Art. XXXVIII.—*A Trilobite retaining Color-Markings;* by Percy E. Raymond.

It has often been questioned, whether trilobites shared the brilliant coloring of some of the modern Crustacea, or whether they in life exhibited the rather dull and drab appearance which characterizes most of their fossil remains.

This problem still remains unsolved, but a small pygidium which I collected from the Cambrian of Cherokee County, Alabama, in 1921, shows a distinct banding, indicating that in some cases, at least, the body was not of a uniform color.

The pygidium mentioned is 9.5 mm. long and 16 mm. broad, and lies upon the surface of one of the siliceous fragments into which the shales of that locality weather. The banding is not very conspicuous, in fact, the specimen was examined several times before I became assured that it was not of accidental origin. The surface is covered by transverse stripes of light and dark gray, the latter almost black. At the anterior margin is a narrow light band, followed by the broadest one of all, quite dark in tone. The two remaining pairs of dark bands are much narrower, the last almost in line with a continuation of the dorsal furrows. The first two pairs cross the axial lobe, but as all turn backward they have a somewhat radial effect. In addition to the bands, there are many small, irregularly placed spots of a yellowish hue.

These markings probably do not retain the original colors, which may well have been brilliant. It is interesting to note that the pattern is such that the animal would not easily have been detected if viewed from above were the surface of the water gently agitated, and also suggests patches or shadows of sea weeds. This trilobite seems in fact to have been protectively colored, although it lived at a time before the advent of jaw-bearing fishes or cephalopods and could have had few if any active enemies. The specimen is unique, not only as the only trilobite yet found showing a color pattern, but also as being the most ancient fossil so marked, the next oldest

being a little gastropod, *Holopea harpa* (Hudson), described by the writer from the Chazy.[1]

I am not sufficiently familiar with the colors of recent crustaceans to make any extensive comparisons, but it appears that those of the deep sea are often brightly colored, but without markings, those inhabiting caverns and other dark places are very pale to dead white, whereas those in the shallow photic waters are of many colors, and often mottled, banded, striped and shaded.

FIG. 1.

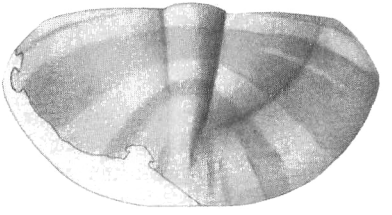

FIG. 1.—A pygidium of *Anomocare vittata,* retaining color-markings. × 3.

Pelagic crustacea usually have pigmentless tests, and owe their brilliant colorations to chromatophores, circulating fluids, or the structure of their shell. The present specimen, as was to be expected, falls in with the group in the shallow waters.

The shells of the branchiopods and copepods do not commonly contain pigments but among the amphipods and isopods are to be seen some patterns which are similar to the one on this trilobite. Della Valle in particular has published colored figures of Amphipods[2] showing strongly contrasted transverse bands of pink, alternating with yellow, white, or green.

According to Newbigin,[3] red lipochromes are the dominant pigments in the Crustacea. Where the shell is thin, red and pink prevail, as in the deep sea crustaceans. When much lime is present in the shell an orange tint is often produced. This being the case, and

[1] The Nautilus, **19**, p. 101, 1906.
[2] Gammarini del Golfo di Napoli, 1893, pls. 3-6.
[3] Colour in Nature, London, 1898, p. 128.

the tests of many trilobites being rather thick and calcareous, it may be possible to predict various shades of orange in their coloration. With an appropriate organic base the red lipocrome apparently produces a blue compound, which with the yellow and red produces green and brown. With the aid of these general principles and applying previously gained knowledge of the probable habits of any particular form, it may be possible to approximate somewhat reasonably to the actual appearance of one of these animals in nature.

Trilobites usually possess colors which are obviously considerably influenced by the nature of the sediment in which they are imbedded, and since carbon and its compounds or oxides of iron are the most common coloring agents in the rocks, the specimens are usually from rusty brown through dark gray to black. A light-colored limestone would seem to be the most favorable matrix for the preservation of original colors, for in this case there would probably be only loss of pigment, without much chance of substitution except where recrystallization has taken place. A number of light-colored limestones yield fossils, and I have always felt that there must be some significance in the fact that the trilobites of the Maquoketa of Iowa, the Upper Ordovician of southern Ohio and Indiana, and the Lower Ordovician of the Ladoga region east of Petrograd were all of about the same color. On the best preserved specimens from which the matrix has been chiseled away the color is a rich chocolate-brown, whereas the ones which have weathered out naturally are usually much lighter, ranging toward yellow or cream-colored. It seems entirely possible that both red and yellow pigments may have entered into the composition of the original coloring matter of these specimens. The fact that all the trilobites of these localities, whatever the family, show the same chromatic characteristics may indicate one of three things; that the color is really in some way due to the composition of the matrix; or, that only the basic colors have left traces; or, that the Ordovician trilobites were rather uniformly colored and exhibited only shades of the primitive red which is dominant among crustaceans at the present time. Trilobites from the light-colored limestone of the Silurian of Indiana, England, and Bohemia,

and other examples which could be cited from Ordovician and Devonian, also show the chocolate tints, so that it seems hardly possible that the constitution of the matrix has anything to do with it.

There is practically no literature on this question of coloration in the trilobites, but henceforth specimens will probably be scrutinized more closely, and it is hoped more evidence will be produced. Banding of the clean cut sort exhibited by this individual seems not to be especially common among modern Crustacea and one would expect that shadings of one color, mottling, and splashes would be more common among the trilobites.

The identification of this individual with any described species has not been possible, and it may therefore bear the name of *Anomocare vittata* sp. nov.

Walcott[4] has described *Anomocare convexa* as a common fossil from the Conasauga formation in northeastern Alabama. This pygidium can not be referred to that species because it has a narrower axial lobe which extends as a very low ridge almost to the posterior border. The axial lobe shows very faintly a pair of rings, and the pleural lobes a pair of ribs which are so inconspicuous that they are not put on the figure.

The specimen was collected by the writer from the Conasauga shale near Moshat's Cross-roads, 3 miles southeast of Center, Cherokee Co., Ala., during the Shaler Memorial Expedition of 1921.

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[4] Smithson. Miscl. Colls. vol. 57, p. 87, 1911.