Report of the Ninth Meeting of the British Association for the Advancement of Science; held at Birmingham in August 1839 (London: John Murray, 1840).

(Reports of the Math and Physics Section, pp. 3-5)

Remarks on M. Daguerre's Photogenic Process.

By Fox TALBOT, *Esq., F.R.S.*

The first part of M. Daguerre's process consists in exposing a silver plate to the vapour of iodine, by which it becomes covered with a stratum of iodide of silver, which is sensitive to light. Mr. Talbot stated that this fact had been known to him for some time, and that it formed the basis of one of the most curious of optical phenomena, which, as it did not appear to have been observed by M. Daguerre, he would describe to the meeting. Place a small particle of iodine, the size of a pin's head, on a plate of silver, or on a piece of silver-leaf spread on glass. Warm it very gently, and you will shortly see the particle become surrounded with a number of coloured rings, whose tints resemble those of Newton's rings. Now, if these coloured rings are brought into the light, a most singular phenomenon takes place; for the rings prove to be sensitive to the light, and their colours change, and after the lapse of a short time their original appearance is quite gone, and a new set of colours have arisen to occupy their places. These new colours are altogether unusual ones; they do not resemble anything in Newton's scale, but seem to conform to a system of their own. For instance, the first tw[r]o colours are, *deep olive green*, and *deep blue inclining to black*, which is quite unlike the commencement of Newton's scale. It will be understood that the outermost ring is here accounted the first, being due to the thinnest stratum of iodide of silver, furthest from the central particle. The number of rings visible is sometimes considerable. In the centre of all, the silver-leaf becomes white and semi-transparent, like ivory. This white spot, when heated, turns yellow, again recovering its whiteness when cold: from which it is inferred to consist of iodide of silver in a perfect state. The coloured rings seem to consist of iodide of silver in various stages of development. They have a further singular property, which, however, has not been sufficiently examined into. It is as follows: It is well known that gold-leaf is transparent, transmitting a bluish green light; but no other metal has been described as possessing coloured transparency. These rings of iodide of silver, however, possess it, being slightly transparent, and transmitting light of different

colours. In order to see this, a small portion of the film should be isolated, which is best done by viewing it through a microscope. Mr. Talbot said, that he had considered the possibility of applying a silver plate thus combined with iodine to the purpose of photogenic drawing, but he had laid it aside as insufficient for that purpose, on account of its sensitiveness appearing to be much inferior to that of paper spread with chloride of silver, and therefore in an equal time it takes a much feebler impression. Now, however, M. Daguerre has disclosed the remarkable fact, that this feeble impression can be increased, brought out, and strengthened, at a subsequent time, by exposing the plate to the vapour of mercury. Another experiment was then related, in which a particle of iodine was caused to diffuse its vapour over a surface of mercury. In order to this, a copper plate was spread over with nitrate of mercury, and then rubbed very bright, and placed in a closed box along with a small cup containing iodine. The result was, a formation of Newton's rings of the greatest splendour and of a large size. But they did not appear to be in any degree sensitive to light.

The next point of M. Daguerre's process is, the exposure of the picture to the vapour of mercury; and this is by far the most enigmatical part of the whole process. For, he states that if you wish to view the picture in the usual manner, that is, vertically, you must hold the plate inclined to the vapour at an angle of 45°, and *vice versa.* Now this is something altogether extraordinary; for who ever heard of masses of vapour possessing determinate *sides,* so as to be capable of being presented to an object at a given angle? From the hasty consideration which he had been able as yet to give to it, his first impression was, that this fact bore a certain analogy to some others which he would mention. If a piece of silver-leaf is exposed to the vapour of iodine, however uniform the tension of the vapour may be, yet it does not combine uniformly with the metal, but the combination *commences* at the edge of the leaf and spreads inwards, as is manifested by the formation of successive bands of colour parallel to the edge. This is not peculiar to silver and iodine, but occurs when other metals are exposed to other vapours: not always with entire regularity, but there is a tendency to combine in that way. A possible explanation is, that this is due to the powerful electrical effect which the sharp edges and points of bodies are known to possess; in fact, that electricity is either the cause or the attending consequence of the combination of vapour with a metallic body. Again, if a minute particle of iodine is laid on a steel plate, it liquefies, forming an iodide of iron, and a dew spreads around the central point. Now, if this dew is examined in a good microscope, its globules are seen not to be arranged casually, but in straight lines along the edges of the minute striæ or scratches which the microscope detects even on polished surfaces. This is another proof how vapour is attracted by sharp edges, for the sides of those striae are such. Whether or not these facts had

any relation to that observed by M. Daguerre, of the action of vapour at an angle of 4-°, Mr. Talbot did not pretend to say, but thought them worthy of being mentioned to the Section.

He observed, that it had been repeatedly stated in the *Comptes rendus* of the French Institute, that M. Daguerre's substance was greatly superior in sensitiveness to the English photogenic paper. It now, however, appeared that this was to be understood in a peculiar sense, inasmuch as the first or direct effect of the French method was very little apparent, and was increased by a subsequent process. This circumstance rendered it difficult to institute a direct experimental comparison between them. If it could be accomplished, he doubted whether M. Daguerre's substance would be found much more sensitive than his. The present degree of sensitiveness of the photogenic paper was stated to be as follows: it will take an impression from a common argand lamp in one minute, which is visible though weak. In ten minutes the impression is a pretty strong one. In full daylight the effect is nearly instantaneous. M. Arago had stated that M. Daguerre had obtained some indications of *colour*. Mr. Talbot thereupon referred to his paper to the Royal Society, read January 1839, and published in the *Athe- nœum* (No. 588), wherein he had stated the same thing. Since then, more considerable effects of colour have been noticed. In copying a coloured print the colours are visible on the photograph, especially the *red,* which is very distinct. Some descriptions of photogenic paper show this more than others; but no means have yet been found of *fixing* those colours, and sunshine reduces them all to an uniformity of mere light and shade. Sir John Herschel has formed images of the solar spectrum, in which the change of colour is seen from end to end of the spectrum, but most clearly at the red end. Mr. Talbot then mentioned a kind of photogenic pictures which afford a very capricious phenomenon. The objects are represented of a reddish colour on a white ground, and the process leaving the pictures in such a state that they are neither *fixed,* nor yet the contrary, but in an intermediate state; that is to say, that when they are exposed to sunshine they neither remain unchanged (as *fixed* pictures would do), nor are they destroyed (as *unfixed* pictures would be); but this singularity occurs, that the white ground remains unaltered, while the colour of the object delineated on it changes from reddish to black with great rapidity, after which no further change occurs. These facts (he thought) serve to illustrate the fertility of the subject, and show the great extent of yet unoccupied ground in this new branch of science.