Basin development is initiated when an area adjacent to a source area begins to receive sediments. The weight of these sediments causes a slight increase in pressure in the crustal rocks at the M discontinuity converting 2.8 rocks to 3.2, and a volume increment of heavy rocks is produced. This mass sinks, lowering the sea floor along with it. Sediments continue to accumulate to thicknesses of as much as 100,000 feet.

Mountain building occurs over the site of the basin. The uplift necessary to destroy the basin is provided by an increase in temperature. Sediments are poor thermoconductors and provide an insulation so that temperatures can increase. The heat source is radioactivity in the crustal rocks. Thus, this heat increase creates a volume increment of lighter rocks causing the system to float upwards, destroying the basin and building mountains.

Granitization accompanies mountain making and occurs in the depths of the basin. This newly produced granitic mass becomes an integral part of the granitic underpinning of the continent. Since basins form adjacent to an area of sufficient elevation to produce a source of sediments, throughout geologic time they have formed at or on the edge of the expanding continental mass. Age dating of the granites of North America indicates that the accretion of continents began around a nucleus or protocontinent and then continued in ever-widening bands around this nucleus.

The Gulf of Mexico is an area of possible future accretion. All the prerequisites following the above scheme are fulfilled; high M discontinuity, sediments being deposited in the basin. When the sediments become thick enough to insulate and retain the heat, the M discontinuity will be forced down by a volume increment of lighter rocks, the entire area will be uplifted, granitization will produce a mass adjacent to the present granite, and this mass will be plastered against the continent to become a newly accreted portion.

March 4, 1963

Charles E. Weaver, Continental Oil Company, Ponca City, Oklahoma

"Geological Significance of Clay Minerals in Sedimentary Rocks"

March 11, 1963

Jack L. Walper, Tulsa University, Tulsa, Oklahoma

"Petroleum Exploration in the Canadian Arctic"

Abstract

Petroleum exploration in the Canadian Arctic has only begun. Although known for some time as one of the last unexplored major sedimentary regions of the world, to date little more than reconnaissance studies have been made of its economic potential. An area the size of Texas and the entire Mid-continent region of the United States combined and geologically as diverse, this northern portion of the continent contains some of the world's greatest unexplored sedimentary basins. Upwards to 45,000 feet of sedimentary rock are present in some of these basins and numerous oil-sands and seeps indicate the presence of hydrocarbons. None of the several wells that have been drilled are strategically located to yield maximum stratigraphic data therefore more information is still obtained from measured stratigraphic sections in the numerous mountain ranges situated throughout the region.

The regional tectonic framework is presented to show the complex geologic history that the North Yukon-Lower Mackenzie portion of the area has undergone. Early depositional history has been controlled by both the Cordilleran and Franklin geosynclines and the area has, since the Cambrian, witnessed at least two complete orogenic cycles. Each of these has resulted in a large variety of sediments and structures and the final orogenic pulse, associated with the Laramide deformation, gave rise to the Richardson, Barn, British, Keele, Ogilvie, and Mackenzie mountains, as well as adjacent plains and plateaus. Underlying these latter features are thick marine sedimentary sequences that contain numerous potential petroleum source and reservoir beds. Strata of every Paleozoic and Mesozoic system are present and the great thicknesses and varied lithologies in many areas justifies one in considering it a most promising oil and gas area.

Because of the remoteness of the area and the inaccessible terrain, geologic exploration encounters many operational problems that are new to most field geologists. Helicopters have been used successfully in geologic exploration in this region and helicopter operations are discussed to show method of data collecting and most efficient use of the helicopter in order to obtain optimum results.

March 18, 1963

Clyde G. Strachan, Tulsa University, Tulsa, Oklahoma

"Crustal Structure and Its Relation to Continental Drift"

Abstract

This complex subject has had no definite factor to which it might be tied. The author suggests that a structural concept expressed in previous papers in connection with exploration for oil may be such a tie. In this concept the occurrence of fundamental northeast-southwest and northwest-southeast trends of deformation are described, which are believed to be the results of zonal pressures parallel to the earth's equator which occurred at the time the first condensation of the crust took place and the continents were formed as segments in these zones. If so, continental drift, including particularly the rotational movement involved, could not have occurred except by rotations of 90°, 180°, or 360°, or by following zigzag courses with 90° turns and no rotation.

As geophysical data on the interior of the earth increase, their interpretation tends to bring out more clearly the highly irregular nature of the Mohorovicic discontinuity. It has been reported from Russia that structure on this surface has been found to reflect generally the regional and local structure at the surface, where it has a northwest-southwest trend. This indicates that the continental crust either extended through the M discontinuity at the time the fundamental trends were formed or that this deformation extended downward as the continental crust thickened. Both possibilities suggest a stable continent, although the mechanism suggested by Dietz probably could apply.

In connection with the occurrence of materials which are interpreted as being evidence of ancient glacial conditions associated with continental drift, it is suggested that these deposits may have been associated with high altitudes. For instance, the Ouachita Mountains of southeastern Oklahoma once probably formed high ranges; as others have pointed out, the erratics of the