societies here, and particularly of those whose needs are urgent or whose interests might be directly concerned, have not yet abandoned the attempt to find a solution which would not involve the removal of any from the Burlington House estate. If we fail in that direction—and there is no ground for optimism —the problem will remain, and the time is not one for neglect or postponement of action.

On all hands we hear talk of reconstruction and see plans for the rebuilding of London. We cannot expect another Christopher Wren—one of our original fellows and a leader in the science of his day ; London missed that opportunity. It is natural and proper for the plans now being presented to make spacious and impressive provision in the new London for opera, drama, music and all the fine arts ; and we shall surely join in a general welcome to any practicable scheme which can open the doors more widely to such cultural privileges, and enhance their dignity and worth in the eyes of London and of the nation. But I do not think that we must stand by and allow the claims of science again to go by default. A fear of over-statement, a passion for critical accuracy which is a part of the very spirit of science, may make us reluctant advocates. If necessary, however, we must be ready to remind all who may be concerned of the part which the British scientific effort has played, in making it possible now to plan at all, with confidence, for our own civic and national reconstruction. But for science, we may remind them, the very different plans which our enemies were so recently making for our future might already be taking effect. I have no doubt that the claim will be handsomely admitted ; but we ought not to be too easily appeased with compliments and oratorical bouquets. The nation's opportunity, when peace returns, of enjoying the arts and the amenities of life will be dependent on its standards of health and prosperity, and these, in turn, ever more directly on science and its applications, as certainly as these are still needed to secure our national survival and victory in this War.

This ancient Royal Society of London, and those societies which have grown from it and around it in later years, constitute a scientific organism which is a national and imperial heritage, second to none in the world's esteem. Here are the roots of the spreading tree of science and technology, which should form a major component of our national contribution to the new world now in the making. Seventy years ago these roots were given only enough soil for the replanting then undertaken ; they have long been badly pot-bound, and some parts of the root system are threatened with strangulation, while others have appeared outside the pot. We can properly claim, I think, that the progressive needs of our scientific societies shall be given early consideration, in any new allotment which plans for reconstruction may allow. We ought to have a scientific centre permitting them to co-ordinate their activities with economy, and giving room for change, expansion and organic growth by budding and division, in accordance with Nature's law. I think that we have the further right to expect that the home of science, in this capital city, will have a dignity symbolizing its value to the nation and the empire, and enabling us to hold up our heads in the company of other countries, whose scientific academies, not more famous than ours, have so long been housed more worthily, and with a more generous recognition of their due place in an enlightened people's scale of cultural values.

THE COMING OF PLYWOOD

A REVOLUTION IN THE UTILIZATION OF TIMBER

THE return to wood in the construction of certain types of aeroplane has given rise to some new factors in the future utilization, or perhaps more correctly expressed, in modifications in the utilization of the remaining timber supplies of the world. Generally speaking, the most important property in materials used in the construction of aeroplane structures is great strength combined with lightness. As a result of research in India (vid. *Ind. For. Records*, "Indian Timbers for Aircraft and Gliders". Delhi : Manager of Pub., 1942) the strength to weight ratios for several materials are as follows : material, Sitka spruce, M. of R./sp. gr., 25,500 ; Douglas fir, 24,000 ; Indian spruce, 26,000 ; Indian fir, 25,900 ; ash, 25,800 ; teak, 24,800 ; *Michelia excelsa*, 25,100 ; *Polyalthia fragrans*, 21,300 ; *Phoebe goalparensis*, 22,600 ; *Canarium euphyllum*, 22,400 ; duralumin, 21,300 ; carbon steel, ordinary, 12,700 ; nickel-chrome steel tempered, 23,600.

These figures at once give the reason for the pre-eminence of spruce in aircraft construction in Europe and America. Weight for weight, it is stronger than the best alloy steel and much superior to duralumin, of which a great many metal aircraft are constructed. Owing to its low specific gravity, timber is also suitable for long members subject to buckling or combined binding and compression. In such cases it is said to be generally easier to increase considerably the moment of inertia of a timber section by simple processes than is possible with metal members without increasing the weight. It may be briefly mentioned that timber is used in aircraft construction in the wings, body-work, tail, airscrews, and the covering of the framework. For the main members, such as the spars which support the wings, the longerons which support the body framework, and the tail members, only faultless timber of the highest quality is accepted. For these parts and other members of the framework, selected Sitka spruce is usually used. Wooden airscrews are mostly of walnut and mahogany. In the covering of the wing surfaces and body frames plywood is used, selected birch being one of the best woods. The construction of gliders is similar to that of aeroplanes, and requires the same consideration of strength and weight. It thus becomes evident that very strict specifications must evidently be in force, and only timber of the highest quality will be accepted for aircraft construction. But a high proportion of this material is required in short lengths only.

In connexion with plywood generally, a "Note on the Manufacture of Plywood in India" (*Ind. For. Rec.*, Utilis., Res. Inst. Delhi : Manager of Pub., 1942) gives information on the prospects of the industry, on existing plywood mills in the country, on possible areas for exploitation, on glues and the manufacture of plywood and tea boxes. It also discusses the machinery required for a plywood mill and the manufacturing costs. A list of timbers considered suitable for plywood work in India is also given. Plywood research is not new to the Research Institute at Dehra Dun. For many years since its inauguration this research was carried out by Mr. W. Nagle, the officer in charge of the Wood-working Section. He retired in 1940, the memorandum in question being written by S. W. Kapur, who has had the additional advantage of having studied Japanese methods of plywood manufacture.

The question of veneers, the foundation of plywood, is dealt with in another publication (*Ind. For. Leaflet* No. 34. Dehra Dun, U.P.: For. Res. Inst., 1943) entitled "Types of Seasoning Kilns suitable for Drying Indian Woods", already referred to in NATURE. On these questions of seasoning veneers the following is of importance: "Thorough seasoning of veneers before gluing and manufacture into plywood is very important, if satisfactory plywood is to be made. Green veneers can be air-seasoned or kiln-dried exactly like ordinary wood. The usual method in Europe and America, for the quick seasoning of veneers, is to dry them in long progressive dryers. These dryers are closed metal chambers 50 ft. to 100 ft. long, fitted with powerful fans for the rapid circulation of air, and with steam-heated pipes for raising the temperature of the air circulating inside the dryer. The green veneers are fed into one end of the drying chamber and slowly moved towards the other end by means of endless belts or between rollers fixed along the length of the dryer. The speed at which the veneers move can be controlled, but they are usually dried in the course of a few minutes which they take to travel from one end of the dryer to the other. Unfortunately progressive dryers are very costly."

It is pointed out, however, that the above type of dryer is not essential for the quick seasoning of veneers, and it is possible to use certain other types of cheaper kilns.

Under the title "The Forest Giant goes to War" (*Christian Science Monitor*, January 9, 1943) details are given of the heavy fellings being made in forests in the United States. The following extract portrays an increasingly serious position. "Even within the Douglas fir region itself, where the facts are at hand, there are forebodings that the tide of war demands for 'the most critical species of lumber in the United States' will leave a wake of wholesale destruction in this incomparable resource. The production of what the trade terms 'West Coast lumber' from the region of 1941 was 8,500,000,000 feet. This was principally Douglas fir, but also included its companion species —West Coast hemlock, Sitka spruce, and Western red cedar. In 1942, production was running about 3 per cent ahead of 1941, despite severe shortages in manpower and equipment. The annual war-time cut is thus roughly $1\frac{1}{2}$ per cent of the region's stand of all species of sawtimber. One fact of importance on this figure is that the choicest grades of timber, such as airplane spruce and 'peeler' Douglas fir, are being overcut. Certain areas also are being overcut, particularly the forests that remain close to tidewater and to rail outlets."

Plywood has now become one of the chief factors in timber utilization. This new factor may be well termed revolutionary in its future possibilities, coupled with the modern plywood mill or factory. In professional circles the latter was regarded as more or less of a Cinderella before the outbreak of war, and only the few visualized it as one of the chief methods of utilizing timber in the future. War developments would seem to have proved this without any reasonable doubts. How will this benefit mankind? It is not difficult to frame an estimate. The exploitation of the primeval forests of the globe, both conifers and broad-leaved, have in the past left much to be desired, the waste in conversion, both in the forest and the sawmill, having been excessive. The forest war fellings are accentuating this deplorable wastage. In the past, in the tropical forests consisting of a large number of species growing in mixture of which so far but a few have had any marketable value, and only one or two of these a world value, the waste in extraction of these latter, owing to the excessively high specifications laid down by the buyer, has been enormous. Great logs with slight external flaws in them and giant butts which would not fulfil the buyer's terms were left to rot in the forest—material of a priceless value. Outside the forest has lain in wait the sawmill. These latter have been vastly improved during the past half-century—but it has not proved possible to eliminate a considerable waste in conversion, especially in sawdust. It is being demonstrated that the modern plywood mill has reduced the waste of timber, the raw product, to a very low percentage. So far as the remaining hardwood forests of the world are concerned, tropical and otherwise, plywood utilization would seem to indicate that their economic life (that is, utilization) can be prolonged, if not indefinitely, at least for a far longer period. For one thing, by means of plywood a larger number of previously unutilizable species in the great rain and deciduous tropical forests will become commercially practicable; while the appalling waste in the conversion of the so-called luxury timbers, current up to date, can in future be eliminated to a considerable extent by the erection of a modern plywood mill in the vicinity of the forest under exploitation.

The modern plywood mill, more correctly designated perhaps as a factory in its most up-to-date war-built design, may be regarded as considerably ahead of its predecessors, and has been the outcome of much thought and careful planning on the part of men who had made a thorough study of the problems to be met. Its erection involves a considerable initial outlay, which during war-time, it is said, has been fully justified due to two facts: the finished product is of the highest order and it is produced very expeditiously.

It is not the object of this article to describe the mill and the various stages through which the material produced by the rotatory cutter or peeler machine finally emerges in its plywood form. It is the possible enormous increase in out-turn per unit of forest to which attention is here directed. The logs—the larger the diameter the better within limits—arriving at the mill are cross-cut to the size required, not less than 7 ft., for the rotatory cutter, which is really a large-scale lathe. The barked log is placed between two spindles which are clamped into the centre of the ends and rotated against a fixed knife which runs the whole length of the log and thus takes a thin shaving off the whole circumference. The knife moves forward at a set speed, which is dependent upon the thickness of the shaving. It will be understood that until the log has been turned to a perfect cylinder only scrap material comes off, though even this is utilized. Once a perfect cylinder is achieved, the veneer comes off as a continuous (moist) sheet which is wound on to a drum. Veneers as thin as 1/90 in. can be cut in the most modern machines. The logs are turned down to an 8–9 in.-diameter core. The core may have defects, but in any event below this the small radius of curvature renders it brittle, the veneer thus splitting. The cores are now made use of for other purposes. In fact, in the modern mill, waste has been almost entirely got rid of. The roll of veneer after leaving the rotatory cutter passes through a number of processes before actually arriving at those in which its manufacture into the particular type of plywood being turned out is undertaken. Most of these processes are in the hands of women and are by no means uninteresting, while the condition in which the women work with artificial sunlight and the latest aerating devices are excellent.

The modern plywood factory is nothing short of a revolution in the prolongation of the life of, notably, the remaining primeval forests on the globe. Each log from each big-sized tree felled in these forests in the future can be put to its full use by man with the minimum of waste. The annual requirements in logs from any forest will thus be restricted automatically, and the existing amounts of timber still available be spread over a longer period.

Never perhaps in the history of the world has such a prolongation been more necessary, for never has a timber famine in one form or another loomed larger on the horizon. But man's cleverness in producing and perfecting the plywood mill will prove of little use unless the Governments of the chief countries concerned come together, and see that its apparent special advantages are made use of, and are not suppressed by existing vested interests, which have little in relation with the true economic uses and exploitation of the forest.

THE U.S.S.R. ACADEMY OF SCIENCES

JUBILEE SESSION

THE Soviet Academy of Sciences celebrated the twenty-fifth anniversary of the U.S.S.R. by a special jubilee session held at Moscow on November 15–18, 1942, and the papers read at the session have now been published in a very neat volume of 250 pages. Apart from the texts of the greetings messages sent by the Academy to Soviet leaders, to fighters of the Red Army and the Navy, to men of science of the world, etc., the volume contains a series of surveys of the progress achieved in the various spheres of the Academy's activities during the twenty-five year period.

Prof. A. A. Baikov reviewed general development of the Academy which in 1917 consisted of three sections (physico-mathematical; Russian language and literature; and historico-philological), with forty-five academicians and 212 other scientific and technical staff. By 1941 the Academy had eight sections (physico-mathematical; chemical; geologo-geographical; biological; technological; historico-philosophical; of economics and law; of literature and languages), with seventy-six institutes, eleven laboratories, forty-two stations, six observatories, twenty-four museums, in which were working 118 academicians, five honorary academicians, 182 corresponding members and 4,700 scientific and technical personnel.

Apart from these quantitative changes, the scope and the character of the work have also undergone great evolution, mainly in the direction of a closer contact between pure research and its applications. This tendency has found its practical expression in the elections to the Academy of a number of eminent engineers, industrial chemists, etc., and culminated in the organization in 1935 of a section of technology. In 1934 the Academy was transferred from Leningrad to Moscow and taken under the immediate control of the Soviet of People's Commissars which discusses and approves plans of research. In 1938 the Soviet recommended the Academy to concentrate its attention on the leading scientific problems necessary for the development of socialistic economics and culture. In 1939 the Academy elected J. V. Stalin as its member, and this event was regarded as a symbol of transformation of the Academy into the "general staff of Soviet science". Since the outbreak of war, the Academy has concentrated its attention on problems connected with the mobilization of natural resources for military purposes. Among such problems an outstanding place belongs to the work of a special commission for the mobilization of resources of the Ural, where great progress has been achieved in the scientific organization of metallurgical industry, and of Kazakhstan, where great reserves of coal, copper, nickel, etc., were discovered.

Prof. A. F. Joffe produced a summary of the development of exact sciences in the U.S.S.R. during the past twenty-five years. In 1918 the Institute of Physics and of Bio-physics (P. P. Lazarev), Physico-technical, Roentgen (A. F. Joffe) and Optical (D. S. Rozhdestvensky) Institutes were founded in Moscow. The Physico-Technical Institute supplied personnel for similar Institutes at Tomsk, Kharkov, Dnepropetrovsk and Sverdlovsk. The Physical Institute of the Academy (L. I. Mandelstam), which moved from Leningrad to Moscow, became a leading institution. New problems of application of physics in agriculture are studied by the Leningrad Institute of Agrophysics. Chemical science also has now a series of institutes: of general and inorganic chemistry (N. S. Kurnakov and L. A. Chugaev); of organic chemistry (A. E. Favorsky, N. D. Zelinsky); other institutes are devoted to colloids, electrochemistry, radiological chemistry, applied chemistry, chemistry of fertilizers, pharmaceutical chemistry, etc.

Astronomy advanced at a less rapid rate, but the Mathematical Institute of the Academy has developed into one of the world centres of mathematical science.

The progress of mining technology and of metallurgy, as reviewed by Prof. I. P. Bardin, reveals gigantic work of reconstruction in which academic institutions and scientific workers have taken an honourable part. An even more impressive picture is presented by Prof. A. V. Vinter in a survey of the energetics of the U.S.S.R.—a fascinating story of the utilization of the resources of the water and air, of the great hydro-electric installations, of the electrification of transport, etc.

In the biological sciences, as reviewed by Prof. L. A. Orbeli, the progress was mainly in the direction of planned research, concentrated on the leading problems of the Darwinian theory of evolution, which are studied not only in laboratories but also in the field. Spectacular progress can be registered, of course, in physiology as a heritage of the late Prof. I. P. Pavlov. Investigations of the floristic and faunistic natural resources of the Soviet Union are proceeding apace and many volumes of the "Fauna of U.S.S.R." and the "Flora of U.S.S.R." have been published.

The geological sciences (V. V. Obruchev) have made one of the greatest contributions to the economic development of the Union, and the Academy took an active part in the extensive and exhaustive investigations carried out by hundreds of expeditions in the remotest corners of the Union.

Not less than seven papers, occupying well over half of the volume, are devoted to the humanitarian