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THE GHOST.

BY PROFESSOR PEPPIER.

Public opinion long ago determined and settled it as a fact that it was quite possible to see a spectral image which should simulate the human form divine. Classical histories tell of phantoms rising before the astonished vision of heroes to warn them of impending disasters and death. Shakespeare continually uses "the Ghost," as one of his great dramatic accessories, employing spectres to afflict the eyes and menace the hearts of murderers, viz. Brutus, Macbeth and Richard the Third. The ancients were not, however, bold enough to manufacture or produce a patent ghost, they had no learned works to instruct them upon the laws of light and optics; but still the human mind, ever restless and yearning after the truthful and the beautiful, brought them very near to a modern experimental ghost when they embodied the idea of reflection in their mythological and poetical fables. The reflection of sound is illustrated in the fate of the nymph Echo who, daring to assist Jupiter in deceiving Juno, was punished by the Queen of Heaven and changed into an echo, and as if the laws of reflection were to be still further illustrated, the silly nymph Echo fell in love with Narcissus, (a name synonymous with a pretty flower), but as her love was not returned, she pined away in grief, and fading gradually left behind her a voice (A Voice) *et præterea nihil* (and nothing besides).

Much, oh patient reader, the fate of Narcissus. Just as poor dear pretty Echo subsided into the reflection of sound and exchanged her corporeal existence for a voice; so Narcissus meets the same unhappy end by the reflection of light, for Dr. Clarke informs us that Narcissus was a beautiful (I presume) youth, and that he was the son of Cepheus and Liriope; but unfortunately for poor Echo was inaccessible to the feeling of love. Echo enamoured of the cold creature died of grief.

But Nemesis, to punish Narcissus, caused him to see a *lovely image reflected in a fountain*, whereupon he became so enamoured of it, that he gradually pined away, until he was metamorphosed into the flower which bears his name. Narcissus saw his own ghost and died.

Thus we are convinced that the ancients illustrated poetically the reflection of sound and light.

Echo died of the reflection of sound. Narcissus of the reflection of light.

The ghost is a reflection; and now for a little philosophy of the nineteenth century.

Light distributes itself from all luminous bodies like radii drawn from the centre of a circle. The smallest portion of light separate is spoken of as a ray of light, and provided this ray remains in the same medium of the same density no change occurs in its path or direction; but directly it passes out of that medium into another of a different density or into any other solid, fluid, or gaseous body, it may undergo other changes, but especially may be reflected and indeed a portion of it is always turned back.

On any irregular surface such as a cloud, or snow, or paper light is scattered and so generally diffused that it will illuminate a large space. If however it falls upon a polished surface of steel, silver, gold, nickel, platinum or other metallic surface, the ray is thrown off in a certain and fixed direction, and now instead of being scattered it illuminates brilliantly a limited space.

The reflection of light takes place in obedience to certain fixed laws of which the fundamental one is that, "The angle of incidence is equal to the angle of reflection," or, "the incident and reflected rays always form equal angles."

The second law is that the incident and reflected rays, always lie in the same plane—i. e. if the path of the incident ray corresponds with the top of a table and is horizontal, the reflected ray will be the same. If the incident ray is perpendicular or in a plane corresponding with the legs of the table, then the reflected ray is identical with that plane.

If a ray of light strikes a surface in a perpendicular direction it returns upon itself and retraces, as it were, its steps. If the ray falls slantingly, then it darts off the reflecting surface in an oblique direction.

It is easy to take pencil and drawing-paper and trace out the direction a ray of light ought to take in obedience to these laws. First, draw a straight line to represent the reflecting surface, then draw a perpendicular to the surface, when the ray is represented as striking the surface. It is easy to complete the angle of the incident ray and to draw the reflected one exactly alike on the other side of the perpendicular.

A hole in a closed shutter will admit into a shaded room a beam or ray of light with which the young experimentalist may operate. The dust in the room by irregular reflection shows the path of the ray, and by taking some plane or flat surface, such for instance as a piece of plate-glass, the student may soon learn the very simple principle upon which the more complicated illusion called "The Ghost," is produced. First, he may hold the glass so that the ray is exactly perpendicular to the reflecting surface, when he will notice the ray retrace its own course. Secondly, he may incline the glass and then observe that whilst a considerable portion of light goes through the glass, a still larger one is thrown off or reflected. And now it is only necessary to imagine a highly illuminated object, such as a plaster of Paris bust or a living being standing before the perpendicular or inclined glass, and the reflection of the real figure will be the spectral image or ghost. When we walk past large plate-glass windows in shops we may see our own "ghosts" walking amongst the silks and satins, or hms, cloaks, butter, &c., within. The ghosts are usually clear and distinct because they are produced by perpendicular reflections, which are always the best and free from any displacement—bending or unnatural distortion. The beautiful photograph of the "Mirror Lake" in Yosemite Valley, is an admirable illustration of the principle of "a Ghost," or of the story of Narcissus. The only difference is that the reflecting surface is water and not glass. As the light from an illuminated object must travel to the surface of the glass and then come back again, it is evident that the reflection will appear just as far behind the glass as the real one is distant from it in front. Nature thus most perfectly registers distances, and art, by the employment of a Theodolite, applies the principle. The amount of light reflected varies,

as already stated, according to the position of the glass. Thus 25 rays only out of a 1,000 are returned from glass when they fall in the perpendicular line, about 400 if they fall upon the glass placed at an angle of 80 degrees. At an angle of 89 degrees the plain unsilvered glass would reflect nearly all the light and quite as much as if coated with quicksilver amalgam at the back. It is on account of this fact that the startling "ghost effect" produced in nature by the Mirage of the Desert is produced.

The strata of air vary in temperature, the layer nearest the sand is hotter than the air above it; the rays from any distant object, such as a house, a tree, a lake, strike at a very oblique angle and then undergo nearly total reflection as explained with the glass when placed at an angle of 89 degrees.

The illusion called the Ghost is, therefore, a spectral image produced by placing any illuminated object before a large sheet of plate-glass. The illuminated object is concealed from the view of the spectator, and is made to appear or vanish by alternately throwing on and cutting off the light used to illuminate the figure. The idea of the ghost was first shown by a toy model in which it appeared to be necessary to build a room specially for the exhibition. The writer by arranging lights before and behind the glass, and combining the action of the living figure with the spectral one, produced those startling effects which put thousands of pounds into the pockets of the Directors of the Polytechnic Joint Stock Company. Out of £2,000 sterling realized during the first year it was exhibited, the writer received the not too liberal and encouraging sum of £200 over and above his salary and percentage, and having to pay all the law expenses arising from the defence of the Ghost Patent was, like nearly every inventor, the worst remunerated person in the affair. An attempt to vote him £1,000 at a General Meeting, was squelched by an informality in registering the proxies for votes.

The Ghost was produced under the writer's direction at the various London Theatres, viz. at Drury Lane, the Adelphi, and Britannia Theatres; also, in Paris, at the Théâtre du Château, likewise at the Crystal Palace, Sydenham, and a number of other provincial Theatres and Lecture Halls.

It found its way *abroad* the permission of the Patentee to Germany, Spain, India, Russia, the United States of America, and must have realized for the various fortunate exhibitors a sum of at least a *portion of a million sterling*—the largest sum ever realized by any optical illusion.

When the very learned Lord Chancellor, Lord Westbury gave judgment for the Patentee in Chancery, he said, that in his boyish days he was taken by his father to see the celebrated Egyptian traveller Belzoni, and the latter exhibited a toy which displayed the same kind of effect as the Ghost apparatus. The Lord Chancellor, in alluding to the evidence and affidavits, with drawings deposited in Court, said that the drawings were direct copies of the Patentee's, and were obtained in some improper manner. In speaking of one person who swore he had seen the ghost at some tea gardens in the neighbourhood of Margate, England, his Lordship remarked "that the witness was spoken of as a 'nigger minstrel'; he was elsewhere denominated an 'Ethiopian Soreador.' He was no doubt a most respectable person, a very honest individual, but to put the evidence of such a person against that of Faraday, Wheatstone and Brewster, was a manifest absurdity, he therefore ruled that the Defendant's Patent be sealed and the Plaintiffs pay the costs."

The writer cannot conclude this little sketch without speaking most approvingly of Mr. Bell Smith's admirable drawing of the appearance of the Ghost to the astonished student, which accompanies this description.

PAGANINI.

About the age of thirty, at which time, as we shall presently narrate, Paganini became free never again to be bound by any official appointment—the great violinist had exhausted all the possible resources of his instrument. From this time Paganini, incredible as it may appear, seldom, if ever, played except at concerts and rehearsals, and not always even at rehearsals. Mr. Harris, who for twelve months acted as his secretary, and seldom left him, never saw him take his violin from its case. At the hotels where he stopped the sound of his instrument was never heard. He used to say that he had worked enough, and had earned his right to repose; yet, without an effort, he continued to overcome the superhuman difficulties which he himself had created with the same unerring facility, and ever watched by the eager and envious eyes of critics and rivals. In vain! No false intonation, no note out of tune, no failure was ever perceptible. The *Times'* critic, reviewing him in London some years before his death, says his octaves were so true that they sounded like one note, and the most enormous intervals with triple notes, harmonics, and guitar effects, seem to have been invariably taken with the same precision. In the words of a critical judge, M. Fetis, "his hand was a geometrical compass, which divided the finger-board with mathematical precision." There is an amusing story told of an Englishman, who followed him from place to place to hear him play in private, in the hope of discovering his "secret." At last, after many vain attempts, he managed to get lodged in the next room to the great artist. Looking through the keyhole, he beheld him seated on a sofa, about to take his violin from its case—at last! He raises it to his chin—but the bow?—is left in the case. The left hand merely measures with its enormous wiry fingers a few mechanical intervals, and the instrument is replaced in silence—not even then was a note to be heard! Yet every detail of rehearsal was an anxiety to him. Although he gave a prodigious number of concerts, he was always unusually restless and abstracted on the morning of the day on which he had to perform. He would be idle for hours on his sofa—or, at least, he seemed to be idle—perhaps the works were then being wound up before going to rehearsal—he would then before starting take up his violin, examine it carefully, especially the screws, and, having satisfied himself, replace it in its shabby worn case without striking a note. Then he would sort and arrange the orchestral parts of his solos, and go off to rehearsal. He was very unpunctual, and on one occasion kept the whole band waiting for an hour, and was at last found sheltering from the rain under a colonnade, rather than take a cab. This was in London. At the rehearsal there was always the most intense eagerness on the part of the band to see him play, and when he came to one of his prodigious cadenzas, the musicians would rise in their seats, and lean forward to watch every movement, and follow every sound. Paganini would then just play a few commonplace notes, stop suddenly, and, turn-

ing round to the band, wave his bow, with a malicious smile, and say, "Et cetera, Messieurs!" If anything went wrong, he got into a paroxysm of fury; but when things went well, he freely showed his satisfaction, and often exclaimed, "Bravissimo sieti tutti virtuosi!" He could be very courteous in his manner, and was not personally unpopular with his fellow-musicians, who stood greatly in awe of him. No one ever saw the principal parts of his solos, as he played by heart, for fear of the music being copied. The rehearsals over, he carried even the orchestral parts away with him. He would then go straight home, take a light meal, throw himself on his bed, and sleep profoundly until his carriage arrived to take him to the concert. His toilet was very simple, and took hardly any time; his coat was buttoned tightly over his chest, and marked the more conspicuously the impossible angles of his figure; his trousers hung loose for trousers of the period; his cravat was tight about his neck. He sweated so profusely over his solos that he always carried a clean shirt in his violin trunk, and changed his linen once at least during the concert. At concert time he usually seemed in excellent spirits. His first question on arriving was always, "Is there a large audience?" If the room was full, he would say, "Excellent people! good! good!" If by any chance the boxes were empty, he would say, "Some of the effect will be lost." He kept his audience waiting a long time, and he would sometimes say, "I have played better," or "I have played worse," and occasionally his first solo would be more effective than his last. After once or twice trying the music of Kreutzer and Hole in public, he decided never to play any but his own, and said to his secretary, Mr. Harris, "I have my own peculiar style; in accordance with this I regulate my compositions. I had much rather write a piece in which I can trust myself entirely to my own musical impressions." "His art," observes M. Fetis, "was an art born with him, the secret of which he has carried to the grave!"—*Good Words.*

Miscellaneous.

The French census has just been declared, and the population of the whole country is fixed at 32,122,821.

Female "Siamese twins" have arrived in Paris, en route for London, where they will exhibit at the Crystal Palace.

Another of the Balaclava heroes has gone. Gen. Mayow, C.B., fell dead from his horse on New Year's Day. The cause of death was heart-disease.

A bicyclist, recently deceased in London, was found to have the heaviest brain on record. It weighed sixty-seven ounces. The man could neither read nor write.

The *Colon Journal* says that the Canadian Government has ordered of Sir William Armstrong a number of 3-pounder field guns of 8 cwt., similar to those supplied to the Royal Artillery.

It is so often the case that "free admission" to a meeting means "no collection at the conclusion," that the English papers are now adding to some of their announcements, "entrance and exit free."

The Grand Duke Alexis of Russia, according to the latest accounts, is expected in Oriental Siberia, where great preparations are being made to receive him. It is said that he will enter Siberia by Kamtschatka, coming from Peking.

It is believed that Prof. Tyndall will clear about \$25,000 by his lectures in the States, and it has been hinted that he proposes to donate the whole of this sum to the founding of something scientific in one of the American colleges.

Japan is about to remodel her whole system of education. The country is to be reorganized into eight divisions, in each of which there are to be a university and thirty-two "middle" schools. There are also to be academies, and, beneath these, primary schools.

Canon Kingsley, in a recent address at the Birmingham Midland Institute, earnestly recommended the teaching of the art, and the encouragement of the practice of preserving health. Shortly afterwards the means were supplied for carrying out the suggestion by a donation of £2,500 sent anonymously for the purpose of establishing a professorship on the subject.

In Paris Alpine rats are being imported as an article of food, and are pronounced to be equal to domestic rabbit and a shade better than cat. Thanks to the ingenuity of an Italian grocer, Paris has not suffered in its supply of "fresh fish" during the late inclement weather; that individual set up machinery to manufacture whiting, gudgeon, flots de sel, &c., out of the tails of salt cod. Horse-flesh is reviving in favour.

The *Nation* has been casting the horoscope of M. Thiers, and finds that the number 34 is the cabalistic figure of the veteran statesman. He made his debut as Minister when he was 36 years old, in 1832, and was Premier in 1846; he has published 35 volumes of French history; he is now twice 35 years and 35 months of age; lastly, in his late victory in the Versailles Assembly, he obtained a majority of 35 votes.

The biggest—and, perhaps the dullest—book which has ever been constructed, is just now in process of building. It is the book which shall contain the names of those inhabitants of Alsace and Lorraine who have now formally proclaimed their wish to remain French subjects to the number of 389,999. The *Patrie* states that 125 composers have been employed on the work during the last three months, that it is being printed on seven presses, and that it will form a volume of 13,151 pages.

The Fenian Amnesty Association are raising a fund for the prosecution of certain gaolers at Chatham and Millbank for alleged cruelty towards Reidin, the late Fenian prisoner, who says that he was placed in solitary confinement, had not sufficient food, and, when afflicted with paralysis, was burnt with red-hot irons and pricked with needles to find out whether he was shamming. One of the charges, however, is of a truly Irish character: it is that his cell was fastened with a padlock instead of the customary bolt! A statement of the tortures is to be printed in detail in every European language and circulated in all countries. Mr. Isaac Butt and Mr. H. Mathew, M. P., have been retained as counsel for the prosecution.

A DAUGHTER OF THE REGIMENT.—Admirers of Donizetti's pretty opera, *La Figlia del Reggimento*, will be interested to hear, on authority of the *Russian Invalid*, that the 150th Regiment of Russian Infantry possesses at this moment a daughter of the regiment. The young lady who bears this not unenviable title is the daughter of Father Malinin, the regimental chaplain, who died in 1867, leaving his little girl, then only ten years old, entirely unprovided for. The officers, with whom the chaplain had been a great favourite, made a subscription for the child, on the understanding that it should be continued annually, and placed her at a boarding-school at Saratoff, where the regiment is stationed during the winter. The *Russian Invalid* does not say whether Mlle. Malinin plays the drum; but whenever a regimental entertainment is given the officers invite their daughter to do the honours.

Victor Emanuel has lately made himself quite popular with