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characteristics until in the common form the presence of calcite would not be suspected, and the surface of the cones, instead of showing clearly the individual calcite needles sharply terminating, has only a peculiar crinkled or roughened appearance.

Owing to the very strong crystalizing force known to be possessed by calcite, so powerful an influence is exerted by this substance in solution, which is manifestly at the point of saturation, though distributed rather sparingly through the clay layers, that even the clay is pressed into the form assumed under normal conditions by the calcite. The process and results are not unlike those which have taken place in certain sandstone beds in central France, in which calcic carbonate has crystalized in the sand, and large perfect models of sand cemented by lime are found, having the well formed and characteristic crystallographic faces of calcite.

TWO REMARKABLE CEPHALOPODS FROM THE UPPER PALEOZOIC.

BY CHARLES R. KEYES.

There have been recently discovered in the coal measures of Mississippi basin some excellently preserved remains of Cephalopods, which are remarkable on account of the huge size attained. Both are representatives of the retrosiphonate Nautiloidea; but one is a member of the most closely coiled end of the series, while the other is a perfectly straight form. The former belongs to the genus *Nautilus* and the latter to *Orthoceras*.

The first group comprises a series of shells, which were obtained from the upper coal measures at Kansas City, Mo. Several unusually fine specimens are the property of M. S. J. Hare of that place, and others are in the possession of other collectors. The form was originally described by White* as *Nautilus ponderosus*, the diagnosis of which is essentially as follows:

* U. S. Geol. Sur., Nebraska, p. 236, 1872.

Shell attaining a large size, subdiscoidal; umbilicus large, or nearly equaling the dorso-ventral diameter of the outer volution near the aperture; volutions three, enlarging their diameter more than three-fold each turn; all broader transversely than dorso-ventrally; inner ones slightly embracing, while the last one is apparently merely in contact with the others near the aperture; each broadly flattened or a little concave on the periphery, and (particularly the last one) somewhat flattened between the periphery and the middle of each side, from which point the sides are broadly rounded into the umbilicus, the greatest transverse diameter being near the middle; ventro-lateral or outer angles of the last whorl (in somewhat worn casts), each provided with obscure traces of about twenty wide, undefined nodes, scarcely perceptible to the eye; septa numerous, rather closely arranged, making a slight backward curve on each side, particularly between the middle and outer angles and crossing the broadly flattened dorsum with a strong backward curve; surface with distinct lines of growth, which curve strongly backward like the septa, in crossing the outer side.

White's specimen was not as perfect; the recently acquired material, and consequently the latter, is of unusual interest as elucidating structural points which were previously obscure. The large dimensions which the shell attained is quite remarkable, especially when taken in comparison with the other forms of the group known from the same geological formation. Rarely do any of the species of the genus from the Carboniferous of the region reach a diametric measurement of more than four or five inches. The specimens of *Nautilus ponderosus* recently found are twelve to fifteen inches in diameter and weigh upwards of fifty pounds.

The second group to which attention is called includes a huge *Orthoceras*—*O. fanslerensis*—from the lower coal measures at Fansler, Guthrie county, Iowa. It may be briefly described as follows:

Shell very large, thin, tapering very gradually; septa very thin, moderately concave, about two to the space of an inch near the large end; surface smooth. Diameter at larger extremity three inches, length probably not less than six feet.

It is a well known fact that the straight-shelled cephalopod was an abundant form of life during Paleozoic times. This is attested by the large number of species that have been described, those of the *Orthoceras* group alone numbering over 1,200. The culmination and greatest expansion of the group was in the Silurian, and from that period it appears to have gradually dwindled in number of species, size and abundance until at the close of the Paleozoic the form was all but extinct. In the American Silu-

rian some of the shells attained huge proportions, but with the general decline of the group the later ones have heretofore seemed to rapidly become dwarfed until only small, unimportant individuals were recorded after the Devonian. In the Carboniferous a few diminutive species have been described, most of them but a few inches in length. In the coal measures of the Mississippi basin the remains found were of rather rare occur-

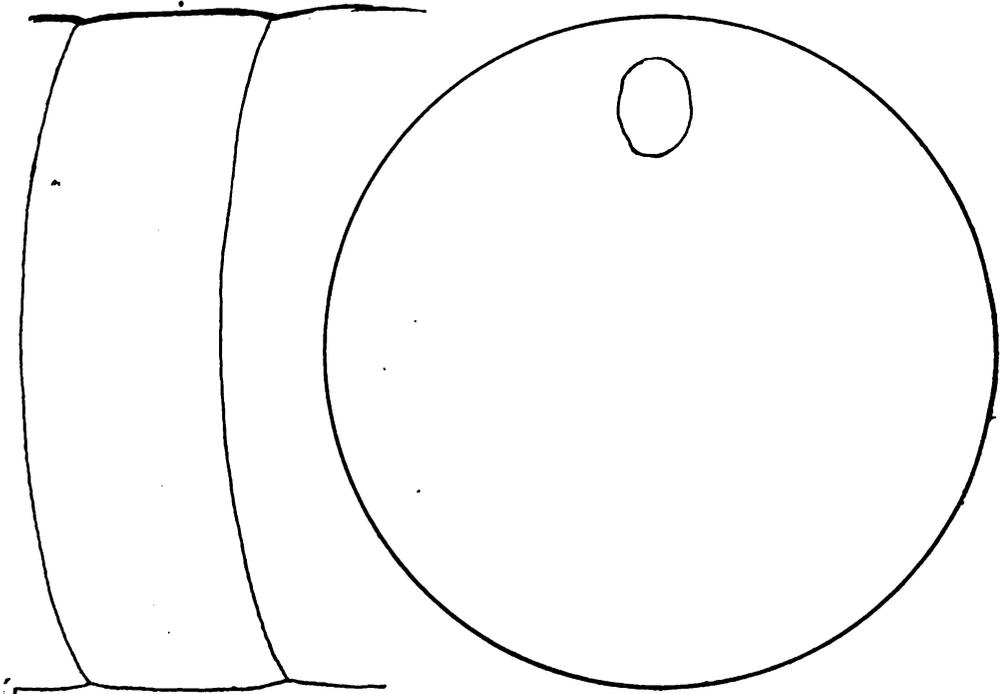


FIGURE 4. Section of *Orthoceras fanslerensis*.

rence, imperfectly preserved and of very small size. Seldom did the shells exceed six inches in length and half an inch in diameter.

Of late years, however, some unusually fine material has been obtained in the black shales of the lower coal measures in the vicinity of Des Moines, Iowa. Several of these shells were so large as to excite considerable wonderment. Some were over two feet long and one inch in diameter at the larger end. These were thought to be giants of their kind and day. But these are small, and all the other Carboniferous species are mere pigmies by the side of the recently found shell from the coal mines of Fansler. The species is *O. fanslerensis*, and the unique specimen here described was obtained by Mr. M. G. Thomas, state mine inspector.