

*Rural Electrification.* Practical, rather than fundamental, problems are met with in the applications of electricity to agriculture, stress being placed always on the attainment of low electric loading and high load factor. The exhibits demonstrated how these essentially economic aims have been achieved in various aspects of soil- and space-heating and crop-drying by electrical methods.

*Electric Power from the Wind.* Photographs illustrated the type of hill usually found suitable for wind-power sites, on which studies of wind regime and wind structure have been made. The model wind-generators exhibited included one of the 100-kW. pilot plant now erected on Costa Hill, on the Orkney mainland.

*Space- and Water-Heating.* The work deals with the fundamental side of problems arising from the use of electricity for space- and water-heating, mainly from the domestic aspect. The major current research is an all-round study of the heat pump. One small installation using static water as a heat source is in operation at Perivale, and other work on heat sources such as the earth is in progress. A model house was on show which could be operated to show the possible saving effected during transient warming periods by the use of reflecting wall papers.

*Ignition Research.* Investigations on the electrical equipment of vehicles, including novel types of sparking plugs and the suppression of radio interference, constituted an important contribution to the national effort during the Second World War, and this work has continued with the support of the Ministry of Supply. A major aspect is the study of ignition by electric sparks, and this is also of considerable interest to the Safety in Mines Research Establishment of the Ministry of Fuel and Power, which maintains close liaison with the Association.

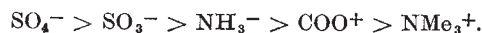
A high-speed single-transient oscillograph, giving a temporal resolution of  $10^{-9}$  sec., has been developed by the Association for these researches and is being extensively used.

*The Welding Arc.* The detailed investigation of ferrous welding arcs was recently interrupted so that a study might be made of a.c. argonarc welding of non-ferrous metals. The result has been the development of a surge injector which maintains the arc with an a.c. r.m.s. voltage of less than 50, and is free from radio interference.

## RHEOLOGY OF FILMS AND SURFACES

THE annual conference of the British Society of Rheology was held jointly with the local section of the Chemical Society at the Washington Singer Laboratories of the University College of the South-West of England, Exeter, during September 27-29. The conference was opened by Prof. H. T. S. Britton and by Dr. G. W. Scott Blair, president of the Society. On the afternoon of September 28 a visit was arranged to St. Mary's Abbey, Buckfast, when Brother Adam demonstrated the thixotropic breakdown and other rheological properties of honey in production processes. Papers were read by B. A. Pethica and by J. H. Schulman and M. Z. Dogan (Department of Colloid Science, Cambridge) dealing with the properties of insoluble monolayers at an air/water interface in the presence of some soluble long-chain electrolytes of strong activity. Com-

parison of the Langmuir isotherms for penetration of liquid-condensed cholesterol with a series of straight-chain  $C_{12}$  compounds has shown that the polar head group specificity falls off in the order:



In the case of the interaction of saponin with condensed cholesterol, where a stoichiometric complex is formed, the penetration isotherm shows a transition corresponding to the formation of a two-dimensional solid film. The areas of the saponin show a corresponding change in the transition zone.

Studies have also been made of the penetration of myristic acid by dodecylamine hydrochloride and of the properties of protein films in the presence of electrolytes in relation to the tanning industry. Prof. F. H. Garner and Dr. C. W. Nutt (Department of Chemical Engineering, Birmingham) read a paper on cybotactic phenomena at interfaces, describing experiments on the movement of droplets in viscous media. Evidence on the molecular orientation into a quasi-crystalline structure was discussed in its relation to chemical engineering phenomena, for example, mass transfer across interfaces.

E. Eisma (Netherlands) described experiments on the rheological properties of interfacial films on water. For films of high yield-stress and small viscosity the rotating disk method is suitable, while in the case of purely viscous interfaces the torsion oscillation method has an advantage.

Under the chairmanship of Prof. M. Reiner (Haifa), K. V. Shooter (Research Laboratory for the Physics and Chemistry of Surfaces, Cambridge) described the mechanism of boundary lubrication at light loads taking into account the pressure-dependence of viscosity of oil films. H. J. Bezer and Dr. R. Schnurman (Manchester Oil Refinery) discussed experiments with extreme-pressure lubricants using a four-ball apparatus of the Boerlage type. There was no evidence for a defined 'breakdown load' of a lubricant. An energy balance would appear to allow for an appreciable proportion, up to 10 per cent, of the mechanical energy to be available for the separation of electrostatic charges.

At another session, with Dr. R. N. Saal (Netherlands) in the chair, C. C. Mill (Printing and Allied Trades Research Association) spoke on the rheology of printing, mainly of letterpress and lithographic processes, the photogravure process being fundamentally different and generally simpler rheologically. There was a discussion on the significance of the phenomenon of parallel ridge formation in the ink film on rotating rollers in contact. M. R. Hopkins (British Iron and Steel Research Association) spoke on the mechanics of the coating of steel sheet with molten tin between rollers. A mathematical investigation based on arguments similar to those used in the theory of lubrication gives a relation between the coating thickness and the relevant variables for a single pair of rollers. This relation was found to be in accord with experimental results obtained with a sheet of nickel foil emerging from a bath of oil through a pair of polished stainless-steel rollers under precise conditions of test. A. de Wael and G. L. Lewis (Gestetner) read a paper on the electrical behaviour of oil-pigment dispersions. They have found that a dispersion with electrically conducting particles behaves differently according to the state of flocculation, whereas with non-conducting particles there is little difference. Conductive systems do not seem to obey Ohm's law. It is possible to correlate the

electrical with the rheological behaviour. Materials exhibiting dilatancy—for example, titanium oxide in liquid paraffin—increase in conductivity during shear and rapidly decrease to a constant value on arrest of shear. In strong deflocculating media, such as carbon black in polymerized linseed oil, the dispersions with high yield values show neither conductivity nor high dielectric constant.

D. W. Jopling (Kodak, Ltd.) described apparatus with a servo-mechanism, designed to measure the rate of radial flow of a liquid between parallel surfaces, for the purpose of ascertaining the rate of swelling of colloidal films. The swelling of a film on one of the parallel surfaces alters the rate of flow between the plates, making it possible to calculate the increased thickness. E. Bielak and Dr. E. W. J. Mardles (Royal Aircraft Establishment), in a paper on the flow of liquid films over solids, reported that from experiments on the flow of drops along inclined planes and through capillaries, and on the radial spread of liquid pools over and between surfaces, anomalous flow-rates have been found. The flow behaviour over any one surface varies considerably with the chemical character of the liquid. Between surfaces, with films of thickness less than  $10 \mu$ , there is a tendency for the film to disrupt with the formation of pin holes and with a consequent onset of film plasticity and thixotropy, noted by earlier investigators with lubricants. This phenomenon appears to be significant in relation to the 'wringing' together of flats, hydraulic 'stiction' and the development of rigidity in lubricant films. E. W. J. MARDLES

## MARINE BIOLOGICAL STATION ON INHACA ISLAND, MOZAMBIQUE

By MRS. OLIVE S. TATTERSALL

FOR several years certain biologists in South Africa have realized that the waters in and around Delagoa Bay are particularly favourable for work in marine biology. In spite of many difficulties, parties of students with the late Prof. C. J. van der Horst, of the University of the Witwatersrand, have paid regular visits to this area and have explored its varied collecting grounds. They found that there are particularly good centres for work along the western shores of Inhaca Island, which forms part of the eastern boundary of Delagoa Bay. There they worked under considerable difficulties, camping out on the foreshore in great heat, preyed upon by mosquitoes and working with inadequate and improvised apparatus. To-day, thanks to the generosity and sympathetic co-operation of the Government of Mozambique and to the enthusiasm of Prof. van der Horst, a remarkably fine biological station has been built on Inhaca Island.

In the early part of this year I was able to spend a few weeks working at this Station. On arrival at Lourenço Marques a small tug-boat was placed at my disposal by the Department of Maritime Services, and at 5 a.m. we left for the Island, 22 miles due east of the city. As we approached, the Island looked flat and uninteresting, and it was not until we were almost at the shore that the few native huts of the fishing village on the north-west coast of Inhaca appeared nestling at the foot of the low hills which rise close to the shore. We then turned south for about

three miles when, on rounding a rocky promontory, we saw, on a flat stretch of dazzling white sand, three low white modern buildings, looking startlingly out of place in this scene which appeared never to have been touched by Western civilization.

Although there are more than four thousand Africans living on the Island, there is not a trace of any human habitation as one approaches from the sea. For the most part the western shores facing on Delagoa Bay have a short foreshore with low hills rising sharply as steep cliffs, densely covered with tropical vegetation. The site chosen for the Biological Station has a wider foreshore, and the hills behind it rise less steeply, though they are near enough to afford shelter from the east.

The Station consists of three detached buildings, connected by a paved causeway: the laboratory, with a wide shady veranda specially designed to meet the climatic conditions; the refectory, with kitchen, storehouses, dining-room and a wide veranda; and the dormitory, with comfortable cool rooms, modern sanitation, running water, shower baths and most appropriate modern furniture. The buildings are thoroughly mosquito-proofed so that one may enjoy the cool of the evenings in comfort. The whole of the cost of the buildings, water, electricity and sanitation has been borne by the Government of Mozambique, while the scientific equipment and furnishing has been provided by the University of the Witwatersrand.

Delagoa Bay is for the most part very shallow, though there are deep channels which will yield rich harvests to the dredge, and large sandbanks are exposed at low water. Here, among the weed and coral, one can find the utmost profusion of marine life—ascidians and sponges of the most wonderful colours, delicate planarians, sea anemones, nudibranchs, echinoderms and many worms and crustaceans.

The shore off the Station slowly shelves, and the sea goes out for a very great distance at low water. Then beyond the low-water level, for an equally long distance, there is water of not more than a foot in depth, so that good collecting is available at practically all stages of the tide. The littoral fauna is particularly rich, and my only regret was that I knew so little of it and that there were not enough books to enable me to identify the animals I found. It will, of course, be years before one can expect to build up an adequate library to cope with such abundance of life. In the meantime, I can imagine no finer holiday than a few weeks spent here, away from all the turmoil of the modern world, in a realm of Nature which man has not yet spoiled. Every possible facility is given by the Portuguese authorities to workers, and it is most refreshing to find such a sympathetic attitude existing in which the scientific investigator is allowed to work for the love of the work and is not hampered by the knowledge that he has to produce results at all costs. Although Inhaca may appear to be very remote, it is actually quite easy of access. The Union Castle ships call weekly at Lourenço Marques, and transport from the city to the Island is generously provided free of cost to the scientific worker by the Captain of the Port at Lourenço Marques. Fishing-boats pass daily between the Island and Lourenço Marques, and the Africans are always willing to bring goods from the mainland and to supply food cheaply.

I had no experience of dredging, for facilities for this type of collecting are not yet available; but nets are being bought, and it is hoped that before long a