sic and Jurassic, a fold-belt zone did not form. Depressions developed with regressive formations around the flanks and littoral formations in the central parts. Such basins developed in the more southern areas (shelf and coastal area of the Laptev, Eastern Siberian, Chukotsk, and Beaufort Seas).

3. In the Late Jurassic-Cretaceous the Arctic province again entered a stage of orogenic development. Extensive flat depressions filled with molasse deposits appeared. The whole region is prospective for oil and gas. Ore mineralization and orogenic intrusive magmatism were relatively unimportant.

4. Changes in the Arctic crust have occurred in recent times. The Polar Ocean is a new feature overlying the previously formed folded structures.

5. The Arctic province is connected structurally with the Pacific Ocean. They were constantly in interaction, but the tectonic processes of each during Phanerozoic time resulted in different tectonic trends.

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Main Structural Features of Arctic

The fold belts of northern Greenland, Arctic Canada, northern Alaska, Chukotsk, and the Siberian Arctic coast (to the mouth of the Lena River) form the latitudinal Arctic belt of Baikalides, Caledonides, Hercynides, and Mesozoides. The spatial location of the Arctic belt was determined by the Hyperboreal and Greenland-Canadian platforms, and by the center of the Yukon, Anadyr-Seward, and Kolyma massifs at the close of the Proterozoic and the beginning of the Paleozoic. It is suggested that the fold belts of the Arctic belt—according to their geographical position, structural framework, style, and type of development—be isolated as a special geostructural zone of the earth (the Arctides) and the Atlantic segments (the Atlantides). The Arctides are characterized mainly by a miogeosynclinal sedimentation regime; the eugeosynclinal regime is characteristic of the Pacifides.

The Arctides may be divided into two segments: Euramerasian (from eastern Greenland to the Mackenzie District) and Amerasian (from Mackenzie to the Lena River), which differ from each other by the ages of the fold systems. These differences emphasize the asymmetric structure of Arctides. The Caledonian and Hercynian folding systems are developed in the Euramerasian segment. The Mesozoic geosynclinal cycle played the main role in the Amerasian segment (the Mesozoides of the northern Alaska and Novosibirsk-Chukotsk fold systems).

The junction of the Arctides and Pacifides occurs along the zone of the Mackenzie-Lena latitudinal and sublatitudinal deep faults. The nature of the Arctides junction with the folding systems of Taimyr, Severnaya Zemlya, Novaya Zemlya, and Spitsbergen is not clear. Hypothetically, this deep-lying border may be drawn along the continental slope from Greenland to the mouth of the Lena.

The great Kolyma megablock (Kolyma massif, and the Verkhoyansk and eastern Amur Mesozoides bordering the massif), limited by the zones of deep-seated faults, exhibits the mutual influence of the Arctic and Pacific structural styles and tectonic types of development. It is suggested that this megablock be considered as a transitional geostructural area—the Arctopacifides.

It is suggested that the western Arctic (*i.e.*, Taimyr, Severnaya Zemlya, and Novaya Zemlya fold area; fold structures of Timan, Spitsbergen, and eastern Greenland; and the area bordering the Barents Sea platform and the Kara Sea massif) that is spatially and genetically associated with the Atlantic segments and occupies the intermediate position between the Atlantides and Arctides be assigned to another transitional area—the Arcto-Atlantides.

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Canada Basin and Lomonosov Ridge: Inferences Based on Precambrian and Lower Paleozoic Geology of Canadian Arctic Islands

Canada basin truncates and post-dates a belt of north-trending structures in the central part of the Arctic Islands. The trends, though exhibited by Phanerozoic strata, are interpreted as rejuvenated Precambrian basement features because they cut across Phanerozoic basin axes and parallel exposed Precambrian structures on the south. The maximum possible age of the Canada basin, therefore, is the age of these trends—about 1.7 b.y.

A geanticline, characterized by volcanism and plutonism, rose out of a late Proterozoic geosyncline and occupied the northern rim of the Arctic Islands and adjacent present offshore region, from Cambrian to Devonian time. What lay beyond the geanticline is unknown, and speculations about that region depend on the tectonic model used.

If present concepts of plate tectonics are applied, it appears that Canada basin (or some predecessor) opened in middle to late Proterozoic time with a geosyncline developing on the newly formed continental margin. The floor of the basin was thrust beneath the geosyncline from latest Proterozoic or Cambrian to Devonian time, and produced a geanticline above and southeast of the postulated Benioff zone.

Lomonosov Ridge.—A belt of north-trending structures in northernmost Ellesmere Island lines up with the southern extremity of Lomonosov Ridge. The structures, formed in sialic metasedimentary and metavolcanic rocks, are partly pre-late Middle Ordovician. The belt aligned with Lomonosov Ridge was elevated relative to terrane on the east during 2 Paleozoic orogenies, but not during the Tertiary orogeny. A short distance inland, the north-trending belt terminates against west-trending structures subparallel with the axis of the Franklinian geosyncline. The zone of intersection, marked by ultrabasic intrusions, was a site of repeated crustal extension on a scale of miles.

If the Lomonosov Ridge has oceanic crust the apparent alignment would be coincidental. If it has continental crust, two interpretations are possible: (1) the north-trending belt represents an early Paleozoic "Lomonosov geosyncline" that joined the Franklinian; (2) both Lomonosov Ridge and the north-trending belt in Ellesmere Island are controlled by meridional Precambrian basement trends, but these trends were rejuvenated in a different manner, and perhaps at different times, on Ellesmere Island and in the present Arctic Ocean. This hypothesis is favored.

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Early Paleozoic Evolution of Northern Parts of Canadian Arctic Islands

A geosyncline occupied northern parts of the Arctic Islands in Late Proterozoic time. It received sediments from the continent and deepened in a northerly direction. A northwestern belt, which included northernmost Ellesmere Island and the present shelf off Ellesmere and Axel Heiberg Islands, underwent an orogeny in latest Proterozoic or Cambrian time. The orogen behaved as an intermittently rising geanticline, and remained a site of volcanism, plutonism, and metamorphism, from Cambrian to Devonian time.

Sediments derived from the geanticline accumulated in a clastic basin on its southeast side. The basin was flanked on the southeast by a subsiding carbonate shelf, in turn grading southward to stable carbonate platforms.

Three phases of sedimentation are recognized in the clastic basin in northeastern Ellesmere Island: (1) Middle to Upper Cambrian (?) post-tectonic deltaic deposition; (2) Early to Middle Ordovician deep-water deposition of starved-basin type (radiolarian chert, graptolitic shale, *etc.*); (3) late Middle Ordovician to Middle Silurian deep-water deposition of flysch-type (graywacke, shale, *etc.*).

The trough must have formed by subsidence of the continental crust rather than by sea-floor spreading, because the deep-water sediments lie on shallow-water sediments and not on volcanics. The trough, which was separated from subaerial parts of the geanticline by a shelf on which carbonates, clastics, and volcanics were deposited, expanded until about mid-Silurian time, then migrated southeast, ahead of the southeast-migrating geanticline. The southeast flank of the trough, characterized by graptolitic shales and limestones, has been traced from northwestern Greenland to northwestern Melville Island. There, starved-basin conditions persisted from Early Ordovician to Early Devonian time.

A north-trending belt in the central islands, extending from the stable platform to the geanticline, was elevated in the Early Devonian. The uplift was basement controlled and reflects Precambrian basement trends unrelated to the early Paleozoic basin configuration.

An orogeny of the entire northern regions, locally accompanied by intrusion of quartz diorite, occurred in Middle Devonian to Mississippian time. Deformation and uplift proceeded from northwest to southeast.

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Paleozoological Division of Pleistocene Marine Basins on Arctic Coast of Eurasia

Stratigraphic and paleontologic data on the Pleistocene marine transgressions make it possible to establish biogeographic regions and subregions in the late glacial (interstadial), ultimate, and penultimate interglacial stages. Morphologic stability of species suggests that the ecology was unchanged, and that the zoogeographical units established recently by Z. A. Filatova can be used for reconstruction.

In nearshore zones of Mindel-Riss sea basins (Stör, Holstein, North, Kolvin-Padymey, Sanchugovka, Pinakul seas), the northern limit of the Atlantic middle boreal subregion was near Denmark, the high boreal subregion was in the eastern part of the "Pechora Land," and the low arctic boundary was on the right tributaries of the Yenisey River. The Pacific boreal region extended to the west coast of Bering Strait. Open shelves were inhabited by low arctic mollusks on the western side of Eurasia; east from the Kanin Peninsula there lived high arctic species now distributed in the Eurasian marine province (fauna with *Propeamussium groenlandicum, Bathyarca,* and *Cuspidaria*).

In the Riss-Würm (Eem, Boreal, Kazantzevo, Val'katlen) seas, the boundaries of the Atlantic middle boreal and high boreal subregions were in the North Dvina River basin and on the Pyasina River, respectively. The Atlantic low arctic subregion was connected with the Pacific. A province with a *Portlandia* fauna was present in the eastern Baltic.

In the Bølling-Allerod stage, middle boreal mollusks were distributed as far north as Bergen; high boreal mollusks reached Tromsö and the Danish Straits. Pacific low arctic species were displaced to 175°W long.

The Mindel, Riss, and Würm seas were inhabited by arctic mollusks along the entire coast.

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Marine Upper Paleozoic Deposits of Arctic

Marine upper Paleozoic deposits within the Arctic are widespread in Novaya Zemlya, the Pechora basin, Taimyr, the Verkhoyansk basin, northeastern USSR, Spitsbergen, Greenland, the Arctic Archipelago of Canada, and Alaska. The upper Paleozoic in all these regions includes not only Permian, but also widespread middle-Upper Carboniferous deposits.

Fossils of middle-Upper Carboniferous deposits in the western Arctic sector (Pechora basin, Novaya Zemlya, Spitsbergen, Greenland, Arctic Archipelago of Canada) do not generally differ from those of the corresponding deposits of the Urals, Russian platform, and other regions of the tropic paleozoogeographical province.

The middle-Upper Carboniferous fauna of the eastern Arctic sector (Taimyr, Verkhoyansk basin, northeastern USSR) is marked by complete lack of fusulinids, colonial corals, and some other groups. This fauna contains several endemic genera of brachiopods and ammonoids (*Yakutoproductus, Orulgania, Taimyrella, Yakutoceras,* and others). This fact allows one to consider the region as a boreal zoogeographical province. Within this region the Bashkirian and Moscovian stages and the Upper Carboniferous are tentatively recognized. The boundary between the Carboniferous and the Permian is drawn at the appearance of *Yakutoproductus verchoyanicus,* which does not correspond to the base of the *Schwagerina* zone.

A westward shift of the boundaries of the boreal province occurred in the Permian. At the beginning of the Late Permian this province covered all the territory considered. In the Early Permian two stages may be distinguished and traced here: the Asselian within the *Schwagerina* zone and the Artinskian, within the limits established by A. P. Karpinskiy.

The Lower-Upper Permian boundary is determined by the appearance of brachiopod genera such as *Grumantia, Megousia,* and *Pterospirifer,* and by flourishing pelecypods of the genera *Prosrassatella, Prooxytoma, Pseudobakewellia,* and a development of the genus *Kolymia.* This renovation of the fauna is connected with a general transgression of the seas and establishment of short-term connections between the Arctic and Tethys seas.

The Pay-Khoy and Kazanian stages may be distinguished in the Upper Permian. In the Arctic, ammonoids became extinct at the end of the Pay-Khoy stage, and brachiopods in the middle of the Kazanian.