of America will hold its fifteenth annual meeting on May 31 and June 1 at Xavier University, Cincinnati. The chairman of the section is Professor Arthur C. Ruge, of the Massachusetts Institute of Technology, and the secretary is Professor William A. Lynch, of Fordham University.

THE tenth annual summer Research Conference of the Johns Hopkins University will be held at the Henlopen Hotel, Rehoboth Beach, Delaware, from June 3 to 7 and 10 to 14. The first week will be devoted to various aspects of biocatalysis; the second to some fundamental topics concerning organic reactions. The conference affords an opportunity for a group of specialists to discuss informally various fundamental topics in biochemistry and in organic chemistry. The attendance is kept sufficiently small to allow all present to participate in the discussions. The schedule of the various sessions is so arranged as to leave time for taking advantage of the many recreational facilities, including surf bathing, golf, fishing, boating and tennis. Further information may be obtained from P. H. Emmett, The Johns Hopkins University, Baltimore, Md.

DISCUSSION

COLOR EFFECTS OBSERVABLE FROM FLUORESCENT LAMPS

IN the April 12 number of SCIENCE for this year, page 357, Scull, Grosscup and Witting draw attention to an "Apparent Splitting of Light from Fluorescent Lamps into Component Parts by Moving Objects." When for instance a wire which had been made to vibrate by a magnetic field produced by 60 cycle current, was illuminated by a "daylight" fluorescent lamp operated also on 60 cycle, they observed two images of the wire, one red and the other blue. This effect and other similar ones they ascribed to the possibility that there are differences in the time intervals of emission of light of various wave lengths from the lamp.

This suggestion is close to an explanation based on observations of the emissive characteristics of phosphors. The fluorescent lamp utilizes a low pressure mercury discharge to excite fluorescence from phosphors coated upon the walls of the bulb.[1] For "daylight" radiation, a mixture of various phosphors is used, each contributing fluorescence of a different color and covering such a spectral range that their combined emission overlaps to give a fairly smooth curve throughout the range of visible light. This curve, however, represents purely their predominant fluorescent emission. At specific points in the cycle of a-c operation, distinctive colors are observable, due to peculiarities in the emissive characteristics of the individual phosphors present in the lamp. Phosphors in general exhibit two types of emission. The first occurs during the period of excitation and the light emitted can be termed fluorescence. When the source of excitation is removed, there is a continued emission of light, but this is of the second type termed phosphorescence. It is characterized by widely different rates of decay depending upon the phosphor involved. Fonda[2] and Johnson and Davis[3] have measured these rates for some typical phosphors and have found that there is a corresponding variation in the rate of pick-up of fluorescence during the period of excitation. A phosphor for instance which shows a slow decay in its phosphorescence shows a correspondingly retarded development of its fluorescence. Another phosphor, characterized by such a rapid decay that its phosphorescence is negligible, is capable of immediate, full response to the exciting light.

In the case cited of the vibrating wire illuminated by the radiation from a mixture of phosphors present in the "daylight" lamp, the blue image would have the color of fluorescence emitted by the phosphor whose response to excitation was most rapid. It would correspond to a point of rising potential in the a-c cycle. The red image on the other hand would be that observable at zero potential and would be produced by the phosphorescence from the phosphor having the slowest rate of decay. These two phosphors when examined separately would be found to fluoresce respectively near the blue end of the spectrum and near the red end.

The other effects noted by the authors can be explained similarly.

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[1] Inman and Thayer, *Elec. Eng.*, 57: 245, 1938.
[2] Fonda, *Jour. Applied Phys.*, 10: 408, 1939.
[3] Johnson and Davis, *Jour. Optical Soc. Amer.*, 29: 283, 1939.

MERCURY POISONING

MOST experimental scientists have become so accustomed to handling mercury in calibrations, manometers, pumps, etc., that they no longer think of it as a poison, yet under certain circumstances mercury may become a source of serious chronic illness. Vaporization of mercury occurs rapidly at room temperatures and one cubic meter of air saturated with mercury vapor at 25° C. contains 19.5 mg of mercury. When a stream of air passes at the rate of one liter per minute over a 10 cm² surface of mercury at 25° C. it becomes about 15 per cent. saturated,[1] containing ap-

[1] P. A. Leighton, private communication, "Concerning Mercury Vapor."

proximately 3 mg of mercury per cubic meter. This much mercury may accumulate in the air of a closed laboratory where numerous droplets of mercury, spattered during the course of manipulations, are present in cracks in the floor and furniture and where open vessels of mercury are kept. Prolonged exposure of some individuals to as little as 0.01 mg of mercury per cubic meter of air[2] and of many individuals to 0.25 mg[3, 4] results in chronic mercury poisoning. Although the content of mercury in the air inhaled is low, a portion of the mercury is retained,[3] and, since air is inhaled at the rate of approximately a cubic meter per hour and the mercury is only slowly voided, the amount in the body soon accumulates beyond tolerance limits.

The biographies of some famous physicists and chemists, such as Faraday and Pascal, show that they were sufferers from chronic mercury poisoning without being aware of the nature of their illness.[2] Victims of mercury poisoning show, among other symptoms, irritability, headaches, catarrhal troubles and recession of the gums. These symptoms may not develop until several months after the exposure and may persist for years.

Small amounts of mercury in the dust of laboratories where mercury has been handled may be detected in a number of ways[5] and may be demonstrated visually by the use of a mercury resonance lamp and a screen of anthracene.[6] The sweepings from such a laboratory are placed in a beaker and warmed and the beaker is then interposed between the source of light and the screen; since the light is mainly of λ2537A and this wave-length is strongly absorbed by the mercury vapor, one can actually "see" the vapor rising from the beaker.[6] If the resonance absorption of mercury were in the visible instead of the ultra-violet, the indifference with which many laboratory workers treat mercury would be replaced by extreme care.

Certain precautions will readily insure one against mercury poisoning: (1) All containers with mercury should be tightly covered. (2) Mercury should always be handled in a container to catch spattered droplets. A satisfactory container is easily made by bending in the edges of a sheet of wrapping paper and fastening the corners with paper clips. On completing manipulations droplets of mercury on glassware used may be easily brushed off with a feather. The stray mercury may be returned to the stock by inclining the paper container and puncturing the corner over the stock bottle. (3) If a room has been previously contaminated with mercury, all cracks should be cleaned by means of a suction pump with trap and tube and the laboratory should be well ventilated each time before use. This is especially urgent if the room has no windows and if the temperature is relatively high. (4) Finally, one should avoid getting mercury onto his clothes and skin and should thoroughly wash his hands, including the nails, after handling mercury. This note merely calls attention to the necessity for precautions in handling mercury; for discussion of mercury poisoning the reader is referred to Goodman[5] and the literature cited by him.

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[2] Stock, *Zeits. angew. Chemie*, 39: 461, 1926; 42: 999, 1929.
[3] Fraser, Melville and Stehle, *Jour. Ind. Hyg.*, 16: 77, 1934.
[4] *U. S. Publ. Health Service Bull.* 234, 1937.
[5] Goodman, *Rev. Sci. Instr.*, 9: 233, 1938.
[6] Leighton and Leighton, *Jour. Chem. Educ.*, 12: 139, 1935.

IS SULFANILAMIDE BACTERIOSTATIC UNDER "ANAEROBIC" CONDITIONS?

RECENTLY R. H. Broh-Kahn[1] presented data which he interpreted as demonstrating "the bacteriostatic action of sulfanilamide under anaerobic conditions." Utilizing a medium of inorganic salts and lactate devised by Quastel, Stephenson and Whetham,[2] Broh-Kahn observed no bacteriostasis with sulfanilamide under aerobic conditions. When air was completely excluded, however, bacteriostasis could be demonstrated by the addition of nitrate to this medium.

At first glance, this would seem to demonstrate bacteriostasis by sulfanilamide under anaerobic conditions. Nevertheless, as Quastel, Stephenson and Whetham explicitly state, *E. coli* cultivated with lactate and nitrate in the absence of air actually grows aerobically, the lactate being oxidized by the nitrate which is reduced to nitrite. "It is generally accepted to-day that the biological significance of the reduction of nitrate is that by it oxygen is supplied to an organism when free oxygen is no longer available." Furthermore, when one applies the reduction of methylene blue as a criterion of anaerobiosis, Broh-Kahn's data will be seen to support the view that anaerobic, reducing conditions interfere with sulfanilamide bacteriostasis.[3, 4] Applying this test to the conditions used by Broh-Kahn, methylene blue was introduced, either initially or after growth had occurred, into cultures of *E. coli* in the media of Quastel *et al.* In Table I are summarized the results of these experiments together with the data reported by Broh-Kahn.

The table shows clearly, as pointed out by Quastel, Stephenson and Whetham, that in the simple lactate medium reducing conditions prevail. Here sulfanilamide has no effect. In the "anaerobic" lactate-nitrate medium in which the methylene blue remains unre-

[1] R. H. Broh-Kahn, SCIENCE, 90: 543, 1939.
[2] J. H. Quastel, M. Stephenson and M. Whetham, *Biochem. Jour.*, 19: 304, 1925.
[3] C. L. Fox, Jr., B. German and C. A. Janeway, *Proc. Soc. Exp. Biol. Med.*, 40: 184, 1939.
[4] C. L. Fox, Jr., *Am. Jour. Med. Sci.*, 199: 487–494, 1940.