9. Notes from the Physical Laboratory of the University
By Professor Tait. (With a Plate.)

After passing through the usual routine work of acquiring skill in the fundamental operations, several of my students have remained long enough in the laboratory to make investigations in various branches of Physics. A great many of these inquiries related to matters already thoroughly known; but some have claims to notice as dealing with subjects on which our information is as yet incomplete. These I propose, from time to time, to lay before the Society. Their value as scientific results must depend on the skill and care of the experimenters. For the forms of apparatus employed, and the mode of conducting the experiments, I am, in most cases, responsible.

(1.) Mr J. P. Nichol has made a long series of experiments upon the Radiation and Convection of Heat, mainly to determine the amount of radiation in absolute measure, but incidentally with a view to finding how convection varies with the density of the air. The following is a preliminary notice of his work. The radiating body was a thin spherical shell of copper, filled with hot water. Its surface was sometimes bright, sometimes covered (by means of photographic varnish) with lamp-black. It was suspended by fine wires in a metallic vessel, which was blackened internally, fitted with a pressure-gauge, surrounded by cold water, and connected with an air-pump. An iron cup was let into the top of the shell, and contained a little mercury surrounding the bulb of a thermometer whose stem ascended in a glass tube which was inserted in the lid of the closed vessel. Considerable trouble was caused at first by the water leaking out of the shell when its temperature was high and the vacuum good—but in the later experiments this was entirely got over.

As it was suspected that a difference of thickness of the lamp-black coating might influence the amount of radiation, the mode of experimenting finally adopted was to alter the air pressure in the vessel from time to time; first, for instance, half an hour's cooling at 100^{mm}, then half an hour at 200^{mm}, then at 100^{mm}, and so on. But the portions of the curves of cooling thus found on separate days fitted well together into a single continuous line, as is seen in

the corner of the diagram, where the dotted lines belong to one day's experiments, and the double lines to those of another day.

The numbers (H) given in the following table, which is formed from means of many experiments, and which is shown graphically in the diagram, express in grains the quantity of water which would be heated 1° Centigrade by the heat lost (by radiation and convection jointly) by one square inch of surface in an hour, its temperature being kept constant. With the apparatus employed, it was not easy to keep the pressure lower than 10^{mm}; but the curves for different pressures show that in this case the convection must be small, so that (roughly) we may take the numbers given for that pressure as representing the radiation alone.

Pressure.	Blackened.		Bright.	
	Temperature C.	H.	Temperature C.	H.
760 ^{mm}	61·2	6258	63·8	3537
	50·2	4875	57·1	3091
	41·6	3867	50·5	2637
	34·4	3082	44·8	2251
	27·3	2294	40·5	2013
	20·5	1629	34·2	1571
			29·6	1353
			23·3	996
			18·6	751
102 ^{mm}	62·5	4650	67·8	1763
	57·5	4150	61·1	1552
	53·2	3760	55·	1371
	47·5	3220	49·7	1220
	43·	2835	44·9	1082
	28·5	1755	40·8	960
10 ^{mm}	62·5	4236	65·	1390
	57·5	3847	60·	1273
	54·2	3593	50·	1025
	41·7	2600	40·	786
	37·5	2292	30·	563
	34·	2040	23·5	445
	27·5	1600		
	24·2	1400		

(2.) Mr A. Brebner made during last winter a number of careful determinations of the polarisation of electrodes of various materials in commercial sulphuric acid of various strengths and at various temperatures. The process employed was essentially the same as that described by me in the Proceedings R.S.E. for May 31, 1869. The following are means of many experiments:—

Platinum Electrodes.

Acid to Water.		Tempera- ture C.		Polarisa- tion.	Acid to Water.		Tempera- ture C.		Polarisa- tion.
1 : 50,	{	8°	{	224	1 : 10,	{	5°	{	188
		68°		187			56°		174
		87°		172			90°		157
1 : 40,	{	6°	{	178		{	7°	{	202
		54°		169	1 : 0,		66°		169
		84°		157			134°		133
1 : 20,	{	10°	{	174		{	11°	{	244
		44°		167	1 : 0,		102°		187
		88°		158			201°		137

The results of such experiments cannot be expected to be very accordant, but, if the means above given may be trusted, the polarisation is less for 1 acid to 20 water than for either stronger or weaker acids; and it also falls off more slowly with increase of temperature.

(3.) Messrs P. W. Meik and J. Murray made many observations with an electric balance, and resistance coils, to test the change of electric resistance produced in a wire by extension. The wires tested were of two specimens of copper—one of high, the other of very low, conducting power. They were taken of equal gauge and of such lengths as to have almost equal resistance; one was associated with a 10 B.A. Unit coil as one side of the balance, the other had associated with it a box of resistance coils initially set at 10 B.A.U. The value of the galvanometric scale was determined in each experiment by increasing by a small known amount the resistance of the coils in circuit. The results are not yet quite reduced; as we require to know the linear extension, and (if possible), the cubical contraction, of each wire produced by the appended weights. But, even in their present state, they appear to be of some consequence, as they show changes of conducting power almost exactly proportional to the weights appended, but singularly differing in absolute amount for these dissimilar specimens of copper.