it eliminates many of the difficulties attendant upon experiments involving hanging drop cultures.

CHARLES E. HADLEY

ZOOLOGICAL LABORATORY,
HARVARD UNIVERSITY

A MICRO-TECHNIQUE FOR OBSERVING OIL PENETRATION IN CITRUS LEAVES AFTER SPRAYING

THE rapidly increasing use of white oil of high viscosity in spraying for the control of scale pests of citrus has been followed in many instances by injurious effects, such as fruit drop, leaf drop, dead-wood, reduction of bloom and reduction of crop, etc.; hence the need for a careful study, by means of the microscope, of the penetration and disposition of oil within the plant tissue.

The problem presented several difficulties. The exigencies of the case precluded the employment of the ordinary solvents used in histological technique. It was necessary to fix or clear the specimen without disturbing or dissolving the oil. Consequently, the use of alcohol, xylol or any other of the essential oils was prohibited, as was also the paraffin method of imbedding which necessitates infiltration with chloroform or ether.

It was desirable to examine both flat sections, cleared and stained, and also fixed cross-sections. This has been accomplished by the use of an aqueous solution of pyridin to dissolve chlorophyll, and Oil Red O[1] dissolved in aqueous-pyridin as a stain.

The technique is substantially as follows:

For Flat Sections:

Immerse specimen in a 60 per cent. aqueous solution of pyridin (60 parts pyridin to 40 parts distilled water).

Heat over water bath. When discolored pour off and refill. Repeat till solution remains clear and specimen becomes transparent. (This can be conveniently done with the use of a small shell vial inserted through the center of a flat cork and floated on water bath.)

Immerse in saturated solution of Oil Red O in 70 per cent. pyridin (70 parts pyridin to 30 parts distilled water) for 24 hours.

Differentiate in 50 per cent. pyridin, until stain ceases to stream. (This takes but a few minutes.)

Wash in running water one hour or more.

Pass through, first glycerine water (equal parts). Second glycerine.

Clear in carbol-glycerine (1 part carbolic acid to 2 parts glycerine). Heat gently in watch glass and observe carefully under dissecting microscope till clear. Specimen should be turned under side up, when oil drops can be distinctly seen.

Pass through glycerine again. (This is important and prevents clouding on the slide.)

Mount in glycerine jelly. Allow to harden and seal with clear Duco.

For Cross-Sections:

Fix in chrome-acetic acid 48 hours.

Wash in running water.

Immerse in 5 per cent. formalin 1 hour.

Wash in running water.

Immerse in 50 per cent. pyridin 10 minutes.

Stain in saturated solution of Oil Red O in 70 per cent. pyridin 24 hours.

Differentiate in 50 per cent. pyridin until color ceases to stream. (Watch carefully.)

Wash in running water.

Section in pith. (The freezing method might be used to advantage but has not been tried.)

Pass through, first glycerine water (equal parts). Second glycerine.

Mount in glycerine jelly and seal with clear Duco.

The oil stains a bright orange to deep red, depending upon the length of time allowed for the staining process. Heavy oils take longer to stain than light. Essential oils, lipoids and other fatty bodies, as well as cutin, also stain but are readily distinguished from the oil. Essential oils are confined to certain well-defined oil cells; they do not occupy the intercellular spaces. Lipoids and other fatty bodies stain deep scarlet, almost black. Cutin stains yellow and, if oil soaked, orange to red.

By employing this technique the writer has been able to observe the penetration of oil into the leaf, its translocation through the vascular system into the stem and across the medullary rays to its final deposition in the storage cells of the pith and old wood fibers. Oils of high viscosity choke the vascular system, to a greater or less degree depending upon the amount of oil, for an indefinite period of time.

HUGH KNIGHT

GLENDORA, CALIFORNIA

[1] F. Proescher, "Oil Red O a Rapid Fat Stain," *Stain Technology*, Vol. 2: 60.

SPECIAL ARTICLES

ON THE STRUCTURE OF THYMONUCLEIC ACID

THE plant nucleic acid is regarded as a tetranucleotide, each nucleotide being composed of phosphoric acid, a sugar (ribose) and a nitrogenous component. The evidence for this theory of structure is complete, inasmuch as it was possible to decompose the nucleic acid into the individual nucleotides, and each of the nucleotides into phosphoric acid and the complex consisting of the sugar and a base.

For the thymonucleic acid an analogous structure was suggested. The evidence, however, was incomplete, since it was impossible to decompose by chemical means the thymonucleic acid in such a manner

as to obtain the complexes consisting of the sugar and bases. Such complexes are known by the name "nucleosides."

In the development of the theory of structure of the plant nucleic acid the nucleosides played a very important part inasmuch as they made it possible, on one hand, to explain the order of union between the individual components of the nucleotides, and, on the other, they afforded a way of isolating in pure state the sugar entering in the structure of the plant nucleic acid. It is evident that the isolation of the nucleosides from the thymonucleic acid will play an analogous rôle in the development of the theory of the structure of thymonucleic acid.

One of these nucleosides has now been isolated in perfectly crystalline form, free from mineral impurities. It is optically active; on hydrolysis it gives rise to a reducing substance and to the base guanine. The reducing substance does not form an osazone under the usual conditions. With Kiliani's reagent the substance gives a greenish-blue coloration which on standing turns to purple. The color is not identical with that described by Kiliani for his desoxysugar. The composition of the nucleoside, however, suggests the possibility of the sugar being either an anhydro- or a desoxyhexose. The theory of the guanine nucleoside of an anhydrohexose requires the following composition: C = 44.74, H = 4.41, N = 23.73. The analytical results found for our substance are C = 44.43, H = 4.41, N = 24.65. The slight discrepancies between the theoretical and the found values are easily explained by a slight admixture of the free base, inasmuch as it is known that nucleosides have a tendency to form complex salts with the free bases.

We request workers in the field of nucleic acids to leave for some time to come further work on this substance to our laboratory.

P. A. LEVENE,
E. J. LONDON

THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH, NEW YORK
November 28, 1928

*THE SPECTRUM OF IONIZED XENON (Xe_{II})

EXTRAPOLATING the separation of the lowest doublet ($^2P'_{2,1}$) of the spark spectra of the preceding rare gases, arising from the s^2p^5 electron configuration, has made possible the estimation of this separation in the first spark spectrum of xenon. The data of Abbink and Dorgelo[1] in the Schumann region have been examined and the doublet separation has been found to be 9621 wave-number units. The most probable classification of the combinations in this region of the spectrum is as follows:

Combination	λ	ν
$(s^2p^5)^2P_2' - (s^2p^4 \cdot 4s)^2P_1$	824.83	121237
$(s^2p^5)^2P_2' - (s^2p^4 \cdot 4s)^2P_2$	854.71	116999
$(s^2p^5)^2P_1' - (s^2p^4 \cdot 4s)^2P_1$	895.92	111617
$(s^2p^5)^2P_1' - (s^2p^4 \cdot 4s)^2P_2$	931.25	107383
$(s^2p^5)^2P_2' - (s^2p^4 \cdot 4s)^4P_1$	1003.36	99665
$(s^2p^5)^2P_2' - (s^2p^4 \cdot 4s)^4P_2$	1051.93	95063
$(s^2p^5)^2P_2' - (s^2p^4 \cdot 4s)^4P_3$	1100.46	90841
$(s^2p^5)^2P_1' - (s^2p^4 \cdot 4s)^4P_1$	1110.62	90039
$(s^2p^5)^2P_1' - (s^2p^4 \cdot 4s)^4P_2$	1170.43	85439

There is some evidence of other combinations both in this region and in the visible spectrum. The interval between the terms tentatively named ^4P and ^2P is abnormally large, and, although the identification of the former is fairly certain, the final interpretation of the latter is reserved until further data are available. Work is now in progress on a complete description and classification of the spectra of xenon. The authors are expecting to make a further report as soon as the investigation can be completed.

C. J. HUMPHREYS
T. L. DE BRUIN

THYROID-FED RATS AND HIGH ROOM TEMPERATURES[1]

DURING the progress of some experimental work on the effects of feeding desiccated thyroid glands upon the reproduction and lactation of the white rat, the results of which will be published in another journal, one experiment was terminated suddenly when all the thyroid-fed rats died as the result of room temperatures of 88° and 92° F.

A search through the available literature showed that Korenchevsky[2] had reported that "after long excessive thyroid feeding, warming may even be followed by a lethal overheating with a rise of body temperature to 43.5° C."

In view of the fact that 92° F. (33° C.) is considerably less than Korenchevsky's lethal temperature of 43.5° C., it was thought that it would be worth while to publish the following report at the present time.

We had found that, if the dosage of desiccated thyroid was increased a definite amount each time a female rat gained twenty-five grams in body weight, many of her litters were born dead and normal lactation was so interfered with that many or all

* Publication approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.

1 J. H. Abbink and H. B. Dorgelo, *Zeits. f. Physik*, 47, 221 (1928).

1 This research was aided in part by a grant from the Committee on Problems of Sex of the National Research Council.

2 V. Korenchevsky, *Journ. Path. and Bact.* 29: 461–472, 1926.