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On the law of radiation

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The driving forward of the oxyhydrogen gas here supposed has also been assumed by Mallard and Le Chatelier*, in order to explain the increase of the velocity of propagation of the ignition observed by them.

From what has been adduced, it follows, *inter alia*, that in precise determinations of the heat of formation of water the H_2O_2 formed must also be taken into account, and, further, that, in the case of explosion, the loss of heat occasioned by the breaking must be taken into consideration.—Wiedemann's *Annalen*, 1882, no. 2, vol. xv. pp. 289-292.

ON THE LAW OF RADIATION. BY J. VIOLLE.

The intensity of a simple radiation emitted by incandescent platinum is very accurately represented by the formula

$$I = mT^3(1 + \epsilon\alpha^{-T})^T,$$

as I have previously pointed out, and as is proved by the following Table, which contains the values calculated by means of this formula for a portion of the measurements before mentioned:—

<i>t.</i>	$\lambda = 656 \left\{ \begin{array}{l} \epsilon = 0.041495 \\ \alpha = 1.00045. \end{array} \right.$		$\lambda = 589.2 \left\{ \begin{array}{l} \epsilon = 0.04295 \\ \alpha = 1.00044. \end{array} \right.$		$\lambda = 535 \left\{ \begin{array}{l} \epsilon = 0.04467 \\ \alpha = 1.00043. \end{array} \right.$	
	Calculated intensities.	Differences from the observed.	Calculated intensities.	Differences from the observed.	Calculated intensities.	Differences from the observed.
775°	...	...	0.05	0		...
954°	1	0	1	0	1	0
1045°	3.1	-0.2	3.4	-0.2	3.6	-0.1
1500°	153	0	218	-1	324	+17
1775°	501	-6	812	+3	1365	0

But if the attempt be made to represent by the same formula the numbers of Dulong and Petit relative to the radiation of their thermometer between 80° and 240°, good results are not obtained. Nor does the celebrated formula of those two physicists, $I = m\alpha^t$, agree with the measurements obtained with incandescent platinum; and the expression $I = mT^4$, recently proposed by M. Stéphan, giving for the relative intensities at 954°, 1045°, 1500°, and 1775° the numbers 1, 1.33, 4.36, and 7.73, cannot be adopted.

On the other hand, a very satisfactory representation of the whole of the measurements is obtained by means of the formula

$$I = mT^bT^2\alpha^T,$$

in which T represents the absolute temperature, m a constant coefficient, b the number 0.9999938, $\alpha = 1.03550 - 13\lambda$, λ being the wave-length in millimetres.

In fact, if we apply this formula, first, to the platinum radiation, we shall have:—

* *Comptes Rendus*, xciii. pp. 146, 147 (1881).

<i>t.</i>	$\lambda=656.$		$\lambda=589.2.$	
	Calculated intensities.	Differences from the observed.	Calculated intensities.	Differences from the observed.
775 ⁰	...	...	0.04	-0.01
954.....	1	0	1	0
1045.....	3.0	-0.3	3.2	-0.4
1500.....	161	+7	219	0
1775.....	507	0	807	-2

<i>t.</i>	$\lambda=535.$		$\lambda=482.$	
	Calculated intensities.	Differences from the observed.	Calculated intensities.	Differences from the observed.
954 ⁰	1	0		
1045.....	3.4	-0.3		
1500.....	311	+4	142	1
1775.....	1371	+6	807	5.7

The calculations were made with the values of α which appeared to accord best with the observations. These values,

1.02713, 1.02772, 1.02838, 1.02935,
satisfy the formula $\alpha=1.03550-13\lambda$, with the respective differences

-0.00016, +0.00012, +0.00015, -0.00012.

The experiments of Dulong and Petit are equally well represented by the same formula, assuming $\alpha=1.01161$,—that is to say, supposing $\lambda=1838$, which is perfectly admissible according to the measurements of M. Mouton, who has determined the wavelengths up to 2140. We have, in fact:—

Excess.	Velocity of cooling.		$\Delta.$
	Determined by Dulong and Petit.	Calculated by my formula.	
80	1.74	1.71	-0.03
100	2.30	2.35	+0.05
120	3.02	3.10	+0.08
140	3.88	3.97	+0.09
160	4.89	4.96	+0.07
180	6.10	6.10	0
200	7.40	7.39	-0.01
220	8.81	8.84	+0.03
240	10.69	10.46	-0.23

The differences are not, in general, greater than those existing between the numbers calculated by Dulong and Petit from their formula and the observed numbers.

From the whole of these facts it appears to me to follow that, between 0° and 1775° , the law of radiation can be represented by the formula

$$I = mTbT^2\alpha^T.$$

Comptes Rendus de l'Académie des Sciences, t. xcii. p. 1204.

ON WHEATSTONE'S BRIDGE. BY K. F. SLOTTE.

The length of the platinum wire belonging to this apparatus, which cannot be exactly determined by measurement, can, it is well known, be ascertained indirectly by comparing and exchanging resistances*. The following procedure is a modification of this method which may not be without advantages.

Let s be the length of the wire, a and b that of its two divisions when two resistances w_1 and w_2 are inserted and the galvanometer shows no current. Then is

$$\frac{w_1}{w_2} = \frac{a}{b} = \frac{s+a-b}{s-(a-b)} = \frac{s+d_1}{s-d_1}, \dots\dots\dots (1)$$

in which $a-b$ is put $= d_1$. If now the resistances w_1 and w_2 be exchanged and the movable contact shifted till again no current passes through the galvanometer, this displacement, taken as positive or negative according to whether a is more or less than b , is equal to d_1 , which quantity can be directly determined by reading it off upon the scale of the apparatus.

If in the same manner w_2 be compared with a third resistance w_3 , and, again, w_3 with w_1 , and if the displacements corresponding to d_1 be denoted respectively d_2 and d_3 , then we have

$$\frac{w_2}{w_3} = \frac{s+d_2}{s-d_2}, \dots\dots\dots (2)$$

$$\frac{w_3}{w_1} = \frac{s+d_3}{s-d_3}, \dots\dots\dots (3)$$

From (1), (2), and (3) we get

$$1 = \frac{(s+d_1)(s+d_2)(s+d_3)}{(s-d_1)(s-d_2)(s-d_3)},$$

and finally, by solving the last equation,

$$s = \sqrt{-\frac{d_1 d_2 d_3}{d_1 + d_2 + d_3}}. \dots\dots\dots (4)$$

Three determinations effected by this method, in which w_2 was chosen approximately equal to $\sqrt{w_1 w_3}$, gave for s the values 1118.11, 1118.75, 1118.6 millim.—Wiedemann's *Annalen*, 1882, no. 1, vol. xv. p. 176.

* See G. Wiedemann, *Galvanismus*, [2] i. p. 254.