fundamental physiological interest; and it is only natural that the chief treatise in this field, Freundlich's "Kapillarchemie," should devote much space to physiological considerations. Sir William Bayliss' little book gives a highly interesting and individual—if necessarily incomplete—account of the physiological importance of interfacial phenomena. He characterizes protoplasm as "a heterogeneous system of many phases, solid and liquid, separated by membranes of whose internal arrangement little is known"; and he favors a conception of "ultra-microscopic reaction-chambers, bounded by reversible semi-permeable membranes." In the first four chapters (occupying more than half of the book) he reviews briefly heterogeneous systems, surface-tension, adsorption and colloids. The importance of adsorption is especially insisted upon; the influence of electrolytes and of surface-charge on adsorption, chemical effects dependent on adsorption, the influence of the accompanying orientation on the reactivity of the adsorbed molecules and the rôle of adsorption in enzyme processes are considered in some detail.

Bayliss regards adsorption as a chief factor in the behavior of all colloidal systems; accordingly he deprecates the neglect of all but purely chemical considerations in the treatment of the colloidal behavior of proteins. To him the distinction between "classical" and "colloidal" chemistry is an imaginary one; naturally the chemical behavior of proteins is in accordance with their amino-acid constitution; but in addition they exhibit characteristic physical features of behavior which can only be explained by reference to adsorption and variation in state of aggregation. The characteristic lyotropic series (Hofmeister series) are the expression of such factors, which are superposed on the purely chemical. The problem of the hemoglobin-oxygen equilibria is discussed briefly in a separate chapter; Bayliss believes that the heterogeneous character of the system has been insufficiently considered, and that this may account in part for the anomalies in its chemical behavior.

There is an interesting brief discussion (pp. 124 ff.) of the possible rôle of adsorption in the metabolic reactions of protoplasm and especially in synthesis. Orientation of molecules at the protoplasmic interfaces may be a means of bringing reactive groups into conjunction. If water is less adsorbed than the interacting molecules it may be displaced from the surfaces; regions relatively free from water may thus originate, and the conditions for dehydrolytic synthesis (*e.g.*, of esters) be furnished. The need for a low concentration of water at the site of many syntheses, including that of protein, is apparent. Here it may be recalled that in many unfertilized egg-cells a temporary dehydration (by hypertonic sea-water) is an essential condition for the artificial initiation of development, a process evidently based on the synthesis of new structure-forming compounds.

The properties of plasma membranes are considered briefly, and the problem of varying permeability, with its relations to the bioelectric processes and stimulation, is reviewed. A brief but suggestive chapter is devoted to the phenomena of muscle, nerve, gland, lymph-formation, stimulation and the action of drugs; these are considered especially in their relation to membrane processes.

In the concluding chapter the author expresses his hope that the future will see an extensive development of physiology as a pure science; he believes that biophysics and biochemistry should be cultivated side by side, in close association with the study of fundamental physical principle.

Physiology owes much to Sir William Bayliss and will honor his memory. His was a generous, many-sided, independent and creative spirit.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLIFIED RAINPROOF VALVE FOR POROUS PORCELAIN ATMOMETERS

THERE are many ways for operating porcelain atmometers, and all are good in various peoples' hands. Workers in ecology, forestry, horticulture, etc., who employ the Livingston porous porcelain atmometers may be interested in a new modification of the mercury valve recently used by the writer. A résumé of a number of different forms of mercury valves for this instrument has been given by Thone.[1] The modification here described has been found more satisfactory for field work than any of those previously presented in the literature.

A glass closely bent J-tube with long arm about 20 cms and short arm about 4 cms long of barometer tubing (internal diameter 2 or 3 mm, external diameter 6 or 7 mm) is used to connect the porcelain piece (sphere, cylinder, etc.) with the reservoir, the bend being in the water below. The usual stoppers, one for the porcelain piece and one to fit the reservoir bottle, and provided with suitable air inlet, properly guarded to prevent the entrance of rain water, are slipped on the long arm and properly placed. The neck of the bottle must be large enough to admit the J-bend and the latter should be as narrow as possible,

[1] Thone, F., "Rainproofing valve for atmometers," *Ecology*, *5*: 408–414, 1924.

so as to allow readings to be more precise than can be made with a wider neck. To the short arm of the tube is temporarily attached a 30-cm flexible rubber tube provided near its free end with a Mohr cock or similar device for closing. Both tubes are completely filled with distilled water (by means of a small funnel or thistle-tube attached to the free end of the rubber tube) and the cock is closed. Next, the porcelain piece is filled with distilled water and the free end of the J-tube is inserted, the rubber stopper being forced firmly into place in the usual way. The whole assemblage is now reversed and held upright with the J-bend below. In this manner it is lowered into the reservoir, which is nearly filled with distilled water until the short arm of the J is below the water, then a drop or two of mercury is introduced into the open end of the rubber tube, and the cock is opened. The mercury drop falls to the glass J below and forms the valve in the same general manner as in several mountings previously described. The rubber tube is now pulled off and removed, and the J-tube is lowered farther till it nearly reaches the bottom of the reservoir. The reservoir stopper borne on the tube is firmly set into place, and the operation of installing is complete except for the subsequent filling the reservoir to the index mark in its neck. The amount of water entering the reservoir for a complete reversal of the valve[2] is not more than .05 cubic centimeters.

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SPECIAL ARTICLES

THE PHOTOCHEMISTRY OF COD LIVER OIL

WHEN Kugelmass and McQuarrie suggested recently[1] that oxidation of cod liver oil gave rise to ultra-violet radiation, the present writers were inspired to the extent of searching for other substances of biochemical or therapeutic interest which, when oxidized, might be persuaded to yield evidence of luminescence by prolonged exposure to sensitive plates. We were more disposed to this research by the encouraging reports of Steenbock[2] on the antirachitic value of radiated foodstuffs, in which he quotes the above results, presumably in support of the probability of his findings. More recently Manville[3] has quoted them in a similar connection.

We have been unfortunate in not being able to find the substances for which we sought, nor have we been able to duplicate the results reported on cod liver oil, with satisfactory controls. We are publishing our work, however, for the use of those who may incline, as we did, toward an attractive interpretation of such findings, the further investigation of which has considerably disillusioned us.

We used Cramer instantaneous iso plates, each plate cut into four quarters just before exposure, one of which was used as a control. In certain of the experiments we bathed the plates in Nujol mineral oil, to sensitize them to ultra-violet of 2,300 to 1,900 Å U[4] checking against unsensitized parts of the same plate. We have also employed preexposure of the whole plate, before cutting, placed at one half meter from a light ruby lamp behind a ground glass screen, for ten seconds. This accomplished an exposure just sufficient to cause a slight fog with normal development; the next increment of exposure, during the experiment, was then several times more effective than the same exposure of the plate without preexposure. Except for this procedure plates were handled in complete darkness until development outside the direct beam from a safe red light.

Our experiments were performed in a light-proof box in the dark room, using Vitreosil five eighth inch test tubes as containers for the test material. Between the test tube and the plate was interposed a glass screen, with a hole or slit through which it was hoped to obtain the effects of ultra-violet radiation. Our first box, of wood, was painted on the inside with asphaltum. The tubes were thrust through holes in the cover, one half inch from the plate covered by the screen. In this box we obtained wonderful images of the slits, whether any cod liver oil was put in the tubes or not. We then transferred operations to a bright copper box, fitted with holders that facilitated manipulation, each tube and its corresponding plate being in a separate compartment. The screens used at this stage consisted of two plates of glass the edges of which were separated one fourth inch, and which were fastened together with two narrow cross

[2] Harvey, E. M., "The action of the rain-correcting atmometers," *Plant World, 16*: 89–93, 1913.

[1] Kugelmass, E. N., and McQuarrie, I., SCIENCE, Vol. 60, No. 1551, Sept. 19, 1924.

[2] Nelson and Steenbock, *J. B. Chem.*, Vol. 62, p. 577, 1925.

[3] Manville, *Jour. A. M. A.*, Vol. 84, No. 19, p. 1401, 1925.

[4] Dr. Samuel Pond, of this institution, informs us that Nujol sensitized iso plates without preexposure have the same sensitivity as, or greater than, the Schumann plates, from the beginning of the gelatin absorption range (2300 Å U) to the quartz absorption range (1900 Å U). (Lyman, T., SCIENCE, July 20, 1921, p. 48.) From 2,300 to 3,500 A U the sensitivity of iso unsensitized plates is equal to or better than the Schumann. (Harrison and Hesthal, *Journ. Opt. Soc. of Am.*, 1924, Vol. 8, p. 482.) We wish to thank Dr. Pond for valuable advice throughout the photographic procedure.