The Road to Prudhoe Bay: Geological Exploration of the Alaskan North Slope, 1900 – 1968

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The road to the discovery of the super-giant Prudhoe Bay oil field is a classic illustration of the interaction between publicly funded scientific research and the private sector for the overall public good. The successful petroleum industry exploration program that resulted in the discovery of the field built on a geologic framework established by the US Geological Survey (USGS).

Geological exploration of northern Alaska began over 100 years ago in 1901 with a pioneering reconnaissance by F.C. Schrader and W.J. Peters of the USGS. Their field party crossed the Brooks Range to Anaktuvuk Pass in the winter, and then in the spring floated in canoes down the Anaktuvuk and Colville Rivers to the Arctic Ocean. In this exploration, Schrader recognized the presence of coal-bearing Cretaceous and Tertiary sediments in the Brooks Range foothills and correctly surmised the presence of a sedimentary basin beneath the North Slope.

The first geologic map of Alaska, compiled by Alfred H. Brooks of the USGS in 1904, included the reconnaissance traverses of Schrader and Peters as well as work by A.J. Collier near Point Hope and Cape Lisburne. The first published mention of petroleum on the North Slope was in 1908 by Brooks, who reported analyses of oil collected by Ernest deKoven Leffingwell from a major oil seep on the coastal plain east of Barrow near Cape Simpson. Brooks commented that “These fragmentary data point to the conclusion that there may be a petroleum field in this extreme northern part of Alaska.”

Leffingwell continued with geological mapping that was carried out between 1907 and 1914 in the course of a remarkable privately funded expedition. His geologic mapping focused on the northeastern Brooks Range in what is now part of the Arctic National Wildlife Refuge (ANWR). During the summers, the expedition, which consisted of him and one or two helpers, established a triangulation network and surveyed the entire coastline and offshore islands from the Canadian border to Point Barrow. His bedrock geologic mapping was done in the winters when dog team travel on the frozen tundra simplified access to the mountain outcrops. Leffingwell’s report on the Canning River region is a scientific classic that was published by the USGS in 1919 as Professional Paper 109. His geologic map is remarkably accurate considering the extreme conditions under which he worked. In the report he again reported the presence of the major oil seeps near Cape Simpson and also seepages near Wainwright. He suggested that there might be an oil field between Wainwright and Smith Bay, and noted that the oil-bearing rocks may also occur in other parts of the Arctic Slope. He also named the Sadlerochit Formation, which is the major reservoir unit in the Prudhoe Bay field, and the Shublik and Kingak formations—which are major source rock units on the North Slope. Leffingwell was also the first to describe many features in what is now known as permafrost.

Leffingwell’s report attracted the attention of the U.S. Navy, which in WW-I had emerged as an international naval power, and had recently converted from coal to diesel power. Concern for long range fuel supplies led to the establishment of