notes an acid reaction in solutions of phenolsulphonaphthalein. The cytoplasm of the bacteria within the vacuole retains its acid reaction unchanged throughout the initial alkalinity of the ingested fluid. As the vacuoles continue their course, the acid yellow of the phenolsulphonaphthalein becomes more and more intense until as the anal spot is approached the reaction may again change and the vacuolar content once more take on the alkaline color. When this stage is reached the chromogen solution in the vacuole is highly concentrated and the food or fecal mass is permeated with the dye and shows also the alkaline reaction of the vacuolar fluid.

In short, a preliminary digestive period characterized by decided alkalinity of the fluid which forms the food vacuole can be recognized in paramecia if sufficiently sensitive indicators are introduced into the fluid which the animalcule ingests. The significance of this initial alkalinity and the part it plays in the metabolic activities of the organism is at present obscure.

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THE AMERICAN TYPE-CULTURE COLLECTION

THE curator of the American Type-culture Collection is preparing a tentative catalogue of the collection, which will be available for free distribution in a short time. This catalogue will be made the basis of a more complete and detailed catalogue which will be published after the collection is made more comprehensive, and corrections can be made in the nomenclature of the present lists.

The collection now includes over 400 cultures of bacteria. About 50 molds and 100 yeasts are also available.

Requests for the catalogue should be addressed to Dr. George H. Weaver, curator, John McCormick Institute for Infectious Diseases, 637 South Wood Street, Chicago, Illinois.

L. A. ROGERS,
Chairman

QUOTATIONS

SCIENCE AT SOUTHAMPTON

THE first object of the British Association is to direct attention to the greater recent achievements of science. Through the addresses of its leaders at each annual meeting it attains a wider publicity than its local audience and, at the same time, acts as a missionary to stimulate local interest and local effort. At the Southampton meeting, which ended recently, the president, Professor Horace Lamb, maintained the highest traditions of his predecessors. In simple but vivid language he reminded all whom it concerns—and it concerns us all—that science must not be pursued or encouraged merely or chiefly for the immediate dividends of material advantage which it often pays. It must be pursued for its own sake, as part of the human effort to comprehend the world of phenomena. Then, turning to geodesy, a subject so remote that even its name was unfamiliar to many, he explained recent additions to knowledge of the structure of the earth which have been won by a combination of mathematical discipline and physical observation. There is no need to attempt to summarize in phrases the addresses of the thirteen sectional presidents; they have been described day by day in our columns. Some, such as the address delivered by Dr. Simpson, government meteorologist, described an unexpected complexity of structure and function in parts of our environment hitherto regarded as homogeneous and simple. Others, like that of Professor Desch in chemistry or of Dr. Orr in agriculture, showed that knowledge advances not only by the fashionable and newest avenues. Others brought familiar theories to the test of new sets of facts. Others, again, appeared to have been written because it is the duty of a president to give an address. It was generally admitted that the individual papers presented to the sections described modest progress rather than dramatic developments. In short, the Southampton meeting was dull. But it does not follow that science is stagnating or that its annual meeting was unproductive. Before and behind every startling discovery there lie great fields of solid work, consolidation of what has been gained and preparation of what is to come, requiring a devotion of labor and knowledge out of all proportion to its immediate reward.

But the dullness of the Southampton meeting had other and less inevitable causes which did something to diminish local interest and to lessen the intrinsic benefits of the annual parliament of science. The organization has been allowed to become too complex. There were thirteen separate sections holding their meetings concurrently, as well as the additional subsection of forestry, a more or less permanent detachment from economy and engineering sitting on transport questions, and the conference of societies in correspondence with the British Association. By no fault of Southampton, which provided the accommodation accepted as sufficient by the officials of the association, these separate parts were placed at distances of which the extreme was nearly three miles. In most cities the visit of the British Association can not escape attention from the inhabitants. The placards indicating the buildings occupied, the special signposts in the streets, and the throngs of badged visitors hurrying from section to section compel attention and interest. In Southampton, even towards the end of the meeting, many members had failed to discover the remote or obscure position of some of the centers, and there is little doubt that many of the inhabitants were unaware that the association was holding its meeting in their town. The corporate feeling of the associates was greatly impaired, and there was much less than the usual opportunity for scientific men in different branches to come into contact. The discussions suffered from the same multiplication and the same disadvantages. There is a further and serious disadvantage, initially due to increasing subdivision, and accentuated at Southampton by its local geography; confusion arises in the public mind about the authority behind some of the pronouncements made. What is taken for the voice of corporate science in session may be little more than the vagaries of a group of specialists or even of faddists. If it be thought necessary to preserve the subdivisions, two steps might be taken. In the first place no invitation should be accepted unless it is certain that compact accommodation can and will be supplied; and, secondly, the number of papers should be reduced and their quality should be more seriously investigated beforehand. Such an arrangement would leave time for a limited number of carefully arranged discussions to which scientific men of several branches could contribute, and, if possible, for at least one or two great discussions in a central meeting-hall where the whole association would be assembled in plenary session.—*The Times,* London.

THE USE OF TEMPERATURE COEFFICIENTS IN THE INTERPRETATION OF BIOLOGICAL PROCESSES

THE measurement of temperature coefficients has found a wide vogue in biology, so much so that at least three books have been written on the subject, two of which do little more than summarize the extensive literature. In addition to these, ten years ago Arrhenius[1] published a short work in which he attempted to show the approximate correspondence of the temperature coefficients of living processes with those of chemical reactions. Doubtless Arrhenius did not expect his statements to be taken too seriously. He was content to show a general similarity in the temperature coefficients of chemical and biological processes. During the last year Crozier and his coworkers, as well as one or two other biologists, have enthusiastically taken up the subject and have sought to identify the temperature coefficients of living processes with those of specific chemical reactions.[2]

In general these authors have followed a principle first stated by Blackmann[3] and then developed by Pütter.[4] According to this principle, in any biological performance it is the slowest process of the entire group of processes that controls the speed of the ensemble. Crozier perhaps regards this as an obvious truth, for he makes no reference either to Blackmann or Pütter. In his investigations he seeks to identify the controlling process by comparing its temperature coefficient with the temperature coefficient of chemical reactions as they have been studied for the most part in test tubes.

On the face of it this is scarcely a sound procedure, for two reasons.

In the first place, the temperature coefficients of various reactions are usually known only in pure water. In protoplasm the speed of reaction and the temperature coefficient of the reaction would be modified by the viscosity of the protoplasmic medium. This point was recognized many years ago by Snyder,[5] who lists a number of references to show the effect of viscosity on reaction velocity and temperature coefficients. Other authors who may be consulted are Grummell[6] and Callow.[7]

Moreover, it is obvious that protoplasm is a heterogeneous system. It seems hardly safe to apply to such a system the data on the reaction velocity in homogeneous systems. It is true that for some reactions the reaction velocity for a heterogeneous medium is the same as it would be if the reaction were proceeding in a homogeneous medium. In other cases this is not true. Freundlich[8] distinguishes the two types of reactions and gives names to both. Fortunately Warburg[9] has discovered a method of determining which type of reaction is involved in any particular case. He has shown that at least some of the chemical reactions occurring in living cells are of the type in which the heterogeneity of the medium exerts an influence. The temperature coefficient of

[1] Arrhenius, 1915, "Quantitative Laws in Biological Chemistry," London.

[2] Crozier, 1924, *Jour. Gen. Physiol.,* VII, 123, 189, Proc. Nat. Acad. Sci., X, 461; Crozier and Frederighi, 1924, *Journ. Gen. Physiol.,* VII, 137, 151; Crozier and Stier, 1925, *ib.,* 429, 571; Glaser, 1924, *ib.,* 177; Cole, 1925, *ib.,* 581.

[3] Blackmann, 1905, "Annals of Botany," XIX, 281.

[4] Pütter, 1914, *Zeitsch. f. allgem. Physiol.,* XVI, 574.

[5] Snyder, 1911, *Amer. Jour. Physiol.,* XXVIII, 167.

[6] Grummell, 1911, *Jour. chim. phys.,* IX, 143.

[7] Callow, 1915, Trans. Far. Soc., XI, 55.

[8] Freundlich, Kapillarchemie, 3te Aufl., Leipzig 1923, pp. 187–204 and 305–315.

[9] Warburg, 1921, *Biochem. Zeitschr.,* CXIX, 134; see also Freundlich, *l.c.*