

oping the West Siberian fields. The first pipeline of 40-in. diameter was completed to the Omsk refinery in 1967, and a second pipeline, of 48-in. diameter, is under construction. Siberia already has achieved self-sufficiency and the flow of crude oil in the Trans-Siberian pipeline was reversed west of Omsk in the summer of 1970 so that surplus West Siberian crude now moves westward to European Russia instead of the previous eastward flow of Volga-Urals crude to Siberia. In the Pechora basin, development of the largest potential producer, the Usa field, was underway in 1970 and construction of a pipeline to the Yaroslavl refinery in central Russia was started. The gas of the Vilyuy basin at present is used only locally, in the city of Yakutsk. No specific plans for long-distance transmission have been announced.

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#### ENGINEERING GEOLOGIC AND SUBSURFACE SOIL INVESTIGATIONS FOR TRANS-ALASKA PIPELINE SYSTEM

Since early 1968, the Trans-Alaska Pipeline System has been involved in surface and subsurface investigations for a pipeline originating at Prudhoe Bay and terminating at Valdez, Alaska. This route, which is slightly less than 800 mi long, crosses numerous geologic provinces, each with its own set of engineering and geologic problems.

Since work was begun, field studies have increased in scope and have advanced from preliminary route studies to more detailed surface and subsurface work. Presently, 12 drilling units are operating in the field and over 800 borings have been accomplished south of the Yukon River. Over 300 pipeline route borings have been put down north of the Yukon River and approximately 800 additional borings are planned. Drilling equipment being used is capable of being moved in rough terrain and of obtaining undisturbed frozen cores of different sizes to depths of 50 ft or more.

Many problems have been and are still being studied to further insure integrity and optimum security of the proposed pipeline. Some of the soil related problems receiving attention are (1) extent and character of permafrost; (2) solifluction; (3) landslides and avalanches; (4) stream and river scour; (5) erosion potential; (6) soil types and physical properties; and (7) seismicity.

Many techniques other than drilling have been, and are being, used or studied. Included are both infrared color and black and white aerial photography and other remote sensing techniques including thermal scanning and sidelooking radar. These techniques have been used to compile geologic maps of the entire route. In addition, seismic and acoustical sounding equipment is being evaluated.

As rapidly as information becomes available, it is utilized to finalize design parameters and determine construction requirements and controls. Because of the highly variable and complex soil and related conditions along the route, evaluation of all geologic and engineering data is a time consuming but extremely necessary process. It is anticipated that careful studies and the design now in progress will continue throughout the preconstruction and construction phases of the project. These studies, together with continued review of all data, will combine to insure a safe, pipeline system.

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#### PRELIMINARY CORRELATION OF MESOZOIC PLUTONIC ROCKS IN BERING SEA REGION

Most of the plutonic rocks of the Bering Sea region are of Cretaceous age and were emplaced in 3 main episodes dated by K/Ar methods at 98-108 m.y., about 90 m.y., and 75-82 m.y. The two younger suites consist of rather typical calc-alkaline granodiorite and quartz monzonite. In the 98-108 m.y.-old suite, quartz monzonite is closely associated with silica-saturated syenite and with strongly potassic subsilicic rocks. Plutons of this suite appear to be aligned along the boundary between the Paleozoic and Precambrian metamorphic and sedimentary rocks of the Seward Peninsula and the adjacent Mesozoic volcanogenic province. Rocks of the 90 m.y.-old suite also occur near this boundary; however, not enough data are available to indicate that rocks of this age are confined to this area. The 75-82 m.y.-old plutonic rocks are present throughout both geologic provinces and are not restricted to the boundary area.

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#### TECTONICS OF ARCTIC REGION OF YAKUT ASSR

The Arctic sector of Yakut ASSR includes the ancient Siberian platform, the late Hercynian Taimyr fold belt, the Mesozoic Verkhoyansk-Chukotsk fold ranges, and shelf seas that represent the recent Laptev-East Siberian Seas paraliageosynclinal region.

The Taimyr fold structures are cut off at the continental slope. Fold systems in the Verkhoyansk-Chukotsk region are divided by median masses, and are traced within the shelf seas. The Verkhoyansk-Kolyma system is divided by the Shelon, Kular, and Laptev buried massifs into 3 branches; one of these, in the northwest, abuts the Hercynides of Taimyr and the others extend northward toward the continental slope. The Novosibirsk-Chukotsk fold system, confined to the north by the Novosibirsk and De-Longa massifs, is traceable northwest to the continental slope; on the southeast it is subdivided into 2 branches. One branch terminates with Mesozooids of the Anyuy zone, and another extends toward Wrangel Island.

Outliers of fold structures of Mesozooids are exposed on islands of the shelf seas. Parts of median massifs represent uplifts of the basement of the recent paraliageosynclinal region. Within the latter there are northern and southern trough systems. The northern eugeosynclinal(?) system includes foreshelf and marginal-shelf troughs and uplifts, separated by systems of deep faults which probably have large associated intrusions of mafic magmatic rocks. The southern system consists of the miogeosynclinal sublatitudinal troughs that are separated by the Lyakhov uplift. Upper Mesozoic and Cenozoic strata of the troughs may reach thicknesses of 10-12 km.

The cut-off by shelf seas and the continental slope of the Mesozooids, Hercynides, and median massif structures; features associated with the building of the Arctic Ocean crust; the nearby presence of mid-ocean and other submarine ridges, which are nearly perpendicular to the continental margins and which commonly are extensions of the continental fold structures of different age; and the formation of a juvenile paraliageosynclinal region within marginal areas of the ocean are