remaining constant) is a logarithmic function was plainly indicated in the last paragraph but one in my second paper in NATURE, p. 277. In my paper in the *American Journal of Science*, Feb. 1875, p. 130, a formula was given at the close of the paper, p. 137, which is equivalent to Hinrich's formula (1), calling τ the time of exhaustion (or number of lifts), and s the strength of the muscle obtained with a dynamometer, and

$$\tau = \alpha (s - \beta)^v \qquad (2)$$

where α and β are constants. If the dynamometer gave the real strength in kilograms, β would equal w. In the series published in NATURE, s was obtained in another way, there described, and β was zero (nearly); v is a function of the weight. So that Hinrichs' formula does not seem to differ essentially from (2). In giving this formula, I stated expressly that I did not wish to discuss this equation at present, as the constants had not been determined with satisfactory precision. I take this occasion to repeat that statement.

Another point to which it may be well to call attention is, that in exhausting the arm with heavy weights very little pain is felt. With light weights, however, the pain is very great.

Our knowledge of this whole subject is yet so fragmentary, and the subject itself is so complex, that we can only hope to represent our knowledge by empirical formulæ. The best service is to be rendered in the direction of careful experiment. I shall therefore devote a few years to the work outlined in my paper in the *American Journal of Science*.

Washington University, F. E. NIPHER
St. Louis, Mo., April 28

Physiological Effects of Tobacco Smoke

Is Dr. Krause (NATURE, vol. xi. p. 456, vol. xii. p. 14) acquainted with the manner in which cascarilla bark modifies the physiological effects of tobacco smoking? The addition of a few very small fragments of the bark can hardly be supposed to materially affect the amount of carbonic oxide produced; and yet, with such an admixture, the strongest tobacco may be smoked by a tyro without, in most cases, the production of the usual nauseating effects. Loss of appetite, thirst, vascular and nervous depression are sometimes produced if such a mixture is smoked in excess. On the other hand, if Dr. Krause's theory, that the nausea, &c., of tobacco smoking is due to the carbonic oxide inhaled, be admitted, the question is suggested whether some of the volatile products of burnt cascarilla bark are antagonistic in their physiological action to the gas in question? C. E. S.

OUR ASTRONOMICAL COLUMN

NEW VARIABLE STAR (?).—Mr. J. E. Gore, of Umballa, writes with reference to a star of about the 6th magnitude noticed on the 13th of January about 1° north, following θ Leporis, and not having found it in Harding's Atlas or in Lalande, or the B. A. C., he supposed it might be a new star. "It is of a reddish colour, and is in the same low-power field with, and about 25′ north of (a little preceding) the 7m. star Lalande 11778 . . . It is closely followed by two small stars which formed with it a curved line." From this description the star is evidently VI. 58 of Weisse's first Catalogue, observed by Bessel early in 1825, and estimated 6·7 magnitude, the small stars preceding it being Nos. 68 and 78 of the same hour. It is not found in D'Agelet, Lamont, or in any other catalogue we have examined, of previous date to that accompanying Heis's Atlas, where it is entered 6·7, but erroneously identified with VI. 78 of Weisse's second Catalogue, instead of VI. 58 of his first. (The large number of similar errors in Heis's references is a serious defect in a work otherwise of so much value.) Mr. Gore mentions that he had not remarked, up to the middle of April, any variation in the star's light, but it evidently requires further examination, and may yet appear on our rapidly extending list of variables.

THE BINARY STAR ζ HERCULIS.—If good measures of this star are obtained during the present season, we may expect to know the elements of the orbit with considerable precision. Dunér's results, founded upon measures 1826–69, will be the best so far published, but he did not regard them as definitive; they will no doubt be very useful in any further investigation, and for this reason are here subjoined:—

Peri-astron passage 1864·23

Node	45° 56′	Excentricity ...	0·42394
Node to peri-astron on orbit ...	250 50	Semi-axis ...	1″·223
Inclination ...	34 52	Period	34·221 yrs.

PETERS' ELLIPTIC COMET 1846 (VI.).—This comet, which was detected at Naples on the 26th of June, 1846, by Dr. Peters, now Director of the Observatory at Clinton, New York, was calculated by Prof. D'Arrest, and in a more complete form by the discoverer himself, who, in a memoir published in the Transactions of the Naples Academy in 1847, found the time of revolution 12·85 years, but with an uncertainty of ± 1·61 years; in a subsequent communication to Brünnow's *Astronomical Notices*, he gave elements for 1859, including the effect of perturbations of the planet Saturn, which, however, he shows to be liable to very considerable doubt, on account of the observations in 1846 being insufficient to fix the mean motion at perihelion in that year within narrow limits. It is to be remarked that in 1846 the comet appeared under nearly the most favourable circumstances possible for observation, and at the time of discovery the comet was distant from the earth less than 0·6 of our mean distance from the sun, yet Dr. Peters found it very small and faint, and unless the perihelion passage should happen to fall about the same time of the year as in 1846, it might be exceedingly difficult, if not impossible, to recover it. The only hope of doing so is in keeping a close watch in the late spring and early summer, upon those parts of the sky indicated with different suppositions for date of perihelion passage, say from May 15 to June 15, which are wholly in south declination, a circumstance that will render the assistance of observers in the other hemisphere very desirable. To give an idea of the comet's track in the heavens when the perihelion falls in May, we assume the 15th and 25th for the passage by this point of the orbit, and thus have the following positions:—

	In perihelion, May 15·0.			In perihelion, May 25·0.		
	R.A.	Decl.	Distance	R.A.	Decl.	Distance
May 15	256°·5	50°·0 S	0·594	228°·8.	55°·8 S	0·600
„ 25	256 ·5	42 ·2	0·552	231 ·1	48 ·4	0·561
June 4	255 ·9	32 ·8	0·538	233 ·4	39 ·2	0·546
„ 14	255 ·3	23 ·1 S	0·555	235 ·8.	29 ·4 S	0·564

The least distance between the orbits of the earth and comet is about 0·53.

Considering the uncertainty in the mean motion deduced from observation in 1846, it is quite within possibility that a perihelion passage may occur as late as the summer of the present year, and it may be worth while to institute a search upon that supposition.

MINOR PLANETS.—No. 26, *Circular zum Berliner Astronomischen Jahrbuch*, just issued, contains new elements and an ephemeris of No. 114, Cassandra, and corrected ephemerides of No. 71, Niobe, and No. 128, Nemesis. The period of revolution assigned to Cassandra for November 1872 is 1598·5 days. Several of this group are now adrift, the elements not having been determined with sufficient approximation to keep them in view. The planet found by Borrelly at Marseilles, 1868, May 29, and that detected by Pogson at Madras on November 17 in the same year, are thus situated; both travel beyond the limits of our ecliptical charts, which contain very small stars.

OUR BOTANICAL COLUMN

THE PANDANEÆ.—A fine series of Pandanus fruits has recently been received at the Kew Museum from Mr. John Horne, of the Botanic Garden, Mauritius