interrogation indicated the crest of a deep closure had not been
penetrated. The Sun 27 G. T. Brooking, drilled in December
1972, found new deep production. New reservoirs also were dis­
covered in the previously drilled upper part of the Frio section.
The improved logging techniques used in the wells allowed a
more quantitative look at all the sandstones. Combination log­
ing tools providing a simultaneous recording of induction resist­
tivity, acoustic velocity, and computed Rwa curve were used
eclusively. Using the Rwa curve as a hydrocarbon indicator,
low resistivity sandstones that appeared wet from casual exami­
nation were tested and found productive. Other sandstones which
appeared to have no vertical separation from overlying
water sandstones were tested and found productive.

Twelve new wells were drilled from 1972 through 1974. The
drilling program resulted in a significant increase in the daily gas
and oil production. Multiple recompletion opportunities also
were recognized.

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Deformational Processes in Delta-Front Deposits

River-mouth depositional patterns are modified by sediment
deformational processes of sufficient magnitude to endanger se­
verely bottom-supported structures. Several types of deforma­
tions are present and include (a) peripheral slumping, (b) differ­
ential weighting and diapirism, (c) graben faulting, (d) mass
wasting by sediment degassing, and (e) deep-seated flowage.
High depositional rates are present near the river mouth and
decrete seaward; with time, the bar front oversteeps and
rotational slump planes form peripheral to the bar front, moving
sediment into deeper water. These blocks have longitudinal di­
3ensions of approximately 200 to 2,000 ft and lateral dimensions
of 600 to greater than 2,000 ft. Differential loading by denser bar
sands overlying low-density clays results in vertical and seaward
flowage of the clays contemporaneously with seaward bar pro­
gradation. Diapiric folds and spines (mudlumps) intrude into
delta-front sediments on the seaward side of the deforming load,
vertical movement affecting sediments to depths in excess of 500
ft. The seaward extrusion and continued movement of clays arch
the overlying delta-front sediments, and this stress is relieved by
small graben faults oriented radially to the deforming load or
delta lobe. The grabens have widths from 150 to 1,500 ft and
lengths of several miles. The finer grained river-mouth sediments
contain high percentages of methane and CO2 gases, formed by
bacterial decomposition of organics. Passage of hurricane waves
produces bottom-pressure perturbations, forcing the entrapped
gas upward, causing loss of sediment strength and allowing mass
movement. The weight of the modern delta has depressed under­
lying Pleistocene sands about 400 ft, causing squeezing and flowage
of clays onto the continental shelf at water depths greater
than 300 ft. Large-scale slumping and faulting near the continen­
tal shelf result from this clay flowage. These processes are con­
temporaneous with deposition and play an important role in
initiating a depocenter.

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Sand Leakage around Rocky Headland at Niteroi, Brazil

A statistical study of foreshore sediments from two adjacent
open-ocean pocket beaches near Niteroi, state of Rio de Janeiro,
Brazil, was undertaken to investigate sand leakage around the
rocky headland separating the beaches. According to May and
Tanner, the rocky headland theoretically could act as a cell
boundary. A statistical analysis should reveal whether or not the
rocky headland is a cell boundary.

Three samples collected from beach 1 (NE of headland) and
seven samples collected from beach 2 (SW of headland) were
sieved and the four moment measures were determined for each
of the samples. The moment-measure analysis was marked by the
following pertinent points: (1) mean phi size increases in both
directions away from the headland; (2) mean phi size for beach
1 (1.577 phi) is significantly different from the mean phi size for
beach 2 (1.297 phi); (3) sorting for both beaches appears to
improve weakly toward the headland (0.370 ± 0.020 to
0.450 ± 0.020); (4) skewness increases from a negative minimum
(−0.150 ± 0.020) away from the headland to a positive maximum
(0.100 ± 0.020) at the headland; (5) kurtosis decreases away from
the headland (1.000 ± 0.020 or 0.200 ± 0.020); (6) two-factor re­
gression analysis of the four moment measures (y) versus linear
distance (x) away from the headland revealed a weak positive
linear trend for mean phi size, a weak negative linear trend for
sorting, and strong negative linear trends for skewness and kurt­
os; (7) analysis of variance indicated that the variation in mean
phi size is significantly different between the two beaches.

Interpretation of the statistical analysis forces one to conclude
that the rocky headland is a cell boundary (e.g., little or no
leakage) separating two pocket beaches, each of which is in
dynamic equilibrium.

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Multivariate Statistical Approach to Sedimentary Environmen­
tal Analysis

A multivariate statistical strategy employing cluster analysis,
ordination, and gradient analysis was used to determine the de­
positional environment of Barataria Bay, Louisiana. Cluster
analysis of sediments suggests the existence of five sedimentary
facies: (1) beach sand, (2) foreshore sand, (3) silty channel sand,
(4) silty channel-margin sand, and (5) organic silt and mud.
Ordination was used to depict the gradational relationships among
individual samples and among facies defined by cluster analysis.
Gradient analysis suggests a wide range of environmental condi­
tions operating within the bay and substantiates Klovan's factor
analysis.

Gradient analysis shows that ordination extracts, successively
with each axis, the most variable combination of the original
variates. The ordination coordinates become new objectively
created variables which are efficient measures of the original
grain-size curve.

This multivariate statistical approach to sedimentary environ­
mental analysis may prove useful for partitioning other sedimeft
samples into facies and for examining the interaction between
these facies and their environment of deposition.

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Towed Horizontal Resistance and Spontaneous Potential Survey
off Sabine Pass, Texas

A program of electrical measurements on unconsolidated ma­
rine sediments was started by the geologic oceanographers at
Texas A&M University in 1968. It consisted of measuring resist­
ance and spontaneous potential on extruded cores and in situ
in the field, and correlating the electrical values with various sedi­
ment and geotechnical properties. The present phase of research
concentrates on delimiting and defining sediment lithologies us­
ing a towed horizontal array. Several combinations and electrode
spacings were tried across Heald Bank, off Sabine Pass, Texas.
Bottom-water and sediment samples were collected from well­
defined submarine lithologies.

Preliminary results indicate that the spontaneous potential is
uniformly highest in mud and clay areas. Large variations occur
over shelly sands and shell debris. Resistance is largely uniform
across Heald Bank, with relative values depending on electrode