Use of Stereoplotter STD-2 in Paleontology for the Morphological Evaluation of Fossil Shells

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ABSTRACT: *This paper deals with the use of stereoscopic prints in paleontology for evaluating fossil shell morphology both quantitatively and qualitatively. The stereoplotter STD-2 which the author experimentally used for this purpose is recommended for the quantitative evaluation.*

MOST authors, who deal with fossil fauna, restrict their attention to subjective word descriptions of the shell morphology, or if they go further than this include drawings and prints, which of course present only a flat picture of the photographed subject. The result is that it is necessary to use some other suitable terms in describing some of the morphological peculiarities of the shell. An ideal way for presenting an objective picture of the shell shape is, as with terrain morphology, a contour map. The problem to be solved from the practical view point or otherwise, was how to construct an accurate contour map of the shell. Stereophotogrammetry solved this problem.

It is known that in foreign literature there is available the publication of A. Pastiels (1953). In this the writer presents a stereophotogram of *Carbonicola acuta* (J. de Sowerby), worked out by Institut Geographique Militaire in Brussels. Unfortunately the writer does not mention the evaluation technique but refers to the publication of M. G. Lemaire (1951). This publication is unknown to the author; he is inclined to believe that the evaluation was carried out on some one of the universal stereoplotting instruments such as Wild A 5.

The author has made an experimental contour evaluation of a new lamellibranch species; *Sanguinolites gengeli*, Růžička-Vašíček, 1957. For doing this there were available only the methods and apparatus of a small institution. The experiment proved to be quite successful. However, it should be kept in mind that the work was not carried out with the accuracy demanded for the topographic map prepared by photogrammetric methods and equipment, because the author in interpreting and delineating the photography used only non-specialized apparatus and photo--material.

The stereophotographs were exposed on Foma Ortho Repro plates 17/10 DIN, using Standard Vertical Camera (Zeiss-Jena), objective Tessar (1:4.5; f = 13, 5 cm). The shell was photographed in one position and then in a second position. In order to obtain a stereopair the position of the photographed shell was changed. The camera was not moved. The amount of shifting was measured by using a scale which had an accuracy of ± 0.5 mm. The principal points of the photographs were determined by joining the inside centres of the plate magazine. Because the camera was fixed in position, the plates were held to a horizontal position and their rotation was impossible. The parallel shift in the X direction was obtained by using a little carrier on which the photographed shell was placed and moving this along a sliding ledge which was fixed to the base of the standard camera. The distance of the objective from the photographed fossil was measured by using a scale with an accuracy ± 0.5 mm.

The delineation itself was carried out by using stereometer (stereoplotter) STD-2; this is used in USSR for a differential method of evaluating the aerial photographs.

By setting on the highest and the lowest point of the photographed shell, the author

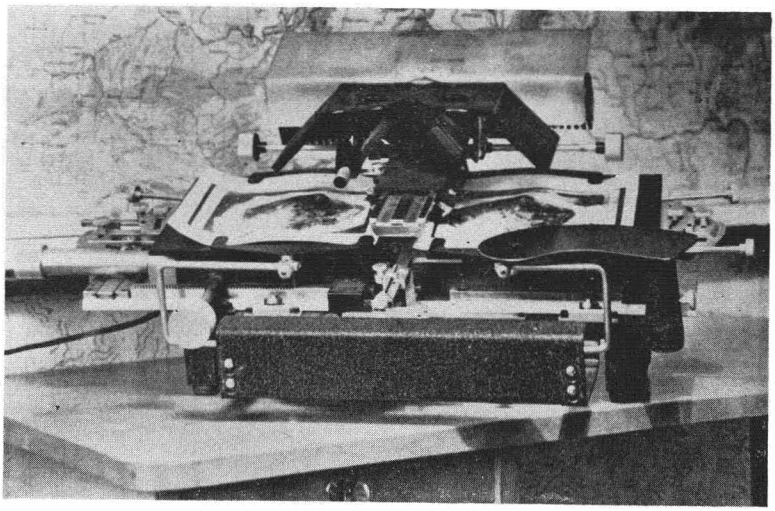

FIG. 1. Stereometer (stereoplotter) STD-2.

obtained the maximum reading difference on the stereometer parallax screw. Using this in a formula:

$$h = \frac{\Delta p \cdot H}{b + \Delta p},$$

where

h = height of photographed object (shell)
H = distance between objective and photographed object (distance between focus and photographed object)
b = basis on photograph (distance be-

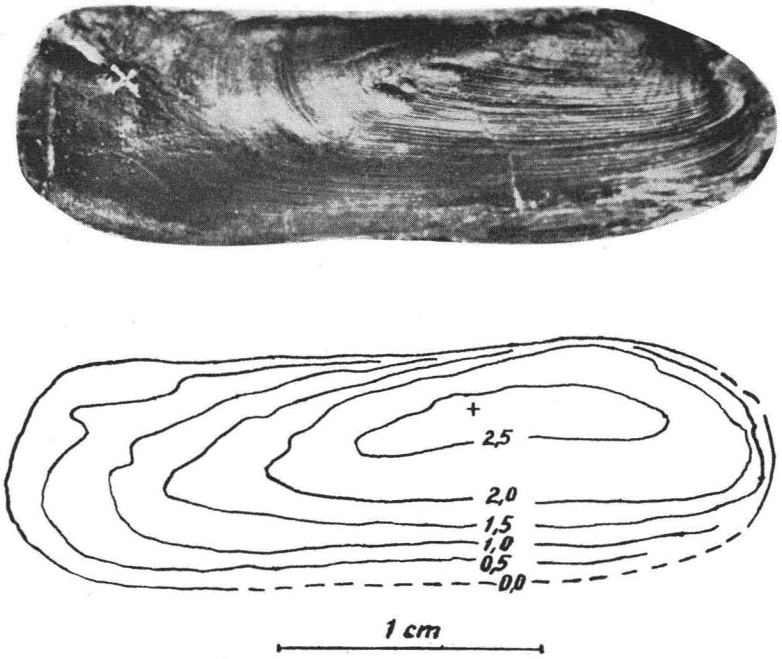

FIG. 2. Contour map of *Sanguinolites gengeli*, Ružička-Vašíček, 1957. (Heights are in mm.)

tween principal stereopair points
Δp = maximum parallax difference

The author obtained data for H and b by direct measurement and that for Δp by reading the parallax screw.

The height of the photographed object thus obtained was divided into the required contour interval. He computed the reading on the parallax screw as equal to the individual contours.

While looking through the stereometer spectacles, the observer had an impression of the stereometer thread intersecting the stereoscopic shell model at a certain point. By shifting the bases where the prints are fixed in direction X, the stereoscopic model moves from left to right, and vice versa. Gradually it is possible to mark in pencil the intersection points of the measuring thread with the stereoscopic shell model on the right print. The line connecting these intersection points is the contour corresponding with the height read on the parallax screw. In the same manner, that is by changing the readings on the parallax screw, the contours of the whole shell surface are delineated. Then using the contour map it is possible to construct longitudinal and transverse cuts of the shell.

Fig. 1 is a picture of the stereometer used and Figure 2 shows a contour map of *Sanguinolites gengeli*, Růžička-Vašíček, 1957, which was constructed by the method described in this paper.

The author believes that this method will remove many inaccuracies in describing examined fossils shell morphology.

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*Architectural Photogrammetry at Ohio State University—First Phase**

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For the past year there has been a continuing project in architectural photogrammetry at the Ohio State University with personnel of the School of Architecture and Landscape Architecture using the equipment and direction of the Institute of Geodesy, Cartography and Photogrammetry.

Though this is to the best of our knowledge the first project in architectural photogrammetry in the United States, there is sufficient need for photogrammetric measurements in architecture to insure a continuous development in this field. One application is in recording historic architecture. During the 1930's the Historic American Buildings Survey of the National Park Service of the U. S. Department of the Interior employed hundreds of architects in measuring and drafting plans, elevations and details of fine historic architecture. This spring the Historic American Buildings Survey was revived, not as a means of employing members of a booming architectural profession but to record the surviving remnants of an architectural past that is disappearing in a chaotic burst of demolition and new building. The speed of photogrammetric recording fits the urgency of this survey.

Photogrammetry was used in Germany

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