degree of precision, many varied arrangements as well as experienced assistants. That idea has secured me the protection of His Imperial Highness the Grand Duke Constantine and the support of the Imperial Russian Technical Society.

I thus conclude this communication which I have the honour to send you. The researches on the co-efficients of dilatation of gases in their general features confirm the accuracy of the deductions drawn from the observations on compressibility. But that matter is in process of elaboration, and only a part of the researches has been completed. Consequently I abstain from expounding all the details of the subject. I shall only remark that the true coefficient of dilatation of air under constant pressure and with variable volume is found to be greater for pressures near to atmospheric pressure than the number generally accepted, notably from the researches which I have made with M. Kaiander, it is equal to 0·003683 if we take 100° C. as the temperature of boiling water under an atmospheric pressure of 760 mm. in latitude 45°.

If you do not find devoid of interest more ample details on this subject, as also on the determination of the weight of a litre of air, I shall have the greatest pleasure in explaining to the English public through your interesting journal the essential points of the researches made on this subject in my laboratory.

St. Petersburg, January 1 DE MENDELEEF

OUR ASTRONOMICAL COLUMN

BINARY STARS.—From one of the very careful and complete investigations on the orbits of the revolving double stars, by which Dr. Doberck is so greatly contributing to our knowledge of the motions of these interesting objects, we have an orbit of ξ Scorpii which is probably a very near approximation to the true one.

We have called the star by what appears to be its correct designation, ξ Scorpii, but few stars have been subjected to more varied nomenclature than the one in question. In Dr. Doberck's paper, published in No. 2,121 of the *Astronomische Nachrichten*, in all probability through one of the typographical errors which have of late so much disfigured this periodical, the star is styled ζ Libræ. It has been previously very commonly lettered ξ Libræ, and it is 51 Libræ of Flamsteed; Secchi, in *Astron. Nach.*, No. 1,614, calls it ρ' Libræ, though we are ignorant upon what precedent.

Dr. Doberck's elements are those of a very nearly circular orbit, and it may be remembered that some thirty years since Mädler gave elements for circular motion with a period of revolution of about 104 years. In *Astron. Nach.*, No. 1,683, Dr. Thiele gave the results of a very complete discussion of the measures up to 1856, in which he has assumed that Sir W. Herschel's angle on the night of his discovery of the duplicity of the star has been registered correctly, though a doubt has been entertained upon this point. He thus arrives at a highly excentrical elliptic orbit with a period of a little over forty-nine years. It should be remarked that from the near approach of the magnitudes of the components forming the double star ξ Scorpii (it is more correctly a triple star), an error of 180° in the measured angle of position is by no means an improbable one.

Dr. Doberck assumes that Sir W. Herschel's angle of 1782 requires this correction, and deduces an orbit in which the period of revolution is nearly twice that of Thiele, and which therefore approaches the period originally assigned by Mädler. His elements are as follow :—

Peri-astron passage 1859·62.

Node ...	12° 15′	Inclination ...	68° 42′
Node to peri-astron on orbit ...		...	89° 16′
Eccentricity ...		...	0·0768
Semi-axis major ...		...	1″·26
Revolution ...		...	95·90 years.

A full comparison with the measures up to the present time, appears in the *Astronomische Nachrichten*.

In the same number Dr. Doberck gives first elements of that exceedingly difficult object γ Coronæ Borealis, in which the period of revolution is 95½ years, and the peri-astron passage 1843·7. The distance calculated from this orbit is still under two-tenths of a second, but it will increase, until towards the end of the first decade of the next century the components, according to Dr. Doberck's calculation, will be separated by more than 0″·8.

THE ANNULAR ECLIPSE OF THE SUN, 1737, MARCH 1.—Prof. Grant, in his "History of Physical Astronomy," mentions this eclipse as the first annular one of which we have any detailed account. This phase passed over Edinburgh, where it was observed by Maclaurin, the well-known mathematician, by Short, the optician, Lord Aberdour, and others. The times were determined by Maclaurin by a pendulum clock of Graham's, and he was also furnished with a meridian instrument by the same maker, with the aid of which the clock was rated by Short for "a long time before and after the eclipse." The clock used by Lord Aberdour, who was located in Edinburgh Castle, was compared with Maclaurin's at noon on the day of the eclipse, and in addition signals were exchanged between the Castle and Maclaurin's station at the college. Both observers determined the duration of the annular phase to have been 5m. 48s.

The following elements of this eclipse have been deduced from a similar system of computation as regards the moon's place to that adopted for other eclipses to which reference has been made from time to time in this column, a system which gives results for the total solar eclipse of 1715 agreeing very closely with the observations of Flamsteed and Halley.

G.M.T. of conjunction in R.A., March 1, at 3h. 1m. 31s.

R.A.	342	35	32·0
Moon's hourly motion in R.A. ...		28	50·9
Sun's ,, ,, ...		2	20·3
Moon's declination	6	44	0·1 S.
Sun's ,, ...	7	24	5·7 S.
Moon's hourly motion in decl. ...		8	49·5 N.
Sun's ,, ,, ,, ...		0	57·2 N.
Moon's horizontal parallax		54	19·1
Sun's ,, ,, ...			9·0
Moon's true semi-diameter		14	48·0
Sun's ,, ,, ...		16	7·7

The equation of time was 12m. 40s. subtractive from mean time. The following were points upon the central line by the above elements :—

Long. 10° 10′ W. Lat. 54° 53′ N.	Long. 4° 11′ W. Lat. 56° 35′ N.
,, 7 26 W. ,, 55 42 N.	,, 0 4 W. ,, 57 36 N.

If reduction equations are founded upon a direct calculation for Edinburgh, there result for any place not far distant :—

$$\cos w = 27\cdot6369 - [1\cdot59611]\sin l + [1\cdot22018]\cos l, \cos(L - 51^\circ\ 1'\cdot4)$$
$$t = 2\text{h. } 13\text{m. } 35\cdot5\text{s.} \mp [2\cdot29350]\sin w + [3\cdot49325]\sin l - [3\cdot89289]\cos l, \cos(L + 147^\circ\ 35'\cdot5).$$

where l is the geocentric latitude of the place, L its longitude from Greenwich + if E, − if W, and t is expressed in Greenwich mean time; the upper sign is to be used for beginning of annular phase, and the lower for the ending. The quantities within square brackets are logarithms.

The calculated duration of annularity at Edinburgh is 5m. 46·6s., differing only 1·4s. from the observations of Maclaurin and Lord Aberdour, but the middle of this phase is given later by 1m. 51s. At other places mentioned in Maclaurin's memoir on this eclipse, published in the *Philosophical Transactions*, the duration of the annulus was as follows :—At Alnwick, 2m. 0s.; at Crosby, near Ayr, 5m. 54s.; at Montrose, 6m. 27s.; and at St. Andrew's, 6m. 12s. At Aberdeen, which was very near the central line, the *annulus* was formed at 3h. 43m. 0s. local mean time, and continued 6m. 30s. On the east coast of Scotland, where the duration of *annulus* was longest, it did not exceed 6m. 35. The eclipse is not given annular at Morpeth, therein agreeing with the observation.