connexion between science and profitable forestry is never lost sight of. Many minor pests are being studied, and help is given to all provinces in solving their problems.

CHEMISTRY.

This is the smallest branch of the Forest Research Institute and its work is chiefly complementary to that of the others. It will be sufficient as an example to refer to the description of work on minor forest products given above, and it is easy to realise how important a part chemistry must play in the examination of the problems they provide. The study of forest soils is carried on in association with the sylviculturist, and the analysis of mixtures used for preserving wood is another example of the activities of the branch.

EDUCATION.

All the research officers take part in the instruction of the students at the Forest College as an important part of their duties. This applies not only to the members of the staff who specialise in entomology, botany, etc., but also to the experts in timber testing, wood-working, paper pulp, seasoning and wood preservation.

PUBLICATIONS.

The results of the work done at the Forest Research Institute are published by the Government Press as soon as possible. Some 200 *Records*, *Bulletins*, etc., have appeared since 1905, as well as many manuals, floras, and volumes on other aspects of forestry.

International Astronomical Union.

LEYDEN MEETING.

THE third ordinary general assembly of the International Astronomical Union was held at Leyden on July 5–13. It was by far the most representative meeting so far held, astronomers of twenty-eight different countries being present. Incidentally, it was the largest gathering of astronomers ever held. During the meeting the adhesion of Rumania to the International Research Council and to the Astronomical Union was announced, increasing the total number of members to twenty-four. The close of the meeting left a very general hopefulness that before the next meeting of the Union most of the seven nations present as visitors for the first time (Germany, Austria, Hungary, Russia, China, Esthonia, Lithuania) would have become members of the Union.

The meeting opened with a reception by the Dutch government at the beautiful old Ridderzaal in The Hague. Addresses were delivered by His Excellency the Minister of Education, Arts and Sciences, the president of the Royal Academy of Sciences at Amsterdam, the Rector Magnificus of the University of Leyden, and the president of the International Astronomical Union (Prof. W. de Sitter, Director of the Leyden Observatory). The keynote of these addresses was one of gratification that under the auspices of neutral Holland the countries separated by the War had found it possible to come together again in the pursuit of science and the study of astronomy. Throughout the meeting, abundant hospitality was organised by the local committee, of which the efficient and active secretary was Dr. C. H. Hins, of the Leyden Observatory. Here we need only mention a trip to the Lake District near Haarlem, a most interesting tour round the reclaiming works by which within a generation the Zuider Zee is to be reclaimed and large stretches of country lost seven hundred years ago to be once more made fertile; a visit to the Frans Hals Museum at Haarlem, and various receptions and garden parties. Honorary degrees were conferred by the University of Leyden upon M. H. Deslandres, Director of the Paris-Meudon Observatories, and upon Dr. Küstner, late director of the Bonn Observatory. The latter was, unfortunately, prevented by ill-health from attending the meeting, and Dr. Guthnick acted as his proxy.

The main work of the Union was performed at the sessions of twenty-eight commissions. A few of the resolutions of general interest brought forward by the commissions and adopted by the Union may be referred to here. It was agreed to publish, with the help of Prof. Stroobant (Uccle), a list of observatories and astronomical staffs, and with the help of M. Delporte an atlas on a small scale with a list of arcs definitely fixing by hour circles and parallels of latitude the boundaries of the constellations. It was agreed to advise astronomers for the present not to use the term G.M.T. (Greenwich Mean Time), which changed its significance on Jan. 1, 1925, but to use for time reckoned from Greenwich Mean Midnight the term G.C.T. (Greenwich Civil Time), W.Z. (Weltzeit), or U.T. (Universal Time). The expression G.M.A.T. (Greenwich Mean Astronomical Time) should be used by anyone reckoning time from Greenwich mean noon.

The report of the Commission on Dynamical Astronomy contained an interesting statement by Prof. de Sitter of the terms required to convert Newtonian or uniform time to astronomical time given by the variable rotation of the earth. The Commission on Solar Physics, collaborating with a commission of the International Research Council on solar and terrestrial relationships, agreed on an index of solar activity. It was also agreed to urge on the Dutch government the need of observing the total eclipse of May 9, 1929, visible in Sumatra, and on the Australian government the need of observing that eclipse and the eclipse of Oct. 22, 1930, visible in the island of Niuafou, in the Tonga protectorate. Further useful co-operation between eclipse observers of different countries was arranged, and a further study of the distribution of the continuous spectrum of the sun in the ultra-violet was urged. The growing importance of line spectrophotometry in the study of the sun's atmosphere was also recognised.

The Committee on Wave Lengths, for which Dr. Babcock had prepared a very valuable report, recommended a number of secondary standards of iron lines, and also a table of standards of solar wave-lengths. Both of these were adopted by the Union. The most important problems in wave-length determination were also scheduled for immediate attention. The Commission on the Physical Observations of Planets urged further work on the absorption bands in planetary spectra and undertook to compile a catalogue for the names of Martian markings. The Commission on Lunar Nomenclature is nearing the end of its work of compiling a definitive catalogue of the markings on the moon. The Commission on Longitude Determination by Wireless reported that it would repeat the experiments of October 1926 about the year 1933, when the lessons of the previous experiments have been fully studied and steps taken to determine and eliminate systematic errors revealed in the previous work. The Committee on Variation of Latitude reported that a new latitude station in latitude 39° N. would shortly be established at Kitab, near Samarkand, under the Uzbekistan-Soviet

Government, with Prof. Nefedjew of Perm in charge; also work was to be started at Lembang in Java, near the equator, and there was a hope that observations might soon be commenced at Adelaide and La Plata, two southern stations in the same latitude, and with a longitude difference of nearly 12 hours.

The Commission on Shooting Stars decided to compile a new catalogue of radiants of meteor showers and to develop the photographic study of meteors. The Commission on the Carte du Ciel reported that the completion of the work was in sight, and the financial support of the Union was considerably increased with the view of hastening its completion. The reports of the Commissions on Stellar Parallaxes and Photometry showed plenty of important work done and in hand, but proposed no serious changes in present work. The Commissions on Double Stars and Radial Velocities were concerned in selecting lists of stars for co-operative or special observation. The Commission on Variable Stars secured several small grants for catalogues and for the publication of observations, and asked for more systematic observations of the spectra of variable stars. The Commission on Nebulæ and Stellar Clusters adumbrated several important schemes to complete the survey of the heavens before starting a fresh catalogue and scheme of classification; also it is examining how to secure accurate positions of nebulæ, to serve as a background against which a rotation of the galaxy might be shown.

The Commission on Stellar Classification, in order to widen the scope of its activities and to apply many physical criteria which modern spectral analysis and spectrophotometry are rendering of importance, has changed its name to the Commission on Stellar Spectra. The Commission on the Bureau de l'Heure asked for an increased grant, which led to a motion being put to the general assembly by the executive committee expressing the hope that some reorganisation of the Bureau would be possible and that after 1931, the end of the present convention, the Union might be relieved of the present charge upon its income involved in maintaining the Bureau de l'Heure.

The Commission on Stellar Statistics is undertaking the execution of tables of conversion of equatorial co-ordinates and proper motions into galactic ones. Finally, the Commission on the Solar Parallax has arranged for the necessary observations, including photometric and spectroscopic ones, to be made in connexion with the approaching conjunction of Eros. Fresh commissions have been appointed to act until the next general assembly; the commission on solar rotation has been absorbed into that on solar physics, and a new commission on stellar constitution, with Prof. Eddington as chairman, has been appointed.

The next meeting of the Union is, on the invitation of the American delegates, to be held early in September 1932, in the eastern United States. The date and place are chosen partly to fit in with a total eclipse of the sun through Canada and the eastern United States on Aug. 31, 1932. As the present convention ends in 1931, there will have to be an intermediate extraordinary assembly of the Union between now and then. The new executive is charged with the tasks of appointing a committee to revise the present statutes, of modifying the present practice limiting membership of the Union to members of various commissions, of preparing fresh regulations for the Bureau de l'Heure, and of securing a new lease of life for the Union after 1931. The new executive committee consists of Sir Frank Dyson (president), Prof. Schlesinger, Prof. Abetti, Prof. Andoyer, Prof. Norlund, and Prof. Nušl (vice-presidents), and Lieut.-Col. Stratton (general secretary).

The final meeting of the general assembly closed with thanks to the Union's hosts, and especially to Prof. de Sitter, who combined the double task of chief host and president at this most successful meeting, and has ruled over the Union through a difficult period of its life.

The Carbon-Nitrogen Ratio in Wheat.

SINCE the publication in 1918 of Kraus and Kraybill's fundamental work on the vegetation and reproduction of the tomato, the carbon-nitrogen ratio has been recognised as a factor of prime importance in the growth and reproduction of the plant. Recently some careful work by Phyllis A. Hicks on the carbon-nitrogen ratio in wheat has confirmed and somewhat extended the conclusions of the two American workers referred to above (*New Phytologist*, vol. 27, No. 1).

It is pointed out that the primary value of the relation lies in the fact that the growth of the plant is dependent on the balance between the metabolic processes of carbon assimilation and respiration on one hand, and nitrogen assimilation on the other. In the present work, pure lines of three strains of wheat were used, two spring and one winter variety, and the carbon-nitrogen ratios were determined at close intervals in the life-histories of the plants by microchemical analysis. 'Carbon' is taken as embracing all forms of carbon in the plant, and 'nitrogen' all forms of nitrogen.

It was found that a low carbon, medium nitrogen, and low carbon-nitrogen ratio encourages vegetative growth. Vegetative activity reduces nitrogen percentage steadily, but the carbon rises to a maximum about half-way through the life-history and again falls considerably before blooming. This is taken to explain the double carbon maxima for apple spur results, since carbon maxima in themselves have nothing to do with flower formation. The carbon-nitrogen ratio rises steadily throughout the vegetation period, and when a sufficiently high ratio obtains, flowering occurs. Strong support is given to the contention of Kraus and Kraybill that fruitfulness is associated neither with highest nitrates nor with highest carbohydrates, but with a condition of balance between them.

Every cultural strain has its own distinctive carbon-nitrogen ratio, at which flowering occurs, but in every case it represents the maximum of the ascending ratio curve. In this relation an interesting difference between the spring and winter strains of wheat is noted. A ratio of 14-17 covers the range of conditions favourable for flowering in both spring varieties, whereas a ratio of 31 is required for the winter variety. This agrees with the conclusions of Hedlund, that varieties of wheat with a higher percentage dry weight are more winter hardy; and the higher percentage dry weight is due to high carbon content, which compensates for the longer seedling life under winter conditions. Senescence is accompanied by a high carbon-nitrogen ratio, and senescent changes can be prevented at the expense of flowering by controlling nitrogen content. It is suggested that it may be possible to apply nitrogen to annual plants in such proportions and at such periods as would first of all allow of flower and seed production, and then prevent senescence of the tissues or induce rejuvenescence.