for attenuation in solids is substantially different from that in liquids; a non-linear mechanism for attenuation has been proposed.

An inversion method can be used to compute the intrinsic Q in shear of the earth's mantle from available data on attenuation of the surface waves and free oscillations. The restrictions and assumptions in the calculation are: (1) Q must be positive; (2) Q is assumed to be independent of frequency; and (3) the mechanism of energy dissipation is through a complex modulus.

The results show that, in shear, the upper mantle has a much higher attenuation than the lower mantle. Q for the upper mantle, from the surface to a depth of 650 km., is estimated at 110; for the lower mantle, below 650 km., it is much higher than this, but the exact value cannot be estimated with precision. There are indications of fine variations of Q in the upper mantle, but present accuracy of the data and the assumptions used do not permit the literal use of these indications. Partial melting in a low velocity layer at shallow depth is considered and a small amount of partial melting is not inconsistent with the above result and the data.

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MINERALOGICAL COMPOSITION AND TEXTURAL PROPERTIES OF RIVER SEDIMENTS FROM BRITISH HONDURAS

An investigation of the mineralogical and textural properties of channel sediments from certain selected rivers of British Honduras, Central America, indicates that the material carried by the northern rivers is distinctly different from that in the southern ones.

The northern rivers contain mainly a carbonate sediment of cryptocrystalline grains and mollusk fragments. A multiple origin for these cryptocrystalline carbonate grains is proposed. Undoubtedly, some grains are recrystallized mollusk fragments. Other grains are rock fragments, while still others appear to have been indirectly precipitated by blue-green algae. The noncarbonate grains have been derived from Pleistocene stream deposits. Abrasion of the heavy minerals and quartz grains appears to be lacking.

The southern rivers contain mainly silici-clastic sediments. The size distributions of bed-load samples plot as approximately straight lines on phi probability paper with a deviation near +2 phi. This deviation is real and has been attributed to an abrasional mechanism. The heavy mineral suites from the southern rivers indicate a more metamorphic provenance than is seen in outcrop in the source areas. The primary provenance has been interpreted to be the metamorphic belts in Guatemala. Petrographic work also indicates a more metamorphic source to the south. The river detritus, if indurated, would appear as lithic graywackes or subgraywackes, depending on the percentage of detrital matrix.

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THE RELATIONSHIP BETWEEN INTERNAL AND EXTERNAL STRUCTURE IN GULF COAST SALT DOMES

Internally, salt stocks consist of isoclinal, attenuated, vertically-plunging, complex folds and resemble a handkerchief drawn vertically through a small ring. They appear to have developed by intermittent and shifting movements which may have been controlled largely by strain hardening of halite crystals and varying rates of sedimentation. These movements must have strongly affected external structures and oil migration. External structures, like grabens and faults, may be related to internal structures like zones of shearing and differential movement (faulting?). Close cooperation among petroleum geologists, geophysicists, and salt-fabric geologists is needed if we are to decipher the origin of salt massifs, salt spines, overhangs, and intermittent salt movements.

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SEDIMENTS AND FAUNA OF THE RHONE DELTA, FRANCE

The Rhone delta is an example of a rapidly growing delta, prograding over a relatively steep slope into the essentially tideless, highly saline Mediterranean. Detailed studies of the sediments and microfaunas by the author and his colleagues have shown that rate of deposition, even more than depth, is the primary factor controlling the nature of the sediments and faunas offshore. Our classification of deltaic-marine environments is accordingly based on rates and depth of deposition.

These studies, supplemented by earlier work in the land part of the delta (Kruit, 1955), have provided the basis for the interpretation of 26 core holes drilled to the top of the Pleistocene "basement." A clearcut distinction can be made between the *onlap complex* of coastal-plain sediments formed under conditions of rising sea level during the late Pleistocene—middle Holocene and the *offlap delta* consisting of marine sediments laid down under conditions of stable sea level since 5,500 B.P.

All core holes through the offlap delta reveal a transgressive-regressive sequence. Those sequences with a typical fluviomarine regressive development consist of (in upward direction):

1) a thin slow-deposition basal bryozoa bed;
2) moderate-deposition distal-fluviomarine clays;
3) rapid-deposition proximal-fluviomarine clays and silts; and
4) rapid-deposition fluviomarine-barrier sands.

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A MICRO-ORGANIC AND ECOLOGIC INVESTIGATION OF RECENT SEDIMENTS FROM TWO GULF COAST CORES

The relationship between the recoverable microorganic remains and the depositional environment of Recent sediments in two cores from the Gulf Coast area was studied.

One continuous $3\frac{3}{4}$-foot core from Matagorda Delta was sectioned and studied every three inches in order to detect minute vertical variations. The second core from Galveston Bay was 63 feet long, but not continuous. Nine samples were studied, each sample representing an interval of two to three feet of sediment.

The detailed analysis of the Matagorda core indicates three distinct depositional environments within the few feet of core. In descending order, these are marine, less marine, and more marine. In the 63 feet of Galveston core, analysis of samples gave an over-all picture of depositional environments, in descending order: marine, less marine, more marine, and continental. Therefore, the environments detected in the very detailed analysis of the continuous samples represent minor fluctuations in what shows up as a single environment in the longer core.

The calcium carbonate content decreases with depth

in both cores, suggesting some diagenetic effects after burial of the sediments and organic remains, rather than a direct relationship with foraminiferal and ostracodal populations.

Foraminifera, Ostracoda, spores, and pollen are present in both cores. In addition, the core from Matagorda Delta contains hystrichosphaerids and the core from Galveston Bay contains diatoms.

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BIOLOGICAL AND ECOLOGICAL INFORMATION FROM PHYSICAL AND CHEMICAL PROPERTIES OF SKELETAL CARBONATES

Progress has been made in relating physical and chemical properties of carbonate skeletons to physiologic and ecologic factors in Recent marine organisms.

Data are accumulating which show that the skeletal mineralogy and its chemistry may change significantly in an individual during growth. Discrete microarchitectural units of individual skeletons may differ widely in mineralogy and chemistry because of differences in the biochemistry of the tissues which deposit them. Investigations of shell regeneration show that the mineral species of the skeletal-repair carbonate is the same as that in normal growth, but there are differences in trace element concentrations. These data emphasize the need for differentiating the various physiological effects on skeletal carbonate deposition within and between species.

A number of ecologic factors are known also to affect the morphology, mineralogy, and chemistry of skeletal carbonates in many species. Consideration is given to the current status of our knowledge of the specific effects of each individual ecologic factor and of distinguishing these from physiologically controlled effects.

Application of these approaches to paleoecological investigations requires criteria for distinguishing diagenetic changes, possible evolutionary changes in mineralogy and chemistry, and physiologically and ecologically controlled effects.

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GEOLOGY AND GEOPHYSICS OF THE GULF OF MEXICO

The geophysical data on the Gulf of Mexico, combined with the known geology, make possible the preparation of a number of maps which define the modern geosyncline and provide some evidence as to its inception. The velocities and depths of interfaces observed in seismic reflection and refraction profiles reflect the characteristics and thicknesses of the layers of rock in the syncline, and the gravity and magnetic data indicate its tectonic framework. The inception of the geosyncline appears to be related to widespread collapse in Triassic time, which had been preceded by the deposition of Paleozoic sediments and the possible extension Gulfward of the Appalachian orogeny. The problems dealt with in this paper are: (1) the shallow Jurassic and Cretaceous aspect of the Gulf, (2) the widespread extent of the salt and the resultant domes, (3) the lateral or wrench faults and the restoration of transposed elements, (4) the pattern of shifting depocenters, (5) the tremendous acceleration of depositional rates in Tertiary time culminating in the rapid present day rate of 24.4 cm/century determined by Hardin and Hardin, (6) the enigmatic Atlantic trench, (7) the unexpected axial directions of magnetic anomalies, and (8) the intermediate (between continental and oceanic) depth of the Moho below the Gulf. The cumulative result of the complex history is a Mesozoic and Cenozoic geosyncline with a sedimentary thickness of perhaps 60,000 feet. The final problem is why this great prism of rocks does not fold into a mountain range after exceeding the accepted depth limit for other geosynclines.

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GRAVITY INTERPRETATION OF MAJOR CRUSTAL PROPERTIES AND MASS DISTRIBUTION

Great anomalies, usually regarded as "regional," clutter gravity and magnetic maps. These anomalies are removed in the process of isolating residual features that are significant as basement and (or) sedimentary effects. A study of these deep crustal features on detailed regional maps of Oklahoma reveals that: (1) each large gravity anomaly has a corresponding large magnetic anomaly, and (2) the most probable depth values calculated from selected large magnetic and gravity anomalies, assuming the same source (dense rocks rich in magnetite), show a surface, well below the top of the crystalline basement, which has considerable relief. The relief includes pronounced lateral displacements along faults, all east-west in trend. The most appropriate name for this surface is the "Algoman surface," the U. S. Geological Survey designation for the vast worldwide surface which reflects the great unconformity which followed the end of the Archean (early Precambrian). Prior to this time, it now appears, the earth had very little oxygen in its atmosphere, and minerals such as magnetite and uraninite, for example, escaped oxidation and were preserved below this Algoman surface. Widespread mapping of this interface has both tectonic and mining significance, because the positions of this surface near the present crystalline basement are commonly associated with mineralization. Speculatively, the folding of the "Archean" rocks and the relief of the Algoman surface may be in part a manifestation of great tidal movements prevalent if the orbit of the moon, projected back 2.5 billion years, was much closer to the earth.

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THE HOCKINGPORT AND WAYNESBURG SANDSTONES (PENNSYLVANIAN AND PERMIAN) OF THE DUNKARD GROUP

The Waynesburg Sandstone, lower member of the Waynesburg Formation, Dunkard Group (Pennsylvanian and Permian), has been considered to be a more or less continuous deposit extending entirely across the Dunkard basin. The true Waynesburg Sandstone is restricted in areal extent to southwestern Pennsylvania and northern West Virginia. A similar sandstone deposit, which exists in portions of Washington, Athens and Meigs Counties, Ohio, and adjacent West Virginia, has been considered to be a part of the Waynesburg Sandstone. In the opinion of the writers, these sandstones are not correlative. The sandstone of southeastern Ohio is herein termed the Hockingport Sandstone for the village of that name in Athens County.

The Hockingport Sandstone is a subgraywacke. It contains much pebble and granule conglomerate and averages 65 per cent quartz. The Waynesburg Sandstone is transitional between a subgraywacke and a protoquartzite, is locally conglomeratic, and averages 76 per cent quartz.