iodine-131 probably include the best single tests at present available, and, while methods involving the output of hormone as described by Prof. Harris are useful in animals, for clinical work all successful tests depend upon uptake of iodine-131 by the gland. Fortunately the uptake is usually equal to the output in the untreated patient. The method employed at the Postgraduate Medical School of London depends upon measurement of urinary radioactivity and the calculation of a T factor. Dr. Fraser's results show that this test is highly efficient in the diagnosis of thyrotoxicosis. It is not quite so good in cases of doubtful myxœdema, although classical cases always give low values. After treatment with goitrogens, the intake is no longer equal to the output, and the position is complicated by iodine deficiency. The test can usefully be employed three months after therapeutic doses of iodine-131.

Results illustrating the diagnostic value of serum protein-bound iodine estimation in the diagnosis of thyroid disorders were described by Dr. R. R. de Mowbray, who said that he cannot agree with some previous claims and has found high values in only 62 per cent of patients with hyperthyroidism. In hypothyroidism, results are below normal in 85 per cent of cases. High levels are seen in normal pregnancy. The overlap with normal values is a definite limitation to the usefulness of this test, but it nevertheless has its value, particularly in the case of patients intolerant of the estimation of basal metabolic rate. Mr. A. Tickner, who joined Dr. de Mowbray in this paper, then described some of the laboratory hazards of the estimation. He also reported some results with serum cholinesterase estimation in thyrotoxicosis. Although high values are frequently obtained, the estimations are of little diagnostic value.

The chairman, Dr. Leonard Simpson, wound up the symposium with a short summary, in which he said that he was particularly impressed with the application of chromatography and the use of radioisotopes in this field. As a clinician he thought that the relationship of the thyroid with other endocrine glands would repay much further study, and he gave a number of examples illustrating these relationships. He hoped that a later symposium might help to explore these other endocrine relationships.

METHODS OF PLANT PEST AND DISEASE ASSESSMENT

THE meeting of the Association of Applied Biologists at Imperial College, London, on February 27 was devoted to a symposium on the assessment of plant pests and diseases. In the opening paper, Mr. E. C. Large, of the Ministry of Agriculture's Plant Pathology Laboratory at Harpenden, referred to the wealth of information[1] on plant diseases in England and Wales that had been extracted from monthly reports sent to the Laboratory since 1917, and gave an account of some of the recent surveys, undertaken jointly by the Laboratory and the National Agricultural Advisory Service, to supplement the reporting service and obtain more quantitative information on the losses caused by plant diseases throughout the country. Mr. Large described the way in which an investigation on potato blight forecasting[2], begun in 1950 in collaboration with the Agricultural Branch of the Meteorological Office, had been developed into a comprehensive survey for both outbreak dates and progress of blight. From the survey maps and curves for the progress of blight on the foliage, taken in conjunction with the results of spraying trials at key centres, it would be possible within a few years to give reliable estimates of the mean gain, or loss, to be expected from routine protective spraying in each region of the country[3]. Disease-assessment (or, as Mr. Large now calls them, 'plant pathometric') methods applied in potato haulm destruction trials at twelve centres over a period of three years were also clearly revealing the blight conditions under which haulm destruction was, and was not, of value for the prevention of the disease in the tubers[4]. Other investigations in progress included a survey of *Epichloe typhina* attack on cocksfoot seed crops[5], now in its third year; a survey of common scab in potatoes, begun in 1952 in collaboration with the Potato Division of the Ministry of Food; and a survey of clover rot in crops of broad red and late-flowering clover, begun in 1953.

The second paper, by Dr. H. E. Croxall (N.A.A.S. Provincial Headquarters, Newcastle upon Tyne), described joint work with D. C. Gwynne and J. E. E. Jenkins in devising rapid methods for assessing the damage caused by apple diseases, particularly apple scab (*Venturia inæqualis*) and brown rot (*Sclerotinia fructigena*). Apple scab damage on the foliage might be conveniently expressed in terms of mean percentage area of the leaves covered by lesions. This could be calculated by comparing leaf samples with standard diagrams showing the appearance of individual leaves with known percentage areas covered by scab. This method was too time-consuming for rapid survey work, and from it had been derived a word-picture key in which brief descriptions were given of the appearance of branches on which the leaves had a known amount of scab damage. In a limited number of tests this method had given results of the same order as those obtained by the standard diagram method.

Similar keys had been drawn up for assessing the amount of scab blemishes on the fruit before picking and also the loss in crop due to brown rot. The results achieved so far were reasonably in agreement with those obtained by a sampling technique using standard diagrams. The possibility of correlating the mean percentage area of fruit covered by scab lesions with the grading of fruit according to the recommended grades of the Ministry of Agriculture Marketing Division was now being investigated. Methods were also being developed for giving a direct estimate of loss of value due to scab in samples of apples after picking.

Dr. R. Hull, of the Rothamsted staff (Dunholme Field Station), dealt with the records of sugar beet diseases made each year by the agricultural staff of the British Sugar Corporation under a scheme organized at Dunholme. Counts of virus yellows in sample fields were checked against yearly estimates of the acreage affected at the end of August. The disease had built up from low levels over four-year periods to peak infections in 1945 and 1949 when more than 50 per cent of the crop was infected. The weather in 1952 had been very favourable for aphid development and movement, and a severe attack of the disease developed late in the season. The losses caused by the disease were assessed by allocating an experimentally determined loss of 4–5 per cent of sugar yield for each week during which plants showed symptoms until harvest. In a bad year, such as 1949, this amounted to about 20 per cent of the sugar yield, or some 900,000 tons of sugar beet. This figure was checked by calculating a regression coefficient of yield on percentage of plants with yellows for the various factory areas. Surveys were also made of the incidence of yellows in sugar beet seed crops and of aphids in clamped mangolds in spring, as these virus and aphid sources were of importance in the initiation of outbreaks of yellows in the root crop.

In opening the discussion on the plant disease assessment papers, Mr. L. P. Smith (Meteorological Office Agricultural Branch) emphasized the need to establish the relationships between the microclimate on the plant surface and the macroclimate as defined by the recording instruments of the meteorologist. Meteorological records could already be used for forecasting potato blight, since it appeared that 75 per cent relative humidity in the air was indicative of saturation on the potato leaf surface. Advances in the application of meteorology to plant disease forecasting depended on exact definition by the plant pathologist of the meteorological factors permitting infection and on the provision of accurate means of disease assessment.

Mr. W. C. Moore (director, Ministry of Agriculture Plant Pathology Laboratory), in concluding the morning session, paid tribute to the pioneer work of Mr. Buddin. He pointed out that the United Kingdom was the only country in which full-time appointments had been made for the development and co-ordination of work on pest and disease assessment. The successful prosecution of this work depended on the co-operation of all those concerned in crop protection who were willing to give time to the surveys necessary to obtain accurate information.

The afternoon session opened with a paper on field technique in pest assessment by Mr. A. H. Strickland, also of the Plant Pathology Laboratory. Mr. Strickland recorded that routine quantitative survey work was started on some twelve pest species by entomologists in the National Agricultural Advisory Service in 1946. Initially the approach had been somewhat arbitrary—necessarily so in view of the almost complete lack of information on pest population variability within and between fields or provinces.

In 1950 four seasons work on the cabbage aphid was critically reviewed and it was realized that a much more intensive approach was needed to give reliable results on aphid abundance and crop damage. Since that time, work had been directed to assessing cabbage aphid damage accurately on an experimental plot scale and in overcoming some of the difficulties met. Two examples were given of the way in which seemingly straightforward population and yield or damage data could be misinterpreted.

It had become increasingly clear that a full interpretation of results in terms of biological activity was not in general possible on present knowledge. In view of the importance of assessing the significance of major ecological factors in relation to pest population build-up, a new pest incidence report scheme had been drawn up and was being given a trial.

Mr. F. G. W. Jones (School of Agriculture, University of Cambridge) classified the seedling pests of beet into three groups : those causing loss of stand only, those causing defoliation only, and those causing both defoliation and loss of stand. Injury caused by these pests could be assessed in terms of money, yield or, occasionally, plant population.

Normally, an excess of 'seed' was sown, from which only 25 per cent of potential seedlings appeared above ground, 10 per cent having succumbed to fungal disease, 5 per cent to insect attack and 60 per cent to other causes, mainly arising from the physical properties of the soil. The cost of insecticidal seed dressings applied to beet on arable land had to be regarded as an insurance against unexpected attacks, especially where reduced seed rates were used to ease the labour problems of singling.

Field experiments had been made in which defoliation and loss of stand were produced artificially. The results of five such experiments showed clearly that beet was capable of withstanding up to 75 per cent defoliation at the four- and eight-leaf stages without suffering more than 10–15 per cent loss of yield. Re-drilling was undesirable so long as even one-half of the intended plant population remained, provided the surviving plants were fairly evenly distributed. The use of insecticides against pest attacks of moderate severity was likely to be uneconomical if the cost exceeded £3–£5 per acre.

Mr. D. W. Wright (National Vegetable Research Station, Wellesbourne) described two methods of assessing damage caused by larvæ of the cabbage root fly. The first was an estimation on the tap root of the proportion of the area injured by the larvæ ; the second was by recording crop yield. These two methods showed little agreement, as the effect of a given level of root fly infestation on crop yield varied from year to year. This appeared to be correlated with the rainfall during the main period of crop growth and infestation. When the rainfall over this period was at or below average, very considerable increases in yield occurred following control of the pest. When the rainfall was well above average at this time, however, no visible or significant improvement followed control. It would thus seem that under dry soil conditions a damaged root system was unable to provide the plant with an adequate supply of water.

Losses due to this insect appeared to be greatest on crops transplanted early in the year. Crops transplanted later, and harvested in autumn and winter, were usually less affected, but with these also marked increases in yield had been obtained when the root fly was controlled.

Dr. M. Cohen (N.A.A.S., Newcastle), opening the discussion on pest assessment, stressed the need for long-term records and for relating insect attack to the physiology of the host plants. Hitherto the only records that had permitted forecasting of pest attacks had been those on leatherjacket populations. Accurate figures on losses due to pests could help to guide the intensification of control measures into those channels that would increase agricultural production most rapidly.

Prof. H. W. Miles (Wye College, University of London) considered that many lines of field work would be promoted as a result of the symposium. He directed attention to the potentialities of plants to compensate for insect injury, and pointed out that the grower must be shown by realistic figures the amount of crop loss due to pests. The need to combine economy with efficiency in pest control was specially apparent at the present time.

Dr. W. F. Jepson (Imperial College Field Station), and other speakers, referred to work on varietal susceptibility to pest damage, and pressed for a clear discrimination between degree of attack and loss of yield.

Dr. I. Thomas (Plant Pathology Laboratory, Harpenden) noted that methods of assessing plant disease loss had been initiated by research workers, but in assessing losses due to pests, methods had had to be improvised. It was essential to avoid the pitfall of ascribing losses to pests when nutrition and soil factors were primarily responsible. Dr. Thomas again stressed the need for a generous measure of co-operation and goodwill to ensure the successful development and application of methods of assessment. R. W. Marsh

[1] Moore, W. C., *Bull. Min. Agric.*, No. 126 (1943) and No. 139 (1948), and earlier bulletins.
[2] Large, E. C., *Plant Path.*, **2**, 1, in the press (1953).
[3] Large, E. C., *Plant Path.*, **1**, 109 (1952).
[4] Large, E. C., *Plant Path.*, **1**, 2, 56 (1952).
[5] Large, E. C., *Plant Path.*, **1**, 23 (1952).

RECENT GEGENSCHEIN STUDIES IN THE SOVIET UNION

A GOOD deal of work has recently been done, in the Soviet Union, on the Gegenschein or 'counterglow', as a result of which a fairly definite point of view has developed. In particular, the Glydén–Moulton theory is regarded as quite overthrown by mathematical analysis (Moïseyev). The Seeliger reflexion theory may account for some portion of the counterglow luminescence, but not for the main effect. Taking advantage of the extraordinarily good seeing conditions in Central Asia, Soviet astronomers have shown both by visual and by photometric observation that the counterglow is variable in shape, in intensity, and in the spatial distribution of its luminescence; that it has an emission spectrum; and that it has a parallax which places it at a distance of about twenty earth radii. This has resulted in the revival of the theory of a gaseous tail extending from the earth's atmosphere. It is thought that the tail is excited to luminescence by the solar 'corpuscular radiation' at some distance from the earth, presumably after it crosses the boundary of the 'forbidden region' (of Chapman, Martyn, Alfvén).

Some of the Russian papers on this subject[1–4] have now been translated and issued in full[5]. A short account also appears in the 1952 edition of Mitra's "Upper Atmosphere"[6], which has just become available.

According to Fesenkov[2], the tenuous exterior atmosphere of the earth may have the form of a paraboloid of revolution, convex toward the sun. Nothing is said about the mechanism by which this form is maintained; but presumably it is a combination of radiation pressure, actual escape, and very high 'bounces' of colliding molecules. The density of the gas is halved every 4·7 earth radii; but apparently, in Fesenkov's view, is uniform over any cross-section of the tail (see ref. 2, p. 500). Astapovich[1], on the other hand, describes the tail as a hollow sleeve of gas, driven off from the twilight rim of the earth by radiation pressure, like the tail of a comet.

To the recognized description of the counterglow, a completely new detail has been added by Divari[3] and Fesenkov[4], who independently discovered that, as the counterglow descends to the west of the meridian, there appears a broad pyramid of fainter luminescence connecting it to the horizon. To this phenomenon Fesenkov gave the name "false zodiacal light" (see ref. 6, p. 492).

The false zodiacal light is confined to the western side of the night sky; it does not appear in the east when the counterglow is rising. No satisfactory explanation is given for this remarkable fact. Obviously it cannot be any ordinary atmospheric distortion or superimposed luminescence, at least so long as our model of the atmosphere is symmetrical. It is necessary to postulate some atmospheric asymmetry in the evening twilight zone, and if we accept the gaseous tail hypothesis at all, we are led to suspect that the asymmetry can only be the tail itself.

In a prefatory note to his translation[5], Mr. Hope has suggested (assuming the gaseous tail really to exist) that the false zodiacal light may be explained by invoking a hitherto unconsidered fact, namely, that the earth's rotation will assist the radiant pressure of the sunlight over the evening twilight zone, but will oppose it on the morning side. The result may be that the gaseous stream is driven off mainly, if not entirely, from the evening side; Astapovich's 'gaseous sleeve' is not complete. If this incomplete sleeve is itself faintly luminous (below the actual counterglow), it will be seen against the western night sky, but not in the east.

A further suggestion is made to account for the fact that the false zodiacal light does not make its appearance before about two o'clock in the morning. This suggestion involves the idea that the fainter luminescence in the incomplete sleeve is generated by atoms or molecules, excited or dissociated in the sunlight, dropping to a lower level of excitation or recombining when they pass into the terrestrial umbra high above the earth. (Incidentally, it seems that the long cone of the earth's shadow, as a possible generator of radiation in the remote exosphere, has been little considered.)

[1] Astapovich, I. S., *Priroda*, No. 1, 25 (1950).
[2] Fesenkov, V. G., *Priroda*, No. 11, 5 (1950).
[3] Divari, N. B., *Astro. Zhur. SSSR.*, **26**, No. 6, 355 (1949).
[4] Fesenkov, V. G., *Astro. Zhur. SSSR.*, **27**, No. 2, 89 (1950).
[5] Hope, E. R., 305 Wilbrod Street, Ottawa 2, Ontario.
[6] Mitra, S. K., "The Upper Atmosphere" (Calcutta, 1952).

ABSTRACTING AND LIBRARY WORK IN THE U.S.S.R.

THREE articles on the organization of scientific information and abstracting in the Soviet Union have appeared in recent issues of *Vestnik Akad. Nauk SSSR* (22 (8, 9), 41, 46 and 80; 1952). The first of these is by A. V. Kremenetskaya and E. V. Vasilyeva, dealing specifically with abstracting (referata) and the work of the State Scientific Library. This is the largest in the Soviet Union, with about three and a half million books and other publications. Among its main objects are publicity on advanced experimental work in industry and on the achievements of Soviet science and technology, and also information on the work of other countries, especially those of Eastern Europe. Special attention is given to the provision of information in suitable form to students. In fact, the library is under the direct control of the Ministry of Higher Education; but it also has a wider range, and its services are available through two hundred and sixty industrial centres throughout the Union.