year ending March 31, 1969, the laboratory spent £2,473,100, and received £176,000 from sponsoring firms. Although that record does not seem too impressive, Mr Weir, the new director, points out that it is impossible to set out the financial benefits resulting from the sponsored research against the laboratory's expenditure. "In many cases, firms are unable to measure these benefits and others are justifiably reluctant to have publicized this information which would be useful to competitors", he says. Mr Weir also points out that much of the NEL's work has environmental benefits, such as the development of quieter machines, and the testing of components and gas cylinders.

These hidden benefits notwithstanding, the NEL is looking for more industrial sponsorship and, tucked away in East Kilbride in Scotland, it faces a rather uphill task in getting its name at least as well known as that of the National Physical Laboratory. One answer suggested by Mr Weir is that a full appreciation of the work of the establishment can only be obtained by a personal visit to the NEL.

One of the laboratory's more widely-publicized activities is that of computer aided design. In 1967, a regional experiment was started which allows participants a controlled amount of time on the NEL computer. This experiment is now nearing completion, and one company, Thermotank Products, in collaboration with the NEL and Glasgow University, has found that the cost of its design programme has been reduced by a factor of between 15 and 30 with the use of a computer.

As far as strength and design of components are concerned, the laboratory has been engaged on research into the stress on a variety of materials and components, from ropes to crane jibs. A versatile loading frame has been built for testing large components, and the report points out that the laboratory has a large number of testing facilities available to industry.

PROTEIN

Food from Oil

WITH the annual world protein shortfall now running at between 20 and 30 million tons, the announcement last week that the British Petroleum (BP) hydrocarbon fermentation plant at Grangemouth will be in full production within weeks is welcome news. In this process, microorganisms—yeasts in the BP process—are grown on crude petroleum and the microbial protein is recovered and used as an ingredient in animal foodstuffs.

It has been calculated that the present annual world production of petroleum is sufficient to manufacture 20 million tons of protein, but BP's involvement will be on a more modest scale. Four thousand tons of 'Toprina', the trade-name BP has given to the protein derived from its process, will be manufactured each year at Grangemouth; and a second plant, at Laverna near Marseilles in France, is scheduled to start production later this year and will have an initial annual capacity of 16,000 tons.

The start of commercial production of protein from petroleum is something of a *tour-de-force* for BP; the protein which will be manufactured in Scotland and France has already been subjected to more than six years of rigorous testing. Although prospects for the manufacture of protein from petroleum for human consumption look bright, the immediate intention is to manufacture only feed for animals. Protein made in BP's pilot plants has been fed successfully to many generations of chickens, poultry and pigs. 'Toprina' is mixed with other ingredients to yield a high protein diet which is of higher nutritional value than fishmeal—a common animal feed—and cost, around £100 per ton, is comparable.

The sustained effort which BP has made during the past few years has certainly paid off, for the company seems to have established a clear lead in this field of food technology—in the West at least. The Chinese are reported to have had a protein plant in operation for some time, and the Russians have been experimenting with paraffin fermentation, but so far no details are available. On the other hand, the 'Toprina' process has stimulated over 200 enquiries from 42 different countries, and a 1,000 ton per year plant has been built under licence in Japan and is already producing protein.

The science behind the process is very simple, but the technology, especially for large scale production, is complicated. BP is at present experimenting with two separate systems. In Grangemouth, the microorganisms are fed with a fairly pure mixture of paraffins, prepared from crude oil by molecular sieving. The microorganisms are capable of assimilating all this hydrocarbon and there is little waste. In Lavena, the microorganisms are raised on gas-oil, a fraction resembling diesel fuel. The yeasts can assimilate only the waxy part of this fraction leaving a much cleaner petroleum fraction. The protein manufactured is thus biological in origin and in nature, and the process is in no sense a chemical synthesis of protein.

There can be no doubt that there is a steadily growing demand for this type of feed product, and the entire production from the BP plant during its first year of operation has already been taken up by leading feed compounders. Nevertheless, in spite of this visible evidence of the commercial viability of the product, BP is shy of divulging its future production plans. The company admits to looking at designs, schemes and locations for larger plants having the capacity to produce perhaps 100,000 tons of protein a year, but denies that any major decisions have yet been taken.

INDUSTRIAL RELATIONS

Vital Amendment

THE scope of the Industrial Relations Bill is to be extended to include professional organizations such as the British Medical Association and the Institution of Professional Civil Servants. The government has given an undertaking that the bill will be amended during the committee stage, and it seems likely that a register of professional organizations will be set up under the auspices of the proposed Registrar of Trade Unions.

If the bill is passed and implemented in its present form, professional organizations would be placed in an anomalous position. Under the terms of the bill, they would be regarded as organizations of workers, but would not be guaranteed the same rights and protection as registered trade unions. A professional organization which advises its members to take industrial action, for example, would be liable to heavy fines, while a registered trade union would be protected against actions for damages if its members break personal contracts with the union's sanction. The bill does, however, include provision for court actions to be brought against a trade union which breaks a contract which it has itself negotiated.

The British Medical Association and the British Dental Association are likely to be most affected by such an amendment to the Industrial Relations Bill. For one thing, their members hold personal contracts with the National Health Service, and both associations would, under the terms of the bill, have been liable to court actions when they advised their members to break contracts during the salary negotiations last year. With their hands tied in this way, professional organizations would lose members to registered trade unions, such as the Association of Scientific, Technical and Managerial Staffs, because such unions would be able to set themselves up as the only organizations capable of negotiating effectively on salaries and conditions of employment. The Association of Scientific, Technical and Managerial Staffs has already absorbed the Medical Practitioners Union.

Engineering associations will be less affected because they formed the United Kingdom Association of Professional Engineers, to negotiate conditions of employment. Similarly, the Association of University Teachers was affiliated last year to the Trades Union Congress, and the machinery used recently to negotiate salary scales for university academic staff would be approved under the terms of the bill.