GROWTH AND SHRINKAGE OF GLACIERS.[1] THE volume referred to below deals with certain glaciers in Savoy; four of them in the *massif* of Mont Blanc, the same number in the Maurienne, and one in the Tarentaise. It is well known that, during the last few centuries, the Alpine glaciers have been increasing and decreasing in volume, though the extent and duration of these oscillations have been less certain, and observers in different parts of the chain are now watching and recording the amount of changes. The glaciers near Chamonix are particularly well adapted for study, because that place has been frequented by travellers for a longer time than other Alpine centres. Hence more information can be obtained, and this in some cases is supplemented by drawings, which, however open to criticism as works of art, are valuable records of facts.

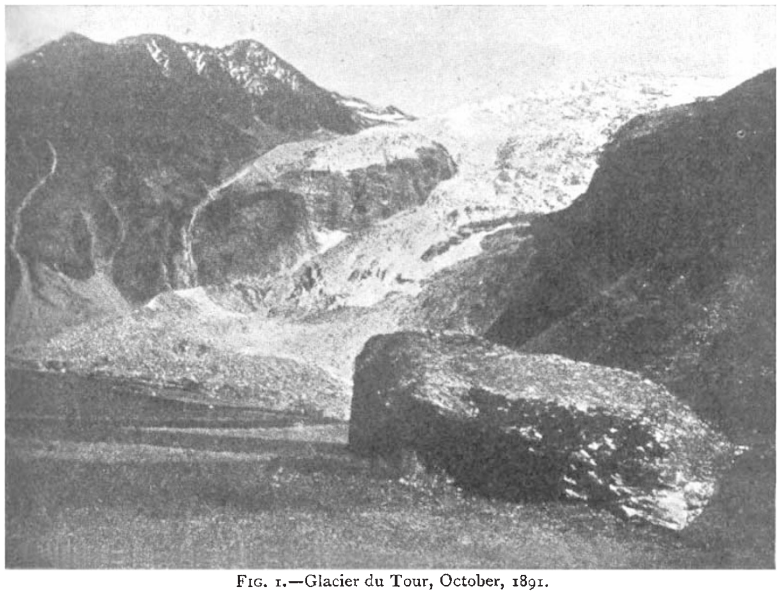

FIG. 1.—Glacier du Tour, October, 1891.

These Savoy glaciers attained one maximum, according to a curious contemporary record, in 1643; they had greatly dwindled in 1770, but during the next ten years they again increased. Early in the next century came another advance, which culminated in 1819, and was followed by another retreat. They again advanced in 1826, and oscillated considerably during the next ten years. In the latter part of this century the Chamonix glaciers apparently did not diminish so much as those in most other parts of the Alps; for they are said to have ceased shrinking in 1875, and to have reached another maximum (though smaller than on some previous occasions) in 1892.

The French surveyors have worked on a definite and comprehensive plan, making maps, fixing points for measurement and observation, and taking photographs, so that a precise register, from year to year, can be kept of the changes in these ice-streams. Some old illustrations have been reproduced, which, though artists might justly criticise, give us a good notion of the state of certain glaciers about the maximum of 1832, and photographs show some of the changes during the last twenty years. Those, for instance, of the Glacier du Tour in 1891 and 1898 (Figs. 1 and 2) indicate a considerable alteration in the volume of the ice; for an ice fall has shrunk enough to disclose a large part of the cliff by which it has been produced, while a third view, taken in 1907, exhibits a still larger amount of bare rock. It is also worth observing, though we must not enlarge upon so controversial a subject, that these illustrations have a bearing on the question of the erosive power of ice. They indicate (and this is corroborated in other parts of the Alps) that a glacier in passing over a well-marked step of rock often neither smooths it away nor digs for itself anything like a deep channel.

The position of the glaciers treated in this work has been, so far as possible, ascertained and recorded, the method of studying them being described and worked out in a typical case, so that students of glaciology receive a valuable addition to the facts at their command, and their successors, in another half-century, will be in a far better position to ascertain the precise causes of these ebbs and flows in the ice-streams of the Alps. A sentence on the title-page of this book is significant, "Service des grandes Forces hydrauliques," for it shows that the French Government (the work is undertaken by the Ministerial Department of Agriculture) recognises the value

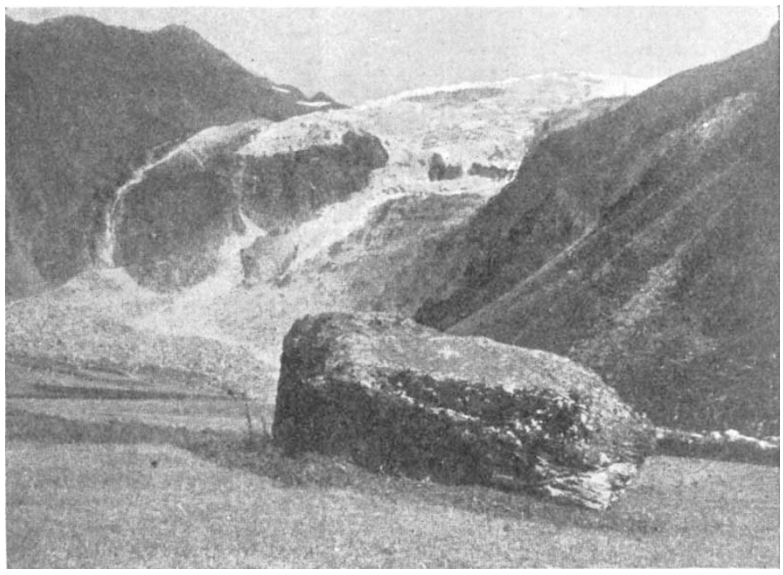

FIG. 2.—Glacier du Tour, October, 1898.

[1] "Études Glaciologiques en Savoie." Tome ii. (Ministère de l'Agriculture. Direction de l'Hydraulique et des Améliorations Agricoles. Service des Grandes Forces hydrauliques, Région des Alpes.) Pp. vii+140+19 plates. (1910.)

of Alpine rivers as inexhaustible stores of energy. Had we the same in Britain we could contemplate with equanimity the exhaustion of our coalfields.

T. G. BONNEY.

CELESTIAL SPECTROSCOPY.[1]

THE publication referred to below contains an account of six separate and distinct investigations, which have been grouped together under the above heading. In part i. are given the results of a comparative study of the sun (Fraunhoferic), chromosphere, and lower type star spectra in relation to the sun-spot spectrum. Part ii. contains an account of an investigation into the spectrum of ε Ursæ Majoris as compared with the normal Sirian spectrum. Under part iii. is found a discussion of the occurrence of nitrogen lines in the stellar spectra, and under part iv. lists of the enhanced lines of certain metals, which have not previously been published. The waye-lengths of certain well-defined lines of simple and definite origin, which are peculiarly suitable for radial velocity measurements, are given in part v., while under part vi. are grouped the wave-lengths of those well-marked lines occurring in celestial spectra for which no terrestrial equivalents have yet been found.

It may be said at once that the two last sections of this book should prove of great value. It is manifestly impossible to obtain accurate results in any radial velocity measurements unless the selected spectrum lines are at once simple in structure and of known origin. The publication of a list of such lines occurring in the spectra of nine different types (Kensington) must certainly aid those engaged in this particular branch of stellar spectroscopy.

The first part of the book is devoted to a comparison between the sun spectra and those of Capella and Arcturus, considered especially in reference to the spectrum of sun-spots. Certain of the Fraunhofer lines are found to be considerably modified in intensity in the Arcturus spectrum, and it has been definitely established by Hale and Adams that the same lines are affected in sun-spots. A close comparison of the Kensington measurements with those taken at Mount Wilson is given as far as they overlap, and though there are present in each certain lines not common to both, the two sets of observations are strikingly concordant. It has always been held by Sir Norman Lockyer and his co-workers that the comparison between the spectra indicate that the temperature of Arcturus and that of the sun-spots are comparable and lower than that of the rest of the solar reversing layer. Although other theories have been advanced, the latest observations go to show that the Kensington theory is the right one.

The second chapter deals entirely with the spectrum of ε Ursæ Majoris, the lines of which have been measured and as far as possible traced to their origin. The differences between this spectrum and those of Sirius and α Cygni are given, and the general conclusion is drawn that ε Ursæ Majoris must be placed between the Sirian and the Procyonian group on the Kensington temperature scale.

It is impossible in a short notice to enter into the details of this work, so many branches of which have been grouped together. Suffice it to say that the whole investigation stands on the same high plane as all those carried out in the Solar Physics Observatory, and the author is to be congratulated on bringing a laborious research to a successful conclusion.

[1] "Researches on the Chemical Origin of Various Lines in Solar and Stellar Spectra; being the Results of Investigations made at the Solar Physics Observatory, South Kensington, after discussion." By F. E. Baxandall. Pp. vii+77. (London: H.M. Stationery Office, 1910.) Price 4s. 6d. (Solar Physics Committee, under the Direction of Sir Norman Lockyer, K.C.B., F.R.S.)

"YELLOW JACK."

A MELANCHOLY interest attaches to this volume inasmuch as it was the last work penned by its gifted author before his premature decease, and serves to emphasise the loss to tropical medicine sustained thereby.

The book is a complete treatise on yellow fever—the "yellow jack" of the earlier navigators, that dread disease which so often broke out with appalling suddenness and severity on ships voyaging to the west coast of Africa, the West Indies, and Central America, and parts adjacent thereto. Its distribution is somewhat peculiar in that it is practically confined to that part of the globe between the parallels of latitude 40° north and south, and of longitude 20°

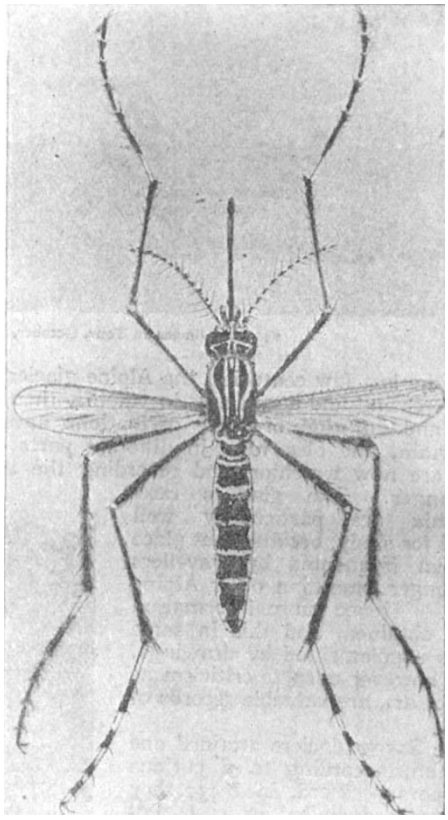

FIG. 1.—*Stegomyia fasciata*, F. (=*Calopus*, Mg.), ♀, the mosquito which carries yellow fever. From "Yellow Fever and its Prevention."

east and 100° west. It is true that outbreaks of the disease have occurred somewhat outside these limits, *e.g.* in North Italy, French seaports, Swansea, and Southampton in this country (a few cases only), and at times severely in New York and Philadelphia, but in these districts it has never obtained a foothold. The reason for this geographical distribution is associated partly with the endemic areas which naturally exist in West Africa and Central America, and partly by reason of the fact that the disease is transmitted by a species of mosquito, the *Stegomyia fasciata* (*calopus*), the distribution of which is practically world-wide *between* the parallels of latitude 40° north and south. Thus in Europe, the Stegomyia is found in southern Spain, Italy, Malta, and Greece, and it

[1] "Yellow Fever and its Prevention: a Manual for Medical Students and Practitioners." By Sir Rubert W. Boyce, F.R.S. Pp. xv+380. (London: John Murray, 1911.) Price 10s. 6d. net.