proceed confidently to use all the energy needed to promote economic progress throughout the world so that all mankind may enjoy a better and richer life.

DELANEY, PATRICK J. V., Escola de Geologia, Universidade do Rio Grande do Sul, Porto Alegre, Brasil

STRATIGRAPHY OF THE VICKSBURG EQUIVALENT OF LOUISIANA

A study, extending from western Mississippi across Louisiana and into East Texas, of the surface stratigraphy of the Vicksburg (Oligocene) equivalent in Louisiana reveals that five units comprise the sequence from upper Jackson (Eocene) to lower Catahoula (Miocene): (5) massive quartzose sandstone; Cassels Hill Member of the Catahoula Formation (20–50 feet); (4) clays and silts, fossiliferous and calcareous; east of Sabine Parish designated Rosefield Formation and in Sabine Parish and farther westward called Nash Creek Formation (25–70 feet); (3) well sorted quartzose sand; Sandel Formation (20 feet); (2) chocolate clays and lenticular quartzose sands; Mosley Hill Formation (80 feet); (1) khaki-colored fossiliferous clays; Danville Landing Beds (100+feet).

These units remain consistent and persistent along strike across Louisiana. The three middle units represent the original Mosley Hill group thought to be Oligocene by Murray, but in this paper the Mosely Hill is restricted to the lower unit which is present at the type locality. The names Sandel and Rosefield are new. The maximum thickness of the total sequence is 180 feet in Catahoula Parish. The Cassels Hill Formation is separated from the Rosefield Formation by a disconformity beneath which the Rosefield decreases in thickness from 70 feet in Catahoula Parish to 7 feet in western Louisiana and East Texas.

The Mint Spring Marl of the lower Vicksburg sequence in Mississippi is subdivided into the underlying marl facies which extends westward and the overlying carbonate facies which extends eastward. The Rosefield Formation of Louisiana is thought to correlate with the entire Vicksburg sequence at Vicksburg plus the uppermost 15 feet of the Forest Hill of Mississippi. The Sandel and upper Mosley Hill represent the Forest Hill (restricted) of Mississippi and the Danville Landing is upper Yazoo equivalent. The Sandel pinches out westward into Texas so that there is no separation between the Mosley Hill and Rosefield clay and silt sequences, both of which are represented in the type Manning of Texas.

DIETZ, ROBERT S., U. S. Navy Electronics Laboratory, San Diego, California

EVOLUTION OF THE CONTINENTAL SHELF AND SLOPE

Further explanations of the origin of the continental slope, such as ascribing it to catastrophism, normal faulting, a wave-built terrace, or marginal downwarping, appear to be unsatisfactory. Instead, the writer considers continental slopes to have been constructed by the folding of the continental rise against the continental block, forming a eugeosynclinal orogen. Accordingly, continental slopes would be the flanks of such orogens; a secondary cause for some continental slopes may be the modified scarp left after a rifting-apart of a continental mass by continental drifting. Once formed, initial continental slopes undergo modification by erosion and sedimentation. A proposed mode for such geomorphic evolution is presented. Continental shelf formation is a part of this evolution.

DIXON, MARK A., Department of Geology, Louisiana State University, Baton Rouge, Louisiana

BIAS FACTORS IN LOOSE-GRAIN DATA

In loose-grain studies, sampling of grains by point-count or other conventional methods is never equivalent to sampling of the sediment by volume. This causes severe difficulties in comparison of Recent sediments, in which loose-grain data are frequently used, with older sediments, in which thin-section or chemical data are used. Even sieve data are not directly comparable. Correction of loose-grain data to a "volumetric" basis is surprisingly complex and uncertain.

Where a sediment must be described in terms of its volume, all loose-grain point-count data are systematically biased in favor of the finest grains present on any area. Given equal volumes, the frequency of encounter of any grain-size category is cut in half every time the grain diameter is doubled. This can be demonstrated with assorted spheres, by chopping a potato into successively smaller cubes, or by simple algebraic derivations. Shape factors may contribute an additional bias which is not considered here.

After transformation of the raw data to "volumetric" ratios by multiplication, a certain amount of bias is still present, or "uncorrectible," unless *every grain* in a sediment is counted. In statistical terms.

$\bar{\bar{X}} = \mu$ only if $n = \infty$ (where μ is the un-biased, "parent," "volumetric" model mean)

The "uncorrectible" portion of the original bias is a function of: (1) sorting or "Variance"; (2) the number of points counted, or "sample size"; and (3) Gaussian normality of the un-biased natural property with respect to volume. Bias (1) increases dramatically as the sorting gets poorer, (2) decreases asymptotically toward zero as the number of points is increased, and (3) becomes highly erratic for properties which are not "normal." The effect of this bias on polymodal properties is catastrophic.

Estimation of the "uncorrectible" portion of the bias, from the behavior of mathematical models, is a haphazard procedure at best. Only a few models have been worked out, due to the number of calculations which become necessary. In the model shown here, the "uncorrectible" bias is more than half of the total bias.

Until good methods of bias-correction can be developed, statistical comparisons of loose-grain properties must be considered either: (1) unrelated to sediment volumes, or (2) confounded with sorting and (or) normality. Hence, comparisons of size, and any property dependent upon ("interacting with" or "correlated with") size, must be accompanied by tests demonstrating complete uniformity of sorting ("Homogeneity of Variance", at the "point" or "error" level). Where this is impossible, interpretation of the test results becomes frustrating and virtually futile.

DRAKE, CHARLES L., Lamont Geological Observatory, Columbia University, Palisades, New York

ATLANTIC MARGIN OF NORTH AMERICA

Recent investigations in previously poorly covered areas and with new techniques have extended our knowledge of the structure of the continental margin of eastern North America. The sedimentary trough under the continental rise has been better defined by seismic profile data and structural trends have been followed by magnetic measurements. Among the features recently identified is a structural offset at 40° North Latitude which appears to be a transcurrent fault off-