

areas, obliterated the Blackfoot surface. The result is the spectacular topography of the present day.

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Stromatolite Classification in the Belt Series

One of the results of recent studies of stromatolites in the Belt series of northwestern Montana is a new classification of these algaloid structures, based on (i) mode of growth, (ii) gross form of the colony, and (iii) nature and orientation of the laminae. It is believed that this scheme for classification may be extended to include Paleozoic and younger stromatolites in a consistent pattern of form-genera and form-species.

Mode of growth is the basis of "generic" distinction in the classification here proposed. Three distinct types of growth have been recognized. The first is characteristic of *Cryptozoon* Hall. These forms begin their growth from a point on the substratum and grow upward by addition of convex upward laminae that increase in area as the stromatolite develops. The second type is exhibited by *Collenia* Walcott. The species begin as incrustations on a surface of the substratum. Growth is upward by addition of convex- or concave-upward laminae that do not increase greatly in surface area. The third type is displayed by *Conophyton* Maslov. Here the structure is sheetlike and in the form of a cone attached to the substratum by its apex. Growth is upward by addition of conical laminae.

Gross form of the colony is considered of primary importance in determining "species." The basic forms are cylindroidal, depressed spheroidal, and turbinate. Combinations of these forms are regarded as distinct species. For example, in one common species from the Belt series (*Collenia willisii* Fenton and Fenton) the lower part consists of varying numbers of expanding cylindroids, whereas the upper part is dome-shaped and covers the lower cylindroids so as to give the entire structure the form of a depressed spheroid.

Nature of the laminae is an important, although difficult, criterion to use in distinguishing species. Attempts have been made to measure the number of laminae per unit distance on several species. Such measurements have not been useful in studies of the stromatolites of the Belt series, because parts of the algal colonies that formed the laminae have been destroyed or obscured during the long interval since pre-Cambrian time. Recrystallization has largely or entirely erased the laminae in some colonies. Weathering may cause several laminae to become fused, simulating one prominent lamina. Varying amounts of silt and clay deposited as the colony was growing would affect apparent thickness and frequency of the laminae. Microscopic measurement of laminae might be used to differentiate species, but studies based

on such measurements have not been encouraging.

Ordinarily the shape of the laminae is reflected in the gross form of the colony. For example, in *Collenia symmetrica* Fenton and Fenton the laminae occur as domelike sheets superimposed one upon the other. The gross form of the colony is a dome or depressed spheroid. An exception to the rule is *Cryptozoon occidentale* Dawson, which has a turbinate form. In vertical cross section, it has a fan-shaped appearance; but the laminae in the younger portion of the colony are dome-shaped, becoming flattened as the colony increases in size. The flattened laminae are abruptly downcurved along their margins, and each one is but slightly larger than the one below, giving rise to the fan-shaped cross section. Laminae may be either smooth or crenulate. The degree of smoothness is consistent within each species.

Size of colony has been used by some authors as a specific characteristic, but in my experience form and laminae remain constant in each species, regardless of size. Specimens of *Collenia symmetrica*, for instance, range from a few inches to about 20 ft in diameter.

The detailed results of the investigations noted, including paleoecologic and stratigraphic applications, are currently being processed for publication as a comprehensive summary of the stromatolites of the Belt series.

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A New Method for the Production of Autoradiographs

By using a light-tight cover over the automatic-staining machine (Autotechnicon), found in many histological laboratories, and successive solutions of silver and halogen salts, we have succeeded in impregnating and coating histological sections with sensitive silver halide.

Personnel who have no training in autoradiographic technique have been able to turn out 10-20 sections with the "Emulsion" as an integral part of the slide in as short a time as 20 min. After the required exposure time (to allow the radioisotope to act on the silver halide), the slides are allowed to continue through the developing, fixing, and staining solutions within the machine, and a finished and stained autoradiograph, ready for the coverslip, is obtained.

This method and technique are simple and automatic, require very little special training of personnel, and can turn out many autoradiographs in a short time. Thus, it is in marked contrast to the conventional methods now in use, which are delicate, difficult, highly specialized, and time consuming.

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