

Resumen por el autor, N. W. Ingalls.

Una cámara estereoscópica simple.

Esta cámara no es sino la cámara fotomicrográfica modelo H de Bausch & Lomb modificada para el trabajo estereoscópico. En breves palabras, los cambios introducidos consisten: 1. En un nuevo ajuste de la cámara y los soportes angulares que la mantienen en una posición vertical para traer traer la lente y eje óptico en coincidencia con el centro de rotación de dicha posición. 2. En la elevación del centro de rotación a una altura conveniente para permitir un espacioso campo de acción. Esto pudo conseguirse mediante el empleo de un pequeño trozo de barra I, cuya superficie superior se inclina 8 grados para compensar el hecho de que el instrumento original solo permite movimiento lateral a la perpendicular. De este modo se puede colocar un objeto en el centro de rotación, enfocándole con la cámara vertical y haciendo exposiciones con la cámara inclinada de 3 a 5 grados a cada lado de la perpendicular. La tuerca opinza de que está provisto el instrumento original servirá para mantener la cámara en la posición deseada. Los objetos planos pueden fotografiarse con mayor ángulo que los objetos que poseen considerable profundidad. El ángulo disminuye también con el aumento de la distancia del objeto. Un ángulo demasiado grande tiende a deformar la imagen al exagerar la profundidad.

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A SIMPLE STEREOSCOPIC CAMERA

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ONE FIGURE

The advantages of a stereoscopic photograph over the ordinary, single, flat photograph are so great and far-reaching that a brief account of the relatively simple apparatus necessary seems in order. For some little time the Anatomical Laboratory has been making extensive use of stereo-photographs, both as records and in routine teaching.

For purposes of record the method all but replaces the actual specimen, and for material which cannot for any reason be preserved, as embryological or histological material, the results are all that could be desired. The same applies also to objects, dissections, and the like, where, on account of their large size, mounting and preservation may not be practicable. The results with small specimens, such as one would ordinarily examine with the aid of a binocular, are especially gratifying when the photographs have been taken under a moderate magnification.

The use of stereophotographs as records of the human embryos in the department collection and also the methods of stereoprojection were demonstrated at the March meeting of the Anatomists in Philadelphia. The slides illustrating Doctor Todd's paper were all of bone specimens and ranged from reductions to enlargements; the slides of the author, representing embryological material, were mainly enlargements. The stereoprojection as shown at this meeting was the same as that in use in the department teaching. The same negatives furnish both lantern slides and prints, so that the student has the opportunity to review what he has seen on the screen by means of the mounted prints in the hand stereoscope.

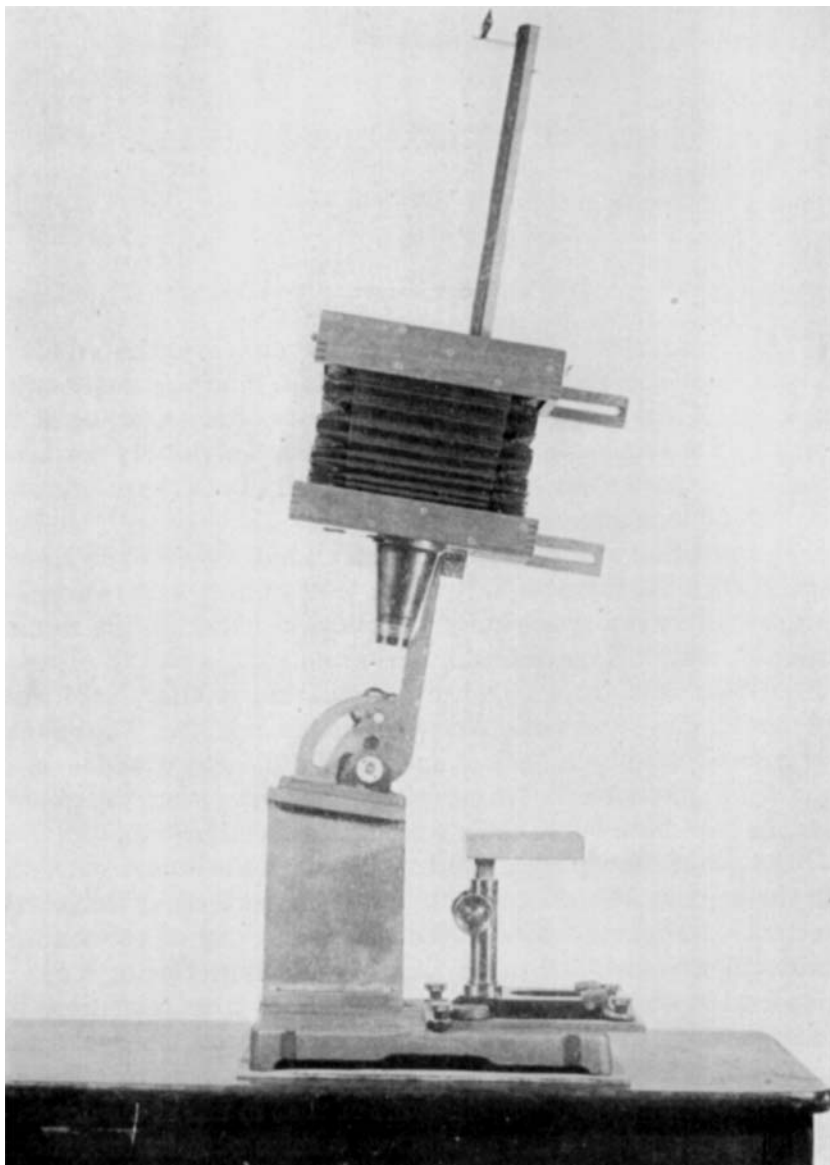


Figure 1

The stereocamera now in use is shown on the accompanying plate. This represents the Photomicrographic Camera Model H of Bausch & Lomb as modified by the author to meet the requirements of stereoscopic photography. Two alterations were necessary to adopt the camera to stereoscopic work. In the first place, the lens had to be brought over the center of rotation of the supporting arm, i. e., the optical axis of the camera must pass through the center of rotation. In its original form the camera box is placed on one side of the vertical support—on the right in the view represented—and some provision was made for lateral adjustment of the camera on this support. Since it was not possible to shift the lens over the center of rotation, it was necessary to remove the camera from the L-shaped brass straps to which it was attached, reverse these straps in the lateral supports, and replace the camera box. The pin with milled head which clamps the camera in lateral adjustments had to be removed and replaced in the brass strap nearer the angle, in order to allow the camera box to be pushed over the center of rotation. The manner in which the camera box has been readjusted may be seen from the original screw holes.

The second alteration serves a double purpose. It was necessary to raise the center of rotation to a sufficient distance above the base to provide working room, to accommodate objects of varying size and to permit their adjustment in a plane passing through the center of rotation. This was accomplished by removing the entire camera support from the flat base and placing it on top of a rather massive casting, I-shaped in section. It will be noticed that the top of this new support is higher at one end. The original mounting allows of movement only on one side of the perpendicular, so that by inclining the top of the new support the vertical axis of the instrument can be inclined about 10° on one side of the perpendicular and, with the old adjustment, nearly 90° in the opposite direction. The original clamp will hold the instrument in any desired position.

It is now possible to place an object in the center of rotation, which is in this case 230 mm. above the base, and to swing the camera to either side of the vertical about this same center

Rotating the object instead of the camera has little if anything to recommend it, is obviously impracticable in most cases, and has the further disadvantage of changing the lights and shadows on the object.

The specimen to be stereoscoped is placed in the plane of the center of rotation and the camera focused as usual. Points exactly in the center will not change their position on the ground-glass when the camera is inclined to either side. Points at a higher or lower level or on the right or left of the axis of rotation will change their position. Since only a small linear portion of any object can lie in the axis, a very accurate adjustment is not called for. The small, remodeled dissecting microscope shown in the illustration is a convenient means of securing the important vertical adjustment of the object. To the upper end of the arm supporting the camera is attached a pointer which moves over a graduated arc on the wall close behind the instrument, so that the vertical position and the amount of inclination to either side can be readily determined. Much of our work has been done with an inclination of 5° or 6° on each side of the vertical, or a difference of 10° or 12° in the two positions of the camera. If the object is of considerable depth, a smaller total angle, 8° , 6° , or even 4° may be used, and the angle would naturally be reduced as the distance between the object and the lens increases. Too great an angle results in a distorted effect by exaggerating the depth.

The lens usually employed for objects of moderate size and also for enlargements is a 72-mm. tessar 1c. In the illustration this is mounted on an aluminum adapter 75-mm. long, to allow better illumination of the field. For large objects and with the camera at a greater distance, a 5 x 7 protar, series V, has given very satisfactory results.

Two exposures are made, on $3\frac{1}{4} \times 4\frac{1}{4}$ plates, at an equal inclination on either side of the vertical, 4° , 5° , or 6° if the total angle is to be 8° , 10° , or 12° . If a better view of the object can be obtained by inclining the camera, this altered position may be taken as the starting-point and the exposures made a given number of degrees to each side of this point. This is very convenient

in securing accurate views of objects which it may not be easy to adjust as a dorsal or ventral view of a small embryo. The finished prints are mounted as the negatives were taken, the right-hand view on the right and the left on the left and in such relation to each other that, as seen through the stereoscope, the two views fuse easily and completely. This is accomplished best by fixing one in place temporarily and making the adjustment with the other print while viewing both through the stereoscope. If the prints are reversed, the left on the right, the result is a reversal of the perspective, an intaglio instead of cameo, or vice versa.

The limitations of this instrument are due to the fact that the optical axis is only about 10 cm. in front of the vertical support. Consequently objects over 20 cm., 8 inches long, cannot be centered unless placed crosswise in the field.