

Mountain system, and includes an almost continuous belt of granitic batholiths and a chain of active and recently active volcanoes. Though numerous, granitic intrusive masses between the Alaska and Brooks ranges are small, except a few in the southeastern part of the Yukon-Tanana upland. Relatively few igneous rocks are known within and north of the Brooks Range.

The Paleozoic and much of the Mesozoic tectonic history of Alaska, involving a broad geosynclinal tract that lay between the Pacific Ocean on the south and west and a stable platform region on the north and east, can be considered conveniently in three major stages: Cambrian through Silurian, Middle Devonian through Permian, and Triassic through early Cretaceous. The mobile belt encroached northward at the expense of the stable region, until by mid-Mesozoic time eugeosynclinal conditions extended over most of Alaska. In mid-Jurassic time in southern Alaska, and in early Cretaceous time in central and northern Alaska, Alaska became differentiated into positive and negative tracts of erosion and deposition that were maintained through the rest of the Mesozoic era. Basins of known Tertiary marine deposition are limited to the northern and southern borders of Alaska. Inland, Tertiary basins were sites of accumulation of continental sediments.

35. General Geology and Hydrocarbons of Cook Inlet Basin, Alaska: THOMAS E. KELLY, Halbouty Alaska Oil Company, Anchorage, Alaska

The Cook Inlet basin of south-central Alaska is an intermontane structural basin approximately 14,000 square miles in area, encompassing almost 80,000 cubic miles of sedimentary rocks ranging in age from upper Triassic to Recent. The basin coincides with most of the northern part of the Matanuska geosyncline, an arcuate Mesozoic trough located at the northwestern end of the Pacific Cordilleran mobile belt.

The Cook Inlet sedimentary trough, in contrast to the structural basin, is defined as a Paleozoic-early Mesozoic eugeosyncline that received sediments from emergent volcanic islands which were part of the volcanic archipelago belt bordering the Pacific Coast of North America. Middle Jurassic epeirogeny transformed southern Alaska into arcuate geanticlinal and geosynclinal belts with the Cook Inlet basin beginning as a half-graben created by complex faulting on the east flank of the Talkeetna geanticline.

The Mesozoic embayment that collected marine sediments and occasional non-marine wedges abutting cratonic source areas was semi-enclosed or silled as the Kenai and Chugach ranges began to emerge following the early stages of the Laramide orogeny. During the early Tertiary, an abundant supply of non-marine clastic sediments and carbonaceous material was widely distributed in the subsiding intermontane basin.

The structural grain of the major tectonic elements describing the basin architecture is preserved in trends of local structure throughout the basin. Intense folding and faulting are exhibited on the north, east, and west flanks of the basin. Several major buried anticlinal trends extend in a northeasterly direction through the interior of the basin.

Mesozoic hydrocarbon accumulations associated with anticlinal traps are found on the western side of the basin. Minor quantities of oil, gas, and condensate have been produced from sandstones of the middle Jurassic Tuxedni formation. The oil is believed to be indigenous to Jurassic beds, the exact age and position of which are questionable on the basis of present-day stratigraphic relations.

Oil and gas accumulations in Tertiary beds will determine the significance of the Cook Inlet basin as an oil

and gas province. Present oil production comes from the Hemlock zone, a distinct sandstone and conglomerate unit near the base of the Tertiary Kenai formation. Entrapment has been influenced by folding and faulting along trend of an interior basin high which lies adjacent to and parallel with an early Tertiary hinge belt. The Tertiary crudes were probably derived from Eocene marginal marine strata or from upper Cretaceous marine shales which are unconformably overlain by the Tertiary sediments.

Significant quantities of gas, predominantly methane, are present in the loosely consolidated sands of the upper Kenai formation. The two conditions necessary for gas accumulation anywhere in the basin are (1) abundance of lignite or coal beds in the section to serve as source rocks, and (2) a suitable trap.

The Cook Inlet basin is in its earliest stage of exploration and development. It is anticipated that many new oil and gas fields will be discovered. Regional isopach maps of the interval between the Mesozoic beds and the base of the Hemlock zone are suggested as a basic approach to delineating old basin highs that may be sound Hemlock prospects. The Cook Inlet basin should become a major gas basin regardless of its future as an oil province.

36. Tectonic Summary of Backbone of Americas: CAREY C. CRONEIS, The Rice University, Houston, Texas

*Thursday Afternoon, April 27*

*Presiding: ORLO E. CHILDS, DANIEL S. TURNER*

37. Challenge of Exploration for Natural Gas: B. W. BEEBE, Consultant, Boulder, Colorado

During the year 1959, more than 11.44 trillion cubic feet of natural gas was marketed in the United States. This is equivalent in energy on a British Thermal basis to approximately 5,300,000 barrels of oil daily. More than six times as much natural gas will be delivered to consumers in 1960 than was delivered in 1935. The current oil production in the United States is approximately 6,800,000 barrels daily. The impact of this tremendous growth of natural-gas consumption on the market for crude oil is obvious.

The American Association of Petroleum Geologists published a symposium, "Geology of Natural Gas," in 1935. During the 25 intervening years, gas transmission systems have been constructed to all of the heavily populated areas in the United States. Consumers have recognized natural gas as a premium source of energy, not only because of its ease of handling and its cleanliness, but because natural gas is so grossly underpriced when compared with other sources of energy. The executive committee of A.A.P.G., recognizing the importance of natural gas, has authorized a new multi-volume symposium, "Natural Gases of North America," now in preparation. This massive authoritative work will be by far the most comprehensive documentation of all of the facets of the natural-gas industry which has ever been attempted.

The greatest source of natural gas in the past has been the so-called Appalachian geosyncline province. For the immediate future, Tertiary rocks of the Gulf Coast embayment will continue to be major sources of natural gas. However, as the reserves of the Permian basin of West Texas and the immense Hugoton-Panhandle field of Kansas, Oklahoma, and Texas are depleted, it appears that the huge intermountain basins of the Rocky Mountain area will become increasingly important as sources of natural gas. Recent discoveries in Tertiary and upper Cretaceous strata in this immense, relatively