partial block similar to that existing in normals, by addition to vitamin B_{12} of normal human gastric juice (*1, 2, 13*), intrinsic factor concentrate from human or hog stomach (*14, 15*), or by lavishly increasing the intake of vitamin B_{12} (*2, 4*) alone. This, through mass effect, overcomes the block and results in the absorption of some fraction of the dose ingested. However, *the principle of regressing efficiency of B_{12} absorption in the intestine with increase of the intake* will still hold also under these circumstances (*16*).

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June 10, 1954.

Carbon Dioxide Compensation Point in Photosynthesis

Rabinowitch (*1*) has emphasized the scarcity of data concerning the "carbon dioxide compensation point" in photosynthesis (the CO_2 concentration which, with abundant light, yields zero values of apparent photosynthesis because photosynthesis just compensates respiration). He quotes values from three sources: Miller and Burr, for a large variety of potted plants, values of about 0.01 percent; Thomas, Hendricks, and Hill, for beet plants, 0.003 percent; Gabrielsen, for *Sambucus* leaves, 0.009 percent. Some additional values, computed from the literature, are presented here.

Table 4 of Heinicke and Hoffman (*2*) contains data from which the CO_2 compensation point can be estimated. In three experiments reported there (No. 9, 10, and 11) the leaf area per envelope was so large that apparent photosynthesis approached zero. Although they do not report the initial and final CO_2 concentrations of the air drawn through the envelopes, these values can be computed from their data. The computed values are presented in Table 1. Since the error in their CO_2 determinations seldom exceeded 0.005 mg/lit, the low value for CO_2 compensation point in No. 9 is significant, and its association with a low initial CO_2 content of air may be worth noting.

Table 1. CO_2 compensation point values computed from data of Heinicke and Hoffman.

Experiment	Initial CO_2 (mg/lit)	CO_2 compensation point (mg/lit)	CO_2 compensation point (vol. %)
9	0.35	0.08	0.004
10	.59	.14	.007
11	.60	.14	.007

Figure 6 of Decker (*3*), if extrapolated to zero values of apparent photosynthesis, would provide estimates of the average CO_2 compensation points for the pines and hardwoods studied by him, but such extrapolation of Decker's data yields CO_2 compensation points of about 0.3 mg/lit (0.015 percent), which is 50 percent higher than the highest previous estimates. An examination of Decker's computations of mean CO_2 concentration, however, reveals an error. His plant chamber contained a fan that effectively stirred the air within the chamber, and photosynthesis determinations were made after steady-state conditions were obtained with a given rate of air flow. The CO_2 concentration around the plants, under such conditions, would be the same as that of the effluent air,

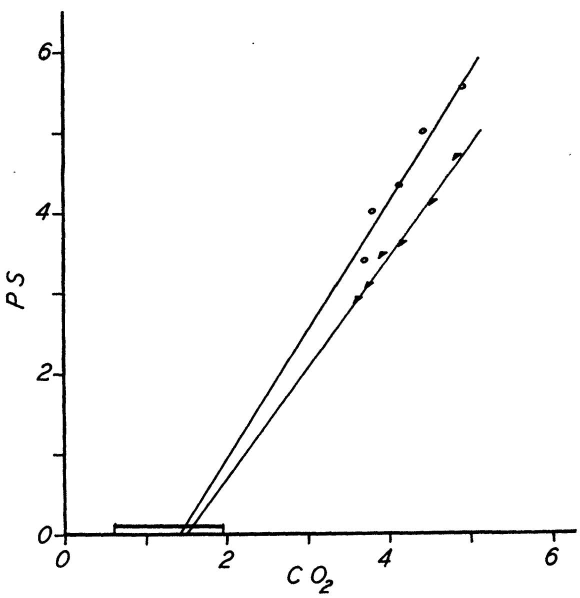

Fig. 1. Photosynthesis (relative values) vs. corrected values of CO_2 concentration (mg/lit, × 10), data of Decker. Each circle is the average of 10 determinations using loblolly pine. Each triangle is the average of 12 determinations combining data from dogwood, and tulip poplar. Extrapolation indicates a CO_2 compensation point of about 0.14 mg/lit (0.007 vol. percent).

not the mean of the values for affluent and effluent air, as Decker assumed.

If Decker's values for CO_2 concentration are corrected, the data appear as graphed in Fig. 1. Extrapolation of the lines shows a CO_2 compensation point of about 0.14 mg/lit (0.007 percent), thus agreeing closely with the values in No. 10 and 11 of Table 1. The initial CO_2 content of air in Decker's experiments averaged about 0.54 mg/lit. The bracket above the abscissa indicates the range of values for CO_2 compensation point appearing in the literature.

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April 9, 1954.

Simple Method of Measuring Opaque Objects

Ozalid plan copying paper provides a simple, inexpensive method of measuring and recording dimensions and shapes of appropriate-sized nontransparent objects. No special equipment is needed other than concentrated ammonia and unexposed Ozalid paper.

An object to be measured is placed on unexposed paper and illuminated so that a sharp, dark shadow falls on the paper surface. After a few seconds to a few minutes, depending on the paper speed and light wavelength and intensity, lighted parts of the paper are bleached. The paper is then "developed" with ammonia fumes in the tank shown in Fig. 1.

Other light-sensitive materials have been used to reproduce true-scale silhouettes, but Ozalid paper is most satisfactory in several respects. Its slow light-reaction, compared with photographic materials, simplifies exposure-timing and permits handling and development in subdued light. However, it does not require the long exposures with intense illumination needed for blueprint paper. Its easy dry development minimizes shrinkage and distortion.

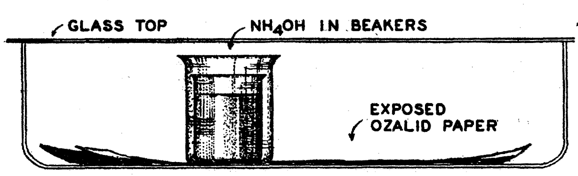
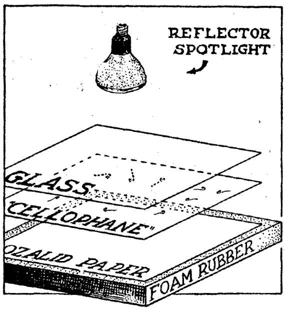


Fig. 1. Ozalid "developing" tank: dishpan covered by pane of glass. Double beakers prevent condensate from staining paper. With fresh concentrated ammonia (28 percent NH_3), latent shadow-image is developed in 5 min. Overdevelopment is impossible.

Versatility of direct-exposure methods using Ozalid paper is well illustrated by the widely different techniques that we used to solve the following specific problems.



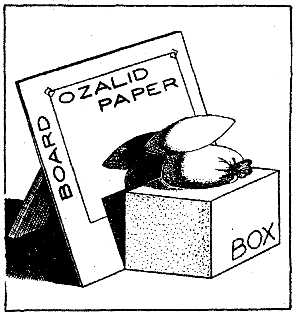


Fig. 2 (left). Expanded diagrammatic setup for silhouetting radish seedlings on Ozalid paper; 3 min exposure to No. 2 reflector photoflood lamp 5 ft above paper. Fig. 3 (right). Setup for silhouetting stream pothole "grinder" on Ozalid paper; 15 sec exposure to bright sunlight.

Schreiber's problem was to measure lengths of radish seedlings. (R. K. Schulz, Department of Soils, University of California, Berkeley, previously solved a similar problem by exposing seedlings on blueprint paper.) For each experiment, 45 seedlings had to be measured accurately and rapidly. In subdued light, seedlings were taken from soil, washed, and placed on waterproof cellophane over foam rubber (Fig. 2). Blotted, the seedlings were then weighted with a pane of glass to assure close contact and sharp shadows. Ozalid paper was inserted between the cellophane and foam rubber and was exposed. After development, the silhouettes were measured and filed for reference and comparison.

Higgins' problem was to make a scale cross-sectional drawing of a discus-shaped, 6-in. stream pothole "grinder." The drawing was traced from a sharp, life-sized Ozalid image obtained in the following manner. The grinder was placed on a sandbag (Fig. 3) so that the sun's shadow bisected the grinder and fell on a board placed perpendicular to the sun's rays. Ozalid paper, in a protective cardboard sandwich, was exposed to the shadow by removal of the upper cardboard for 15 sec.

These illustrations should suggest many possible applications of Ozalid direct-exposure methods to a great variety of problems involving measurements of opaque objects.

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April 30, 1954.