

ascribable to the separation from the material of one or other of its constituents by the action of the radiation, which separation is only possible provided there is present in the material a suitable impurity; but change the line of argument a little, and there are facts which would appear strongly to support the view that it is the impurity itself,

in many instances, which becomes separated out in a fine state of division by the radiations and imparts the colour to the glass or mineral. We do not know. There is a mass of evidence to be considered, but much more experimental work is needed before that evidence can be dealt with and properly assessed.

Hæmolysis.

THE discussion at the recent meeting of the British Medical Association in Edinburgh, opened by Dr. Eric Ponder, afforded much information as to the nature of hæmolysis, and was particularly fruitful in clearing up the apparently contradictory data concerning the structure of the erythrocyte or red blood corpuscle.

On one hand, it has been held that the red blood corpuscle, although to all appearance homogeneous, in reality consists of an external envelope of colourless material which forms a thin film enclosing the dissolved coloured material or hæmoglobin. Thus this envelope would be controlled by the laws of osmotic pressure. When water reaches the corpuscle it passes through the film and swells the corpuscle, causing it to become globular; eventually the envelope will burst or become sufficiently distended to allow the fluid to escape through its pores, the envelope being left. The loss of water from the cell causes shrinking and corrugation of the surface, the wrinkled or crenated form being produced. On the other hand, it has been supposed that the corpuscle is formed of a homogeneous porous material, in the pores of which the hæmoglobin is contained.

A few years ago a reversal effect was described by Brinkman, but the reaction is only apparent. After hæmolysing the cells, the solution was centrifuged and the supernatant fluid subjected to cataphoresis. This treatment resulted in the appearance of the ghosts at one pole and of the hæmoglobin at the other; on mixing the ghosts and hæmoglobin together the cells were apparently re-formed, but on analysis only 50 per cent. of the hæmoglobin could be accounted for. Further, it can be shown that the isoelectric point of the normal cell and that of hæmoglobin are different, whereas the isoelectric point of the re-formed cell and hæmoglobin are the same, which is evidence that in this phenomena the cell is not re-formed as was originally thought, but that the hæmoglobin is merely adsorbed on to the surface of the ghost.

The further evidence advanced by Brinkman, that section of the red cell does not result in the exudation of fluid, is by no means contradictory to the theory of the envelope-like structure of the cell, for indeed, as Schafer pointed out, it is possible to cut a soap bubble in a similar manner, the razor reuniting the edges of the cut membrane.

The changes in size and shape which the cell undergoes both in hypotonic solutions and in solutions containing hæmolysins afford considerable evidence that the red cell of mammals is a balloon-like structure possessed of an envelope of consider-

able strength. The work of Seifriz offers direct information. This observer has actually micro-dissected the human red cell, stretched its envelope, and observed the escape of fluid containing hæmoglobin from the cell. The membrane is probably similar to that suggested by Beehold, namely, that it has a protein frame-work in the interstices of which lipoids are contained. It is probably inaccurate to describe the lipoids as a constituent of the cell membrane; for recent work goes to show that the lipoids are mainly if not entirely within the cell. Mellanby, in the discussion, raised the objection that the cell membrane could scarcely be of a protein and lipid structure, as the enzymes lipase and trypsin are without hæmolytic action upon the red cell. In this instance the specificity of enzyme action must be remembered; and, further, Ponder has shown that certain proteolytic enzymes of bacterial origin are capable of producing hæmolysis.

The ingenious method devised by Mellanby has afforded a means of making rapid and accurate observations on hæmolysis. A beam of light passes through a system of lenses, the emerging parallel rays being incident upon one of the parallel faces of the glass cell containing the suspension of corpuscles. The beam of light, after passing through the suspension, falls upon a selenium cell which is connected in circuit with a galvanometer. Variations in the intensity of light passing through the suspension of corpuscles produce variation in the deflexion of the galvanometer. The galvanometer scale is calibrated so that the readings may be made direct in terms of hæmolysis. To keep the experimental conditions constant, the parallel-faced dish is surrounded by a water bath, the temperature of which is kept constant by an electric thermo-regulator.

Using this method, Ponder has shown that a large number of lysins fall into what might be called the class of simple hæmolysins. With this class of lysins, hæmolysis results in the using up of the lysin due to its union with some protein component of the cell envelope, the reaction being of the first order. Among this simple class of hæmolysins are the majority of the hæmolytic glucosides, the soaps, salts, and acids allied to the bile salts; while recently McLachlan and Ponder have shown that the majority of the lysins of bacterial origin fall into this class. It is very interesting to note that two of these bacterial lysins, namely, that of *B. histolyticus* and that of *Streptococcus pyogenes*, are definitely known to be proteolytic.

With the lysins of the saponin class, the reaction which results in hæmolysis appears to be one between the lysin and the protein of the cell envelope, and it is possible to demonstrate that these lysins will unite with other proteins to form non-hæmolytic compounds. Further, the results indicate that the combination takes place as an adsorption process. An interesting point arises with regard to the action of bile salts, as it has been shown that the serum proteins may either inhibit or accelerate the action of the bile salts according to the order in which the components of the hæmolytic system are added. The inhibitory action may be explained in the same manner as the saponin series, but the manner in which acceleration is brought about is far more difficult.

Mackie's experiments on brilliant green are of interest in this respect. 'Brilliant green' in high concentrations is a hæmolysin, but in lower concentrations it acts by 'sensitising' the cells so that the subsequent addition of small quantities of serum produce rapid lysis. Further, as in the bile salt system, if the components are mixed together in the reverse order, no hæmolysis occurs. Although the sensitised cells are apparently free

from 'brilliant green,' in reality they contain large quantities of the dye, as is evidenced by extraction with alcohol and acetone. Experiments have shown that the dye is united to the hæmoglobin as well as to the cell envelope, and that the amount taken up is nearly proportional to the amount used in bringing about the sensitivity. The reaction between the 'brilliant green' and the cells is divisible into at least two distinct changes:

(1) The adsorption of the dye by the cell envelope and contents.

(2) A reaction, which results in hæmolysis, occurring between the adsorbed dye and the cell envelopes.

The amount of lysin formed will depend on the amount of dye adsorbed to the cell and the amount of protein added. If one unit of 'brilliant green' is adsorbed to the cells, this unit will unite with one unit of serum to form one unit of the new lysin. If only half a unit of protein is added, there will be insufficient protein present for the combination and one half unit of lysin will be formed. The phenomena observed with the bile salts can be shown to be identical with those observed with 'brilliant green,' the taurocholate replacing the dye as a 'sensitising agent.'

The Leeds Meeting of the British Association

LOCAL ARRANGEMENTS.

LEEDS, in these days of railway amalgamations, is supplied with a railway terminus of confusing profusion, the L.M.S. trains arriving at no less than three different stations. All the stations are close together, however, and convenient for the reception rooms. At all stations members will be met by guides wearing armlets, and those proceeding to hostels can, if they wish, entrust their luggage to these officials for despatch to the hostels.

The inaugural meeting, where the presidential address will be delivered, is to be held in the Majestic Cinema, which lies between these main stations, and faces on City Square.

The abundance of restaurants near the city has obviated the need for extensive provision for meals in the Reception Room, but lunch or tea can be obtained there, whilst at the University, in addition to the usual refectories, a buffet luncheon will be served in the elementary physics laboratory throughout the week.

The local handbook is now ready for distribution to members. Under the editorship of Dr. C. B. Fawcett, this handbook is more on the lines of modern regional geographic studies than has been customary. A special feature of the meeting is the series of guides to the various excursions, which are gathered into a neat cloth folder making another volume equal in size to the handbook. Under the editorship of Mr. H. E. Wroot, these excursion handbooks have been done with unusual thoroughness, and will be found of permanent value.

Members will also receive a guide to the extensive exhibition of scientific apparatus in the Crypt of

the Town Hall, whilst the local handbook contains brief descriptions of the special exhibits by the Air Ministry and Meteorological Office, and the British Broadcasting Corporation, which are also in the Town Hall, and of the demonstration of television, noctovision, and the phonoscope which is to be given by Mr. J. L. Baird in a room at the Education Offices next door to the Town Hall.

The General Committee, the Committee of Recommendations, and the Council will meet in the Crown Court of the Town Hall—in close proximity, therefore, to the Reception Room.

Badges are prepared for issue to members, which, by resolution of the City Council, will frank members over the Corporation tramways during the week.

Excursions are rapidly booking up. Those to Gaping Ghyll, the St. Leger at Doncaster, Farnley Hall, and Rievaulx Abbey, and Ampleforth are already over-applied for. When possible, early applicants will receive their excursion tickets through the post before the commencement of the meeting. But in some cases their issue will, of necessity, be delayed until the meeting starts. In these cases the tickets will be awaiting members at the excursion counter in the Reception Room.

The Leeds Art Theatre announces the performance of the "Cradle Song," translated from the Spanish of G. Martini Sierra by John Garret Underhill, which will be given on the evenings of Monday, Tuesday, and Wednesday, Sept. 5-7, at 8.30 p.m.

Citizen's lectures in Leeds have been arranged as follows: Sir Oliver Lodge. "Energy." In the Albert Hall.