seas on five occasions—in Canada three times and in Australia and South Africa each once. The York meeting for 1881 was a jubilee, the fiftieth anniversary of the original York meeting. An appendix to the volume presents dates and places of all the meetings, together with biographical notes on the presidents.

Besides holding the annual meetings, the British Association has been active in the initiation of many pieces of research and in the support, through grants, of very many more. A list of grants made in support of research, for the period from 1834 to 1921, is given in an appendix. The association has successfully called the attention of the government to various scientific needs from time to time. It has received some government help, but "to voluntary service in the interests of science the whole record of the British Association stands as one great memorial. Every word spoken at its meetings, every page of its annual reports, represent voluntary effort on the part of individual 'cultivators of science.'"

BURTON E. LIVINGSTON

SAFRANIN AND METHYL GREEN

IN a report last summer made by the Committee on the Standardization of Stains it was stated that good success had been obtained in securing satisfactory samples of almost all the important biological stains with the exception of safranin and methyl green. It is very encouraging now to be able to report satisfactory sources of both of these stains.

Safranin has proved a difficult stain to secure in exactly the right quality, because one is desired which will contrast with both gentian violet and with orange G when used in the Flemming triple stain. The products on the market two years ago when the first samples were collected were generally the textile safranins without much modification and proved to be of too blue a shade to contrast with gentian violet. A sample of Grübler's safranin was compared with them at that time which seemed to give good results, and one manufacturer agreed to duplicate this for the committee. This particular Grübler sample proved, however, to be a mixture of safranin and auramin; and when the American manufacturer made a similar mixture, the resulting shade was found by some of the investigators to be too yellow to contrast with orange G. In one of the laboratories where it was tested, however, it was found to be entirely satisfactory for the particular purpose for which it was used, and it is felt that this mixture may well have its value but should not be sold as a safranin. The matter was in this state when it was finally referred to the National Aniline Company. They have now prepared a safranin which is very pure and considerably more concentrated than any which has before been put on the market. It has been reported upon in the highest terms from every laboratory except the one where best results were obtained with the mixture of safranin and auramin. It seems to give satisfactory results in the Benda stain with light green, also in contrast with both orange G and gentian violet and appears to be identical with the best of the pre-war Grübler safranin O, except that it is more concentrated.

Methyl green is used quite largely in the Pappenheim stain together with pyronin; but it is also used by botanists in staining plant tissue and by zoologists as a chromatin stain, and for staining living protozoa. The first samples of this stain obtained in this country were apparently either methylene green or methyl green with violet impurities, probably methyl violet. Of the samples obtained in the original investigations of the committee none proved very satisfactory; but last summer a sample was obtained from the Providence Chemical Laboratories of Providence, R. I. which has proved as satisfactory as the samples of Grübler's methyl green with which it has been compared. More recently a series of three samples, each one purer than the preceding, have been sent to us from the National Aniline Company. The first sample proved unsatisfactory; the next one submitted proved of good quality, while the most recent sample submitted seems to be one of the purest samples obtainable. There is still some question, however, which of these methyl greens is actually the most satisfactory when judged from the standpoint of performance. Although one laboratory has reported in highest terms of the purest of these samples, two other laboratories found best results with one of the

less pure methyl greens. It is not impossible that some of the impurities present in Grübler's methyl green may have been of special value in staining. If this is the case, it is plainly the problem now for biologists in cooperation with the manufacturers to find out what these particular impurities were. Meanwhile it seems safe to recommend any one to buy a methyl green from either of these two companies, in as much as their methyl greens are evidently as good as any obtainable at the present time.

The findings obtained in this investigation have been very interesting in showing the amount of variation in different lots of Grübler stains. Before obtaining the satisfactory American sample of safranin O, mentioned above, data were secured concerning the properties of two different Grübler samples. One proved to be actually safranin O, but with considerable inert material (dextrin). The other proved, as stated above, to be a mixture of safranin and auramin, and contained fully 90 per cent. dextrin. Although considerable variation has been found in the samples now on the market in this country, no two samples of safranin have been found differing from each other to such an extent as these two samples, one imported before the war, the other during the war.

Attention is called to this fact to show that standardization can not be obtained by going back to imported stains. There is, moreover, very good reason to believe that the imported stains now on the market are still different. Investigation of this point is in progress at present. Meanwhile we have learned of one well-known German laboratory which has just ordered stains from America, with the comment that the European products are now very unsatisfactory.

H. J. CONN
Chairman, Commission on the Standardization of Biological Stains
GENEVA, N. Y.,
FEBRUARY 20, 1923

SPECIAL ARTICLES

FURFURAL AS A BIOLOGICAL REAGENT

IN spite of its wide range of solvent power, preserving qualities and rapid penetration of tissues, furfural has remained until recently a chemical curiosity, its properties and even its appearance practically unknown even to many who have frequently employed it. Investigations concerning its uses as a biological reagent have been wholly confined to its physiological effects. This is perhaps due to the fact that until recently it has not been manufactured in commercial quantities, being little used in the industries. Now, however, the "Miner Laboratories" of Chicago have developed a process of manufacturing furfural from oat hulls which are obtained in large quantities as a by-product in several industries. At the same time several commercial uses have been developed in the manufacture of resins, varnishes, rubber, dyes, perfumes, anesthetics, antiseptics and germicides. Thus larger demand and increased efficiency of manufacturing process have made possible the reduction in price to a point where it bids fair to become the cheapest aldehydic body commercially available.

Furfural is an aldehyde of deep amber color and a pungent odor, having the formula C_4H_3OCHO, which, in general, resembles the reactions of benzaldehyde on the one hand and formaldehyde on the other. It differs from either of them in being a liquid of very high boiling point and wide range of solvent power. As a biological reagent its chief interest lies in the fact that its properties closely resemble those of formaldehyde, suggesting its use as a preservative, and secondly its wide range of solvent power including most of the coal tar dyes, hæmatoxylin, alcohol, xylol, toluol, benzole, balsam and parlodion, suggesting its possibilities as a vehicle for stains as well as a general reagent in micro-technique; and thirdly, its reaction with acids forming resins, suggesting its use as an injection fluid.

In connection with current laboratory procedure we have had occasion to test out furfural in these three fields and the results are herewith reported.

The qualities of furfural as a preservative were investigated for a period of four months on several animals used in the laboratory for dissection purposes, such as cats, frogs, fish, mussels and some plant forms. Although H. McQuigan ('22) has shown the germicidal and toxic properties of furfural to be less than that of formaldehyde it has nevertheless been adequate to preserve these specimens in good