Observations and Measurements of the Planet Vesta. By John Jerome Schroeter, *F.R.S.* Read May 28, 1807. [*Phil. Trans.* 1807, *p.* 245.]

The observations contained in Mr. Schroeter's communication, comprise those of Dr. Olbers, made at Bremen, from the 29th of March to the 6th of May, and those of Mr. Bessel at Lilienthal, from the 1st of April to the 11th of May; from which it appears that this planet, now called Vesta, became stationary between the 8th and 11th of May, and is now progressive.

Mr. Schroeter endeavoured also to ascertain her magnitude; with magnifying powers of 150 and 300 applied to a 15-feet reflector she seemed equal to a star of the 6th magnitude, but without any appearance of a disc. Mr. Schroeter, and his assistant, both saw the planet at that time with the naked eye.

As they had formerly observed Ceres, Pallas, and Juno, with a 13-feet reflector, and with eye-glasses magnifying 136 and 288 times, they now examined Vesta with the same telescope and the same powers, and found her appearance to be exactly the same, her apparent diameter not exceeding $\frac{488}{1000}$ths of a second, which Mr. Schroeter says is only one half the apparent diameter of the 4th satellite of Saturn. Mr. Schroeter considers the intensity and unsteadiness of its light, together with its extraordinary smallness, as very remarkable for a body which, according to the calculations of Dr. Gauss, is in the same region between Mars and Jupiter, in which the three other lately discovered planets perform their revolutions round the sun.

A new Eudiometer, accompanied with Experiments, elucidating its Application. By William Hasledine Pepys, *Esq. Communicated by* Charles Hatchett, *Esq. F.R.S.* Read June 4, 1807. [*Phil. Trans.* 1807, *p.* 247.]

After some preliminary observations upon the important part that atmospheric air performs in numerous processes of nature and art, and upon the variety of other gaseous bodies now known, Mr. Pepys traces cursorily the progress of eudiometry from Hales, who first observed a contraction upon the admixture of atmospheric air with an air that he had obtained from spirit of nitre and pyrites. The cause of this contraction, and the nature of the nitrous gas that occasioned it, were more distinctly discovered by Dr. Priestley, who also pointed out the use to which it might be applied for ascertaining the purity of air; and he employed for that purpose a graduated tube, which he denominated an eudiometer.

Phosphorus, and the liquid sulphurets, were afterwards substituted for nitrous gas; but these being found tardy in their operation, or if accelerated by heat fallacious in their results, Mr. Davy proposed the solutions of sulphate, or muriate of iron impregnated with nitrous gas, as sufficiently sudden in their action, and more uniformly free from contamination by other gases.

Much, however, in Mr. Pepys's estimation, remained to be done in the mechanical part of the apparatus, and in the course of various experiments on these subjects, that it might be rendered more commodious in its application, and capable of giving correct results with the utmost minuteness.

The instruments which he proposes consist of two tubes, one larger and one smaller, with a bottle of elastic gum to each, and a glass cylinder, or cistern, of the same length as the tubes. The larger of the tubes, containing one cubic inch, is the principal measure, and is divided into hundredths; the smaller is intended to measure fractional parts; and in this each of the former divisions is divided into ten parts, or thousandths of the cubic inch.

One of the bottles of elastic gum has attached to it a tube, which serves as a perforated stopper to the larger measure, through which any liquid to be applied to the gas under examination may be forcibly injected. When the full contraction has taken place, the measure is immersed in the cistern, filled with mercury or with water, according to circumstances, and the contraction noted. But if the surface is found not to correspond with a division of the principal measure, the smaller tube, which slides through a cork in the bottom of the cistern, is to be passed up till its extremity (which is open) reaches the gas contained, and the fractional part is then withdrawn by means of its elastic bottle, and measured with the greatest precision.

Mr. Pepys next proceeds to an account of various gases, of which he tried the purity by means of this apparatus, as nitrous gas, containing $\frac{1}{100}$ of impurity, oxygen gas $\frac{1}{100}$; atmospheric air, of which $\frac{21}{100}$ were absorbed; carbonic gas, which left $\frac{1}{100}$, and sulphuretted hydrogen $\frac{5}{100}$ of impurity.

In the analysis of compound gases also, he imagines it will be found peculiarly useful. He recommends using the solutions hot, which facilitates chemical union, but prevents the absorption of carbonic and other gases by the mere water of solution, which might otherwise take place.

In order to avoid the expansion that would be occasioned by handling the measure, Mr. Pepys employs a pair of forceps, having circular extremities lined with cloth, for grasping the tube.

The elastic gum, he observes, is so little acted upon by chemical agents, that a great variety of them may be employed, and may with facility be used at any temperature.

Observations on the Nature of the new celestial Body discovered by Dr. Olbers, *and of the Comet which was expected to appear last January in its return from the Sun. By* William Herschel, *LL.D. F.R.S.* Read June 4, 1807. [*Phil. Trans.* 1807, *p.* 260.]

It was on the 24th of April that Dr. Herschel first saw the new planet Vesta; but though he saw her again on the 25th, he could not determine which of several stars he noted was the planet, for