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THE ROYAL OBSERVATORY

THE announcement in the daily Press that the Admiralty has decided, in principle, that the Royal Observatory shall be moved from Greenwich to a new site, where conditions are more favourable for astronomical observations, will not have come as a surprise to those who have watched the trend of events in recent years. Rather is it a matter for surprise that the Observatory has been able to carry on for so long, under conditions of increasing difficulty, on its original site. Many observatories elsewhere have been compelled by similar circumstances to move. In the case of the Royal Observatory, the long associations with Greenwich, the advantages in fundamental astronomy of continuity of observation on the same site and with the same instruments, and its position on the prime meridian, have no doubt all played a part in postponing a decision the ultimate inevitability of which must long have been apparent.

The Royal Observatory was founded in 1675 by Charles II, to meet the needs of navigation. The problem of finding longitude at sea had then become urgent. The positions of the moon and stars were not known with sufficient accuracy to enable the method of lunar distances to be used. The Royal Warrant for the building of the Observatory states that "in order to the finding out of the longitude of places for perfecting navigation and astronomy, we have resolved to build a small Observatory within our park at Greenwich, upon the highest ground, at or near the place where the Castle stood". Sir Christopher Wren was appointed as architect and the Rev. John Flamsteed was appointed "our astronomical observator" and directed "to apply himself with the most exact care and diligence to the rectifying the tables of the motions of the heavens, and the places of the fixed stars, so as to find out the so-much-desired longitudes of places for the perfecting the art of navigation".

This branch of astronomy has continued to be the fundamental work of the Observatory throughout its long history. It provides the foundations upon which so much astronomy is built. The importance of the contribution made by Greenwich was stressed by the eminent American astronomer, Simon Newcomb :

"The most useful branch of astronomy has hitherto been that which, treating of the positions and motions of the heavenly bodies, is practically applied to the geographical positions on land and at sea. The Greenwich Observatory has . . . been so far the largest contributor in this direction as to give rise to the remark that, if this branch of astronomy were entirely lost, it could be reconstructed from the Greenwich observations alone."

When the need had arisen for general agreement about the choice of a zero or prime meridian from which longitudes should be measured, and a conference was called in Washington in 1883 by the State Department of the United States to consider the question, no alternative to the meridian through Greenwich was seriously considered. By an almost unanimous vote, the meridian through the centre of

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the transit instrument of the Greenwich Observatory was adopted as the prime meridian and as the basis for a zone time system. The choice of Greenwich was due to the close concern of the Observatory for more than two centuries with the practical needs of navigation.

The work of the Royal Observatory has not, however, been restricted to fundamental astronomy. In Airy's time meteorological, magnetic, solar and spectroscopic observations were added. Meteorological and magnetic observations were commenced in 1840. The Royal Observatory has the longest continuous series of magnetic observations and was the first observatory to employ photography, in order to obtain continuous records of the variations of the earth's magnetism. The magnetic observations were removed from Greenwich to Abinger, in Surrey, in 1923, consequent upon the electrification of the suburban system of the Southern Railway. The Solar Department, added in 1873, was a natural development arising out of the discovery that there were certain definite relationships between terrestrial magnetism and phenomena on the sun. In 1886, the 28-in. refractor was added to the Observatory's equipment, for visual spectroscopic observations and for double-star measurements. The application of photography to astronomy opened many new fields of work, and the Royal Observatory has taken a prominent part in the work of the Astrographic Catalogue, in the measurement of stellar parallaxes, in the determination of magnitudes and proper-motions of stars, in the measurement of colour temperatures and in other important investigations. A 26-in. photographic refractor, a 30-in. reflector and a 36-in. reflector have been added to the equipment of the Observatory at various times.

When the Royal Observatory was built, Greenwich was a fashionable village in the country, several miles from London. It was many years before the outward growth of London, with its accompanying pall of smoke, began to be troublesome. In 1824 Pond, then Astronomer Royal, erected an azimuth mark at Chingford for the new Troughton transit instrument. It must have been possible at that time to observe this mark with fair regularity; but it is many years since it has been visible from Greenwich even under the best conditions. The first note of concern about the future appears in the report of the Astronomer Royal (Sir William Christie) to the Board of Visitors of the Royal Observatory in 1906: "The continued efficiency of the Observatory is seriously threatened by the schemes for generating stations planted, or to be planted, in the immediate neighbourhood of the Observatory." The London County Council was then building a generating station exactly on the Greenwich meridian, half a mile from the Observatory and overshadowing the noble buildings of the Royal Naval College. That a public authority should have been allowed to commit such an act of vandalism is a reproach to the nation. The two chimneys, which stride the meridian, were indeed truncated to reduce the interference from smoke and heated gases with observations of circumpolar stars below the pole. Nevertheless, this generating station

has been a source of continual trouble, discharging smoke and fumes and, with a northerly wind, showering grit over the Observatory, which has caused damage to pivots and other delicate parts of the instruments.

At the close of the War of 1914-18, there were still green fields and country lanes within an easy walk of Greenwich in the south-east direction. But since then London has stretched its tentacles well beyond Greenwich and, during the same period, there has been considerable industrial development in the vicinity of the River Thames. The deterioration of conditions for observation during the past twenty-five years has been marked and progressive, and has been referred to in the annual report of the Astronomer Royal on several occasions. The measurement with an Owens automatic filter of the pollution of the atmosphere by solid matter was commenced in 1934 and has shown that the pollution at Greenwich is not surpassed, on the average, at any reporting station in Great Britain. The difficulties were summarized in the Astronomer Royal's report for the year 1939.

The progressive decrease in the transparency of the atmosphere at Greenwich is shown by comparison between the Greenwich and Kew annual sunshine totals. From 1911 until 1920, Greenwich averaged sixty-four hours more sunshine than Kew; thereafter there was a rapid relative decrease in the Greenwich totals, so that during 1936-38 Kew averaged 159 hours more than Greenwich. This decrease in the amount of sunshine recorded at Greenwich in relation to the amount recorded at Kew is the result of loss of register at Greenwich when the sun is low, caused by atmospheric impurity.

A further trouble, first referred to in the report of the Astronomer Royal for 1937, was the brightness of the sky resulting from scattering of light from street lamps and illuminated advertisement signs; modern developments in street lighting, such as mercury vapour lamps and high-pressure gas, to meet insistent demands for better road illumination, have made the night sky at Greenwich (in peace-time) so bright that the Milky Way is never visible with the naked eye and long-exposure photography has become impossible. All types of observation, both visual and photographic, have been adversely affected; some, such as photometric observations, which require uniform transparency of the sky in different directions, can no longer be undertaken. New types of instrument, such as the Schmidt camera for the photography of faint stars, cannot be used at Greenwich because of the fogging of the plates.

It should not be necessary for a scientific establishment—even though it is the oldest in Great Britain—to stand out against public amenities. The astronomer requires a dark sky and a clean atmosphere; the public wants well-lit roads and puts up with a polluted atmosphere as the penalty of urbanization. The staff of the Royal Observatory has for many years been waging an unequal and losing struggle against progressively worsening conditions. It is not right that the reputation and prestige of the Royal Observatory should suffer by having to turn back

from the van of progress in astronomy. The contributions that the Observatory has made to astronomical and nautical science in its long history, and the prestige that it has brought to the British nation, give it a right to ask for a new and a worthy home, where it will be free from the troubles that have so sorely beset it and where it may enter upon a new era of service to the community and of scientific achievement.

The Paris Observatory, faced with somewhat similar problems in a much less acute form, set up its large telescopes at Meudon and established a high-altitude station at the Pic du Midi. The possibility of keeping the meridian work and the time service at Greenwich and moving the rest of the work has evidently been considered and rejected. The meridian observations are handicapped and their accuracy is impaired by the difficulty of observing low north stars. The long-range programmes of observation, which should be undertaken by a great national observatory, require every member of the staff to observe, usually with more than one instrument; division into two branches would entail a serious loss of flexibility. The Observatory need not necessarily be tied to the prime meridian, which has been fixed by international agreement and will remain. The War has already necessitated the removal of the time service from Greenwich, and Greenwich time is now being provided by two time stations, neither of which is on the Greenwich meridian.

It is to be hoped that the original building, which Wren said that he built "a little for pompe", and the old buildings clustered around it will remain and that the historic instruments—including Halley's, Bradley's and Pond's transits, Bradley's zenith sector, with which aberration and nutation were discovered, the old quadrants, and, most famous perhaps of them all, the Airy transit circle—will be suitably displayed in them. They will become an object of pilgrimage not merely to astronomers but also to many visitors to Great Britain from all parts of the world.

Much of the work of the Royal Observatory has had to be removed elsewhere during the War, either for reasons of security or because of enemy action. The continuity of many programmes of observation has been broken. It is to be hoped that a new home will be made available as soon as conditions permit, so that the various branches of the Observatory can be brought together again and normal work resumed under more favourable conditions. It is understood that Treasury sanction will be required; but surely in a case such as this, to obtain it will be little more than a formality. The new home should be one befitting the long history and great traditions of the Royal Observatory. What could be more appropriate than that one of our large historic country houses, mellowed with age and rich in associations with the past, should form the nucleus of the new Observatory, the various telescopes being erected in the surrounding grounds? A fundamental need is for a neighbourhood not likely to be affected by the spread of industry, and it should not be impossible to find such a site.

A TURNING POINT IN EDUCATION

Education in Transition

A Sociological Study of the Impact of War on English Education, 1939-1943. By H. C. Dent. (International Library of Sociology and Social Reconstruction.) Pp. xi+244. (London: Kegan Paul and Co., Ltd., 1944.) 12s. 6d. net.

THE Education Bill now before Parliament is remarkable in many ways. The complete break it effects with the traditions of a century is enough to justify a description of it as revolutionary. Yet support for it is well-nigh unanimous, and criticisms offered during the second reading debate were confined to relatively minor points.

What is most remarkable about all this is that it should have been possible to introduce such a Bill at all, let alone to do so amid such general approval. It would have been inconceivable even as recently as three years ago.

Evidently some profoundly important change of outlook has occurred in Great Britain within a very short time. The new sense of educational needs is obviously a result of this deeper and wider change. It might well have happened eventually without the shock of total war. But the shock has certainly accelerated it and given it both sharper definition and, for the time being at least, a powerful backing of national conviction.

Essentially the change is towards a new conception of national destiny both in internal life and in external relations and responsibilities. It is British society as a whole which now tends to think so differently of itself. That the changed outlook should find expression first and most prominently in a liberally inspired plan of educational reconstruction is both natural and significant. The quickened sense of destiny and new life comes to its logical focus there, and Mr. Dent is well justified in the suggestion he offers in the subtitle of his book.

What is needed then, at such a turning point, is a backward glance with a critical eye over the past four years to mark out the route we have travelled. Mr. Dent is very favourably placed and unusually well qualified to perform this service, and he has discharged it with grasp and understanding in a timely and competent book. Though he writes with both warmth and insight he shows no tendency to dramatize the story. Yet the material itself is so intensely dramatic, passing as it does from the nerveless and sluggish Britain of the last decade to the sinewy and expectant Britain of to-day, that, in effect, it dramatizes itself.

The author tells his story in four stages, beginning with the mass-evacuation of children upon the outbreak of war. These are: disintegration, recuperation, adaptation and ferment. How strongly this suggests a five-act play of which the final act is still to be played! One could wish that something of this sense of drama on the great national scale might be communicated to those numerous critics of the Education Bill who see in it not at all the earnest of a great awakening but merely a failure to give full effect to some petty or short-sighted interest of their own.

Disintegration is, of course, the story of the disastrous consequences of hasty and ill-planned evacuation, planned it would seem by those who had little or no concern for educational consequences but were only eager to get the children away from the danger-