plates, but as it is the part strongly heated by the fire, the cell is filled with steam, which escapes in bubbles through the slits; the water then creeps into the cell, to be converted immediately into steam. This process goes on at first intermittently, but it soon reaches a stationary state. The bubbling of steam through the slits acts as exciter, and the kettle emits sonorous notes, which may be likened to the ruffling of pine trees by a gentle breeze or the sound produced by stridulating insects. The difference of sound is mainly due to the form of the kettle rather than to the method of exciting the vibration. To make the kettle sing loudly it is necessary to regulate the fire in such a way that the expulsion of steam bubbles from the cell is in good accord with the natural period of vibration of the kettle, so that it is set in sympathetic vibration. Excessive heating is, therefore, unfavourable to singing.

Various forms of steam exciter can be easily designed, and different manufacturers seem to have their own speciality. When and where this method of exciting the vibration came into use is not well known, but as the kettles were common for many centuries, the exciter seems to have been invented by the amateurs of teaism (*chanoyu*) long before Western science was introduced to Japan.

H. NAGAOKA.

Science College, Tokyo, September 27.

Bursaries at the Royal College of Science, London.

SCIENCE scholars selected from the whole of Great Britain for their ability and promise, maintaining themselves on 17*s.* 9*d.* per week, are year by year saved from much privation by secret gifts of small bursaries—see the subjoined audited account for last year.

I have no right to ask for help from the generous men who helped me last year, but I have all the sturdiness of a chartered beggar. I ask in a good cause.

It was originally intended that these bursaries should be given only to such National Scholars as required assistance, but some of the subscribers have given me power to assist other students of the college. Also one of the two City companies has given me power to grant an occasional bursary of more than 10*l.* It is understood that every student is morally bound to repay this money to the fund at some future time.

JOHN PERRY.

November 12.

ROYAL COLLEGE OF SCIENCE.

BALANCE SHEET, BURSARIES, 1905–6.

Moneys Received and Paid by Prof. Perry from July 12, 1905, to July 12, 1906.

Received.

	£	s.	d.
July 12, 1905—Balance in hand ...	22	19	0
,, ,, ,, —Royalty on Slide Rules ...	1	4	0
Oct. 20, ,, — ,, ,, ,, ...	2	11	0
Nov. 6, ,, —Dr. Sprague ...	20	0	0
,, 13, ,, —A. T. Simmons, Esq. ...	10	0	0
,, 16, ,, —Oscar Guttman, Esq. ...	1	1	0
,, 21, ,, —The Drapers' Company ...	100	0	0
Dec. 4, ,, —Robert Kaye Gray ...	10	0	0
,, 7, ,, —Matthew W. Gray ...	10	10	0
Jan. 13, 1906—George Beilby, Esq. ...	10	10	0
,, 13, ,, —Royalty on Slide Rules ...	3	15	0
,, 16, ,, —The Goldsmiths' Company ...	100	0	0
July 6, ,, —Royalty on Slide Rules ...	1	1	0
	£293	11	0

Paid.

	£	s.	d.
July 12 to Dec. 20, 1905—			
One Bursary ...	7	0	0
Two Half-Bursaries, each £7 10*s.* ...	15	0	0
Twenty-three Half-Bursaries, each £5 ...	115	0	0
April 6 to June 15, 1906—			
Two Half-Bursaries, each £7 10*s.* ...	15	0	0
Twenty Half-Bursaries, each £5 ...	100	0	0
Balance ...	41	11	0
	£293	11	0

Audited and signed by

July 17, 1906. WILLIAM A. TILDEN.

LAKE BALATON.[1]

LAKE BALATON, the largest lake in the Hungarian Plain, occupies a basin of internal drainage at the level of 343 feet above the sea, and has an area of some 230 square miles. It is well known from the watering-places and mineral springs upon its shores. In 1891 the Hungarian Geographical Society appointed a commission to undertake a detailed investigation of the lake. The scheme was supported financially by the Hungarian Minister of Agriculture, the Hungarian Academy of Sciences, and Dr. Andor von Semsey. The results are being published in three volumes; the first deals with the geography, geology, hydrography, climate, and the physical and chemical characters of the lake water. The second volume is devoted to biology; the third to the anthropography, ethnography, archæology, bibliography, and the description of the watering-places. There is also an atlas. Several sections of the work and the topographic atlas have been issued. They contain contributions to all three volumes, and illustrate the thorough nature and wide range of the work.

The report on the ethnography, by the late Dr. Johann Jankó, translated by Dr. Willibald Semayer, is the longest contribution, and is perhaps of most general interest. It begins with a concise geographical description of all the localities around the shores of the lake, and then gives an interesting discussion of the place-names. They are mainly Magyar, with some Sclav and German additions. The place-names are classified into groups, based on orographic and hydrographic conditions, on plants, on the general features of the vegetation, on animals, on soils and rocks, on echoes (as in Ekko and Zongo odal, "the resounding side"), on industries, ecclesiastical terms, family and personal names, and races. (English occurs in the term Angol zollok, the "English vineyard," and in other names associated with gardens.) Other places are named after the days of the week, military terms, numerals, and unnatural death (such as "Olo" for murder). Historical place-names are placed as a special group, and they can be traced back to between the eleventh and fifteenth centuries; they are regarded by Dr. Jankó as of especial historical value as showing the unbroken continuity of the Magyar occupation of the Balaton district during the past nine centuries, in spite of the invasions of Tartars and Turks. The old families who have been domiciled round Lake Balaton for at least a century are mostly Hungarians; 6·5 per cent. are Jews, and 1 per cent. are foreigners. The census of 1890, enumerating a population of 55,000, gave their numerical proportions as follows:—98·809

[1] "Resultate der Wissenschaftlichen Erforschung des Balatonsees." Balatonsee-Commission der Ung. Geographischen Gesellschaft. (Vienna: Ed. Hölzel, 1902–1906.)

Vol. i. "Physische Geographie des Balatonsees und seiner Umgebung." Part iv., Sect. 3, Resultate der Phytophänologischen Beobachtungen in der Umgebung des Balatonsees. By Dr. Moriz Staub, completed by Dr. J. Bernatsky. 45 pp., 1 map. (1906.) Part v. Die Physikalischen Verhältnisse des Wassers des Balatonsees. Sect. 2 and 3, Die Farbenerscheinungen des Balatonsees, by Dr. E. von Cholnoky; Die Reflexionserscheinungen an Bewegten Wasserflächen, by Dr. Baron Bela Harkanyi. 88 pp., 2 col. plates. (1906.)

Vol. ii. "Die Biologie des Balatonsees." Part i., Die Fauna des Balatonsees. Beiträge zur Kenntniss des Planktons, by Dr. Geza Entz, Jun., and i. and ii. Nachtrag zur Aufzählung der Weichthiere, by Dr. A. Weiss and Theodor Kormos. 76 pp. (1906.) Part ii., Die Flora. Sect. 1, Die Bacillarien des Balatonsees, by Dr. Josef Pantocsek. 112 pp., 17 plates. (1902.)

Vol. iii. "Social- und Anthropogeographie des Balatonsees.' Part i., Archæologie der Balatonsee-Umgebung. Sect. i., Archæologische Spuren aus der Urzeit und dem Altertum bei Veszprem. By Gyula Rhé. 33 pp., 2 col. plates. (1906.) Part ii. Ethnographie der Umwohner des Balatongestades. By the late Dr. Johann Jankó, continued by Dr. Willibald Semayer. 499 pp., 1 map. (1906.) Part v. Bibliographie des Balatonsees. By Julius von Sziklay. 65 pp. (1906.)

"Spezialkarte der Balatonsees und seinen Umgebung." By Dr. Ludwig von Loczy. 4 sheets. Scale 1 to 75,000. (1903.)

per cent. Magyar, 0·828 per cent. German, 0·081 per cent. Croat, 0·059 per cent. Slovak, and 0·005 per cent. Wend.

The description of the daily life and industries of the inhabitants of the district of Balaton is of especial interest. Some of the people live in artificial caves dug out on the hill-sides, in what, from the photographs, look like deposits of loess. Some of these cave-dwellings are high up in the face of the cliff, and they are explained by Dr. Jankó as having been occupied when a slope led up to them, and before denudation had cut back the ground and left the ends of the old excavations like hanging tunnels on the face of the cliff. The author figures the picturesque mud-walled, thatched houses, and the carved wooden furniture, and describes the industries, of which the most interesting is his account of the fishery. He describes the regulations of the Fishers' Guild, and the methods of fishing, from the fire-hollowed, flat-sterned canoes (bottich schiffe), from sledges used on the ice in winter, and by the fish traps composed of labyrinthine fences.

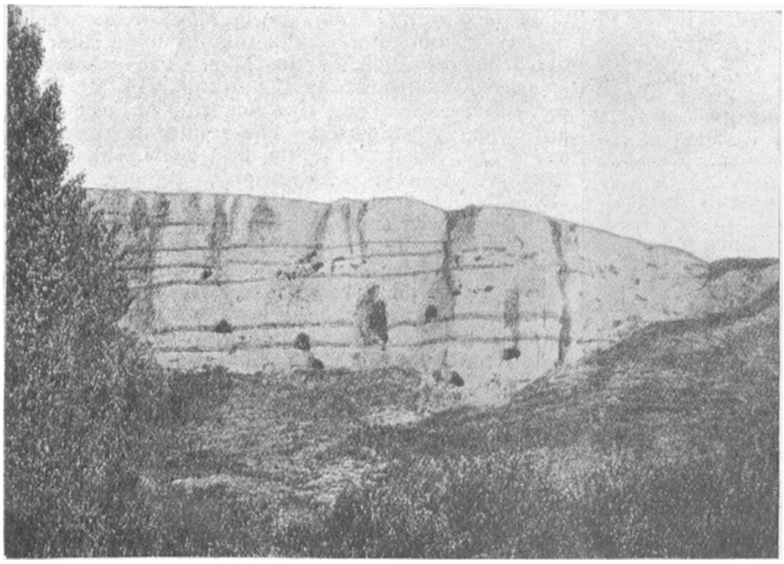

FIG. 1.—Ancient Artificial Cave Dwellings n the District of Lake Balaton.

The archæology of Lake Balaton is described by Gyula Rhé. There are tools and flakes of the Stone age, numerous implements and pottery of the Bronze age, and well-preserved remains of a Roman settlement at Poganytelek.

The three sections of the first volume deal with seasonal plant distribution and with the physical characters of the lake water. The work on phenology was begun by Dr. Moriz Staub, and continued by Dr. Bernatsky; extensive observations on the time of blooming of *Galanthus nivalis*, *Corylus avellana*, and *Cornus mas* have been used to map out the part of Hungary between the Danube and the Drave into seven zones, characterised by the earliness or lateness of the vegetation.

The investigation of the physical characters of the lake water has been conducted by Dr. von Cholnoky and Baron Harkanyi. The former has determined the transparency of the water under different conditions of wind and season, and its essential colour, which varies from the highest to the middle numbers (11–6) in Forel's scale. He also discusses the influence of movements of the water on its colour, and the complex colour and light effects produced by wind and ripples. The sky has an especially powerful effect on the colour, as the lake is in open plains with low banks; but different colours are seen under the same sky conditions, and they are explained as polarisation effects. The apparent uplift of hills by mirage is illustrated by a telephotograph, and by a series of views showing the different elevation of distant hills under varying conditions of refraction. The discussion of the colour effects is illustrated by excellent sketches showing colour effects on the shores of the lake under different climatic conditions, and is followed by an investigation by Baron Harkanyi on reflection effects from moving water.

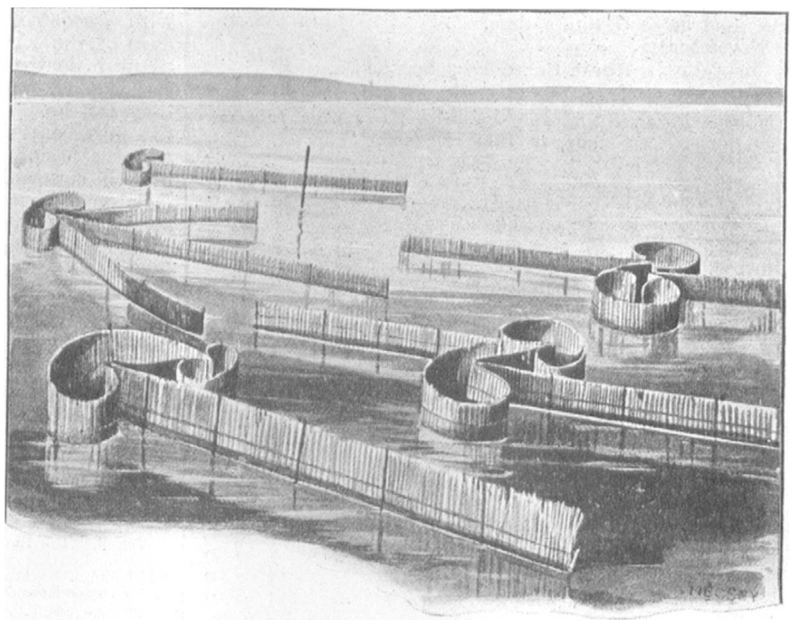

FIG. 2.—Fish Traps on Lake Balaton.

The reports on the biological sections of the work are represented by two sections. A monograph of the diatoms by Dr. Josef Pantocsek gives a systematic account of the 288 species, many of which are new. The Mollusca are catalogued by Dr. Weiss and Theodor Kormos. Dr. Weiss's list raises the number of known species in the fauna to 106. Contributions to the knowledge of the plankton are given by Dr. Geza Entz; he describes twenty-three species of Peridiniaceæ, and figures the seasonal variations of *Ceratium hirundinella,* which lives in the lake throughout the year, and is common from May to November.

The last part of the whole work, the bibliography, has been compiled by Dr. Julius von Sziklay. It enumerates all the independent works, with summaries of their contents, and has special sections for maps and for contributions in journals and serials.

The Hungarian Geographical Society is to be congratulated on this valuable contribution to natural science. The monograph on Lake Balaton will be of value to all students of the natural history and geography of Central Europe, and its summary of modern methods of research will be of use to students of lakes elsewhere. Moreover, the description of the country, revealing the quiet charm of its scenery and the many interests in the life of its people, should lead more visitors to this attractive district.

A 100-INCH REFLECTING TELESCOPE.

As time passes and astronomical work advances there is a greater demand, year by year, for more powerful instruments of research. Fortunately, instrument makers have so far been able to fulfil the requirements for large refractors and reflectors, but a few years ago the time seemed to be reached when further progress appeared a long distance off. At the present day there are refractors in existence the object-glasses of which are as large as 30, 36, and 40 inches in diameter, while the greatest glass mirror that has been used measures 60 inches in diameter.

In the case of the largest refractor, namely, that erected in the Yerkes Observatory in America, it seems possible that the size of this form of telescope has nearly reached its limit. The reasons for this are that, not only is it extremely difficult and costly to cast and figure lenses of such dimensions, which to give the best definition must be practically flawless, but the mounting has to be so immense and strong, and consequently very expensive in proportion.

It must be remembered that in the refracting form of telescope the object-glass has to be placed at the *upper* end of a long tube, while the observer takes his place at the lower end; these ends have to be very rigidly connected together, and the whole tube mounted so as to be capable of being moved in any direction. Thus in the case of the Yerkes telescope the tube had to be 62 feet long (weighing six tons), and the whole mass of metal that required moving every time the telescope was required in a different position was twenty tons. This will give some notion of the engineering difficulties that are involved in large refractors. In reflectors, on the other hand, the mirror is placed at the *lower* end of a comparatively light tube, and as close as possible to the mounting on which it is carried. In fact, in the case of the late Dr. Common's 5-feet reflector a means was adopted of actually floating the mirror.

In considering, therefore, the construction of telescopes much larger than those that already exist, attention is naturally being paid more to the reflecting type than to refractors. Further, it is not necessary that the glass casting for a mirror should be so perfect as that required for an object-glass, for in the former case only a perfect reflecting *surface* is required, while in the latter the light has to pass through the whole mass of glass. It is obvious, then, that much larger discs of glass can be made which may be suitable for reflectors but useless for refractors. Aperture for aperture, a mirror costs about one-tenth the price of an object-glass, and this gives some idea of the extra work and risk involved in producing a good object-glass.

The expense attached to the mounting of a reflector is also considerably less than that of refractors when large instruments are in question.

Now, not only is the reflector the less expensive of the two forms of instruments, but it has many distinct advantages optically. Thus chromatic aberration is a thing unknown in reflectors. Again, light being totally reflected from the silvered surface of a mirror is not lost like it is in refractors, where it always has to pass through the object-glass, and is consequently partially absorbed.

Mirrors are, however, easily tarnished and affected by changes of temperature, but these disadvantages do not counterbalance the many points in their favour, to which reference has been made, when exceedingly large instruments are under consideration.

In the Proceedings of the American Philosophical Society (vol. xlv., No. 182, p. 44, 1906) Prof. E. C. Pickering communicated a paper entitled "An International Southern Telescope," and in it he strongly advocated the erection of a large telescope of the reflector type. His proposal was that the telescope should have a diameter of about 84 inches, and should be set up in some locality such as South America or South Africa, where the observing conditions are considered very favourable. Towards the end of the paper Prof. Pickering referred to the important work that could be accomplished by means of such a large reflector, and mentioned that the name of a donor "could in no way be better immortalised than by associating it with such a real advance in the greatest problem to the solution of which the mind of man has aspired—the study of the sidereal universe."

We learn now from the current number of the *Astrophysical Journal* (vol. xxiv., No. 3, October) that Mr. John D. Hooker, of Los Angeles, who on former occasions has rendered financial assistance to astronomy, has presented to the Carnegie Institution of Washington the sum of forty-five thousand dollars to purchase a glass disc 100 inches in diameter, 13 inches thick, and 50 feet focal length, and to meet other expenses incident to its construction. These latter will include the erection of a building in which the mirror can be ground, figured, and tested; the construction of a large grinding machine, with crane for lifting the mirror ($4\frac{1}{2}$ tons); the provision of a 54-inch glass disc to be made into a plane mirror for testing purposes, and other necessary items.

The large mirror is intended for use at the Solar Observatory of the Carnegie Institution situated on Mount Wilson, in California, and under the directorship of Prof. G. E. Hale. This observatory has already a 60-inch mirror in its optical shop, and at the present moment it is being tested. In the case of the new 100-inch reflector, we are told the St. Gobain Company expresses its deliberate opinion that such a disc, 13 inches thick, can be produced, and that the Company will be able to carry out the order which has been given to it.

The grinding and figuring will be entrusted to Prof. G. W. Ritchey, and no unsurmountable difficulty is anticipated by him in bringing such a mirror to a high order of perfection. The 60-inch mirror, now nearly completed, is the largest he has yet attempted, and this is now nearly ready for mounting.

At present no financial provision has been made for the mounting and housing of this 100-inch reflector, but as the mirror will take, as we are told, about four years to complete there is no immediate hurry.