Mineral production is a declining component of the gross national product. Even so the total value of production will probably exceed $40 billion in 1980. The supply and demand for different minerals will grow at different rates, but the total amount of mineral product during the next decade will be almost ⅔ as much as cumulative consumption during the past 35 years. Finding the mineral reserves to supply expanding economy will be an enormous challenge to industry and to the geologist.

Industry's attention is drawn daily to problems which divert it from its primary goal of supplying sufficient mineral production to promote the economic growth of the nation, such as problems of depletion, pollution, taxation, federal leasing regulations, and import quotas.

A major problem facing the industry and the explorationist is the creation of an environment to improve our mineral-finding ability. Past practices of the industry and explorationist merit change. The industry must stabilize its employment practices to retain and encourage an influx of high-caliber personnel into the industry. These scientists must be able to innovate and to use the rapidly increasing amount of data. This will require a stress on geologic teamwork in lieu of individual effort, which has been our trademark.

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DEVONIAN REEFS IN WEST-CENTRAL ALBERTA AS REVEALED BY STRUCTURAL ANALYSIS OF SHALLOW CRETACEOUS HORIZON

Trend-surface analysis of structure on the Cretaceous Fish Scales marker horizon indicates the presence of underlying Leduc (Devonian) reef bodies in deeply-buried strata adjacent to the Foothills belt. Included are reef bodies associated with Windfall, Pine Creek, Bigstone, Simonette, and Sturgeon Lake fields. Results of this analysis have exploration significance because of sparse well control for deep Devonian strata and the availability of more widespread data from shallower drilling. Several anomalies shown by the analysis indicate the possible presence of undrilled Leduc reefs.

Success with this technique depends greatly on careful stratigraphic correlation of the higher beds as the anomalies are commonly very subtle. For example, the third-order residual map which best defines the Leduc reefs represents only 0.29% of the total map variability. The present study used data from 776 wells evenly distributed across about 33,000 sq mi; maximum well density was 3 wells per township (36 sq mi). Other geologic features revealed by the analysis include low-displacement normal faults and, apparently major depositional trends in the Beaverhill Lake and Woodbend (Devonian) intervals.

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PRINCIPLES OF DELTAIC PROSPECTING

Deltas generally are formed at river mouths during stillstands of sea level under conditions of either cyclic transgression or regression. Consequently, they generally are not isolated phenomena, but rather occur in multiples in a predictable fashion. Reservoir facies consist of both continuous and discontinuous bifurcating channel sandstones, which thicken downward at the expense of the underlying prodelta clays.

All the lithologic components of a deltaic complex are related and are collectively referred to as a type of "genetic increment of strata" (G.I.S.). The G.I.S. is a sequence of strata in which each lithologic component is genetically related to all the others. It is defined at the top by a marker bed (such as a thin limestone or bentonite) and at the base by either a marker bed or an unconformity. It generally consists of the total of all marginal marine sediments deposited during a stage of either cyclic subsidence or emergence. An isopach map of a G.I.S. clearly shows the bifurcating trends of the individual distributaries and the shape of the delta, regardless of the varied lithology of the channel fills.

A "genetic sequence of strata" (G.S.S.) consists of 2 or more G.I.S. and, on an isopach map, the shelf, hinge line, and less-stable parts of a depositional basin are clearly defined. An isopach map of the McAlester Formation in the Arkoma basin is a good example of a G.S.S. The oil-productive Booch Sandstone is a good example of a deltaic complex occurring within a G.I.S. of this G.S.S. The upper Tonkawa, Endicott, and Red Fork Sandstones of the Anadarko basin are identified as deltaic accumulations within different G.I.S.'s.

A hypothetical model serves as a basis for establishing the criteria for (1) recognizing successive stillstand positions of a shoreline, (2) predicting paleodrainage courses, (3) predicting positions of a series of deltaic reservoirs, (4) locating isolated channel sandstone reservoirs, and (5) tracing related beach-sandstone reservoirs.

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IMPORTANCE OF TIDAL-INLET SEDIMENTATION IN BARRIER-ISLAND SYSTEMS

Barrier-island complexes, long thought to be composed largely of inlet-fill material deposited during migration, have been shown by recent work in geomorphology, stratigraphy, and petrology to contain only 10% tidal-inlet sediments.

Geomorphology of the North Carolina "Outer banks" barrier-island complex, as determined from recent aerial photographs, indicates that tidal inlets and their deposits comprise only 13 of the 120 mi between Beaufort and Nags Head. These 13 mi of inlets and inlet fill represent only 10.8% of the barrier-island system. Furthermore, geomorphic study of the earliest to most recent USCGS charts shows that tidal inlets and their deposits never have accounted for more than 10–11% of the barrier-island complex. Washover fans, tidal deltas, lagoon deposits, dunes, and beaches appear to be of far greater importance.

To confirm volumetric percentages of tidal-inlet deposits, 80 holes were drilled and 178 bottom samples collected from Pamlico Sound and the Atlantic shelf. Grain-size analyses made by settling-tube techniques indictate that tidal-inlet sediments are distinct. Standard deviation versus mean plots allows the best separation of fields. These subsurface studies clearly define the limits of tidal-inlet sedimentation and indicate that only 10% of the total sedimentary complex consists of such deposits.

We must conclude, therefore, that (1) inlet-fill sedimentation is minor in the depositional framework of these barrier systems, and (2) tidal-inlet systems do not migrate significantly in the formation of these barrier islands.