and to which Wöhler has assigned the formula $Si_4 H_4 O_5$ (Si=21). If it be assumed that this conclusion is correct, the further inference is that the bodies are similarly constituted. On this hypothesis, to arrive at the atomic weight of graphite, the total weight of carbon, 132, is to be divided by 4, which gives the number 33; and for the formula of the body, putting Gr=33, we have $Gr_4 H_4 O_5$.

This conclusion is confirmed in a remarkable manner by the specific heat of graphite. The specific heat of the elemental bodies varies inversely with their atomic weight. This law is so well established, that Regnault has even proposed to determine the atomic weight by it exclusively. There are, at any rate, only two numbers which can be assigned as the product of the specific heat into the atomic weight of the elemental bodies, namely, approximately the numbers 3·3 and 6·6. But to this law there is one singular exception. Carbon in all its forms is anomalous. The specific heats of diamond, graphite, and wood-charcoal are each different, and taking the atomic weight of carbon as 6 or 12, no one is accordant with the law. The specific heat of graphite is 0·20187. Now, taking the atomic weight of graphite as 33, we have $33 \times 201 = 6{\cdot}63$, a result in accordance with the law. The inference is, that the assertion that 33 is the atomic weight of graphite is not only a convenient expression of chemical analysis, but corresponds to a physical fact.

May 19, 1859.

Major-General SABINE, R.A., Treas. and V.P., in the Chair.

Professor Henry Darwin Rogers was admitted into the Society.

The following communications were read:—

I. "On the Alloys."—Part I. "The Specific Gravity of Alloys." By A. Matthiessen, Ph.D. Communicated by Prof. Wheatstone. Received May 17, 1859.

(Abstract.)

Before commencing a research into the electric conductivity of alloys, the author deemed it requisite, as a preliminary step, to

determine their specific gravities; and the methods employed and results obtained in this inquiry are given in the present paper.

The metals used were antimony, tin, cadmium, bismuth, silver, lead, mercury, and gold. The silver and gold were obtained in a state of purity from the refiners, the other metals were purified by methods which are described. The quantity prepared of each alloy was twenty grammes. The fused alloys were cast in a form and very thin, to avoid internal cavities from crystallization. Three separate determinations were made of their specific gravity, which, together with the mean result, are given in Tables. In every case the alloy was recast at least three times before the first determination, and once again before each succeeding one. The distilled water used in the weighing was first boiled and allowed to cool *in vacuo*, and the alloys were suspended in it by a fine platinum wire, except the soft amalgams, which were weighed in a tube similarly suspended. In calculating the specific gravities, the weight of water displaced was corrected for the temperature, the unit in all cases being distilled water at 0° C. All the weighings were reduced to a vacuum, and a correction was made for the platinum wire which dipped in the water.

The numerical results are stated in three Tables, of which the first gives the specific gravities of the pure metals employed, and the temperature in Centigrade degrees; the second gives the same of the alloys; and the third exhibits the mean specific gravities found, and the specific gravities as calculated,—1, from the volume of the metals forming the alloy; 2, from their equivalent; and 3, from their weight.

From the last Table it appears that the alloys of antimony are greater in volume than the aggregate of the constituent metals, while those of bismuth, silver, and gold are less. The following alloys expand greatly on cooling, viz. all those of bismuth-antimony, bismuth-gold, and bismuth-silver, which were experimented on; those of bismuth-tin, from $Bi_6\,Sn$ to $Bi_2\,Sn$, the rest of the series very slightly; and bismuth-lead, viz. $Bi_6\,Pb$ and $Bi_4\,Pb$ ($Bi_2\,Pb$ slightly), the rest apparently not at all. Of the bismuth-cadmium series, $Bi_6\,Cd$ and $Bi\,Cd_4$ expand very slightly, the rest not at all. The zinc-alloys are all so very crystalline that no results of value were obtained respecting them.

In making the determinations given in the paper, the author was assisted by Dr. M. Holzmann and Mr. C. Long.