Ostensibly the purpose of Mr. Bryan's outpouring of idiotic contempt for science and learning was to assert the glory of man, to prove that he came "from above" and is created in the image of God. We have never read a more blasphemous speech than Mr. Bryan's. For the whole purport of it was to hold up to ridicule and contempt, to discredit and malign, the one achievement of man that most clearly distinguishes him from all the rest of the animal kingdom. For surely if man is distinct from the other animals the distinction lies in his creation of science, in his power to extend his understanding of the universe. Mr. Bryan cries out that the wicked scientists are robbing man of his sublime ancestry. Mr. Bryan is robbing man of all sublimity now. For when, pray, does man rise to a greater dignity than when a Copernicus, a Newton, a Darwin or an Einstein makes some part of the universe intelligible? Has man a greater dignity when he makes political speeches for big fees and plays upon the fears of the ignorant?

The assumption that righteousness as well as divinity is a monopoly of Mr. Bryan's fundamentalist friends is an impudent conceit. Mr. Bryan talks as if he, for example, were a better man, better morally, than the scientists upon whom he pours his contempt. They won't answer him, but the answer can and should be made for them. The answer is this: to contribute successfully to the progress of science requires more integrity of mind, more purity of heart, more unselfishness, more devotion, more unworldliness, than any other kind of human activity. The work is harder, the standards are higher, the discipline is more rigorous, than men like Mr. Bryan have ever dreamed of demanding of themselves.

There are quacks and knaves among scientists, to be sure, but among the men who are really doing the work of science a moral code exists and is followed which would put the rest of us to shame. The search for truth. That is a simple phrase, but the labor, the care, the patience and the exactness which it requires are something beyond the comprehension of a man who has lived by flamboyant speeches. Has Mr. Bryan ever conceived, while he was on the Chautauqua as Secretary of State, or selling real estate in Florida, the quality of soul that is needed to induce a man to work thirty years over a microscope and then give his results, without a penny for himself, to all mankind?

The whole thing is beyond his ken. But at least he might be silent in the presence of men who are doing, if any men are doing it, the work God gave men brains to do. God did not make the human reason solely for use on the lecture platform. If the human reason has any purpose which may be called divine, that purpose is the full, free and fearless use of reason to understand the mysteries of the universe. —*The New York World.*

SCIENTIFIC BOOKS

Interfacial Forces and Phenomena in Physiology. By Sir William M. Bayliss. E. P. Dutton & Co., New York, 1923. 196 pages.

With the advance in our knowledge of the processes of living matter has come an increasing appreciation of the degree to which the underlying chemical reactions are controlled by the special physical structure of the protoplasmic system. Perhaps the most remarkable feature of the reactions determining the response of an irritable cell to stimulation is their susceptibility to electrical control; with this is associated a special sensitivity to the presence of surface-active compounds of all kinds. The general significance of these facts and their bearing on the problem of the structure of protoplasm have only recently been appreciated. Electrical sensitivity and narcotizability are universal properties of protoplasm.[1] These properties, however, are clearly based on surface-processes—the former depending on changes in the electrical polarization of interfaces (as Nernst first showed), and the latter on the displacement of reactive compounds from the protoplasmic surfaces (see especially Otto Warburg's recent work). The dependence of the metabolic reactions on protoplasmic structure thus appears to be essentially a consequence of their dependence on surface-conditions. Protoplasm is a colloidal system, bounded and partitioned by films with diffusion-proof or semi-permeable properties; hence it is a system in which the phenomena characteristic of surfaces or interfaces are exhibited in a highly developed form. Irritability, contractility, electrical and chemical sensitivity, distance-action (transmissivity) are now seen to be expressions of this all-pervading rôle of surface-forces in protoplasmic activity. There is also every indication that normal growth (which is similarly electrically sensitive and narcotizable) is based primarily on the deposition of structure-forming material at the protoplasmic interfaces. This view implies that a concentration or deposition under the influence of surface forces, in other words a process of adsorption (which is essentially oriented attachment of molecules to surfaces), plays a controlling part in the formation of new organized structure; at least it is difficult to conceive of any other physical means of securing the necessary structural regularity.

The manner in which chemical reactions in polyphasic systems are influenced by the special conditions at the phase-boundaries is evidently a subject of

[1] This was recognized by Claude Bernard in his "Leçons sur les phénomènes de la vie," and elsewhere.

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 semipermeable 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.