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TERTIARY CLIMATIC CHANGE IN SAN JOAQUIN BASIN, CALIFORNIA: EVIDENCE FROM SHALLOW-WATER MOLLUSKS[1]

Early and middle Tertiary molluscan faunas of the California Coast Ranges are characterized by taxa now living far south in tropical and subtropical latitudes. Unusually large percentages of warm-water molluscan genera in Eocene and Miocene faunas of the San Joaquin basin reflect episodes during which the climate was substantially warmer than at present. Sharp decreases in warm-water genera and in taxonomic diversity during the middle Oligocene represent an intervening climatic deterioration. Parallel faunal trends occur in other Tertiary basins of the California Coast Ranges.

The post-Oligocene climatic amelioration reached a peak during middle Miocene time; tropical and subtropical genera were nearly four times as abundant as during the Oligocene climatic minimum. Percentages of warm-water genera declined during the late Miocene and dropped sharply during the early Pliocene. The last significantly large element of tropical and subtropical molluscan genera is found in the late Miocene of the San Joaquin basin. By the late Pliocene, molluscan assemblages were of temperate aspect and comparable to those now living at that latitude. The Miocene climatic peak indicated by mollusks is reflected by parallel trends in taxonomic diversity of foraminiferal faunas recently reported by other workers.

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CYCLICITY IN UPPER TERTIARY BASIN-MARGIN DEPOSITS OF CALIFORNIA COAST RANGES

Upper Tertiary marginal-marine sedimentary rocks of California are important reservoirs and have been studied extensively. However, they have been difficult to analyze in detail in terms of reservoir-scale genetic rock units because of the lack of a conceptual and fine stratigraphic framework for paleoecologic analysis and because sedimentation along the tectonically active Pacific Coast was dissimilar to that along the Gulf Coast where our modern depositional models have been largely generated.

Detailed study of Pliocene and Miocene strata of the Coalinga region, integrating both macrofossil and lithologic evidence, indicates that basin-edge sediments were deposited during well-defined transgressive-regressive cycles. The thickness of strata deposited during the cycles and the proportion that was deposited during the transgressive phase of each cycle are proportional to the slope of the surface that was being transgressed. The Pliocene depositional slope in the Kettleman Hills area was very low (many cycles are represented by less than 100 ft of strata), and sedimentation occurred primarily during regression. In the Miocene examples, the depositional slope was greater, the cyclic units are thicker and probably represent longer periods, and much of the deposition occurred during transgression.

Cyclicity in the marginal marine strata provides finer subdivision and more precise correlation than has been possible by use of either fossils or lithology. It also provides the conceptual framework within which genetic rock units can be distinguished at reservoir scale. Positions of shoreline, loci of deltaic deposition, and environmental gradients within the shallow-marine deposits can be discriminated in the Kettleman Hills on layer maps representing subdivisions within individual cycles.

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SUPRATIDAL DOLOSTONES: AN OVEREMPHASIS ON THEIR SIGNIFICANCE IN GEOLOGIC RECORD?

Numerous discoveries of recent dolomite forming primarily in the supratidal zone have prompted analogies with ancient dolostones. Although evidence seems to support most of these contentions, it is likely that overgeneralization has resulted: many dolostones lack definitive evidence of supratidal and/or evaporitic conditions.

Detailed field and laboratory examinations of three dolomitic units in New York (Little Falls, Upper Cambrian; Herkimer, Middle Silurian; Lockport, Middle Silurian) and one in California (Lost Burro, Middle to Upper Devonian) show that the dolomite, all of replacement type, represents original carbonate sediments of variable environmental deposition. These dolostones are not extremely fine grained, as is modern supratidal dolomite; replacement may have begun penecontemporaneously, but generally continued later into diagenesis. Stromatolites, mudcracks, and intraclasts in the Little Falls and Lockport dolostones strongly suggest intertidal to supratidal occurrences; Lost Burro carbonates accumulated in a nearshore, perhaps slightly hypersaline, subtidal environment; Herkimer carbonates apparently formed in a neritic environment of normal salinity.

Several other dolomitic units, cursorily examined, contain evidence (particularly faunal) of not having accumulated in an evaporitic, supratidal setting. In some recent carbonate deposits (*e.g.*, Sugarloaf Key, Florida; Coorang Lagoon, Australia), dolomite formation may not be related directly to high salinities.

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GEOMORPHOLOGY AND SEDIMENTARY CHARACTER OF REDONDO SUBMARINE FAN

(No abstract submitted)

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MAGNETIC GRAIN FABRIC OF SEDIMENTARY ROCKS

It is well known that measurement of magnetic anisotropy indicates the dimensional grain fabric of natural rocks. Although the directional results are easily interpreted, the quantitative descriptive parameters of the magnetic fabric require more care—but they can give valuable information as to the nature of the grain fabric. In direct grain-shape-related magnetic anisotropy, *e.g.*, in magnetite, it is possible to compare magnetic and optical fabric results by using a density function to describe the distribution of the dimensional axes of an aggregate of similar particles. The data are tested with sand deposited at the angle of repose. By using this method to produce a standard depositional

[1] Publication authorized by the Director, U.S. Geological Survey.

mechanism, it is seen that the magnetic fabric resulting from magneto-crystalline anisotropy within particles such as hematite has similar directional properties, but the descriptive parameters differ from the magnetite example. In natural sedimentary rocks the source mineral grains causing the magnetic fabric are more elusive. Nevertheless, simple deposition tests with crushed samples confirm that the directional data are correct. Also the descriptive parameters can be used to distinguish between primary and various deformational fabrics.

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PALEOCURRENT AND BASIN ANALYSIS OF LATE CRETACEOUS "CHICO" FORMATION, SIMI HILLS, CALIFORNIA

Analysis of the Upper Cretaceous "Chico" formation in the Simi Hills of Southern California reveals rock types and megascopic features typically associated with turbidity-current deposits. The sandstone is principally arkosic arenite. The "Chico" formation is over 5,000 ft thick and is considered to be Late Cretaceous (Campanian and Maestrichtian).

Cross-bedding data indicate a mean direction of traction-current flow N21°E with statistical significance of 10^{-5}. Current data derived from analysis of sandstone grain fabric and from sole marks indicate turbidity-current flow toward the north, northwest, and west.

Many sandstone beds are very coarse grained and thickly bedded. Outcrops in some areas have sandstone to mudstone ratios in excess of 3:1, whereas in other outcrops the ratio is more nearly 1:1. Conglomerate beds are few and are composed mainly of pebble-size clasts.

Pre-Cretaceous granitic and metamorphic rocks make up the basement terrane in the western San Gabriel Mountains, 5 mi east of the Simi Hills, and in the eastern Santa Monica Mountains southeast of the Simi Hills. Collectively the basement terrane on the north, east, and southeast is known as "Mohavia."

The reconstructed submarine-current patterns, the petrology of the sandstone and conglomerate beds, the coarseness and great thickness of the sandstone beds, and the high sandstone-to-mudstone ratio support the suggestion that the source area was nearby Mohavia. Further, it is suggested that the sandstones were deposited as coalescing submarine fans on a topographically smooth north-to-northwesterly surface.

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BIOSTRATIGRAPHY OF LEG 5, JOIDES HOLES, OFF CALIFORNIA COAST

(No abstract submitted)

REPORT OF CONSTITUTION REVIEW COMMITTEE

The Executive Committee has accepted the report of the Constitution Review Committee and, with the approval of legal counsel, has directed that it be published in the *Bulletin* for the information of the membership. Refer to May 1969 *Bulletin*, page 1137, for provisional Constitution and Bylaws approved by the membership to become effective on July 1, 1970.

SUBJECT: Report of the Constitution Review Committee

TO: Executive Committee, American Association of Petroleum Geologists

The Constitution Review Committee herewith submits its report. This committee is an *ad hoc* committee appointed by President Frank B. Conselman and confirmed by President Kenneth H. Crandall. We were charged with receiving, evaluating, and recommending action on any suggestions for revision of the pending Constitution and Bylaws originating from the membership subsequent to the Dallas meeting of AAPG. If the Executive Committee approves, it is contemplated that our recommendations will be voted upon by the Business Committee in Calgary in June 1970.

In our deliberations it was necessary to set certain guidelines within which we could work. The more important of these were as follows.

1. The basic philosophies of the new Constitution and Bylaws and the related governmental structure had been approved previously by the general membership of the Association.
2. The new Constitution and Bylaws is a permissive document, and it is not necessary to spell out each and every detail of organization and operation of the governmental structure.
3. Every suggestion submitted to us would receive due consideration.
4. Prior consideration and rejection by previous executive committees of proposals would be given no weight in our deliberations.

For example, one proposal recommended abolishing the Professional Division of AAPG. This was obviously not in our scope of authority under the first guideline, and was rejected forthwith. Several excellent proposals dealt with the organization and committee structure of the House of Delegates. Our committee felt that this was an internal matter of the House, falling under the second guideline, and that we would be exceeding our authority if we were to tell the House of Delegates what to do. Nevertheless, because these matters were studied in detail, we would like to make certain comments for the House of Delegates to consider if it so wishes.

1. It is the opinion of our Committee that the House of Delegates has the right to conduct all internal affairs and procedures of the House and to appoint such standing and *ad hoc* committees as may be useful or needed.
2. In view of the temporary nature of our Committee we believe the House of Delegates should appoint committees on Constitution Review and on Resolutions.
3. We believe the Resolutions Committee of the House of Delegates should be charged with receiving all proposals, with screening illegal and/or capricious items, and with submitting proper proposals for inclusion on the agenda of the annual meeting of the House of Delegates.
4. We believe that the originators of proposed amendments should be informed promptly by the Constitution Review Committee of the House of the