My own early experience suggested a solution. Might I not deliver some well advertised public scientific lectures of a sufficiently light and sensational character to captivate the intellect by the natural bait of wonderment? If so, the systematic classes might be fed by their means.

My first idea was, considering the poverty of the Institute at that time, to charge twopence or threepence for admission to such lectures, but on communicating my scheme to Mr. Arthur Ryland, the Vice-President of the Institute, he improved it materially by suggesting that the charge for such lectures should be one penny, and that they should be called "Penny Lectures."

The Council assented to this, and on Jan. 22, 1856, I commenced the first course of Twelve Penny Lectures in the Lecture Theatre, Cannon Street.

The lecture theatre was crowded throughout the course, which served its intended purpose of supplying an outline of the grasp of Physical Science. This course was followed by others. I continued them every Tuesday evening during above nine months of each year until July 1863, when I left Birmingham. They were always well attended but with some degree of fluctuation. The smallest attendance was during a course on the Birmingham manufactures, and the best attendance when subjects connected with combustion, electricity, or my own travelling experiences were treated and well illustrated.

I do not at all presume to describe these lectures as nearly equal to the Manchester lectures that have been lately delivered. They were necessarily extemporised, as may be supposed from the fact that, with the exception of an occasional volunteer (four or five lectures per annum), I delivered them all myself, and at the same time conducted the Lectures on Chemistry, Experimental Physics, Junior and Ladies' Classes, and the Practical Analytical Class in the Laboratory, besides being compelled to supplement my very small salary by writing newspaper articles.

I mention this to show how much may be done by small means. The Institute was so poor at its beginning that I was obliged to fit the lectures to the small stock of apparatus we possessed, and lecture on whatever subjects I could best illustrate. The average outlay upon illustrating these early lectures did not exceed three or four shillings each.

Nevertheless their object was fulfilled. The Penny Lectures fed the Science Classes, which without such aliment would have been starved and extinguished in their infancy. Their success led to the establishment of the "Penny Readings" of the Midland Institute in 1857 or 1858, which were, I believe, the first of these entertainments that have since become so popular and so much degenerated. These again were followed by the Penny Arithmetic Classes and the other Penny Classes which have since formed one of the leading and most important features of good work done and doing in Birmingham.

The egotism of the above narrative will possibly be pardoned, seeing that the experiences of the early struggles of the Science Classes of the Midland Institute have been so often repeated where similar efforts have been made, and are likely to be continued so long as the prevailing inefficiency or total absence of scientific instruction in our primary schools remains. The success of these Penny Lectures, in spite of all their shortcomings, in creating a demand for more thorough instruction indicates an available means of rendering science classes successful in other places. My advice to all concerned in the promotion of such classes is that they should make no compromise in reference to the classes themselves, by attempting to bring *in them* the subjects down to the level of present requirements of the majority, but that instead of this, they should, by means of very popular, attractive, aye, even sensational public penny lectures, excite curiosity, and create an interest in science among those they desire ultimately to teach.

Being now in the confessional I may as well admit that I practised several small illegitimate devices to keep my audiences together, one especially copied from the young lady who occupied "the thousand and one nights," that of leading the subject up to some amusing experiment just at the end of the lecture, and then discovering that it was time to conclude, and therefore that the experiment must be shown next Tuesday. The small boys who occupied the front seats and applauded all the explosions soon found me out, but they came next week nevertheless, and some of these who at first were blue-fire pupils only, ultimately joined the classes and became satisfactory students. Therefore the Penny Lecturer should not be too rigidly regardful of his own scientific dignity, but Barnumise to some extent, when he can thereby advance towards the high object he seeks to attain.

"Should this meet the eye" of any disconsolate projector and manager of a failing Mechanics' Institution or similar effort, let him try Penny Lectures forthwith, not musical or dramatic lectures, but lectures on the most wonderful of natural phenomena, including as much scientific explanation as the audience can digest, and at the same time let him prepare to supply the solid class instruction for which such lectures should ultimately create a demand.

W. MATTIEU WILLIAMS

Belmont, Twickenham

Proposed Optical Barometer

I WAS led the other day to consider the possible effect of changes of barometric pressure on the ultimate destination of light passing through lighthouse refracting agents, and although I was satisfied that such changes cannot produce any effects of practical importance, the idea occurred to me that a glass prism might be used as a barometer. When a refracting prism is successively immersed in media of different refractive indices the ultimate angular deviation of the ray will, as is well known, depend in each case on the relative indices of the glass and the medium surrounding it at the time of the experiment. And as the refractive index of atmospheric air varies with its density, the amount of deviation of the refracted ray will be a measure of the density of the air, *i.e.* will give the means of ascertaining the reading of the barometer at the time.

If the ray of light were made to pass through a number of refracting and totally reflecting prisms the deviation would be increased. If with these prisms a microscope were combined the prisms might be used as a barometer. Or if the ray be received obliquely on a number of pieces of glass having parallel faces and slightly separated from each other, although there would be no angular deviation there would be horizontal displacement which would admit of being measured by a micrometer. How far such an application would be of practical value is certainly doubtful, as the effects of changes of temperature on the prism itself might interfere with the very limited range of the instrument. Or again, it is possible that easterly, westerly, or other currents—or perhaps differences in the hygrometric state of the atmosphere—may affect the index of refraction otherwise than by the mere changes of density which they produce. But if such be the case, the refracting prism will be useful in determining the existence and amount of such variations in the refrangibility of the atmosphere.

Edinburgh, Dec. 13

THOMAS STEVENSON

Seasonal Colour in Flowers

THE "blue of the wild hyacinth" (see vol. xiii. p. 129) is anticipated by the yellow of the primrose, the daffodil, the marsh marigold, the coltsfoot, the lesser celandine (*Ranunculus Ficaria*), and especially the winter aconite. We may add as contemporaries the buttercup, the yellow deadnettle, and the cowslip. The furze blooms in autumn and winter, and the golden broom in spring; the dandelion and the groundsel flower during the greater part of the year. The "deep scarlet of our summer flowers," represented in Britain by the poppies and the pimpernel only, is accompanied by the no less vivid blue of the cornflower, the wild chicory, the viper's bugloss (*Echium*), whose blossoms change from red to blue as they approach maturity, the flax, and the various campanulas. I say nothing of white flowers; but it is worth notice that the hepatica, bugle (*Ajuga*), and milkwort (*Polygala*), vary to almost precisely the same shades of blue, white, and pink, at quite different seasons.

R. A. PRYOR

Hatfield, Dec. 17

Glands of the Cherry Laurel

THE nectariferous glands on the back of the leaf of the cherry laurel (vol. xiii. p. 107) are present also, I believe, in all the Drupaceæ. The position is not in all cases the same; but when the glands are not found on the back of the leaf, they may be seen on the petiole. Ants may often be found drinking this leaf-honey; and I heard, two or three years ago, that the same attraction had brought many hive-bees to the laurels in a garden at Sidmouth.

E. H.

OUR ASTRONOMICAL COLUMN

VARIABLE STARS.—Nos. 2065-67 of the "Astronomische Nachrichten" contain another of Prof. Schönfeld's

important contributions to our knowledge of the variable stars, the eighth of a series commenced in No. 1628, ten years since. The observations discussed in the last communication were chiefly made in 1874, but there are also observations of several objects to the middle of the present year. In the comparisons of the observed epochs of maxima and minima with those calculated, the elements in Schönfeld's second Catalogue (Manheim, 1875), which should be in the hands of every observer of variable stars, have been employed, while in a few cases new elements are given.

Mira Ceti was at minimum 1874, Nov. 20 (mag. 8·6), and at maximum 1875, March 4 (mag. 2·5), the latter being about eight days later than is deduced from Argelander's formula of sines.—T Tauri, the star adjoining the variable nebula in Taurus (Hind, 1852), has exhibited irregular fluctuations between the years 1868 and 1875; previous to 1868 it had occasionally been as bright as 9·5, but according to Schönfeld's observations since that year, it has not been higher than 10·3, while at a maximum, 1871 Nov. 25, it was only 12·0, and at another very certain one, 1874 Feb. 10, it was 11·7. Schönfeld states that the nebula of 1852 was invisible in the Manheim refractor (6·5 inches aperture) during the whole period 1868-75, while the small nebula detected by Mr. Otto Struve immediately preceding this was only occasionally glimpsed. This spot requires to be closely watched with large instruments.—U Geminorum was satisfactorily observed at a maximum, 1874 Feb. 4·4 (mag. 9·6), 111 days after the preceding one; another maximum may be expected at the beginning of January next, or possibly in the last days of the present month; since the discovery of this star in 1855, it has shown variation of period between about 70 and 150 days.

R Crateris, the star following *a*, which Sir John Herschel describes (Cape Obs., p. 448) as of "a most intense and curious colour," and "scarlet, almost blood colour," has exhibited during the last ten years a slight variation estimated from 8·2 to 8·9 mag., but the observations have not afforded any epoch to assist in determination of elements.—S Virginis has been twice observed by Schönfeld at minimum viz., 1874, April 20 (mag. 12·5), and 1875, April 26 (mag. 12·4), which he believes are the first minima yet secured; at certain maxima this star becomes distinctly visible without the telescope (mag. 5·7).—χ Cygni attained a maximum 1874, Nov. 9, mag. 4·7, or about midway between ϕ and η Cygni; this epoch is upwards of two months later than the date assigned by Argelander's formula in the Bonn Observations, vol. vii., but the extreme difference between the formula and observation appears to have occurred in 1870, when it exceeded three months; the star must be near a maximum at the present time.—R Vulpeculæ: the further observations support the addition of the term depending on E^2 introduced in Schönfeld's last catalogue; he remarks that a uniform period would involve differences from the observed epochs amounting to twenty-two days, while these epochs are uncertain to three days at the most.—S Pegasi. This star, detected by Mr. Marth at Malta, 1864, Nov. 24, when its magnitude was 8·3, was at maximum 1874, July 8 (mag. 7.3): it must not be confounded with the star which first appeared upon our list of variables as S Pegasi, the insertion of which probably arose from an error of observation. The position of the variable for 1876·0 is in R.A., 23h. 13m. 46s; N.P.D., 81° 48′·8.

The following are Greenwich times of geocentric minima of Algol according to the third elements of Schönfeld (Der Lichtwandel des Sterns Algol in Perseus. Manheim, 1870).

		d.	h.	m.			d.	h.	m.
1875.	Dec.	24	15	7	1876.	Jan.	2	5	35
,,	,,	27	11	57	,,	,,	16	13	41
,,	,,	30	8	46	,,	,,	19	10	30
					,,	,,	22	7	20

The next maximum of Mira Ceti may be expected about January 17.

THE MINOR PLANETS.—M. Bossert has calculated elements of the small planet discovered by M. Paul Henry at Paris, Nov. 2, from which it appears the planet is not identical with No. 98, Dike, as surmised by Prof. Tietjen, and the actual number in this group, therefore, stands at 157. The best orbit of Dike is that of MM. Lœwy and Tisserand (*Comptes Rendus*, 1872, Feb. 19), and is subjoined with M. Bossert's for No. 152, for the sake of comparison.

	No. 98, Dike.	No. 152.
	° ′ ″	° ′ ″
Longitude of perihelion	240 35 34	... 80 0 3
Ascending node	41 43 42	... 41 28 49
Inclination	13 53 18	... 12 10 13
Angle of excentricity	13 47 30	... 4 42 59
Log. semi-axis major	0·446639	... 0·49582
Long. from equinox of	1868·0	... 1875·0

Circular No. 37, issued by Prof. Tietjen, contains ephemerides of Sylvia, Austria, No. 148 with elements from two months' observations, No. 150, No. 151 from elements founded on three weeks' observations, No. 152, No. 153, and No. 156: a circular orbit of the latter places the ascending node in 253° 52′, with an inclination of 4° 42′.

COGGIA'S COMET, 1874.—Dr. Schmidt, Director of the Observatory at Athens, publishes the first portion of the results of his observations on the appearance of the great comet of 1874, between May 3 and July 23, when he believes to have glimpsed the tail for the last time. The observations refer to the brightness of the nucleus as viewed in the telescope, and of the head of the comet seen with the naked eye, the apparent length of the tail, and semi-diameter of the coma; the measures are not reduced to actual values, in the absence of a complete ephemeris from good elements. On June 9 and subsequently the nucleus was always remarked to be yellow, and the mean of its apparent diameters, given by Dr. Schmidt, would be, for the earth's mean distance, about 0″·65, or 290 miles, as we find by taking the distance of the comet from the earth, deduced from one of the best parabolic orbits.

HUMAN ANATOMY AS A PART OF THE BIOLOGICAL CURRICULUM

WE would draw the attention of our readers to the following "minute" from Cambridge, dated Dec. 2:—

"The Board of Natural Sciences Studies report that the study of human anatomy in the University is at a disadvantage in consequence of its not occupying a more prominent and definite position in the Natural Sciences Tripos. It is found from experience that medical students who are candidates for the Natural Sciences Tripos relinquish the study of human anatomy until after the examination for the Tripos, and many are therefore deterred from making the attempt to obtain a degree with honours. Further, the more distinct recognition of human anatomy in the examination for the Tripos cannot fail to elevate the character of the teaching and study of it in the University as a branch of science, especially as it is contemplated by the Board that the subject of human anatomy shall include the mechanism of the human body, the comparison of its parts with those of lower animals, its development, &c. In proposing this addition to the subjects of the Natural Sciences Tripos it is not intended to add to the number of subjects with which students are expected to be acquainted; but the subjects represented in the examination are now so numerous and extensive that they have become practically, to a large extent, alternative, and the additional subject would, it is thought, prove attractive to a large number of students. The addition would also help to maintain the connection between the schools of Natural Science and Medicine.