

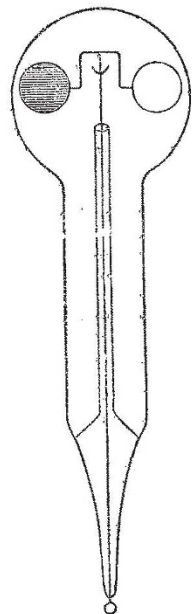
Action on Frog's Eye of Spectrum of Oxyhydrogen Flame.

	Initial Effect.	Final Effect.
Yellow, near orange ...	rise of 70 ...	rise of 10
Green yellow ...	" 25 ...	" 5
Green—low ...	" 15 ...	" 0
Green—high ...	" 15 ...	" 0
Green—higher ...	" 18 ...	" 8
Yellow green ...	" 85 ...	" 35
Yellow ...	" 80 ...	" 40

(To be continued.)

SIR WILLIAM GROVE ON THE RADIOMETER<sup>1</sup>

SIR WILLIAM GROVE described some experiments he had recently made with a modification of Crookes's radiometer. After a few prefatory trials, such as covering one-half of the bulb with tinfoil and electrifying it, which gave no notable results, he devised a method, shown in the accompanying sketch, by which he could electrise the whole of the internal system. Four aluminium vanes, each blackened on one side, had metallic arms and a metal point at their crossing that rested in a metal cup. The latter was united to a platinum wire that passed through a glass tube and was fused into it, the platinum wire protruding. Lastly, the glass tube was fused inside the apparatus and hermetically sealed, the end of the platinum wire being exposed. The vacuum in this apparatus was considered by Mr. Crookes<sup>2</sup> to be as perfect as in his radiometers generally, but Sir William Grove doubted that it was so. The following were the results:—



1. With the faint light of a lucifer match or of one or two candles, the vanes invariably turned the opposite way to the normal, the polished surface being repelled. With a dark heat, as from an iron shovel heated short of redness, they went the normal way. These effects continued for several days, but not permanently; the apparatus seemed to have leaked and to have become sluggish and irregular.

2. On electrising the protruding platinum wire with a rubbed rod of glass or sealing-wax, the vanes rotated sometimes one way and sometimes the other.

3. On connecting the negative pole of a Ruhmkorf's coil the results were uncertain, but the positive pole caused the vanes to rotate steadily, and its effect was even better than that from light or heat. In the dark the effect was very beautiful, as the dark vanes moved through a phosphorescent glow. The total results were considered by Sir William Grove to be somewhat negative, but they tended to show that all the effects were due to residual air. He suggested in explanation of the last experiment, that more electricity would escape from the rough than from the polished faces of the vanes, as the former presented a vast number of points. Consequently the rough faces would produce more disturbance of the gas in front of them, and would themselves be more affected by the reaction than the plane faces. The polished surfaces being repelled by luminous heat is, however, very difficult of explanation.

In his second notice Sir William Grove described some further experiments he had made with Crookes's radiometers since the last meeting of the club. He did not now entertain much doubt that these movements are due to the effect of residual air. Mr. Crookes had kindly made a second instrument for him, and the one that he described at the last meeting, of which the vanes were metallic and in metallic connection with a platinum wire that protruded outside the apparatus, had been re-exhausted. Both now act normally, the black faces of the vanes being repelled by light and by heat. When the protruding wire is now electrised by a Ruhmkorf's coil the effects that were previously observed are altogether absent, there is not the slightest luminosity round the vanes, and the current does not pass. But although the current is now incapable of traversing the

small space of one-tenth of an inch that separates the vanes from the glass, induction acts across it just as well as before. This is shown by the readiness with which the vanes follow the movements of a piece of rubbed glass or sealing-wax held near the apparatus. It is therefore evident that the effects of attenuation of air upon discharge and upon induction are not the same. When attenuation has commenced and is increasing, the discharge passes more and more rapidly, until it becomes a glow, or according to the old theory of electricity, polarisation becomes more and more readily subverted; but a further attenuation stops the discharge entirely. On the other hand, induction continues, and appears to be in no way lessened by extreme attenuation. These results cannot be accounted for by the old theory that discharge is the consequence of subverted induction.

It farther appears that a radiometer is a most delicate electro-scope. By tilting it until the vanes touch the glass, the interior of the glass may be electrised, and it will then remain for days in that condition. He had performed this operation eight days ago, and the movements of the instrument by light or heat have been thereby wholly checked. Every endeavour has been made to discharge or neutralise the electricity on the glass surface, as, for example, by covering the exterior of the globe with tinfoil and connecting this with the platinum wire, nevertheless the glass remains charged, showing what a perfect insulator a good vacuum is.<sup>1</sup>

The above is a copy of the abstracts in the club book. They are now further published, as some partial notices of them have appeared in foreign journals. W. R. G.

THE NORWEGIAN NORTH SEA EXPEDITION, 1876<sup>2</sup>

II.

Researches relating to the Salt-water Fisheries.

BY the side of the more strictly scientific researches it was also our intention during the expedition, if opportunity offered, to give close attention to all the circumstances that might stand in any connection with or throw any light upon our most important salt-water fisheries. As I already during a series of years had been engaged in the study of our fisheries, the prosecution of these researches was committed to me.

For this reason there was added to our other equipment various fishing apparatus, as hooks and lines for deep-sea fishing, and several sorts of drag-nets with various sizes of mesh. The use of such implements could, as a matter of course, only be reckoned upon in good weather and with a pretty smooth sea, which we, however, had promised ourselves might occur at least now and then during our three months' excursion at the best season of the year. But the state of the weather was unfortunately so utterly unfavourable during our whole expedition that the employment of the apparatus we have referred to was not to be thought of. For the same reason the apparatus for measuring the velocity of the currents, exceedingly important in the first place for the physico-meteorological researches, but also for those with which we are now concerned, could not be brought into use. During the few fine days we had in the course of our expedition we were too near the coast for these researches to have any special interest.

Although the state of the weather thus laid insurmountable obstacles in the way of the researches referred to, I have, however, during our expedition, been able to establish certain facts which, in my opinion, are of no inconsiderable importance in this direction, and will be of great use in guiding us in the continued practical scientific researches concerning our fisheries. It is of these facts that I now proceed to give some details.

It is ascertained by our soundings that off our coast there are several fish-banks of whose existence there was no previous knowledge, and on which a profitable fishery with bank vessels may certainly be carried on during the summer months.

The so-called "Storegg" (great edge) off Romsdal's Amt has been from old times famous for its immeasurable richness in fish, and there has been an obscure tradition that it was not the only point where such fishing could be carried on on a large scale, but that there were to be found similar rich fish banks at many other points far out in the open sea, "were man only fortunate enough to fall upon them." The mystic account of the "Havbro" (sea

<sup>1</sup> Ab tract of two communications by the Hon. Sir William Grove, F.R.S., to the Philosophical Club, May 18 and June 15, 1876.

<sup>2</sup> Who kindly made it for me from my description. — W. R. G.

<sup>1</sup> I may state that the electricity did ultimately become dissipated, but not until several weeks had elapsed. — W. R. G.

<sup>2</sup> By Prof. G. D. Sars. From *Christiania Dagbladet* of January 27. Continued on p. 414.