

### Education in the New Era.

IN addresses given in Leeds last February Mr. F. W. Sanderson, headmaster of Oundle School, very boldly faces the root of the evil in existing educational systems as it is felt in the school, and advocates radical reconstruction upon new lines. His view is that schools should be altruistic in their aims and methods and be based on service and co-operation rather than on competition. They exist solely to aid and enrich the life of the people. Traditional methods based upon public-school models accentuate the anti-social spirit of competition and damp down co-operation, whereas the schools of the country ought to be the source from which the transfiguring and transforming spirit of the age is breathed through the thoughts of men. A school is a microcosm, and its subject-matter is to be found, not in books, but in the world around it, of which it itself should be an idealised model upon a small scale. It should concern itself with the tragedies of undeveloped talent, the slow decay of the faculties of masses of men caused by their employment in industry, and the sullen mental stupor that, after the violent revolutionary period of youth, brings peace on an animal level. For the schools are concerned with similar problems. The elevation of the submerged, the bringing back into the stream of school-life of the weak, and the raising of the general average are even more important there than the provision of the fullest opportunity for talent and ability. So is it in the national life. We are presented with a vision of spacious halls and galleries, workshops, laboratories, gardens and fields, art-rooms, libraries, and museums for children to learn in instead of in stuffy class-rooms, by doing, making, inquiring, and co-operating rather than by the preparation for interminable examinations, which suit better those of the possessive and dominating order, of whom the world is growing so tired.

The policy of leaving dull, bread-winning drudgery unredeemed in the state it is, and concentrating upon the cultivation of the artistic and literary faculties of the workers in enlarged periods of leisure, can only have the effect of making the real work even more impossible. In spite of the cold douche of authority, we are told; in spite of the attitude of labour-leaders, once bit twice shy; and in spite of the enthusiasm ever seeking a new rallying ground for lost causes, workers, when they are left to themselves to plan their own scheme of salvation, choose for their education vocational and technical work. The average man glories in his daily work and trade so long as his heart is kept in it by his being treated as a human being rather than as a machine. In the spirit of craftsmanship, better than in medieval and drawing-room studies, is to be found the remedy for the evils of industrialism.

Science, the gift of the age, notwithstanding its repercussion upon the foundations of society, has not yet penetrated appreciably into our institutions of governance and education. It is the bed-rock upon which all future educational ideals must be based, and the new creative spirit it has reincarnated in the world—its spirit of inquiry for the love of truth for its own sake and its spirit of co-operation with others engaged in the same work—is that by which the age must outgrow the nightmare which the old spirit has made of it and the world. Scientific thought and research must be applied to creating new wine-skins rather than more new wine until this is put right. It has demolished the cobwebs of traditional economics and finance and substituted for them fundamental conceptions of the laws by which men live and move and have their being. It meets no

opposition, and scarcely even discussion, now from the professional exponents of the merits of the existing régime. Were it not for private interests and the ignorance of its ruling classes science would not have any difficulty in restarting the world on saner lines.

What is especially remarkable about this is that it is no vision of a dreamer, "sicklied o'er with the pale cast of thought," but rather that of a practical public-school headmaster, who has burst open the prison-doors of the pedagogic strongholds of the past and reclaimed for the schools the right and duty of serving and studying their own age. If there were ten such men, haply they might yet be in time.

This picture from a schoolmaster of what could be done in the school opens out broader visions of what universities might accomplish. They are in the most extraordinary case. They can claim that they have given in the research ideal of science—the finding out of the fundamentally new, *not* the mere rediscovery of the old that has been lost—the creative agency by which alone the modern world is great or even distinguished. But it has been done in the teeth of official apathy and discouragement. On the other side of the balance sheet is the traditional education they continue to give to the ruling classes, training them to be impervious to new knowledge and able only to find in the old and dead past ideals for imitation and reverence. These ideals and maxims have set the producers of wealth of the modern world at one another's throats for the benefit of its wasters. The code of laws remains as in olden time, though its obvious result has been to turn to debt the increase in the wealth of the community which the labours of scientific investigators have made possible. The world despises such results and wants something more from its old universities than that they should be beggars for their existence for crumbs from the tables that its own schools of science have loaded with gifts. It looks to them for a clear enunciation of the first right of the community to the produce of its own labours, which the law allows by taxation, for the upbringing of its own youth and for the cultivation of its creative institutions where knowledge is made and disseminated. The claim of the user upon that produce is secondary both by law and by common sense. And, lest again the stability of the world be endangered by its rulers being educated on myth and verbal subtleties to the total exclusion of the laws that appertain equally to Nature and to life, let them in the spirit of Plato inscribe over their reformed portals:—

"Let no one enter who is destitute of science."

FREDERICK SODDY.

### British Aeronautics.<sup>1</sup>

THE Report of the Advisory Committee for Aeronautics for the year 1918-19 is an interesting record of work achieved, which acquires additional interest by including a general review of progress made since the beginning of the war. More than ever, after reading it, one is impressed by the range and extent of the demands which this new industry has made upon existing knowledge; of the structural engineer it requires that its stress calculations and the testing of its materials shall be conducted with an accuracy never contemplated before; of the mechanical engineer, that its engines shall be economical both of material and of fuel to a degree which until very recently would have seemed almost

<sup>1</sup> "Aeronautics." Report of the Advisory Committee for Aeronautics for the Year 1918-19. Pp. 77. (London: H.M. Stationery Office, 1920.) Cmd. 488. Price 4d. net.

fantastic; and, above all, of its pilots, that with the skill and technique peculiar to their craft they shall combine a practical working knowledge of structure and of machinery, of instruments and "wireless," of meteorology and of navigation, which in other professions would be the province of different specialists. And this universality, as might be expected, is no less characteristic of the appeal which aeronautics has made to the man of science, who provides it with fresh data; so that it is not surprising to find that the single committee of pre-war days has been compelled to adopt a policy of devolution, and that special sub-committees have been formed to deal with problems of such different scope as "scale effect," the investigation of accidents, internal-combustion engines, light alloys, meteorology, atmospheric electricity, and new inventions.

The report abounds with indications of fields in which further research is needed, and there seems every reason to believe that this research will be prosecuted with equal success under the auspices of the newly constituted Aeronautical Research Committee. We learn with satisfaction that the demand for the earlier technical reports has been vigorous enough to justify the printing of a complete second edition, since an opportunity is thus given for inserting much more complete cross-references than were possible when they first appeared. It is, perhaps, a matter for some little regret that a more definite lead has not been given in this direction by the present report. We imagine that any reader whose interest in the subject extends to the detailed reports of the several sub-committees would wish to have such references to individual papers and their authors as will enable him to find additional information on any special point; moreover, an account so detailed, and yet empty of names and references, may fail to impress what we believe is the secret of British supremacy in aeronautics: that our official Committee has interpreted its functions as being advisory rather than executive, and has endeavoured to assist, co-ordinate, and encourage research rather than to originate and control it.

No useful end would be served, and perspective would be lost, by abstracting from these excellent and thoroughly condensed reports. Their range is very wide, extending from complete investigations, on both the practical and theoretical sides, of such complex evolutions as "spinning" to researches on the properties of light alloys, the transmission of heat from rough and smooth surfaces to passing currents of air, the conditions leading to discharge of atmospheric electricity from kite-balloons and cables, and the best shape for parachutes. Few, we believe, will read these pages without discovering some points of contact between aeronautical science and their own particular field of investigation.

Mention should be made of the very interesting table of comparative performances of British aircraft which is included as an appendix.

### Climatic Cycles and Tree-growth.

PUBLICATION No. 289 of the Carnegie Institution of Washington is devoted to Prof. Douglass's study of the annual rings of trees in relation to climate and solar activity. When the late Prof. Lowell was seeking an ideal climate for his observatory, with the view of studying the planet Mars, he chose the dry region of Flagstaff, Arizona, on account of its low rainfall and high proportion of clear skies. While Prof. Douglass was at the Lowell Observatory it occurred to him that variations in solar activity might have a measurable effect on tree-

growth, since the latter was probably dependent on rainfall, and rainfall might very likely be affected by solar activity. He began by studying the yellow pines of those arid regions, arguing that a very dry climate should be the best for such an investigation. He soon found that the intimacy of the connection between the width of the annual tree-rings and the rainfall, when the latter was known, was far closer than he had dared to hope, and he pushed further afield, examining tree specimens and fossils in European collections as well as in other districts of America.

Considerable labour was involved in the interpretation of the various appearances of the rings, the red tissue that denotes the close of a period of growth. The year starts in the autumn. With normal winter snow and spring and summer rainfall growth continues throughout until the autumn, and a ring of normal width is produced. If winter snow is deficient and spring rain also scanty, a narrow ring is produced, closing prematurely without waiting for summer rain. An intermediate condition is shown when winter snow is deficient and the spring drought is not so severe; red tissue begins to form, but growth starts again, and the result is a double ring for the year.

The author considers that five trees in a group give a trustworthy result in general, though in a very dry district like Arizona two might suffice. The only district where five trees failed to give a satisfactory cross-identification was a rugged region near Christiania, in Norway.

The Flagstaff record is complete from A.D. 1385, but among the sequoias of California stumps are in existence dating back more than three thousand years. Some of these sequoias grew on hillside slopes, and others in basins where plenty of moisture is found at all times. The latter are unsuitable for investigation, and the author calls them "complacent," as they show practically no variation in the annual growth. The others he calls "sensitive," as they have to depend upon snow melting down the slope and upon rain as it comes, not being provided with any storage such as that found in the basins. Some specimens, including the oldest of all, showed signs of a change in environment, "complacent" in later growth but "sensitive" earlier. Prof. Huntington had previously investigated these sequoias in his search for evidence of climatic change, but his purpose was served with much less detailed measurements, ten-year periods being short enough for his unit of time. His dates agree fairly well with those of the present work. The analysis of the data for periodicities required considerable accuracy in the method employed, and ultimately led to the adoption of the "automatic optical periodograph," of the construction and application of which full details are given.

Practically all the groups of trees investigated show the sun-spot cycle or its multiples; the solar cycle becomes more certain and accurate as the area of homogeneous region increases or the time of a tree record extends farther back; this suggests the possibility of determining the climatic and vegetational reaction to the solar cycle in different parts of the world. A most suggestive correlation exists in the dates of maxima and minima found in tree-growth, rainfall, temperature, and solar phenomena, pointing to a physical connection between solar activity and terrestrial weather. There is a very important point discussed under the title of "Meteorological Districts." It is essential to restrict any such district for this purpose to one in which homogeneous weather conditions are found. Clearly, if one set of conditions makes one district wet and a neighbouring district