amounts too small to combat disease but which ensure maximum growth rate and weight gain by overcoming sub-acute infections such as chicken pest. The Ministry of Agriculture considers it unlikely that the very small amounts of antibiotics given in foodstuffs could produce a resistance to antibiotic drugs, but the last word on that subject will have to be the report of the Swann Committee, now sitting. In the meantime, the Therapeutic Substances Act decrees that antibiotics require a veterinary prescription and has made special regulations which allow the addition of penicillins and some tetracyclines to foodstuffs in specified amounts. The amounts laid down are precise and vary for the different drugs: thus, for example, a feed supplement may contain only 1 part of procaine benzyl penicillin to 90 parts of the supplement which is then added to the total feed to give an antibiotic : feed ratio of 1 : 10,000. Non-antibiotics such as nitrofurazone are controlled by the Veterinary Products Safety Precaution Scheme, a voluntary scheme run by the Ministry of Agriculture in conjunction with the foodstuff manufacturers.

In Britain, in contrast with the United States, there is no absolute legislation controlling the amounts of pesticides allowed in foodstuffs. The Food and Drug Act merely says that food must not contain injurious substances. If, however, residue analysis shows that the animal tissues contain too much of the pesticide metabolite, prosecution may result. In other words, the analysis service now offered by the Government Chemist should help in two ways. First, it provides information for the public analyst or buyer of animal foodstuffs—and also the manufacturer—to ensure that the food does indeed contain prophylactic agents and in what amounts. The very high price of these drugs makes this economically worthwhile. But it should also help that there is now a way of spotting high levels of these agents while they are still only in animal foods.

EDUCATION

Higher Degrees

THE second largest degree-awarding organization in Britain is not an ancient university, a red-brick or even a plate-glass university and, indeed, not a university at all but the Council for National Academic Awards. Like any university, the council is empowered by its Royal Charter to award first degrees, masters' degrees and doctorates and, in addition, diplomas and certificates. (The last have not yet been used.) Since its establishment in 1964, chiefly as a result of recommendations in the Robbins Report, the number of students on the CNAA's books had risen from about 3,000 to 15,500 by October 1968 and should be close to 20,000 by next October. The University of London apart, the council is the organization with the largest enrolment of degree candidates in Britain.

The CNAA now offers more than 230 full-time, part-time and sandwich degree courses at fifty-odd polytechnics and colleges of technology, compared with the eighty courses available in 1964. This route to a degree seems destined to play an increasingly important part in British higher education, especially now that rapid growth in the number of arts and social sciences courses and candidates is drawing many of the colleges away from their overwhelming preoccupation with science and technology. Of the 15,500 candidates enrolled in 1968, 3,800 were studying the arts and social sciences.

The CNAA took over the overall supervision of the former Dip.Tech. courses at the best of the technical colleges and the twenty-six polytechnics after the colleges of advanced technology had been hived off as independent technical universities. If all the plans for the large-scale expansion of the polytechnics materialize, the polytechnics should become the council's chief customers in the future. With the example of the City and Guilds course and examination programmes in front of it, the council will have to fight hard to avoid the same fate of becoming smothered by its own red tape.

In a country with more than its fair share of academic snobbery, it is particularly important that this should not happen. The CNAA has the crucial function of ensuring that education to degree standard outside the universities is both expanded and rewarded by a degree. By the same token it has the complementary role of ensuring that courses eligible for degrees at the polytechnics and technical colleges are really of degree standard.

As things stand, the council works by vetting the course proposals of the colleges and giving them a stamp of approval. Naturally enough, with the tradition of technical education behind it and candidates drawn from industry, the sort of courses the CNAA deals with are designed to be more in tune with the demands of industry and commerce than those offered by the universities. The committees and boards which vet the proposals are made up of representatives of industry, the universities and the colleges and polytechnics in equal proportions.

To judge from the striking proliferation of approved courses and the number of degrees awarded (in 1967–68 there were 1,100), as well as the increasing enrolment, the council has found a particularly rich vein in the British academic set-up to exploit. Nobody seems quite certain about that other crucial statistic, the failure rate—the Department of Education and Science is in the process of making a survey—but there is no reason to think that it is anything out of the ordinary. The 1,100 who graduated in 1967–68, for example, came from a fourth year class of 1,311.

But, apart from ensuring that the part-time and sandwich-course degree candidate does not suffer in status as well as having a harder life than his full-time university counterpart, the council has the equally important job of giving status and credit to serious research done in industry. There are 600 higher degree candidates. The council registers students at an early stage in a project and helps to recruit approved supervisors, one from industry and one from the academic world. It will be interesting to see whether its degree holders are more to the taste of industry and commerce than those emerging from the universities.

COMPUTERS

Generating Good Figures

THERE has been a large increase in the sale of electronic computers in Britain during the first quarter of 1969, compared with the same period in 1968. Although the

record sales for the last quarter of 1968 have proved too tough a yardstick for the first few months of the year, which are usually lean, the overall trend must be considered quite promising. The increase in exports of computers from Britain is particularly encouraging, with an increase of 29 per cent compared with the first quarter of 1968 to give total sales of £10·6 million.

TABLE OF COMPUTER SALES FROM BRITAIN

	Total	Exports	Running totals	Running exports
1966 Q4	29,405	7,622	114,938	33,580
1967 Q1	25,907	8,481	114,184	33,993
Q2	29,702	9,443	114,613	34,391
Q3	35,186	9,473	120,200	35,019
Q4	36,438	9,905	127,233	37,302
1968 Q1	33,819	8,244	135,145	37,065
Q2	36,785	10,246	142,228	37,868
Q3	44,147	10,147	151,189	38,542
Q4	50,596	12,203	165,347	40,840
1969 Q1	43,037	10,641	174,565	43,237

The table, which shows how the sales of computers from Britain have fluctuated during the past two and a half years, is based on figures issued by the Ministry of Technology. The first two columns show the actual quarterly figures, and the others contain running totals for the four quarters up to and including that in question. The latter columns give a more accurate guide to the overall trends in sales. Turnover relating to the repair and maintenance of existing computers has been excluded, but both British manufactured and "factored" computers are included. The irregularly high figure for sales in the last quarter of 1968 is attributable almost entirely to a boom in factored hardware.

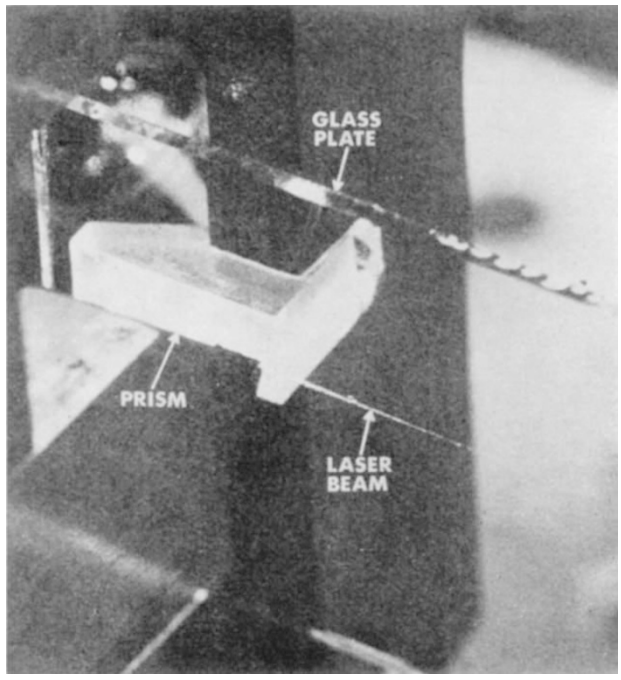
The pattern of export sales will be a source of satisfaction to those who have put their faith in the healing powers of devaluation. Apart from the predictable plateau immediately after devaluation in November 1967, the figures have risen at a rate which can certainly be called promising, and which may within the next two quarters turn out to be quite remarkable. Total orders at March 31 were at the record level of £258 million, according to the Ministry of Technology.

LASERS

Thin Film Modes

AN unexpectedly obvious method of guiding laser beams into thin crystal films by means of a simple prism looks like being the solution to a problem that has been plaguing Bell Telephone Laboratories for some while now. By allowing laser light to tunnel across the junction between a prism and a thin semiconducting film, P. K. Tien, R. Ulrichand and R. J. Martin of the Bell Laboratories have managed to transfer more than 50 per cent of the energy of the laser beam to the film. The efficient introduction of laser energy into thin crystal films is crucial to the development of laser amplifiers, light modulators and other components of a potential laser communication system.

Earlier attempts to direct a laser beam through the edge of a semiconducting film have been flawed by scattering from ragged edges of the film. In addition,



The bright streak of light is a laser beam travelling in an invisibly thin crystal film deposited on the back of the glass plate.

the films are usually much thinner than the width of the laser beam and, even if the problem of focusing the beam had been overcome, there would be immense difficulties in aligning the beam with the film.

In the experiments at the Bell Laboratories, the base of the prism was placed parallel to the film and at a precise distance from it. A proportion of the laser light then passed through the prism, tunnelled through the gap and set up electromagnetic oscillations in the film. This prism-coupling technique has the advantage, it seems, that a single mode of oscillation can be excited in the film by the appropriate orientation of the laser beam. The photograph shows the laser beam travelling in a thin film. One of the chief problems of thin film laser beam circuitry is the loss of light by scattering at microscopic imperfections in the films. A good deal of research is being carried out both at Bell and elsewhere to improve the production of these very thin crystal films.

A possible use for the prism film coupler is to split light beams into groups of different wavelength to form the separate channels of a laser communication system. Within the film, the beams could be modulated or amplified. They could then be taken out of the film, travel to some destination by a "pipeline", and then be coupled into a new film for signal processing.

TELECOMMUNICATIONS

Stored Programs for Sale

COMPUTERIZED telephone systems are finding new applications in Australia. L. M. Ericsson, the Swedish telephone equipment manufacturer, has just received a contract of undisclosed value from the Overseas Telecommunications Commission for a computer controlled exchange which is to deal with calls between