enchyma cells to be in a state approximating normal turgidity and the protoplasts with a distended, although not truly life-like, appearance. The chloroplasts of the mesophyll were distributed approximately as in the living condition. The twig also resumed its flexibility and turgidity. It was possible to cut free-hand sections of the twig with nearly the same ease as with fresh material; and the cells of the pith, wood parenchyma, and cork resembled very closely the forms of those in the living tissues.

Prolonged treatment is to be avoided; for after 18 hours at 60° C., or upon standing for several days at room temperature, certain tissues begin to show areas of brown discoloration (due presumably to the breakdown of chlorophyll and the diffusion of lignin derivatives). After 24 hours at 60° C., treated leaves become uniformly brown and begin to lose resiliency.

The success in restoring herbarium specimens led to the application of this method to the preparation of peats for analysis of microfossils. After trying concentrations which varied from 0.25 per cent to 10 per cent and temperatures ranging from 24° to 60° C., the best results again were achieved with 0.25–0.5 per cent solutions heated for 2 hours at 60° C. The peat sample is placed in a 15-cc. centrifuge tube, covered with approximately 10 times its volume of solution, and placed in the oven. If the peat has been stored in the wet condition, it can be gently broken up in the centrifuge tube with the tip of a camel's-hair brush before heating. If, however, the peat has been dried in storage, this operation is best delayed until the solution has reached 60° and has thoroughly moistened the peat. The addition of a wetting agent, e.g. Nacconol (National Aniline Company), to the solution accelerates the action on dried material. After heating, the material is twice washed with distilled water, centrifuged, and decanted. An amount of glycerine equal to the volume of the sediment is then added, and sufficient quantities are pipetted out to make slide mounts.

Although the trisodium phosphate preparation of peat samples has the disadvantage of removing very little of the materials which may tend to make the identification and counting of pollen and spores difficult, it seems desirable because it restores the sediment to a condition similar to its state when freshly deposited. The particulate matter is well deflocculated. Pollen, spores, fungal hyphae, trichomes, and most tissues of a more gross nature are re-expanded to approximately their normal shape in life. In addition to the re-expanding of the pollen grains, the exine layers appear to become turgid, so that characters such as the arcuate bands between pores of the *Alnus* grain, the hyaline bodies beneath the pore of the *Fagus* grain, and the "fingerprint" markings on the surface of the *Acer* grain stand out very clearly. The most delicate features of waxy excrescences on certain fern spores were entirely undamaged. The method causes no apparent change in the preserved diatoms, insect chitin, exoskeletons of planktonic crustacea, etc.

The study and identification of small fragments of tissues and microfossils other than pollen will prove to be of increasing significance in peat studies, particularly in contributing new lines of evidence concerning the biota and the ecological factors relating to particular strata or deposits. The use of the trisodium phosphate method is recommended as an aid in the study of this whole fossil biota of peats.

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Three-dimensional Graphs

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With respect to the construction of three-dimensional graphs (*1*), it has occurred to me that a simple procedure I have used for this purpose will be of interest. On a sheet of ordinary graph paper a base is laid out by drawing lines at angles of 45° from the horizontal. On this are plotted independent variables (x, y),

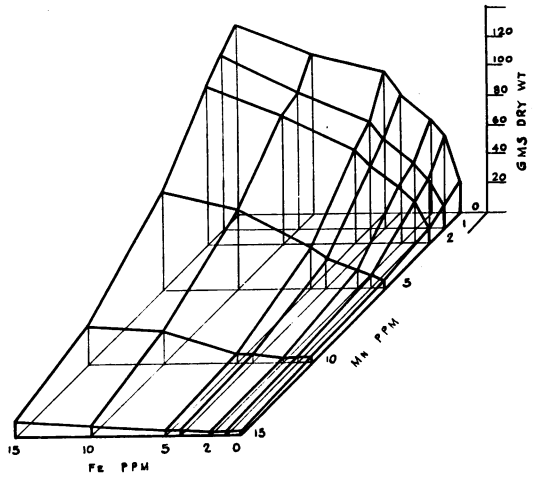

Fig. 1. Effect of simultaneous variation of manganese and iron on the total dry weight of bean plants.

while the dependent variable (z) is plotted on verticals from the base. Spaces on the graph paper serve for all three dimensions, and, if desirable, logarithmic values may be used. By connecting the points in two directions and to the base a solid figure is shown in perspective. The best effect is obtained if the graph is oriented so that the smaller values of z are in the fore-

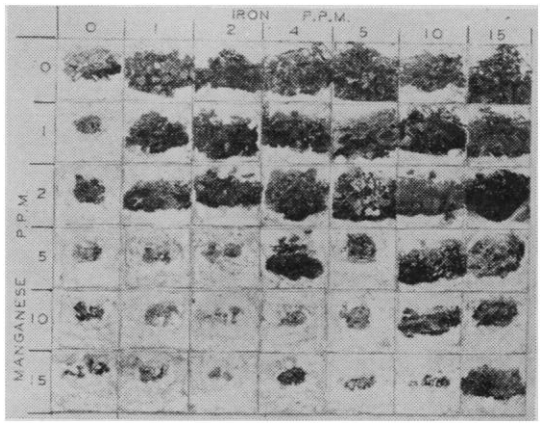

Fig. 2. Photographs of cultures of bean plants represented in Fig. 1.

ground. Heavier lines should be used for the "roof" and front and right "walls" to give the correct optical appearance. For publication the graph may be copied on tracing paper and photographed.

On Fig. 1, which was constructed as described above, are

shown the dry weights obtained by varying both the iron and the manganese concentration in a series of 42 solution cultures of bean plants (*2*), while Fig. 2 is made up of photographs of the same plants. Extreme toxicity of manganese in the absence of insufficient iron and the antidoting effect of iron are clearly shown.

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Penicillin as an Agent for Sterilization of Protozoan Cultures

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Cleveland (*1*) attempted to obtain sterile cultures of *Trichomonas* using bactericidal agents. He states that the search for efficient chemical agents for the sterilization of protozoan cultures "appears to be almost a hopeless undertaking" (p. 256). However, various chemicals have been used successfully upon protozoan cysts. Morgan's (*3*) success in obtaining sterile cultures of *Trichomonas* with the use of penicillin and streptomycin suggested the possibility of using these antibiotics as agents for the sterilization of free-living protozoa.

In the present investigation *Colpidium campylum* was used. Organisms from a wild culture were concentrated by centrifugation and were washed three times with sterile Hahnert's solution (*2*). A few drops of the washed concentrate were then added to a solution of sterile 3 per cent Difco proteose-peptone containing 5,000 units of penicillin[2]/cc. After being in the penicillin solution for 12 hours, the organisms were transferred through three successive washes of 3 per cent proteose-peptone. A drop containing organisms and culture fluid from the third wash was plated on nutrient agar. No bacterial growth was observed on any of the agar slants used in the 8 tests conducted. The colpidia were apparently uninjured by exposure for 12 hours to solutions containing 5,000 units of penicillin/cc.

It appears that this method may be used with success in obtaining sterile cultures of most protozoa. However, with each different species used, preliminary tests must be made to ascertain the length of time the organism will survive in a given concentration of penicillin. If the survival time is extremely short, lower concentrations should be used. Preliminary observations indicate that *Paramecium nucleatum* is killed in 12 hours in solutions containing 5,000 units of penicillin/cc., but remains in a vigorous condition for 5 hours in the same concentration.

The process described above does not require constant attention of the investigator, large numbers of organisms are recovered after the final wash, and the number of transfers is reduced to a minimum, thus reducing the possibility of contamination.

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[1] The author wishes to express his gratitude to C. G. Wilber for aid in the preparation of the manuscript.

[2] The penicillin used was supplied by Merck & Co., Inc.

A Monitoring Probe for Radiochemistry Laboratories[1]

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In order to detect contamination of equipment and to protect the health of workers in laboratories handling radioactive materials, it is necessary to have instruments capable of indicating small amounts of radiation at the working space and on the person and clothing of workers. Several excellent portable radiation meters are now on the market, but only the most recent ones are effective in detecting weak radiation, the older ones generally being designed for monitoring X-rays.

As Libby (*1*) points out, the isotopes emitting the least energetic radiation are among the most useful. By substituting a more sensitive GM tube for the one ordinarily furnished, older instruments easily may be changed to permit them to detect a fraction of these weak radiations large enough so that they may be of service in monitoring laboratories. Moreover, the housing for the GM tube described here permits using the tube at some distance from the meter, allowing more flexibility in monitoring and incidentally permitting any scaler to be used as a detector of contamination.

A thin-walled, silvered, self-quenching tube is mounted in a stainless-steel housing, provided with mesh-covered windows over the sensitive area of the tube. The use of stainless steel permits ready decontamination of the probe itself in case of contamination, a nitric acid wash being sufficient in most cases. Fig. 1 shows some of the constructional details of the

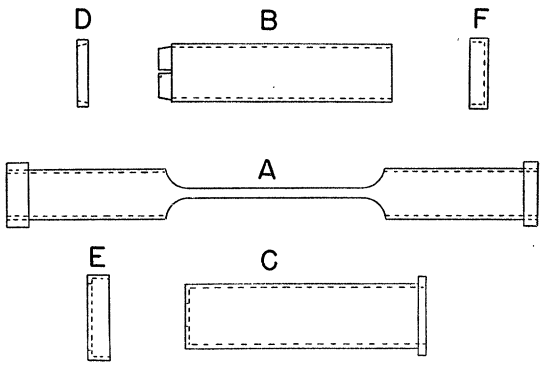

FIG. 1

probes used in this Laboratory. A, the body of the probe, is tubing, 10 inches long and 1 inch in diameter, which is attached to handle C by means of collar E. Tube B slides over A and can be secured in a position over the windows by tapered collar D. When not required in this position to protect the GM tube or to distinguish gamma from beta radiation, it is pushed back toward handle C. By making slide B $\frac{1}{16}$ inch thick, the original calibration (in R's/8-hour day) of a Herbach and Rademan Model GLR-200 Radiation Meter is sensibly unchanged when B covers the windows. With the slide open, the sensitivity of this meter is increased more than 10-fold for energetic radia-

[1] Research sponsored by the Office of Naval Research, Contract N-6 ori-47, Task Order No. 4.