

The difference in the constant b which exists between poikilothermic and homiothermic organisms seems to indicate that the protoplasmic viscosity is regulated with regard to the thermal adaptation of a given species.

Any biological reaction is a complex of many physical and chemical processes forming a chain. In determining the temperature coefficient of such a complex, we in effect determine the temperature coefficient of only one of the underlying processes, namely, that which is least accelerated by rising temperature and is therefore the limiting factor of the whole complex (Blackmann's and Pütter's principle). In the majority of cases, however, the rate of molecular diffusion in the protoplasm is the limiting factor (see W. M. Bayliss²⁵). As the rate of diffusion depends on the viscosity of the reacting system, our hypothesis is justified also from a purely physico-chemical point of view.

Thus the protoplasmic viscosity may be studied by simply measuring the effect of temperature on any biological reaction in which the new formula holds good. Further investigations will show whether this way of determining the protoplasmic viscosity would be not only less injurious to the living system, but also more accurate than the existing methods of protoplasmic viscosimetry (see F. Weber²⁶).

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August 12.

Science and Psychical Research.

HAVING read with interest the correspondence in recent issues of NATURE arising out of Dr. Tillyard's article on Sir A. Conan Doyle's "History of Spiritualism," I beg space for the following remarks which I shall try to confine so far as possible within the editorial limits stated in the issue of September 11 to be the main point of the reviewer's article of July 31, namely, "that scientific men generally presented an unscientific attitude to the subject of psychical research." But Dr. Tillyard in his article appears to prefer the substitution of the term 'supernormal phenomena' to the term 'subject of psychical research.' Therefore my remarks will deal almost wholly with that department of 'psychical research' which concerns itself with such supernormal phenomena as may be included under the head of *accounts given of communications between living persons and the 'discarnate' spirits, or 'intelligencies,' or 'ghosts'* of those who are normally called the dead, and thus omit here all reference to much of the material studied by the Psychical Research Society, for example, telepathy, etc., as quite irrelevant to this correspondence.

All the statements regarding the above-named accounts hitherto published and believed to be true by some of all descriptions of persons, including such as are or have been students of various branches of science, lack any evidence of a character which could make possible their submission to strict scientific investigation, the requirements of which I need not repeat in these pages. In this statement I include all the accounts given or referred to by Sir A. C. Doyle or his reviewer in the "History of Spiritualism." Recently when talking with Sir Ray Lankester about a review he had written of Sir A. C. Doyle's book, and the ghost-stories it contained, he brought to my notice the following quotation from some remarks made by Mr. T. P. O'Connor in the *Sunday Times* of August 15

in connexion with a conversation with Sir Edward Clarke, the chief counsel for the plaintiff in the case of O'Shea v. Parnell. In the course of this case it was proved that there was no 'fire-escape' in the house in question. "This," says Mr. O'Connor, "was not the first time I realized the truth of the statement that you cannot be quite sure that you know all the facts of any historical or personal transaction. I never trust implicitly any historical statement. I have rarely seen any of the historical transactions in which I myself have taken a part strictly recorded according to the facts." Sir Ray thoroughly endorsed Mr. O'Connor's attitude as to placing no reliance on such 'story-telling,' and holds that it applies equally to reputed researches by eminent scientists—all hearsay—and useless as evidence.

On all of the many occasions, within a period of more than fifty years, when I have given serious attention to allegations of facts made by students of the 'occult' or so-called 'supernormal phenomena,' I have found that the actual necessities for carrying out scientific investigation were unattainable, the consent of the 'medium,' whether 'professional' or not, being withheld.

Scientific men generally do not refuse to examine into any matters of reputed or seeming importance on the ground of certain alleged facts being impossible, or even highly improbable. They cannot, however, but refuse to make inquiry into any matter when the conditions of investigation, necessarily required, are denied or restricted and actual experiment thus excluded. As one example only of an unproved statement made in the course of the present correspondence, I quote that of Dr. Tillyard's in which he says that in a certain class of cases "the medium is actually in trance and does not know what is going on." I do not know what he means by the word 'trance,' but his statement would seem to be of some importance to spiritualists and the Psychical Research Society, as in the present dispensation of their doctrines the 'entranced' medium plays a most important part in the manifestations of occult phenomena generally. I am not aware, after making several inquiries into this point, of any thorough investigation having been made into the condition of a 'medium' reported to be 'entranced.'

BRYAN DONKIN.

September 17.

THE present controversy, which the editor of NATURE has wisely confined to a discussion of the "scientific study of what are called *supernormal phenomena*," is somewhat confused by the irrelevancies which have been introduced into the debate.

The entomologist, Dr. Tillyard, complains that his critics confuse psychical research with spiritualism, when the fact is that his original article was a review of a book on spiritualism and not on psychical research. Moreover, when he accuses Dr. Lotsy of making "the usual blunder of those who, knowing nothing of the elementary principles of psychical research, persist in regarding the medium as the 'guide' in the experiments," he himself is betraying his lack of acquaintance with the subject. This is readily excusable since, I believe, his experience with physical mediums is limited to less than a dozen sittings. Apart from this, Dr. Tillyard's statement strikes at the root of the present discussion. The majority of scientific men suspect that what Dr. Tillyard denies is true, namely, that the medium is the 'guide' in the experiments. In this they are right, although the words 'and his/her manager' might be added to the word 'medium.'

The conditions of experiment are usually arranged

²⁵ Bayliss, "Principles of General Physiology," London, 1918, p. 41 seq.
²⁶ F. Weber, *Abderhalden's Handb. d. biol. Arbeitsmeth.*, vol. II, 2, I, half, 1924.