LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

Astronomy in the University of London.

It seems desirable to call special attention to the change which has recently been made in the conditions with regard to astronomy for the B.Sc. Pass and Honours degrees of the University of London. This is the more important as, owing to an unfortunate slip of the much-overworked academic Registrar, the point was omitted from the published examination schedules, and has only been corrected by an attached slip in recent issues.

The point is this, that in future astronomy is to be counted as an independent subject for the B.Sc. degree. It will rank equally with geology, botany or zoology. It is true that the Faculty of Arts has retained a certain amount of astronomy in its mathematical syllabus—in my opinion a very poor syllabus—which represents, not modern astronomy, but the condition of affairs in “three day papers” at Cambridge fifty years ago, when the University of London was founded. Why the Faculty of Arts does not insist also on a little antiquated geology and a little pre-Darwinian biology is cause for wonder. At any rate, the Faculty of Science has recognised that astronomy is a suitable subject for graduation, and we may hope that students of astronomical physics and theoretical and observational astronomy will realise that they can now specialise in London before graduating. A Pass student will be able to graduate by studying mathematics, physics and astronomy, and an Honours student by taking astronomy and either mathematics or physics. We may hope that a school of astronomy will form itself in London free from the traditions of the Cambridge Mathematical Tripos, and recognising mathematics for the astronomer as ancillary only to observational and physical work. KARL PEARSON.

University College, London, June 15.

De Vriesian Species.

THE recent work of Prof. H. de Vries on the origin of species by mutation has attracted a great deal of attention, although it cannot be said that the facts he presents are of a new kind, or that, taken by themselves, they prove anything about the origin of species. The great merit of the work is to be found in its clear presentation of the subject, with carefully worked out examples, at an opportune time. In former years botanists were not so ready as they are to-day to recognise apparently minor characters as specific, and the great variety of slightly modified plant forms passed almost unnoticed. It was not considered worth while to investigate the polymorphism of the old specific aggregates, and men like Jordan, who did so, were not regarded altogether favourably. The old conception of species seemed to give us a superabundance of plant types, taking the world over; and many botanists thought, as one recently said to me, that it was impossible to catalogue and name the minor forms, because they were infinitely numerous. However, there has arisen a new school, especially dominant in America, which recognises the fact that many of the old specific names cover a number of types which are readily distinguishable from one another. These may intergrade, but in many cases they do not seem to do so, and though the distinctions may seem small, they are perfectly constant. The result of the new investigations is in many cases to increase the number of recognised species four-fold, ten-fold, or more. Now when one comes to study these numerous species, it is evident that much of the difference is not absolute, but consists in different combinations of the same or similar characters, like the patterns of a kaleidoscope. With a little ingenuity, one could almost predict the characters of undiscovered forms. Heredity seems every now and then to take a new throw of the dice, with results exactly such as de Vries has described. The successful throws are those which give results adapted to the environment, and these, under the laws governing the survival of the fittest, give us what we proceed to describe as new species.

The proof that species do thus originate is not to be found in garden experiments alone, but must be confirmed by field observations. Unfortunately, the average systematic botanist seems to be much more interested in defending his “new species” than in asking whether they may not be “new” in a more literal sense than he imagines. Nevertheless, search will be made for

“de Vriesian species,” and thereby the true status of many described plants may be revealed. Two instances of such which have lately come to my notice may be worth recording.

(1) *Helianthus petiolaris phenax* (new variety). Rays 13, mustard yellow, 11 mm. diameter; corollas and stigmas yellow, giving the flower a yellow disc. Found at Boulder, Colorado, August, 1901, growing in a field full of normal *H. petiolaris*, with deep saffron-yellow rays about 8 mm. diameter, and corolla and stigmas a very dark wine red. I took both plants to the meeting of the American Association for the Advancement of Science at Denver, and showed them to an eminent botanist who knows the flora of Colorado well, and is not regarded as a “splitter.” I said, “these appear to be forms of one species.” “Oh, no,” he replied, “one is a *Helianthus*, the other a *Rudbeckia*!” However, the flowers were carefully examined in company with Prof. Pammel, and were also shown to Miss Eastwood, and no doubt remained that the new variety was really an offshoot from *H. petiolaris*, which had probably originated where it was found. The variation is the more interesting because in the sunflowers (*Helianthus*) the colour of the disc is used as a character to separate groups of species.

(2) *Ribes cereum viridior* (new variety). Plant perhaps more resinous; tube of calyx shorter, pale greenish, stigma exerted beyond petals. Fruit deep red, small, perfectly spherical. Found (first by my wife) between San Ignacio and Las Vegas, New Mexico. A clump of bushes presenting these characters (observed in two seasons) grows only a few yards away from plenty of what Mr. Coville considers genuine *R. cereum*, with a longer calyx-tube, streaked with purplish pink, and fruit a little larger and more inclined to be oblong. I was at first quite sure I had a valid species in this *viridior* variety, and Mr. Coville, before we got the fruit, thought the specimens might be his *R. mesacalerium*, which has black fruit. Now, however, it appears reasonably certain that the plant represents a de Vriesian “species” or mutation. Miss Eastwood has lately described a somewhat similar mutation of a Californian species, under the name *Ribes sericeum viridescens*. T. D. A. COCKERELL.

East Las Vegas, New Mexico, U.S.A., May 22.

Formula for the Perimeter of an Ellipse.

THE formula given by your Queensland correspondent (NATURE of April 10, p. 536) for the perimeter of an ellipse is not at all objectionable on the score of degree of approximation. It leads, however, to another, which for practical purposes is much preferable. If for shortness' sake λ be written for $\log 2 / \log \frac{1}{2}\pi$, he says in effect that the perimeter of an ellipse with semi-axes a and b is approximately equal to the circumference of a circle of radius

$$\left(\frac{a^\lambda + b^\lambda}{2}\right)^{\frac{1}{\lambda}}.$$

Now $\lambda = .3010300 / .1961199$, two convergents to which are $3/2$ and $20/13$. Taking the former of these—a course which entails the extraction of no roots other than the square and the cube—we obtain the following result:—The perimeter of an ellipse is approximately equal to the circumference of a circle the radius of which is the semi-cubic mean of the semi-axes of the ellipse (see *Messenger of Math.*, xii. pp. 149-151; *Proc. Manchester Lit. and Phil. Soc.*, February 1, 1901).

But by far the best result of this kind known to me may be put in the shape of a rule as follows:—To obtain the radius of a circle the circumference of which will be a close approximation to the perimeter of a given ellipse, diminish twenty-one times the arithmetic mean of the semi-axes of the ellipse by twice the geometric mean and thrice the harmonic mean and divide the remainder by 16. As an illustration of the value of this, we may take the classical example where $a=1$ and $b=.8$. The three means A, G, H, referred to in the rule are then .9, $\sqrt{.8}$, $8/9$ and

$$\begin{aligned} \frac{21A - 2G - 3H}{16} &= \frac{18.9 - \frac{4}{3}\sqrt{5} - 2\frac{8}{9}}{16} \\ &= \frac{18.9 - (1.7888544 - 2.6666666)}{16} \\ &= \frac{18.9 - 4.4555210}{16} \\ &= \frac{14.4444790}{16} \\ &= .90277993 \dots \end{aligned}$$