cil and of the Geodetic and Geophysical Union as we deemed necessary. It is a satisfaction to report that the newly adopted statutes of the Union, and also the statutes of the Research Council, as prepared by the Committee on Revision of Statutes of the Research Council for action at the plenary session of the Council to be held next year, are in substantial conformity with German desires, so that in the opinion of those who took part in the Stockholm meeting the way is now open for German geodesists and geophysicists to join the International Geodetic and Geophysical Union. The adhesion of Germany to the International Research Council is no longer a prerequisite to adhesion to the various unions; the question of adhesion to the International Geodetic and Geophysical Union is, therefore, laid before the members [of the Deutsche Geophysikalische Gesellschaft] for decision.

W. D. L.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

PEN AND INK DRAWINGS FROM PHOTOGRAPHS

THE ordinary method of making line drawings for publication by means of the camera lucida is tedious, especially when minute details are concerned. Photographs are frequently blurred, often do not give enough contrast or are not clear enough to be suitable for publication. The method here presented combines both the clearness of definition of the line drawing and the accuracy of the photograph. Very little seems to be known of the method in scientific fields, but it is used commercially to a considerable extent to make various types of etchings and line sketches.[1] In general, the procedure is to photograph the material, make a print on a good grade of paper and draw over it with India ink. All stippling or other shading may be done directly on the photograph. The print is then placed in solutions which bleach away the photographic image and leave the ink tracing standing out on a white background. If the original photograph is so small that details can not be drawn in easily, it may be enlarged several times, treated as above and the drawing reduced in reproduction.

The process of removing the photographic image is accomplished by two solutions. The first dissolves away the photographic image and the second bleaches the paper.

Solution 1.	Potassium iodide	15 gms
	Iodine	5 "
	Water	500 cc
Solution 2.	"Hypo" crystals	100 gms
	Water	450 cc

When the ink on the drawing is thoroughly dry, quickly immerse the print in solution 1. Rock the tray immediately so that the solution covers the print rapidly and evenly. The photographic image will disappear almost at once, and at the same time the print will become brown from the iodine. As soon as all traces of the photograph have disappeared, remove the print and wash gently in water in order to remove the excess iodine. Then place in solution 2. Here the brown color is completely lost and the print becomes quite white in about five minutes. Transfer to water and wash thoroughly to remove the "hypo." Dry the print by placing it in a horizontal position on blotting paper. It will curl as it drys, but later it can be flattened by dampening the back and placing in a press. Throughout the entire process care should be taken that nothing touches the surface on which the drawing has been made, for the ink smears very easily while wet. The iodine solution may be used repeatedly until it becomes too weak, when it may again be brought to strength by adding more iodine. The "hypo" solution may likewise be used many times.

The method has been used by the writer to make drawings of section of leaves. Microphotographs are taken on a $3\frac{1}{4} \times 4\frac{1}{4}$ inch negative and enlarged to a 5 x 7 inch print. The time required to take the photograph and to complete the entire process is very little more than that required to make a camera lucida drawing. After the chemical treatment no traces of the photograph remain, and the drawing stands out on a white background without any staining or blurring of the print. If desired, pencil or even charcoal may be used in place of the ink.

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[1] J. C. Tobias, "Working up Silver Prints," *Am. Ann. of Photo.*, 44: 30–38, 1930. The writer also wishes to make acknowledgment to J. P. Barham, of the photographic service department of the University of Missouri, who first brought the method to his attention.

A METHOD OF CLEANING MICROSCOPICAL FOSSILS

ONE of the difficulties of cleaning microscopical fossils, already removed from out the matrix, is in keeping them in a desirable position under the microscope, while working on them with a needle. There is always the great danger of crushing them with forceps or of losing them when they jump out of the forceps.

In my work on foraminifera I was able, to a certain extent, to avoid the dangers referred to through the use of the common adhesive tape. The tape was used in the form of small strips, and the whole manipulation was carried on in the following way. A tiny drop of water was put on the gummed surface of the tape, and the fossil placed on the wet spot in a desirable position. After a few minutes the glue was dried and held the fossil firmly enough to allow of its preparation. When the preparation was finished, the strip of the tape was plunged into water, the fossil removed from the tape with a soft brush and the adherent remains of glue washed off. It is very important to take as little water as possible for fixing fossils on the tape. If the drops were too large, it would not only take too much time before they would dry out sufficiently to give a good hold to fossils, but the latter might sink into the glue which, dried on their surface, would interfere with the work of the needle. The most difficult part of the operation is the fixing of the fossils on the gummed surface in exactly the desired position.

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SPECIAL ARTICLES

AN OBSERVATION WHICH SUGGESTS AN EXPLANATION OF THE ANEMIA IN HOOKWORM DISEASE

During the course of an experiment on absorption from the small intestine of the dog in which the mucosal surface of the gut was exposed in a special device for observation of the movements of the villi, the author's attention was attracted by the activity of several hookworms (*Ancylostoma caninum*) attached to the mucosa. While watching one of them through a binocular microscope, a large droplet of blood was seen to emerge suddenly from its anal orifice. Within the next few minutes a considerable number of droplets had been ejected by the same worm. Eight or ten other worms present were all seen to be passing blood in the same manner.

The passing of blood in such quantities naturally aroused our interest, as it seems to suggest a plausible explanation of the anemia in hookworm disease. For, although anemia has long been recognized as the essential feature of the disease, its cause has remained obscure. Hemorrhagic areas, due to the bites of the worms, have been noted, and blood has frequently been found in the digestive tracts of the canine and the human forms of the parasites. Indeed, the worms have been seen to eject blood, both from the mouth and from the anus, on placing them in water after removal from the dead host. But no direct observations on the blood-sucking activities in the living host have been made heretofore, so far as the author is aware. All evidence of the presence of blood in the tracts of the worms has been considered merely as showing that blood may be the principal food of the animals. It has naturally been assumed that, as the worms can not require much blood for food and as the loss to the host by hemorrhage from the mucosa is seldom very great, there must be some other reason for the anemia. Toxins, including agents acting on the blood-forming organs or on the blood cells directly, have been postulated as possible causes. But aside from the finding of a hemolytic agent in extracts from dead worms, the evidence for such toxins has never been convincing. The observations here reported show that, in the case of the dog hookworm at least, blood may be removed from the host to a degree hitherto unsuspected, which indicates that it may be necessary to reconsider the factor of blood-sucking in relation to the causation of anemia.

Although a rather elaborate apparatus was used in the original observations, this is not necessary. The procedure may be successfully carried out as follows. A dog having a fairly heavy infestation, as shown by examination of a fecal smear for ova, is anesthetized by the administration of 0.35 gram of sodium barbital per kilo in approximately 10 per cent. solution, either by mouth or intravenously. In an hour or less the abdomen may be incised in the midline and a loop of bowel pulled out. With sharp scissors the wall of the gut is cut longitudinally on a line opposite the attachment of the mesentery. Hemorrhage from the cut borders of the segment should be checked by the application of spring paper clamps. The activity of the worms may be observed with the unaided eye and with ordinary illumination, but better results can be obtained with a Greenough type binocular microscope of low power and with the field illuminated by means of an arc or other strong source. It is advisable to keep the worms submerged in warm isotonic saline solution to prevent them from drying.

To date, several dogs have been used and some fifty worms examined, all of which were seen to be passing blood as in the first experiment. The frequency of ejection of the droplets varied considerably. In the first two dogs studied, the intervals between ejections varied from 2 seconds to 10 or 15 minutes. However, during several active periods extending over 20 minutes or more, the intervals were never longer than one