Globorotalia inflata (d'Orbigny) but also included subarctic or subtropical species. Highest foraminiferal concentrations were found in the temperate-subarctic zone, and the lowest in the central Sargasso Sea.

Bathythermograph temperatures ranged from 4.4°C. to 27.5°C. Temperature inversions occurred at nine stations SE. of Newfoundland. Within the BT range (0–274 m) temperatures fluctuated from 2.2°C. to 10.6°C. Surface salinities varied from 32.58 °/₀₀ in cold water to 37.59 °/₀₀ in warm water.

Morphological variations resulting from environmental influences were evident in some species. The maximum diameter of *Globigerina bulloides* was generally less than 0.4 mm above 14°C. Large specimens (0.6+mm) and specimens with the aperture over four chambers were abundant below 12°C. and when the salinity was less than 35.5 °/₀₀. Deeper-water samples from stations having temperature inversions contained abundant forms with a reduced final chamber, similar to *Globigerina quadrilata* Galloway and Wissler. The terminal chamber in some specimens had a secondary aperture.

Globigerina cf. *quinqueloba*, common in waters below 15°C., graded into *G. pachyderma* with decreasing temperature. Typical *G. pachyderma* was not found in surface tows. Although encountered rarely, it did appear when water temperatures were below 10°C.

Globorotalia inflata was abundant between 13.5°C. and 18°C. Only deep-water tows with temperatures about 10°C. contained small forms with thick tests, a reduced final chamber, and an aberrant aperture.

The signal morphological variation was observed from the deepest tow taken (0–1150 m), and contained forms transitional between common *Hastigerina pelagica* and large, digitate *Hastigerinella rhumbleri*.

That depth and temperature greatly influence the distribution as well as the morphology of planktonic foraminifers is evident.

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Diagenesis in Pelleted Limestones

The abundant pelleted limestones encountered in the geologic record are of polygenetic origin. Selected examples, biased by the author's personal field experience, are used to illustrate various textures and structures involving different pellet and matrix types.

Lithification is the most important problem. A remarkable lack of features apparently due to compaction characterizes all pellet limestones. Volume reduction by stylolitization is common, but the basic limestone fabric remains intact and essentially uncompressed. Apart from stylolitization which appears to be a late stage diagenetic effect, detectable pressure solution at points of grain contact is minor.

Calcite filling of apparent voids raises the question of what constituted a void? It is suggested that more stable crystals could grow equally as well in "voids" largely filled by metastable crystals as in fluid-filled space and the source problem is lessened. The presence of sparry or fibrous calcite is not necessarily evidence of a pre-existing void.

Drop in relative sea-level and exposure to fresh water probably promoted lithification but they were not the prime control. The course of lithification depended more on the primary distribution of carbonate minerals, particularly aragonite.

Dolomitization and silicification are only to be mentioned from the point of view of their bearing on lithification and the development of porosity.

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Diagenesis and Depositional Environment of Pre-Harrogate Devonian, British Columbia*

The Middle Devonian of the Stanford Range, British Columbia, is separated into a lower, gray, light gray, and locally red-weathering sandy limestone, dolomite, and sandstone formation laterally equivalent to the Burnais gypsum and an upper fossiliferous brown limestone and dolomite, the Harrogate formation, both of which are described by Belyea and Norford (in press).

The lower formation consists predominantly of cryptograined silty to sandy limestone, dolomite, sandstone, and breccias. Beds 2 inches to 2 feet thick are separated by undulatory surfaces, locally channelled. The carbonates were probably deposited as ooze, some of the dolomite being primary or early diagenetic. Post-depositional changes include micro-brecciation, slump structures, burrowing in plastic carbonate, and desiccation cracks filled by calcite or hematite. Advancing dolomitization is marked by growth of euhedral rhombs, commonly with a nucleus of dusty material, pyrite, or spores. Increase in number and size of rhombs results in a crystalline grain growth mosaic. Pellets, bahamiths, detrital grains, and older fabrics are partly or completely destroyed in the process. Internal cavities and fractures are filled by crystalline (granular) cement and drusy growth. Quartz grains are extensively corroded by carbonate, and late tension cracks are filled by quartz and carbonate. Ostracods and charaphytes are common in some beds. This rock unit, correlative with the Burnais gypsum, is interpreted as the deposit of a shallow water, near-shore environment, periodically exposed, that received drainage from an early Paleozoic terrane of carbonates and clastics.

The overlying Harrogate is dark brown, mostly aphanitic, limestone and finely crystalline dolomite. Post-depositional effects have resulted in development of grain-growth mosaic and drusy growth. Deposition took place in deeper water than the lower unit but subject to wave or current action; lack of oxidation due to abundance of organic growth is suggested as the cause of dark color.

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Differentiation of Late Mississippian—Early Pennsylvanian Pentremites

Blastoids were virtually unknown in post-Mississippian rocks of North America until about 50 years ago when abundantly occurring specimens of *Pentremites* were described from Morrowan beds in Oklahoma and Arkansas. The early Pennsylvanian age of these beds has been generally accepted by geologists for many years; some paleontologists, however, have questioned this age assignment because of the gross resemblance of type Morrow *Pentremites* to those of the upper Mississippian Chester. Morrowan *Pentremites* can be differentiated from those of the late Mississippian by a distinctive external shape and ambulacral cross-sectional outline and, internally, by the hydrospires which have a characteristic shape, thick walls, and a nearly constant number of hydrospire folds, except for a reduced number of folds adjacent to the anus. In the field, latest Chester *Pentremites* commonly can be distinguished from those

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