

the plant tissues often contain less than the optimal needs of animals. Certain fertilizer treatments seem to depress the concentration of magnesium in herbage to the extent that cows feeding on the herbage develop hypomagnesaemia which ends in tetany and death.

Copper and molybdenum present particular problems because one affects the other. In some conditions, for example when the soil is limed, plants may take up so much molybdenum that their content of copper is decreased, and symptoms of copper deficiency may appear in livestock feeding on the plants. When farmers practised rotation, manure was an important source of copper, not only that originating in the soil, but also copper provided in feeding stuffs such as protein-rich meal and cake.

Although mineral deficiencies and excesses influence animal production considerably, the supply of energy and protein is usually a more important determinant of animal production. Fertilizers increase the carbohydrate, lipid and protein of a crop, but not always in proportion to each other. And such an increase induced by fertilizers does not necessarily result in a proportional increase in animal production. Dr Blaxter said he feels strongly that when a crop is to be fed to animals trials of fertilizers should involve tests of their effects on animal production.

OCEANOGRAPHY

German Research Ship in London

OCEANOGRAPHERS from the research ship Meteor are visiting London on their way home after three months at sea trying to find out how safe it is to dump radioactive waste in the deep sea west of the Iberian peninsula.

The German Hydrographic Institute owns the ship and is responsible for half the research work it does, while the German Research Association is responsible for the other half. The ship was commissioned in 1964 and has made fifteen cruises so far, carrying out research in physical oceanography and hydrology. It is designed to be easily manoeuvrable, to be relatively noise and vibration free and to have laboratories and working decks where there is little pitching. Facilities on board include deep sea winches, television cameras, radar sets, specialized echo sounders, a temperature controlled aquarium and a helicopter.

The long-term research programme is to investigate the as yet untapped food, mineral and energy resources of the oceans. During the present cruise, the scientists have been measuring horizontal and vertical currents in the deep sea so that they can calculate how fast radioactive material released from the ocean floor would move and how soon the biological accumulation of trace elements such as heavy metals would become part of the food chain from marine plants to man. French, Spanish, Portuguese and British scientists are also cooperating in this project.

There are many difficulties involved in measuring parameters such as current in the deep seas. The most obvious, perhaps, is the danger of losing the instruments. During this trip the Meteor crew lost none of the thirty-eight current meters they had moored at depths of about five kilometres—usually, 60 to 70 per cent of the instruments are lost. One problem is that five kilometres of steel wire weigh so much that it is

very difficult to haul up any respectably sized instruments. The German scientists have been using almost weightless plastic ropes and a mechanism to release the instrument from its anchor. The first kilometre of the rope is made of steel to prevent sharks near the surface from severing the rope.

During a previous cruise, the ship was powered as an experiment by three jet engines, so that the thrust on the ship could be accurately measured. Together with accurate measurements of the ship's velocity, these



The Meteor research vessel.

enable the resistance of the water to be calculated so that extrapolations from model ships in tanks to real ships in the sea can be made more reliable. On its next cruise the Meteor will drift with other British, American and German ships in the trade wind area so that the oceanographers can measure quantitatively how energy is exchanged between the oceans and the atmosphere. They will also investigate the height and electromagnetic structure of the ionosphere which will be particularly interesting because the Sun will be in a period of maximum activity at the time.

QUALIFICATIONS

Chemists and Teaching

THE Royal Institute of Chemistry is annoyed that the Burnham Committee does not recognize the Graduate Membership and Associateship of the institute as a teaching qualification comparable to a university honours degree. The institute's case is put in a pamphlet just published, called *Chemists and Teaching*. The chemist with the Royal Institute of Chemistry qualifications starts on a salary which is £120 lower than that earned by the honours graduate, the pamphlet says, and this sort of salary difference continues throughout his teaching career.

Although the majority of the institute's 25,000 members were admitted because they held a university degree in chemistry, there are some 3,500 chemists who became members by taking the Graduate Membership examination which is their main chemistry qualification. The course given by the institute for the Membership examination is identical in structure and in duration to that for a university degree and the examiners also examine in universities. The qualification itself is considered to be of the same standard as a good honours degree and is accepted as such for

postgraduate work by all universities in Britain, by the Science Research Council, by the Civil Service Commissioners and by employers in industry. The number of people taking the institute examinations is increasing. In 1966, 274 chemists qualified, while in 1968 the number was 410. The universities produced 1,150 graduates with honours degrees in chemistry in 1966, hence those who obtain their qualification from the Royal Institute of Chemistry form 20 per cent of the whole.

This pool of qualified people could be particularly valuable in the teaching profession, especially as many of them have spent some time in industry and could therefore encourage an awareness of industry in schools. The Scottish Education Department recognizes the associateship as being worth an honours degree even though the Burnham Committee does not. The institute now intends to bring the matter to the attention of Parliament. It feels that it would be in the interests of the Department of Education and Science to improve the status of Graduate Membership and Associateship of the institute and thus increase the supply of science teachers.

FUEL

Economy on a Computer

THE computer model of the fuel economy, on which the Ministry of Power has been working for the past two years, has reached the stage where each of the five sub-models is ready to be incorporated into a unified model covering all the fuel industries. Mr C. I. K. Forster, director of statistics at the Ministry of Power, said at a press conference last Tuesday, however, that it was still likely to be years rather than months before the model was really complete.

The reasons for this slow development seem to lie both in the complexities of the model itself and in the administrative problems that accompany a new project of this sort. For each of the five sub-models—four for supply from each of the four fuel industries and one for consumer demand—the computational facilities have been provided by the industry concerned or by a special purchase of computer time. In order to operate the integrated model the ministry is negotiating through the Stationery Office for the purchase of large quantities of computer time from a computer bureau.

What does the model actually consist of physically? Mr I. J. Whitting, chief statistician at the ministry, had some difficulty in answering this question, but it seems to be a combination of magnetic tapes, computer programmes, books of equations and certain relevant brains. The transfer of information between the different sub-models is still carried out by old-fashioned manual methods.

The main aim of the model is to be able to give quick forecasts of how fuel supply and demand will vary as functions of numerous factors. The model incorporates a whole range of assumptions, each of which is the result of detailed analysis carried out by experts, but it is nevertheless essential that reliable tests should be carried out to check that the assumptions are not producing absurd results. So far the sub-models have only undergone minor tests, and one of the major problems here is to find suitable test cases on which to try out the model. It is unfortunately

impossible to double the cost of oil purely to test the model.

The long-term aim, to incorporate the fuel economy model into one of the whole economy, still seems to be a long way off.

Parliament in Britain

Scientific Exchanges

AGREEMENTS between the British and Russian governments cater for scientific and technical exchanges between the two countries for the period 1965 to 1969, and Mr Goronwy Roberts, Minister of State in the Department of Foreign and Commonwealth Affairs, listed the exchanges which have taken place so far. Altogether 74 Soviet scientists have visited Britain and 20 British scientists have visited Russia to carry out research work. These scientists pay their own expenses, the Department of Education and Science and the British Council being largely responsible at the British end. Six British and 7 Russian scientists have made short visits, the host governments paying the internal expenses. The governments have exchanged specialists and delegations interested in architecture and construction, industrial design, coal research, metrology, plastics, information, accident prevention and footwear manufacture. Direct exchanges between the Royal Society and the Soviet Academy of Sciences are encouraged. (Written answer, November 18.)

Nuclear Tests

MR MICHAEL STEWART, Secretary of State for Foreign Affairs, stated that recent developments described by the International Institute for Peace and Conflict Research enable seismologists to distinguish between earthquakes and explosions down to the equivalent of 10 kilotons in hard rock. It was more difficult to identify explosions carried out in less dense material or in underground caves. (Written answer, November 18.)

Mentally Handicapped Children

THE Prime Minister, admitting that he had been giving line-holding replies to questions on the transfer of responsibility for mentally handicapped children from the Social Services Department to the Department of Education and Science, said that he would definitely give his decision in a few days' time. Although the Seebohm Committee had recommended the transfer, consultations with the organizations involved were still necessary and were taking time. Complaints were made that the delay was holding up the release of money raised for the benefit of the children, that there was a waiting list for special places of about 10,000, and that the training of teachers for the handicapped children was being held up. (Oral answer, November 19.)

Anarchy over the Ocean Floor

THE Prime Minister agreed that anarchy over the ocean floor was becoming increasingly important as a result of extensive explorations in the Indian Ocean and the North Sea and the discoveries of important minerals under the sea bed, and that some sort of international regime would have to be adopted. He said that the Labour Government was at least as internationalist over this as the United States, but he thought that prolonged negotiations would be necessary before any agreement could be reached. (Oral answer, November 21.)