

occurring in the section at nearby Le Castella, the results of the present study indicate that none of the earliest Calabrian is exposed at that locality. Most of the Quaternary section exposed at Le Castella is younger than the youngest sediment exposed at Santa Maria di Catanzaro.

At Santa Maria di Catanzaro, the range of *Discoaster brouweri* Tan Sin Hok was found to be concurrent with the planktonic foraminiferal species *Globorotalia truncatulinoides* (d'Orbigny). Most of the section represents cooler water deposition.

At Le Castella, most of the exposed Quaternary sediments represent warmer water deposition (Emilian = "late warm Calabrian"), with cooler water deposition represented near the top (Sicilian). At Le Castella, the range of *Discoaster brouweri* Tan Sin Hok was found to be concurrent with *Gephyrocapsa caribbeana* Boudreaux and Hay.

The Calabrian at Santa Maria di Catanzaro, with the presence of both *Discoaster brouweri* and *Globorotalia truncatulinoides* in section deposited in cooler water, correlates very well with the American marine Nebraskan. The Emilian at Le Castella, with the occurrence of both *Discoaster brouweri* and *Gephyrocapsa* in section deposited in warmer water, is equivalent to the American marine Aftonian.

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#### SURFACE AND SUBSURFACE MORPHOLOGY OF TWO SMALL AREAS OF BLAKE PLATEAU<sup>1</sup>

A detailed seismic profiler, bottom sampling, and bottom photographic study reveal considerable information about the surface and subsurface morphology of two small areas on the Blake Plateau. The northern area is a N-S-trending depression (32°N, 77°30'W) near the continental slope, and the southern area is defined by a narrow NE-SW linear depression (30°50'N, 78°30'W). Both of these topographic features are erosional in origin; subsurface strata crop out on the sides of the depressions. The north-south depression is flanked by numerous biohermal coral banks that have developed above the flat underlying strata. Sediments in the vicinity of these banks are dominated by coral fragments, particularly *Dendrophyllia*. With increasing distance from the banks the sediment becomes primarily a *Globigerina* sand and ooze, with varying amounts of pteropods. The distinctive sediment components in the southern depression area are manganese and phosphorite slabs and nodules; coral banks and coral sediment are practically absent. Indurated slabs of *Globigerina* "sandstone" are locally common in both depression areas, and are believed to be restricted to the uppermost sedimentary strata and to have been lithified at present depths.

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#### DIAGENETIC PATTERNS IN SUBSURFACE BAHAMAN ROCKS, SAN SALVADOR ISLAND

A 550-ft continuous core from San Salvador allows detailed study of depositional and diagenetic facies patterns with depth. From the surface to about 25 ft, the rocks are oolites and oolitically coated intraclasts,

cleanly washed and bedded. Below, to about 80 ft, the rock is grain supported, less well sorted, unbedded, and contains no coating. The rock is vuggy, with drusy calcite lining vugs at certain intervals. Similar transitions from bedded oolite to vuggy lagoonal facies have been cited at roughly this depth from other islands. Allochems are intraclasts and skeletal material, mostly mollusks, miliolid and peneroplid foraminifers, red algae, and *Halimeda* plates. Burrowing is evident below 55 ft. The rocks are sparites, but some mud matrix is present sporadically. From 80 to 110 ft, the rock is micrite or pelmicrite, the few scattered fossils are foraminifers and red algae. Pelmicrites predominate through the rest of the core; below 110 ft extensive dolomitization has occurred.

Cementation, leaching of cryptocrystalline grains and infill by drusy calcite, neomorphism of cryptocrystalline grains to microspar, loss of aragonite, and concurrent loss of Sr increase with depth. Stable isotope analyses show  $\delta O^{18}$  and  $\delta C^{13}$  becoming progressively more negative with depth. Fe concentration shows a peak at 90 ft and is probably indicative of major pedogenesis.

Thin sections show some of the difficulties associated with attempting to differentiate pore-precipitated calcite spar from neomorphic spar in grain-supported rocks which contain some mud matrix. This difficulty is heightened by the "micritization" of allochems, diffusing into the spar cement.

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#### VIRTUES AND VICIS OF PALEOMAGNETIC METHOD AS APPLIED TO MARINE SEDIMENTARY CORES

The geomagnetic polarity has changed irregularly at least 20 times during the last 5 m.y. These polarity changes are worldwide synchronous events and are readily recorded by most sediments of fine silt or smaller size. For reasons which are not clearly understood, polarity and faunal changes sometimes occurred simultaneously. It follows that the paleomagnetic method is a very powerful technique for resolution of Plio-Pleistocene stratigraphic problems.

Like many new techniques, the method is susceptible to misapplication. The misapplication may result from lack of consideration of (a) variable deposition rates, (b) disconformities and unconformities, (c) faunal redeposition, (d) magnetic recording lag of consolidating sediment, (e) imperfectly defined polarity history, (f) limitations of unoriented cores in low latitudes, and (g) experimental difficulties. Results from continuing studies of deep-sea sedimentary cores from the South Pacific illustrate some of the difficulties.

It is concluded that the study of paleomagnetism in marine sedimentary cores parallels the earliest conventional stratigraphic methods, in that integration of several disciplines is required for efficient and reliable exploitation of the technique.

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#### STRUCTURAL RELATIONS BETWEEN LESSER ANTILLES, VENEZUELA, AND TRINIDAD-TOBAGO

More than 2,500 nautical mi of seismic-reflection profiling, gravity, magnetic and bathymetric data were collected in 1968 by the ESSA Coast & Geodetic Survey ship *Discoverer*.

<sup>1</sup> Contribution No. 2347 of the Woods Hole Oceanographic Institution.

A review of the structural geology of the southeastern Caribbean and the South American continent in conjunction with the ESSA data supports a relatively "simplistic" explanation for the geologic structure.

The Barbados ridge was found to be a strongly fractured anticlinorium, supported by "basement" rocks, and consisting of two parallel arches with a central syncline. The Lesser Antilles volcanic arc, the Tobago trough, and the Barbados anticlinorium are traceable into the Venezuelan and Trinidadian shelves (South American continent).

An analogy between the Caribbean island arc system and previous work done in the Andaman Sea (Indonesian island arc) shows the validity of the concept of continuation of continental mobile belts into island arc systems. The mobile belt and the island arc system are manifestations of orogeny in different crustal types. Evidence is against wrench faulting, with its implication of vast horizontal movements of individual blocks.

The island arc structural belts and the mobile belts of the continent are interrelated, gradational, and interlocked.

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#### TECTONICS OF SOUTHERN RIM OF GULF OF MEXICO BASIN

Major orogenesis affected the southern rim of the Gulf basin during late Paleozoic, middle Cretaceous, and Laramide times. Post-Laramide deformation has been dominantly epirogenic or fault movements of normal or strike-slip character. Many tectonic features of southern Mexico and northern Central America are continuous beneath the adjacent Gulf of Mexico and/or Caribbean Sea. The following examples are cited: (1) Zacatecas zone-boundary of zones 3 and 4 of Bryant *et al.*, (2) Trans-Mexican volcanic belt-Teziutlan massif-southern limit of zone 4 of Bryant *et al.*-Pera Salient-Progreso shear zone of northern Yucatan-Yucatan Channel uplift, (3) Ticul fault and Nuevo-Arenas swell, (4) Maya Mountains-Glovers Reef High-Cayman/Misteriosa Ridge-Sierra Maestra of Cuba, (5) San Cristobal-Comitan fault zones-Chixoy-Polochic and Motagua Fault zones-Bonacca Ridge, (6) Uluva graben of Honduras-downfaulting of continental margins of British Honduras and Quintana Roo.

Evaporite deposits are widespread in the southern Gulf. Diapirs are common in the Isthmian region of Mexico and extend northward to the Sigsbee Deep west of the Campeche Banks. Probable salt ridges are found in Bryant *et al.* zones 1-4. Significant quantities of Cretaceous evaporites underlie the Yucatan platform and may extend northward beneath the Campeche Bank. Salt diapirs are known to be present in Cuba. It is postulated that the salt in the Isthmian basin of Mexico may also be of Cretaceous age and continuous with the Yucatan deposits. The age and distribution of the salt are critical in understanding the Mesozoic history of the southern Gulf. It is doubtful that appreciable quantities of evaporites underlie easternmost Yucatan or are present in the Yucatan basin (northern Caribbean), but more detailed knowledge of this area is necessary. Cretaceous evaporites are present in Guatemala and it is possible that they may extend beneath the northern Caribbean.

## MID-CONTINENT SECTION OF AAPG 3RD BIENNIAL MEETING

Amarillo, Texas  
October 1-3, 1969

Theme: Dawn of the Deep

Host Society: Panhandle Geological Society

The third biennial meeting of the Mid-Continent Section of the AAPG will be held October 1-3, 1969, in Amarillo, Texas. The convention headquarters will be the Coronado Inn; the technical program will be presented at the Civic Center Auditorium; and the exhibits will be on display at the Civic Center.

#### SCHEDULE OF EVENTS

##### WEDNESDAY, OCTOBER 1

- 12:00 NOON-7:00 P.M.: Registration, Civic Center Exhibit Hall
- 12:00 NOON-6:30 P.M.: Ladies Hospitality Room, Coronado Inn
- 1:00 P.M.: Mid-Continent Council Luncheon and Business Meeting, Coronado Inn
- 1:00-4:00 P.M.: Speakers Trials, Civic Center Auditorium
- 1:30-4:30 P.M.: Palo Duro Canyon Field Trip, Coronado Inn
- 6:30-7:30 P.M.: Ice Breaker, Civic Center Plaza
- 7:30-9:30 P.M.: Bar-B-Que, Civic Center Plaza

##### THURSDAY, OCTOBER 2

- 7:30 A.M.: Speakers and Moderators Breakfast, Coronado Inn
- 8:30 A.M.-4:30 P.M.: Registration, Civic Center Exhibit Hall
- 9:00 A.M.-6:30 P.M.: Ladies Hospitality Room, Coronado Inn
- 9:00-10:00 A.M.: Opening Session and Keynote Speaker, Civic Center Auditorium
- 10:00-11:30 A.M.: Technical Session, Civic Center Auditorium
- 12:00 NOON: Alumni Luncheon, Coronado Inn
- 1:30-4:30 P.M.: Technical Session, Civic Center Auditorium
- 8:00-12:00 P.M.: Dawn of the Deep Dance, Tascosa Country Club

##### FRIDAY, OCTOBER 3

- 7:30 A.M.: Speakers and Moderators Breakfast, Coronado Inn
- 8:30-11:30 A.M.: Registration, Civic Center Exhibit Hall
- 9:00 A.M.-6:30 P.M.: Ladies Hospitality Room, Coronado Inn
- 9:00-11:30 A.M.: Technical Session, Civic Center Auditorium
- 1:00-4:00 P.M.: Technical Session, Civic Center Auditorium

#### TECHNICAL PROGRAM (Tentative)

- PHIL C. WITHROW: Hunton--western Anadarko Basin
- PHILIP A. CHENOWETH: Cambrian oil prospects, Anadarko basin
- JOHN H. FOLKS: Controversies and shortcomings in formation of units