the disease seems to have been introduced from the US where it is endemic. Bacteria of the Arizona paracolon group are closely related to the salmonellae, but are fortunately not particularly pathogenic to man except in very high doses. Arizona paracolon is clearly not the foot and mouth disease of the poultry world. In the US, for example, poultry farmers have learned to live with it as a nuisance rather than a major plague, although it can be economically serious; once established in a stock, it is virtually impossible to eradicate and can cause losses among young birds of anything between 10 and 90 per cent. Clearly it is important that it should not be allowed to gain a permanent foothold, and the recent outbreaks, which seem to have caught everyone unawares, reveal a gap in import arrangements which are designed to protect against its introduction.

The problem is that the disease is exceptionally difficult to diagnose. Often there are no definite symptoms, although some of the birds affected in the recent outbreak began to go blind. The birds sicken and die of septicaemia, and diagnosis depends on laboratory tests for the bacteria. To complicate matters further, birds which survive infection become symptomless carriers and can transmit the disease in fertile eggs.

Since the British Government adopted vaccination instead of slaughter as a control of fowl pest, importation of live poultry under licence and subject to fairly strict control has been permitted. Under the existing regulations, imported birds or eggs have to be covered by a veterinary certificate and are held in quarantine for six months and regularly inspected. By all accounts the Arizona paracolon was introduced in a batch of day-old poults of the Williams strain which were imported from the United States to quarantine premises in Wales. This strain, Big W to American breeders, has two characters—broad breasts and a good food conversion ratio—which British poultry farmers are anxious to introduce, but unfortunately the strain is particularly susceptible to Arizona paracolon. Apparently some of the poults imported for breeding were carriers of the disease and went undetected during quarantine; it was their progeny which were found with the disease on the six farms.

At present, Arizona paracolon is not a notifiable disease and the ministry has no power to enforce inspection of birds or slaughter. Mr J. Mackie, in a written parliamentary answer for the ministry on November 20, said that an eradication campaign was not practicable but the ministry has recommended farmers not to breed from the Williams strain or from birds exposed to the risk of infection. In the meantime, the ministry is considering whether to introduce further safeguards. The recent outbreak has proved that the existing ones should be tightened; one possible alternative would be to insist that all imported turkeys should not be released from quarantine until the first generation progeny had been proved free of the disease.

INSTITUTIONS

Interdisciplinarians

It will come as a surprise to many British scientists and engineers to learn of the existence of a special body, set up by a group of scientific institutions, whose aim is to probe and develop scientific work which does not fall uniquely into any of the conventional disciplines. The status of the body is that of an informal committee, and it is known as the Interdisciplinary Working Party (IWP). It seems that the absence of publicity has its origins in the nature of the IWP, which has an almost pathological dislike of officialdom and the other strings normally attached to being a "committee". The chairman of the group, Dr J. A. Ratcliffe, stresses that each of the nine members of the IWP represents nobody but himself and has no outside obligations.

The history and aims of the IWP are straightforward. In February 1967 the scientific institutions representing chemistry, biology, physics, metallurgy and mathematics invited the Council of Engineering Institutions to participate in the activities of an IWP. The idea was that this unit should be independent and should have an informal action group to galvanize the institutions into interdisciplinary functions—meetings and conferences, for example. The management of the working party has been in the hands of the Institution of Metallurgy since the IWP was set up in July 1967. It is due to be transferred to the Institution of Mechanical Engineers in the new year, and there may also be a new secretary to replace Mr D. W. Harding.

The original committee consisted of eight members taken from universities and industry and appointed by the scientific institutions. Extra members can be added to the group either by invitation or by recommendation, and there has been one addition to date. The IWP has already had some success in enticing the Institution of Metallurgists to hold several meetings of an interdisciplinary nature, covering subjects like "Tribology" and "Plastics, Materials and Ceramics". The secretary and chairman of the IWP are both confident that the functions of the group will increase in the coming year.

FERTILIZERS

Hazards of Progress

Increasing use of artificial fertilizers has resulted in a tendency to separate crop and animal farming. In a lecture "Fertilizers and Animal Production" Dr K. L. Blaxter of the Rowett Research Institute told the Fertilizer Society on November 28 that during the past fifty years the role of livestock on the arable farm has changed from a central feature of an ancient fertility rite to a separate enterprise to be judged solely on its economic validity. This has meant that in arable farming less attention has been paid to the effects of arable manuring practice on animal production, although the stock farmer still depends absolutely on the quantity and quality of the crops produced for his animals to feed on.

There is evidence, Dr Blaxter said, that, although most farm crops and grass are grown for consumption by stock, fertilizer policy is decided according to the economics of the primary crop response rather than the secondary animal response. This can lead to problems, because crops giving high yields as a result of treatment with fertilizer may not provide the best nutritive value for the stock feeding on them. Sodium, iodine and selenium, for example, are essential to animals but not to plants. If the optimal needs of many plants for cobalt, magnesium and iron are met,

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

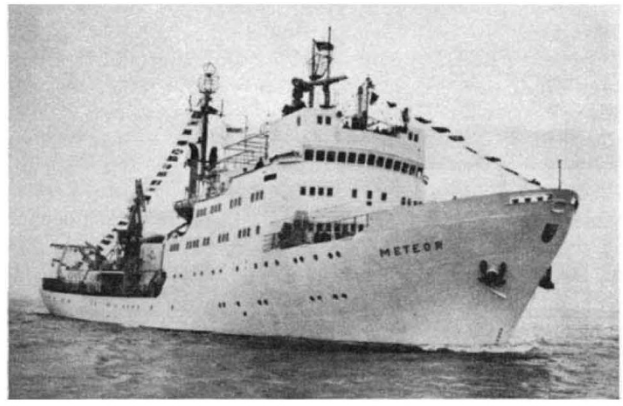
OCEANOGRAPHERS from the research ship Meteor are visiting London on their way home after three months at sea trying to find out how safe it is to dump radioactive waste in the deep sea west of the Iberian peninsula.

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