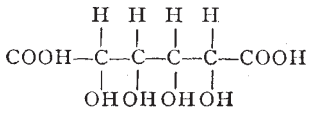
MESSRS. W. AND A. K. JOHNSTON have issued, under the authority of the Royal Agricultural Society of England, a valuable series of eight diagrams representing the life-history of the wheat plant. The diagrams are reproductions of original drawings by Francis Bauer, now in the Botanical Department of the British Museum, and are printed in colours. With each set is sent a pamphlet by William Carruthers, F.R.S., consulting botanist to the Society, entitled "The Wheat Plant: How it Feeds and Grows." This pamphlet consists of notes explanatory of the diagrams.

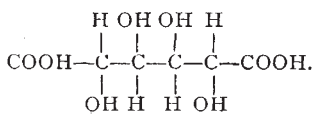
DR. L. MESCHINELLI AND DR. S. SQUINABOL announce for publication a Tertiary Flora of Italy.

FOUR lectures upon recent stellar spectroscopy and the new star in Auriga will be delivered in Gresham College, by the Rev. Edmund Ledger, at 6 p.m. on the evenings of May 10, 11, 12, and 13.

ANOTHER contribution to our knowledge of the sugars and their related compounds is published by Prof. Emil Fischer in the current number of the *Berichte*. It relates to the constitution of the group of substances at the head of which stands dulcitol, $CH_2OH—(CHOH)_4—CH_2OH$, the hexahydric alcohol obtained from Madagascar manna, and prepared artificially by the reduction of milk sugar. It has already been established that the aldehyde corresponding to dulcitol is galactose, $CH_2OH—(CHOH)_4—COH$, the glucose obtained from many gums, and which is formed when milk sugar is boiled with dilute acids. Moreover, it has long been known that, when either dulcitol or galactose are oxidized by means of nitric acid, a dibasic acid of the composition $COOH—(CHOH)_4—(COOH)$ is produced. This acid, although expressed by the same formula as saccharic acid, the acid obtained by the oxidation of common cane-sugar, differs considerably in properties from that acid, and has been termed mucic acid. It is now known to be a geometrical isomer of saccharic acid—that is to say, the two compounds only differ with regard to the relative positions of the atoms comprising their molecules. Saccharic acid, as obtained from cane-sugar, is probably unsymmetrically built up, for its solution rotates the plane of polarization of light to the left. The main result of the work now described has been to show that the molecules of mucic acid are, on the contrary, symmetrically constructed, and that its observed optical inactivity is due to this fact. Theoretical considerations, based upon the postulates of the Van 't Hoff-Wislicenus hypothesis concerning the arrangement of carbon, hydrogen, and oxygen atoms in space, lead to the view that, of the ten possible geometrically-isomeric dibasic acids of the constitution $(CHOH)_4$ $(COOH)_2$, two must be optically inactive. These two optically inactive isomers would be represented respectively by the formulæ



and



One of these two was presumably mucic acid. It was evident that if the molecules possessed a configuration similar to that roughly indicated in one plane by either of the above formulæ, upon reduction to a monobasic acid there would be an equal number of chances of each of the two end carboxyl groups being attacked by the reducing agent and converted to CH_2OH groups. Consequently it was to be expected that equal quantities of two geometrically isomeric monobasic acids would be obtained, one dextro- and the other lævo-rotatory. Such has, indeed, been found by Prof. Fischer to be the case; for, upon reducing either the ethyl ester or the lactone of mucic acid (the acid itself being unattacked) by means of sodium amalgam, an optically inactive acid of the constitution $CH_2OH—(CHOH)_4—COOH$ was obtained, which formed a salt with strychnine yielding two distinct kinds of crystals, resembling the well-known complementary racemates of Pasteur. From these two kinds of crystals solutions of the free acids were obtained, which were respectively dextro- and lævo-rotatory, and each was again converted into mucic acid upon oxidation. One of these, the right-handed variety, was identical with the common galactonic acid prepared by oxidation of galactose. Moreover, by further reduction of the inactive acid, an inactive glucose was obtained, from which eventually common dextro- and also lævo-galactose were isolated by fermentation; and finally, by still further reduction of the galactose, dulcitol itself was obtained. Hence, the symmetrical structure of the dulcitol group may be considered as proved, and the work also completes the artificial synthesis of these compounds; for, given the synthesis of any one by the method previously described by Prof. Fischer, any of the others may be prepared from it by the processes now described.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus*) from India, presented by Miss Beatrice Raymond; a Wild Swine (*Sus scrofa* ♀) from Tangiers, presented by Mr. E. H. Banfather; a Great Kangaroo (*Macropus giganteus*) from Australia, presented by Mrs. Frazer; a Purple Heron (*Ardea purpurea*), European, presented by Captain Woodward; a Bateleur Eagle (*Helotarsus ecaudatus*), a Tawny Eagle (*Aquila nævioides*) from Africa, presented by Captain Webster; a Raven (*Corvus corax*), European, presented by Mr. F. J. Stokes; seven Common Vipers (*Vipera berus*), British, presented by Mr. T. A. Cotton, F.Z.S.; a Rufous-necked Weaver Bird (*Hyphantornis textor*) from West Africa, purchased; an English Wild Bull (*Bos taurus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

SUN-SPOTS.—In the March number of the *Memorie della Società degli Spettroscopisti Italiani*, there are some interesting notes relating to spots and prominences. Prof. Tacchini gives a tabulated statement of the solar observations made at the Royal Observatory for the last three months of the year 1891. The most frequent records of faculæ occurred in the zones $\pm 10° \pm 30°$, only one being seen as high as the zone $+40° + 50°$. As regards the spots, the greatest frequency of groups took place in the zones $\pm 10° \pm 20°$, 23 and 10 being observed in the north and south respectively.

Profs. A. Mascari and J. Fenyi both contribute some notes on the large group of spots visible in February last, the latter pointing out that the relation of the eruption to the large group was such that its centre was situated very near the side of the great nucleus of the south spot, but was entirely outside the spot itself.

M. H. Deslandres records also his observations with respect to the remarkable protuberance visible on March 3 at about 10 a.m. From spectroscopic observations he obtained a radial velocity of 200 kilometres per second, using the hydrogen and helium lines. He also obtained a photograph of the invisible ultra-violet region, which furnished him with "an exact image" of this protuberance. The H and K lines were extraordinarily brilliant, and the negative contained the entire series of ultra-violet rays of hydrogen. It may be mentioned that at the appearance of this large protuberance no special indication was registered on the curves of the magnetic instruments which M. Deslandres obtained from M. Wolf.

Prof. Tacchini communicated to the Paris Academy on April 25 the results of solar observations made at the Roman College during the first three months of this year. Spots and

faculæ were observed on 56 days, viz. 19 in January, 19 in February, and 18 in March. The results are shown below :—

1892,	Relative frequency of spots.	Relative frequency of days without spots.	Relative magnitude of spots.	Relative magnitude of faculæ.
January ...	19·63	0·00	79·79	56·58
February ...	23·31	0·00	153·61	60·28
March ...	13·12	0·00	61·67	86·39

The following are the results for prominences :—

1892.	Days of observation.	Mean number.	Mean height.	Mean extension.
			"	°
January	13	6·39	39·6	1·6
February	13	7·00	36·0	1·6
March...	14	8·14	36·4	2·3

The frequency and magnitude of spots during these months are much greater than during the preceding quarter, but prominences do not show a marked increase. No augmentation of this class of phenomena appears to have accompanied the great spot of February, if the mean numbers for the month be taken.

ECLIPSE OF THE MOON, MAY 11.—A partial eclipse of the moon will occur on May 11, and, if weather permits, it should be widely observed. The magnitude of the eclipse is 0·953, the moon's diameter being represented by 1. But although it is not total, important naked-eye observations can be made on the darkness of the shadowed moon for comparison with previous eclipses, and possessors of telescopes will doubtless take advantage of the occasion to obtain some new facts. The following times are from the "Nautical Almanac" :—

	G.M.T. h. m.
First contact with the penumbra, May 11	7 55·9
,, ,, ,, shadow ,,	9 10·2
Middle of the eclipse ,,	10 53·4
Last contact with the shadow ,,	12 36·6
,, ,, ,, penumbra ,,	13 50·9

The first contact with the shadow occurs at 82° from the most northern point of the moon's limb, counting towards the east ; the last contact at 41° from the same point, counting towards the west.

SPECTRUM OF SWIFT'S COMET (*a* 1892).—Mr. W. W. Campbell observed the spectrum of Swift's comet on April 6, by means of a spectroscope having one prism of 60° attached to the 36-inch of the Lick Observatory (*Astronomical Journal*, No. 262). The spectrum could be distinguished from about C to G. Three bright bands had the wave-lengths of their less refrangible edges determined as 5630, 5170·4, and 4723, by comparison with spark-spectra of iron and magnesium. The intensities of the bands were estimated to be in the ratio 1 : 6 : 2.

COMET SWIFT, 1892. — *Astronomische Nachrichten*, No. 3087, contains the following ephemeris of Swift's comet :—

For 12h. Berlin Mean Time.

1892.	R.A. h. m. s.	Decl. ° ′	log *r*.	log Δ.	B.
May 5	22 45 25	+23 41·7			
,, 6	22 48 19	24 21·5			
,, 7	22 51 12	25 0·5	0·0608	0·1115	0·70
,, 8	22 54 3	25 38·7			
,, 9	22 56 53	26 16·2			
,, 10	22 59 41	26 52·9			
,, 11	23 2 28	27 28·9	0·0723	0·1236	0·62

The brightness on March 10 is taken as unity.

On the 5th the comet will be found to form very nearly an equilateral triangle with the stars λ and μ in Pegasus, while on the 11th it will be near β in the same constellation.

COMET SWIFT, 1892.—The spectrum of this comet has been observed by Prof. Konkoly, who contributes his observations to the *Astronomische Nachrichten*, No. 3087. The spectrum on April 1 appeared very bright, and showed five bright lines whose intensities were as follows :—I. = 0·4 ; II. = 0·3 ; III. = 1·0 ; IV. = 0·2 ; V. = 0·1, the continuous spectrum extending from λ = 580 to λ = 440.

The following measures are the means of five direct scale readings of the above-mentioned lines :—

I. = 558·82 μμ
II. = 544·94
III. = 516·30
IV. = 472·54
V. = 468·78

Similar observations were also repeated the next night, only by means of a larger telescope and spectroscope. The continuous spectrum was found to extend from λ = 559 μμ to λ = 449 μμ. The intensities were I. = 0·5 ; II. = 0·3 ; III. = 1·0 ; IV. = 0·2 ; V. = 0·1.

The mean values of the five measures obtained for each line were :—

I. = 558·40 μμ
II. = 543·82
III. = 516·26
IV. = 472·70
V. = 468·10

NOVA AURIGÆ.—*Astronomische Nachrichten*, No. 3083, contains some measurements and remarks by Prof. Konkoly relative to the spectrum of this Nova. Five lines were, according to him, very satisfactorily measured on March 20, and the means of six measures for each were as follows :—

I. = 531·80 μμ
II. = 516·50
III. = 501·95
IV. = 492·30
V. = 486·15

Using a 10-inch objective prism on the 21st, he found that II. was the brightest line, III. being somewhat feebler ; I. was very weak, while IV. was not bright, but broad ; V., again, seemed quite visible. With regard to the dark lines, he was only able to suspect them in the region of C and F (especially the latter), owing to their feebleness. The hydrogen lines on the 21st appeared feebler than those in γ Cassiopeiæ.

A NEW VARIABLE.—A circular (No. 32) that we have received from the Wolsingham Observatory contains the following :—

The star D.M. + 55° 1870—

16h. 39m. 49s. ; +55° 12′ ; 9·2

was found 7·3 ; 7·7, April 26 ; 29. Variable. Spectrum like Mira.

T. E. ESPIN.

THE TEMPERATURE OF THE BRAIN.

THE Croonian Lecture was delivered this year by Prof. Angelo Mosso, Professor of Physiology in the University of Turin. His subject was the temperature of the brain, especially in relation to psychical activity. Prof. Mosso's earlier investigations on the human brain only related to the blood circulation.[1] He then found that the blood pressure rises during psychical work, and that during such more blood is sent from the peripheral parts of the body. Prof. Mosso also found that the blood circulation in the brain showed fluctuations which are not dependent on psychical activity. These and other variations in the brain circulation led him to suspect that Dr. Schiff's theory about brain temperature as introduced into physiology required revision. In a published work on fatigue,[2] Prof. Mosso gave his views on the influence of psychical work on the organism, especially on the muscular force. We do not yet know what form of phenomena subserves the first condition of thought. Fatigue caused by psychical activity acts as a poison, which affects all organs, but especially the muscular system. This is clearly demonstrated by Prof. Mosso's investigations on men who have been subjected to great mental strain. The blood of dogs, fatigued by long racing, acts as a poison, and when injected into other dogs they exhibit all the symptoms of fatigue. The characteristic phenomena of fatigue depend more on nerve-cell products than on a deficiency of suitable material.

During investigation into the physical conditions during psychical activity, Prof. Mosso's attention was directed to the subject of the temperature of the brain. To avoid errors arising from blood changes he endeavoured to keep the blood temperature and that of the organs in agreement with that of the brain. For such a purpose he found that the thermo-electric pile which Dr. Schiff employed would not suffice, and he had

[1] "Kreislauf des Blutes in menschlichen gehirne," Leipzig, 1881.
[2] "Die Ermudung," Leipzig, 1892.