ULTRA-VIOLET LIGHT AND THE OXIDATION OF COD LIVER OIL

IN these columns a year ago appeared a note,[1] stating that ultra-violet light is emitted when cod liver oil is oxidized. Careful experiments in this laboratory have failed to confirm these findings.[2] With an absolutely gas-tight camera, no darkening of a photographic film could be discerned after bubbling oxygen through cod liver oil in a quartz cell for ten days.

In other experiments the cod liver oil was heated to 100° C. while oxygen was passed through for three days, but no trace of a photographic effect was registered. The oxidation was sufficient to change the character of the oil as shown by a change in its iodine number.

The oxidation of para brom-phenyl magnesium bromide under identical conditions gave a distinct shadow of the cross wires behind the quartz lens, with an exposure of only two minutes. This reaction is known to be luminescent[3] and the positive effect proved that the apparatus was working properly. Feeding experiments in the laboratory of Professor H. Steenbock proved that the cod liver oil used was effective in curing rickets.

The reported evolution of oxygen by the action of ultra-violet light on oxidized cod liver oil was not found, when precautions were taken to drive out the dissolved air.

In connection with recent comments on this subject[4, 5] it should be emphasized that ordinary chemical fog ("Russell effect"[4]) is readily produced if reducing or other chemically active gases are allowed to come in contact with the photographic film.[6] In all our experiments the utmost care was taken to eliminate ordinary chemical fog as a factor, because in our early experiments we found that a fine mist of cod liver oil and vapors from asphaltum paint or beeswax acted chemically on the film to give a darkening on development and that these false images simulated the apertures through which the vapors had diffused.

It does not seem likely that black body radiation could have affected the photographic plates, as suggested,[5] unless they were especially sensitized to the infra red. No effect of this kind was observed in our experiments, although the cod liver oil and its container were heated to 100°, at which temperature the black body radiation should have been much greater.

It is unfortunate that the erroneous conclusions of the original article,[1] in spite of their correction,[4] should have led to such widespread speculation concerning the mechanism of the cure of rickets.

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[1] Kugelmass and McQuarrie, SCIENCE, 60, 272, 1924.
[2] Details are given in B. S. Thesis, 1925, Univ. Wis.
[3] Evans and Dufford, *J. Am. Chem. Soc.*, 45, 278, 1923.
[4] Kugelmass and McQuarrie, SCIENCE, 52, 87, 1925.
[5] West and Bishop, SCIENCE, 52, 86, 1925.
[6] Mathews and Dewey, *J. Phys. Chem.*, 17, 230, 1913.

THE THIRD STAGE OF DIGESTION IN PARAMECIA

APPARENTLY the earliest attempts to demonstrate the acidity or alkalinity of the protozoan food vacuole were made by allowing the organism to ingest small grains of litmus powder and noting the color change which the ingested fluid induced in the individual granules. Later, when the use of aniline dyes became common in the field of microchemistry, solutions of neutral red replaced both litmus and the somewhat capricious and unreliable indicator alizarin-sodium-sulphonic acid for the detection of acid and base in microscopic preparations. The studies which have been made of the reaction of the food vacuole of protozoa and the bolus of food within with the above-mentioned micro-indicators have resulted in the dictum now generally taught and accepted that in paramecium, at least, there are two stages of digestion—an initial one during which the prey is supposed to be killed in an acid fluid and a second or digestive-absorptive stage in which the food vacuole is alkaline.

In paramecia (either caudatum or aurelia) grown in hay infusion or in malted milk, acid solutions of phenolsulphonaphthalein can be seen flowing down the gullet in a yellow stream to distend the nascent food vacuole. As the stream passes through the narrow end of the gullet, just before entering the vacuole, evidences are visible of the beginning of a distinct alkaline reaction in part of the fluid. The borders of the stream next to the wall of the gullet become faintly but distinctly pink. The ingested bacteria which are colored yellow by the dye are carried into the newly formed food vacuole which is filled with an *alkaline* fluid. As the vacuole is freed from the gullet and moves off into the cytoplasm, it becomes slightly smaller and at the same time the alkalinity of the contained fluid becomes more pronounced, perhaps from concentration resulting from the passage of water from it into the cytoplasm, an increased alkalinity which is indicated by a deepening of the color in the dye-containing fluid. The alkaline reaction in the food vacuole persists until the vacuole turns to begin its journey to the anterior end of the organism when the pink color, which has become paler, is changed to the yellow tint which denotes 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 pla-