(wave lengths 5,510 and 5,730) are near to, but *more* refrangible than, well-known emission lines of those elements.

The absorptions produced by the mixtures of vapours plainly offer a wide field for further observation. At present we have not succeeded in observing those produced by mixtures of vapours other than those here recorded; and it seems needful to use tubes of a less fusible material than iron, which, notwithstanding the protection of fire-clay, very quickly gives way at the temperatures we have used.

With regard to those above described, we may observe that there is in the solar spectrum an absorption line, hitherto unaccounted for, closely corresponding to each of them. Thus, on Ångström and Thalèn's map there are dark lines at 6,580 and 6,585, with more or less continuous absorption between them, a broad dark line between 6,474 and 6,475, and a dark line at 5,300. There are also dark lines nearly, if not exactly, coincident with the series of seven bright lines of magnesium above described, which we have not seen strictly reversed. The coincidences of the series of the solar spectrum hitherto observed have, for the most part, been with lines given by dense electric sparks; while it is not improbable that the conditions of temperature, and the admixtures of vapours in the upper part of the solar atmosphere, may resemble much more nearly those in our tubes.

We intend to pursue our observations, using higher temperatures, if we can obtain tubes which will stand under those circumstances.

III. "Preliminary Note on Experiments in Electro Photometry." By Professor James Dewar, F.R.S., Jacksonian Professor University of Cambridge. Received March 26, 1878.

Edmond Becquerel, in the year 1839, opened up a new field of chemical research through the discovery that electric currents may be developed during the production of chemical inter-actions excited by solar agency.

Hunt, in the year 1840, repeated, with many modifications, Becquerel's experiments, and confirmed his results.

Grove, in 1858, examined the influence of light on the polarized electrode, and concluded that the effect of light was simply an augmentation of the chemical action taking place at the surface of the electrodes.

Becquerel, in his well-known work, "La Lumière," published in 1868, gives details regarding the construction of an electro-chemical actinometer formed by coating plates of silver with a thin film of the sub-chloride, and subsequent heating for many hours to a temperature of 150° C.

Egeroff, in 1877, suggested the use of a double apparatus of

Becquerel's form, acting as a differential combination, the plates of silver being coated with iodide instead of chloride.

The modifications of the halogen salts of silver when subjected to the action of light have up to the present time been used most successfully in the production of electric currents, and although mixtures of photographically sensitive salts have been shown by Smee to produce currents of a similar kind, yet no attempt has been made to examine the proper form of instrument required for the general investigation of the electrical actions induced by light on fluid substances.

This subject has occupied my attention for some time, and the completed investigation I hope to present to the Society. In the meantime the following description will give an idea of the method of investigation.

A little consideration shows that the amount of current produced by a definite intensity and quality of light acting during a short period of time on a given sensitive substance in solution, is primarily a function of the nature, form, and position of the poles in the cell relatively to the direction in which the light enters, and the selective absorption, concentration, and conductivity of the fluid.

The diffusive action taking place in such cells complicates the effects and is especially intricate when insoluble substances are formed. In order to simplify the investigation in the first instance, poles that are not chemically acted upon, and a sensitive substance yielding only soluble products on the action of light, were employed. For this purpose platinum poles and chlorous acid or peroxde of chlorine were selected.

The best form of cell had one of the poles made of fine platinum wire fixed as closely as possible to the inner surface where the light enters, the other pole being made of thicker wire placed deeper in the fluid.

As the action is confined to a very fine film where the light enters, the maximum amount of current is obtained when the composition of the fluid is modified deep enough to isolate temporarily the front pole in the modified medium. Under these conditions the formation of local currents is avoided, and the maximum electromotive force obtained.

In cells of this construction the amount of current is independent of the surface of the fluid acted upon by light, so that a mere slit sufficient to expose the front poles acts as efficiently as a larger surface. This prevents the unnecessary exhaustion of material and enables the cell to be made of very small dimensions. By means of such an apparatus the chemical actions of light and their electrical relations may be traced in many new directions.

The amount and direction of the current in the case of chlorous acid is readily modified by the addition of certain salts and acids, and

thus electrical variations may be produced, resembling the effects observed during the action of light on the eye.

Certain modifications taking place in the chlorous acid by exposure to light increase its sensibility, and as a general result it is found that the fluid through these alterations increases in resistance. We have thus an anomalous kind of battery where the available electromotive force increases with the resistance. The addition of neutral substances which increase the resistance without producing new decompositions improves the action of the cell.

Care has to be taken in these experiments to use the same apparatus in a series of comparative experiments, as infinitesimal differences in the contact of the active pole render it difficult to make two instruments giving exactly the same results. Cells have been constructed with two, three, and four poles, and their individual and combined action examined. Quartz surfaces have also been employed instead of glass, thus enabling the chemical opacity of different substances to be determined.

The electrical currents derived through the action of light on definite salts are strong in the case of ferro- and ferri-cyanide of potassium, but remarkably so in the case of nitroprusside of sodium.

Of organic acids the tartrate of uranium is one of the most active. A mixture of selenious acid and sulphurous acid in presence of hydrochloric acid yields strong currents when subjected to light in the form of cell described. The list of substances that may be proved to undergo chemical decomposition by the action of light is very extensive; full details will be found in the completed paper.

IV. "On the Determination of the Scale Value of a Thomson's Quadrant Electrometer used for Registering the Variations in Atmospheric Electricity at the Kew Observatory." By G. M. WHIPPLE, B.Sc., Superintendent of the Kew Observatory. Communicated by ROBERT H. SCOTT, M.A., F.R.S. Received April 3, 1878.

The Meteorological Council, being desirous of discussing the photographic traces produced by their electrograph at the Kew Observatory some time since, requested the Kew Committee to institute a series of experiments, with the view of determining the scale value of the instrument, in order to prepare a suitable scale for measuring the curves.

The Kew Committee, at their meeting in November, entrusted the matter to me, and accordingly, having obtained the loan of a battery of 300 Bunsen cells, some preliminary experiments were made, which