

## PHOTOGRAPHY AT THE EXHIBITION OF VIENNA.

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BY W. J. STILLMAN.

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## GROUP XII.

Amongst the industrial products collected at Vienna, and which, owing to a bad arrangement of the contributions, were deprived of an adequate presentation, perhaps the least cared for, considering the prominence which it has attained of late in many scientific and industrial undertakings, was photography. Its position, half-way between art and manufacture, is one which explains, perhaps, this want of attention; for art had its separate quarters, and photography, too much dependent on the capacities of individuals and unadapted to the arrangements of the great industries, had no collective interest to be looked after or national advantage to be subserved by bringing it prominently before the public. Yet it is safe to say, that if due regard had been given to the immense range of subjects of absorbing attraction and scientific value, over which it has extended itself since the last great international industrial gathering, and the proper steps had been taken to bring together a complete collection of its products, the world would have been astonished at the results which have grown out of what, within the memory of the present generation, was only a curious phenomenon of the action of light upon certain chemical products, of scarcely more promise of commercial value than the spectrum analysis has to-day. It not only has become the constant and indispensable solace of domestic affections,—almost as wide-spread and cheap as light itself,—and brought reminders and lessons of art to the homes of the millions, but it has become the infallible record of almost all physical phenomena, the touchstone of astronom-

ical observation, and the main reliance of physico-chemical research. It promises to replace all the more tedious processes connected with pictorial reproduction by mechanical ones, at once immeasurably more rapid and more exact; and to spread the cultivation of the plastic arts to an extent certainly never dreamed of by the most devoted enthusiast fifty years ago.

In reviewing the province assigned to me, it seems fitting to divide the Report into two parts,—one on the negative or primary reproduction in which the image is first secured; and the other on the positive or multiplying methods, in which will be included all the new printing processes. The quest of that philosopher's stone of photography,—the representation of nature in her actual colors,—so ardently pursued at one time, seems to have been in a great measure lost sight of; and, without assuming such a knowledge of chemistry as should pretend to recognize a limitation of its resources, it may be permitted at least to say, that until new conditions, as yet undreamed of, are developed, this quest must remain a fruitless one. The simple fact that the photographic effect is produced, not by the optical, but by the chemical action of light, would seem to debar us from entertaining any hope that color, which belongs to the former, should ever become an attribute to the latter, in the sense demanded by photography, and the equally unquestionable fact that the sub-chloride of silver, in course of reduction under the action of light transmitted through colored media, takes, under certain circumstances, somewhat of the color of those media (which is the only phenomenon so far recorded tending to chromo-photography), does not necessarily imply the possibility of a sequential reproduction of colors, as this solitary phenomenon may be (and probably is) merely a case of coincident iridescence, the sub-chloride passing through the different primary tints in the course of its further reduction; which conclusion is practically established by the final reduction of the chloride to the usual monochrome by the continual action of light, and the impossibility of rendering permanent the tints so obtained. So far, chemistry has given no hint of a process for practically reproducing color; and the phenomena of this class which have been produced are, by their fugitive



character, not subjects for an exhibition, much less of commercial value.

The original daguerreotype was a positive photograph, incapable of multiplication; but the law of the reduction of silver, under the joint action of light and a developing agent, having once been made known, practical investigators soon worked out the bases of the negative processes now in use,—the first being the paper process, introduced by Talbot, and now abandoned except by amateurs, who find its pictorial advantages and practical convenience more than a compensation for the greater delicacy and perfection of the detail which are obtained by the processes which employ a film of the sensitive salts spread on glass. There was no contribution of works by the original paper process in the Exhibition; and there seems never to have been any serious attempt made to produce a satisfactory substitute for the fragile glass,—the precarious foundation of all our present effective processes. With the introduction of the collodion process and the modifications which the experience of photographers have found advisable, progress seems to have stopped, so that most of the work shown at Vienna is produced by the wet collodion negative process, substantially as introduced by Archer in England about a quarter of a century ago. In the many and useful modifications of it, the English photographers, amateur and professional, have distinguished themselves beyond all rivalry; and especially in the perfection of dry collodion processes, which, for all out-of-door work, where portability is an advantage, for tourists' uses and for architects and amateurs' work generally, have become a notable feature in the status of the art. All who have attempted the manipulations of photography under the difficulties which portable or improvised dark rooms present, with all the chances and disasters of broken apparatus,—chemicals poured over delicate mechanism and mixed in waste,—or who, under urgent need of working at inaccessible stations, have found how cumbersome is the most portable apparatus for the working of the ordinary process, will appreciate the desirability of a modification of it, by which sensitive films of equal rapidity, capable of indefinite preservation and always ready for use without the necessity of apparatus either for prepara-

tion or development, will be glad to know that these conditions are very nearly attained, and that the most difficult part, technically, of the photographic art bids fair to become superseded by trustworthy manufacture for commercial purposes.

Several manufacturers in England now send sensitive plates all over the world, and one of them especially, the "Liverpool Dry Plate Company," produces them of so great certainty and rapidity of action, that for ordinary uses, and especially for landscape work, they are likely to supersede the common methods of working; while another, a photographer of wide repute, Colonel Stuart Wortley, has perfected a modification of the same dry process, by which plates of great rapidity are produced, and, like the Liverpool plates, may be kept indefinitely.

A scientific expedition starting on a three years' voyage might carry with it plates enough to suffice for all its purposes, and carry on its operations without any of the inconveniences which travelling photographic laboratories cause.

The advance of commercial activity in this direction is so great, that since the Exhibition has been closed a new facility for scientific photography has been added to its former products by the Liverpool Dry Plate Company, in a preparation containing in a single solution all the elements necessary for photographic results, which retains for an indefinite time all its qualities, and needs only to be applied to the glass and dried to be ready for use.

With the introduction of a successful substitute for glass the commercial preparation of sensitive films, for photographic uses, will become so satisfactory that for all but portrait or other localized practitioners, they will supersede the preparations of the photographers themselves. The importance of these developments of photographic industry to all kinds of scientific research, as well as all branches of pictorial reproduction, cannot fail to strike every one, and there is good reason to hope that the whole of the desiderata above mentioned will soon be attained.

In the English department of the Exhibition there were some frames of landscapes of a very high excellence, and some large heads by Colonel Wortley, all on dry plates; and



since the opening of the Exhibition a still farther improvement, in the substitution of gelatine for collodion in the preparation of dry plates, has been announced, and presented with such success as to leave no doubt of its finally superseding collodion for this purpose.

In the important department of the apparatus requisite for photography, there was little to represent the actual state of either optical construction or the portable appliances which have been carried to so high a perfection, especially in England. A single case of the work of George Hare, of London, is beyond any question the finest display of common workmanship and general good construction that was sent, and fully sustained the maker's reputation as the manufacturer of the best apparatus of this kind in the world; but from the English opticians now at the head of the trade, even considering the great continental celebrities, Steinheil and Voightländer, there is no contribution. No representation of photographic optics could to-day be given which would not put in the first place the admirable rectilinear lenses of Ross and Dallmeyer, of London, which, especially for scientific purposes, where correction to perfect rectilinearity of the photographic image is necessary, are incomparable; and have long been recognized as such even by the continental photographers, who are by their aid enabled to give architectural views free from the curvilinear distortions formerly always present in this class of work, and which were consequent on the use of the old view lenses.

A complete apparatus for microscopic photography, by Haack of Vienna, was a most admirable piece of construction, and showed proofs of enlargements to four hundred diameters, with admirable definition and flatness of field.

But in that which is after all the immediate object of the most arduous study on the part of investigators in photographic reproduction, the printing processes, properly so called, that is, those in which the image is transferred to a surface capable of producing impressions as from a block, stone or plate, the Exhibition contained but little, though that little is full of magnificent promise.

While all the negative processes by which the first impression from nature is received depend on the action of light

on the haloid salts of silver,—an action so subtle and imperceptible as to require the supplementary force of a reducing agent, or developer, and the ordinary silver prints being the result of the same agency without this supplementary action, making the reproduction of the impression dependent on the uncertain condition of weather,—the printing processes depend on a preliminary action of light on a film of gelatine, which, when impregnated with a chromate, has the fortunate faculty of being rendered insoluble by the influence of light, and the copies are then produced by a merely mechanical action. The gelatine film, charged with the bichromate, is exposed to light under a negative; and as the ray penetrates more readily through the shadows or transparent portions of the negative, these become indurated and repel the action of water. On this fact, employed in several ways, the different processes are based; one employing the film in its unequally softened condition, in which the portions imbued with water repel the printing ink, and those parts which were protected by the denser portions of the negative become the lights of the print, the indurated portions receiving the ink in proportion to their induration. This, with various provisions for the adhesion of the gelatine film to the basis, is the Albert-type, of which some examples are contributed to the Exhibition by Herr Albert, of a size hitherto unknown in such perfection of workmanship, some of them being a metre in length, portraits in life-size, copies of pictures and drawings in graduated tints, in which the reproduction is simply incapable of being bettered for large prints.

This gelatine film, exposed to light, as indicated, and then subjected to the action of moderately warm water, has the unindurated portions washed away, and, on drying, becomes a horny pellicle, with the subject in relief, and may be separated from the support used in printing and kept between the leaves of a book and used again as often as required, being in effect insoluble and indestructible, except by application of a force not required in printing. In this state it is utilized by Mr. Woodbury in his photo-relief process (better known by the name of its inventor, as the Woodbury-type), by producing, under hydraulic pressure, a relief in soft metal, which, filled with a transparent gelatinous ink and put



under gentle pressure on paper, produces a print equal in every respect to the best produced by any photographic process, with a texture and gradation absolutely more delicate than the most carefully printed silver prints under any conditions whatever. This process is the solution of one of the most interesting practical problems ever developed in photographic industry, and the results, within the limits of size dependent on the hydraulic pressure available, are, for certainty, equality of result, and beauty, quite unrivalled in pictorial art. The limitations of hydraulic power have, so far, kept these prints down to the size of twelve by ten inches,—not, of course, to be judged with the immense prints of Herr Albert,—but they have the advantage over those of all other processes, that they give gradation without any grain; and perfect uniformity of result,—a point not yet attained by any of the rival processes, in most of which the perfect result is exceptional. The action of the Woodbury press is so equal and certain that, once the metal intaglio is obtained, the merest tyro can print more rapidly than the most experienced printers can produce ordinary lithographs. This structureless film of tinted gelatine, when put on glass, forms transparencies, which, for the magic-lantern, for reproduction of the negative, for scientific purposes, for the production of enlarged diagrams, etc., is almost without limit in the power of enlargement; and its advantages over the granular film of the common collodion transparency, or even the albumen film prepared with silver, is evident at once on seeing the enlarged image.

The delicate relief of gelatine, when dried, is subjected to the pressure of several tons per square inch, and is completely imbedded in the soft metal, without the slightest injury from the pressure, and may be used again and again to produce duplicate moulds. This film, though, as will be understood, relieved only on one side, may be reversed, and the relief forced, through itself, to appear on the previously plane side, without destroying its value or injuring its detail,—a quality which, it will be seen, adapts the process to negatives, taken either direct or reversed.

The Woodbury-type is, of all forms of the mechanical production of photographic prints, the most fitting for book

illustrations, with the exception of such illustrations as require a considerable extent of white ungraduated surface, on which the gelatinous ink will leave marks,—the result of its imperfect expulsion from the two plane surfaces in contact. In reproduction of drawings, therefore, and wherever broad, white masses are included, the Albert-type and its analogous process, the Helio-type, have a decided advantage, as well as in the almost unlimited size of which they may be produced. The Helio-type differs in several important particulars from the Albert-type, or its close relative, Lichtdruck. The latter have a gelatine, or gelatine and albumen, film supported on a plate of glass; the former employs a film entirely detached, and only temporarily laid on a metallic or other basis while being printed from. The sheet of gelatine which is employed for the printing material in the Albert-type receives the image on its *outer* surface, which is necessarily more liable to accidental imperfections than the under surface or that which is formed by the glass on which the gelatine is spread, which is employed in the Helio-type; and the flexibility of the detached film is of the highest value in receiving the impressions from the negative, insuring perfect contact between the negative and sensitive film, scarcely to be obtained when the latter is on a rigid material.

This, and the analogous processes, are in comparative infancy yet; but we have already results produced by them, which, in certain directions, are hardly capable of very material improvement; and, when the conditions of certainty and excellence are absolutely determined, we may expect to see the splendid results of photography made more accessible than those of any other form of pictorial reproduction.

The accidental employment of a granular pigment in the gelatine used for making the relief in the Woodbury process led to the discovery that in this way a grain may be produced similar to that of a mezzotint engraving; and this was ingeniously developed by Mr. Woodbury into an admirable substitute for that kind of engraving. The film of gelatine, which was exposed under the negative, was prepared with a granular substance of various degrees of fineness, so arranged that the coarser particles are on the side to be placed opposite the negative, and the finest next to it; which is readily



effected by allowing the granular substance to deposit gradually in the fluid gelatine, so that, when the film has been exposed, the induration caused by light penetrates to the coarser deposit, which elsewhere is washed away, leaving the coarseness of grain in the result proportional to the depth of induration, *i. e.*, to the transparency of the negative; and, as this is in the shadows, of course the photo-engraving plate produced by electro-deposit, will have the desired granulation more strongly marked as the shadows are deeper.

The results of this process, in the hands of a French firm who are working it commercially, rival in effect and far surpass in fidelity the best mezzotint engraving.

The chromatinized gelatine, charged with such color as may be desired, becomes also the basis of a light-printing process, long known as the Autotype, in which a tissue prepared for the purpose is exposed to the action of light under the negative; and then, being immersed in tepid water, the unindurated gelatine is washed away, carrying the color with it and leaving the protected parts of the tissue thin and colorless in proportion to their degree of protection.

Any tint or pigment may be employed. This process, however, from the fact of its continual dependence on light, each impression being produced from the negative as in the chloride of silver process of printing, can hardly be expected to maintain a permanent footing beside the mechanical processes. The Autotype Company, however, have developed another admirable use for this gelatine tissue, by preparing it with a strong color and then supporting it by glass instead of paper, so that, on development, it makes a transparency with all the exquisite delicacy of detail and gradation which have been alluded to as belonging to the gelatine film. From this, by an enlarging camera, a new negative is made of any required dimensions, preferably not to exceed eight diameters of the original negative, the enlarged prints thus produced having a charm quite unique; and if the original negative was well calculated for the purpose, with no loss of any of the qualities most desirable in a photograph. By this application of the various facilities drawn from the optical, chemical and mechanical resources of photography, the smallest apparatus which it is desirable to use may be made to

produce results scarcely inferior to those formerly obtained by the ponderous and expensive apparatus in use for the large photographs, which are so much in vogue and so admirable when judiciously executed.

It will not escape attention that, on the one hand, the results of photographic science and art are so cheapened and perfected as to come almost within the cost of the most imperfect manual methods of pictorial reproduction; and on the other, that the processes which are the means of the art have been so far simplified and reduced to the condition of commercial productions, that neither lack of time nor technical training need prevent any person having even a low average of manual dexterity from becoming, for all practical purposes, a successful photographer. There remains one important desideratum, already alluded to (a substitute for glass), with the attainment of which photography can place in the hands of every person of average intelligence and taste, most portable means of making, at an expense of time and trouble quite trivial, representations more accurate than art can produce, of all visible objects which come within the chromatic conditions imposed.

The weight of glass and the liability to fracture of the negatives when finished, have been the great drawbacks to the use of photography in remote and not easily accessible regions; but even with this drawback, a tourist may carry literally in his pockets, photographic apparatus, with dry plates, sufficient to do all the work required in many days, and without exceeding the weight one man could carry on his back, enough of all material required to cross a continent on foot and secure negatives of a small but available size of every object most worthy reproducing, up to several hundreds, and these may be reproduced in a most perfect and superb manner at a cost of less than one cent each to the producers.

Regarded from this point of view it would seem that photography need not go much farther; but we may confidently expect that even this will be inefficiency compared with what will be done when what is now being sought for is attained.

It is to be hoped that the Exhibition about to be held in Philadelphia will not let the opportunity be lost of doing



what Vienna so signally failed in, bringing together and so systematically arranging the results of photography that they can be seen and understood at a view; and we shall see how large a place in the world of industry the last of the arts has made, and how fully it supplements the others; and, highest of all its uses, serves as the link between art and science, the interpreter and aid of both alike, the automatic record of all things, least and greatest, that the sun has looked on and science made known.

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