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PHOTOGENIC DRAWINGS.

PUBLIC attention has been called of late to a mode of drawing said to have been invented at Paris by M. Daguerre, and by which he fixes upon a metallic plate the lights and shadows of a landscape or figure solely by the action of the solar light. The interest thus excited has been increased by the publication of a series of experiments made by our countryman Mr. Talbot, directed towards the same object, and producing nearly similar results. In describing this interesting invention it will be well to commence with the first discoveries made by Mr. Wedgwood about the year 1800, and afterwards extended by Sir Humphry Davy.

The attention of these two eminent chemists was directed to the subject by the extraordinary effect produced by light upon the nitrate of silver, which led them to hope that the purposes of the artist might be assisted by the susceptibility of the metallic oxide. The first experiment was made by Mr. Wedgwood for the purpose of copying paintings upon glass, and was eminently successful; the copy obtained possessing all the figures of the original, in their native shades and colours: it was also in a high degree permanent, so long as it was preserved from the action of the light. The same gentleman discovered that the shadow of an opaque object thrown upon the paper was copied in outline with great correctness; but though both these celebrated chemists were constant and persevering in their endeavours to render the drawing permanent they were entirely unsuccessful; the lighter shades darkening by exposure and thus obliterating the impression.

Their failure in this important object was published with their experiments in the Philosophical Transactions, and both having given up the attempt, their discoveries have since remained unimproved. But in the meanwhile M. Daguerre, it appears, struck by some hints he had received from a friend, has steadily pursued his experiments for the last twenty years, and, having at length attained his object has declared his discoveries and claimed the invention as his own. Full and satisfactory descriptions are promised by M. Arago and two other scientific engineers appointed to report on the subject, and in the interval a slight outline has been given in the French papers, from which the following account is taken.

A polished metallic plate is the substance made use of, and being placed within the apparatus is in a few minutes removed and finished by a slight mechanical operation. The sketch thus produced is in appearance something similar to aquatint, but greatly superior in delicacy; and such is the extraordinary precision of the detail that the most powerful microscope serves but to display the perfection of the copy. The first efforts of the

inventor were directed towards architectural subjects, and a view of the Louvre and Notre Dame are among the most admired of these engravings. In foliage he is less successful, the constant motion in the leaves rendering his landscape confused and unmeaning; and the same objection necessarily applies to all moving objects, which can never be properly delineated without the aid of memory. But in the execution of any stationary subject, buildings, statues, flowers, the leaves of plants, or the bodies of animals, the fac-simile is perfect; and the value of the invention may therefore be easily conceived.

Several eminent artists have examined the designs, and were equally delighted with the precision and delicacy of the representation. Among the sketches exhibited by the projector was a marble bas relief and a plaster imitation; the first glance was sufficient to detect the difference between these two; and in three views of a monument taken in the morning, noon, and evening, the spectators easily distinguished the hours at which they were executed, by the difference of the light, though in the first and last instances, the sun was at an equal altitude.

But perhaps the anatomist or zoologist will derive the greatest advantages from the discovery, the form of the animal being as easily studied from the drawing as from the original, and the most powerful microscopes not having hitherto detected the smallest deficiency in the details. Nor is the invention devoid of interest to the astronomer, for the light of the moon is sufficient to produce the usual results, requiring only additional time for its operations. The following extract from “Le Commerce” is sufficient to substantiate its value in this respect:—“The experiments on the light of Sirius have confirmed the testimony of natural philosophy, and abundantly proved that the stars are bodies of the same nature as the sun; at the request of M. Biot, M. Daguerre has submitted his apparatus to the influence of the light of the moon, and has succeeded in fixing the image of that luminary. We observed that the image had a trail of light something like the tail of a comet, and we ascribed it to the movement of the body during the operation, which is of much longer duration than that by the light of the sun.”

In the spring of 1834 Mr. Talbot began a series of experiments, with the hope of turning to useful account the singular susceptibility evinced by the nitrate of silver when exposed to the rays of a powerful light; but not being acquainted with the researches of former chemists on the subject, he commenced with the same disadvantages which had baffled the skill and perseverance of Sir Humphry Davy. The plan he at first proposed was, to receive a well-defined shadow upon a sheet of paper covered with a solution of nitrate of silver, by which means the part shaded would remain white, while the surrounding portion was blackened by exposure to the light. But he was well aware that the sketch thus obtained would require to be protected from the rays of the sun, and examined only by an artificial light. He had carried these inquiries to some extent, and become possessed of several curious results before he learnt the steps which others had taken to attain the same object; and the decided terms in which Sir Humphry Davy expresses his failure might perhaps have discouraged his less experienced follower, had he not fortunately already conquered the difficulty which had destroyed the hopes of the former chemists.

Mr. Talbot continues:—“In the course of my experiments directed to that end, I have been astonished at the variety of effects which I have found produced by a very limited number of different processes when combined in various ways; and also at the length of time which sometimes elapses before the full effect of these manifests itself with certainty. For I have found that images formed in this manner, which have appeared in good preservation at the end of twelve months from their formation, have nevertheless

somewhat altered during the second year." He was induced from this circumstance to watch more closely the progress of this change, fearing that in process of time all his pictures might be found to deteriorate; this however was not the case, and several have withstood the action of the light for more than five years.

The images obtained by this process are themselves white, but the ground is differently and agreeably coloured; and by slightly varying the proportions, and some trifling details of manipulation, any of the following colours were readily obtained:— light blue, yellow, pink, brown, black, and a dark green nearly approaching to black.

The first objects to which this process was applied were leaves and flowers, which it rendered with extraordinary fidelity, representing even the veins and minute hairs with which they were covered, and which were frequently imperceptible without the aid of a microscope. Mr. Talbot goes on to mention that the following considerations led him to conceive the possibility of discovering a preservative process. Nitrate of silver, which has become darkened by exposure to the light, is no longer the same chemical substance as before; therefore, if chemical reagents be applied to a picture obtained in the manner already mentioned, the darkened parts will be acted upon in a different manner from those which retain their original colour, and after such action they will probably be no longer affected by the rays of the sun, or, at all events, will have no tendency to assimilate by such exposure; and if they remain dissimilar, the picture will continue distinct, and the great difficulty be overcome.

The first trials of the inventor to destroy the susceptibility of the metallic oxide were entirely abortive; but he has at length succeeded to an extent equal to his most sanguine expectations. The paper employed by Mr. Talbot is superfine writing paper: this is dipped into a weak solution of common salt, and dried with a towel till the salt is evenly distributed over the surface: a solution of nitrate of silver is then laid over one side of the paper, and the whole is dried by the heat of the fire. It is however necessary to ascertain by experiment the exact degree of strength requisite in both the ingredients, for if the salt predominates, the sensibility of the paper gradually diminishes, in proportion to this excess, till the effect almost entirely disappears.

In endeavouring to remedy this evil, Mr. Talbot discovered that a renewed application of the nitrate not only obviated the difficulty, but rendered the preparation more sensitive than ever; and by a repetition of the same process the mutability of the paper will increase to such a degree, as to darken of itself without exposure to the light. This shows that the attempt has been carried too far, and the object of the experamentalist must be to approach, without attaining this condition. Having prepared the paper and taken the sketch, the next object is to render it permanent, by destroying the susceptibility of the ingredients for this purpose. Mr. Talbot tried ammonia and several other re-agents with little success, till the iodide of potassium, greatly diluted, gave the desired result: this liquid, when applied to the drawing, produces an iodide of silver, a substance insensible to the action of light. This is the only method of preserving the picture in its original tints, but it requires considerable nicety, and an easier mode is sufficient for ordinary purposes. It consists in immersing the picture in a strong solution of salt, wiping off the superfluous moisture, and drying it by the heat of the fire; on exposure to the sun, the white parts become of a pale lilac, which is permanent and immoveable. Numerous experiments have shown the inventor that the depths of these tints depends on the strength of the solution of salt; he also mentions that those prepared by iodine become a bright yellow under the influence of heat, and regain their original colour on cooling. Without the application of one of these preservatives the image will disappear by the action of the sun; but if

inclosed in a portfolio, will be in no danger of alteration: this, Mr. Talbot remarks, will render it extremely convenient to the traveller, who may take a copy of any object he desires, and apply the preservative at his leisure. In this respect Mr. Talbot's system is greatly superior to that of M. Daguerre, since it would be scarcely possible for a traveller to burden himself with a number of metallic plates, which in the latter process are indispensable.

An advantage of equal importance exists in the rapidity with which Mr. Talbot's pictures are executed, for which half-a-second is considered sufficient; a circumstance that gives him a better chance of success in delineating animals or foliage; and although our countryman has not thought it necessary to adorn his invention with his own name, nor to keep it a secret till he could sell it to advantage, his claim to originality is equal to M. Daguerre's, and can only be rivalled by that of Mr. Wedgwood, the real discoverer and originator of the art.

Since the publication of the above discoveries, numerous candidates have appeared in the field, all claiming the palm of originality, while philosophers of every grade and country have eagerly pursued the investigation of the subject. The first we shall notice is M. Niepce, who claims priority even over M. Daguerre; and the account he publishes, if correct, will undoubtedly determine the question in his favour. A letter from M. Bauer is the principal evidence for M. Niepce, who it appears mentioned his discovery to this gentleman in the year 1827, while on a visit at Kew, and by the advice of his friend he drew up a memoir on the subject, and caused it to be forwarded to the Royal Society. This document was however returned, it being contrary to the rules of the Association to receive accounts of scientific discoveries unless they detailed the process employed. M. Niepce shortly afterwards returned to France, having presented to his friend several specimens of the newly discovered art, which are still in the possession of M. Bauer. The pictures taken are of two kinds, copies from engravings, and copies from nature; the best of the former is in the possession of Mr. Cussel, and is considered nearly equal to those of M. Daguerre, with suitable allowance for twelve years' exposure; the specimen taken from nature is however by no means so successful, and is considered inferior to the earliest attempts of his countryman. There can be little doubt that the principle of both processes is precisely the same, though greatly improved by diligent experiments, the material employed in each being a metallic plate, apparently covered with a transparent varnish; but whether intended to receive or to fix the impression is not at present made public. We now come to a statement of M. Bauer which, if not founded on error, will raise the invention of Niepce far above those of both his rivals; he distinctly asserts that he possessed copies of engravings produced solely by the action of light, which were capable of being multiplied in the same manner as an ordinary copper-plate; if this be the case, the greatest secret still remains unknown, even to M. Daguerre himself. It is much to be regretted that M. Niepce did not at once publish his extraordinary discovery, with a full detail of the process employed, as he would then have retained the indisputable right to the merit of the invention, but having preserved the secret so long, and the process being in every respect so different, we cannot see that it in any way interferes with the position of Mr. Talbot.

We must leave this question and now proceed to analyze the claims of two of our countrymen, Messrs. Havell and Wellmore [Willmore—ed.], who are said to have introduced an important addition to the process pursued by Mr. Talbot, a full description of which is contained in a letter to the editor of the Literary Gazette. The first attempt of this gentleman was directed towards an etching, by Rembrandt, of an old man reading,

and the result was a reversed fac-simile;—a negro face surmounted by locks of silver; the disappointed artist discovered that a second transfer entirely destroyed the spirit of the picture. To remedy this evil he had recourse to a new process, by which this defect was indeed removed, but the great merit of the art, namely, its self-acting power, was lost. A thin plate of glass was laid on the subject to be copied, upon which the high lights were painted with a mixture of white lead and copal varnish, the proportion of varnish being increased for the darker shading of the picture. The next day Mr. Havell removed the white ground with the point of a penknife, to represent the dark etched lines of the original, and a sheet of prepared paper having been placed behind the glass and thus exposed to the light, a tolerable impression was produced; the half tints had however absorbed too much of the violet ray, an imperfection which was remedied by painting the parts over with black on the other side of the glass; if allowed to remain too long exposed to the sun's rays the middle tints became too dark and destroyed the effect of the sketch; about ten minutes in a powerful sun was considered sufficient. Another method employed by Mr. Havell was to spread a ground composed of white lead, sugar of lead, and copal varnish, over a plate of glass, and having transferred a pencil drawing in the usual manner, to work it out with the etching point till it bore the appearance of a spirited ink drawing, or in the hands of an engraver a highly finished engraving. The above process Mr. Havell made public under the impression that it had been hitherto overlooked, but Mr. Talbot hearing that he was about to apply for a patent laid claim to the improvement as his own, and not only pointed out some parts of his former memorial where it was distinctly mentioned, but also produced several drawings made precisely in the manner described; he has also laid before the Royal Society a new method of preparing the sensitive paper, which consists in immersing it in a solution of nitrate of silver, and, afterwards washing it with bromite of potassium the nitrate of silver is again applied, the preparation being dried by the fire between each operation; the paper thus treated is extremely sensitive, changing with the feeblest daylight, first to a bluish green, then to olive green, and finally to black.

A letter to Mr. Talbot from his friend Mr. Biot has also been published, and contains many interesting experiments. After commenting upon the value of the discovery, he continues—"The interest with which I viewed this circumstance engaged me to make some experiments upon your preparation, in order to vary its application to the researches in which I am occupied. First—I wished to know whether the change of colour was in any degree influenced by the paper itself; I therefore spread the substance on a piece of white unglazed porcelain instead of paper, taking care to operate by night, and drying it each time at the fire, as you say, I thus obtained a dry solid coating upon the porcelain, which I shut up in a dark place until the morning. In the morning I took it out and found it of a pale sulphur yellow colour; I then presented it to the daylight at an open window looking north, the Weather was then very cloudy, yet no sooner had I so presented it than already it was turned green, and soon afterwards it became black. I then wished to know whether the preparation would succeed equally well if not dried at the fire; I therefore, in a darkened room, mixed the aqueous solution of bromide of potassium with that of nitrate of silver, a precipitate fell which I spread on a porcelain plate and left it to dry in the dark; the next day I wrapped it in several folds of paper, and brought it into another room to show it to a friend; but having taken off the covers in a dark corner of the room in order to exhibit the original colour, pale lemon yellow, instantly we saw its tint become green, and I had hardly time to present it to a window opening to the north before its colour had passed to dark olive green, after which it almost immediately became nearly

black. I do not think it possible to find any substance more sensitive to light." Had M. Daguerre or M. Niepce published their experiments at the commencement, Mr. Talbot would have appeared merely as an improver of a foreign discovery.

We must notice here that, by possibility, this art may not be altogether unknown to jugglers in India. It is many years since an offer was made, in our presence, by one of them, to show any gentleman his portrait taken by a single look alone. The master of the house, however, deeming the proposal an insult on the credulity of the company, ordered the man of science to be instantly expelled with the rattan.

[End of text.]

EDITOR'S NOTES:

The text also was reprinted (with two other related essays) in *American Journal of Science and Arts* (New Haven) 37:1 (July 1839): 169–175.
