



## *The Stereoscope and the Stereograph*

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1. Democritus of Abdera, commonly known as the Laughing Philosopher, probably because he did not consider the study of truth inconsistent with a cheerful countenance, believed and taught that all bodies were continually throwing off certain images like themselves, which subtle emanations, striking on our bodily organs, gave rise to our sensations. Epicurus borrowed the idea from him, and incorporated it into the famous system, of which Lucretius has given us the most popular version. Those who are curious on the matter will find the poet's description at the beginning of his fourth book. Forms, effigies, membranes, or films are the nearest representatives of the terms applied to these effluences. They are perpetually shed from the surfaces of solids, as bark is shed by trees. Cortex is indeed, one of the names applied to them by Lucretius.
2. These evanescent films may be seen in one of their aspects in any clear, calm sheet of water, in a mirror, in the eye of an animal by one who looks at it in front, but better still by the consciousness behind the eye in the ordinary act of vision. They must be packed like the leaves of a closed book; for suppose a mirror to give an image of an object a mile off, it will give one at every point less than a mile, though this were subdivided into a million parts. Yet the images will not be the same; for the one taken a mile off will be very small, at half a mile as large again, at a hundred feet fifty times as large, and so on, as long as the mirror can contain the image.
3. Under the action of light, then, a body makes its superficial aspect potentially present at a distance, becoming appreciable as a shadow or as a picture. But remove the cause,--the body itself,--and the effect is removed. The man beholdeth himself in the glass and goeth his way, and straightway both the mirror and the mirrored forget what manner of man he was. These visible films or membranous exuviae of objects, which the old philosophers talked about, have no real existence, separable from their illuminated source, and perish instantly when it is withdrawn.
4. If a man had handed a metallic speculum to Democritus of Abdera, and told him to look at his face in it while his heart was beating thirty or forty times, promising that one of the films his face was shedding should stick there, so that neither he, nor it, nor anybody should forget what manner of man he was, the Laughing Philosopher would probably have vindicated his claim to his title by an explosion that would have astonished the speaker.
5. This is just what the Daguerreotype has done. It has fixed the most fleeting of our illusions, that which the apostle and the philosopher and the poet have alike used as the type of instability and unreality. The photograph has completed the triumph, by making a sheet of paper reflect images like a mirror and hold them as a picture.
6. This triumph of human ingenuity is the most audacious, remote, improbable,

incredible,--the one that would seem least likely to be regained, if all traces of it were lost, of all the discoveries man has made. It has become such an everyday matter with us, that we forget its miraculous nature, as we forget that of the sun itself, to which we owe the creations of our new art. Yet in all the prophecies of dreaming enthusiasts, in all the random guesses of the future conquests over matter, we do not remember any prediction of such an inconceivable wonder, as our neighbor round the corner, or the proprietor of the small house on wheels, standing on the village common, will furnish any of us for the most painfully slender remuneration. No Century of Inventions includes this among its possibilities. Nothing but the vision of a Laputan, who passed his days in extracting sunbeams out of cucumbers, could have reached such a height of delirium as to rave about the time when a man should paint his miniature by looking at a blank tablet, and a multitudinous wilderness of forest foliage or an endless Babel of roofs and spires stamp itself, in a moment, so faithfully and so minutely, that one may creep over the surface of the picture with his microscope and find every leaf perfect, or read the letters of distant signs, and see what was the play at the "Variétés" or the "Victoria," on the evening of the day when it was taken, just as he would sweep the real view with a spy-glass to explore all that it contains.

7. Some years ago, we sent a page or two to one of the magazines,--the "Knickerbocker," if we remember aright,--in which the story was told from the "Arabian Nights," of the three kings' sons, who each wished to obtain the hand of a lovely princess, and received for answer, that he who brought home the most wonderful object should obtain the lady's hand as his reward. Our readers, doubtless, remember the original tale, with the flying carpet, the tube which showed what a distant friend was doing by looking into it, and the apple which gave relief to the most desperate sufferings only by inhalation of its fragrance. The railroad-car, the telegraph, and the apple-flavored chloroform could and do realize, every day,--as was stated in the passage referred to, with a certain rhetorical amplitude not doubtfully suggestive of the lecture-room,--all that was fabled to have been done by the carpet, the tube, and the fruit of the Arabian story.

8. All these inventions force themselves upon us to the full extent of their significance. It is therefore hardly necessary to waste any considerable amount of rhetoric upon wonders that are so thoroughly appreciated. When human art says to each one of us, I will give you ears that can hear a whisper in New Orleans, and legs that can walk six hundred miles in a day, and if, in consequence of any defect of rail or carriage, you should be so injured that your own very insignificant walking members must be taken off, I can make the surgeon's visit a pleasant dream for you, on awakening from which you will ask when he is coming to do that which he has done already,--what is the use of poetical or rhetorical amplification? But this other invention of the mirror with a memory and especially that application of it which has given us the wonders of the stereoscope, is not so easily, completely, universally recognized in all the immensity of its applications and suggestions. The stereoscope, and the pictures it gives, are, however, common enough to be in the hands of many of our readers; and as many of those who are not acquainted with it must before long become as familiar with it as they are now with friction-matches, we feel sure that a few pages relating to it will not be unacceptable.

9. Our readers may like to know the outlines of the process of making daguerreotypes and photographs, as just furnished us by Mr. Whipple, one of the most successful operators in this country. We omit many of those details which are everything to the practical artist, but nothing to the general reader. We must premise, that certain substances undergo chemical alterations, when exposed to the light, which produce a change of color. Some of the compounds of silver possess this faculty to a remarkable degree,--as the common indelible marking-ink, (a

solution of nitrate of silver,) which soon darkens in the light, shows us every day. This is only one of the innumerable illustrations of the varied effects of light on color. A living plant owes its brilliant hues to the sunshine; but a dead one, or the tints extracted from it, will fade in the same rays which clothe the tulip in crimson and gold,--as our lady-readers who have rich curtains in their drawing-rooms know full well. The sun, then, is a master of chiaroscuro and, if he has a living petal for his pallet, is the first of colorists.--Let us walk into his studio, and examine some of his painting machinery.

10. 1. THE DAGUERREOTYPE.--A silver-plated sheet of copper is resilvered by electroplating, and perfectly polished. It is then exposed in a glass box to the vapor of iodine until its surface turns to a golden yellow. Then it is exposed in another box to the fumes of the bromide of lime until it becomes of a blood-red tint. Then it is exposed once more, for a few seconds, to the vapor of iodine. The plate is now sensitive to light, and is of course kept from it, until, having been placed in the darkened camera, the screen is withdrawn and the camera-picture falls upon it. In strong light, and with the best instruments, three seconds exposure is enough,--but the time varies with circumstances. The plate is now withdrawn and exposed to the vapor of mercury at 212 degrees. Where the daylight was strongest, the sensitive coating of the plate has undergone such a chemical change, that the mercury penetrates readily to the silver, producing a minute white granular deposit upon it, like a very thin fall of snow, drifted by the wind. The strong lights are little heaps of these granules, the middle lights thinner sheets of them; the shades are formed by the dark silver itself, thinly sprinkled only, as the earth shows with a few scattered snow-flakes on its surface. The precise chemical nature of these granules we care less for than their palpable presence, which may be perfectly made out by a microscope magnifying fifty diameters or even less.

11. The picture thus formed would soon fade under the action of light, in consequence of further changes in the chemical elements of the film of which it consists. Some of these elements are therefore removed by washing it with a solution of hyposulphite of soda, after which it is rinsed with pure water. It is now permanent in the light, but a touch wipes off the picture as it does the bloom from a plum. To fix it, a solution of hyposulphite of soda containing chloride of gold is poured on the plate while this is held over a spirit-lamp. It is then again rinsed with pure water, and is ready for its frame.

12. 2. THE PHOTOGRAPH.--Just as we must have a mould before we can make a cast, we must get a negative or reversed picture on glass before we can get our positive or natural picture. The first thing, then, is to lay a sensitive coating on a piece of glass,--crown-glass, which has a natural surface, being preferable to plate-glass. Collodion which is a solution of gun-cotton in alcohol and ether, mingled with a solution of iodide and bromide of potassium, is used to form a thin coating over the glass. Before the plate is dry, it is dipped into a solution of nitrate of silver, where it remains from one to three or four minutes. Here, then, we have essentially the same chemical elements that we have seen employed in the daguerreotype,--namely, iodine, bromine, and silver; and by their mutual reactions in the last process we have formed the sensitive iodide and bromide of silver. The glass is now placed, still wet, in the camera, and there remains from three seconds to one or two minutes, according to circumstances. It is then washed with a solution of sulphate of iron. Every light spot in the camera-picture becomes dark on the sensitive coating of the glass-plate. But where the shadows or dark parts of the camera-picture fall, the sensitive coating is less darkened, or not at all, if the shadows are very deep, and so these shadows of the camera-picture become the lights of the glass picture, as the lights become the shadows. Again, the picture is reversed, just as in every camera-obscura where the image is received on a screen

direct from the lens. Thus the glass plate has the right part of the object on the left side of its picture, and the left part on its right side; its light is darkness, and its darkness is light. Everything is just as wrong as it can be, except that the relations of each wrong to the other wrongs are like the relations of the corresponding rights to each other in the original natural image. This is a negative picture.

13. Extremes meet. Every given point of the picture is as far from the truth as a lie can be. But in travelling away from the pattern it has gone round a complete circle, and is at once as remote from Nature and as near it as possible.--"How far is it to Taunton?" said a countryman, who was walking the wrong way to reach that commercial and piscatory centre.--"Bäout twenty-five thäousan' mild,"--said the boy he asked,--" f y' go 'z y' 'r' goin' näow, 'n' bäout häaf a mild 'f y' right räoun' 'n' go t'other way."

14. The negative picture being formed, it is washed with a solution of hyposulphite of soda, to remove the soluble principles which are liable to decomposition, and then coated with shellac varnish to protect it.

15. This negative is now to give birth to a positive,--this mass of contradictions to assert its hidden truth in a perfect harmonious affirmation of the realities of Nature. Behold the process !

16. A sheet of the best linen paper is dipped in salt water and suffered to dry. Then a solution of nitrate of silver is poured over it and it is dried in a dark place. This paper is now sensitive; it has a conscience, and is afraid of daylight. Press it against the glass negative and lay them in the sun, the glass uppermost, leaving them so for from three to ten minutes. The paper, having the picture formed on it, is then washed with the solution of hyposulphite of soda, rinsed in pure water, soaked again in a solution of hyposulphite of soda, to which, however, the chloride of gold has been added, and again rinsed. It is then sized and varnished.

17. Out of the perverse and totally depraved negative,--where it might almost seem as if some magic and diabolic power had wrenched all things from their properties, where the light of the eye was darkness, and the deepest blackness was gilded with the brightest glare,--is to come the true end of all this series of operations, a copy of Nature in all her sweet graduations and harmonies and contrasts.

18. We owe the suggestions to a great wit, who overflowed our small intellectual home-lot with a rushing freshet of fertilizing talk the other day,--one of our friends, who quarries thought on his own premises, but does not care to build his blocks into books and essays,--that perhaps this world is only the negative of that better one in which lights will be turned to shadows and shadows into light, but all harmonized, so that we shall see why these ugly patches, these misplaced gleams and blots, were wrought into the temporary arrangements of our planetary life.

19. For, lo! when the sensitive paper is laid in the sun under the negative glass, every dark spot on the glass arrests a sunbeam, and so the spot of the paper lying beneath remains unchanged; but every light space of the negative lets the sunlight through, and the sensitive paper beneath confesses its weakness, and betrays it by growing dark just in proportion to the glare that strikes upon it. So, too, we have only to turn the glass before laying it on the paper, and we bring all the natural relations of the object delineated back again,--its right to the right of the picture, its left to the picture's left.

20. On examining the glass negative by transmitting light with a power of a hundred diameters, we observe minute granules, whether crystalline or not we cannot say,

very similar to those described in the account of the daguerreotype. But now their effect is reversed. Being opaque, they darken the glass wherever they are accumulated, just as the snow darkens our skylights. Where these particles are drifted, therefore, we have our shadows, and where they are thinly scattered, our lights. On examining the paper photographs, we have found no distinct granules, but diffused stains of deeper or lighter shades.

21. Such is the sun-picture, in the form in which we now most commonly meet it,-- for the daguerreotype, perfect and cheap as it is, and admirably adapted for miniatures, has almost disappeared from the field of landscape, still life, architecture, and genre painting, to make room for the photograph. Mr. Whipple tells us that even now he takes a much greater number of miniature portraits on metal than on paper; and yet, except occasionally a statue, it is rare to see anything besides a portrait shown in a daguerreotype. But the greatest number of sun-pictures we see are the photographs which are intended to be looked at with the aid of the instrument we are next to describe, and to the stimulus of which the recent vast extension of photographic copies of--Nature and Art is mainly owing.

22. 3. THE STEREOSCOPE.--This instrument was invented by Professor Wheatstone, and first described by him in 1838. It was only a year after this that M. Daguerre made known his discovery in Paris; and almost at the same time Mr. Fox Talbot sent his communication to the Royal Society, giving an account of his method of obtaining pictures on paper by the action of light. Iodine was discovered in 1811, bromine in 1826, chloroform in 1831, gun-cotton, from which collodion is made, in 1846, the electroplating process about the same time with photography; "all things, great and small, working together to produce what seemed at first as delightful, but as fabulous, as Aladdin's ring, which is now as little suggestive of surprise as our daily bread."

23. A stereoscope is an instrument which makes surfaces look solid. All pictures in which perspective and light and shade are properly managed, have more or less of the effect of solidity; but by this instrument that effect is so heightened as to produce an appearance of reality which cheats the senses with its seeming truth.

24. There is good reason to believe that the appreciation of solidity by the eye is purely a matter of education. The famous case of a young man who underwent the operation of couching for cataract, related by Cheselden, and a similar one reported in the Appendix to Muller's Physiology, go to prove that everything is seen only as a superficial extension, until the other senses have taught the eye to recognize depth, or the third dimension, which gives solidity, by converging outlines, distribution of light and shade, change of size, and of the texture of surfaces. Cheselden's patient thought "all objects whatever touched his eyes, as what he felt did his skin." The patient whose case is reported by Muller could not tell the form of a cube held obliquely before his eye from that of a flat piece of pasteboard presenting the same outline. Each of these patients saw only with one eye,--the other being destroyed, in one case, and not restored to sight until long after the first, in the other case. In two months' time Cheselden's patient had learned to know solids; in fact, he argued so logically from light and shade and perspective that he felt of pictures, expecting to find reliefs and depressions, and was surprised to discover that they were flat surfaces. If these patients had suddenly recovered the sight of both eyes, they would probably have learned to recognize solids more easily and speedily.

25. We can commonly tell whether an object is solid, readily enough with one eye, but still better with two eyes, and sometimes only by using both. If we look at a square piece of ivory with one eye alone, we cannot tell whether it is a scale of

vener, or the side of a cube, or the base of a pyramid, or the end of a prism. But if we now open the other eye, we shall see one or more of its sides, if it have any, and then know it to be a solid, and what kind of solid.

26. We see something with the second eye which we did not see with the first; in other words, the two eyes see different pictures of the same thing, for the obvious reason that they look from points two or three inches apart. By means of these two different views of an object, the mind, as it were, feels rooted it and gets an idea of its solidity. We clasp an object with our eyes, as with our arms, or with our hands, or with our thumb and finger, and then we know it to be something more than a surface. This, of course, is an illustration of the fact, rather than an explanation of its mechanism.

27. Though, as we have seen, the two eyes look on two different pictures, we perceive but one picture. The two have run together and become blended into a third, which shows us everything we see in each. But, in order that they should so run together, both the eye and the brain must be in a natural state. Push one eye a little inward with the forefinger, and the image is doubled, or at least confused. Only certain parts of the two retinae work harmoniously together, and you have disturbed their natural relations. Again, take two or three glasses more than temperance permits, and you see double; the eyes are right enough, probably, but the brain is in trouble, and does not report their telegraphic messages correctly. These exceptions illustrate the every-day truth, that, when we are in right condition, our two eyes see two somewhat different pictures, which our perception combines to form one picture, representing objects in all their dimensions, and not merely as surfaces.

28. Now, if we can get two artificial pictures of any given object, one as we should see it with the right eye, the other as we should see it with the left eye, and then, looking at the right picture, and that only, with the right eye, and at the left picture, and that only, with the left eye, contrive some way of making these pictures run together as we have seen our two views of a natural object do, we shall get the sense of solidity that natural objects give us. The arrangement which effects it will be a stereoscope according to our definition of that instrument. How shall we attain these two ends?

29. 1. An artist can draw an object as he sees it, looking at it only with his right eye. Then he can draw a second view of the same object as he sees it with his left eye. It will not be hard to draw a cube or an octahedron in this way; indeed, the first stereoscopic figures were pairs of outlines, right and left, of solid bodies, thus drawn. But the minute details of a portrait, a group, or a landscape, all so nearly alike to the two eyes, yet not identical in each picture of our natural double view, would defy any human skill to reproduce them exactly. And just here comes in the photograph to meet the difficulty. A first picture of an object is taken,--then the instrument is moved a couple of inches or a little more, the distance between the human eyes, and a second picture is taken. Better than this, two pictures are taken at once in a double camera.

30. We were just now stereographed, ourselves, at a moment's warning, as if we were fugitives from justice. A skeleton shape, of about a man's height, its head covered with a black veil, glided across the floor, faced us, lifted its veil, and took a preliminary look. When we had grown sufficiently rigid in our attitude of studied ease, and got our umbrella into a position of thoughtful carelessness, and put our features with much effort into an unconstrained aspect of cheerfulness tempered with dignity, of manly firmness blended with womanly sensibility, of courtesy, as much as to imply,--"You honor me, Sir," toned or sized, as one may say, with

something of the self-assertion of a human soul which reflects proudly, "I am superior to all this,"--when, I say, we were all right, the spectral Mokanna dropped his long veil, and his waiting-slave put a sensitive tablet under its folds. The veil was then again lifted, and the two great glassy eyes stared at us once more for some thirty seconds. The veil then dropped again; but in the mean time, the shrouded sorcerer had stolen our double image; we were immortal. Posterity might thenceforth inspect us, (if not otherwise engaged,) not as a surface only, but in all our dimensions as an undisputed solid man of Boston.

31. 2. We have now obtained the double-eyed or twin pictures, or STEREOGRAPH, if we may coin a name. But the pictures are two, and we want to slide them into each other, so to speak, as in natural vision, that we may see them as one. How shall we make one picture out of two, the corresponding parts of which are separated by a distance of two or three inches ?

32. We can do this in two ways. First, by squinting as we look at them. But this is tedious, painful, and to some impossible, or at least very difficult. We shall find it much easier to look through a couple of glasses that squint for us. If at the same time they magnify the two pictures, we gain just so much in the distinctness of the picture, which, if the figures on the slide are small, is a great advantage. One of the easiest ways of accomplishing this double purpose is to cut a convex lens through the middle, grind the curves of the two halves down to straight lines, and join them by their thin edges. This is a squinting magnifier and if arranged so that with its right half we see the right picture on the slide, and with its left half the left picture, it squints them both inward so that they run together and form a single picture.

33. Such are the stereoscope and the photograph, by the aid of which form is henceforth to make itself seen through the world of intelligence, as thought has long made itself heard by means of the art of printing. The morphotype or form-print, must hereafter take its place by the side of the logotype or word-print. The stereograph as we have called the double picture designed for the stereoscope, is to be the card of introduction to make all mankind acquaintances.

34. The first effect of looking at a good photograph through the stereoscope is a surprise such as no painting ever produced. The mind feels its way into the very depths of the picture. The scraggy branches of a tree in the foreground run out at us as if they would scratch our eyes out. The elbow of a figure stands forth so as to make us almost uncomfortable. Then there is such a frightful amount of detail, that we have the same sense of infinite complexity which Nature gives us. A painter shows us masses; the stereoscopic figure spares us nothing,--all must be there, every stick, straw, scratch, as faithfully as the dome of St. Peter's, or the summit of Mont Blanc, or the ever-moving stillness of Niagara. The sun is no respecter of persons or of things.

35. This is one infinite charm of the photographic delineation. Theoretically, a perfect photograph is absolutely inexhaustible. In a picture you can find nothing the artist has not seen before you; but in a perfect photograph there will be as many beauties lurking, unobserved, as there are flowers that blush unseen in forests and meadows. It is a mistake to suppose one knows a stereoscopic picture when he has studied it a hundred times by the aid of the best of our common instruments. Do we know all that there is in a landscape by looking out at it from our parlor-windows? In one of the glass stereoscopic views of Table Rock, two figures, so minute as to be mere objects of comparison with the surrounding vastness, may be seen standing side by side. Look at the two faces with a strong magnifier, and you could identify their owners, if you met them in a court of law.

36. Many persons suppose that they are looking on miniatures of the objects represented, when they see them in the stereoscope. They will be surprised to be told that they see most objects as large as they appear in Nature. A few simple experiments will show how what we see in ordinary vision is modified in our perceptions by what we think we see. We made a sham stereoscope, the other day, with no glasses, and an opening in the place where the pictures belong, about the size of one of the common stereoscopic pictures. Through this we got a very ample view of the town of Cambridge, including Mount Auburn and the Colleges, in a single field of vision. We do not recognize how minute distant objects really look to us, without something to bring the fact home to our conceptions. A man does not deceive us as to his real size when we see him at the distance of the length of Cambridge Bridge. But hold a common black pin before the eyes at the distance of distinct vision, and one-twentieth of its length, nearest the point, is enough to cover him so that he cannot be seen. The head of the same pin will cover one of the Cambridge horse-cars at the same distance, and conceal the tower of Mount Auburn, as seen from Boston.

37. We are near enough to an edifice to see it well, when we can easily read an inscription upon it. The stereoscopic views of the arches of Constantine and of Titus give not only every letter of the old inscriptions, but render the grain of the stone itself. On the pediment of the Pantheon may be read, not only the words traced by Agrippa, but a rough inscription above it, scratched or hacked into the stone by some wanton hand during an insurrectionary tumult.

38. This distinctness of the lesser details of a building or a landscape often gives us incidental truths which interest us more than the central object of the picture. Here is Alloway Kirk, in the churchyard of which you may read a real story by the side of the ruin that tells of more romantic fiction. There stands the stone "Erected by James Russell, seedsman, Ayr, in memory of his children,"--three little boys, James, and Thomas, and John, all snatched away from him in the space of three successive summer-days, and lying under the matted grass in the shadow of the old witch-haunted walls. It was Burns's Alloway Kirk we paid for, and we find we have bought a share in the griefs of James Russell, seedsman; for is not the stone that tells this blinding sorrow of real life the true centre of the picture, and not the roofless pile which reminds us of an idle legend?

39. We have often found these incidental glimpses of life and death running away with us from the main object the picture was meant to delineate. The more evidently accidental their introduction, the more trivial they are in themselves, the more they take hold of the imagination. It is common to find an object in one of the twin pictures which we miss in the other; the person or the vehicle having moved in the interval of taking the two photographs. There is before us a view of the Pool of David at Hebron, in which a shadowy figure appears at the water's edge, in the right-hand farther corner of the right-hand picture only. This muffled shape stealing silently into the solemn scene has already written a hundred biographies in our imagination. In the lovely glass stereograph of the Lake of Brienz, on the left-hand side, a vaguely hinted female figure stands by the margin of the fair water; on the other side of the picture she is not seen. This is life; we seem to see her come and go. All the longings, passions, experiences, possibilities of womanhood animate that gliding shadow which has flitted through our consciousness, nameless, dateless, featureless, yet more profoundly real than the sharpest of portraits traced by a human hand. Here is the Fountain of the Ogre, at Berne. In the right picture two women are chatting, with arms akimbo, over its basin; before the plate for the left picture is got ready, "one shall be taken and the other left"; look! on the left side there is but one woman, and you may see the blur where the other is



melting into thin air as she fades forever from your eyes.

40. Oh, infinite volumes of poems that I treasure in this small library of glass and pasteboard! I creep over the vast features of Rameses, on the face of his rockhewn Nubian temple; I scale the huge mountain-crystal that calls itself the Pyramid of Cheops. I pace the length of the three Titanic stones of the wall of Baalbec,-- mightiest masses of quarried rock that man has lifted into the air; and then I dive into some mass of foliage with my microscope, and trace the veinings of a leaf so delicately wrought in the painting not made with hands, that I can almost see its down and the green aphid that sucks its juices. I look into the eyes of the caged tiger, and on the scaly train of the crocodile, stretched on the sands of the river that has mirrored a hundred dynasties. I stroll through Rhenish vineyards, I sit under Roman arches, I walk the streets of once buried cities, I look into the chasms of Alpine glaciers, and on the rush of wasteful cataracts. I pass, in a moment, from the banks of the Charles to the ford of the Jordan, and leave my outward frame in the arm-chair at my table, while in spirit I am looking down upon Jerusalem from the Mount of Olives.

41. "Give me the full tide of life at Charing Cross," said Dr. Johnson. Here is Charing Cross, but without the full tide of life. A perpetual stream of figures leaves no definite shapes upon the picture. But on one side of this stereoscopic doublet a little London "gent" is leaning pensively against a post; on the other side he is seen sitting at the foot of the next post;--what is the matter with the little "gent?"

42. The very things which an artist would leave out, or render imperfectly, the photograph takes infinite care with, and so makes its illusions perfect. What is the picture of a drum without the marks on its head where the beating of the sticks has darkened the parchment? In three pictures of the Ann Hathaway Cottage, before us,--the most perfect, perhaps, of all the paper stereographs we have seen,--the door at the farther end of the cottage is open, and we see the marks left by the rubbing of hands and shoulders as the good people came through the entry, or leaned against it, or felt for the latch. It is not impossible that scales from the epidermis of the trembling hand of Ann Hathaway's young suitor, Will Shakespeare, are still adherent about the old latch and door, and that they contribute to the stains we see in our picture.

43. Among the accidents of life, as delineated in the stereograph, there is one that rarely fails in any extended view which shows us the details of streets and buildings. There may be neither man nor beast nor vehicle to be seen. You may be looking down on a place in such a way that none of the ordinary marks of its being actually inhabited show themselves. But in the rawest Western settlement and the oldest Eastern city, in the midst of the shanties at Pike's Peak and stretching across the court-yards as you look into them from above the clay-plastered roofs of Damascus, wherever man lives with any of the decencies of civilization, you will find the clothes-line. It may be a fence, (in Ireland,)--it may be a tree, (if the Irish license is still allowed us,)--but clothes-drying, or a place to dry clothes on, the stereoscopic photograph insists on finding, wherever it gives us a group of houses. This is the city of Berne. How it brings the people who sleep under that roof before us to see their sheets drying on that fence! And how real it makes the men in that house to look at their shirts hanging, arms down, from yonder line!

44. The reader will, perhaps, thank us for a few hints as to the choice of stereoscopes and stereoscopic pictures. The only way to be sure of getting a good instrument is to try a number of them, but it may be well to know which are worth trying. Those made with achromatic glasses may be as much better as they are dearer, but we have not been able to satisfy ourselves of the fact. We do not

commonly find any trouble from chromatic aberration (or false color in the image). It is an excellent thing to have the glasses adjust by pulling out and pushing in, either by hand, or, more conveniently, by a screw. The large instruments, holding twenty-five slides, are best adapted to the use of those who wish to show their views often to friends; the owner is a little apt to get tired of the unvarying round in which they present themselves. Perhaps we relish them more for having a little trouble in placing them, as we do nuts that we crack better than those we buy cracked. In optical effect, there is not much difference between them and the best ordinary instruments. We employ one stereoscope with adjusting glasses for the hand, and another common one upon a broad rosewood stand. The stand may be added to any instrument, and is a great convenience.

Some will have none but glass stereoscopic pictures; paper ones are not good enough for them. Wisdom dwells not with such. It is true that there is a brilliancy in a glass picture, with a flood of light pouring through it, which no paper one, with the light necessarily falling on it, can approach. But this brilliancy fatigues the eye much more than the quiet reflected light of the paper stereograph. Twenty-five glass slides, well inspected in a strong light, are good for one headache, if a person is disposed to that trouble.

45. Again, a good paper photograph is infinitely better than a bad glass one. We have a glass stereograph of Bethlehem, which looks as if the ground were covered with snow,--and paper ones of Jerusalem, colored and uncolored, much superior to it both in effect and detail. The Oriental pictures, we think, are apt to have this white, patchy look; possibly we do not get the best in this country.

46. A good view on glass or paper is, as a rule, best uncolored. But some of the American views of Niagara on glass are greatly improved by being colored; the water being rendered vastly more suggestive of the reality by the deep green tinge. Per contra we have seen some American views so carelessly colored that they were all the worse for having been meddled with. The views of the Hathaway Cottage, before referred to, are not only admirable in themselves, but some of them are admirably colored also. Few glass stereographs compare with them as real representatives of Nature.

47. In choosing stereoscopic pictures, beware of investing largely in groups. The owner soon gets tired to death of them. Two or three of the most striking among them are worth having, but mostly they are detestable, Ñvulgar repetitions of vulgar models, shamming grace, gentility, and emotion, by the aid of costumes, attitudes, expressions, and accessories worthy only of a Thespian society of candle-snuffers. In buying brides under veils, and such figures, look at the lady's hands. You will very probably find the young countess is a maid-of-all-work. The presence of a human figure adds greatly to the interest of all architectural views, by giving us a standard of size, and should often decide our choice out of a variety of such pictures. No view pleases the eye which has glaring patches in it,--a perfectly white-looking river, for instance,--or trees and shrubs in full leaf, but looking as if they were covered with snow,--or glaring roads, or frosted-looking stones and pebbles. As for composition in landscape, each person must consult his own taste. All have agreed in admiring many of the Irish views, as those about the Lakes of Killarney, for instance, which are beautiful alike in general effect and in nicety of detail. The glass views on the Rhine, and of the Pyrenees in Spain, are of consummate beauty. As a specimen of the most perfect, in its truth and union of harmony and contrast, the view of the Circus of Gavarni, with the female figure on horseback in the front ground, is not surpassed by any we remember to have seen.

48. What is to come of the stereoscope and the photograph we are almost afraid to

guess, lest we should seem extravagant. But, premising that we are to give a colored stereoscopic mental view of their prospects, we will venture on a few glimpses at a conceivable, if not a possible future.

49. Form is henceforth divorced from matter. In fact, matter as a visible object is of no great use any longer, except as the mould on which form is shaped. Give us a few negatives of a thing worth seeing, taken from different points of view, and that is all we want of it. Pull it down or burn it up, if you please. We must, perhaps, sacrifice some luxury in the loss of color; but form and light and shade are the great things, and even color can be added, and perhaps by and by may be got direct from Nature.

50. There is only one Coliseum or Pantheon; but how many millions of potential negatives have they shed,--representatives of billions of pictures,--since they were erected ! Matter in large masses must always be fixed and dear; form is cheap and transportable. We have got the fruit of creation now, and need not trouble ourselves with the core. Every conceivable object of Nature and Art will soon scale off its surface for us. Men will hunt all curious, beautiful, grand objects, as they hunt the cattle in South America, for their skins and leave the carcasses as of little worth.

51. The consequence of this will soon be such an enormous collection of forms that they will have to be classified and arranged in vast libraries, as books are now. The time will come when a man who wishes to see any object, natural or artificial, will go to the Imperial, National, or City Stereographic Library and call for its skin or form, as he would for a book at any common library. We do now distinctly propose the creation of a comprehensive and systematic stereographic library, where all men can find the special forms they particularly desire to see as artists, or as scholars, or as mechanics, or in any other capacity. Already a workman has been travelling about the country with stereographic views of furniture, showing his employer's patterns in this way, and taking orders for them. This is a mere hint of what is coming before long.

52. Again, we must have special stereographic collections, just as we have professional and other special libraries. And as a means of facilitating the formation of public and private stereographic collections, there must be arranged a comprehensive system of exchanges, so that there may grow up something like a universal currency of these bank-notes, or promises to pay in solid substance, which the sun has engraved for the great Bank of Nature.

53. To render comparison of similar objects, or of any that we may wish to see side by side, easy, there should be a stereographic metre or fixed standard of focal length for the camera lens, to furnish by its multiples or fractions, if necessary, the scale of distances, and the standard of power in the stereoscope-lens. In this way the eye can make the most rapid and exact comparisons. If the "great elm" and the Cowthorpe oak, if the State-House and St. Peter's, were taken on the same scale, and looked at with the same magnifying power, we should compare them without the possibility of being misled by those partialities which might tend to make US overrate the indigenous vegetable and the dome of our native Michel Angelo.

54. The next European war will send us stereographs of battles. It is asserted that a bursting shell can be photographed. The time is perhaps at hand when a flash of light, as sudden and brief as that of the lightning which shows a whirling wheel standing stock still, shall preserve the very instant of the shock of contact of the mighty armies that are even now gathering. The lightning from heaven does actually photograph natural objects on the bodies of those it has just blasted,--so

we are told by many witnesses. The lightning of clashing sabres and bayonets may be forced to stereotype itself in a stillness as complete as that of the tumbling tide of Niagara as we see it self-pictured.

55. We should be led on too far, if we developed our belief as to the transformations to be wrought by this greatest of human triumphs over earthly conditions, the divorce of form and substance. Let our readers fill out a blank check on the future as they like,--we give our endorsement to their imaginations beforehand. We are looking into stereoscopes as pretty toys, and wondering over the photograph as a charming novelty; but before another generation has passed away, it will be recognized that a new epoch in the history of human progress dates from the time when He who

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