

approximation to the actual azimuths before the height of the horizon has been measured.

Now, while the summer solstice sun thus rises in different azimuths with different heights of the horizon, its position in the heavens, that is, its declination, is unchanged. It is clear, then, that we cannot, by our azimuth measures alone, obtain the true position of the sun in the heavens, that is, in the celestial sphere. The same remark also applies to every star which rises and sets in the latitude of Britain. In addition to the azimuth of the rising or setting place, we must also take the height of the horizon into account. When we do this, the determination of the true position in the heavens, whether of sun or star—the declination—is easy.

As I shall show in the sequel, we have now the means, as the result of astronomical calculations, of determining the dates at which the sun or a star occupied declinations in times past different from those they occupy at present. All the archæologist has to do is to consult certain tables in which the sun's declination at the solstice and the varying declinations of the stars are shown for the past six thousand years. This is enough for the purpose the archæologist has in view.

NORMAN LOCKYER.

#### THE GROWTH AND SHRINKING OF GLACIERS.<sup>1</sup>

THE interesting publications referred to below show that the study of the fluctuations of glaciers is making good progress. Those of the Swiss Alps have been watched systematically for nearly thirty years, and similar work is now being carried on, not only in all parts of that chain, but also in the Pyrenees, Scandinavia, Bokhara, the Altai, the Tian Shan, and the North American chains, and has been started in the Himalayas. In the European Alps a general retreat of the glaciers began about 1861. At first rapid, it slackened after a time, but, though here and there a glacier has slightly retraced its steps and an advance became more general towards the end of the last century, the majority are still either slowly shrinking or at best stationary. In the French Alps, we learn, sundry small glaciers have quite melted away during the last few years. It is to be hoped that these places will be carefully watched in order to ascertain more precisely the conditions (temperature, precipitation, &c.) under which the formation of a glacier becomes possible. That, as I pointed out in 1894 (see "Ice Work," part iii., ch. i.), would enable us to estimate the mean temperature in certain localities during the Glacial epoch, and thus to obtain one firmer footing in that most slippery subject. This shrinkage of the world's ice mantle, we may add, appears to characterise all the countries observed, for only in Scandinavia, and perhaps at Mount St. Elias, are glaciers beginning to advance in notable numbers.

Prof. Forel contributes to the special report on the Swiss glaciers a valuable discussion on the relations of their changes to the meteorology of the region, founded on observations which have been taken continuously at Geneva for the last eighty years. The advance or retreat of an ice-stream depends mainly on two factors: the annual snowfall and the general temperature, the one chiefly affecting its upper part, the other its lower. The effects, especially of the former, obviously cannot be immediate, and a glacier may con-

<sup>1</sup> "Les Variations périodiques des Glaciers." xii<sup>me</sup> Rapport, 1906, de la Commission internationale des Glaciers. Résumé par F. A. Forel. *Arch. des Sci. Phys. et Nat. Quatr. Pér.*, t. xxv., pp. 577-587.  
<sup>2</sup> "Les Variations périodiques des Glaciers des Alpes Suisses." By F. A. Forel, E. Muret, P. L. Mercanton and E. Argand. 28<sup>me</sup> Rapport, 1907. Extrait de l'Annuaire du S.A.C., xliii<sup>me</sup> année. Pp. 302-331.

tinue its advance when the conditions are adverse, or *vice versa*. As forty-three years elapsed before the relics of members of Dr. Hamel's party, who perished in a crevasse on the Ancien Passage, were discovered on the Glacier des Bossons, after travelling about five and a half miles, we must expect changes and their results to be separated by an interval, depending on the length, slope, and other characters of an ice-stream. It is perhaps too soon to generalise from Prof. Forel's discussion of the Geneva observations, and the distance of that observatory from the higher parts of the chain will always be a drawback; but the results are already suggestive, and his method of smoothing off the irregularities of individual years, by taking the mean of the decade which they close, enables us to form a better estimate of the real climatal changes. Time will render the work of the professor, his coadjutors, and all members of the International Commission increasingly valuable; for this is one of the cases where one generation must plant the tree and another gather the fruit.

T. G. BONNEY.

#### INTERNATIONAL CONFERENCE ON ELECTRICAL UNITS AND STANDARDS.

BY invitation of the British Government an International Conference on Electrical Units and Standards will be held in London at the rooms of the Royal Society during this month. Eighteen countries are sending delegates to the conference; the names are given below.

The first meeting of the conference will be held on Monday, October 12, at 11.30, when the delegates will be received by the President of the Board of Trade; in the evening there will be a reception by the Royal Society. The meetings of the conference are expected to last until October 22, but this date is not fixed, as it will entirely depend on the progress made with the work at the conference.

The main object of the conference is to obtain international agreement on the three electrical units, the ohm, the ampere, and the volt, so that the realisation of these units in all the countries of the world shall be as near as possible identical. The best method of setting up the mercury ohm, the silver voltameter, and cadmium cell will be considered, and it is hoped that detailed specifications may be issued with the authority of the conference.

The delegates will be entertained at an official banquet, and will lunch with the Lord Mayor; they will also make an excursion to Cambridge on the invitation of Trinity College, and pay a visit to the Cavendish Laboratory. The Board of Trade Government Standards Laboratory will be open to inspection by the delegates, and the National Physical Laboratory at Teddington will be visited. The delegates will also dine at the Franco-British Exhibition with the "Dynamicables," and are invited to the annual dinner of the Institution of Electrical Engineers.

#### List of Delegates.

*America (United States).*—Dr. Henry S. Carhart, professor of physics at the University of Michigan; Dr. S. W. Stratton, director, Bureau of Standards, Washington; Dr. E. B. Rosa, physicist, Bureau of Standards, Washington.

*Belgium.*—M. Gérard, director of the Montefiore Electro-technical Institution and president of the Consultative Commission on Electricity; M. Clément, secretary of the Consultative Commission on Electricity.

*Denmark and Sweden.*—Prof. S. A. Arrhenius, Nobel Institute, Stockholm.

*Ecuador.*—Senor Don Celso Nevares, Consul-General.