rimental processes employed in his investigation; and points out several circumstances which require to be attended to in order to ensure success.

June 16, 1842.

SIR JOHN W. LUBBOCK, Bart., V.P. and Treas., in the Chair.

The following papers were read, viz.—

1. "On the Action of the Rays of the Solar Spectrum on Vegetable Colours." By Sir John Frederick William Herschel, Bart., K.H., F.R.S.

The author, having prosecuted the inquiry, the first steps of which he communicated in a paper read to the Royal Society in February 1840, relating to the effects of the solar spectrum on the colouring matter of the *Viola tricolor*, and on the resin of guaiacum, relates, in the present paper, the results of an extensive series of similar experiments, both on those substances, and also on a great number of vegetable colours, derived from the petals of flowers, and the leaves of various plants. In the case of the destruction of colour of the preparations of guaiacum, which takes place by the action of heat, as well as by the more refrangible rays of light, he ascertained that although the non-luminous thermic rays produce an effect, in as far as they communicate heat, they are yet incapable of effecting that peculiar chemical change which other rays, much less copiously endowed with heating power, produce in the same experiment. He also found that the discoloration produced by the less refrangible rays is much accelerated by the application of artificial terrestrial heat, whether communicated by conduction or by radiation; while, on the other hand, it is in no degree promoted by the purely thermic rays beyond the spectrum, acting under precisely similar circumstances, and in an equal degree of condensation. The author proceeds to describe, in great detail, the photographic effects produced on papers coloured by various vegetable juices, and afterwards washed with solutions of particular salts; and gives a minute account of the manipulations he employed for the purpose of imparting to paper the greatest degree of sensitiveness to the action of solar light. This action he found to be exceedingly various, both as regards its total intensity and the distribution of the active rays over the spectrum. He observed, however, that the following peculiarities obtain almost universally in the species of action exerted.

First, the action is *positive*; that is to say, light destroys colour, either totally, or leaving a residual tint, on which it has no further, or a very much slower action; thus effecting a sort of chromatic analysis, in which two distinct elements of colour are separated, by destroying the one and leaving the other outstanding. The older the paper, or the tincture with which it is stained, the greater is the amount of this residual tint.

Secondly, the action of the spectrum is confined, or nearly so, to the region of it occupied by the luminous rays, as contra-distinguished both from the so-called chemical rays beyond the violet, (which act with chief energy on argentine compounds, but are here for the most part ineffective,) on the one hand, and on the other, from the thermic rays beyond the red, which appear to be totally ineffective. Indeed, the author has not hitherto met with any instance of the extension of this description of photographic action on vegetable colours beyond, or even quite up to the extreme red.

Besides these, the author also observed that the rays which are effective in destroying a given tint, are, in a great many cases, those whose union produces a colour complementary to the tint destroyed, or at least one belonging to that class of colours to which such complementary tint may be referred. Yellows tending towards orange, for example, are destroyed with more energy by the blue rays; blues by the red, orange and yellow rays; purples and pinks by yellow and green rays. These phenomena may be regarded as separating the luminous rays by a broadly defined line of chemical distinction from the non-luminous; but whether they act *as such*, or in virtue of some peculiar chemical quality of the heat which accompanies them *as heat*, is a point which the author considers his experiments on guaiacum as leaving rather equivocal. In the latter alternative, he observes, chemists must henceforward recognise, in heat from different sources, differences not simply of intensity, but also of quality; that is to say, not merely as regards the strictly chemical changes it is capable of effecting in ingredients subjected to its influence.

One of the most remarkable results of this inquiry has been the discovery of a process, circumstantially described by the author, by which paper washed over with a solution of ammonio-citrate of iron, dried, and then washed over with a solution of ferro-sesquicyanuret of potassium, is rendered capable of receiving with great rapidity a photographic image, which, from being originally faint and sometimes scarcely perceptible, is immediately called forth on being washed over with a neutral solution of gold. The picture does not at once acquire its full intensity, but darkens with great rapidity up to a certain point, when the resulting photograph attains a sharpness and perfection of detail which nothing can surpass. To this process the author applies the name of *Chrysotype*, to recall to mind its analogy with the Calotype process of Mr. Talbot, to which in its general effect it affords so close a parallel.

2. "Experimental Researches on the Elliptic Polarization of Light." By the Rev. Baden Powell, M.A., F.R.S., Savilian Professor of Geometry in the University of Oxford.

This paper contains an experimental investigation of the phenomena of elliptic polarization resulting from the reflexion of polarized light from metallic surfaces, and the theory on which they are explicable; the analytical results being given in a tabular form, and applied to the cases of the experiments themselves.