ing, I add my mite to photographic lore. Professional secrecy I regard as wrong. "There is that scattereth, and yet increaseth." One grain of wheat may produce sheaves, and thousands of shot may be got from a lump of lead.

Collodio-Chloride Process.—Very much depends upon the ivory having a smooth or polished surface. There are various methods of obtaining this. A nice surface can be obtained by rubbing the ivory with a piece of wash-leather, occasionally dipped in putty powder. When polished, immerse the ivory in a thin solution of spirit varnish, and dry gently over a gas stove or before the fire. Any kind of varnish will do that is white and clear. Then prepare the following:—

French gelatine	1 drachm
Water	1 ounce
Loaf sugar	½ drachm.

Coat one side of the varnished ivory (the polished side) by pouring collodion fashion, or with a camel-hair brush. The gelatine solution should be strained through fine muslin, or filtered through cotton wool, until very clear. When dry, coat with collodio-chloride of silver in the dark room; dry, and print deep; wash, either under the tap or in a flat dish. Any old toning bath will do to tone the picture. Fix in a weak solution of hypo; say,—

Hyposulphite of soda	2½ ounces
Water	20 „

Very beautiful pictures can be obtained by the above.

Photo-Diaphanie Process.—The following is interesting, and the results are beautiful, but it is difficult to manage. Procure albuminized transfer paper—that made expressly for photo-diaphanie; float five minutes on—

Nitrate of silver	120 grains
Water	1 ounce.

Print in the sun, if possible, and until the high lights are well covered. The right amount of printing required can only be judged by experience. Wash, and tone in—

Distilled water	10 ounces
Pure chloride of gold	15 grains.

It will take some time to tone. When toned, wash, and immerse the picture in a saturated solution of hyposulphite of soda for five minutes. Now wash in several changes of water until the albumen film upon which the picture is printed loosens itself from the paper. When detached, the film floats on top of the water as a delicate transparency. The polished ivory is now brought under the film in the water, and gently arranged by the fingers. The picture, after coming from the water, is placed between smooth note-paper, inserted in a book, and left until dry.

ON THE MEASUREMENT OF THE LUMINOUS INTENSITY OF LIGHT.

BY WILLIAM CROOKES, F.R.S., ETC.

The measurement of the intensity of a ray of light is a problem the solution of which has been repeatedly attempted, but with less satisfactory results than the endeavours to measure the other radient forces. The problem is susceptible of two divisions—the absolute and the relative measurement of light.

1. Given a luminous beam, we may require to express its intensity by some absolute term having reference to a standard obtained at some previous time, and capable of being reproduced with accuracy at any time in any part of the globe. Possibly two such standards would be necessary, differing greatly in value, so that the space between them might be subdivided into a definite number of equal parts; or the same result might, perhaps, be obtained by the well-known device of varying the apparent intensity of the standard light by increasing and diminishing its distance from the instrument.

2. The standard of comparison, instead of being obtained once for all, like the zero- and boiling-points of a thermometer, may be compared separately at each observation; and the problem then becomes somewhat simplified into the determination of the relative intensities of two sources of light.

The *absolute* method is, of course, the most desirable; but as the preliminary researches and discoveries are yet to be made, before a photometer, analogous to a thermometer in fixity of standard and facility of observation, could be devised, the realisation of an absolute light-measuring method appears somewhat distant. The path to be pursued towards the attainment of this desirable object appears to be indicated in the observations which from time to time have been made by Becquerel, Herschel, Hunt, and others, on the chemical action of the solar rays, and the production thereby of a galvanic current, capable of measurement on a delicate galvanometer, by appropriate arrangements of metallic plates and chemical baths connected with the ends of the galvanometer wires.

Many so-called photometers have been devised by which the chemical action of the rays at the most refrangible end of the spectrum have been measured, and the chemical intensity of light tabulated by appropriate methods; and within the last few years Professors Bunsen and Roscoe have contrived a perfect chemical photometer, based upon the action of the chemical rays of light on a gaseous mixture of chlorine and hydrogen, causing them to combine with formation of hydrochloric acid.

But the measurement of the chemical action of a beam of light is as distinct from photometry proper, as is the thermometric registration of the heat rays constituting the other end of the spectrum. What we want is a method of measuring the intensity of those rays which are situated at the intermediate parts of the spectrum, and produce in the eye the sensation of light and colour; and, as previously suggested, there is a reasonable presumption that further researches may place us in possession of a photometric method based upon the chemical action of the *luminous* rays of light.

The rays which effect an ordinary photographic sensitive surface are so constantly spoken of and thought about as the ultra-violet invisible rays, that it is apt to be forgotten that some of the highly luminous rays of light are capable of exerting chemical action. Fifteen years ago* the writer was engaged in some investigations on the chemical action of light, and he succeeded in producing all the ordinary phenomena of photography, even to the production of good photographs in the camera, by purely luminous rays of light, free from any admixture with the violet and invisible rays. When the solar spectrum, of sufficient purity to show the principal fixed lines, is projected for a few seconds on to a sensitive film of iodide of silver, and the latent image then developed, the action is seen to extend from about the fixed line G to a considerable distance into the ultra-violet invisible rays. When the same experiment was repeated with a sensitive surface of bromide of silver instead of iodide of silver, the result of the development of the latent image showed that in this case the action commenced at about the fixed line *b*, and extended, as in the case of the iodide of silver, far beyond the violet. A transparent cell, with parallel glass sides, one inch across, was filled with a solution of 25 parts of sulphate of quinine to 100 parts of dilute sulphuric acid; this was placed across the path of the rays of light, and photographs of the spectrum were again taken on iodide of silver and on bromide of silver, the arrangements in all cases being identical with those in the first cited experiments, with the exception of the interposition of the quinine screen. The action of the sulphate of quinine upon a ray of light is peculiar; to the eye it scarcely appears to have any action at all, but it is absolutely opaque to the ultra-violet, so-called chemical rays, and thus limits the photographic action on the bromide and iodide of silver to the purely luminous rays. On developing the latent images it was now found that the action on iodide of silver was confined to a very narrow line of rays, close to the fixed line G, and in the case of bromide of silver to the space between *b* and G. Designating the spaces of action by colours instead of fixed lines, it was thus proved that, behind a screen of sulphate of quinine, iodide of silver was affected only by the luminous rays about the centre of the indigo portion of the spectrum, whilst bromide of silver was affected by the green, blue, and some of the indigo rays.

It is very likely that a continuance of these experiments would lead to the construction of a photometer capable of measuring the luminous rays; for although bromide of silver behind quinine is not affected by the red or yellow rays, still it is by the green and blue; and as the proportion of red, yellow, green, and blue rays is always invariable in white light (or the light would not be white, but coloured), a method of measuring

* *The Journal of the Photographic Society*, vol. I.