mass from whence the pebbles were derived was fairly high and thus furnished stream gradients sufficiently steep to transport the pebbles.

Probably owing to the southeasterly retreat of the shore line by the sinking of Appalachia, coarse pebbles were carried into this region for only a short time. Most of the deposits of Hardyston time were sands, generally fairly fine. Crystalline rocks from Appalachia were breaking up without the complete decomposition of the feldspars, and numerous grains of fresh orthoclase were deposited with the quartz grains and kaolin. The arkosic character is a prominent feature of the Hardyston sandstones.

A progressive change in the sediments from sands to shales and calcareous oozes took place and we pass from the Hardyston to the Tomstown sediments. The Tomstown and also the overlying Allentown formations contain occasional fine sandstone lenses, indicating that unusual conditions, probably freshets or floods, once in a great while brought some sands into the region. Generally, however, only the finest land-derived material came in. This indicates the lowering of Appalachia to the extent that the streams entering the sea carried only the finest material in suspension and these only at certain times. They brought calcareous matter in solution and this was precipitated on the ocean bottom either by purely chemical processes or by the agency of minute organisms, particularly bacteria. Probably both methods were operative. The rocks themselves present no evidence as to the method by which the calcareous matter was taken out of solution.

During Allentown time, less sand and mud entered the sea although shaly layers and a few fine sandstone lenses indicate that occasionally terrigenous matter came into the sea from Appalachia. The life of the Allentown seas was not varied, so far as local evidence indicates. The only abundant fossils are the calcareous algae, Cryptosira, which are fairly abundant. In places they withdrew from the sea water and built into their structures sufficient calcareous matter to form deposits several feet in thickness.

Occasionally during both Tomstown and Allentown time the sea was so shallow that at low water, perhaps low tide, the fine muds were exposed to the drying action of the sun and developed mud cracks as they contracted in drying. These are preserved in many localities. Ripple marks and oolites also indicate shallow water.

When the deposits of the Tomstown and Allentown formations were accumulating, the oozes contained much magnesia, and these limestones are prevailingly dolomitic. In part the magnesia may be secondary but it is regarded as largely original.