January and June on a specimen of *Acer Negundo*. During the whole of this period the temperature of the tree was lower than that of the air in the morning and at noon, but higher in the evening. The lowest temperature of the tree recorded was in February, −21°·1 C. In the same part Miss H. G. Fox gives a monograph of the species of *Cypripedium* belonging to the Atlantic region of North America, six in number, with a scheme of the affinities of all the American species of the genus.

THE fourth volume of the *Transactions* of the Royal Society of Victoria (1895, pp. 166) is taken up with "A Monograph of the Tertiary Polyzoa of Victoria," by the late Dr. MacGillivray. The monograph is illustrated by twenty-two lithographed plates, all of which were prepared by Dr. MacGillivray, but only a few pages of the descriptive text had been written, and Prof. Baldwin Spencer and Mr. T. S. Hall are responsible for the descriptions required to complete it. In Victoria, as well as in South Australia, there are numerous Tertiary formations containing large deposits of Polyzoa, the accurate determination of which, especially in relation to the living species, is of great geological interest. Dr. MacGillivray's monograph, with its numerous fine illustrations of species, will prove of great assistance in working out this relation.

THE second volume on "Africa," in the new issue of Stanford's Compendium of Geography and Travel, deals with South Africa, and the author is Mr. A. H. Keane. The volume is not merely an enlarged edition of Keith Johnston's work, but practically a new publication, containing but a few passages of the original text, while only three of the old text-figures have been retained. Nnmerous new and carefully selected illustrations give attractiveness to the text, which is well abreast of the knowledge of African geography. How enormously the available information has increased may be gathered from the fact that the present volume, dealing with South Africa alone, runs into 671 pages; and we can quite believe Mr. Keane when he says: "Occurrences of far-reaching consequence have followed in such swift succession that in the preparation of this work the chief difficulty has been to keep pace with the shifting scenes." A broad view is taken of geography, attention being given to African history, political questions, and ethnology, as well as to the physical features, hydrography, and natural history of the continent. Altogether the volume is a valuable addition to the works dealing with Africa, and a desirable acquisition to every geographer's library.

THE first volume of what promises to be a very elaborate "Traité de Chirurgie clinique et opératoire," has come to us from MM. J. B. Baillière et Fils. The editors of the work, which will be completed in ten bulky volumes, are Profs. A. Le Dentu and P. Delbet; and if the first volume, dealing with general and special pathology, is followed by others of like fulness and quality, a valuable work of reference will have been added to the literature of surgery. The chief object of the editors—the object towards which the efforts of all physicians and surgeons tend—will be to make the publication the *livre de chevet* of those who are concerned with the origin and treatment of diseases. It is the surgery of to-day that will be expounded, not that of the past. The recent conquests in the domain of anatomy, bacteriology with all its applications to therapeutical surgery, and operative methods which have extended the field of action of surgery, will all be fully dealt with. Such a broad scope, when considered by the side of the distinguished men who have undertaken to write the various sections, is sufficient to establish the work in a high position.

IN a paper in the current number of the *Berichte* (January 13) by Lobry de Bruyn and A. van Ehenstein, further details are given of the properties of free hydrazine, $NH_2—NH_2$. In the first preliminary communication by M. Lobry de Bruyn, two methods of obtaining the anhydrous base were described, viz., by the action of barium oxide upon hydrazine hydrate, and by the reaction between sodium methylate and hydrazine hydrochloride in absolute methyl alcohol; in either case the hydrazine being separated by fractional distillation under reduced pressure. Free hydrazine is a liquid which at 23° has a density of 1·003, and on cooling with ice solidifies to a crystalline mass melting at 1°·4 C. Unlike free hydroxylamine, which is explosive, hydrazine is a very stable body, boiling unchanged under ordinary atmospheric pressure at 113°·5 C., and not decomposing at a temperature of 300°. In its chemical behaviour the free base resembles the hydrate, being oxidised to nitrogen by oxygen or air, and converting solid sulphur into hydrogen sulphide on warming. In a subsequent note in the same journal, by M. Lobry de Bruyn, an improved method is given for the preparation of hydrazine hydrate in quantity, advantage being taken of the fact that glass is not attacked by this substance at temperatures under 50° C. Since the hydrate boils at 47° under a pressure of 26 mm., the fractional distillation, if conducted at pressures below this, may be carried out in glass vessels.

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus*, ♂) from India, presented by Mr. Edmund Sheriff; a Common Boa (*Boa constrictor*) from Trinidad, presented by Mr. S. A. Cumberland; a —— Antelope (*Cervicapra*) from Africa, a Kinkajou (*Cercoleptes caudivolvulus*) from South America, a Cormorant (*Phalacrocorax carbo*), British, two Samoan Fruit Pigeons (*Ptilonopus apicalis*) from Samoa, deposited; a Sharp-nosed Snake (*Passerita mycterizans*) from India, purchased.

OUR ASTRONOMICAL COLUMN.

ECLIPSES IN FEBRUARY.—During the present month there will be an annular eclipse of the sun and a partial eclipse of the moon. The former will occur on February 13, but as the path of the annulus lies wholly in the South Atlantic and Antarctic Oceans, it is of little interest. At the Cape of Good Hope it will be visible as a partial eclipse, magnitude 0·849, the greatest phase occurring at 6h. 38m. Cape mean time, that is, sixteen minutes before sunset.

The more important phases of the partial eclipse of the moon on February 28 will be visible in this country, provided the weather be favourable. The following particulars for Greenwich are from the *Companion to the Observatory*:—

	h. m.		h. m.
First contact with penumbra	5 15·5	... With shadow	6 16·3
Last ,, ,,	10 15·9	... ,, ,,	9 15·1

First contact with shadow takes place at an angle of 85° from the north point towards the east, and the last contact at 30° towards the west. The magnitude of the eclipse (moon's diameter = 1) will be 0·870. The moon will rise at 5h. 27m.

During the partial eclipse the following stars will be occulted:

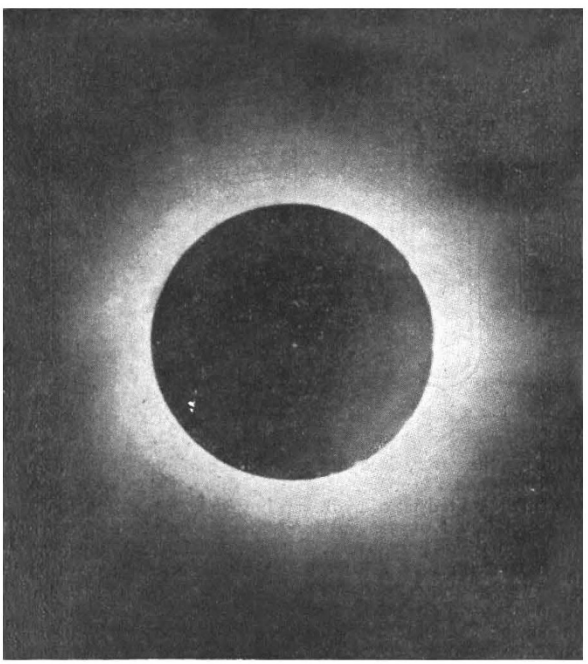
Star.	Mag.	Disappearance or Reappearance.	G.M.T.	Angle E. of N.
			h. m.	°
B.D. +7°2373	9·3	D	6 42	81
+6°2364	8·8	D	7 6	147
+7°2370	9·5	R	7 7	325
+7°2373	9·3	R	7 28	334
+7°2364	8·8	R	7 56	270

ASTROPHYSICAL STANDARDS.—The need for greater uniformity in standards, &c., has long been felt by all engaged in astrophysical researches, and we learn with pleasure that the Editorial Board of the *Astrophysical Journal* has taken up the matter. As the result of a circular addressed to the Associate Editors, the following decisions have been arrived at, and an

appeal is made for their general adoption. Rowland's scale of wave-lengths, as represented by the tables in course of publication in the journal above named, is to be employed, and the unit of wave-length is to be the ten-millionth of a millimetre, or "tenth-metre." For measurements of velocity in the line of sight, the kilometre is to be taken as the unit. To distinguish the lines of hydrogen, the nomenclature starting with H_α in the red and continuing in alphabetical order through the entire series is agreed upon. Maps of spectra are to be drawn with the red end to the right, and tables of wave-length are to be printed with the shorter wave-lengths at the top.

Although some of the leading workers in astrophysics have not been consulted, it is probable that these arrangements, so far as they go, will meet with general approbation. It is to be regretted, however, that the representation of intensities of spectrum lines was not considered, as a scale which every one might be willing to adopt is, perhaps, even more urgently required than any general agreement on the points to which reference is made above.

REPRODUCTION OF ASTRONOMICAL PHOTOGRAPHS.—The Council of the Royal Astronomical Society has lately undertaken the reproduction (by paper prints and lantern slides) of a selection of the instructive astronomical photographs in the possession of the Society. The prints and lantern slides are sold to Fellows of the Society at approximately cost-price, and full details as regard subject, instrumental data, exposure, &c., are given upon each. Among the celestial pictures which have been thus rendered available to a wider circle of astronomers, are



photographs of total solar eclipses of 1886, 1889, and 1893, Dr. Roberts' photographs of the Pleiades and the Great Nebula in Orion, Prof. Barnard's photographs of the Milky Way, and of Brooks' and Swift's comets, Dr. Gill's photograph of the nebula about η Argûs, and MM. Loewy and Puiseux's lunar photographs. The accompanying illustration of the eclipse of April 16, 1893, has been reduced by one-third from a print sold by the Society. The original was taken by Sergt.-Major Kearney, R.E., at Fiundium, West Africa, with a Dallmeyer photo-heliograph, the exposure being twenty seconds.

HOLMES' COMET.—Prof. Barnard has just published an account of his observations and photographs of this comet, made during its appearance in 1892 and 1893 (*Astrophysical Journal*, vol. iii. No. 1). Some of the telescopic features appear to have been quite unique. On January 4, 1893, only a feeble glow was visible; twelve days later it seemed like a hazy star, and the nucleus was actually seen to brighten in the few hours of observation, while the body itself expanded; six days afterwards, the nucleus had almost disappeared again. A photograph taken on November 10, 1892, is chiefly remarkable as showing a large irregular mass of nebulosity covering an area of at least a square degree, and connected with the comet by a short hazy tail. This curious appendage, which certainly belonged to the comet, seems to have been overlooked by most observers, but its recognition may possibly at some time or other prove to be of importance. The facts seem to be in favour of the comet having suddenly become bright just before the time of its discovery. It differed from the average comet in having a nearly circular orbit, and unless there had been some great change in its path, or some internal change, it should have been discovered long before. As the comet could not be seen with the Lick telescope during the succeeding opposition, Prof. Barnard thinks that it no longer exists in the cometary form, and will never be seen again.

THE LIQUEFACTION OF AIR AND RESEARCH AT LOW TEMPERATURES.[1]

THE best and most economical plant for the production of liquid air or oxygen is one based on the general principle of that used by Pictet in 1878, for liquefying oxygen; instead, however, of using Pictet's combined circuits of liquid sulphur dioxide and carbon dioxide kept in circulation by compression, liquefaction and exhaustion, it is better to employ ethylene in one circuit, as Cailletet and Wroblewski did, and to use nitrous oxide, or preferably carbon dioxide, in another. Further, instead of causing the oxygen to compress itself during its formation from potassium chlorate heated in an iron bomb connected with the refrigerator, it is found convenient to use gas previously compressed in steel cylinders.

A very convenient laboratory apparatus, the arrangements of the circuits of which will be easily understood from the sectional view shown in Fig. 1, has been devised for the liquefaction of small quantities of oxygen or other gases; with this simple arrangement, 100 c.c. of liquid oxygen can readily be obtained, using liquid carbon dioxide at $-79°$ C. for cooling and employing no exhaustion. The gaseous oxygen, cooled before expansion by passing through a spiral of copper tube immersed in solid carbon dioxide, passes through a fine screw stopcock under a pressure of 100 atmos., and thence backwards over the coils of pipe. The liquid oxygen begins to drop in about a quarter of an hour from starting. The pressure in the oxygen cylinders at starting is generally about 150 atmos., and the best results are got by working down to about 100. This little apparatus will enable liquid oxygen to be used for demonstration and research in all laboratories.

By employing jacketed glass vessels, of which the annular space is highly exhausted, for storing liquefied gases, the influx of heat is reduced to one-fifth of that which occurs when the jacket contains air; if the interior walls are silvered, or excess of mercury vapour is left in the jacket, the influx of heat is again reduced to one-sixth, so that the total effect of the high vacuum and the silvering is to reduce the ingoing heat to about 3½ per cent. of that which enters when these precautions are neglected. The suggestion that the metallic coating is useless, because Pictet has found that all kinds of matter are transparent to heat at low temperatures, is thus disposed of; further, no increase in the transparency of glass to thermal radiation occurs on cooling to the boiling point of air.

In order to test Olszewski's statement that air cannot be solidified at the lowest pressures (*Phil. Mag.*, February 1895), the author's former experiments have been repeated on a larger scale. If a litre of liquid air be exhausted in a silvered vacuum vessel, half a litre of solid air may be obtained and kept solid for half an hour. The solid is at first a stiff transparent jelly, which, when placed in a magnetic field, has the still liquid oxygen drawn out to the poles, showing that solid air is a nitrogen-jelly containing liquid oxygen. Solid air can only be examined in a vacuum or an atmosphere of hydrogen, because it instantly melts on exposure to the air, causing an additional quantity of air to liquefy; it is strange to see a mass of solid air melting in contact with the atmosphere, and all the time welling up like a fountain.

On causing dry air, contained in sealed flasks, to solidify by

[1] A paper read before the Chemical Society on December 19, 1895, by Prof. J. Dewar, F.R.S. (Abridged from the *Proceedings* of the Society issued January 14.)