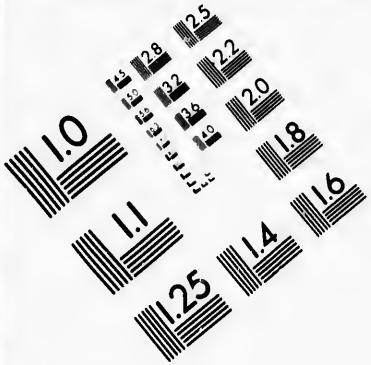

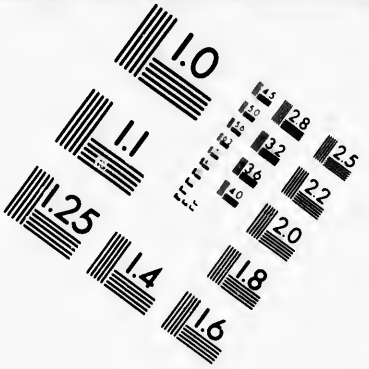

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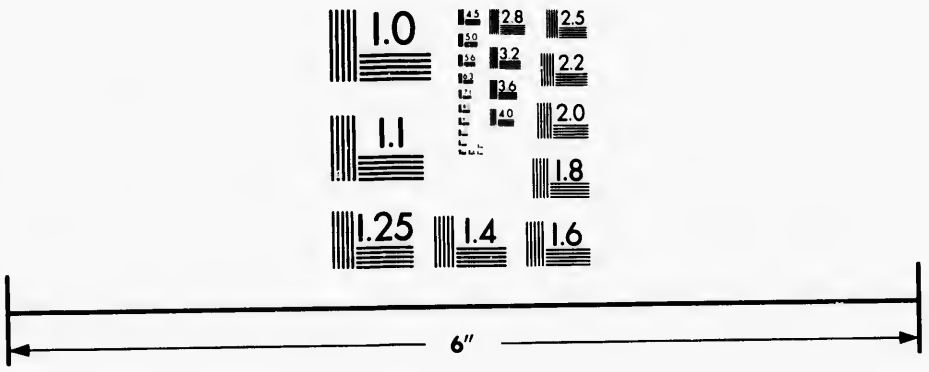

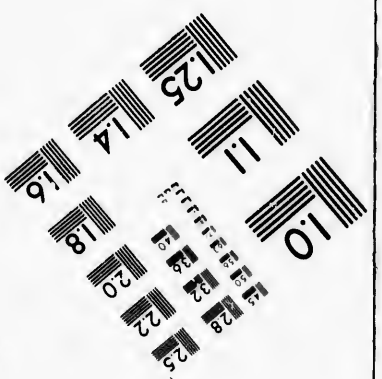

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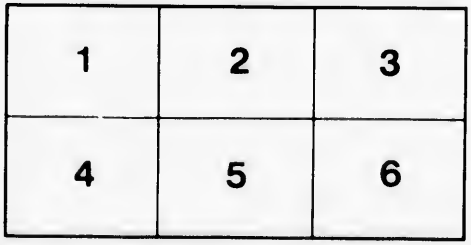

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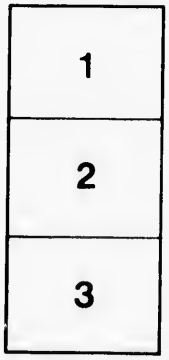

A. Claudet, F.R.S.

A Memoir.

A. CLAUDET F.R.S.

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A Memoir.

REPRINTED FROM "THE SCIENTIFIC REVIEW."

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1868.

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A. CLAUDET, F.R.S.:

A Memoir.

Science also has her martyrs: not the persecuted only, but those too who devote themselves willing victims. Such men, even if appreciated, live in the past uncanonised, notwithstanding the severity of those penalties which they suffer in the cause of truth. Among the names lately inscribed on the melancholy death-roll, here is one which deserves more than a passing expression of regret. Claudet died at Christmas. The delay of this notice is, we believe, not without advantage. The repute of the photographer is more readily recognised than the merit of the man of science. Our sympathy is chiefly with the latter, and with deeds which shed a brighter lustre when the fever of popularity has subsided. Not that we would underrate the value of Claudet's services to a beautiful and fascinating art, an art which must always go hand-in-hand with science. Those services have been beneficial to society, and Claudet will be named with a small company of ingenious men, who to their honour, gave photography to the world. Yet we may say, that it was not merely to the fame of a photographer that his genius aspired. It was not that for which

he "scorned delights, and lived laborious days." If, in any degree, he sacrificed to Plutus, his heart-homage was at the shrine of Minerva. He knew that much of the applause which by his industry he gained was but of an ephemeral nature :—

"*Terminat hora diem, terminat auctor opus.*"

Antoine François Jean Claudet was born at Lyons in 1797, amid the social cataclysm of the Revolution, an event that greatly changed the prospects of his life. He was well educated, and, at the age of twenty-one, entered the office of his uncle, Monsieur Vital Roux, an eminent banker, who, a few years after, placed him at the glass-works o. Choisy le Roi, as director in conjunction with Monsieur G. Bontemps, the well-known glass manufacturer. Eventually M. Claudet came to London to introduce the productions of Choisy.* In 1833 he invented the machine now generally used for cutting all cylindrical glass. For this invention Prince Albert awarded him the medal of the Society of Arts, in 1853. But all this while he was a student of science, training and waiting for the object to which his true life was to be devoted. The path was opened to him by the almost simultaneous realisations of photography by Daguerre and Fox Talbot. In citing those well-known names, we do not forget Niepce, the noble pioneer of the

* Namely, glass shades and sheet glass made in cylinders. This pursuit brought him into relations with Mr. Lucas Chance, of Birmingham, and hence M. Claudet was the final cause of the institution of a new branch of manufacture in England. Indeed, the manufacture of sheet glass by this method has since been so largely developed, that it promises to supersede all other means of making window-glass.

photographic art. His imperfect results, and those of Wedgwood, Davy, and others, had not aroused the interest of men of science. Even the achievement of Daguerre was received with the coldness of incredulity; but Claudet saw at once the breadth and beauty of the prospect it opened, and dashed into photography with a warmth and resolution that took his associates by surprise. He was by title a "Photographer" before the name was known, or photography believed in. We remember him then. Ours was the spring-time of life, his the meridian. We caught his enthusiasm, we became his disciple—as who would not that felt the influence of his gifts and acquirements, and witnessed his unflagging energy, his heroism of purpose? There he would be, day after day, among the fumes of mercury and iodine—careless of life or health—experimenting, producing, expounding, never tiring, never exhausting the fecundity of his expedients, never desponding in his aspirations. And, happily, he was found equal to what he undertook. When at first chemistry had to be called in aid, he was a chemist (as testifies François Arago).* When, later, optics had to be appealed to, he was a mathematician; when mechanical science was to be invoked—he was an ingenious mechanician; when art was required, he was an artist of consummate taste; whatever new resources had to be sought, he was ever ready, for the spark of genius was there, needing but the breath of opportunity to fan it into the flame of achievement.

Thus qualified, Claudet (1840) took up photography as a

† "M. Claudet, qui a trouvé le moyen de réduire à quelques secondes la durée d'exposition dans la chambre obscure." — Œuvres complètes de François Arago. Tome vii., p. 516.

philosophic pursuit; and henceforth, literally, his days were devoted to the practice, his nights to the theory of the new art and science. In the beginning, the procedure was naturally imperfect, and this, by numberless contrivances, he improved and rendered certain. This was for the Daguerreotype—the photographic picture upon a polished metal tablet, in which exquisite process he soon became the accomplished master. For be it said in passing, that paper-photography, the calotype of Fox Talbot, though already instituted, had not yet attained to practical perfection.

The first notable result of Claudet's efforts was made known in communications to the Académie des Sciences, and to the Royal Society, on a method of accelerating the production of the image of the Daguerreotype by the use of bromide and chloride of iodine, as noticed by M. Arago, above. The operation was thus made a hundred times more rapid, and hence Claudet has the credit of first rendering possible the effectual portraiture of animate objects. So sensitive had he now made his metal tablet, that he obtained a portrait by the oxyhydrogen light in fifteen seconds; an impression of black lace by the light of the full moon in two minutes, and by the light of the stars in fifteen minutes; an impression of a sculptured figure by the light of a candle in fifteen minutes, and the same from the light of a lamp in five minutes; and an image of the moon in four seconds.

Claudet's mind was not of an order to be satisfied with results without inquiring into causes. His experiments, therefore, soon yielded him abundant opportunities of philosophic investigation. We find him immediately after the establishment of Daguerreotype, raising and answering important questions: "What is the action of light on the

sensitive coating?" "How does the mercurial vapour produce the Daguerreotype image?" "Which are the particular rays of light that impart to the chemical surface the affinity for mercury?" "What is the cause of the difference in achromatic lenses between the visual and photogenic foci? Why do they constantly vary?" "What are the means of measuring the photogenic rays, and of finding the true focus at which they produce the image?" Or, in a still wider field of physical science: "Are there then periodic changes in the nature of the sun's light?" These questions and many others he answered from time to time in papers for scientific societies, such as—"On the chemical action of different rays of the solar spectrum."—"On the different properties of solar radiation producing or preventing a deposit of mercury on silver plates, &c., modified by coloured glass media."—"On the use of a polygon to ascertain the intensity of the light at different angles in the photo-room."—"On various phenomena of refraction through semi-lenses, &c." Thus he at once makes Photography the handmaid of Science; his photographic practice subserves the high considerations of philosophy; and whilst his hands are busily engaged in producing admirable specimens of art, his head is occupied with abstruse questions as to the properties of the agents employed, the chemical constituents of light, and the theory of optics.

Claudet's experiments in pursuit of his inquiries were most interesting. After describing in detail his method of analysis for the purpose of discovering the photographic value of the several rays of the spectrum, he says: "Thus we might construct a room lighted only through an inclosure of pale yellow glass, in which light would be very dazzling to the

eye, and in this room no photographic operation could be performed; or a room inclosed by deep blue glass, which would appear very dark, and in which the photographic operation would be nearly as rapid as it would be in open air." "Thus we may conceive certain states of the atmosphere under which there will be an abundance of illuminating rays, and very few photogenic rays; and some others, under which the reverse will take place." And he beneficently concludes his exposition of the mysteries of light, which are apt to tantalise the photographer, by presenting his Photographometre, which enables the operator to ascertain the quality of the light at any moment in the comparative prevalence or deficiency of the photogenic rays. So, when he had assured himself that in achromatic object-glasses, the photogenic and the visual focus do not generally coincide—and, moreover, that there is a continual variation between the two foci—he did not rest with the mere exposition of these curious facts, but at the same time brought forward for the use of photographers his Focimetre, to enable them to find the differences between the two foci, and to discover the place of the photogenic focus at the moment of operating. When treating on this subject he gives a problem to the opticians—whether it would be possible to produce an object-glass in which the two foci should be very little separated, or even coincide? And again, since, in some unaccountable way, object-glasses will differ in their quality as to the degree of separation or coincidence of the two foci, he, when declaring this, also brings forward his Dynactinometre—for measuring the actinic or photogenic power of object glasses. This instrument is also a Photometre—for measuring the intensity of photogenic light.

For some years M. Claudet had, as a photographer merely, a speciality in his superior knowledge, skill, and resources with regard to the process of Daguerre. But when the invention of Fox Talbot had been perfected in the adoption of glass tablets, culminating in the adaptation of the ingenious Archer—the collodion film—the glory of Daguerre began to decline, and before long his prophet had, however unwillingly, to give up by degrees, the incomparable Daguerreotype. The superior convenience and applicability of the Talbot-type process out-valued the exquisite detail—the absolute perfection—of the Daguerreotype. Nor was Claudet less able as the interpreter of the Archer-type than he had been of the invention of the Frenchman. And, fortunately, there came a solace in that beautiful and philosophical instrument—the Stereoscope. Claudet was here again the first to appreciate and adopt. He assisted Sir Charles Wheatstone in the early application of the stereoscope to photography; he comprehended and expounded its scientific principles, and did all that an ingenious admirer could to give it to the world. His enthusiasm was indeed as warm for the stereoscope as it had been earlier for photography itself. It was, he said, the complement of photography; it was by the aid of photography alone that the principles of the stereoscope could be effectually exhibited; whilst from the application of the stereoscope, the art of photography derived increased interest and value. With the true instinct of the man of science, he saw that the two must combine to demonstrate the laws of vision. In his admirable treatise on the stereoscope, he says: "It is essential, in the history of this art, to give the theory of the principles of binocular vision, accompanied by practical details of the

manner of obtaining these images of which the conjunction is the marvellous phenomenon of objects in relief, so that they appear as if they were really solids—with an illusion such as that one seems able to seize them with the hand." And he proceeds, as usual with him, to explain his "Binocular Camera," which he says "appears to me to meet all the exigencies of stereoscopic photography." And that his zeal to satisfy these "exigencies" did not overwhelm generous impulses for the pleasures and advantages of society, witness an eloquent passage on the stereoscope from one of his papers:—

"The stereoscope is the general panorama of the world. It brings to us in the cheapest and most portable form, not only the picture, but the model, in a tangible shape, of all that exists in the various countries of the globe; it introduces us to scenes known only from the imperfect relations of travellers; it leads us before the ruins of antique architecture, illustrating the historical records of former and lost civilisations, the genius, taste, and power of past ages, with which we have become as familiarised as if we had visited them. By our fireside we have the advantage of examining them, without being exposed to the fatigue, privation, and risks of the daring and enterprising artists who, for our gratification and instruction, have traversed lands and seas, crossed rivers and valleys, ascended rocks and mountains with their heavy and cumbrous photographic baggage."

Claudet was endowed by nature to be an investigator. A watchful and sagacious observer, he was quick to detect coincidences or exceptions, and untiring in pursuit. Thus, in his paper on "The Phenomenon of the Relief of the Image," he observed, "that the image formed on the ground glass of the camera obscura, appears as much in relief as the natural object when seen with two eyes, and his experiments have disclosed the singular and unexpected fact, that although only one image *seems* depicted on the ground glass,

yet each eye perceives a different image. The image seen by the right eye is the representation refracted by the left side of the lens," and *vice versa*. "Consequently, these two images presenting two different perspectives, the result is a stereoscopic perception, as when we look through the stereoscope at two images of different perspectives." He then explains that he ascertained these facts by many experiments, "the most decisive of which consists in placing before one of the marginal openings of the lens a blue glass, and before the other a yellow glass. The result is two images superposed on the screen of the camera, one yellow, the other blue, forming one image of a grey tint, the mixture of yellow and blue, when we look with both eyes at an equal distance from the centre. But when we shut alternately, now the right eye and then the left eye, the image appears first yellow, and second blue." Again, in his very elaborate paper "On the Laws which regulate the Conjugate Foci," written with a view to relieve photographers from the uncertainty and trouble of setting the focus, he says: "That the proportion of the image is in an inverse ratio to the distance of objects, is a law which is exact only for the camera obscura without lens. But when the opening of the camera is supplied with a lens, some new principle modifies the calculation, and the consequence is, that the distances of objects and focal distances must be measured, not from the hole of the camera or from the lens, but from certain points distant from the lens on both sides, and the position of which varies according to the power and curvature of the lens.

"I have endeavoured to solve that problem, and I think I have found the means of setting the focus by some sure and fixed rules adapted to all kinds of lenses, thereby

enabling every photographer to find the focal distance for any given distance of objects, and *vice versa*, and further enabling him to determine both these distances for any degree of reduction or amplification of image." And to his illustrations he adds: "By these examples we conceive what is meant by approaching the infinite and never reaching it."

Claudet's unswerving purpose was to elevate Photography by rendering her work scientifically true. In one of his papers on the optics of photography he writes: "One of the greatest deficiences of photography in the representation of solid figures is the incapability of obtaining a well-defined image of all the various parts situated on different planes. * * * * * My object has been to discover a method of removing, if possible, from photographic portraiture, that mechanical harshness which results from the action of the most perfect lenses. In the best works of art, the effects are produced by a soft and harmonious treatment," &c. Such studies led later to "The Self-acting Focus Equaliser, or the means of producing the differential movement of the two lenses of a photographic optical combination, which is capable, during the exposure, of bringing consecutively all the planes of a solid figure into focus, without altering the size of the various images superposed." He relates that he submitted the plan to M. Voigtlander, who "charged his step-son, Dr. Sonnet, to calculate," &c. "Dr. Sonnet soon sent me a series of formulæ showing that, although for all practical purposes in photography, the movement I had proposed fulfilled the object in view, yet that a more scientific consideration called for a modification, &c. * * * This presented another difficult problem, the solution of

which was indeed most perplexing. But I did not like that it should be said my plan was not entirely in accordance with the mathematical laws of optics, and I set to work to find a mechanical means by which I could avail myself of the calculations of Dr. Sommer. I have found such means and it proves that the differential movement can be effected not only as readily, but with a greater command and steadiness than by moving only one lens."

Claudet had truly a fruitful source of interest in the science of photography. Scarcely had he solved one problem when he was immersed in another. His inquiry into the causes of "the relief of the image," above adverted to, led after a while to the beautiful illustration seen in the Stereomonoscope. If it be proved that the effect of relief observed on the screen of the camera is caused by the combination of the two images of different perspectives, one from the right side of the lens, the other from the left side, and if the same effect of relief results from two photographs of different perspectives superposed by the stereoscope, then it should occur that by refracting two images of different perspectives upon a ground glass screen by means of an adjustment which shall bring them to coincide, we shall in like manner obtain the effect of relief. The stereomonoscope then produces one object in relief from two flat pictures—a statue in perfect symmetry and solidity by the combination of two images from photographs of different perspectives; and the result is not only beautiful to the vision, but in its scientific principles highly interesting. Such was the Stereomonoscope, only conspicuous among Claudet's countless devices for facilitating and perfecting the procedure of photography. Sometimes, too, he allowed himself to stray

from his chief garden of delight into outlying paths; and we find him at the British Association describing his "Star Chromatoscope—an instrument for examining and comparing the rays of the stars." The purpose of this instrument is "to develop an infinitely small spot of light into a large circle, exhibiting on its periphery, the various rays emitted by the star, all following each other in spaces corresponding with their duration; showing also blank spaces between two contiguous rays, corresponding with the black lines of the spectrum. We have, in fact, a spectroscope by which we can analyse the particular light of any star; and further, by this instrument we may arrive at the discovery of the real cause of the scintillation, and compare its intensity in various climates and at different altitudes of a given star." Or, again, we have a discourse "on moving photographic figures, illustrating some phenomena of vision connected with the combination of Stereoscope and the Phenakistoscope, by means of photography." "Our sensation of vision," he says, "is not in the eyes, but only in the single sensorium of vision, to which both eyes convey their separate perceptions." Again, he gives us "A new fact relating to binocular vision," to illustrate the persistence of the impression made by light upon the retina. At the conclusion of this paper he modestly as justly adds, that Professor Wheatstone by his admirable discovery—the Pseudoscope—has left very little for further investigation in the physiology of binocular vision. He expounds with generous praise the inventions of others, as in his paper "On the principles of the Solar camera." "Such he says, "is the essential principle of Woodward's solar camera. * * * * This principle is truly marvellous. * * * Without question,

its introduction into the photographer's studio will mark a period of considerable improvement in the art."

Yet, whilst we point to Claudet as a philosopher, it would be less than justice not to recognise his ability as an artist, and his great services to the art of photography. He not only himself produced beautiful and perfect works in photography, but was also eminently, by his studies and inventions, the means of enabling others to refine and advance the art. He was, indeed, the champion of photography as an art. When the managers of the Universal Exhibition of 1862 had placed photography in the mechanical department, he emerged from the laboratory into the studio, and, lance in rest, chivalrously proclaimed photography one of the fine arts against all comers. "I am one of those," he says, in one of his printed letters of that date, "who are convinced that photography deserves to be ranked among the fine arts. If photography was only a machine, such as a magic lantern, with which every one can strike pictures on a white screen with the same success, its productions might indeed be exhibited in the mechanical department; but as I find from my own experience, which is as old as photography itself, that nothing is more difficult than to produce photographs deserving to be looked at—that it requires thought, taste, judgment, and refinement to use with success the apparatus and the process—I consider there is as much art in the result as in any of the so-called fine arts."

Claudet's scientific relations with Sir David Brewster had a very affecting conclusion. The two philosophers, for some months during last year, were concurrently engaged in investigating an interesting point in the optics of photography. The correspondence was broken—never to be

renewed—by the death of one. The other, sixteen years the senior, undertook to write a memoir of his friend. In a letter dated "Allerly, Melrose, January 1, 1868," addressed to Mr. Frederic Claudet, he says of Claudet: "His scientific acquirements and his inventive genius were of a very high order, and his kind nature and generous character will be acknowledged by all who had the pleasure of knowing him."

"I shall be glad to do anything you desire that can do honour to his memory, and I will thank you to send me the fullest information in your power respecting his early as well as his later life and inventions." * * *

Six weeks later, "that old man eloquent" passed away, and the full testimony he would have borne to the scientific worth of Claudet—is not.

The chief subject of the letters of Brewster above referred to, is the greater perfection of photo-portraiture by means of small lenses made of materials of different dispersive powers, with a view to obtaining a depth of focus unattainable with glass lenses. These letters are indeed surprising instances of vigour and freshness of intellect in a man of 86. The extracts at foot will, we think, be their own apology.*

---

* *March* 22, 1867.—I am persuaded that the great desideratum in photography, whether monocular or binocular, is the *perfection of the picture* on the camera. I am certain that different cameras, even when the lenses are corrected for colour and aberration, do not give *the same likeness.*

This imperfection obviously arises from the different apertures of the lens, in a great measure, but I believe also from the number and form of the separate lenses.

An infinitely small pin-hole is the most perfect camera, and the nearer we can approach to the smallest and thinnest lens, the nearer do we approach to a perfect portrait.

The extreme sensitiveness of the process enables the photographer to

This latest joint investigation of Brewster and Claudet is described in a memorandum by the latter: "I tried a lens of rock crystal non-achromatic and simply double convex, such as those used for common spectacles. I operated with an aperture of about half an inch, but the lens being non-

---

reduce his lens to the size of the human pupil, which is absolutely necessary to produce the portrait of the person whom we actually see, but something also depends on the perfect homogeneity of the glass employed, and of the number and curvature of the refracting surfaces.

No proper experiment has yet been made to ascertain the effect of a single lens of diamond or any other substance. I wish you would enter upon this inquiry. You are the only person I know fitted to do it.

April 18, 1867.—I have no doubt that with your knowledge, theoretical and practical, you will give a new character to photographic portraiture.

I think the two great points to be attended to are: 1. The smallness of the aperture of the lens; and 2. The simplicity of the optical apparatus, the smallest thickness of the refracting material, and the smallest number of refracting surfaces.

I do not think *sharp definition* at all necessary; on the contrary, I think it an evil.

In society, I see faces, and every expression upon them, with sufficient distinctness, notwithstanding my long-sighted vision. When I put on glasses to have perfect vision, the very distinct picture, even of the youngest and smoothest faces, is disagreeable, while that of middle-aged and old persons is still more so. Beauty either of form or expression is injured by sharpness of outline, and the vision of minute parts, and the corrugations and wrinkles of age, and even of middle life, are made doubly disagreeable.

Has it ever occurred to you, that a large lens perfectly achromatic, and without spherical aberration, cannot give a correct representation even of a *perfectly flat space*, such as the breadth of a line?

I shall be glad to read the papers you mention, which I hope will soon be published.

June 3, 1867.—I am delighted with the result of the topaz experiment: the portrait is singularly fine. The dispersive power of topaz is 0·024, that of crown glass being 0·033, and that of flint glass 0·048. To have the smallest aberration, the side of the lens with its flatter surface should be next the image, the aberration in this case being 1, and the aberration in the other case 4, so that your excellent effect has been produced *with the largest aberration*. This seems to throw a new light on the subject. The lens had thus a great

achromatic, I had to operate with the focus of the chemical rays, which, by previous experiment, I had found to be equal to the focus of an object placed at 21in. behind the plane, giving a correct visual focus of a person placed at 12ft. before the camera. The result was a very sharp and

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number of foci, a number increased by the number of chromatic foci, and *hence the excellence of the picture*. It is easy to increase the number of foci by increasing the size of the lens, but then you introduce the error arising from the superposition of different views of the figure as seen from different points of the lens.

If these views are correct, it would be worth while to try a lens of *flint glass* with various chromatic and actinic foci, and with the radii of its surface as 1 to 6 (a plano-convex nearly), having its flattest side towards the sitter. It will be curious if we find that the lens which is the worst for the telescope and the microscope should be the best for taking the picture of a solid object, such as the human figure. * * *

I wish you would try some experiments with the largest lens you have in your cameras, and take five pictures of a large statue, one from half an inch of its centre, one from the lowest point, one from the highest part of its circumference, and one from its left and right. This would show clearly the effect produced by the size of the lens.

If the experiment were made upon a living figure, the change of expression would be seen. It would be also very interesting to take a photograph of the same statue with a small pin-hole.

P.S.—I will read the account of your focus equaliser. Your paper on the Binocular Thaumatrope is most interesting. The dispersive power of diamond is 0·038, rock crystal 0·026.

August 7, 1867.—I am much interested both with the experimental and historical part of your last letter.

Your five experiments on Dallmeyer's method of focus diffusion confute it completely.

The experiments on Voigtländer's lens with the fixed and moved focus prove the great advantage of the *latter*, but I should have liked to see the effect of the central aperture *alone*, and of the two extremes. Voigtländer with five holes beats Dallmeyer with five holes, and your experiments with the single flint glass lens in the good and bad positions seems to refute my theory of using, in photography, a lens unfit for the telescope or microscope. I recur, then, to the small topaz lens, and I am anxious you should try with an aperture of a $\frac{1}{4}$ of an inch, which will give almost equal distinctness to all

correct portrait, every plane of the figure being equally well defined.

"Sir David Brewster was much pleased with the success of this experiment, and considering that it was partly due to the small dispersive power of rock crystal, suggested that I should now try a lens of topaz, the dispersive power of which

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the leaves of your focimetre, and be the best instrument for depth of focus.

Thus it is theoretically true, for the depth of focus increases as the aperture diminishes.

If I am right in believing that the numerous refractions, and surface reflections, and thickness of glass, may affect *the expression of the human face*, then the single lens, of least dispersion, and least aberration, and least thickness, is the most perfect of photographic instruments, when the chemical process is sufficiently sensitive.

Am I right in supposing that your focimetre does not show the effect of large lenses in widening the head; that is, in showing (or enlarging) the ears when they should be either not seen, or partly seen?

I hope you will be able to show the results of your experiments at Dundee, by means of the magic lantern.

August 20, 1867.—I cannot resist thanking you for your interesting letter and its enclosures.

Your portrait by the topaz lens is *perfect*. Nothing can surpass it, and it is hardly necessary for you to try the one-fourth of an inch aperture. It might be worth while to try three-fourths of an inch, which will reduce more than one-half the time of sitting.

In trying either the one-fourth or three-fourths, however, the thickness of the lens should be reduced to its minimum, to remove whatever might be due to the mass of refracting matter, or the imperfection of structure. Strictly speaking, too, the face of the lens should be perpendicular to one of the axes of double refraction. Both these, however, are nearly infinitesimal in their effects.

The portrait with Voigtlander and two apertures proves the deleterious influence of large apertures.

I rather doubt your explanation of the bad effect of aberrations.

The images given by different parts of a lens are not "of a different size:" they are views of the same object from different points of sight, and they differ in size only in so far as their size is affected by the object being viewed from different points.

is still less than that of rock crystal. Accordingly, I had a lens of topaz made, with the curves of 6 to 7, giving the less amount of spherical aberration, so that the result was still more surprisingly beautiful than that obtained with the double convex rock crystal lens."

"In order to prove the defects of operating with large apertures in lenses, I operated in the following manner:—

"I had a disc of the same size as the lens (5in.), having on its diameter an aperture of 1in., which could at will be turned alternately to the right or left of the horizontal line corresponding with the diameter of the lens. Having taken a portrait with the aperture on one side, the diaphragm was turned so as to present the opening on the other side, and then a second portrait was taken before the sitter had moved."

"The result of this experiment is very conclusive, for the two portraits being examined with a stereoscope, present the strongest stereoscopic effect which can be obtained by the usual mode of operating."

In 1851, Claudet set up a Temple to Photography after his own heart. Here, in the Hall of Audience, could he be consulted at call from the *adytum sanctum*. Here, surrounded by symbols and examples, the neophyte was impressed with the dignity and beauty of photography: perhaps first learned that photography is an outcome of the labours of philosophers through the ages of civilisation. For he saw, on glancing at the medallion portraits around the cove, names of men now thought of as ancients—Roger Bacon, Porta, Da Vinci, Newton—and was reminded of the honour due to many nearer to his own time, as Davy, Wedgwood, Niepce, Daguerre, Talbot, Wheatstone, Brewster, Arago. He saw

described by allegorical paintings the progress of the arts by which natural objects and the human form have been represented from the earliest time—statuary, painting, application of the camera obscura to photography, and of photography to the stereoscope, emblems of the discovery of photography and of the means of producing photographic pictures, mural scrolls, chronological records of the inventions and discoveries whereunto photography is indebted. Or, looking again, he read inscriptions of the classic testimony of Virgil or Martial; "*Nulla recordanti lux est ingrata*," "*Solem quis dicere falsum audeat?*" "*Lux est mundi lumen.*" All this is to be seen no more. This Temple, so characteristic of Claudet's devotion to photography, was burnt a few weeks after its chief priest had quitted it for ever. With it were lost many beautiful works and valuable relics of the master's labours.

But, as we have elsewhere said, that for which Claudet deserves best to be remembered, is of such a fabric as fire cannot destroy. He has left his impress upon science—a gap in the ranks. Like all men of original thought, he will be followed, not replaced. Those who haunt the groves of science will miss his familiar form, and listen in vain for his instructive lucubrations. For he was of the order of the Peripatetics. Whether at the Royal Society or at photographic confederations in England or Scotland, or at universal exhibitions—wheresoever the British Association wandered, there was he seen and heard. Or whether in the *Philosophical Transactions*, or in the *Comptes Rendus*, or in photographic journals, or in art journals—wherever photography had to be expounded or vindicated, there would be found

the product of his pen. His activity was incessant, his motto that of Pascal: "*Le repos c'est la mort.*"

Nor would we conclude a memoir of Claudet without indication of his personal qualities. That he was of a generous temperament, liberal and genial, is indeed partly implied by what has been previously said of his enthusiasm. It was so. He was "one of nature's gentlemen." Unsordid, he allowed the interests of science to overrule all meaner considerations, and with the true sentiment of the philosopher, subdued all things to the purpose of investigating the recondite principles of nature's laws. This was his adoration:—"*Est Deus in nobis, est Deus in rebus.*" Whatever his toils or his disappointments, he was not discouraged. "He that seeketh to be eminent amongst able men hath a great task," says Bacon, and with such a task Claudet was contented. He was one who had set himself to answer the insatiate Sphinx, not expecting the success of Œdipus, willing to die in the encounter. For with him it was truly a "labour of love." Science was the mistress of his heart, a sweet echo ever responsive to his constant call. And so he found solace in—

> "Divine Philosophy,
> Not harsh and crabbed as dull fools suppose,
> But musical as is Apollo's lute,
> And a perpetual feast of nectared sweets,
> Where no crude surfeit reigns."

The recognition of Claudet's merits in his lifetime was perhaps sufficient to satisfy a man who sought only such honour. He received awards of eleven medals, including the Council Medal of the Universal Exhibition, 1851, besides

that on other great occasions, being on juries, he was excluded from the awards. He was elected Member of the Royal Society in 1853, and in 1865, he was made a Chevalier of the Legion of Honour. But of such was not his ambition. He was a votary to science, and wrought chiefly to feed her altar-flame. For him that was enough.

"*Recte facti fecisse merces est.*"

APPENDIX.

SCIENTIFIC PAPERS

BY

A. CLAUDET, F.R.S.,

SHEWING HIS PRINCIPAL DISCOVERIES AND RESEARCHES IN PHOTOGRAPHY, ETC.

1841. Read before the Royal Society.

On a new process for accelerating the production of the image on the Daguerreotype plate by the addition of bromide and chloride of iodine to the iodide of silver. Royal Society, June 10th, 1841.—*Phil. Mag.*, vol. xix., p. 167.

1844. Read before the Royal Society.

On the non-coincidence of the focus of the photogenic rays with that of the visual rays of the solar spectrum.—*Proc. Roy. Soc.*, vol. v., p. 513; *Académie des Sciences*, May, 1844; *Phil. Mag.*, November, 1849.

1847

Des actions que les diverses radiations solaires exercent sur les couches d'iodure, de chlorure ou de bromure d'argent.—*Comptes Rendus*, t. xxv., pp. 554, 555.

Sur l'action chimique des différents rayons du spectre solaire.—*Comptes Rendus*, t. xxv., pp. 338, 940.

1847. Read before the British Association, Oxford.

On the different properties of solar radiation producing or preventing a deposit of mercury on silver plates coated with iodine, or its compounds with bromine or chlorine, modified by coloured glass media, and the atmosphere.—*Phil. Trans.*, 1847, pp. 253, 262; *Brit. Assoc. Rep.* 1847, part ii., pp. 35, 37; *Ann. de Chim. et de Phys.*, 1848, t. xxii., pp. 332, 256; *Phil. Mag.* 1848, vol. xxxii. pp. 88, 98; *Zantedeschi Ann. Fis.*, 1849, vol. l., pp. 257, 275.

On the progress of photography.—*Trans. Soc. Arts*, Sup. vol., p. 196.

1848. Read before the British Association, Swansea.

On the action of the red, orange, and yellow rays upon iodised and bromo-iodised silver plates after they have been affected by daylight, and other phenomena of photography. *Phil. Mag.*, 1848, vol. xxxii., p. 199; *Brit. Assoc. Rep.*, 1848, part ii., p. 50.

On the Photographometer, an instrument for measuring the intensity of the chemical action of the rays of light on all photographic preparations, and for comparing with each other the sensitiveness of these different preparations.—*Phil. Mag.*, 1848, vol. xxxiii., p. 329.

1849. Read before the British Association, Birmingham.

Researches on the theory of the principal phenomena of photography in the Daguerreotype

process.—*Brit. Assoc. Rep.*, 1849, part ii., pp. 35, 36; *Phil. Mag.* 1849, vol. xxxv., p. 374.

On the Dynactinometer, an instrument for measuring the intensity of the photogenic rays and comparing the power of object-glasses, with observations on the difference between the visual and Photogenic Foci, and their constant variation. —*Brit. Assoc. Rep.*, 1850, p. 12; *Phil. Mag.*, 1851, vol. i., p. 478. 1850. Read before the British Association, Edinburgh.

On the dangers of the mercurial vapours in the Daguerreotype process and the means to obviate the same.—*Brit. Assoc. Rep.*, 1851, part ii., pp. 44, 45. 1851. Read before the British Association, Ipswich.

On the use of a Polygon to ascertain the intensity of the light at different angles in the photographic room.—*Brit. Assoc. Rep.*, 1851, part ii., p. 45.

Nouvelles recherches sur la différence entre les foyers visuels et photogéniques, et sur leur constante variation. Paris.

On the Stereoscopometer, and on a manifold binocular camera.—*Brit. Assoc. Rep.*, 1852, p. 6. 1852. Read before the British Association, Belfast.

On the angle to be given to binocular photographic pictures for the stereoscope.—*Brit. Assoc. Rep.*, 1853, part ii., p. 4. 1853. Read before the British Association, Hull.

Le stéréoscope et ses applications à la photographie. (Extrait d' un Mémoire lu à la Société des Arts de Londres, le 19 Janv., 1853, et pour lequel

l'auteur a reçu la médaille de la société des mains de son Président, S. A. R. le Prince Albert.) Paris, Lerebours et Secretan, opticiens de l'Empereur.—*Soc. Arts Jour.*, vol. i., p. 97.

On the introduction of mercurial vapour into the camera in Daguerreotypy.—*Photo. Soc. Jour.*, 1854, pp. 117, 119.

1853. Read before the British Association, Glasgow.

On the Polystereoscopticon, an instrument with mechanical arrangements, by which many stereoscopic pictures can be successively changed and examined at once by six persons.

1856. Read before the British Association, Cheltenham.

On various phenomena of refraction through semi-lenses or prisms producing anomalies in the illusion of stereoscopic images.—*Proc. Roy. Soc.*, vol. viii., pp. 101, 110; *Brit. Assoc. Rep.*, 1856, part ii., pp. 9, 10; *Phil. Mag.*, 1857, vol. xiii., p. 71.

Read 1857. before the Royal Society.

On the phenomenon of relief of the image formed on the ground glass of the camera obscura. —*Proc. Roy. Soc.*, vol. viii., pp. 569, 572; *Phil. Mag.*, 1858, vol. xv., p. 397; *Photo. Soc. Jour.*, 1858, pp. 124, 126.

1858. Read before the Royal Society.

On the Stereomonoscope, a new instrument by which an apparently single picture produces the stereoscopic illusion.—*Proc. Roy. Soc.*, vol. ix., pp. 194, 196; *Phil. Mag.*, 1858, vol. xvi., p. 462.

1859 Read before the British Association, Aberdeen.

On the stereoscopic angle, &c.; on the stereomonoscope; on the focus of object glasses; on a

changing diaphragm for double achromatic combinations.—*Brit. Assoc. Rep.*, 1859, p. 62.

Photography in its relations to the fine arts. An essay read May 6, 1860, before the Photographic Society of Scotland on the occasion of the author's election as a member of the society.—*Photo. Soc. Jour.*, June, 1860.

On the principles of the solar camera.—*Brit. Assoc. Rep.*, 1860, part ii., pp. 62, 63; *Photo. Soc. Jour.*, 1860, pp. 288, 289. 1860. Read before the British Association, Oxford.

On the means of increasing the angle of binocular instruments in order to obtain a stereoscopic effect in proportion to their magnifying power.—*Brit. Assoc. Rep.*, 1860, part ii., pp. 61, 62.

On the laws which regulate the conjugate foci and the sizes and proportion of images according to the distance of objects. New method for computing all these various measurements.—*Photo. Soc. Jour.*, 1861, pp. 133, 139. 1861

On the means of following the small division of the scale regulating the distances and enlargement in the solar camera.—*Brit. Assoc. Rep.*, 1862, p. 18. 1862. Read before the British Association, Cambridge.

On the question of a separate exhibition of photography as an annex to the International Exhibition of 1862, March 15, p. 5. The New Picture Galleries, April, p. 33. Enlargement of photographs, June, p. 62, and July, p. 94. Photographic Society's Journal.

1863. Read before the British Association, Newcastle.

The Star Chromatoscope, an instrument to examine and compare the rays of the stars.—*Brit. Assoc. Rep.*, 1863, p. 5.

On some phenomena produced by the refractive power of the eye.—*Phil. Mag.*, 1863, vol. xxvi., p. 324; *Comptes Rendus*, t. lviii., p. 89.

1864. Read before the British Association, Bath.

On Photo-sculpture.—*Brit. Assoc. Rep.*, 1864, p. 10; *Photo. Soc. Jour.*, 1864, April 15 and October 15, pp. 19, 121.

1865. Read before the British Association, Birmingham.

On moving photographic figures, illustrating some phenomena of vision connected with the combination of the stereoscope and the phenakistoscope by means of photography.—*Phil. Mag.*, 1865, vol. xxx., p. 271; *Brit. Assoc. Rep.*, 1865, p. 9.

On stereoscopic phenakistoscopy.—*Photo. Jour.*, November 16, 1865, p. 189.

1866. Read before the British Association, Nottingham.

Optics of photography on a new process, for equalising the definition of all the planes of a solid figure represented in a photographic picture—means of obtaining harmonious and artistic portraits.—*Brit. Assoc. Rep.*, 1866, p. 9; *Phil. Mag.*, 1866, vol. xxxii., p. 212.

On photography as an art.—*Photo. Soc. Jour.*, 1866, p. 243.

The "Gazette des Beaux Arts" on photography, January, 16, 1866, p. 244.

On a new fact relating to binocular vision.—*Proc. Roy. Soc.*, vol. xv., p. 424. 1867. Read before the Royal Society.

Optics of photography: on a self-acting focus-equaliser, or the means of producing the differential movement of the two lenses of a photographic optical combination, which is capable, during the exposure, of bringing all the planes of a solid figure into focus, without altering the size of the various images superposed.—*Proc. Roy. Soc.*, vol. xv., p. 456. Read before the Royal Society.

On photographic portraits obtained by single lenses of rock crystal and topaz. 1867. Read before the British Association, Dundee.

On the production of natural colours by photography, January, p. 4; physiology of binocular vision—stereoscopic and pseudoscopic illusions, February, p. 49; physiology of binocular vision, March, p. 73; Photosciagraphy—on the art of painting portraits, only from the shadow of the photograph projected on the ordinary canvas or paper, while the artist is at work. Description of process invented by A. Claudet, May, p. 128. Art Journal. 1867.

COMMUNICATIONS FAITES A LA SOCIÉTÉ FRANÇAISE DE PHOTOGRAPHIE PAR M. CLAUDET.

Méthode d'héliographie sur porcelaine. Vol. iv., p. 4.

Sur la variation des foyers dans les lentilles. Vol. iv., p. 5.

Réclamation de priorité à propos des stéréoscopes de M. Hermagis. Vol. iv., p. 86.

Epreuve obtenue pendant l'eclipse de 1858. Vol. iv., p. 96.

Stéréomonoscope. Vol. iv., p. 255.

Sur la construction du stéréoscope (réponse à Mr. Hermagis). Vol. v., p. 95 et 97.

Sur le principe de la chambre solaire de M. Woodward. Vol. vi., page 249.

Des rapports de la Photographie avec les beaux-arts, Vol. vi., p. 263.

Sur le moyen d'agrandir l'angle des instruments binoculaires. Vol. vi., p. 278.

Observations sur l'emploi de la chambre solaire de Woodward. Vol. vii., p. 3.

Sur les travaux primitifs de M. Bayard. Vol. vii., p. 19.

Observation sur l'emploi de la chambre solaire. Vol. vii., p. 86.

Emploi de l'acide formique pour accroître l'action photographique. Vol. viii., p. 221.

Sur l'agrandissement des epreuves photographiques. Vol. viii., p. 229.

Emploi d'écrans mobiles. Vol. viii., p. 313.

Application de la Photographie au phénakistocope. Vol. xi., pp. 286 et 292.

Photoplastographie; nouveau procédé de photosculpture. Vol. xi., pp. 88 et 99.

Sur un nouveau procédé pour donner une égale netteté à tous les plans d'un corps solide représenté dans une épreuve photographique. Vol. xii., p. 225.

Epreuves à l'appui; observations diverses. Vol. xii., p. 282.

Objectif égalisateur des foyers. Vol. xiii., p. 146.

Emploi d'objectifs en pierres précieuses. Vol. xiii., p. 153.