PREPARED IN COOPERATION WITH THE OFFICE OF THE DIRECTOR
NAVAL PETROLEUM AND OIL SHALE RESERVES

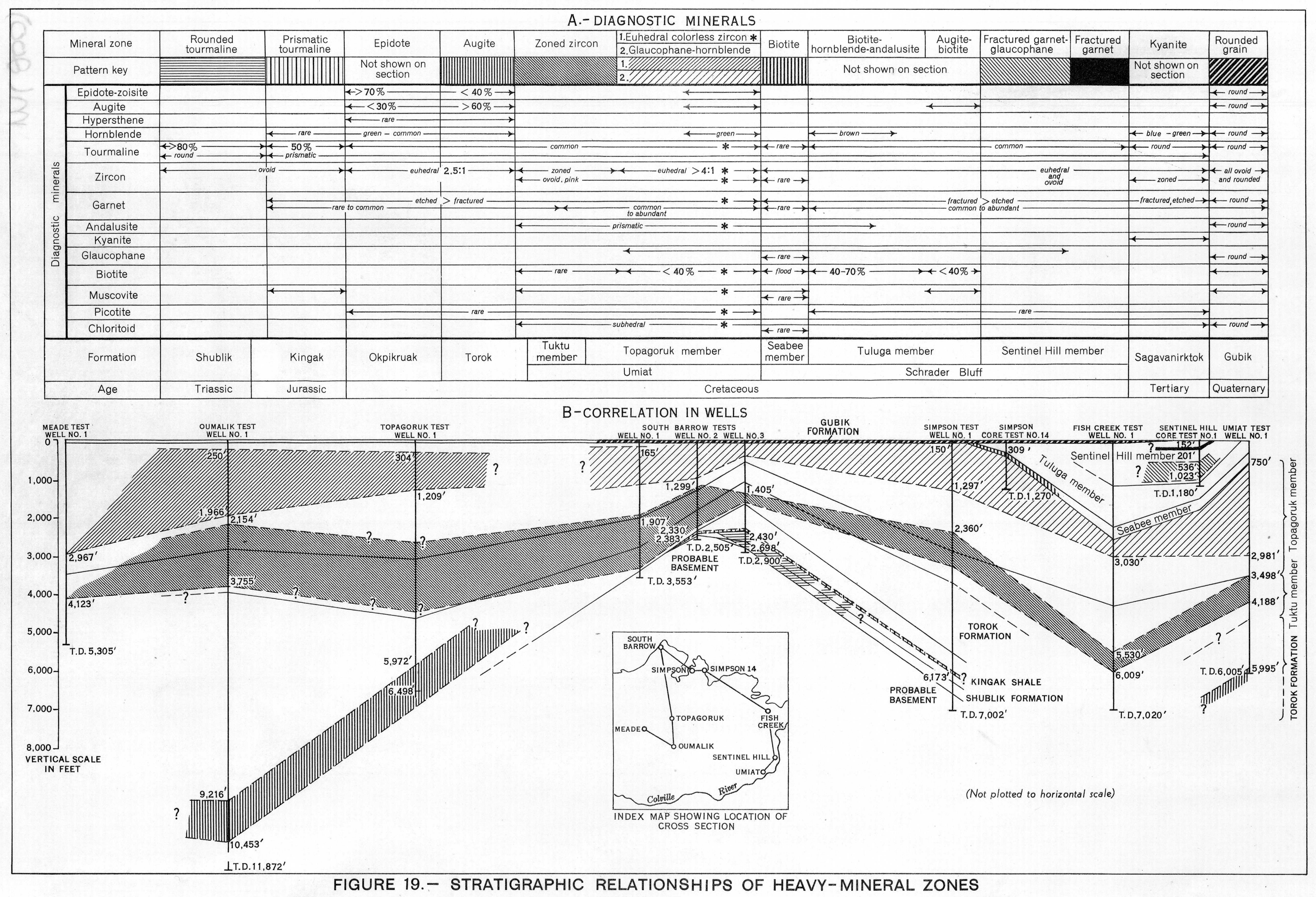


FIGURE 19.— STRATIGRAPHIC RELATIONSHIPS OF HEAVY-MINERAL ZONES

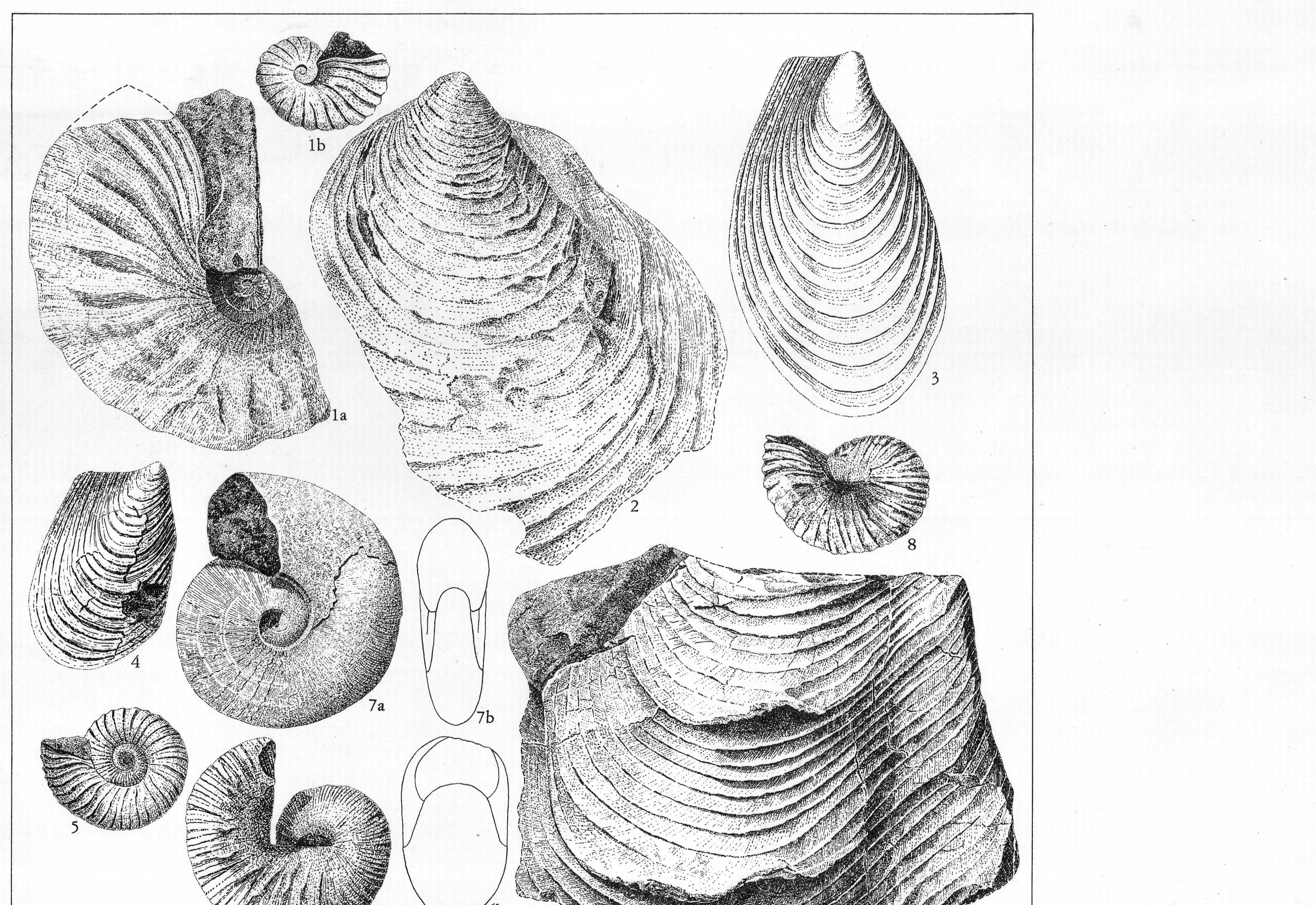


FIGURE 20.— CRETACEOUS INDEX FOSSILS OF NORTHERN ALASKA

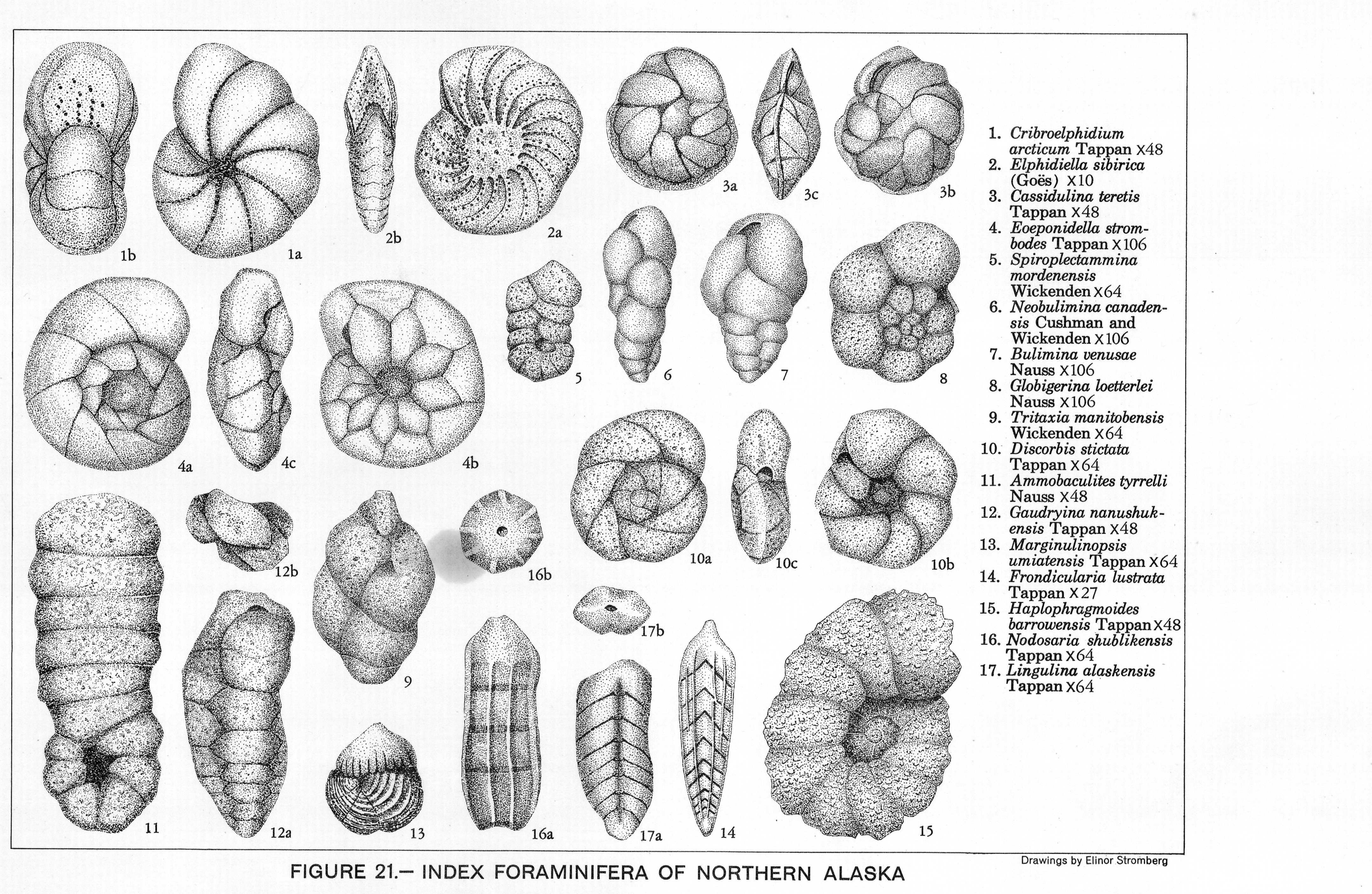


FIGURE 21.— INDEX FORAMINIFERA OF NORTHERN ALASKA

HEAVY MINERAL STUDIES

By R. H. Morris and E. H. Lathram

The heavy minerals of approximately 1,400 samples of sandstone from northern Alaska, mostly from rocks of Cretaceous age, have been studied. Composite chip samples were taken from outcrops and from cored intervals in wells. In outcrops one composite sandstone sample was taken for each 100-foot stratigraphic interval; shale units were not sampled. Sandstone layers in the wells were sampled at 10-foot intervals.

The disaggregated sample material passing 80-mesh and retained on 235-mesh screens was separated in bromoform (sp gr 2.79) and methylene iodide (sp gr 3.0) into light, medium, and heavy fractions. The grains were mounted in Canada balsam or aroclor.

MINERALOGIC ZONATION

The following discussion refers to the nonopaque heavy minerals in rocks ranging in age from Triassic to Pleistocene; the opaque heavy minerals were found to be nondiagnostic. For some zones biotite and muscovite, which normally appear in the medium fraction, are included in the heavy fraction in this discussion, as they are somewhat diagnostic. Five criteria were used in recognizing and delimiting the mineralogic zones: (1) presence or absence of diagnostic minerals or mineral suites; (2) relative abundance of certain minerals (expressed here as percent of total nonopaque minerals; (3) percent of garnet grains etched in contrast to garnet grains with conchoidal fracture; (4) degree of rounding of mineral grains; and (5) grain shape or form, such as euhedral and anhedral (ovoid). The mineralogic zones have been found to be characteristic and useful in determining stratigraphic position and correlation, especially in the subsurface. Some zones identified only locally may possibly be more extensive, but this cannot be demonstrated because of facies changes from sandstone to shale. Fourteen major heavy-mineral zones have been recognized, including two that are time equivalent, and are discussed here from oldest to youngest.

Rounded tourmaline zone.--A zone of subround to round tourmaline grains marks the Triassic and the lower part of the Jurassic sedimentary rocks in South Barrow Test Well No. 3. Several varieties of tourmaline are present--olive green, mauve, brown, and blue. More than 80 percent of the mineral suite is tourmaline. The remainder is zircon grains, which are ovoid, but the roundness may be influenced by the original crystal form as well as by wear during transportation.

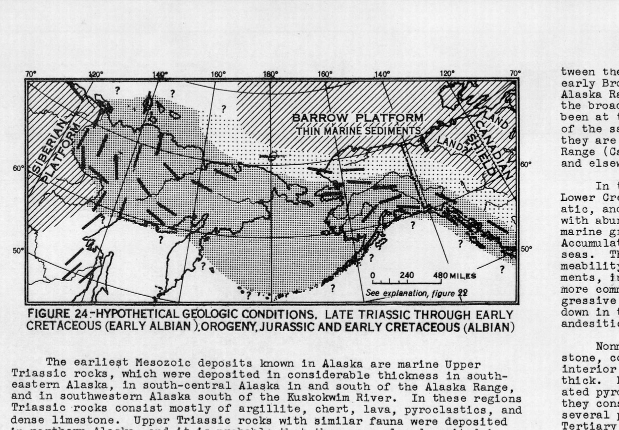


FIGURE 24.–HYPOTHETICAL GEOLOGIC CONDITIONS, LATE TRIASSIC THROUGH EARLY CRETACEOUS (EARLY ALBIAN) (OROGENY, JURASSIC AND EARLY CRETACEOUS (ALBIAN))

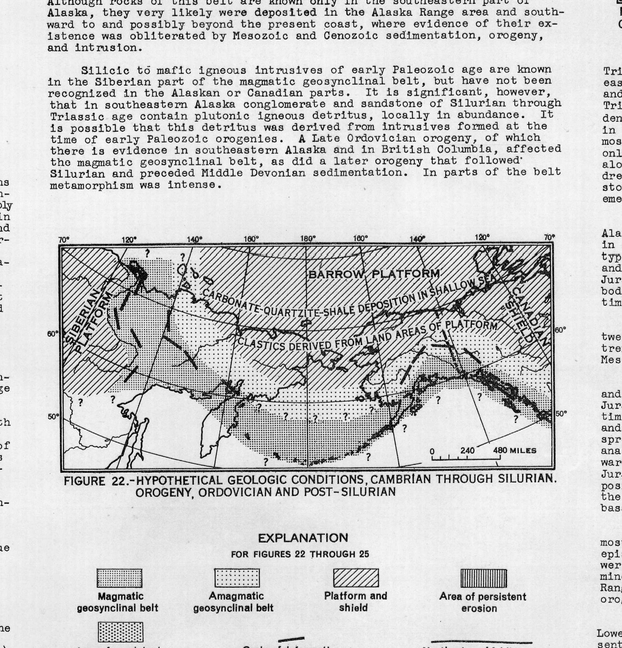
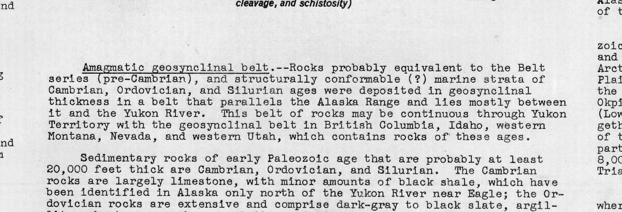


FIGURE 22.–HYPOTHETICAL GEOLOGIC CONDITIONS, CAMBRIAN THROUGH SILURIAN OROGENY, ORDOVICIAN AND POST-SILURIAN



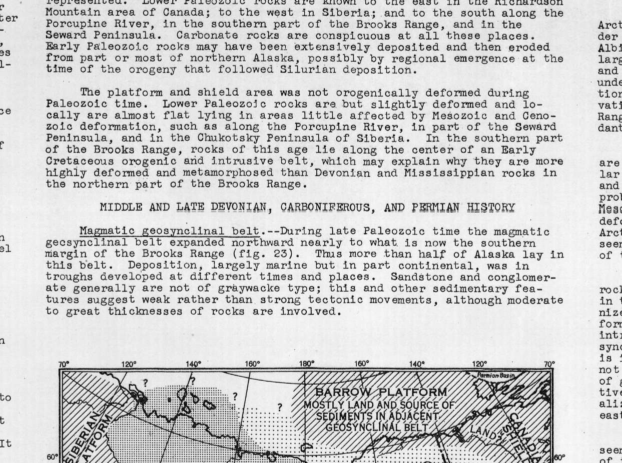


FIGURE 23.–HYPOTHETICAL GEOLOGIC CONDITIONS, MIDDLE DEVONIAN THROUGH PERMIAN. LOCAL DEFORMATION OF EPEIROGENIC TYPE

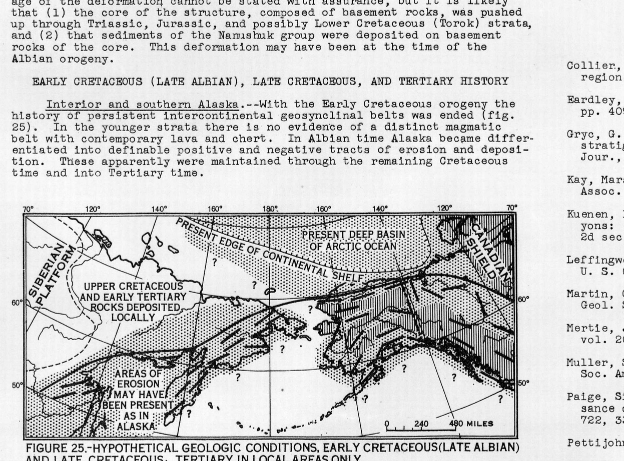


FIGURE 25.–HYPOTHETICAL GEOLOGIC CONDITIONS, EARLY CRETACEOUS (LATE ALBIAN) AND LATE CRETACEOUS, TERTIARY IN LOCAL AREAS ONLY. OROGENY, LATE CRETACEOUS AND TERTIARY

GEOLOGY OF THE ARCTIC SLOPE OF ALASKA

by

Thomas G. Payne and others

1951

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