

## UNIVERSITY COURSES IN THE U.S.S.R.

ON September 1, 1955, new syllabuses came into force for first-, second- and third-year students of all university faculties in the U.S.S.R. These have been described by M. G. Uroyev, of the Central Board of Universities and Institutes of Law and of Economics.

Fourth- and fifth-year students continue to follow the old courses; but there is an important addition for students in the faculties of philology, history, physics and mathematics, biology, chemistry and geography. In their seventh term they will take a course on teaching methods and, in their eighth term, will do teaching practice in schools for six weeks; during this time they will have no lectures or other work.

For a number of subjects one of the main weaknesses of the old syllabuses was that they produced specialists of too narrow a type. One of the chief demands of the new syllabuses is that they should provide conditions suitable for the training of 'broad' specialists—people with a command of the fundamentals of the sciences but with a proper preparation for work in various branches of industry and culture.

Subjects of general scientific and technical importance are given more weight in the syllabuses; for closely related degree subjects within the faculties of biology, geology, philology and geography there will be unification of the general theoretical grounding given to all students. For the first two or three years students taking kindred subjects will follow exactly the same courses, covering the same ground and devoting the same amount of time to various courses. For example, for the six different degree courses which can be taken in geology, there are twenty-seven courses which are the same for all students. These take up to 66–68 per cent of the total time of the syllabus, leaving 32–34 per cent of their time for special subject courses.

The new syllabuses provide for broader subject divisions than the old and do not, as a rule, allow for specialization within the chosen subject. Such excessively specialized degree subjects as, for example, 'the editing of literary and political writings', 'the economics of the countries of the non-Soviet East', 'world economics', 'the history of international relations', 'Darwinism and genetics' have been discarded. Inorganic chemistry, organic chemistry and analytical chemistry, which used to be independent degree subjects, have now become subjects in which one specializes inside the framework of a general chemistry degree.

The number of hours available for faculty courses and seminars has been reduced. Universities now have the right to decide for themselves the subjects and extent of faculty courses and seminars, and to discuss and approve for themselves the advance plans produced for such courses. In this way such courses and seminars will reflect the scientific work being done in the given university.

In the case of students in the faculty of biology, the reduction in the amount of time allowed for their faculty courses and seminars has made it possible to increase the time devoted to learning a foreign language, to studying teaching methods of their subject, and to physics, chemistry and botany and higher mathematics.

The importance of the independent work done by students is recognized and reflected in the new syllabuses in the following way: the number of lectures and classes at which attendance each week is obligatory has been cut down; certain classes, in which the material dealt with can well be mastered by the student independently, have been done away with altogether; and the number of pieces of independent work required from the student in different courses has been increased.

The increase in the time given to teachers' training is of major significance; the main task now is to train teachers for the senior classes of the secondary schools. As from 1956, not less than 80 per cent of each year's graduates in the faculties of philology, history, geography and biology, and not less than 60 per cent from the faculties of chemistry and physics and mathematics, will be going to work as secondary school teachers.

The actual titles of the qualification received by graduate teachers has also been changed: the diploma given to a graduate used to read "qualified in history (or mathematics)" but will now read "qualified in history and as a teacher of history in secondary schools"\*.

\* *Translators' note.* The translators, who have carried out their task on behalf of the Society for Cultural Relations, write that the way in which Soviet and British university 'technical terms' have been equated in the translation is not consistent: Soviet graduates, for example, do not receive degrees, but diplomas. The word 'term' has been used for translating the Russian 'semester', though this is really a half-year; but 'faculty' has been used in the Soviet way, although their faculties correspond to our schools or departments.

## OVERSEAS FOOD CORPORATION

### REPORT FOR 1954–55

THE annual report of the Overseas Food Corporation for the year ended March 31, 1955\*, is the last report which the Corporation will publish, since the balance of funds made available for investigating the economics of mechanized and partly mechanized agriculture under tropical conditions has been transferred to the Colonial Development and Welfare Fund for the use of the newly established Tanganyika Agricultural Corporation, which will continue the investigations until September 1957 and report on them in due course. The legislation establishing the new Corporation provides also for the dissolution of the Overseas Food Corporation, and accordingly this final report is accompanied not only by the usual statement of accounts for the year but also by an interim review of the work of the whole undertaking from its inception. Some of the findings and conclusions merely confirm those of other workers in the Colonial Empire; but others are original, and the report should be of value to many concerned with the development of tropical agriculture both in East Africa and elsewhere. Moreover, it indicates the excellent work carried out not merely by the Scientific Department but also in land clearing and development. The African Tenant Farmers Scheme is developing satisfactorily in all three areas, and results have justified a continued extension of the Scheme. There is now every probability of consolidating one of the Corporation's original areas, Urambo, into an economic communal enterprise based on a flue-cured tobacco economy, and experience gained

\* Overseas Food Corporation. Annual Report and Statement of Accounts for the Year ended 31st March, 1955. Pp. viii + 183 + 8 plates. (London: H.M.S.O., 1955.) 6s. 6d. net.

in cattle-ranching in Kongwa indicates that the potentialities of that area for beef production are good.

The report thus indicates the real dividend that has accrued from the vast investment in the original Groundnut Scheme, and the chapter reviewing the scientific and experimental work over the whole period, which includes a list of published papers as well as an outline of present and future lines of research, should be of some general scientific interest. The areas in which the work has been done represent vast tracts of Africa which, if they could be opened up and economically developed, would play a major part in the development of those territories. Since the revised agricultural plan was introduced in 1951, the Corporation has had to dispense with the services of more than 1,100 Europeans and 14,700 Africans, most of whom have found satisfactory employment elsewhere, almost three out of every four Europeans remaining in Africa.

Steady progress was made in the investigations during the year, and although it is yet too early to say which size of farm and method of farming will eventually prove to be the most economical, the farm with 1,000 acres under crop appears to have a distinct advantage over those having 1,500 and 2,000 acres under cultivation in allowing a higher degree of supervision, while a combination of annual and perennial crops should prove the safest and most remunerative in the long run. As a result of experience during the past four years and with the advice of the Empire Cotton Growing Corporation and the Department of Agriculture, Tanganyika, it has been decided to discontinue cotton in Nachingwea, chiefly owing to the incidence of red bollworm.

The scientific and experimental work carried out during the past five years or more has covered soils and soil fertility, agronomy, pests and diseases, the residual effect of fertilizers, nitrate accumulation, rainfall and weed control, chiefly with reference to groundnuts, soya, maize, sorghum, sunflower and cotton. It has been shown, for example, that, for the successful production of groundnuts and the harvesting of a good final population, early planting and harvesting at the correct time are of particular importance and much more important than cultural methods. Early experiments have shown the great value of seed dressings of the organic mercurial type for improving stands, two dressings based on an organic mercurial and on tetramethylthiuram proving consistently better than the others. Seed-bed losses were due chiefly to a wide range of fungi, mainly of the Phycomycetes group, while fungi of the *Aspergillus niger* van Tiegh. and variants were responsible for post-emergent losses. A serious threat to the production of groundnuts is rosette disease, a virus disease transmitted by the aphid, *Aphis craccivora* Koch, and it has been established that in the Nachingwea district a local variety, *Asiarya Mwitunde*, showed field resistance to this disease; it is hoped that selection will further raise the general level of resistance of the variety. Rosette infection has also been reduced considerably by treating groundnut seed with the systemic insecticide 'Schradan'.

The success of crop production at Nachingwea depends fundamentally on the maintenance of soil fertility and especially of soil structure so that the rainfall percolates into the soil where it falls, thus preventing soil wash at times of heavy rainfall and holding the water where the plant can use it, particularly in seasons of low rainfall. Permanent

experiments have been laid down to test the value of continued application of artificial fertilizers and of two- and three-year Rhodes grass leys; but a solution must be sought along the lines of a resting phase that will reconstitute drainage channels in the soil, and in soil-management methods such as ridging. Methods of stubble disposal may also be important in this context.

When the present work on producing uniform varieties of Katambli that are resistant to *Polysora* rust disease is complete, the prospect of producing good yields of maize and groundnuts appears to be reasonably high. To complete a basic rotation, a white sorghum with good resistance to central shoot fly, *Atherigona indica subfuscata*, is needed. The variety Dobbs shows appreciable resistance. Soya bean yields also require a great improvement or else other crops must be introduced to provide breaks between successive cereal crops since, if these form too high a proportion of a rotation, the danger of serious losses from *Striga* is high. Work to produce a suitable sorghum and on breeding and selecting higher-yielding varieties of soya has commenced, as well as on sunflower and castor bean.

A study on the economic usage of fertilizers is projected. Even on one soil yields vary from field to field, and the continued application of phosphate on some of the older fields may have improved their phosphate status. Groundnuts generally respond well and economically to 100 lb. of single superphosphate. Maize often responds well to 100 lb. of single phosphate and 100 lb. of ammonium sulphate under experimental conditions; but the economic value of the fertilizer under production conditions is doubtful, while the response of soya and sorghum to fertilizers is low and unlikely to be economic. Future work should accordingly be directed to assess the value of the fertilizer for rotations rather than for individual crops.

Soil types on the catena vary greatly, and full utilization of these would assist the maximum utilization of land; but to use the easily erodible types is a work of great magnitude. So far, erodible types that have been cleared have been laid down as cashew plantations, but their use as pasture in a system of cattle management designed to bring fertility uphill is worth considering. Research at Kongwa is now devoted to pasture studies, particularly of the effects on natural pasture of grazing at different seasons of the year and intensity of grazing. Other investigations include the improvement of pasture by planting various mixtures and numbers of plants, seed-rates with and without superphosphate, seed production, protection of sown seed against ants, and the selection of improved strains of a wide variety of grasses. A study of 'dry farming' demonstrated that benefits of dry farming can be achieved with a protective covering of a short-season shallow-rooted grass, and that weeds and self-established grasses extract as much water as do heavy crops of maize and sorghum.

Urambo is a typical area of miombo bush, and the clearing is surrounded with forest heavily infested with *Glossina morsitans*. Recommendations made by the East Africa Tsetse and Trypanosomiasis Research Organization for controlling sleeping sickness and the fly population have been adopted by the Corporation and modified as experience indicated; but an experiment in the elimination of fly population by air spraying indicated that the cost—£1,000 per square mile—is not warranted unless immigration

of further flies is impossible. Discriminative clearing has proved very successful around Tabora, and a plan has been adopted to eliminate breeding areas inside the barrier clearing, to strengthen the barrier clearing so that the bush inside is isolated, and to reduce the pressure on the outside of the barrier by discriminative clearing for two miles into the bush all around the area. The results should be apparent during the next two years. It is not anticipated that

immigration will ever be completely prevented; but the danger can be substantially eliminated by the destruction of all habitat inside the barrier. If cattle are to be kept economically, cover in which 'immigrants' can live should be eliminated so far as possible from the bush around the grazing area. The present acreage of tobacco and consequent use of firewood for curing should ensure automatic clearing of most of the inside bush in future.

## STERIC EFFECTS IN ANIONOTROPIC REARRANGEMENTS\*

By PROF. E. A. BRAUDE, DR. J. A. COLES, DR. E. A. EVANS  
and DR. C. J. TIMMONS

Chemistry Department, Imperial College of Science and Technology, London, S.W.7

THE concept of steric hindrance, as applied to the reactions of organic compounds, has undergone a great deal of elaboration in recent years. Two main types of phenomena may be distinguished, though they are necessarily interconnected: those which arise primarily from spatial resistance by the molecule undergoing change to the approach of the reagent ('kinetic' effects); and those which are due mainly to either an increase or a decrease in steric strain in going from the reactant to the product ('thermodynamic' effects). Steric effects of thermodynamic origin have been rather less fully studied than those of kinetic origin; yet the former should be more readily amenable to quantitative interpretation since the reactivity differences will, in general, bear a more direct relationship to the physical properties of the reactants or products. We have established such a correlation between the rates of formation and the electronic spectra of certain conjugated systems, and since the principles involved should be of general applicability, a summary is presented here.

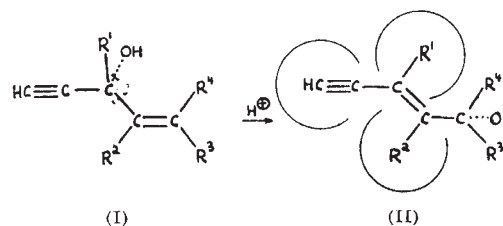
The reactions concerned are acid-catalysed anionotropic rearrangements of the type  $X-C(OH)=C=C \rightarrow X-C=C-C(OH)$ , where  $X$  is an acetylenic, ethylenic or phenyl group. Previous studies have shown<sup>1</sup> that, under the usual conditions, these rearrangements proceed via the corresponding oxonium ions as indicated below, and are normally facilitated by electron-donating substituents, such as methyl, as would be expected for a reaction involving preliminary addition of a proton. The present data cover a range of reaction-rates of more than  $10^{10}$ , and show that the differences of rate are largely due to changes in the energies of activation.

When  $X$  is  $C\equiv CH$ , the accelerating influence of methyl substituents is apparent at each of the

Table 1. REARRANGEMENTS OF ALKENYLETHYNYLCARBINOLS (I)  $\rightarrow$  (II)

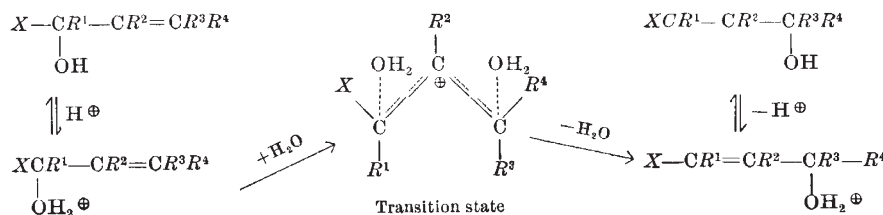
$R^1$	$R^2$	$R^3$	$R^4$	$k'$	$\Delta E_A$	$\Delta \Delta E_A$	$\lambda_{max}$	$\epsilon$
H	H	H	H	0.00001	—	—	2230	13,500
Me	H	H	H	0.0002	-1.8	0.0	2235	13,500
H	Me	H	H	0.0005	-1.0	0.0	2230	13,500
H	H	Me	H	0.0006	-2.5	0.0	2235	13,500
H	H	Me	Me	0.13	-5.7	0.0	2240	13,000
Me	H	Me	H	0.09	-5.5	-1.2	2235	13,000
Me	H	Me	Me	4.0	-7.7	-0.2	2240	12,500

In this and the following tables,  $k'$  are the specific first-order rate-constants ( $\text{min.}^{-1}$ ) in 60 per cent aqueous dioxan-hydrogen chloride at  $30^\circ$ , and  $\lambda_{max}$  and  $\epsilon$  are the wave-lengths (in Å) and molecular extinction coefficients of maximal near ultra-violet absorption of the rearrangement products. For the meaning of other symbols, see text;  $\Delta E$  and  $\Delta \Delta E$  values are in k.cal./mol.



positions  $R^1$ ,  $R^2$ ,  $R^3$  and  $R^4$ , and the effects of several substituents when expressed as the decrease in energy of activation ( $-\Delta E_A$ ) are approximately additive (Table 1). No steric hindrance in the resulting conjugated vinylacetylene system is indicated by scale projections, even in the highly substituted derivatives, and this is borne out by the fact that the characteristic electronic spectra of the products show only minor differences in this series.

Quite a different situation is encountered when  $X$  is Ph (Table 2). Methyl substituents again cause an acceleration at  $R^3$  or  $R^4$ ; but at  $R^1$  or  $R^2$  they produce a decrease in rate and an increase in the energy of activation, which can be expressed as the difference ( $+\Delta \Delta E_A$ ) between the observed and the additive or calculated values. These retarding effects are evidently not electronic and may therefore be presumed to be steric; but they can scarcely be of kinetic origin



\* Paper read at the XIVth International Congress of Pure and Applied Chemistry in Zurich on July 22, 1955.