graith (10) suggested that hepatic venous constriction may be intimately concerned in the control of the blood flow through the organ and in the pathogenesis of lesions which appear in various disease states.

It would appear possible to use a similar procedure with laboratory animals to measure the variations in the width of the large blood vessels, thus eliminating the variations caused by the contrast agents in use at present.

It thus seems clear that problems of both theoretical and practical importance can be investigated with photogrammetric methods; intimate cooperation between medicine and technology in this field should be of benefit to both.

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STEREOPHOTOGRAMMETRY AND STUDIES OF MOVEMENTS*

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FOR years the manual movements in certain working processes have been taken cinematographically or by the so-called light point's process. By both methods we obtain a clear picture of the movements executed; they do not, however, permit obtaining a sufficiently accurate determination of their form and especially of their strewing. For the study of the economy of working processes, need exists for an exact knowledge of the spatial curves of the single movements and their strewing, and consequently the possibility of a comparison with other working dispositions. Only this possibility of comparison permits ascertaining the most favorable working conditions with regard to length of way and form. For the study of the movements, the operator who was examined was provided with incandescent lamps on both hands, and also on the head and shoulders. For the task in question the "Wild" Stereo-Camera of a basic length of 40 cm. was used by which a plotting accuracy of about 1 mm. on the scale of 1:2 was obtained for taking distances up to about 4 mm.

In studies of movements another light signature has to be chosen for every working course. This is obtained by using an automatic interrupter with variable intervals. This is necessary, since the courses of the lamps belonging together must be established beyond a doubt, within a range where different movements are continually crossing.

Furthermore the first experiments have shown that from a series of about 24 working courses on one pair of photographs it is advisable to take out only 3 to 4 repetitions in certain intervals. Thereby we obtain also a better mean value of the movements and a more reliable picture of the strewing. The photographs were taken in a feebly darkened room, the shutter of the stereo-camera remaining open while taking

* Summary of the treatise in the Congress Number VIII, 1951/52, 4 of "Photogrammetry."

3 to 4 repetitions of a working course, and with the light signs altered for every new working course by automatic connections. This method permits a reliable identification of the various working movements which is quite impossible with the usual light point's process. The stereoscopic observation offers, furthermore, some very considerable advantages as against monocular observation, since only in the former may the differences of depth also be observed.

The plotting was executed with the "Wild"—Autograph A 5 with the scale of 1:2. The plotting permits also determining the way passed over in units of time. These experiments led for instance to the following statements.

1. The greater the distance run, the greater the velocity and the straighter the course of the movement.
2. The shorter the distance run, the smaller the velocity and the vaster the course of the movement.
3. The plotting of the courses of the movements further shows, that the right hand sometimes has to wait for the left, and that there occur shiftings of time between the two hands which are caught up at the fix points of movement.
4. The experiments confirm the fundamental rule, that human work has the tendency to rhythmical movement.

There should be no doubt that the stereoscopic plotting of movements opens up quite new perspectives for the scientific study of working processes and for the determination of working depositions giving maximum results.

A NEW METHOD FOR INTRA-ORAL RADIOGRAPHY[1]

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THERE exists in the science of odontology a real need of an accurate method for following physiological and pathological processes in the jaws with the aid of radiography.

The radiographic material at the disposal of the practicing odontologist does not, unfortunately, always possess the most desirable properties, so that the opportunities of performing good diagnoses in odontology, and particularly in oral surgery, are much restricted. In most cases the diagnosis is made and the therapy decided from clinical examinations and from the study of single radiographs. These single pictures can, however, be of great value when the object is to estimate changes in a particular region of the jaw, provided that one works on the principle of serial identical radiography. The term "serial identical radiography" should not mislead one into thinking that it is a question of identity in the mathematical sense. It is in fact a question of a greater or lesser degree of geometrical similarity in orientation.

Rather than to study single pictures, however, we have found it preferable to exploit the advantages of stereo-radiography. After interpretation of 3,000 radiographs taken by our method we have found that a comparison between a single picture and a stereo-pair taken in the correct manner has proved that the latter is superior. The information yielded by the stereo-picture, despite shortcomings inherent in the character of the radiograph, is always more detailed than that given by the single picture. Even if, on account of the distribution of contrasting points in the object, a correct space conception of all such points cannot be obtained, the stereo-picture can be said to reproduce, in some degree, the three-dimensional effect.

So long as stereo-radiography is performed in accordance with the theoreti-

[1] The contents of this paper are based on experiments treated in the thesis "Photogrammetric Principles Applied to Intra-oral Radiodontia," by Nils Berghagen, Stockholm 1951, and on later developments. A more complete account will appear in *Acta Odontologica Scandinavica*, Volume 11, 1953.

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