preosseous substance; d, deposition of calcium phosphates and carbonates. These processes are dependent upon humoral and interstitial rather than upon cellular factors.

Osteoblasts are regarded as fibroblasts with only a feeble osteolytic capacity. Their function is to oppose and restrict osseous extension. Cases are cited in which new formation of bone, as disclosed by skiagraph, is unaccompanied by osteoblasts. Conversely, osseous areas in which there is no new formation of bone are covered with osteoblasts of typical epithelioid character. Osteoblasts become secondarily involved in osteogenesis and thus are incorporated as osteocytes. As such they have no osteogenic nor nutrient functions; they are "useless parasites of osseous tissue." However, under the influence of certain pathologic factors they may have their original osteolytic capacity greatly stimulated. Osteolysis also is primarily dependent upon humoral processes. Osteoclasia, by action of osteoclasts, is said to be a relatively minor factor in bone resorption.

The results of experiments with rabbits, involving resections, fractures and transplants, are in accord with the earlier ideas of Havers, Bichat, and Macewen, who regarded the periosteum simply as a structure limiting ossification. The periosteum "blocks osteogenesis." The so-called osteogenetic layer of the periosteum is not a bone-forming tissue; it opposes and restricts the spread of bone. New formation of bone is invariably associated with bone resorption. The formation of callus in the repair of fractures is preceded by resorption of the broken extremities of the bone. Likewise, in the case of bone transplants; the transplant is resorbed before new bone appears. Such resorption supplies the necessary local excess of calcium for the stimulation of the osseous metaplasia. Osseous metaplasia of connective tissue is a reversible process. Bone resorption follows upon increased circulatory activity locally, a condition dependent upon vasomotor control. The authors believe that the results of their investigations open a new chapter in bone pathology, that of bone diseases of vasomotor origin.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

METHODS FOR DETERMINING THE COLOR OF OBJECTS IN MICROSCOPIC MOUNTS

MICROSCOPISTS who have attempted to determine the color of minute objects in microscopic mounts, such as fungous spores, have felt the need of improved methods.

The method commonly employed for this operation is to observe the object through the microscope, form a mental color image and match this, as soon as possible, with a color on a color chart. However, the color chart is sometimes omitted and an opinion rendered. The results obtained by these methods have been uncertain since an accurate mental color impression of sufficient duration and intensity could not be retained until the observer had made proper comparisons with the standard colors, or his memory of color standards was inaccurate. These difficulties might be overcome if the microscopic object could be projected on a color chart or images of the microscopic object and the color chart observed simultaneously.

Krieger[1] has described a method for determining the color of spore prints made from *Volvaria speciosa Fr.* as a type. However, a good method for determining the colors of spore mounts by microscopic examination remained to be described. The writers have devised methods by which the object in a microscopic mount may be projected and observed simultaneously with those on a chart of standard colors.

In the first method employed by the writers, the apparatus consisted of a microscope equipped with Abbé condenser, camera lucida with drawing board, two table lamps each bearing a 75-watt daylight ground glass bulb, a Ridgway color chart, and a comparing screen which consists of a sheet of gray paper about 8 x 10 inches with a slit 1 x 0.75 inches cut in the center. The color standards were lighted by one of the lamps and the microscope by the other. By properly adjusting the Abbé condenser, the two lamps and the camera lucida, an image of the colored microscopic object was superimposed on the comparing screen beside the slit. While the comparing screen was held stationary, the color standards were moved so that an analogous color showed through the slit. The color standards were further adjusted and proper comparisons made until the slit contained a standard color which matched favorably with that of the microscopic object. By this method, the observer can compare the colors as accurately as his ability will permit. When one type of microscope was used, the microscope was placed on a plane about three inches above the level of the drawing board but when another type was employed, the best results were obtained when this distance was increased to five inches. How-

[1] Krieger, L. C. C. "Observations on the Use of Ridgway's New Color Book. The Color of the Spores of *Volvaria speciosa Fr.*" *Mycologia* 6: No. 1: 29–31. 1914.

ever, the microscope and drawing board may be placed on the same level. The methods of lighting the microscope and chart may also be varied from those already described. Good lighting was obtained with three forty-watt lights; one for lighting the microscope and two for the color chart. When sunlight was employed, it seemed preferable to place the color chart in the bright sunlight, for a short time, and the microscope in a shadow.

In the second method, the apparatus commonly used for making photomicrographs was employed. Working in a darkroom, an image of the microscopic mount was focused on the ground glass of the camera in the usual way. The ground glass was then removed and placed about eight inches back from its natural position and the object refocused. The color standards with the comparing screen were then substituted for the ground glass. The color of the microscopic mount as projected could then be compared with the colors on the color chart by employing methods already described. However, the camera may be removed and an image of the microscopic mount projected on a horizontal surface by aid of a mirror commonly attached to the apparatus for this purpose.

The third method was devised as a laboratory aid in classifying fleshy fungi. Students experienced considerable difficulty in determining the colors of basidiospores, especially those of ochre, brown and rose colors. An eyepiece color comparator was constructed by flowing a negative varnish over a cover glass which could be placed in the tube of an eyepiece to a microscope. Before the varnish had hardened, four narrow parallel bars of transparent water colors were painted across the center. Deep yellow, geranium pink, mahogany brown of the Japanese transparent water colors were employed while India ink supplied the black. The color was more dense on one end of the bar thus giving a comparison of the diluted with the concentrated color. By placing this eyepiece color comparator in the eyepiece of the microscope, its colors and those of the microscopic object could be observed simultaneously and the relative colors of basidiospores determined. The colors on the eyepiece color comparator were standardized by the camera lucida as previously described. Thicker glass for the color comparator was obtained by choosing a microscopic slide of clear, thin white glass and a disc of the desired diameter was cut with shears under water. It seemed inadvisable to place the colors on a microscopic slide or its cover glass.

Finally, the methods described in this article may be successfully employed by one familiar with the use of a camera lucida. Furthermore, the proper lighting of the microscope, photographic apparatus and the color chart insures success when determining the color of microscopic objects by these methods.

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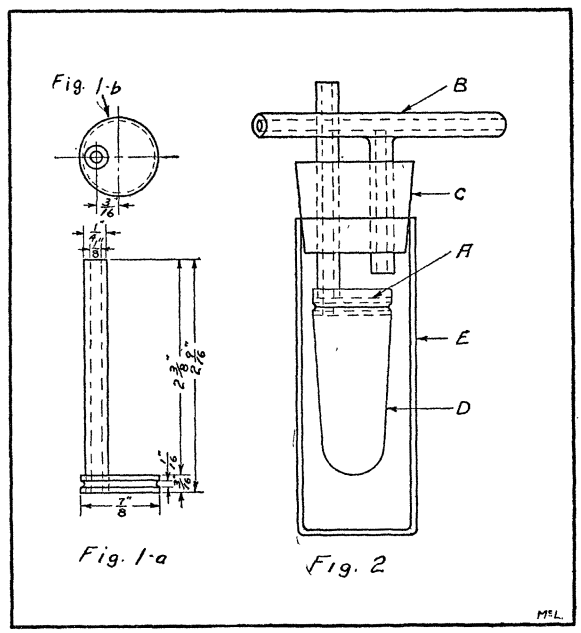
A MODIFIED .ERLANGER SPHYGMOMANOMETER

ABOUT a year ago, when the writer attempted to assemble an Erlanger type recording sphygmomanometer, he was confronted by the impossibility of securing the special rubber bulb used in such apparatus. In casting about for a suitable one, many types of rubber bulbs and finger cots were tried without success until one day, after the cuff had been used for arm plethysmographic apparatus, the cast-off fingers of a rubber glove were tried. The finger of the glove was tied over a disc placed inside a capsule constructed as described (Figures 1 and 2) and served so satisfactorily that the writer thought others might find the apparatus useful.

The center of a 7/8-inch round brass rod was located and a 1/4-inch hole was centered and drilled 3/16 inch from the center of the rod. With a lathe a 3/32-inch groove was cut around the circumference of the rod and a 3/16-inch disc cut off. A piece of 1/4-inch brass tubing about 2½ inches long was soldered in the hole in the disc. The side and bottom views, respectively, of this disc are shown in figures 1a and 1b.



When assembling (see figure 2), the finger of the glove D is slipped over the disc A and tightly tied by means of strong waxed linen thread. The brass tube B is forced through one of the holes in a number 7 rubber stopper C. One arm of the T-tube B is pressed