

facial film on the stability of emulsions in general as measured by the change of area of the interface with time. Emulsions stabilized by agents such as soaps give much finer emulsions than those stabilized by solids such as alumina, but the former are easily influenced by the presence of salts and temperature, whereas the latter are stable against most conditions, such as salts, temperature and pH. The effect of salts of the lyotropic series on emulsions stabilized by saponin are interesting. Thus sulphates increase both stability and viscosity, whereas thiocyanates and iodides markedly reduce these properties of the emulsions.

J. Powney and L. J. Wood (London), in con-

clusion, brought to the attention of the meeting the interesting fact that whereas electrophoretic mobility of droplets and interfacial surface tension both depend on the formation of interfacial films, in a number of cases no correlation apparently exists between the two phenomena. Thus over very small concentrations of the salts of long-chain sulphates and amines, great changes in electrophoretic mobility (of oil droplets) are observed with no measurable change of interfacial tension. Only over the range of concentration where the electrophoretic mobility is nearly constant does the interfacial tension seem to change in any marked degree.

## OBITUARIES

### Mr. D. Ward Cutler

THE death of Donald Ward Cutler, head of the Microbiological Department at the Rothamsted Experimental Station, came as a sudden and unexpected shock to his colleagues. He had been at his work as usual, then was suddenly struck down with pneumonia and survived only a few days. He was trained in zoology at Cambridge under Prof. Stanley Gardiner, and after his happy and successful undergraduate years at Queens' College he went to the Marine Biological Station at Plymouth to investigate fish scales. In 1915 he joined Prof. S. J. Hickson's staff at Manchester, where his gift for lecturing and for teaching made him a useful member of the department; in his free time he studied the Protozoa of termites. A weak heart prevented his being accepted for active service, but he gave valuable help in the Pathological Department set up for the Manchester war hospitals and became an expert on amoebic dysentery.

After the War he transferred to Rothamsted to take charge of the microbiological work that had for some time been going on there. His first investigations were on the Protozoa of the soil which had been shown to play an active part in the microbiological processes, and he soon succeeded in clearing up many of the difficulties that had arisen in connexion with them. He confirmed Goodey's observation that the ciliates were probably not very active, and Martin and Lewin's observation that the amoebae were active, and he showed why amoebae could not easily be picked out from the soil. In conjunction with L. M. Crump he made daily counts of the numbers of bacteria and of certain Protozoa in the soil of one of the Rothamsted fields, carrying on the work without intermission for a whole year, and so obtained a rich mass of data which has since proved very valuable in soil microbiology. The numbers showed considerable fluctuations from day to day,

but the bacteria and the Protozoa fluctuated in opposite directions: when the Protozoan numbers were high those of bacteria were low, and vice versa. This accorded with the view that the Protozoa were acting detrimentally on soil bacteria. Later work, however, showed the operation of another factor: in culture solutions the bacteria generally proved to be more efficient when their numbers were low than when they were high, so that the amount of activity per head of bacterial population was actually increased by the action of the Protozoa.

He also studied the bacterial oxidation of ammonia to nitrate, and showed that this is a commoner property than had been supposed.

In recent years his chief work had been on the purification of effluents from sugar beet and milk factories, an investigation carried out at the request of the Department of Scientific and Industrial Research. He was in charge of the microbiological side and the late E. H. Richards of the chemical side, and the good personal relationships of the two leaders enabled them to bring the work to a satisfactory conclusion. During these investigations much valuable information was accumulated about the decomposition of organic matter by bacteria, and this is now being put together.

Ward Cutler's interests, however, were by no means confined to microbiology. He was an active member of the Councils of the Eugenics Society and of the British Social Hygiene Society, and he wrote two well-known books, "Hereditity, Evolution and Adaptation" and "Some Problems in Soil Microbiology". He was also a good lecturer, giving generous service to the Workers' Educational Association and other bodies. For many years, too, he was an enthusiastic supporter of amateur theatricals, wherein he displayed no mean ability. Finally, he had an attractive personality and the great gift of winning the loyal support of his staff.

E. J. RUSSELL.