

that the soluble cytoplasm is devoid of structure and electronmicrograms of cytoplasm *in situ* suggest that in many cells it may well be laced with an endoplasmic reticulum of membranes.

While it would be premature to say that mitochondria are the only sites at which the production of transformable energy occurs, they are clearly the principal site of oxidative phosphorylation which provides the only mechanism of energy transfer in respiration that we know much about. Neither chloroplasts nor ribosomes contain a respiratory oxidation system, nor do the nuclei appear to possess a normal oxidation equipment. We have therefore the intriguing query whether the mitochondria can export their oxidatively accumulated energy to nuclei and ribosomes which appear to need it. There certainly appears no reason why ATP regenerated by mitochondria should not be exportable, and experiments with nuclei and mitochondria isolated from the wheat germ have suggested that a sort of shuttle service $ATP \rightleftharpoons ADP$ was being maintained by diffusion between mitochondria and nuclei, which used the ATP-bound energy to build peptide linkages.

MARGINAL ASPECTS OF MODERN BRITISH FORESTRY

MR. M. V. EDWARDS discusses the "Marginal Aspects of Modern British Forestry" in his presidential address to Section K* (Forestry).

The practice of forestry in Britain, the forests and soils of which have been removed or altered by man, cannot be organized on the basis of methods devised in natural forests. Afforestation has been planned for former woodlands and for grasslands; but difficulty has been experienced in fixing the limit to marginal land. Experience has shown that greater success has been achieved if the site was modified and if exotic species were planted. Recent Government policy changes emphasize a planned acreage programme concentrating on uplands and places where employment is deficient. The re-assessment of afforestation limits on the basis of sustained volume of timber production and of manpower requirements is being made.

The critical limiting factors are primarily climatic, of which precipitation (rain or snow), wind, and temperature are of first importance. These must be known in general by regions, and also in particular for local areas and for micro-climates within the forest. Soil factors of importance include the amount of soil available for rooting, its moisture balance and nutrient status, over the whole life of the forest. All these factors have to be determined in relation to a range of different species of trees which are capable of establishment, and Britain is fortunate in having an extremely large number to work with.

These factors result in a certain aspect of marginality over much of Britain's new forests. Stresses between forest and habitat may be set up in Britain's new afforestation, and these have to be investigated as the forests develop. The margins beyond which trees cannot be made to grow at all and those at which they can be established by modification of the site are gradually being supplanted by the marginal balance within the site and forest ecosystem.

Problems are complicated by the long time-lapse which takes place between seed sowing and marketing of produce, and the difficulties of early determination of the qualities and quantities of mature produce.

It may also be difficult to determine the right scale by which to measure results, either as volume of timber or by alternatives such as dry weight or measures of quality. Economic scales are difficult to apply in the absence of long-term data and they tend to operate against the use of degraded sites, the rehabilitation of which is one of the prime objects of afforestation. The present scale of acres planted as used by the Government is a rough and ready approximation which should be replaced by a more definite appraisal of probable results.

In natural forests the balance between habitat and crop has already been attained; but in artificial forests some form of human control is necessary. Experience in forest nurseries has shown how artificial fertilizers can be used to replace organic manures, but only by maintaining a check on both the soil and the plant. The same principles apply to forests. Many possible future paths for progress in forestry now appear open, but probably the situation is in fact less unconstrained than it seems. The future programme must be based on the investigation of the changes occurring in both habitat and crop as a result of new developments, and detailed recording of these changes is essential if undue risks are not to be run.

THE UNITY OF KNOWLEDGE: A NEW DYNAMIC FOR THE SCHOOLS

MR. PERCY WILSON begins his address to Section L (Education) with two quotations from Sir Julian Huxley's introduction to *The Humanist Frame*. The first declares man's historic indebtedness to the arts and sciences, in all their variety and multiplicity; the second sketches Huxley's view of "evolutionary truth"—a process of enlightenment and liberation of mind to which, over a long process of time, we owe our culture, our security in life, so far as we have any, and our hopes for "the long future of our planet". These thoughts are linked briefly in the address with current fears about the fragmentation of the different branches of learning. Mr. Wilson's thesis is that, even at this late hour, the time is propitious for realizing Huxley's and Snow's hopes of a more united and dynamic national culture before the process of disintegration goes too far.

These hopes—and their attendant problems—are then looked at in the schools, especially the fifth and sixth forms of the English grammar schools, where over-specialization is rife. The mounting pressure needs to be relieved by an expansion and diversification of university education, by internal reforms in the schools and by modernizing the school curriculum. This applies, for rather different reasons, to non-selective as well as to selective schools.

Looked at from the wider perspective of the "Two Cultures", there are some alarming portents in contemporary culture. These apply to arts and sciences alike, and examples are given from both sides. But the most alarming is the arrogant mistrust of science and its contribution by those—and they are the majority of educated men—who are almost wholly ignorant of the physical sciences. This ignorance cripples our understanding of the world we live in, as well as our ability to steer a rational course in our affairs.

Apart from questions of internal administration, organization and curriculum in the schools and universities, there are important problems of the nature and inter-relation of the different disciplines.