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THE LANTERN—SOME OF ITS USES.

THE optical lantern affords an example of what may be termed spontaneous scientific development. Its genus was the magic lantern, of nursery fame. But the new instrument has so far outgrown the modest proportions of its prototype as to render the task of tracing the kinship a matter of difficulty. Light, lens, and lantern have been so combined and perfected as to raise the ancient toy to a first-class rank as an optical instrument. It has, indeed, taken a place so important that it would be impossible to assign a limit to its usefulness. It alike unfolds the wonders of the spectroscope, microscope, and camera. When November fogs have blotted out all things urbane, the photographer seeks solace in his lantern. Its lime-light becomes his sun, while its perfectly-actinotized lens enlarges his views and increases his returns. Time would frequently lie fallow on his hands were it not for his lantern.

Our immediate concern is to point out how professionals and amateurs may avail themselves of the power thus placed at their disposal. When a negative awaits enlargement, and the solar rays are not forthcoming, it by no means follows that business should come to a dead lock. To begin with, a fairly good negative is required, such as shall produce an available transparency. To an expert this is as palpable as the axiom: "Things that are equal to the same thing are equal to one another." But how should he go to work about the transparency? He longs for sunlight to yield the delicate gradations of the carbon print, and in his extremity falls back upon a gelatino-bromo-iodide plate — bromo-iodide in preference to bromide, since the former produces an undoubted impression, and, under proper treatment, a transparency altogether suitable for enlargement.

It is not wise to use a rapid plate, but it is essential that the bromo-iodide of silver should exist in a fine state of division. This is important, and is best composed when emulsification has not been unduly prolonged, and when it has not been effected in too weak a solution of gelatine. Most of the well-known makers may be trusted to supply plates in every respect suitable.

The impression should, for convenience, be printed by contact in an ordinary camera slide, and by gas or lamp light. Should the plates prove uneven, and contact imperfect, a sharp impression may be obtained by exposure to the direct rays of the lantern. By this means a fully-exposed transparency may be taken in a few seconds. In the matter of development, as well as duration of exposure, experience must here guide, as no rules can be laid down in the absence of the light, plate, and negative.

This much may be said, however: a weak solution of alkaline pyrogallic will confer softness and delicacy, if they exist in the negative; whereas a strong solution has an opposite effect. A full exposure and strong solution will yield a vigorous impression.

A lantern with a four-inch condenser, fitted with lime or magnesium light, will afford ample illumination for enlargement from carte up to life-size. In focussing, a flat sheet of white cardboard may be used as a screen, having the dimensions of the enlargement inscribed in black lines. The condensing lens should be larger than the transparency, so as to ensure uniform illumination over the entire field. The objective may be any sort, provided it be achromatised and stopped down, so as to present a well-defined image on the cardboard. A wet collodion plate, well drained of surface silver, may now take the place of the focussing screen, receive the impression, and be developed in the ordinary way, and intensified at will.

"Why not a dry plate?" some of our readers may say; and we repeat, Why not? First get—or, better still, make—the dry plate large enough, and such as shall give the same vigour as the wet plate, and the difficulty vanishes. Assuming that a dry plate has been prepared, one or two small ones should be coated at the same time, and with the same material. These may be used for a preliminary exposure, so as to make certain of the film when dealing with the large one.

Passing on to another phase of lantern work, we open up a prospect of pleasant evenings to the amateur microscopist. We have a notion, perhaps mistaken, that microscopists are unlike their fellow men; they seem to betake themselves to the microscopic world in which they dwell, and find friends more congenial than the human. If they would take us with them now and again, show us the wonders in which they revel, their reward would be certain. When they have bagged a fine "diatom," or trapped some special "infusoria," let them photograph the specimen or group, and serve up the delicacy on a gelatine plate in the lecture room. It is done, but not so well or so frequently as it might be. There are myriads of microscopic objects whose surpassing beauty might be unfolded to the multitude by means of photography and the lantern.

There are simple methods by which the object glass of the microscope may become the lens of the camera. We will here indicate in outline how the two instruments may be so combined as to enable the amateur to prepare microscopic enlargements for the lantern. The operations of taking the negative and making the lantern slide are managed with gelatine dry plates.

Supposing the operator has a simple quarter-plate camera and a microscope, they should be united by withdrawing the eyepiece of the microscope, and introducing the tube of the instrument into the front aperture of the camera. For this purpose a temporary front may be fixed to the camera, pierced so as to fit the body of the microscope, and to exclude light. The stand of the microscope is then turned back to its fullest extent, so as to support the body in a horizontal position when the instruments are placed upon a table.

The body of the microscope should now be adjusted so as to project at right angles to the focussing screen of the camera. Adapt a low-powered object glass, and having placed lamp, adjust object on the stage. The reflector having been brought into operation, and the field properly illuminated, the enlarged image will be seen on the ground-glass screen of the camera, when it must be carefully focussed. The dimension of the image may, of course, be regulated at will by increasing distance between lens and focusing-screen, and the decreasing distance between lens and object.

When the image appears sharply defined from centre to edge of field, we arrive at the most important part of the process—taking the photograph. The dark slide of the camera is charged with a gelatine dry plate. The plate must be manipulated throughout under an inactinic red light (see instructions supplied on commercial plate boxes). The slide with plate may now take the place of the focusing-screen. When all is ready, the front of the slide is drawn up, the image falls upon the plate, and is there impressed.