

rapid, complete evaluations of well productive potential.

Electronic computers permit rapid and accurate analysis of gravity and aeromagnetic data. The calculation of second derivatives and sophisticated methods for upward and downward continuation of the gravity or magnetic field are amenable to computer solution. The theoretical gravity or magnetic effect resulting from a known, or hypothetical, structure can be determined in detail rapidly by an electronic computer.

Automatic plotters enable large volumes of results to be made immediately available in their most useful form thereby retaining the advantage of the computer's speed.

Computers are available within major companies, and to smaller organizations and independents through service bureaus. Converting large volumes geological data to a form suitable for computer input can be done economically with proper planning by computer-oriented geologists. The exploration geologists should become sufficiently familiar with computers to recognize problems in which they can be used advantageously. A geologist who wants to use the computer for a particular problem should consult with people trained in the use of computers and preferably with experience in scientific or engineering computing.

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William E. Ham, Oklahoma Geological Survey, Norman, Oklahoma  
"Problems of Carbonate Rock Classification"

#### Abstract

Carbonate rocks consist of a closely related family of consolidated sediments, normally quite simple in mineralogical composition and generally marine in depositional environment. Various mixtures of only two mineral species -- calcite and dolomite -- make up the bulk of limestones and dolomites in this interesting and economically valuable group.

In addition to their mineralogical composition, the carbonate rocks possess three distinctive features which must be recognized in classification. First, most carbonate sediment is derived from sea water, the particles remaining within the basin where they originated. They are admixed with land-derived clastics along the margins of epicontinental basins, but offshore, and particularly in isolated banks of the Bahama type, the sediment is nearly pure carbonate of local origin. Second, there is strong dependence on organic activity. Secreted skeletal elements of both animals and plants, conspicuous in so many limestones that the possibility of chance occurrence is absolutely ruled out, demonstrate how calcium and magnesium carbonates are abstracted from sea water and fixed as sediment. Even the more enigmatic lime muds are known to be at least partly derived through organic processes. Finally, as a result of their peculiar chemical composition, the carbonate rocks are especially susceptible to solution and recrystallization. In all these respects the carbonate rocks are set distinctly apart from their nearest sedimentary relatives -- sandstones and shales -- and because of these distinctions they have unique problems of classification and interpretation.

Recrystallization in particular destroys original features, locally to the extent that meaningful classification becomes impossible. Pervasively recrystallized carbonates are thus set aside as a special group.

Another specialized group consists of reefs and beds that are dominated by in-place organic remains. Carbonate rocks of this group are unique and must be set apart in any classification scheme.

Carbonate rocks that are strongly dolomitized may be classified in the same way as ordinary limestones, provided only that relicts of the original calcium carbonate sediment are preserved. Other dolomites, originating as wave-swept grains that do not replace limestone, are classified according to grain size into dololutes and dolosiltites.

The major classification scheme of normal limestones is based on the concept that the rock consists of grains that have been transported away from the site at which the carbonate particles were originally fixed from the marine water. In moving away from their original depositional site, the grains have an opportunity to become sorted by size, shape, and density, with the resulting formation of calcilutites, calcisiltites, calcarenites, and calcirudites. Only four compositional features of these grains are quantitatively important -- skeletal grains; lithoclasts, derived by mechanical erosion of consolidated or semi-consolidated carbonate sediment; fecal pellets and other composite grains that have originated by agglutination on the sea floor, these two types being genetically dissimilar but extremely difficult to distinguish in consolidated rocks; and oolites, pisolites, and other similar grains that are coated through organic, mostly algal, activity.

In addition to the composition of the grains and a quantitative measurement of their size, the classification of normal limestones must also consider whether the interstitial space between grains is an open pore space or is filled with lime mud or with clear calcite cement. A consideration of just three parameters -- grain composition, grain size, and interstitial pore space, matrix, or cement -- is enough to provide a working classification for basic investigations of most limestones for petroleum research.

January 28, 1963

Frank J. Gardner, Oil & Gas Journal, Tulsa, Oklahoma  
"Exploration Review and Forecast"

February 4, 1963

James F. Johnson, Sinclair Research Laboratories, Inc., Tulsa, Oklahoma  
"Oil Exploration From the Research Standpoint"

#### Abstract

Progress and trends in oil exploration are evaluated from the overall view afforded by a research organization. The state of development of current exploration methods is discussed briefly in relationship to their effectiveness in the present exploration picture. The ineffectiveness of present geophysical methods in stratigraphic trap exploration leads to the conclusion that new methods must be developed if stratigraphic traps are to be located routinely. These methods will involve parameters more closely related to oil accumulation than geologic structure. The idea is advanced that in all probability these new methods exist today in prototype form, or even in a stage of considerable development. They may be unpopular or controversial and may have been assumed invalid by many people on the basis of second-hand evidence. Special emphasis is placed on the difficulties, psychological and industrial,