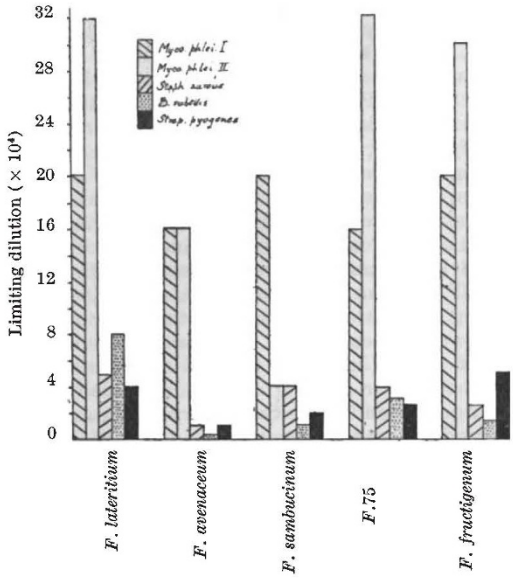

product of *F. fructigenum*, it is believed that under the culture conditions employed these new compounds represent the whole of the antibacterial activity present in the crude metabolism solutions. Naming them conventionally according to the species from which they are derived (that from *F.*75 being provisionally termed lateritiin-II) these compounds are quite distinct, the melting point of a mixture of any two being depressed: Lateritiin-I, $C_{26}H_{46}O_7N_2$, m.p. 121–122°; lateritiin-II, $C_{26}H_{46}O_7N_2$, m.p. 125°; avenacein, $C_{25}H_{44}O_7N_2$, m.p. 139°; fructigenin, $C_{26}H_{44-46}O_7N_2$, m.p. 129°; sambucinin, $C_{24}H_{42}O_7N_2$, m.p. 85–86°. These formulæ are regarded as subject to some revision of detail, though each is based on repeated concordant analyses. The compounds are also distinct in their antibacterial properties, as appears from the differing 'bacterial spectra' in the accompanying graph.

On the other hand, the compounds are so similar in chemical behaviour as to leave no doubt that they owe their biological activity to similar structural features. They are colourless, optically active, neutral, and sparingly soluble in water, but very soluble in organic solutions including light petroleum. All are stable to mineral acids under ordinary conditions, and to heat; indeed, lateritiin-I could be distilled *in vacuo* without chemical change occurring. However, all are very unstable to alkali, so that all antibacterial activity is irreversibly lost in solution at pH = 10–11 at room temperature after 18 hours. During this inactivation approximately two acid groupings per molecule are produced but disappear again, possibly by lactonization, when attempts are made to isolate the primary inactivation product. The group of compounds is otherwise notable for its lack of easily recognizable structural features. Thus avenacein contains no acidic, basic, carbonyl or alkoxy groups, nor any active hydrogen atoms detectable by the usual means. It does, however, contain two N-methyl and four C-methyl groups. When the compounds are heated with concentrated hydrochloric or hydrobromic acid at 120°, they are degraded to optically active crystalline bases which contain all the nitrogen present in the antibiotics. In addition, each of the antibiotics gives rise to the same crystalline acid, $C_5H_{10}O_3$; in the case of lateritiin-I the yield approaches that corresponding to the formation of two molecules of acid. The latter has been completely identified as the optically active α-hydroxy*iso*valeric acid corresponding to *d*(-)valine. To the best of our knowledge this acid has not previously been obtained directly from any natural source. It is interesting to note its correspondence with the amino-acid and particularly its retention of optical activity, the configuration being the 'unnatural' one.

Attention was specially directed to these antibiotics because of their action against *Myco. phlei* and possibly, therefore, against *Myco. tuberculosis*. Tests with lateritiin-I against three strains of tubercle demonstrated *in vitro* inhibitions at limiting dilutions of 1 : 160,000–1 : 640,000, indicating a high activity. Mouse experiments pointed to relatively low toxicity, at least by intraperitoneal administration. We are indebted to Drs. P. D'Arcy Hart and R. E. Glover (National Institute for Medical Research) for these results, but any therapeutic possibilities remain largely to be explored.

It has been noted that these *Fusarium* antibiotics are best produced when the mould is in a somewhat metabolically degenerate state. Perhaps such antibiotics are normal but mostly transient metabolic products, which only accumulate in sufficient quantities to permit of their recognition and isolation under abnormal culture conditions. It may perhaps be further envisaged that more deliberate induction of a moderately degenerate state may afford a degree of control over antibiotic production. Finally, it is worth noting that the above compounds appear to be products of an arrested metabolism exerting an antibiotic action on other presumably similar though obviously distinct metabolisms. The fact appears to offer perhaps profitable speculation on the mechanism of such manifestations of interference.

Full details of the above work will be published elsewhere. We are indebted to the Medical Research Council for assistance, and to Sir Ian Heilbron for his interest and encouragement.

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[2] Arnstein, H. R. V., Cook, A. H., and Lacey, M. S., *Nature*, **157**, 333 (1946).
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NATIONAL INSTITUTE OF ECONOMIC AND SOCIAL RESEARCH

ANNUAL REPORT

THE annual report of the National Institute of Economic and Social Research for 1945–46 welcomes the recommendations of the Clapham Committee and particularly the declaration in that Report as to the national importance of the realistic studies to which the Institute has consistently devoted itself. Commenting on the new approach to economic problems illustrated by the elaboration of national income studies, the Institute's report points out that in Britain, in spite of sharp disagreement about particular methods and policies, there is a considerable measure of agreement about the ultimate goals of economic and social policy and the intellectual terms in which these problems may most profitably be set out, discussed and investigated. Moreover, the Institute has been able, through its Occasional Paper No. X, "A System of National Book-keeping:

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Illustrated by the Experience of the Netherlands Economy", by Prof. J. B. D. Derkson, to make available to English readers some of the basic researches behind developments in economic planning in Holland, and it has also provided a meeting-place for the discussion of technical aspects of such problems between official representatives from Norway and Sweden and those engaged in similar work in Britain.

The immense tasks which face the advisers of Government call for a wealth of factual, quantitative information about the British economy and its development in the recent past which cannot be supplied entirely from official sources, and the contribution of the Institute in this field is of increasing importance. Of particular significance in this connexion, through its bearing on the structure and productivity of the national economy, is the inquiry on the "National Expenditure, Output and Income, 1920–38", which continued to be directed by Mr. Richard Stone. A first volume containing the results of the investigation into consumers' expenditure is already in the hands of the printers: as is a report on "Productivity, Prices and Distribution in Selected British Industries". A second report from the same investigation, "International Comparisons of Productivity in British and American Manufacturing Industry", is now being finally prepared for publication, while during the year work was started on the distribution inquiry with the aim at the first stage of building up a factual picture of the channels by which consumer goods passed from the manufacturer to the public in the immediate pre-war period. The second stage of the inquiry is concerned with the more difficult problem of the functions, stock turn, and cost and profit experience of different types of wholesaler and retailer. Late in 1945 a building inquiry was commenced, under Mr. I. Bowen, covering the structure and efficiency of the building industry, housing demand and the building cycle, and economic problems arising from new building techniques. Main attention is being given to the first topic, and it is hoped that a report on this part of the programme will be completed during 1947.

The work on capital formation and public authority expenditure has continued, attention so far having been concentrated on the current and capital expenditure of local authorities. The inquiry into disease mortality and its changing distribution has issued in a draft report "The Social Geography of Mortality in England and Wales, 1911–38"; but Dr. Kuczynski's study of post-war population problems has been suspended while the Royal Commission on Population is in session. The inquiry into advertising has been completed, and a report on "Statistics of Advertising" is to be published later. Miss P. M. Deane completed her Occasional Paper, "The Measurement of Colonial National Incomes: an Experiment", before taking up her field experiments as a Colonial research fellow in Africa. A joint exploratory committee with representatives of the Institute of Chartered Accountants has considered the field of work in which accountants and economists have a common interest, and it is hoped to publish later an agreed statement of its findings. Senior research fellowships were awarded during the year, under the scheme described in last year's report, to Mr. E. J. M. Buckatzsch for an inquiry into "Factors Affecting Income per Head in Towns and Areas in England and Wales, 1929–1939", to Miss K. Liepmann, for an inquiry into "The Extent and Composition of Labour Markets in Selected Areas in the South West", and Mr. H. G. Schenk's part-time fellowship has been extended to enable him to complete his inquiry into "European Romanticism and the Social Revolution, 1790–1830". The Register of Research in the Social Sciences for 1940 is being distributed as a confidential document. New Institute publications during the year are listed in the report.

SALMON MIGRATION AT SEA

THE Buckland Foundation Lecture was given by J. W. Menzies at the University of Liverpool, on May 28, Prof. J. H. Orton presiding. Taking for his subject "The Migrations of Salmon in the Sea", Mr. Menzies summarized the information learned from the experiments of marking salmon in Scottish, Norwegian, Baltic, and Canadian haunts, and suggested that European and Canadian salmon have a common feeding ground in the North Atlantic near Iceland, where a new marking station will probably be opened under international co-operation in a few years time. The only area where *Salmo salar* has been traced from the river of origin to its feeding ground in the sea and then back to the river as adult fish is the Baltic, where Swedish marking experiments showed that smolts left the northern Swedish and Finnish rivers in spring when only 5 in. long and reached the southern Baltic, 600–800 miles away, in October and November, when they weighed just over a pound after feeding; but they did not show evidence of passing out of this belt into the North Sea. Salmon apparently do not feed in the North Sea, or The Minch of western Scotland, or they would have been caught more often in the herring nets. The Swedish salmon feed in the southern Baltic for possibly up to two or three years before returning to their native rivers.

Salmon marked in the Gulf of St. Lawrence, and off the shores of Scotland and Norway, have shown two types of movements. In one they have been recovered after they have nearly completed their journey home again, when they remain off the river until a flood induces them to ascend. They cease feeding once they reach the coast, and if a drought keeps them there some weeks or months, they lose weight, a 15-lb. fish losing 2–3 lb. in a little more than two months while waiting to ascend the river; a 15-lb. fish lost 4 lb. in 67 days; a 12-lb. fish lost 2 lb. in two months. Only five marked fish were recovered more than ten miles from Thurso Bay, and marking showed a similar restricted movement in the inner Moray Firth; only six out of more than 400 strayed outside the outer limits of the Firth, and there were similar results from Canada and Norway.

Other salmon, particularly those marked off south-west Newfoundland, western Scotland and western Norway, made long journeys to the place of capture, the record being a St. Lawrence fish caught as a clean fish in sea nets 2,000 miles away up the Labrador coast, while from near the north of Norway an easterly migration has been traced to the River Petchora, the easterly limit in the distribution of *Salmo salar*. In both Canada and Scotland these long journeys have often been four or six hundred miles, and on the Norwegian coast 1,600 miles to the White Sea. Marked salmon have travelled between Scotland and Norway, but not across the Atlantic, so far as recoveries show; but all these fish seem to be going back to the river from which they came as smolts.

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