higher plants. However, the author has become more catholic in the selection of materials in this revision than in the original edition of "Plant Genetics." That title he recognizes as too narrow, inasmuch as "the fundamental principles of inheritance are the same in the two groups of organisms" and "it is necessary to use many of the results of animal investigation." The book is designed to be used as an elementary text, yet is provided with material for advanced students. It is one of the first elementary texts that has been issued; the "essentials" reduced to 200 pages. It is accompanied by numerous new diagrams. Altogether it is clearly the work of a teacher with hereditary capacity and long experience and will do much to help train a new generation of genetical students. As compared with Castle's "Genetics and Eugenics" (of which a new edition has just appeared) it is more of an elementary text rather than a compendium. It is less dominated by the author's viewpoint based on the personal researches of a lifetime; it lays more stress on plants and does not consider human material at all.

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SCIENTIFIC APPARATUS AND METHODS

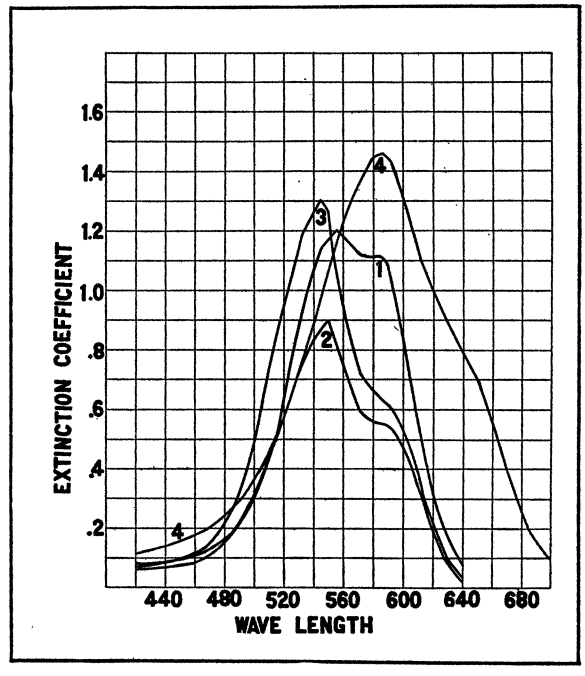
THE INVESTIGATION OF BIOLOGICAL STAINS IN THE COLOR LABORATORY OF THE BUREAU OF CHEMISTRY[1]

THE chemical investigation of stains in the Color Laboratory is undertaken in cooperation with the Commission on Standardization of Biological Stains, of which one of the authors is a member.

In determining the dye content of samples, both the spectrophotometric method and titration with titanous chloride have given general satisfaction, while alternate methods of analysis have been developed in specific instances. In establishing the essential chemical character of samples or determining, so far as is possible, the identity and relative proportions of all coloring matters present in appreciable quantities, spectroscopic examination has proved particularly convenient and effective.

An examination of twenty-five samples of basic fuchsine showed a wide range of chemical variation, attributable to differing views of manufacturers as to the relative effectiveness of the three basic fuchsines listed by Schultz for general or specific application. The relative degree of methylation of these dyes constitutes the principal factor of chemical variation for the determination of which reliable spectrophotometric methods have been developed. Collaborative investigations of the staining characteristics of a variety of typical fuchsines, of which the identity has been established in this manner, are now being undertaken. The results obtained in these tests should do much to dispel the present uncertainty as to the specific utility of the different constitutional types of the stain.

The preliminary examinations of the samples of cresylecht violet used by Williams in his investigation on the staining of tissues,[2] and of another sample of Grübler product proved illuminating. The Grübler stains contained variable proportions of a red and of a violet dye, whereas the same violet dye, free from admixture with other dyes, was present in the American stain. It was clearly demonstrated that the effective staining agent in the application of the stain made by Williams was the violet dye. It re-



CRESYLECHT VIOLET

(1) = Williams' original Grübler stain—100 mg. dye per liter.

(2) = Williams' second Grübler stain—100 mg. dye per liter.

(3) = A third Grübler stain —100 mg. dye per liter.

(4) = Williams' American (No. 1197)—100 mg. dye per liter.

Solvent = buffered aqueous sol. (pH 6.5) 1 cm. layer.

[1] 98th contribution from the Color Laboratory, Bureau of Chemistry, Washington, D. C.

[2] *J. of Lab. and Clin. Med.*, Vol. VIII, No. 4, January, 1923.

mains for further investigation to determine whether the red dye, which is the principal constituent of the imported products examined, is of use in any connection.

Between forty and fifty samples of methylene blue have been examined. The great majority have proved to be of normal chemical type. In a number of instances, however, the presence of considerable quantities of dyes other than methylene blue was established. The spectrophotometric evidence indicated that such products were probably prepared from methylene blue by treatments similar in type but milder in degree than those employed in the manufacture of certain American methylene violets and azures. Since these products have proved to be excellent stains, the determination of the constitution of the component dyes and their preparation in a pure state will be undertaken as opportunity is afforded.

The most difficult phase of the work before the laboratory is the differentiation of products of normal type in which the minor variation involved is in respect to the subsidiary dyes produced by the side reactions which are unavoidable in the manufacturing processes. It remains to be demonstrated whether or not such minor variations affect the performance of stains appreciably.

Many samples of methylene blue, basic fuchsine, acid fuchsine, eosine and safranine and a few samples of methyl green, cresylecht violet and thionine have been examined. Of these over thirty have been of pre-war *Grübler* origin and about one hundred of recent American manufacture. The investigation has been sufficiently comprehensive, accordingly, to provide an adequate basis for a comparison of the chemical characteristics of pre-war stains and the corresponding products now marketed in this country.

In general, the American stains have contained from two to four times as much dye as the corresponding pre-war products. The commission has made a reasonably high dye content one of their specifications for stains which shall be suitable for their "certification." Apart from protecting the economic interests of purchasers, such specifications will promote uniformity in performance.

Although it has not been considered necessary to carry out a systematic determination of the insoluble matter in the stains examined, it has been noted repeatedly that pre-war stains contained quantities of insoluble residue (principally tarry material) which were abnormal, even if the deficiency in dye content was not taken into consideration.

Several pre-war stains contained dyes of types which precluded the possibility of natural origin in the manufacture of the stain, in quantities which were too large to have resulted from accidental contamination in mixing and grinding and too small to make it probable that they were added with the intention of modifying the staining characteristics of the stain. Since products of this type are of frequent occurrence in textile dyes, with which it is of the greatest importance to maintain precise standard shades, the conclusion that the stains in question were prepared from textile products appears warranted.

Large proportions of auramine were found in two pre-war safranines and large proportions of fluoresceine in two pre-war eosines. Several pre-war methylene blues were of the abnormal character to which reference has already been made. In each instance the labeling of these mixtures was identical with that of other pre-war products of normal chemical characteristics. The propriety of marketing mixtures of dyes may be questioned, unless their components are not available in relatively pure form. The label should invariably warn customers of the character of such products.

Many of the earliest stains of American origin were reasonably satisfactory, and the general improvement in the subsequent output has been marked. Most American manufacturers have given the commission active cooperation in its effort to develop superior products.

It is the aim of the commission to provide a certification of satisfactory stains (whether of American or foreign origin) which will insure products of relatively excellent and uniform chemical characteristics, as well as of tested performance. It is believed that such a certification will make feasible a corresponding standardization in technic and result in establishing biological staining on a more satisfactory basis.

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SPECIAL ARTICLES

THE EFFECTS OF DISLOCATION OF THE EYE UPON THE ORIENTATION OF THE GOLDFISH

(Carassius Auratus)[1]

THE eye, the semicircular canals and the lateral line have been invoked by various biologists to explain the facile orientation of the fish. The following experiment was devised in order to determine, if possible, what part vision performs in this orientation. The eyes being normally in the lateral position, it was

[1] Preliminary Report from the Hull Physiological Laboratory of the University of Chicago.