Valley: namely, Goudkoff's E', F'-1, and F-2 zones. These are facies fauna and all three existed simultaneously in environmentally different areas of the basin during much of F zone time. Different environmental conditions producing these fauna were largely due to a southern tilting of the basin which, combined with a continual regression of the sea to the south, produced a rapid crossing of time lines by the faunal contacts.

Most of the gas production from the Forbes shale is due to stratigraphic and fault stratigraphic entrapment and is derived from sands which generally comprise less than 20 per cent of the formation. Two primary current vectors were responsible for sand distribution in the Forbes shale, one being the southerly along-shore current in the east portion of the basin, the other being westerly currents induced by rivers to the east feeding sediments onto the west sloping basin floor. Velocity changes in these currents were responsible for the pattern of sand distribution and localization of sand accumulation. The pattern of sand distribution, the distance from zero line of deposition, and depth of deposition are major factors in localizing areas of most rapid facies changes and best gas accumulation.

Deposition of the F zone closed with a transgression of the sea and a return to environmental conditions so similar to those under which the Dobbins shale was deposited that locally some faunal elements of the Dobbins shale recur in the Sacramento shale which normally has the fauna of Goudkoff's E zone. The Sacramento shale is only 200 to 400 feet thick and conformably overlies the F zone.

Conformably overlying the Sacramento Shale is the Winters formation. During deposition of the Winters formation there was a continual regression of the sea and a consequent reduction in the size of the basin. A minor amount of erosion accompanied this regression and the near shore facies of the Winters was probably removed shortly after deposition. Massive sand development is characteristic of this formation in the central portion of the basin. The Winters formation has the fauna of Goudkoff's D-2 and E zones. In the Sacramento Valley the first E fauna is commonly found below the sand development and in the Northern San Joaquin Valley the first E fauna is found above the sand development. This higher position of the E fauna in the San Joaquin Valley is the result of difference in depositional environments which is also evidenced by a difference in sand development. A western land mass existed during deposition of this formation. It either emerged at this time or else represents a more easterly advance of land area that may have existed during deposition of the F zone. A connecting channel to the open sea may have existed southwest of Rio Vista and this may account for the different environments. A gas discovery, probably of major proportions, has been made from sands in this formation at Lathrop.

A rapid transgression of the sea initiated deposition of the Starkey formation. This formation had seven cycles of transgression and regression which form "carrot" type sands on the E-log. The bottom three regressive sands correlate with the Tracy sand, the next three are in that portion of the section occupied by the Blewett and Azeveda sands, and the top regressive sand correlates with the Garzas sand. In the central part of the basin these sands (except the top one) are missing. A gross reduction of section is believed to accompany this loss.

The Starkey formation has the fauna of Goudkoff's C, D-1, and D-2 zones but exact zonation is difficult except in the San Joaquin Valley. Highest known occurrence of Cretaceous fauna is found in the H & T shale immediately below the top regressive sand. The lithologic change at the top of the highest sand is taken as the Paleocene-Cretaceous contact. In most areas the two appear conformable but along the west side the Paleocene erodes the Cretaceous.

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HOLIDAY DINNER DANCE

The Annual Holiday Dinner Dance, sponsored jointly by the Pacific Section of the A.A.P.G., S.E.G., and S.E.P.M. was held December 16, 1961, in the Ballroom of the Huntington-Sheraton Hotel in Pasadena. In attendance were 186 persons who enjoyed dinner and dancing to the music of Ivan Scott and his orchestra, and especially the cocktail party preceding, which was sponsored by the following service companies:

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The Dance Committee wishes to thank everyone attending and the service companies for their help in making the dance a successful affair.

COAST GEOLOGICAL SOCIETY

At the December 13, 1961 dinner meeting at Wagon Wheel Junction, J. J. Williams of Ohio Oil Co., presented a summary of his Alaskan field experience. His slide presentation of Northern Alaska was a splendid aid in visualizing this remote area.

Abstract:

Northeast Arctic Slope

In the summer of 1959 a Union-Ohio field party, composed of Gene Borax, Dick Lyon amd Jerry Williams, mapped 5000 square miles in Northeast Alaska. Adverse weather conditions, including a 10 day blizzard, limited activity as to area covered on ground but the entire region was reconnoitered from the air.

This portion of Alaska is bounded by Arctic Ocean on the North, and mountains of the Brooks range to the south, Canning River on the west to the Canadian Border to the east. The area is at present closed to leasing as it has been designated a wild life refuge. Sedimentary rocks ranging in age from Mississippian to Tertiary are present. Formations generally become younger progressing from the mountains towards the sea. Mountains are asymetric anticlines with steep to overturned north flanks. Rocks forming the mountains are commonly the Mississippian Lisburne limestone. The flat tundra-covered arctic slope in this region is 50 miles wide, and outcrops are found there in occassional streams that run from mountains toward the coast

PACIFIC SECTION DUES

Dues for the Pacific Section, A.A.P.G. for 1962 are now overdue. Those who have not paid, and who desire to continue to receive the PPG, should send $3.50 to Richard Hester, Treasurer, c/O Pauley, Petroleum, Inc., 10,000 Santa Monica Blvd., Los Angeles 25, California.

CHANGE OF ADDRESS

Listed below are changes of address for those members listed in the latest Directory.

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San Gabriel, Calif.

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PERSONAL ITEMS

When Bruce Coltman "cut out" of Sunray in Bakersfield during "the last thirty" to find a new "pad", Buzz Welsh "cut in" as District Exploitation Geologist and is finding the job a "blast".

Rod Nahama, hot pilot for Sunray in Bakersfield, sought to test his LPFVD (Light Plane Fog Visability Device) over the very foggy Christmas weekend with a trip to San Francisco. However, it was Tuesday noon before Rod, acknowledging defeat, returned, emerging from the mist on a Greyhound bus. Back to the drawing board!

Rumor has it that the scouts of Union, Superior, and Standard were all assigned a VERY "hush-hush" mission in the Northwest; BUT unfortunately found they had reservations on the same planes all the way up.

Gerald Fawcett, youthful retired Union Oil geologist from Bakersfield, was married in Las Vegas to a Wasco school teacher over the holidays. Congratulations, Gerry!

We've all heard of birdies under the hood of a car, but Tom Roy, Ohio geologist at Bakersfield, has come up with a bird up the exhaust pipe. Trying to get a new company car, Tom?

Bob Johnston (Gulf Oil-Bakersfield) spent a week in November on one of his numerous trips south of the border. My informant, Mick Lachenbruch, stated that Bob is extremely fond of deep Mexico. Wild times in wild country, Bob?

It is remored that John Wagner, another retired Union Oil Geologist from Bakersfield, is looking over a lot in Kern City with an eye to his future.

Jerry Williams, Ohio Oil Co., Ventura, expects an early call for his assignment in Libya. Reports are that panic has hit the bachelor-girl population of coastal cities, and their going away parties are rumored to be of a welcome-home nature.

Jack Durrie is joining Tidewater in Ventura, having come from Core Lab in Bakersfield.

Don Collins, Shell, Sacramento, won the battle of delays four days before Christmas, and moved into his new home approximately four months after it had been promised.

Sarge Reynolds, Consultant, Woodland, recently raised the roof in his neighborhood by adding a second story to his home.

Will Griffin, Mobil, Taft, long a fixture in the Willows area, Sacramento Valley, returned to olde haunts to do a little well sitting.

Jack Kearns, Gulf, Sacramento, finally returned to the Sacramento Valley after temporary duty in Bakersfield. Jack couldn't get over the wonderful climate that prevailed in Bakersfield during his stay.

Schlumberger, Sacramento, has a new engineer, Lennia McCollum, from Midland, Texas.

Lowell E. Garrison has joined Signal Oil & Gas Company as Geologist in the Sacramento Valley. He Will be located at Signal's Sacramento office, 2222 Watt Avenue. Mr. Garrison graduated from Stanford University in 1954, majoring in Geology and Paleontology. Since that time he has been with Gulf Oil at various locations most recently in Sacramento.

NURSERY NEWS

Congratulations to Joe and Earlene Rossi, Union, Sacramento, on the arrival of Joseph Fredrick, 7 lbs, 10 oz., December 9th.

Congratulations to Doug and Vicki Manske, Texaco, Sacramento, who welcomed Monte Charles, 9 lbs, 1 oz., into the family, December 8th.

Congratulations to Pete and Sonya Oran, Texaco, Sacramento, whose recent addition, A'jalynn Marie, 6 lbs., 6 oz., was born November 21st.

Oscar and Elsa Weser, Standard Oil Co., Ventura, added a 6 lb. 13 oz. boy, Kurt Koehler to their family on December 21, 1961.

ANDY CLINE by Sullwold

CALENDAR

January 9, 1962: Tuesday, Geological Society of Sacramento, 7:45 PM, California Public Works Building 1120 "N" Street. Speaker: Dr. Vincent Gianella, University of Nevada, Subject to be announced.

January 15, 1962: Earth Sciences - Key to future energy resources, by Gage Lund, Director and Vice-President, Standard Oil Company of California, San Francisco. Room 320 Geology Building, Stanford University, 4:00 PM.

January 17, 1962: Wednesday, Sacramento Petroleum Association, Installation of Officers Dinner, Scheidel's Bavaria, 2764 Fulton Avenue, Sacramento; 6:00 PM, Cocktail hour, 7:00 Pm Prime Rib Dinner, $3.50 per person. Speaker to be announced.

January 22, 1962: Concentrations of Manganese, Sources and genesis, by Dr. D. F. Hewett, Staff Geologist, U.S.G.S., Stanford University, Room 320 Geology Building, 4:00 PM.

January 29, 1962: Electrical methods of mining exploration, by Dr. Arthur A. Brant, Newmont Exploration Limited, Danbury Connecticut. Room 320 Geology Building, Stanford University, 4:00 PM

January 31, 1962: Wednesday, Room 104, Geology "A" University of Southern California at 7:00 PM. "The Earliest Life on Earth", Speaker: Dr. Martin F. Glaessner, Professor of Geology at the University of Adelaide, Australia.

February 5, 1962: The Canadian Rockies - Orientation time and space, by Dr. E. W. Shaw, Exploration Manager, Imperial Oil Limited, Calgary, Alberta. Stanford University, Room 320, Geology Building at 4:00 PM.

February 5, 1962: Petroliferous Reefs in Western Canada, by George de Mille, Assistant to Regional Exploration Manager, Imperial Oil Limited, Calgary, Alberta. Stanford University, Room 320 Geology Building, 8:00 PM.

February 5, 1962: Monday evening, 7:30-9:30 PM, Room 56, Science and Engineering Building, Bakersfield College. Biostratigraphy seminar, "Interpretation of the La Jolla Submarine Fan", F. P. Shepard (Scripps).

February 12, 1962: Delta influence on Cretaceous sedimentation and petroleum accumulation in the Rocky Mountain area, by Dr. Robert J. Weimer, Associate Professor of Geology, Colorado School of Mines, Golden Colorado. Room 320 Geology Building, Stanford University at 4:00 PM.

February 13, 1962: Tuesday, Geological Society of Sacramento, 7:45 PM, California Public Works Building 1120 "N" Street, Speaker: Dr. Cordell Durell, University of California at Los Angeles, "Lovejoy Formation".

February 13, 1962: Tuesday Evening, Hotel El Tejon, Bakersfield, cocktails 6:30 PM., dinner 7:30 PM. Dr. John C. Ludlum, A.A.P.G. distinguished lecturer, will speak on "Prospects and Structural Problems of Exploration for Natural Gas in the Appalachian Area".

March 26-29, 1962: A.A.P.G. - S.E.P.M. Annual meetings, San Francisco, California

April 16-18, 1962: Meetings Cordilleran Section, The Geological Society of America, University of Southern California, Los Angeles, California

BIBLIOGRAPHY OF RECENT PUBLICATIONS

U. S. GEOLOGICAL SURVEY

Bulletin 1090: Iron and copper deposits of Kasaan Peninsula, Prince of Wales Island, Southeastern Alaska, by L. A. Warner, E. N. Goddard and others (Plates in separate book)..................$ 4.50

Bulletin 1104-B: Geology of the Bernal-Jalpan Area Estado de Queretaro, Mexico, by Kenneth Segerstrom....................................$ 1.00

Professional Paper 374-H: Stratigraphy of outcropping Permian rocks in parts of northeastern Arizona and adjacent areas, by C. B. Read and A. A. Wanek....................................$ .65

MAPS:

Geologic Quadrangle (GQ) 142: Geology of the Valdez (A-5) Quadrangle, Alaska, by H. W. Coulter and E. B. Coulter.........................$ 1.00

Map I-340: Geologic map and section of the Fairbanks D-3 Quadrangle, Alaska, by Troy L. Pewe and Norman R. Rivard......................$ .50

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS BULLETIN, vol. 45, no. 12, December 1961.

Dip-slip versus strike-slip movement on San Gabriel Fault, Southern California, by Robert H. Paschall and Theodore Off.

Reservoir water resistivities and possible hydrodynamic flow in Denver Basin, by William L. Russell

Foraminiferal zonation in Matanuska Formation, Squaw Creek-Nelchina River area, South-Central Alaska, by Harlan R. Bergquist.

Clay-Mineral distribution in Permo-Pennsylvanian shales of Val Verde Basin and Yates-Todd Arch, Texas, by Drayton B. Speights and George Brunton.

ARIZONA BUREAU OF MINES, (University of Arizona, Tucson, Arizona)

County Geologic Map Series:

Coconino County (1960) $1.00; Cochise County 1959 $ .75; Gila County (1959) $ .75; Graham-Greenlee Counties (one map) (1958) $ .75; Maricopa County (1957) $ .75; Mohave County (1959) $ .75; Navajo-Apache Counties (one map) (1960) $1.00; Pima-Santa-Cruz Counties (one map) (1960) $ .75; Pinal County (1959) $1.75; Yavapai County (1958) $ .75; Yuma County (1960) $ .75.

Map of known Metallic Mineral Occurrences in Arizona. (1961) $ .50.

Mining Districts of Arizona (1961) $ .50.

Map of known nonmetallic mineral occurrences in Arizona. (1961) $ .50.

CALIFORNIA OIL WORLD, Second Issue, vol. 54, no. 20, October 1961.

California Crude suffers deepest cuts, by Stark Fox.

WORLD OIL, vol. 153, no. 7, December 1961

Aeromagnetics develop new prospects and techniques (part 4), By W. P. Jenny

How to determine and remove diurnal effects precisely, by H. Wayne Hoylman

Modified slim hole program cuts costs, by H. J. Flatt

New method for estimating primary oil reserves, by Dr. William F. Stevens and Dr. George Thodos.

OIL AND GAS JOURNAL, vol. 59, no. 49, December 4, 1961

Giant fields from littler fields do grow, by Frank J. Gardner

Person field indicates tremendous potential of deep Edwards trend, by R. W. Knapp

Big compressors help air drilling, by Ed McGhee

Slim-hole completions save money, by Philip L. McLaughlin

OIL AND GAS JOURNAL, vol. 59, no. 50, December 11,1961

California search goes on, by Carl Lawrence

Washington's Puget Basin will get wildcat

Piceance may become biggest gas producer in the Rockies, by Clark Millison

Bringing order to a disorderly transition

New mud cuts drilling costs, by J. L. Lummus, J. E. Fox, Jr. and D. B. Anderson

OIL AND GAS JOURNAL, vol. 59, no. 51, December 18,1961

Dynamic approach to gas-pipeline analysis promises minimum operating costs, by E. H. Batey, H. R. Courts, and K. W. Hannah.

Old coal mine converted to gas storage, by W. B. W. B. Bleakley

Continuous dipmeter survey can be an important exploration tool, by J. D. Thompson

Dozen tests active in San Juan's Cha Cha Totah Gallup fields.

Needed: ground rules for study of crude vs. gas, by John C. Casper

OIL AND GAS JOURNAL, vol.59, no. 52, December 25,1961

World-wide oil, special attention

OIL AND GAS JOURNAL, vol. 59, no. 52, Dec. 25, 1961

World-wide oil, special section

Growing population and economy underline Philippines need for oil

Highlights of the exploration world in 1961, by Frank J. Gardner

Big year seen for Utah's Uinta

JOURNAL OF GEOPHYSICAL RESEARCH, vol. 66, no. 11, November 1961

Traveling pressure waves associated with geomagnetic activity, by Peter Chrzanowski, Gary Greene, K. T. Lemmon, and J. M. Young

Depth to sources of magnetic anomalies, by LeRoy R. Alldredge and Gerald D. Van Voories

Some characteristics of surface gravity waves in the sea produced by nuclear explosions, by William G. Van Dorn

A telemetering ocean-bottom seismography, by John Ewing and Maurice Ewing.

An evaluation of a signal-summing technique for improving the signal-to-noise ratios for seismic events, by L. H. Koopmans

Permeability measurements of rock salt, by Earnest F. Gloyna and Tom D. Reynolds

Tritium geophysics, by W. F. Libby

Books:

Field Geology, by Frederic H. Lahee. Sixth Edition. McGraw-Hill Book Co., Inc. 330 W. 42nd St., New York, 36, N.Y. 927 pages 641 ill.$10.75

Introduction to Geophysical Prospecting, by Milton B. Dobrin. McGraw-Hill Book Co.,Inc., 330 West 42nd st., New York 36, N. Y. Second Edition 446 pages, 295 ills........................$ 9.50

Physics and Geology by J. A. Jacobs, R. D. Russell and J. Tuzo Wilson. McGraw-Hill Book Co., Inc. New York, 424 Pages 165 Ills.........$ 9.75

Petroleum prehistoric to petrochemicals, by G. A. Purdy. McGraw-Hill Book Co., Inc. New York, 492 Pages, 454 ills.......................$16.00

Mathmatical Handbook for Scientists and Engineers, by Granino A. Korn and Theresa M. Korn. McGraw-Hill Book Co., Inc., New York, 943 Pages 110 tables...............................$20.00

Volcanoes: in history, in theory, in eruption: By Fred M. Bullard. University of Texas Press, Austin, Texas. 456 Pages..................$ 7.50

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Volume 16 Number 1

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