was cast adrift off Nantucket Shoal, and recovered near Campbelton after the lapse of 512 days, giving an average daily velocity of 5·1 miles. Three other bottles, which were thrown overboard in mid-ocean at the same time, were all recovered within a short distance of each other in the same week after a drift eastward of 1200 miles, the mean rate of travel being 9·9 miles a day.

Two sphygmograph curves, obtained by Mr. R. De C. Ward at altitudes of 15,700 feet and 19,200 feet, are reproduced in a short paper in the *Journal* of the Boston Society of Medical Sciences (June). The curves derive interest from the fact that they are the first from so great altitudes to be reproduced, and also because the peculiarities of heart action shown in them are the result of altitude pure and simple, as absolutely no physical was taken in making the ascents.

IN the current number of the *Zeitschrift für physikalische Chemie*, Mr. S. L. Bigelow describes some interesting results of experiments made in Prof. Ostwald's laboratory on the catalytic action of organic substances on the oxidation of sodium sulphite. It has been known for a considerable time that the rate of oxidation of sulphurous acid is increased by the presence of many inorganic salts. In beginning a closer investigation of this subject, Mr. Bigelow was accidentally led to the discovery that the oxidation of a sodium sulphate solution by a current of air is hindered to a remarkable extent by the presence of a small quantity of alcohol. One part of alcohol in ten thousand of a one-hundredth normal solution of sodium sulphite had a perceptible influence. In another case it was found that the admixture of mannitol with sodium sulphite in the proportion of one molecule to eight hundred, diminished the rate of oxidation 50 per cent. Great difficulty was experienced in obtaining constant results, and it was found that the small quantities of impurity in the water used as solvent, and in the aspirated air, produced large variations: it was, in fact, not found possible to obtain perfectly constant conditions. An extension of the inquiry to other organic substances led to the discovery of some regularities, but not to the establishment of any general theory of the action. The phenomenon obviously bears some relation to the well-known inhibitory action of organic substances on the oxidation of phosphorus.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus*, ♂) from India, presented by Miss E. Sandell; a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Madam Giorgi; a Rhesus Monkey (*Macacus rhesus*) from India, presented by Miss Leathers; a Sykes' Monkey (*Cercopithecus albigularis*, ♀) from East Africa, presented by Mr. C. Carter; a Grand Eclectes (*Eclectus roratus*) from Molluccas, presented by Mrs. Peter Watson; a Corai's Snake (*Caluber corais*) from British Guiana, presented by Mr. C. W. Lilley; a Chimpanzee (*Anthropopithecus troglodytes*, ♀) from West Africa, a Tiger (*Felis tigris*) from Eastern Asia, a Leopard (*Felis pardus*) from Africa, a Red-bellied Wallaby (*Macropus billardieri*) from Tasmania, two Elephantine Tortoises (*Testudo elephantina*) from Aldabra and Mahe Islands, a Reticulated Python (*Python reticulatus*) from the East Indies, deposited; two Maximilian's Aracaris (*Pteroglossus wiedi*), three Lettered Aracaris (*Pteroglossus inscriptus*), six Superb Tanagers (*Calliste fastuosa*), four Brazilian Hangnests (*Icterus jamaicai*), three Merrem's Snakes (*Rhachnœa mirrimi*) from Brazil, two Red Under-winged Doves (*Leptoptila rufaxilla*), a Little Guan (*Ortalis motmot*) from Guiana, three Golden-headed Conures (*Conurus aureus*) from South-east Brazil, two Red-ground Doves (*Geotrygon montana*) from South America, purchased; a Burrhel Wild Sheep (*Ovis burrhel*), born in the Gardens; six Californian Quails (*Callipepla californica*), a Crested Pigeon (*Ocyphaps lophotes*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

COMET PERRINE (MARCH 19).—Dr. Berberich communicates to *Ast. Nach.* (3510) the following elliptical elements for Comet I. 1898 (Perrine, March 19):—

$$T = 1898 \text{ March } 17{\cdot}11244 \text{ Berlin M.T.}$$

$$\left.\begin{aligned} \omega &= 47^\circ\ 15'\ 4''{\cdot}0 \\ \Omega &= 262\ 24\ 37{\cdot}1 \\ i &= 72\ 32\ 45{\cdot}2 \end{aligned}\right\} 1898{\cdot}0$$

$$\log q = 0{\cdot}040842$$
$$\log e = 9{\cdot}9897755$$
$$\text{Period} = 322{\cdot}56 \text{ years.}$$

An ephemeris for Berlin midnight, computed from these elements, is also given; but seeing that the brightness is now only about one-twentieth that at the time of discovery, we give only the following abstract:—

1898.		R.A. h. m. s.		Decl. ° ′		Br.
August 26	...	6 25 22	...	+51 13·4	...	0·055
Sept. 1	...	29 22	...	51 0·9	...	0·053
,, 7	...	32 14	...	50 50·9	...	0·050
,, 13	...	33 56	...	50 43·1	...	0·048
,, 19	...	34 27	...	50 37·4	...	0·047
,, 25	...	33 39	...	50 33·5	...	0·046
Oct. 1	...	6 31 33	...	+50 30·4	...	0·044

During the above period the comet passes from the north-eastern part of Auriga into the constellation of the Lynx.

PARALLAXES AND MASSES OF γ VIRGINIS AND γ LEONIS —The mass and dimensions of a binary system can be readily calculated if the parallax as well as the apparent size of the orbit be known, but there is another possible method of arriving at the same facts without a previous knowledge of the parallax. This consists in a measurement of the relative velocities of the two components, from which, the period being known, the circumference or semi-axis major of the orbit at once follows, so that, in addition, the parallax itself can be determined in the case of telescopic binary stars. In spectroscopic binaries, where the velocities are usually very great, the spectroscopic measurement of the relative orbital velocity is easy, but it becomes a much more difficult matter in the case of slowly moving telescopic binaries. Dr. Belopolsky, however, has had the courage to attack the problem, and has applied the spectroscopic method to γ Virginis and γ Leonis (*Ast. Nach.*, 3510). The 30-inch refractor at Pulkowa, he tells us, permits the investigation of the spectra of stars down to magnitude 4·5, and enables him to separately photograph the spectra of the components of double stars which are not less than 3″ apart.

In the case of γ Virginis the mean values of the velocities of the components in the line of sight, with respect to the sun, were found to be −2·926 g.m. (13·49 Eng. miles) per sec. and −2·648 g m. (12·21 Eng. miles) per sec. respectively for the northern and southern components. It follows, then, that the velocity of the northern component with respect to the southern one is −0·278 g.m. (1·28 Eng. miles) per sec., from which the relative orbital velocity can be deduced. Following the methods of Lehman-Filhes, and adopting Doberck's elements of the orbit, which give a semi-axis major of 4″ and a period of 180 years, Dr. Belopolsky arrives at the following results for the system of γ Virginis:—

Semi-axis major ...	=	79·4 astronomical units.
Combined mass ...	=	15 sun's mass.
Parallax	=	0″·051
Velocity of system in line of sight ...	=	−2·79 g.m. (12·86 Eng. miles) per sec.

In the case of γ Leonis, where the components are 3″·2 apart, and have magnitudes of 2·0 and 3·5 respectively, the mean velocity in the line of sight of the brighter component, including the Potsdam measurements, is −5·32 g.m. (24·53 Eng. miles) per sec. with respect to the sun, while that of the companion, as measured at Pulkowa, is −5·03 g.m. (23·19 Eng. miles) per sec. The relative velocity is therefore +0·29 g.m. (1·34 Eng. miles) per sec., if the brighter component be regarded as the central body. Adopting Doberck's elements, giving the semi-axis major as 2″·0 and the period as 402·6 years, Dr. Belopolsky finds the following results:—

Semi axis major ... = 102 astronomical units.
Combined mass ... = 6·5 sun's mass.
Parallax ... ... = 0″·0197.
Velocity of system in line of sight ... = − 5·18 g.m. (23·88 Eng. miles) per sec.

The investigation is one of such delicacy that considerable uncertainty remains as to the data deduced; but the individual results appear to be sufficiently consistent to warrant the publication of the foregoing provisional values. The results are especially interesting as being the first practical outcome of a suggestion first made by Fox-Talbot in 1871, and developed mathematically by Dr. Rambaut and Dr. See (NATURE, vol. liii. p. 15).

A CATALOGUE OF FOURTH-TYPE STARS.—The Rev. T. E. Espin has recently revised his valuable catalogue of stars of the fourth type (Group VI.) which are at present known, including stars discovered at Harvard and Arequipa, and not before published (*Monthly Notices*, vol. lviii. p. 443). The following summary shows the distribution of the stars in magnitude and in the two hemispheres, the magnitudes of variable stars being entered according to their maxima:—

Mag.	N.	S.	Total.
to 6·0	3	4	7
6·1 ,, 7·0	12	11	23
7·1 ,, 8·0	19	20	39
8·1 ,, 9·0	51	25	76
Below 9·0	69	11	80
Mag. not given	1	11	12
Total ...	155	82	237

It is considered probable that our knowledge of the number of stars of this type is complete for the northern heavens as far as 8·9, and for the southern heavens as far as 8·5. The catalogue contains twenty-eight variables to which letters have been assigned, twenty-two being north and six south. "It would appear that almost all the stars of Type IV. are subject to fluctuations in brightness, though the red colour makes it not easy to decide when the variation is small."

A YORKSHIRE MOOR.[1]

II.

THE Bilberry (or Blueberry, as we ought to call it) is one of the few exceptions to the rule that moorland plants are evergreen; it casts its leaves in early winter. But the younger stems are green, and take upon themselves the function of leaves, when these are absent. Kerner has described one adaptation of the Bilberry to seasons when water is scarce. Many plants, especially those of hot and wet climates, throw off the rain-water from their tips, and so keep the roots comparatively dry; others direct the water down the branches and stem to the roots. Bilberry is one of the latter sort. The rounded leaves slope downwards towards the leaf-stalk, and from the base of every leaf-stalk starts a pair of grooves, which are sunk in the surface of the stem. A light summer shower is economised by the guiding of the drops towards the roots. Bilberry abounds on the loose and sandy tracts of the moor, and especially on its verges; it is seldom found upon a deep bed of peat.

There is a moorland plant which may be said to mimic the heaths, as a Euphorbia mimics a Cactus, or Sarracenia a Nepenthes. Similarity of habit has brought about similarity of structure. The plant I mean is the Crowberry, which is so like a true heath in its foliage and manner of growth, that even the botanists, who did not fail to remark that the flowers are altogether different, long tried to bring the Crowberry and the heaths as near together in their systems as they could. Crowberry has the long, dry, wiry stems, the small, narrow, rolled, clustered, evergreen leaves of a true heath. The leaf-margins are turned back till they almost meet, and the narrow cleft between them is obstructed by close-set hairs, so that the transpiring surface is effectually sheltered. Crowberry is a peat-loving shrub, and is often found with ling and other heaths in the heart of the moor. The berries are a favourite food of birds, which help to disseminate the species. Crowberry has an uncommonly wide distribution, not only in the Arctic and Alpine regions of the Old World, but also in the New. It abounds in Greenland, where the Eskimo use the berries as food, and extract a spirit from them. A very similar species, with red berries, occurs in the Andes.

The heaths, Bilberry, Crowberry, and many other peat-loving shrubs or trees, have a peculiar root-structure. The usual root-hairs are wanting, and in their place we find a peculiar fungus-growth, which invades the living tissues of the root, sometimes penetrating the cells. There is often a dense mycelial mantle of interwoven filaments, which covers all the finer roots. This looks like parasitism, but the fungus is apparently not a mere parasite, for the tree or shrub shows no sign of injury, but thrives all the better when the fungus is plentiful, and may refuse to grow at all if the fungus is removed. Rhododendron, Ling, most heaths, Bilberry, Crowberry, Broom, Spurge-laurel, Beech and Birch are among the plants which have a mycelial mantle.

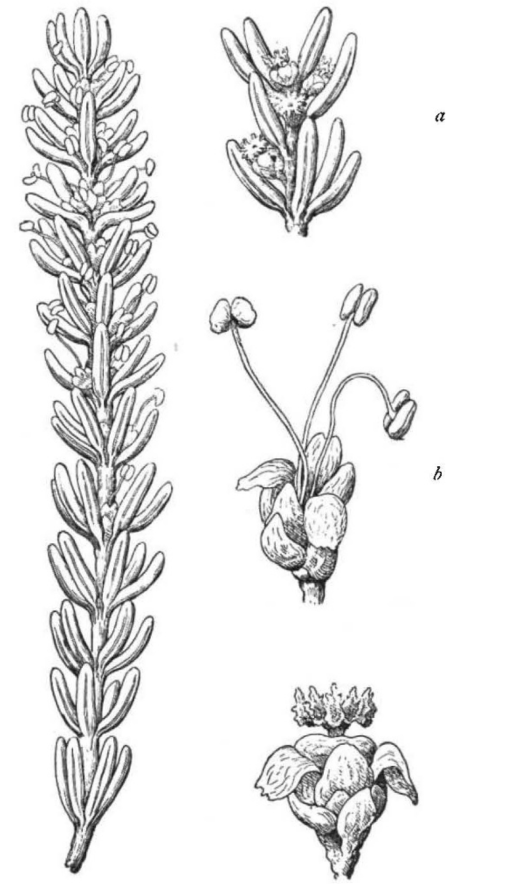

FIG. 7.—Crowberry (*Empetrum nigrum*). A staminate branch, slightly enlarged; *a*, part of a pistillate branch; *b*, one staminate flower; *c*, one pistillate flower.

If the native soil which clings to the roots of any of these is completely removed, if the fine roots with the mycelial mantle are torn off by careless transplanting, or if peaty matter is withheld, the plant dies, or struggles on with great difficulty until the mycelial mantle is renewed. Such plants cannot, as a rule, be propagated by cuttings, unless special precautions are taken. Frank maintains that the mycelial mantle is the chief means of absorption from the peaty soil, and that the tree or shrub has come to depend upon it. The known facts render this interpretation probable, but thorough investigation is still required. In some cases at least the plant can be gradually inured to the absence of a mycelial mantle. I have repeatedly planted crowberry in a soil devoid of peat. It generally succumbs, but when it survives the first year, it maintains itself and slowly spreads. Microscopic examination shows that the roots of crowberry grown without peat contain no mycelial filaments or very few.

[1] A discourse given at the Royal Institution, February 1898. By Prof. L. C. Miall, F.R.S. Continued from p. 380.