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GEOPHYSICS IS HERE TO STAY

The ever-increasing need for oil in the world market demands that the search for new oil, both on land and under the oceans, be continued or even escalated. The area of intensive search has shifted from land to the continental shelves. Geophysical methods are the most practicable tools for investigating the water-covered areas of the world because conventional geologic observations are severely limited. Recent improvements have been made in seismic energy sources, field recording procedures, and data enhancement. Three or more independent geophysical variables can be recorded simultaneously in offshore work as the ship proceeds. This technique permits a more complete analysis of the subsurface geology than previously was possible.

Job stability is needed to attract and hold good personnel. The advent of the processing center has provided some stability insofar as job location is concerned but a greater force is needed to eliminate the extreme swings in the work load. Although geophysics as a profession will have its ups and downs along with the rest of the industry, geophysicists will cooperate fully in the total exploratory effort to find new oil and gas at a profit.

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SUBDUCTION, OROGENY, AND MAINSTREAM MANTLE CONVECTION

Orogenic belts are the fossil sites of lithospheric plate subduction. Subduction along continental edges forms huge compressive drag folds or rotation zones which are expressed as fan-shaped arrangements of schistosity, folds, and dip-slip faults. Associated thrust belts are small, and are antithetic to the subduction. Large thrust belts synthetic to the subduction are typical of subduction zones which have oceanic crust in the upper plate, but may also develop as late stages of extreme rotation in continental upper plates. Most mountain systems are composed of several converged subduction zones, and most subduction zones have flipped or reversed their direction of subduction.

On the basis of the difference in crustal response to westward versus eastward underthrusting along active subduction zones, we postulate that an eastward-flowing mainstream is present within the earth's upper mantle. Coupled to convection cells beneath the oceanic ridges, the mainstream forms a pattern of migrating zones of primary and secondary upwelling which, in a kinematic model, indicates (1) that a form of asymmetric sea-floor spreading has created the small ocean basins behind island arcs, (2) that the depth to the base of convection increases systematically eastward from ridge to ridge, (3) that secondary zones of mantle upwelling underlie such features as the East African rifts, and (4) that plates descend into the mantle along subduction zones in response to the removal of material from below.

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STRATIGRAPHIC REVISION, EDWARDS GROUP (LOWER CRETACEOUS) OF TEXAS, AND REGIONAL SURFACE-SUBSURFACE SYNTHESIS

Porous carbonate rocks called "Edwards" form a widespread aquifer in the Edwards Plateau region of west-central Texas and prolific petroleum reservoirs beneath the coastal plain of south-central Texas. Recently completed surface mapping in the Edwards Plateau and subsurface mapping in south-central Texas permit correlation of Edwards rocks in both areas, and allows the entire central Texas region to be viewed as an evolving carbonate depositional complex. To better express this surface-subsurface synthesis, a new stratigraphic nomenclature is proposed: Edwards is elevated to group status, 2 new outcropping formations are recognized in the Edwards Plateau, and 2 new formations are defined in the subsurface of south-central Texas. Previously unverified disconformities at and near the top of the Edwards have been documented and a boundary that was considered to be disconformable is now interpreted to be conformable.

Regional structural-depositional elements that influenced Edwards deposition are reflected by lithofacies and isopach patterns. Dominant elements on the Comanche shelf formed a vast "sediment trap" in which shallow marine and tidal flat carbonates and evaporites accumulated preferentially over the Central Texas platform, protected by the Stuart City reef on the southeast, the Devils River bank on the southwest, and the broad North Texas shelf-lagoon on the northwest and northeast. Edwards and associated rocks record the progressive inundation of the Central Texas platform.

Porosity in the subsurface Edwards is related chiefly to early exposure on positive tectonic elements, whereas porosity in the surface and near-surface Edwards is related chiefly to the present geomorphic cycle.

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HISTORICAL GEOLOGY FROM LATE NEOGENE PLANKTONIC FORAMINIFERA

Study of the JOIDES, Deep Sea Drilling Project, Leg 1, Gulf of Mexico Sites 02 and 03; study of Texas A&M Sigsbee Knoll piston core #64-A-9-5E; and study of the Jamaica surface localities of E. Robinson (SEPM 1969 field trip) reveal a complete late Neogene history.

Marine planktonic histories are synchronous in the Gulf of Mexico, the Caribbean, and the Pacific. Across these geographic provinces from the tropics to the poles, however, the synchronous climatic events are expressed by differing and commonly unique assemblages of temperature sensitive planktonic foraminifers.

Mirror image analogs of the tropical history are represented by warmer (right coiling) and cooler (left coiling) "*pachyderma* group" biostratigraphic records in the late Neogene of Alaska and New Zealand.

These paleoclimatic events of several million years duration, based on K/A dating, are described as follows.

(1) The end of the middle Miocene warm climatic event approximately 15 m. y. ago coincides with the extinction of the "*fohsi* group" at the top of the Montpellier Formation of Jamaica and the Cipero Formation of Trinidad.

(2) The relatively cooler late Miocene recorded 2 cooler and 2 warmer events characterized by the "*nepenthes* group" and ended approximately 11 m. y. ago.

(3) A worldwide early Pliocene warm climax 7 m. y. ago was preceded by an intense cooler event of extinction and coiling changes, the "Sigsbee zone."