want of sufficient motion at that time. He examined her at that time with a power of 460, but could not distinguish anything in her appearance different from surrounding stars of equal brightness.

On the 21st of May, when he had learned her position more precisely from the Astronomer Royal, he observed her again with the same power, but could discern no appearance of a planetary disc.

On the 22nd he perceived her to have moved since the preceding evening, and now examined her with increased powers of 460, 577, and 636, but could find no difference between the planet and a fixed star, the 463rd of Bode's Catalogue.

Since Vesta thus bears to be examined by high magnifying powers without apparent enlargement of her disc, which is the test by which Dr. Herschel formerly determined the apparent discs of Ceres, Pallas, and Juno, to be spurious, he considers her as belonging to that formerly unknown species of celestial bodies which he has termed asteroids.

May 24th.—Dr. Herschel compared Vesta with the Gregorian planet, and found that with a power of 577 her apparent disc was about one ninth or one tenth as large; and with his 20-feet reflector, of $18\frac{3}{4}$ inches aperture, she had no surrounding atmosphere or nebulosity.

Dr. Herschel's observations on the comet, which follow, were confined to three days, January 27, January 31, and February 1. It was near the electrometer of the constellation, called by Bode *Machina electrica.* Its coma was of an irregular round form, extending six or seven minutes in diameter.

Upon revising his observations of sixteen telescopic comets, Dr. Herschel remarks, that fourteen have been without any visible solid body in their centre, and that the other two had but an ill-defined small central light, which did not deserve the name of a disc.

On the Quantity of Carbon in carbonic Acid, and on the Nature of the Diamond. By William Allen, *Esq. F.L.S. and* William Hasledine Pepys, *Esq. Communicated by* Humphry Davy, *Esq. Sec. R.S. M.R.I.A.* Read June 18, 1807. [*Phil. Trans.* 1807, *p.* 267.]

The experiments, which form the subject of the present communication were undertaken, not only on account of the difference between the estimates that have been made of the quantity of carbon in carbonic acid, but because those of Guyton de Morveau, which are most frequently preferred at this time in various systems of chemistry, appeared liable to many objections, from the manner in which they were conducted; while the original experiments of Lavoisier, on the contrary, appear to have been performed with much accuracy, and had moreover been confirmed by Mr. Tennant in his researches on the nature of the diamond.

The design of the authors was to consume certain known quantities of diamond and of other carbonaceous substances in oxygen gas; for which purpose it had been originally their intention to employ

the sun's rays, by means of a powerful lens; but, considering the uncertainty of a favourable opportunity in this country, they resolved to employ an apparatus consisting of two mercurial gas-holders, with a tube of platina interposed between them in a horizontal position, and passing through a small furnace, by which the tube and its contents might be heated to any degree requisite for the combustion of the substance employed.

Into this tube the diamond or other variety of carbonaceous matter was introduced in a small tray, also of platina; after which, by opening a due communication with each gas-holder, the oxygen was made to pass freely over the surface, from one gasometer to the other, during the continuance of the heat, and subsequently examined by means of the eudiometer lately described by Mr. Pepys.

Having found that oxygen gas was liable, notwithstanding every precaution, to be deteriorated by keeping, the authors were careful to prepare it, on all occasions, within an hour or two of the time of using it, from the hyperoxygenized muriate of potash. Its purity was also ascertained before every experiment. The solution employed for this purpose was the solution of green sulphate of iron, saturated with nitrous gas; and lest any increase might have been occasioned by the extrication of this gas from the solution, the simple sulphate alone was subsequently employed, so that the residuum enabled them to determine exactly the quantity of oxygen contained in the gas.

Their charcoal was prepared from different kinds of wood, sawed into slips, and gradually heated in small crucibles covered with sand, and ultimately retained in a white heat for forty minutes. By this treatment

Fir yielded	18·17	per cent.
Lignum Vitæ	17·25	——
Box	20·25	——
Beech	15	——
Oak	17·40	——
Mahogany	15·75	——

Having next examined the absorbent power of charcoal, and found that the weight which it gains by exposure to air is principally attributable to water, the charcoal to be employed in any experiment was always subjected to a red heat immediately before using it, and weighed as expeditiously as was consistent with accuracy.

Since the volumes of gas employed and produced would be influenced by temperature, as well as barometric pressure, the states of both barometer and thermometer were noted at the time of every experiment, and allowance was made by adding, or subtracting, $\frac{1}{180}$th part of every degree below or above 60°.

The exact weights of certain measures of oxygen gas, and of carbonic acid gas, were also carefully examined, by allowing a glass globe, previously exhausted and weighed, to receive a given measure of either of these gases from a gasometer. By the increase of weight acquired in each case, it was found that 100 inches of oxygen gas

weighed 33·82 grains, and that the same measure of carbonic acid gas weighed 47·26 grains.

In the first experiment, which they made upon the combustion of charcoal, four grains of box-wood charcoal were employed, and it was found that only $\frac{1}{50}$th of a grain remained of a white ash. The volume of gas employed appeared unaltered after the heat had subsided; but the combustion of 3·98 grains of charcoal had produced 29·13 inches of carbonic acid gas, or 13·76 grains; so that according to the experiment, 100 grains carbonic acid gas contains 28·92 charcoal. But by a computation founded on the quantity of oxygen consumed, it would appear that the quantity of charcoal is only 28·77 per cent.

In their next experiment 2·49 grains of diamond, in small fragments, were consumed. In this case, as in the former, the combustion caused no apparent increase or diminution of the quantity of gas; but there were found to be 18·20 inches of carbonic acid gas, in which the diamond would appear to be contained in the proportion of 28·95 per cent. But again, by estimation from the weight of 18·20 inches of oxygen consumed, the proportion of diamond was slightly different, being 28·81 per cent.

In this experiment, the authors could perceive no appearance of moisture or dullness on the surface of the quicksilver, or sides of the glasses; and they observed that the diamond had left no discolouration of the tray, and no residual ash.

In a second experiment eleven small diamonds, weighing 4·01 grains, were consumed; and they produced 13·91 grains of carbonic acid gas, in the proportion of 28·82 parts diamond for each 100 of gas.

By a similar experiment upon stone-coal from Wales, such as is employed by maltsters, the quantity of carbonic acid gas produced was found to contain 28·20 per cent. of coal; but in this case the proportion deduced from the quantity of oxygen consumed, rather exceeded the estimate formed from the carbonic acid, instead of being less, as in former experiments.

Carbonic acid formed in the same manner from the combustion of plumbago, contained 28·46 of carbonaceous matter, whether estimated from the gas produced, or from the oxygen gas consumed.

From the average result of these five experiments, the authors conclude that 100 parts of carbonic acid contain 28·6 of carbon, a quantity rather greater than appeared to Mr. Tennant, who did not find it more than 27·8; but this difference may easily be accounted for, by the different modes of operating.

The authors conclude, that the estimate given by Lavoisier at 28, which is between that of Mr. Tennant and their own, is very near the truth.

2ndly. That the diamond is pure carbon.

3rdly. That well burned charcoal contains no hydrogen, but soon absorbs moisture from the air, which would occasion fallacious results.

4thly. That charcoal is not an oxide of carbon; since, when rightly prepared, it requires quite as much oxygen for its combustion as diamond.

And lastly, That the diamond differs from charcoal, solely in the firmness of its aggregation, which is generally known to be an obstacle to every chemical change.

An Account of the Relistian Tin Mine. By Mr. Joseph Carne, *in a Letter to* Davies Giddy, *Esq. M.P. F.R.S.* Read May 7, 1807. [*Phil. Trans.* 1807, *p.* 293.]

Mr. Davies Giddy communicated a letter from Mr. Joseph Carne, giving an account of the Relistian Mine in Cornwall, in which rounded pebbles were found at the depth of seventy-five fathoms from the surface. The description is accompanied with a section of the mine, and plan of the lode.

The lode has been seen at various depths, from twelve to ninety fathoms, but its width then diminishes rapidly toward the east, but more gradually toward the west. The substances not metallic are schist, chlorite, and quartz. There is an engine-shaft at eight fathoms from the lode, on the north side from which levels are driven to the lode in the direction of a flucan, or cross lode, which cut the main lode nearly at 45° from N.W. to S.E. The distance, in this oblique direction, is about fifteen fathoms; for the first ten fathoms there was only one flucan, of four inches width. Then it became divided into four parts, so much divergent from each other, that at the depth of seventy-five fathoms the extreme branches extended twelve feet in width; where the flucan reached the lode at this depth, there was first discovered a little copper, and then a body of pebbles, the section of which was about twelve feet square. In this part of the lode the schist greatly predominates; of course (says Mr. Carne) the pebbles are schistose, cemented in some parts by chlorite, in others by oxide of tin, which is generally crystallized, and in some of the crevices there is a little copper pyrites. The pebbles did not continue in a body to the height of more than two fathoms; but scattered bunches were found four fathoms above, and six fathoms below the place where they were first discovered.

At the depth of sixty-five fathoms, and in the lode adjacent to the flucan, on each side, had been found also a great number of schistose stones; but these were angular fragments, not rounded; nor was there any tin in or about them.

An Analysis of the Waters of the Dead Sea and the River Jordan. By Alexander Marcet, *M.D. one of the Physicians to Guy's Hospital. Communicated by* Smithson Tennant, *Esq. F.R.S.* Read June 18, 1807. [*Phil. Trans.* 1807, *p.* 296.]

This analysis is preceded by a short abstract of the notice taken of the Dead Sea by various ancient authors, by Strabo, by Tacitus,