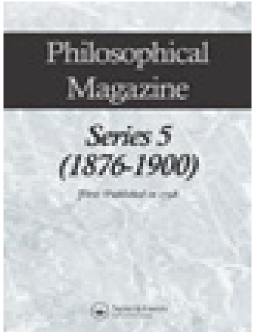

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On the density of the vapour of iodine

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under the same conditions, in the molecules of air. The laws of Mariotte and Gay-Lussac, established solely upon three simple gases, are therefore inapplicable either to iodine or to the other halogen elements.

This is the place to mention that the law of specific heats is no more applicable than the above-mentioned to this group of elements; for the specific heats of gaseous chlorine and bromine exceed by one fourth those of the other simple gases, and that between the ordinary temperature and 200° C., temperatures at which dissociation cannot be admitted.

It hence follows that the increase of the total energy of the halogen gases with the temperature exceeds that of the three other simple gases hitherto investigated (nitrogen, oxygen, hydrogen), as well as the increase of the *vis viva* of translation: these two orders of effects seem to be correlative.

Moreover, the diminution of density of iodine gas being progressive, the same is the case with the augmentation of its *vis viva* of translation; and, as M. Troost very judiciously remarks, this does not permit us to draw any correct conclusion respecting the variation of the number of the molecules; that sort of reasoning becomes arbitrary the moment the weight of the molecule of iodine, viewed either at a high temperature or at a low pressure, eludes the old definitions.

Only one law remains applicable to the elements, possessing an absolute and universal character; it is the invariableness of the proportions by weight in which the elements combine with one another. That is now the only immovable foundation of chemical science.—*Comptes Rendus de l'Académie des Sciences*, July 12, 1880, t. xci. pp. 77, 78.

ON THE DENSITY OF THE VAPOUR OF IODINE. BY L. TROOST.

The highly important researches published by M. V. Meyer on the variation of the density of iodine-vapour at very high temperatures, and the results obtained by MM. Crafts and Meyer which confirm them, have decided me to take up those densities again, with the apparatus made use of by M. H. Sainte-Claire Deville and myself for the vapour-densities of selenium and tellurium, and in which we determined the temperature with the aid of the air-thermometer*.

I have employed, as in those old experiments, balloons of porcelain, glazed inside and outside, and of a capacity of from 250 to 300 centims. They are tared with the little porcelain stopper, which at the moment of closing will be fused at the oxyhydrogen blowpipe.

* The supposition which has appeared in a recent publication, that we did not employ the air-thermometer for the determination of temperatures above that of the boiling-point of zinc, is erroneous.

The balloon containing the iodine is introduced into a horizontal muffle made of fireclay; this is placed in a stove heated by heavy coal-oil, which comes through a graduated and very delicate cock. For determining the temperature, I have utilized the new air-thermometer described by M. H. Sainte-Claire Deville and me at the meeting of the 29th of March last. The following are the results of the experiments, made at elevated and easily-obtained temperatures:—

	I.	II.	III.
Volume of the balloon	269·4 cub. cent.	255 cub. cent.	252 cub. cent.
Temperature of the balance	16°·5	16°·5	15°·8
Atmospheric pressure	756·14 millims.	755 millims.	757 millims.
Increase of weight	−0·056 gram.	+0·008 gram.	−0·021 gram.
Gas remaining, measured moist	16·1 cub. cent.	5·1 cub. cent.	8·6 cub. cent.
Temperature	19°	27°	18°·5
Pressure	753·4 millims.	745 millims.	757 millims.
Gas drawn from the reservoir	14 cub. cent.	14·2 cub. cent.	13·5 cub. cent.
Temperature	21°·4	27°	16°·2
Pressure	541·4 millims.	544·4 millims.	534 millims.
Volume of the reservoir	46·24 cub. cent.	46·24 cub. cent.	46·24 cub. cent.
Gas drawn from the compensator	1·38 "	1·59 "	1·40 "
Temperature	21°·6	27°·7	16°
Pressure	438 millims.	440 millims.	434·3 millim.
Temperature deduced	1235°·5	1241°	1250°
Density, obtained by means of the coefficient of expansion of the air	5·82	5·71	5·65

The numbers given in this Table for the vapour-density of iodine were calculated by assuming that that vapour possesses a constant coefficient of expansion and equal to that of air. Is it right to make that assumption? I thought it necessary, in order to solve this question, to make other experiments. These are the results which I obtained by taking the densities at the constant temperature of the ebullition of sulphur, but under variable pressures:—

	I.	II.	III.	IV.	V.
Volume of the balloon	334 c.c.	281 c.c.	295 c.c.	320·3 c.c.	310 c.c.
Temperature of the balance	9°·5	19°·8	20°	20°	18°·8
Atmospheric pressure	768·5 mm.	758·82 mm.	755·72 mm.	764·6 mm.	758 mm.
Excess of weight	+10·01 gr.	−0·238 gr.	−0·286 gr.	−0·3035 gr.	−0·325 gr.
Air remaining	4 c.c.	0·7 c.c.	0·6 c.c.	0·63 c.c.	0·6 c.c.
Temperature	9°·5	23°	22°·5	22°·8	24°
Pressure	768 mm.	676·8 mm.	495 mm.	735·9 mm.	485·5 mm.
Presure at closing the balloon	768 "	67·2 "	48·6 mm.	48·57 mm.	34·52 mm.
Density obtained on applying Mariotte's law	8·70	8·20	7·75	7·76	7·35

The numbers given in this second Table were calculated on the hypothesis that iodine vapour follows Mariotte's law exactly.

These results show that the vapour-density of iodine, calculated with $\alpha=0{\cdot}00367$ and $PV=1$, diminishes quite as much at a low as at a high temperature.

All the hypotheses which have been framed on the assumption of either a dissociation of, or isomeric change in, iodine henceforth appear to me hardly admissible. In the present state of our knowledge, nothing authorizes us to suppose that a partial vacuum would be adequate to produce a modification of that nature. The only necessary consequences of the experiments made at high temperatures or at low pressures are, that the expansion-coefficient of iodine varies with the temperature, and that its coefficient of compressibility varies with the pressure. Every hypothesis proposed in order to explain these results will have to take into account this double variation.—*Comptes Rendus de l'Académie des Sciences*, July 5, 1880, t. xci. pp. 54–56.

NOTE ON A DEMONSTRATION-DIFFERENTIAL THERMOMETER. BY HENRI DUFOUR.

For the purpose of exhibiting, in lectures on physics, the principal phenomena due to the radiation of heat, the thermoelectric pile and a galvanometer are usually employed. If the latter is a reflecting one (such as that of M. Wiedemann), it is easy to render visible to a numerous auditory some of the most delicate thermal phenomena. The only inconvenience of these two instruments is their high price; perhaps it is on account of this that the study of the radiation of heat is so often neglected in colleges which possess but slender resources. It is in order to render the study of these phenomena possible to every one, that I have constructed the following instrument, which can be easily executed anywhere at a very moderate price.

A tube in the shape of a very widely open V (the two branches making an angle of about 140°) is terminated at one of its ends by a blackened bulb. A horizontal lever of very light wood unites the two branches as the bar of an inverted A (∀) would do; this lever turns on a horizontal axis fixed to the middle of its length; upon the axis is a vertical needle, which moves in front of a graduated dial, likewise vertical.

A short column of mercury is introduced into the tube so that it occupies its lower portion. Equilibrium being established, the indicating needle is at the zero of the graduation. Under these conditions any heating of the bulb produces expansion of the air which it contains, and consequently a displacement of the mercury index, under the influence of which the apparatus inclines more or less; it afterwards returns to zero when the action of the source of heat ceases to operate.

To regulate the horizontality of the beam, a small brass cursor can be placed on the lever at a variable distance from the axis. Lastly, the motion of the apparatus is very regular if the precaution