Kirstenbosch, the site selected, is peculiarly favourable for the purpose, and affords scope for the development of a singularly beautiful South African garden. It is a farm on the Rhodes estates, to the south of Groote Schur, on the eastern slopes of Table Mountain. It contains the ruins of at least three old homesteads, and was probably occupied very early in the history of the settlement of this portion of the Cape Peninsula. The country seat of Van Riebeek, the first Dutch Governor (1652–1662), adjoins Kirstenbosch on its eastern boundary, and, according to tradition, Van Riebeek obtained from the latter a large supply of native woods for building purposes.

The survey of the Kirstenbosch estate is not yet completed; its area is probably about 400 acres. Of this, the eastern half consists of flat or slightly undulating land, about 200 ft. above sea-level. Above this the western half rises to about 1000 or 1500 ft. The latter includes the lower ends of three richly wooded gorges, in which the native vegetation during recent years has been little interfered with except by occasional fires. The lower-lying parts have been heavily planted with pines (*P. pinaster* and *P. pinea*), oaks, and poplars. Here the native bush has been mostly exterminated. The poplars have completely taken possesion of considerable areas. The oaks, most of which were pollarded many years ago, have been altogether neglected, and now, with few exceptions, are in an advanced state of decay.

The underlying rock, except perhaps in the most elevated parts of the estate, is granite. The slopes, however, are for the most part strewn with blocks of Table Mountain sandstone, fallen from above. Along one edge of the area there is believed to be an outcrop of Malmesbury slates. Many acres are overlain by a rich deposit of humus derived mainly from the oaks and the poplars. The water supply is exceptionally good. Two of the streams from the adjacent gorges, traversing the whole breadth of the estate, are permanent, and a spring, issuing about 200 ft. above the eastern boundary, is perennial. It will therefore be a matter of no great difficulty to irrigate as much of the cultivated land as may be necessary. In the cultivation of South African vegetation the importance of aspect is very considerable. Kirstenbosch offers a choice which is unlimited, save towards the west (where it is shut in by the lower slopes of Table Mountain), and also, of course, there is no direct exposure to the sea. Another factor which calls for careful consideration is that of wind. The well-known Cape South-Easter, which is of frequent occurrence during the season of most active growth and of flowering, has a most injurious effect upon very many species. Owing to the curvature of the Table Mountain range between Mowbray and Muizenberg, and the situation of Kirstenbosch in the curve, the south-east wind rarely reaches it.

Kirstenbosch, therefore, possesses a combination of natural features which make it eminently suitable for the cultivation and study of a very large proportion of the varied floras of South Africa. It already bears several hundreds of species more or less representative of the Cape region itself. Experience already obtained of the cultivation in the Cape Peninsula of dry-climate species from Namaqualand and the central plateau, and of sub-tropical forms from the south-eastern coast belt, affords no room for doubt that many of these also will find a suitable home side by side with the flora of Table Mountain and the adjacent Cape Flats.

The control of the garden is vested in a board of five trustees, to which the following have been nominated by the Government:—Lord de Villiers, Sir David Graaff, Sir Lionel Phillips. Two further nominations are yet to be made, one by the Corporation of Cape Town, and another by the Botanical Society of South Africa, constituted for the purpose of giving general and financial support to the project.

The trustees have made the following appointments:—Hon. director, Prof. H. H. W. Pearson; secretary, Miss H. J. Davison. Plans for a director's residence and a laboratory have been approved. A gardening staff will be appointed immediately.

WIRELESS TIME SIGNALS.

IN the *Annuaire* for 1913 of the Paris Bureau des Longitudes will be found a full account by Commandant Ferrié of the development of wireless time-signalling.

For a long period in the past local time was the only requirement of this kind, until the discovery of America rendered the determination of longitude at sea a matter of great practical importance, thus making the knowledge of the time on a fixed meridian as necessary as that of local time. The growth of railway enterprise in the nineteenth century made the adoption of standard time over large districts an obvious convenience, with the result that different countries adopted their own standard time, and Paris time, for instance, was made legal time throughout France in March, 1891. The subsequent gradual adoption of Greenwich time, or time differing from Greenwich by an exact number of hours or half-hours, has continued until the present time, France, only so recently as March, 1911, substituting Greenwich time for Paris time throughout France and Algeria.

The accurate determination of local time (or Greenwich time altered by a constant) comes into the domain of practical astronomy, and is responsible for a considerable amount of routine work, especially at Government observatories. The difference of longitude between two stations, including, for instance, the "constant" mentioned above, has provided a problem the solution of which has steadily progressed towards accuracy since the invention of the electric telegraph; but for any place not in telegraphic communication with a fixed observatory the greatest stride in advance since the invention of the chronometer has been the application of wireless telegraphy, of which the possibilities began to be considered in this connection very soon after Marconi's first success.

Few unexplored districts of the habitable globe would be beyond the reach of a powerful wireless installation if distributing stations were an ordinary adjunct of every national observatory, and it is likely that the network of stations will be able to distribute Greenwich time over the whole of the oceans.

For general purposes time-determination within a quarter of a second is sufficiently exact, but this accuracy at a fixed observatory was by no means always attainable under old conditions, since a week of cloudy skies, especially if accompanied by considerable changes of temperature, would leave the fixed observatory almost as dependent on the rate of a chronometer as a ship at sea. Here, however, the new development steps in and suggests that, since it is not likely to be cloudy everywhere, the time can be checked by that of an observatory perhaps thousands of miles away; so that no error approaching a second of time need be feared.

This state of things, needless to say, is not yet universal; but there is no doubt about the beginning that has been made. The distributing stations, requiring great electrical power and much more costly and elaborate fittings, will always be comparatively few, but the receiving stations can also take part in the scheme. The Eiffel Tower station sends out the Paris Observatory determination of Greenwich mean midnight, for instance, and this is received, say, at Greenwich with a modest equipment and compared with the Greenwich determination. The difference can be sent without much delay to Paris by post or telegram. When it is remembered that at night, under favourable conditions, signals from the Eiffel Tower have been received at a distance well above 3000 miles (5200 kilometres), it will at once be seen how this device will prevent any accumulation of error due to a spell of bad weather.

But a quarter of a second cannot be regarded as indicating the possible limit of accuracy attainable. By employing clocks with a small difference of rate, coincidences of beat can be noted with great accuracy, the arrangement forming what might be called an acoustic vernier. For example, if two sidereal clocks supposed to be synchronised differ by a small fraction of a second owing to a difference of lag in taking up the current from the control clock, this difference can be readily obtained by comparing each with the same mean solar clock, as the coincidences will occur at a definite interval. An accuracy of one-hundredth of a second (to use a loose, convenient phrase) is not by any means impossible in this way, and Commandant Ferrié suggests one-thousandth of a second as practicable. In this way may be measured not only the lag between the clock beat and the closing of the transmitting circuit, the additional lag before the Hertzian waves actually leave the Eiffel Tower, and the lag at the receiving station, but also the velocity of the waves themselves, which can be measured, he says, with an error of less than 3 per cent., though this velocity nearly reaches 200,000 miles per second.

It is part of the routine of the station to transmit time-signals by night and by day, the latter being followed by a meteorological report giving barometric pressure, direction and force of the wind, and the state of the sea for six stations in and around the Atlantic. Similar work, at times arranged not to interfere with that of the Eiffel Tower, is done at the German station at Norddeich, and other extensions will doubtless follow. Japan, at any rate, has already started an independent system.

Commandant Ferrié's account gives very full mechanical details of each step of the process, and should be of great interest to the growing number of people possessing private wireless installations, some of whom compare their time almost daily with both Eiffel Tower and Norddeich. There is no indication at present of any intention to erect a distributing station at Greenwich, and, as stated above, it may be considered unnecessary, the fortuitous presence of the Eiffel Tower giving Paris a great advantage, as its range goes far beyond the British Isles.

W. W. B.

NOTES.

THE exhibition of specimens illustrating the modification of the structure of animals in relation to flight which has been in preparation for many months at the Natural History Museum will be open to the public on Friday, August 15. It occupies the fourth bay on the right of the central hall, and comprises 166 mounted objects and twelve microscopic specimens for the purpose of elucidating the subject in a popular manner. The adaptation of each kind of flying animal for aërial locomotion is explained, and the changes that must have taken place in the structure of the body before the animal could really fly are indicated, and attention is directed to the remarkable fact that the power of flight has been evolved independently in different groups of animals—*e.g.* bats, birds, Pterodactyles, and insects.

THE death is announced, in his fifty-first year, of Prof. Edwin Goldmann, honorary professor of surgery in the University of Freiburg i/B. since 1892. Prof. Goldmann's scientific career and work are referred to in an appreciative notice contributed by Prof. Ehrlich to *The Times* of August 13, and here summarised:—As a pupil and friend of the famous pathologist Weigert, he mastered the technique of microscopy completely. In early days he busied himself principally with researches into biochemistry. Here he turned his attention especially to the study of minute vascular changes. And then an inner impulse compelled him to devote himself to the important field of cancer research, and by ingenious experiments to advance our knowledge of this difficult problem. His great work with a large