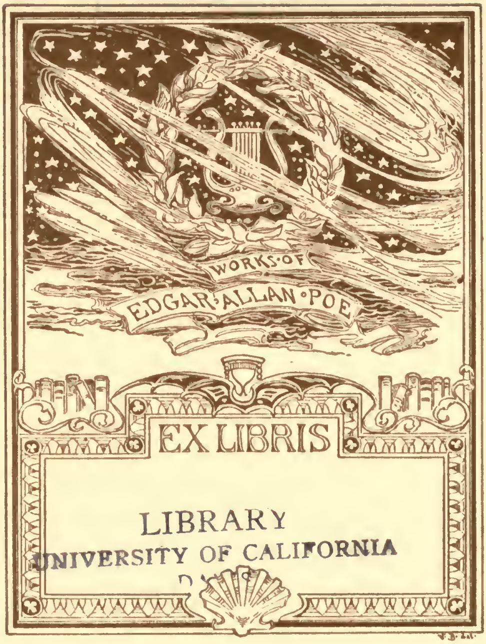
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OF

EDGAR ALLAN POE

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"There is no passion in nature so demoniacally impatient, as that of him who, shuddering upon the edge of a precipice, thus meditates a plunge."

10

MISCELLANY

G. P. PUTNAM'S SONS
NEW YORK AND LONDON
The Knickerbocker Press

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MISCELLANY

Maelzel's Chess-Player

PERHAPS no exhibition of the kind has ever elicited so general attention as the Chess-Player of Maelzel. Wherever seen it has been an object of intense curiosity to all persons who think. Yet the question of its *modus operandi* is still undetermined. Nothing has been written on this topic which can be considered as decisive, and, accordingly, we find everywhere men of mechanical genius, of great general acuteness and discriminative understanding, who make no scruple in pronouncing the Automaton a pure machine, unconnected with human agency in its movements, and consequently, beyond all comparison, the most astonishing of the inventions of mankind. And such it would undoubtedly be, were they right in their supposition. Assuming this hypothesis, it would be grossly absurd to compare with the Chess-Player any similar thing of either modern or ancient days. Yet there have been many and wonderful automata. In Brewster's *Letters on Natural Magic* we have an account of the most remarkable. Among these may be mentioned, as having beyond doubt existed, firstly, the coach invented by M. Camus for the amusement of Louis XIV. when a child. A table, about four feet square, was introduced into the room appropriated for the exhibition. Upon this table was placed a carriage six inches in length, made of wood, and drawn by two horses of the same material. One window being down, a lady was seen on the back seat. A coachman held the reins on the box and a footman and page were in their places behind. M. Camus now touched a spring; whereupon the coachman smacked his whip and the horses proceeded in a natural manner along the edge of the table, drawing after them the carriage. Having gone as far as possible in this direction, a sudden turn was made to the left, and the vehicle was driven at right angles to its former course and still closely along the edge of the table. In this way the coach proceeded until it arrived opposite the chair of the young prince. It then stopped, the page descended and opened the door, the lady alighted and presented a petition to her sovereign. She then reentered. The page put up the steps, closed the door, and resumed his station. The coachman whipped his horses, and the carriage was driven back to its original position.

The Magician of M. Maillardet is also worthy of notice. We copy the following account of it from the *Letters* before mentioned of Dr. B., who derived his information principally from the *Edinburgh Encyclopædia:*

"One of the most popular pieces of mechanism which we have seen is the Magician constructed by M. Maillardet, for the purpose of answering certain given questions. A figure, dressed like a magician, appears seated at the bottom of a wall, holding a wand in one hand and a book in the other. A number of questions, ready prepared, are inscribed on oval medallions, and the spectator takes any of these he chooses, and to which he wishes an answer, and, having placed it in a drawer ready to receive it, the drawer shuts with a spring till the answer is returned. The magician then arises from his seat, bows his head, describes circles with his wand, and, consulting the book as if in deep thought, he lifts it toward his face. Having thus appeared to ponder over the proposed question, he raises his wand, and, striking with it the wall above his head, two folding-doors fly open and display an appropriate answer to the question. The doors again close, the magician resumes his original position, and the drawer opens to return the medallion. There are twenty of these medallions, all containing different questions, to which the magician returns the most suitable and striking answers. The medallions are thin plates of brass, of an elliptical form, exactly resembling each other. Some of the medallions have a question inscribed on each side, both of which the magician answers in succession. If the drawer is shut without a medallion being put in it, the magician rises, consults his book, shakes his head, and resumes his seat, the folding-doors remain shut, and the drawer is returned empty. If two medallions are put into the drawer together, an answer is returned only to the lower one. When the machinery is wound up, the movements continue about an hour, during which time about fifty persons may be answered. The inventor stated that the means by which the different medallions acted upon the machinery, so as to produce the proper answers to the questions which they contained, were extremely simple."

The Duck of Vaucanson was still more remarkable. It was of the size of life, and so perfect an imitation of the living animal that all the spectators were deceived. It executed, says Brewster, all the natural movements and gestures, it ate and drank with avidity, performed all the quick motions of the head and throat which are peculiar to the duck, and like it muddled the water which it drank with its bill. It produced also the sound of quacking in the most natural manner. In the anatomical structure the artists exhibited the highest skill. Every bone in the real duck had its representative in the automaton, and its wings were anatomically exact. Every cavity, apophysis, and curvature was imitated, and each bone executed its proper movements. When corn was thrown down before it, the duck stretched out its neck to pick it up, swallowed, and digested it.[1]

But if these machines were ingenious, what shall we think of the calculating machine of Mr. Babbage? What shall we think of an engine of wood and metal which can not only compute astronomical and navigation tables to any given extent, but render the exactitude of its operations mathematically certain through its power of correcting its possible errors? What shall we think of a machine which can not only accomplish all this, but actually print off its elaborate results, when obtained, without the slightest intervention of the intellect of man? It will, perhaps, be said in reply, that a machine such as we have described is altogether above comparison with the Chess-Player of Maelzel. By no means, it is altogether beneath it, that is to say, provided we assume (what should never for a moment be assumed) that the Chess-Player is a pure machine, and performs its operations without any immediate human agency. Arithmetical or algebraical calculations are, from their very nature, fixed and determinate. Certain data being given, certain results necessarily and inevitably follow. These results have dependence

[1] Under the head "Androides" in the *Edinburgh Encyclopædia* may be found a full account of the principal automata of ancient and modern times.

upon nothing, and are influenced by nothing but the data originally given. And the question to be solved proceeds, or should proceed, to its final determination by a succession of unerring steps liable to no change and subject to no modification. This being the case, we can without difficulty conceive the possibility of so arranging a piece of mechanism, that upon starting it in accordance with the data of the question to be solved, it should continue its movements regularly, progressively, and undeviatingly toward the required solution, since these movements, however complex, are never imagined to be otherwise than finite and determinate. But the case is widely different with the Chess-Player. With him there is no determinate progression. No one move in chess necessarily follows upon any one other. From no particular disposition of the men at one period of a game can we predicate their disposition at a different period. Let us place the first move in a game of chess in juxtaposition with the data of an algebraical question, and their great difference will be immediately perceived. From the latter, from the data, the second step of the question, dependent thereupon, inevitably follows. It is modelled by the data. It must be thus and not otherwise. But from the first move in the game of chess no especial second move follows of necessity. In the algebraical question, as it proceeds toward solution, the certainty of its operations remains altogether unimpaired. The second step having been a consequence of the data, the third step is equally a consequence of the second, the fourth of the third, the fifth of the fourth, and so on, and not possibly otherwise, to the end. But in proportion to the progress made in a game of chess is the uncertainty of each ensuing move. A few moves having been made, no step is certain. Different spectators of the game would advise different moves. All is then dependent upon the variable judgment of the players. Now even granting (what should not be granted) that the movements of the Automaton Chess-Player were in themselves determinate, they would be necessarily interrupted and disarranged by the indeterminate will of his antagonist. There is, then, no analogy whatever between the operations of the Chess-Player and those of the calculating machine of Mr. Babbage, and if we choose to call the former a pure machine we must be prepared to admit that it is, beyond all comparison, the most wonderful of the inventions of mankind. Its original projector, however, Baron Kempelen, had no scruple in declaring it to be a "very ordinary piece of mechanism, a bagatelle whose effects appeared so marvellous only from the boldness of the conception and the fortunate choice of the methods adopted for promoting the illusion." But it is needless to dwell upon this point. It is quite certain that the operations of the Automaton are regulated by mind and by nothing else. Indeed, this matter is susceptible of a mathematical demonstration, *a priori.* The only question, then, is of the manner in which human agency is brought to bear. Before entering upon this subject it would be as well to give a brief history and description of the Chess-Player for the benefit of such of our readers as may never have had an opportunity of witnessing Mr. Maelzel's exhibition.

The Automaton Chess-Player was invented in 1769 by Baron Kempelen, a nobleman of Presburg, in Hungary, who afterward disposed of it, together with the

secret of its operations, to its present possessor.[1] Soon after its completion it was exhibited in Presburg, Paris, Vienna, and other continental cities. In 1783 and 1784 it was taken to London by Mr. Maelzel. Of late years it has visited the principal towns in the United States. Wherever seen, the most intense curiosity was excited by its appearance, and numerous have been the attempts, by men of all classes, to fathom the mystery

[1] This was written in 1835, when Mr. Maelzel, recently deceased, was exhibiting the Chess-Player in the United States.—Editor.

of its evolutions. The cut on opposite page gives a tolerable representation of the figure as seen by the citizens of Richmond a few weeks ago. The right arm, however, should lie more at length upon the box, a chess-board should appear upon it, and the cushion should not be seen while the pipe is held. Some immaterial alterations have been made in the costume of the player since it came into the possession of Maelzel —the plume, for example, was not originally worn.

At the hour appointed for exhibition, a curtain is withdrawn, or folding-doors are thrown open, and the machine rolled to within about twelve feet of the nearest of the spectators, between whom and it (the machine) a rope is stretched. A figure is seen habited as a Turk, and seated, with its legs crossed, at a large box apparently of maplewood, which serves it as a table. The exhibitor will, if requested, roll the machine to any portion of the room, suffer it to remain altogether on any designated spot, or even shift its location repeatedly during the progress of a game. The bottom of the box is elevated considerably above the floor by means of the castors or brazen rollers on which it moves, a clear view of the surface immediately beneath the Automaton being thus afforded to the spectators. The chair on which the figure sits is affixed permanently to the box. On the top of this latter is a chess-board, also permanently affixed. The right arm of the Chess-Player is extended at full length before him, at right angles with his body, and lying, in an apparently careless position, by the side of the board. The back of the hand is upward. The board itself is eighteen inches square. The left arm of the figure is bent at the elbow, and in the left hand is a pipe. A green drapery conceals the back of the Turk and falls partially over the front of both shoulders. To judge from the external appearance of the box, it is divided into five compartments—three cupboards of equal dimensions, and two drawers occupying that portion of the chest lying beneath the cupboards. The foregoing observations apply to the appearance of the Automaton upon its first introduction into the presence of the spectators.

Maelzel now informs the company that he will disclose to their view the mechanism of the machine. Taking from his pocket a bunch of keys, he unlocks with one of them a door marked 1 in the cut on page 8, and throws the cupboard fully open to the inspection of all present. Its whole interior is apparently filled with wheels, pinions, levers, and other machinery, crowded very closely together, so that the eye can penetrate but a little distance into the mass. Leaving this door open to its full extent, he goes now round to the back of the box, and, raising the drapery of the figure, opens another door situated precisely in the rear of the one first opened. Holding a lighted candle at this door, and shifting the position of the whole machine repeatedly at the same time, a bright light is thrown entirely through the cupboard, which is now clearly seen to be full, completely full, of machinery. The spectators being satisfied of this fact, Maelzel closes the back door, locks it, takes the key from the lock, lets fall the drapery of the figure, and comes round to the front. The door marked 1, it will be remembered, is still open. The exhibitor now proceeds to open the drawer which lies beneath the cupboards at the bottom of the box, for although there are apparently two drawers there is really only one, the two handles and two key-holes being intended merely for ornament. Having opened this drawer to its full extent, a small cushion and a set of chessmen, fixed in a framework made to support them perpendicularly, are discovered. Leaving this drawer, as well as cupboard No. 1, open, Maelzel now unlocks door No. 2 and door No. 3, which are discovered to be folding-doors, opening into one and the same compartment. To the right of this compartment, however (that is to say, to the spectators' right), a small division, six inches wide and filled with machinery, is partitioned off. The main compartment itself (in speaking of that portion of the box visible upon opening doors 2 and 3 we shall always call it the main compartment) is lined with dark cloth and contains no machinery whatever beyond two pieces of steel, quadrant-shaped, and situated one in each of the rear top corners of the compartment. A small protuberance about eight inches square, and also covered with dark cloth, lies on the floor of the compartment near the rear corner on the spectators' left hand. Leaving doors No. 2 and No. 3 open, as well as the drawer and door No. 1, the exhibitor now goes round to the back of the main compartment, and, unlocking another door there, displays clearly all the interior of the main compartment by introducing a candle behind it and within it. The whole box being thus apparently disclosed to the scrutiny of the company, Maelzel, still leaving the doors and drawer open, rolls the Automaton entirely round and exposes the back of the Turk by lifting up the drapery. A door about ten inches square is thrown open in the loins of the figure, and a smaller one also in the left thigh. The interior of the figure, as seen through these apertures, appears to be crowded with machinery. In general, every spectator is now thoroughly satisfied of having beheld and completely scrutinized, at one and the same time, every individual portion of the Automaton, and the idea of any person being concealed in the interior, during so complete an exhibition of that interior, if ever entertained, is immediately dismissed as preposterous in the extreme.

M. Maelzel, having rolled the machine back into its original position, now informs the company that the Automaton will play a game of chess with any one disposed to encounter him. This challenge being accepted, a small table is prepared for the antagonist and placed close by the rope, but on the spectators' side of it, and so situated as not to prevent the company from obtaining a full view of the Automaton. From a drawer in this table is taken a set of chessmen, and Maelzel arranges them generally, but not always, with his own hands, on the chess-board, which consists merely of the usual number of squares painted upon the table. The antagonist having taken his seat, the exhibitor approaches the drawer of the box and takes therefrom the cushion, which, after removing the pipe from the hand of the Automaton, he places under its left arm as a support. Then, taking also from the drawer the Automaton's set of chessmen, he arranges them upon the chess-board before the figure. He now proceeds to close the doors and to lock them, leaving the bunch of keys in door No. 1. He also closes the drawer, and, finally, winds up the machine by applying a key to an aperture in the left end (the spectators' left) of the box. The game now commences, the Automaton taking the first move. The duration of the contest is usually limited to half an hour, but if it be not finished at the expiration of this period, and the antagonist still contends that he can beat the Automaton, M. Maelzel has seldom any objection to continue it. Not to weary the company is the ostensible and, no doubt, the real object of the limitation. It will, of course, be understood that when a move is made at his own table by the antagonist, the corresponding move is made at the box of the Automaton, by Maelzel himself, who then acts as the representative of the antagonist. On the other hand, when the Turk moves, the corresponding move is made at the table of the antagonist, also by M. Maelzel, who then acts as the representative of the Automaton. In this manner it is necessary that the exhibitor should often pass from one table to the other. He also frequently goes in the rear of the figure to remove the chessmen which it has taken, and which it deposits, when taken, on the box to the left (to its own left) of the board. When the Automaton hesitates in relation to its move, the exhibitor is occasionally seen to place himself very near its right side, and to lay his hand now and then, in a careless manner, upon the box. He has also a peculiar shuffle with his feet, calculated to induce suspicion of collusion with the machine in minds which are more cunning than sagacious. These peculiarities are, no doubt, mere mannerisms of M. Maelzel, or, if he is aware of them at all, he puts them in practice with a view of exciting in the spectators a false idea of the pure mechanism in the Automaton.

The Turk plays with his left hand. All the movements of the arm are at right angles. In this manner, the hand (which is gloved and bent in a natural way), being brought directly above the piece to be moved, descends finally upon it, the fingers receiving it, in most cases, without difficulty. Occasionally, however, when the piece is not precisely in its proper situation the Automaton fails in his attempt at seizing it. When this occurs, no second effort is made, but the arm continues its movement in the direction originally intended, precisely as if the piece were in the fingers. Having thus designated the spot whither the move should have been made, the arm returns to its cushion, and Maelzel performs the evolution which the Automaton pointed out. At every movement of the figure machinery is heard in motion. During the progress of the game, the figure now and then rolls its eyes as if surveying the board, moves its head, and pronounces the word "echec" (check) when necessary.[1] If a false move be made by his antagonist, he raps briskly on the box with the fingers of his right hand, shakes his head roughly, and, replacing the piece falsely moved in its former situation, assumes the next move himself. Upon beating the game, he waves his head with an air of triumph, looks around complacently upon the spectators, and, drawing his left arm farther back than usual, suffers his fingers alone to rest upon the cushion. In general, the Turk is victorious—once or twice he has been beaten. The game being ended, Maelzel will again, if desired, exhibit the

[1] The making the Turk pronounce the word "echec" is an improvement by M. Maelzel. When in possession of Baron Kempelen, the figure indicated a check by rapping on the box with his right hand.

mechanism of the box in the same manner as before. The machine is then rolled back, and a curtain hides it from the view of the company.

There have been many attempts at solving the mystery of the Automaton. The most general opinion in relation to it, an opinion, too, not unfrequently adopted by men who should have known better, was, as we have before said, that no immediate human agency was employed,—in other words, that the machine was purely a machine and nothing else. Many, however, maintained that the exhibitor himself regulated the movements of the figure by mechanical means, operating through the feet of the box. Others, again, spoke confidently of a magnet. Of the first of these opinions we shall say nothing at present more than we have already said. In relation to the second it is only necessary to repeat what we have before stated, that the machine is rolled about on castors, and will, at the request of a spectator, be moved to and fro to any portion of the room, even during the progress of the game. The supposition of the magnet is also untenable, for if a magnet were the agent, any other magnet in the pocket of a spectator would disarrange the entire mechanism. The exhibitor, however, will suffer the most powerful loadstone to remain even upon the box during the whole of the exhibition.

The first attempt at a written explanation of the secret, at least the first attempt of which we ourselves have any knowledge, was made in a large pamphlet printed at Paris in 1785. The author's hypothesis amounted to this—that a dwarf actuated the machine. This dwarf he supposed to conceal himself during the opening of the box by thrusting his legs into two hollow cylinders, which were represented to be (but which are not) among the machinery in the cupboard No. 1, while his body was out of the box entirely and covered by the drapery of the Turk. When the doors were shut, the dwarf was enabled to bring his body within the box, the noise produced by some portion of the machinery allowing him to do so unheard, and also to close the door by which he entered. The interior of the Automaton being then exhibited, and no person discovered, the spectators, says the author of this pamphlet, are satisfied that no one is within any portion of the machine. The whole hypothesis was too obviously absurd to require comment or refutation, and, accordingly, we find that it attracted very little attention.

In 1789 a book was published at Dresden by M. I. F. Freyhere, in which another endeavor was made to unravel the mystery. Mr. Freyhere's book was a pretty large one, and copiously illustrated by colored engravings. His supposition was that "a well-taught boy, very thin and tall of his age (sufficiently so that he could be concealed in a drawer almost immediately under the chess-board)" played the game of chess and effected all the evolutions of the Automaton. This idea, although even more silly than that of the Parisian author, met with a better reception, and was in some measure believed to be the true solution of the wonder, until the inventor put an end to the discussion by suffering a close examination of the top of the box.

These bizarre attempts at explanation were followed by others equally bizarre. Of late years, however, an anonymous writer, by a course of reasoning exceedingly unphilosophical, has contrived to blunder upon a plausible solution, although we cannot consider it altogether the true one. His essay was first published in a Baltimore weekly paper, was illustrated by cuts, and was entitled *An Attempt to Analyze the Automaton Chess-Player of M. Maelzel.* This essay we suppose to have been the original of the pamphlet to which Sir David Brewster alludes in his *Letters on Natural Magic,* and which he has no hesitation in declaring a thorough and satisfactory explanation. The results of the analysis are undoubtedly, in the main, just; but we can only account for Brewster's pronouncing the essay a thorough and satisfactory explanation by supposing him to have bestowed upon it a very cursory and inattentive perusal. In the compendium of the essay, made use of in the *Letters on Natural Magic,* it is quite impossible to arrive at any distinct conclusion in regard to the adequacy or inadequacy of the analysis, on account of the gross misarrangement and deficiency of the letters of reference employed. The same fault is to be found in the *Attempt,* etc., as we originally saw it. The solution consists in a series of minute explanations (accompanied by wood-cuts, the whole occupying many pages), in which the object is to show the possibility of so shifting the partitions of the box as to allow a human being, concealed in the interior, to move portions of his body from one part of the box to another during the exhibition of the mechanism, thus eluding the scrutiny of the spectators. There can be no doubt, as we have before observed, and as we will presently endeavor to show, that the principle, or rather the result of this solution is the true one. Some person is concealed in the box during the whole time of exhibiting the interior. We object, however, to the whole verbose description of the manner in which the partitions are shifted to accommodate the movements of the person concealed. We object to it as a mere theory assumed in the first place, and to which circumstances are afterward made to adapt themselves. It was not, and could not have been, arrived at by any inductive reasoning. In whatever way the shifting is managed, it is, of course, concealed at every step from observation. To show that certain movements might possibly be effected in a certain way is very far from showing that they are actually so effected. There may be an infinity of other methods by which the same results may be obtained. The probability of the one assumed proving the correct one is, then, as unity to infinity. But, in reality, this particular point, the shifting of the partitions, is of no consequence whatever. It was altogether unnecessary to devote seven or eight pages for the purpose of proving what no one in his senses would deny, viz., that the wonderful mechanical genius of Baron Kempelen could invent the necessary means for shutting a door or slipping aside a panel, with a human agent, too, at his service in actual contact with the panel or the door, and the whole operations carried on, as the author of the essay himself shows, and as we shall attempt to show more fully hereafter, entirely out of reach of the observation of the spectators.

In attempting, ourselves, an explanation of the Automaton, we will, in the first place, endeavor to show how its operations are effected, and afterward describe, as briefly as possible, the nature of the observations from which we have deduced our result.

It will be necessary for a proper understanding of the subject, that we repeat here, in a few words, the routine adopted by the exhibitor in disclosing the interior of the box—a routine from which he never deviates in any material particular. In the first place, he opens the door No. 1. Leaving this open, he goes round to the rear of the box and opens a door precisely at the back of door No. 1. To this back door he holds a lighted candle. He then closes the back door, locks it, and, coming round to the front, opens the drawer to its full extent. This done, he opens the doors No. 2 and No. 3 (the folding-doors), and displays the interior of the main compartment. Leaving open the main compartment, the drawer, and the front door of cupboard No. 1, he now goes to the rear again and throws open the back door of the main compartment. In shutting up the box no particular order is observed, except that the folding-doors are always closed before the drawer.

Now, let us suppose that when the machine is first rolled into the presence of the spectators a man is already within it. His body is situated behind the dense machinery in cupboard No. 1 (the rear portion of which machinery is so contrived as to slip *en masse* from the main compartment to the cupboard No. 1, as occasion may require), and his legs lie at full length in the main compartment. When Maelzel opens the door No. 1, the man within is not in any danger of discovery, for the keenest eye cannot penetrate more than about two inches into the darkness within. But the case is otherwise when the back door of the cupboard No. 1 is opened. A bright light then pervades the cupboard, and the body of the man would be discovered if it were there. But it is not. The putting the key in the lock of the back door was a signal, on hearing which the person concealed brought his body forward to an angle as acute as possible, throwing it altogether, or nearly so, into the main compartment. This, however, is a painful position and cannot be long maintained. Accordingly, we find that Maelzel closes the back door. This being done, there is no reason why the body of the man may not resume its former situation, for the cupboard is again so dark as to defy scrutiny. The drawer is now opened, and the legs of the person within drop down behind it in the space it formerly occupied.[1] There is, consequently, now no longer any part of the man in the main compartment, his body being behind the machinery in cupboard No. 1, and his legs in the space occupied by the drawer. The exhibitor, therefore, finds himself at liberty to display the main compartment. This he does, opening both its back and front doors, and no person is discovered. The spectators are now satisfied that the whole of the box is exposed to view, and exposed, too, all portions of it at one and the same time. But, of course, this is not the case. They neither see the space behind the drawer nor the interior of cupboard No. 1, the front door of which latter the exhibitor virtually shuts in shutting its back door. Maelzel, having now rolled the machine around, lifted up the dra-

[1] Sir David Brewster supposes that there is always a large space behind this drawer even when shut—in other words, that the drawer is a "false drawer," and does not extend to the back of the box. But the idea is altogether untenable. So commonplace a trick would be immediately discovered, especially as the drawer is always opened to its full extent, and an opportunity thus offered of comparing its depth with that of the box.

pery of the Turk, opened the doors in its back and thigh, and shown his trunk to be full of machinery, brings the whole back into its original position and closes the doors. The man within is now at liberty to move about. He gets up into the body of the Turk just so high as to bring his eyes above the level of the chess-board. It is very probable that he seats himself upon the little square block or protuberance which is seen in a corner of the main compartment when the doors are open. In this position he sees the chess-board through the bosom of the Turk, which is of gauze. Bringing his right arm across his breast, he actuates the little machinery necessary to guide the left arm and the fingers of the figure. This machinery is situated just beneath the left shoulder of the Turk, and is consequently easily reached by the right hand of the man concealed, if we suppose his right arm brought across the breast. The motion of the head and eyes, and of the right arm of the figure, as well as the sound "echec" are produced by other mechanism in the interior, and actuated at will by the man within. The whole of this mechanism, that is to say, all the mechanism essential to the machine, is most probably contained within the little cupboard (of about six inches in breadth) partitioned off at the right (the spectators' right) of the main compartment.

In this analysis of the operations of the Automaton we have purposely avoided any allusion to the manner in which the partitions are shifted, and it will now be readily comprehended that this point is a matter of no importance, since, by mechanism within the ability of any common carpenter, it might be effected in an infinity of different ways, and since we have shown that, however performed, it is performed out of the view of the spectators. Our result is founded upon the following observations taken during frequent visits to the exhibition of Maelzel.[1]

1. The moves of the Turk are not made at regular intervals of time, but accommodate themselves to the moves of the antagonist, although this point (of regularity), so important in all kinds of mechanical contrivance, might have been readily brought about by limiting the time allowed for the moves of the antagonist. For example, if this limit were three minutes, the moves of the Automaton might be made at any given intervals longer than three minutes. The fact, then, of irregularity, when regularity might have been so easily attained, goes to prove that regularity is unimportant to the action of the Automaton; in other words, that the Automaton is not a pure machine.

2. When the Automaton is about to move a piece, a distinct motion is observable just beneath the left

[1] Some of these observations are intended merely to prove that the machine must be regulated by mind, and it may be thought a work of supererogation to advance further arguments in support of what has been already fully decided. But our object is to convince, in especial, certain of our friends upon whom a train of suggestive reasoning will have more influence than the most positive *a priori* demonstration.

shoulder, and which motion agitates in a slight degree the drapery covering the front of the left shoulder. This motion invariably precedes, by about two seconds, the movement of the arm itself; and the arm never, in any instance, moves without this preparatory motion in the shoulder. Now, let the antagonist move a piece, and let the corresponding move be made by Maelzel, as usual, upon the board of the Automaton. Then let the antagonist narrowly watch the Automaton until he detect the preparatory motion in the shoulder. Immediately upon detecting this motion, and before the arm itself begins to move, let him withdraw his piece, as if perceiving an error in his manœuvre. It will then be seen that the movement of the arm, which, in all other cases, immediately succeeds the motion in the shoulder, is withheld, is not made, although Maelzel has not yet performed, on the board of the Automaton, any move corresponding to the withdrawal of the antagonist. In this case, that the Automaton was about to move is evident; and that he did not move was an effect plainly produced by the withdrawal of the antagonist and without any intervention of Maelzel.

This fact fully proves (1) that the intervention of Maelzel, in performing the moves of the antagonist on the board of the Automaton, is not essential to the movements of the Automaton; (2) that its movements are regulated by mind, by some person who sees the board of the antagonist; (3) that its movements are not regulated by the mind of Maelzel, whose back was turned toward the antagonist at the withdrawal of his move.

3. The Automaton does not invariably win the game. Were the machine a pure machine, this would not be the case—it would always win. The principle being discovered by which a machine can be made to play a game of chess, an extension of the same principle would enable it to win a game; a further extension would enable it to win all games, that is, to beat any possible game of an antagonist. A little consideration will convince any one that the difficulty of making a machine beat all games is not in the least degree greater, as regards the principle of the operations necessary, than that of making it beat a single game. If, then, we regard the Chess-Player as a machine, we must suppose (what is highly improbable) that its inventor preferred leaving it incomplete to perfecting it, —a supposition rendered still more absurd when we reflect that the leaving it incomplete would afford an argument against the possibility of its being a pure machine, the very argument we now adduce.

4. When the situation of the game is difficult or complex, we never perceive the Turk either shake his head or roll his eyes. It is only when his next move is obvious, or when the game is so circumstanced that to a man in the Automaton's place there would be no

necessity for reflection. Now, these peculiar movements of the head and eyes are movements customary with persons engaged in meditation, and the ingenious Baron Kempelen would have adapted these movements (were the machine a pure machine) to occasions proper for their display, that is, to occasions of complexity. But the reverse is seen to be the case, and this reverse applies precisely to our supposition of a man in the interior. When engaged in meditation about the game he has no time to think of setting in motion the mechanism of the Automaton by which are moved the head and the eyes. When the game, however, is obvious, he has time to look about him, and, accordingly, we see the head shake and the eyes roll.

5. When the machine is rolled round to allow the spectators an examination of the back of the Turk, and when his drapery is lifted up and the doors in the trunk and thigh thrown open, the interior of the trunk is seen to be crowded with machinery. In scrutinizing this machinery while the Automaton was in motion, that is to say, while the whole machine was moving on the castors, it appeared to us that certain portions of the mechanism changed their shape and position in a degree too great to be accounted for by the simple laws of perspective; and subsequent examinations convinced us that these undue alterations were attributable to mirrors in the interior of the

trunk. The introduction of mirrors among the machinery could not have been intended to influence, in any degree, the machinery itself. Their operation, whatever that operation should prove to be, must necessarily have reference to the eye of the spectator. We at once concluded that these mirrors were so placed to multiply to the vision some few pieces of machinery within the trunk so as to give it the appearance of being crowded with mechanism. Now, the direct inference from this is that the machine is not a pure machine. For if it were, the inventor, so far from wishing its mechanism to appear complex, and using deception for the purpose of giving it this appearance, would have been especially desirous of convincing those who witnessed his exhibition, of the simplicity of the means by which results so wonderful were brought about.

6. The external appearance, and, especially, the deportment of the Turk, are, when we consider them as imitations of life, but very indifferent imitations. The countenance evinces no ingenuity, and is surpassed, in its resemblance to the human face, by the very commonest of waxworks. The eyes roll unnaturally in the head, without any corresponding motions of the lids or brows. The arm, particularly, performs its operations in an exceedingly stiff, awkward, jerking, and rectangular manner. Now, all this is the result either of inability in Maelzel to do better, or of inten-

tional neglect, accidental neglect being out of the question, when we consider that the whole time of the ingenious proprietor is occupied in the improvement of his machines. Most assuredly we must not refer the unlife-like appearances to inability, for all the rest of Maelzel's automata are evidences of his full ability to copy the motions and peculiarities of life with the most wonderful exactitude. The rope-dancers, for example, are inimitable. When the clown laughs, his lips, his eyes, his eyebrows, and eyelids—indeed, all the features of his countenance—are imbued with their appropriate expressions. In both him and his companion, every gesture is so entirely easy and free from the semblance of artificiality, that, were it not for the diminutiveness of their size and the fact of their being passed from one spectator to another previous to their exhibition on the rope, it would be difficult to convince any assemblage of persons that these wooden automata were not living creatures. We cannot, therefore, doubt Mr. Maelzel's ability, and we must necessarily suppose that he intentionally suffered his Chess-Player to remain the same artificial and unnatural figure which Baron Kempelen (no doubt also through design) originally made it. What this design was it is not difficult to conceive. Were the Automaton lifelike in its motions, the spectator would be more apt to attribute its operations to their true cause (that is, to human agency within) than he is now, when the awkward and rectangular manœuvres convey the idea of pure and unaided mechanism.

7. When, a short time previous to the commencement of the game, the Automaton is wound up by the exhibitor as usual, an ear in any degree accustomed to the sounds produced in winding up a system of machinery will not fail to discover, instantaneously, that the axis turned by the key in the box of the Chess-Player cannot possibly be connected with either a weight, a spring, or any system of machinery whatever. The inference here is the same as in our last observation. The winding up is inessential to the operations of the Automaton, and is performed with the design of exciting in the spectators the false idea of mechanism.

8. When the question is demanded explicitly of Maelzel, "Is the Automaton a pure machine or not?" his reply is invariably the same: "I will say nothing about it." Now, the notoriety of the Automaton, and the great curiosity it has everywhere excited, are owing more especially to the prevalent opinion that it is a pure machine than to any other circumstance. Of course, then, it is the interest of the proprietor to represent it as a pure machine. And what more obvious and more effectual method could there be of impressing the spectators with this desired idea, than a positive and explicit declaration to that effect? On the other hand, what more obvious and effectual method

could there be of exciting a disbelief in the Automaton's being a pure machine than by withholding such explicit declaration ? For people will naturally reason thus: It is Maelzel's interest to represent this thing a pure machine; he refuses to do so, directly, in words, although he does not scruple, and is evidently anxious, to do so indirectly by actions; were it actually what he wishes to represent it by actions, he would gladly avail himself of the more direct testimony of words; the inference is, that the consciousness of its not being a pure machine is the reason of his silence; his actions cannot implicate him in a falsehood, his words may.

9. When, in exhibiting the interior of the box, Maelzel has thrown open the door No. 1 and also the door immediately behind it, he holds a lighted candle at the back door (as before mentioned) and moves the entire machine to and fro with a view of convincing the company that the cupboard No. 1 is entirely filled with machinery. When the machine is thus moved about, it will be apparent to any careful observer that, whereas that portion of the machinery near the front door No. 1 is perfectly steady and unwavering, the portion farther within fluctuates, in a very slight degree, with the movements of the machine. This circumstance first aroused in us the suspicion that the more remote portion of the machinery was so arranged as to be easily slipped, *en masse,* from its position when

occasion should require it. This occasion we have already stated to occur when the man concealed within brings his body into an erect position upon the closing of the back door.

10. Sir David Brewster states the figure of the Turk to be of the size of life, but, in fact, it is far above the ordinary size. Nothing is more easy than to err in our notions of magnitude. The body of the Automaton is generally insulated, and, having no means of immediately comparing it with any human form, we suffer ourselves to consider it as of ordinary dimensions. This mistake may, however, be corrected by observing the Chess-Player when, as is sometimes the case, the exhibitor approaches it. Mr. Maelzel, to be sure, is not very tall, but upon drawing near the machine his head will be found at least eighteen inches below the head of the Turk, although the latter, it will be remembered, is in a sitting position.

11. The box, behind which the Automaton is placed, is precisely three feet six inches long, two feet four inches deep, and two feet six inches high. These dimensions are fully sufficient for the accommodation of a man very much above the common size; and the main compartment alone is capable of holding any ordinary man in the position we have mentioned as assumed by the person concealed. As these are facts, which any one who doubts them may prove by actual calculation, we deem it unnecessary to dwell upon

them. We will only suggest that, although the top of the box is apparently a board of about three inches in thickness, the spectator may satisfy himself by stooping and looking up at it when the main compartment is open, that it is in reality very thin. The height of the drawer also will be misconceived by those who examine it in a cursory manner. There is a space of about three inches between the top of the drawer as seen from the exterior and the bottom of the cupboard, a space which must be included in the height of the drawer. These contrivances to make the room within the box appear less than it actually is are referable to a design on the part of the inventor to impress the company again with a false idea, viz., that no human being can be accommodated within the box.

12. The interior of the main compartment is lined throughout with cloth. This cloth we suppose to have a twofold object. A portion of it may form, when tightly stretched, the only partitions which there is any necessity for removing during the changes of the man's position, viz., the partition between the rear of the main compartment and the rear of cupboard No. 1, and the partition between the main compartment and the space behind the drawer when open. If we imagine this to be the case, the difficulty of shifting the partitions vanishes at once, if, indeed, any such difficulty could be supposed under any circumstances to exist. The second object of the cloth is to deaden and

render indistinct all sounds occasioned by the movements of the person within.

13. The antagonist (as we have before observed) is not suffered to play at the board of the Automaton, but is seated at some distance from the machine. The reason which, most probably, would be assigned for this circumstance, if the question were demanded, is, that were the antagonist otherwise situated, his person would intervene between the machine and the spectators and preclude the latter from a distinct view. But this difficulty might be easily obviated, either by elevating the seats of the company, or by turning the end of the box toward them during the game. The true cause of the restriction is, perhaps, very different. Were the antagonist seated in contact with the box, the secret would be liable to discovery, by his detecting, with the aid of a quick ear, the breathings of the man concealed.

14. Although M. Maelzel, in disclosing the interior of the machine, sometimes slightly deviates from the routine which we have pointed out, yet never in any instance does he so deviate from it as to interfere with our solution. For example, he has been known to open, first of all, the drawer, but he never opens the main compartment without first closing the back door of cupboard No. 1; he never opens the main compartment without first pulling out the drawer; he never shuts the drawer without first shutting the main com-

partment; he never opens the back door of cupboard No. 1 while the main compartment is open, and the game of chess is never commenced until the whole machine is closed. Now, if it were observed that never, in any single instance, did M. Maelzel differ from the routine we have pointed out as necessary to our solution, it would be one of the strongest possible arguments in corroboration of it; but the argument becomes infinitely stengthened if we duly consider the circumstance that he does occasionally deviate from the routine, but never does so deviate as to falsify the solution.

15. There are six candles on the board of the Automaton during exhibition. The question naturally arises: "Why are so many employed, when a single candle, or, at farthest, two, would have been amply sufficient to afford the spectators a clear view of the board in a room otherwise so well lit up as the exhibition room always is; when, moreover, if we suppose the machine a pure machine, there can be no necessity for so much light, or, indeed, any light at all, to enable it to perform its operations; and when, especially, only a single candle is placed upon the table of the antagonist?" The first and most obvious inference is, that so strong a light is requisite to enable the man within to see through the transparent material (probably fine gauze) of which the breast of the Turk is composed. But when we consider the arrangement

of the candles, another reason immediately presents itself. There are six lights (as we have said before) in all. Three of these are on each side of the figure. Those most remote from the spectators are the longest, those in the middle are about two inches shorter, and those nearest the company about two inches shorter still, and the candles on one side differ in height from the candles respectively opposite on the other by a ratio different from two inches; that is to say, the longest candle on one side is about three inches shorter than the longest candle on the other, and so on. Thus it will be seen that no two of the candles are of the same height, and thus also the difficulty of ascertaining the material of the breast of the figure (against which the light is especially directed) is greatly augmented by the dazzling effect of the complicated crossings of the rays, crossings which are brought about by placing the centres of radiation all upon different levels.

16. While the Chess-Player was in possession of Baron Kempelen, it was more than once observed, first, that an Italian in the suite of the Baron was never visible during the playing of a game at chess by the Turk, and, secondly, that, the Italian being taken seriously ill, the exhibition was suspended until his recovery. This Italian professed a total ignorance of the game of chess, although all others of the suite played well. Similar observations have been made since the

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Poe's Cottage at Fordham.

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Automaton has been purchased by Maelzel. There is a man, Schlumberger, who attends him wherever he goes, but who has no ostensible occupation other than that of assisting in the packing and unpacking of the Automaton. This man is about the medium size, and has a remarkable stoop in the shoulders. Whether he professes to play chess or not, we are not informed. It is quite certain, however, that he is never to be seen during the exhibition of the Chess-Player, although frequently visible just before and just after the exhibition. Moreover, some years ago Maelzel visited Richmond with his automata, and exhibited them, we believe, in the house now occupied by M. Bossieux as a dancing academy. Schlumberger was suddenly taken ill, and during his illness there was no exhibition of the Chess-Player. These facts are well known to many of our citizens. The reason assigned for the suspension of the Chess-Player's performances was not the illness of Schlumberger. The inferences from all this we leave, without farther comment, to the reader.

17. The Turk plays with his left arm. A circumstance so remarkable cannot be accidental. Brewster takes no notice of it whatever beyond a mere statement, we believe, that such is the fact. The early writers of treatises on the Automaton seem not to have observed the matter at all, and have no reference to it. The author of the pamphlet alluded to by Brewster mentions it, but acknowledges his inability to account for

it. Yet it is obviously from such prominent discrepancies or incongruities as this that deductions are to be made (if made at all) which shall lead us to the truth.

The circumstance of the Automaton's playing with his left hand cannot have connection with the operations of the machine, considered merely as such. Any mechanical arrangement which would cause the figure to move, in any given manner, the left arm, could, if reversed, cause it to move, in the same manner, the right. But these principles cannot be extended to the human organization, wherein there is a marked and radical difference in the construction, and, at all events, in the powers, of the right and left arms. Reflecting upon this latter fact, we naturally refer the incongruity noticeable in the Chess-Player to this peculiarity in the human organization. If so, we must imagine some reversion, for the Chess-Player plays precisely as a man would not. These ideas, once entertained, are sufficient of themselves to suggest the notion of a man in the interior. A few more imperceptible steps lead us finally to the result. The Automaton plays with his left arm, because under no other circumstances could the man within play with his right—a desideratum, of course. Let us, for example, imagine the Automaton to play with his right arm. To reach the machinery which moves the arm, and which we have before explained to lie just beneath the shoulder, it would be necessary for the man within either to use his right arm in an exceedingly painful and awkward position (viz., brought up close to his body and tightly compressed between his body and the side of the Automaton), or else to use his left arm brought across his breast. In neither case could he act with the requisite ease or precision. On the contrary, the Automaton playing, as it actually does, with the left arm, all difficulties vanish. The right arm of the man within is brought across his breast, and his right fingers act, without any constraint, upon the machinery in the shoulder of the figure.

We do not believe that any reasonable objections can be urged against this solution of the Automaton Chess-Player.

Prefaces to "The Conchologist's First Book"[1]

FIRST EDITION, 1839

THE term "Malacology," an abbreviation of "Malacozoology," from the Greek μαλακός (soft), ζῷον (an animal), and λόγος (a discourse), was first employed by the French naturalist De Blainville to designate an important division of Natural History, in which the leading feature of the animals discussed was the softness of the flesh, or, to speak with greater accuracy, of the general envelop. This division comprehends not only the Mollusca, but

[1] The full title is "The Conchologist's First Book: a System of Testaceous Malacology, arranged expressly for the use of schools; in which the animals, according to Cuvier, are given with the shells, a great number of new species added, and the whole brought up, as accurately as possible, to the present condition of the science. By Edgar A. Poe. Second edition. With illustrations of two hundred and fifteen shells, presenting a correct type of each genus. Philadelphia: Published for the Author by Haswell, Barrington, & Haswell, and for sale by the principal booksellers in the United States." [First edition, 1839; second edition, 1840; both prefaces signed "E. A. P."]

also the Testacea of Aristotle and Pliny, and, of course, had reference to molluscous animals in general, of which the greater portion have shells.

A treatise concerning the shells, exclusively, of this greater portion, is termed, in accordance with general usage, a "Treatise upon Conchology or Conchyliology"; although the word is somewhat improperly applied, as the Greek *conchylíon,* from which it is derived, embraces in its signification both the animal and shell. Ostracology would have been more definite.

The common works upon this subject, however, will appear to every person of science very essentially defective, inasmuch as the relation of the animal and shell, with their dependence upon each other, is a radically important consideration in the examination of either. Neither, in the attempt to obviate this difficulty, is a work upon Malacology at large necessarily included. Shells, it is true, form, and for many obvious reasons will continue to form, the subject of chief interest, whether with regard to the school or the cabinet; still, there is no good reason why a book upon Conchology (using the common term) may not be malacological as far as it proceeds.

In this view of the subject the present little work is offered to the public. Beyond the ruling feature, that of giving an anatomical account of each animal, together with a description of the shell which it inhabits, I have aimed at little more than accuracy and simplicity, as far as the latter quality can be thought consistent with the rigid exactions of science.

No attention has been given to the mere history of the subject; it is conceived that any disquisition on this head would more properly appertain to works of ultimate research than to one whose sole intention is to make the pupil acquainted, in as tangible a form as possible, with results. To afford, at a cheap rate, a concise, yet sufficiently comprehensive, and especially a well-illustrated school-book, has been the principal design.

In conclusion, I have only to acknowledge my great indebtedness to the valuable public labors, as well as private assistance, of Mr. Isaac Lea of Philadelphia. To Mr. Thomas Wyatt and his late excellent *Manual of Conchology,* I am also under many obligations. No better work, perhaps, could be put into the hands of the student as a secondary text-book. Its beautiful and perfectly well-colored illustrations afford an aid in the collection of a cabinet scarcely to be met with elsewhere.

SECOND EDITION, 1840

In issuing a second edition of this "Conchology" in so very brief a period since the publication of the first large impression, the author has little more to do than to express the high pleasure with which he has seen his labors well received. The success of the work has been decided; and the entire design has been accomplished in its general introduction into schools.

Many important alterations and additions are now made; errors of the press carefully corrected; many more recently discovered American species added; and the work, upon the whole, is rendered more worthy of public approbation.

Philosophy of Furniture

IN the internal decoration, if not in the external architecture of their residences, the English are supreme. The Italians have but little sentiment beyond marbles and colors. In France, *meliora probant, deteriora sequantur,* the people are too much a race of gadabouts to maintain those household proprieties of which, indeed, they have a delicate appreciation, or, at least, the elements of a proper sense. The Chinese and most of the Eastern races have a warm but inappropriate fancy. The Scotch are poor decorists. The Dutch have, perhaps, an indeterminate idea that a curtain is not a cabbage. In Spain they are all curtains—a nation of hangmen. The Russians do not furnish. The Hottentots and Kickapoos are very well in their way. The Yankees alone are preposterous.

How this happens it is not difficult to see. We have no aristocracy of blood, and having, therefore, as a natural, and, indeed, as an inevitable thing, fashioned for ourselves an aristocracy of dollars, the display of wealth has here to take the place and perform the office of the heraldic display in monarchical countries. By a transition readily understood, and which might have been as readily foreseen, we have been brought to merge in simple show our notions of taste itself.

To speak less abstractly. In England, for example, no mere parade of costly appurtenances would be so likely, as with us, to create an impression of the beautiful in respect to the appurtenances themselves, or of taste as regards the proprietor; this for the reason, first, that wealth is not, in England, the loftiest object of ambition as constituting a nobility; and, secondly, that there, the true nobility of blood, confining itself within the strict limits of legitimate taste, rather avoids than affects that mere costliness in which a *parvenu* rivalry may at any time be successfully attempted. The people will imitate the nobles, and the result is a thorough diffusion of the proper feeling. But in America, the coins current being the sole arms of the aristocracy, their display may be said, in general, to be the sole means of aristocratic distinction; and the populace, looking always upward for models, are insensibly led to confound the two entirely separate ideas of magnificence and beauty. In short, the cost of an article of furniture has at length come to be, with us, nearly the sole test of its merit in a decorative point of view, and this test, once established, has led the way to many analogous errors, readily traceable to the one primitive folly.

There could be nothing more directly offensive to the eye of an artist than the interior of what is termed in the United States, that is to say, in Appalachia, a well-furnished apartment. Its most usual defect is a want of keeping. We speak of the keeping of a room as we would of the keeping of a picture, for both the picture and the room are amenable to those undeviating principles which regulate all varieties of art; and very nearly the same laws by which we decide on the higher merits of a painting suffice for decision on the adjustment of a chamber.

A want of keeping is observable sometimes in the character of the several pieces of furniture, but generally in their colors or modes of adaptation to use. Very often the eye is offended by their inartistical arrangement. Straight lines are too prevalent, too uninterruptedly continued, or clumsily interrupted at right angles. If curved lines occur, they are repeated into unpleasant uniformity. By undue precision the appearance of many a fine apartment is utterly spoiled.

Curtains are rarely well disposed, or well chosen, in respect to other decorations. With formal furniture, curtains are out of place; and an extensive volume of drapery of any kind is, under any circumstances, irreconcilable with good taste, the proper quantum, as well as the proper adjustment, depending upon the character of the general effect.

Carpets are better understood of late than of ancient days, but we still very frequently err in their patterns and colors. The soul of the apartment is the carpet. From it are deduced not only the hues, but the forms of all objects incumbent. A judge at common law may be an ordinary man; a good judge of a carpet must be a genius. Yet we have heard discoursing of carpets, with the air *d'um mouton qui rêve,* fellows who should not and who could not be entrusted with the management of their own moustaches. Every one knows that a large floor may have a covering of large figures, and that a small one must have a covering of small; yet this is not all the knowledge in the world. As regards texture, the Saxony is alone admissible. Brussels is the preter-pluperfect tense of fashion, and Turkey is taste in its dying agonies. Touching pattern, a carpet should not be bedizened out like a Riccaree Indian—all red chalk, yellow ochre, and cock's feathers. In brief, distinct grounds and vivid circular or cycloid figures, of no meaning, are here Median laws. The abomination of flowers, or representations of well-known objects of any kind, should not be endured within the limits of Christendom. Indeed, whether on carpets, or curtains, or tapestry, or ottoman coverings, all upholstery of this nature should be rigidly arabesque. As for those antique floor-cloths still occasionally seen in the dwellings of the rabble, cloths of huge, sprawling, and radiating devices, stripe-interspersed, and glorious with all hues, among which no ground is intelligible,—these are but the wicked invention of a race of time-servers and money-lovers, children of Baal and worshippers of Mammon, Benthams, who, to spare thought and economize fancy, first cruelly invented the kaleidoscope and then established joint-stock companies to twirl it by steam.

Glare is a leading error in the philosophy of American household decoration, an error easily recognized as deduced from the perversion of taste just specified. We are violently enamored of gas and of glass. The former is totally inadmissible within doors. Its harsh and unsteady light offends. No one having both brains and eyes will use it. A mild, or what artists term a cool light, with its consequent warm shadows, will do wonders for even an ill-furnished apartment. Never was a more lovely thought than that of the astral lamp. We mean, of course, the astral lamp proper—the lamp of Argand, with its original plain ground-glass shade and its tempered and uniform moonlight rays. The cut-glass shade is a weak invention of the enemy. The eagerness with which we have adopted it, partly on account of its flashiness, but principally on account of its greater cost, is a good commentary on the proposition with which we began. It is not too much to say that the deliberate employer of a cut-glass shade is either radically deficient in taste, or blindly subservient to the caprices of fashion. The light proceeding from one of these gaudy abominations is unequal, broken, and painful. It alone is sufficient to mar a world of good effect in the furniture subjected to its influence. Female loveliness, in especial, is more than one half disenchanted beneath its evil eye.

In the matter of glass, generally, we proceed upon false principles. Its leading feature is glitter, and in that one word how much of all that is detestable do we express! Flickering, unquiet lights, are sometimes pleasing—to children and idiots always so; but in the embellishment of a room they should be scrupulously avoided. In truth, even strong, steady lights are inadmissible. The huge and unmeaning glass chandeliers, prism-cut, gas-lighted, and without shade, which dangle in our most fashionable drawing-rooms, may be cited as the quintessence of all that is false in taste or preposterous in folly.

The rage for glitter, because its idea has become, as we before observed, confounded with that of magnificence in the abstract, has led us, also, to the exaggerated employment of mirrors. We line our dwellings with great British plates and then imagine we have done a fine thing. Now, the slightest thought will be sufficient to convince any one, who has an eye at all, of the ill effect of numerous looking-glasses, and especially of large ones. Regarded apart from its reflection, the mirror presents a continuous flat, colorless, unrelieved surface, a thing always and obviously unpleasant. Considered as a reflector, it is potent in producing a monstrous and odious uniformity: and the evil is here aggravated, not in merely direct proportion with the augmentation of its sources, but in a ratio constantly increasing. In fact, a room with four or five mirrors arranged at random, is, for all purposes of artistic show, a room of no shape at all. If we add to this evil the attendant glitter upon glitter, we have a perfect farrago of discordant and displeasing effects. The veriest bumpkin, on entering an apartment so bedizened, would be instantly aware of something wrong, although he might be altogether unable to assign a cause for his dissatisfaction. But let the same person be led into a room tastefully furnished, and he would be startled into an exclamation of pleasure and surprise.

It is an evil growing out of our republican institutions, that here a man of large purse has usually a very little soul which he keeps in it. The corruption of taste is a portion or a pendant of the dollar-manufacture. As we grow rich, our ideas grow rusty. It is, therefore, not among our aristocracy that we must look (if at all, in Appalachia) for the spirituality of a British boudoir. But we have seen apartments in the tenure of Americans of modern means, which, in negative merit at least, might vie with any of the ormolu'd cabinets of our friends across the water. Even now, there is present to our mind's eye a small and not ostentatious chamber with whose decorations no fault can be found. The proprietor lies asleep on a sofa, the weather is cool, the time is near midnight; we will make a sketch of the room during his slumber.

It is oblong, some thirty feet in length and twenty-five in breadth, a shape affording the best (ordinary) opportunities for the adjustment of furniture. It has but one door, by no means a wide one, which is at one end of the parallelogram, and but two windows, which are at the other. These latter are large, reaching down to the floor, have deep recesses, and open on an Italian veranda. Their panes are of a crimson-tinted glass, set in rosewood framings, more massive than usual. They are curtained within the recess by a thick silver tissue adapted to the shape of the window, and hanging loosely in small volumes. Without the recess are curtains of an exceedingly rich crimson silk, fringed with a deep network of gold, and lined with the silver tissue which is the material of the exterior blind. There are no cornices; but the folds of the whole fabric (which are sharp rather than massive, and have an airy appearance) issue from beneath a broad entablature of rich giltwork, which encircles the room at the junction of the ceiling and walls. The drapery is thrown open also, or closed, by means of a thick rope of gold loosely enveloping it, and resolving itself readily into a knot; no pins or other such devices are apparent. The colors of the curtains and their fringe, the tints of crimson and gold, appear everywhere in profusion and determine the character of the room. The carpet—of Saxony material—is quite half an inch thick, and is of the same crimson ground, relieved simply by the appearance of a gold cord (like that festooning the curtains) slightly relieved above the surface of the ground and thrown upon it in such a manner as to form a succession of short, irregular curves, one occasionally overlying the other. The walls are prepared with a glossy paper of a silver-gray tint, spotted with small Arabesque devices of a fainter hue of the prevalent crimson. Many paintings relieve the expanse of the paper. These are chiefly landscapes of an imaginative cast, such as the fairy grottoes of Stanfield, or the lake of the Dismal Swamp of Chapman. There are, nevertheless, three or four female heads of an ethereal beauty—portraits in the manner of Sully. The tone of each picture is warm, but dark. There are no " brilliant effects." Repose speaks in all. Not one is of small size. Diminutive paintings give that spotty look to a room which is the blemish of so many a fine work of art overtouched. The frames are broad but not deep, and richly carved without being dulled or filigreed. They have the whole lustre of burnished gold. They lie flat on the walls, and do not hang off with cords. The designs themselves are often seen to better advantage in this latter position, but the general appearance of the chamber is injured. But one mirror, and this is not a very large one, is visible. In shape it is nearly circular, and it is hung so that a reflection of the person can be obtained from it in none of the ordinary sitting-places of the room. Two large low sofas of rosewood and crimson silk, gold-flowered, form the only seats, with the exception of two light conversation chairs, also of rosewood. There is a pianoforte (rosewood, also), without cover, and thrown open. An octagonal table, formed altogether of the richest gold-threaded marble, is placed near one of the sofas. This is also without cover; the drapery of the curtains has been thought sufficient. Four large and gorgeous Sèvres vases, in which bloom a profusion of sweet and vivid flowers, occupy the slightly rounded angles of the room. A tall candelabrum, bearing a small antique lamp with highly perfumed oil, is standing near the head of my sleeping friend. Some light and graceful hanging shelves, with golden edges and crimson silk cords with golden tassels, sustain two or three hundred magnificently bound books. Beyond these things there is no furniture, if we except an Argand lamp, with a plain crimson-tinted ground-glass shade, which depends from the lofty vaulted ceiling by a single slender gold chain, and throws a tranquil but magical radiance over all.

Cryptography

AS we can scarcely imagine a time when there did not exist a necessity, or at least a desire, of transmitting information from one individual to another in such a manner as to elude general comprehension, so we may well suppose the practice of writing in cipher to be of great antiquity. De la Guilletiere, therefore, who, in his *Lacedæmon Ancient and Modern*, maintains that the Spartans were the inventors of cryptography, is obviously in error. He speaks of the *scytala* as being the origin of the art; but he should only have cited it as one of its earliest instances, so far as our records extend. The *scytalæ* were two wooden cylinders, precisely similar in all respects. The general of an army, in going upon any expedition, received from the *ephori* one of these cylinders, while the other remained in their possession. If either party had occasion to communicate with the other, a narrow strip of parchment was so wrapped around the *scytala* that the edges of the skin fitted accurately each to each. The writing was then inscribed longitudinally, and the epistle unrolled and despatched. If, by mischance, the messenger was intercepted, the letter proved unintelligible to his captors. If he reached his destination safely, however, the party addressed had only to involve the second cylinder in the strip to decipher the inscription. The transmission to our own times of this mode of cryptography is due, probably, to the historical use of the *scytala* rather than to anything else. Similar means of secret intercommunication must have existed almost contemporaneously with the invention of letters.

It may be as well to remark, in passing, that in none of the treatises on the subject of this paper which have fallen under our cognizance have we observed any suggestion of a method, other than those which apply alike to all ciphers, for the solution of the cipher by *scytala.* We read of instances, indeed, in which the intercepted parchments were deciphered; but we are not informed that this was ever done except accidentally. Yet a solution might be obtained with absolute certainty in this manner: The strip of skin being intercepted, let there be prepared a cone of great length comparatively, say six feet long, and whose circumference at base shall at least equal the length of the strip. Let this latter be rolled upon the cone near the base, edge to edge, as above described; then, still keeping edge to edge, and maintaining the parchment close upon the cone, let it be gradually slipped toward the apex. In this process, some of those words, syllables, or letters, whose connection is intended, will be sure to come together at that point of the cone where its diameter equals that of the *scytala* upon which the cipher was written. And as in passing up the cone to its apex all possible diameters are passed over, there is no chance of a failure. The circumference of the *scytala* being thus ascertained, a similar one can be made and the cipher applied to it.

Few persons can be made to believe that it is not quite an easy thing to invent a method of secret writing which shall baffle investigation. Yet it may be roundly asserted that human ingenuity cannot concoct a cipher which human ingenuity cannot resolve. In the facility with which such writing is deciphered, however, there exist very remarkable differences in different intellects. Often, in the case of two individuals of acknowledged equality as regards ordinary mental efforts, it will be found that, while one cannot unriddle the commonest cipher, the other will scarcely be puzzled by the most abstruse. It may be observed generally that in such investigations the analytic ability is very forcibly called into action; and, for this reason, cryptographical solutions might, with great propriety, be introduced into academies as the means of giving tone to the most important of the powers of mind.

Were two individuals, totally unpractised in cryptography, desirous of holding by letter a correspondence which should be unintelligible to all but themselves, it is most probable that they would at once think of a peculiar alphabet, to which each should have a key. At first it would, perhaps, be arranged that " a " should stand for " z," " b " for " y," " c " for " x," " d " for " w," etc., etc.; that is to say, the order of the letters would be reversed. Upon second thoughts, this arrangement appearing too obvious, a more complex mode would be adopted. The first thirteen letters might be written beneath the last thirteen, thus:

n o p q r s t u v w x y z
a b c d e f g h i j k l m;

and, so placed, " a " might stand for " n " and " n " for "a", "o" for "b" and "b" for "o," etc., etc. This, again, having an air of regularity which might be fathomed, the key alphabet might be struck absolutely at random. Thus,

a might stand for p
b " " " x
c " " " u
d " " " o, etc.

The correspondents, unless convinced of their error by the solution of their cipher, would, no doubt, be willing to rest in this latter arrangement as affording full security. But if not, they would be likely to hit upon the plan of arbitrary marks used in place of the usual characters. For example,

(might be employed for a
. " " " " b
: " " " " c
; " " " " d
) " " " " e, etc.

A letter composed of such characters would have an intricate appearance unquestionably. If still, however, it did not give full satisfaction, the idea of a perpetually shifting alphabet might be conceived, and thus effected: Let two circular pieces of pasteboard be prepared, one about half an inch in diameter less than the other. Let the centre of the smaller be placed upon the centre of the larger one and secured for a moment from slipping, while radii are drawn from the common centre to the circumference of the smaller circle, and thus extended to the circumference of the greater. Let there be twenty-six of these radii, forming on each pasteboard twenty-six spaces. In each of these spaces on the under circle write one of the letters of the alphabet, so that the whole alphabet be written—if at random so much the better. Do the same with the upper circle. Now run a pin through the common centre and let the upper circle revolve, while the under one is held fast. Now stop the revolution of the upper circle, and, while both lie still, write the epistle required, using for "a" that letter in the smaller circle which tallies with "a" in the larger, for "b" that letter in the smaller circle which tallies with "b" in the larger, etc., etc. In order that an epistle thus written may be read by the person for whom it is intended, it is only necessary that he should have in his possession circles constructed as those just described, and that he should know any two of the characters (one in the under and one in the upper circle) which were in juxtaposition when his correspondent wrote the cipher. Upon this latter point he is informed by looking at the two initial letters of the document which serves as a key. Thus, if he sees "a m" at the beginning, he concludes that by turning his circles so as to put these characters in conjunction, he will arrive at the alphabet employed.

At a cursory glance, these various modes of constructing a cipher seem to have about them an air of inscrutable secrecy. It appears almost an impossibility to unriddle what has been put together by so complex a method. And to some persons the difficulty might be great; but to others, to those skilled in deciphering, such enigmas are very simple indeed. The reader should bear in mind that the basis of the whole art of solution, as far as regards these matters, is found in the general principles of the formation of language itself, and thus is altogether independent of the particular laws which govern any cipher, or the construction of its key. The difficulty of reading a cryptographical puzzle is by no means always in accordance with the labor or ingenuity with which it has been constructed. The sole use of the key, indeed, is for those *au fait* to the cipher; in its perusal by a third party, no reference is had to it at all. The lock of the secret is picked. In the different methods of cryptography specified above, it will be observed that there is a gradually increasing complexity. But this complexity is only in shadow. It has no substance whatever. It appertains merely to the formation, and has no bearing upon the solution of the cipher. The last mode mentioned is not in the least degree more difficult to be deciphered than the first, whatever may be the diffiiculty of either.

In the discussion of an analogous subject, in one of the weekly papers of this city about eighteen months ago, the writer of this article had occasion to speak of the application of a rigorous method in all forms of thought, of its advantages, of the extension of its use even to what is considered the operation of pure fancy, and thus, subsequently, of the solution of cipher. He even ventured to assert that no cipher, of the character above specified, could be sent to the address of the paper which he would not be able to resolve. This challenge excited, most unexpectedly, a very lively interest among the numerous readers of the journal. Letters were poured in upon the editor from all parts of the country; and many of the writers of these epistles were so convinced of the impenetrability of their mysteries as to be at great pains to draw him into wagers on the subject. At the same time, they were not always scrupulous about sticking to the point. The cryptographs were, in numerous instances, altogether beyond the limits defined in the beginning. Foreign languages were employed. Words and sentences were run together without interval. Several alphabets were used in the same cipher. One gentleman, but moderately endowed with conscientiousness, inditing us a puzzle composed of pot-hooks and hangers to which the wildest typography of the office could afford nothing similar, went even so far as to jumble together no less than seven distinct alphabets, without intervals between the letters or between the lines. Many of the cryptographs were dated in Philadelphia, and several of those which urged the subject of a bet were written by gentlemen of this city. Out of, perhaps, one hundred ciphers altogether received, there was only one which we did not immediately succeed in resolving. This one we demonstrated to be an imposition, that is to say, we fully proved it a jargon of random characters, having no meaning whatever. In respect to the epistle of the seven alphabets, we had the pleasure of completely nonplussing its inditer by a prompt and satisfactory translation.

The weekly paper mentioned was, for a period of some months, greatly occupied with the hieroglyphic and cabalistic-looking solutions of the cryptographs sent us from all quarters. Yet, with the exception of the writers of the ciphers, we do not believe that any individuals could have been found among the readers of the journal who regarded the matter in any other light than in that of a desperate humbug. We mean to say that no one really believed in the authenticity of the answers. One party averred that the mysterious figures were only inserted to give a queer air to the paper for the purpose of attracting attention. Another thought it more probable that we not only solved the ciphers, but put them together ourselves for solution. This having been the state of affairs at the period when it was thought expedient to decline further dealings in necromancy, the writer of this article avails himself of the present opportunity to maintain the truth of the journal in question, to repel the charges of rigmarole by which it was assailed, and to declare, in his own name, that the ciphers were all written in good faith and solved in the same spirit.

A very common and somewhat too obvious mode of secret correspondence is the following: A card is interspersed, at irregular intervals with oblong spaces, about the length of ordinary words of three syllables in a bourgeois type. Another card is made exactly coinciding. One is in possession of each party. When a letter is to be written the key-card is placed upon the paper and words conveying the true meaning inscribed in the spaces. The card is then removed and the blanks filled up, so as to make out a signification different from the real one. When the person addressed receives the cipher he has merely to apply to it his own card, when the superfluous words are concealed, and the significant ones alone appear. The chief objection to this cryptograph is the difficulty of so filling the blanks as not to give a forced appearance to the sentences. Differences also in the handwriting between the words written in the spaces and those inscribed upon removal of the card will always be detected by a close observer.

A pack of cards is sometimes made the vehicle of a cipher in this manner: The parties determine, in the first place, upon certain arrangements of the pack. For example, it is agreed that, when a writing is to be commenced, a natural sequence of the spots shall be made, with spades at top, hearts next, diamonds next, and clubs last. This order being obtained, the writer proceeds to inscribe upon the top card the first letter of his epistle, upon the next the second, upon the next the third, and so on until the pack is exhausted, when, of course, he will have written fifty-two letters. He now shuffles the pack according to a preconcerted plan. For example: He takes three cards from the bottom and places them at top, then one from top, placing it at bottom, and so on, for a given number of times. This done, he again inscribes fifty-two characters as before, proceeding thus until his epistle is written. The pack being received by the correspondent, he has only to place the cards in the order agreed upon for commencement to read, letter by letter, the first fifty-two characters as intended. He has then only to shuffle in the manner pre-arranged for the second perusal to decipher the series of the next fifty-two letters, and so on to the end. The objection to this cryptograph lies in the nature of the missive. A pack of cards, sent from one party to another, would scarcely fail to excite suspicion, and it cannot be doubted that it is far better to secure ciphers from being considered as such than to waste time in attempts at rendering them scrutiny-proof when intercepted. Experience shows that the most cunningly constructed cryptograph, if suspected, can and will be unriddled.

An unusually secure mode of secret intercommunication might be thus devised: Let the parties each furnish themselves with the copy of the same edition of a book, the rarer the edition the better, as also the rarer the book. In the cryptograph numbers are used altogether, and these numbers refer to the locality of letters in the volume. For example, a cipher is received commencing, 121-6-8. The party addressed refers to page 121, and looks at the sixth letter from the left of the page in the eighth line from the top. Whatever letter he there finds is the initial letter of the epistle, and so on. This method is very secure; yet it is possible to decipher any cryptograph written by its means, and it is greatly objectionable otherwise on account of the time necessarily required for its solution, even with the key-volume.

It is not to be supposed that cryptography, as a serious thing, as the means of imparting important information, has gone out of use at the present day. It is still commonly practised in diplomacy; and there are individuals, even now, holding office in the eye of various foreign governments, whose real business is that of deciphering. We have already said that a peculiar mental action is called into play in the solution of cryptographical problems, at least in those of the higher order. Good cryptographists are rare indeed; and thus their services, although seldom required, are necessarily well requited.

An instance of the modern employment of writing in cipher is mentioned in a work lately published by Messieurs Lea and Blanchard of this city,[1] *Sketches of Conspicuous Living Characters of France.* In a notice of Berryer, it is said that a letter being addressed by the Duchess de Berri to the Legitimists of Paris, to inform them of her arrival, it was accompanied by a long note in cipher, the key of which she had forgotten to give. "The penetrating mind of Berryer," says the biographer, "soon discovered it. It was this phrase substituted for the twenty-four letters of the alphabet: *Le gouvernement provisoire.*

The assertion that Berryer "soon discovered the

[1] Philadelphia.—Ed.

key-phrase" merely proves that the writer of these memoirs is entirely innocent of cryptographical knowledge. Monsieur B. no doubt ascertained the key-phrase; but it was merely to satisfy his curiosity, after the riddle had been read. He made no use of the key in deciphering. The lock was picked.

In our notice of the book in question (published in the April number of this magazine)[1] we alluded to this subject thus:

"The phrase *Le gouvernement provisoire* is French, and the note in cipher was addressed to Frenchmen. The difficulty of deciphering may well be supposed much greater had the key been in a foreign tongue; yet any one who will take the trouble may address us a note, in the same manner as here proposed, and the key-phrase may be either in French, Italian, Spanish, German, Latin, or Greek (or in any of the dialects of these languages), and we pledge ourselves for the solution of the riddle."

This challenge has elicited but a single response, which is embraced in the following letter. The only quarrel we have with the epistle is, that its writer has declined giving us his name in full. We beg that he will take an early opportunity of doing this, and thus relieve us of the chance of that suspicion which was attached to the cryptography of the weekly journal

[1] *Graham's*,—Ed.

above mentioned—the suspicion of inditing ciphers to ourselves. The postmark of the letter is "Stonington, Conn."

S——, Ct., April, 1841.

To the Editor of *Graham's Magazine:*

Sir—In the April number of your magazine, while reviewing the translation by Mr. Walsh of *Sketches of Conspicuous Living Characters of France,* you invite your readers to address you a note in cipher, 'the key-phrase to which may be either in French, Italian, Spanish, German, Latin, or Greek,' and pledge yourself for its solution. My attention being called, by your remarks, to this species of cipher-writing, I composed for my own amusement the following exercises, in the first part of which the key-phrase is in English, in the second in Latin. As I did not see (by the number for May) that any of your correspondents had availed himself of your offer, I take the liberty to send the enclosed, on which, if you should think it worth your while, you can exercise your ingenuity.

I am, yours respectfully,

S. D. L.

No. 1

"Cauhiif aud ftd sdftirf ithot tacd wdde rdchfdr tiu fuaefshffheo fdoudf hetiusafhie tuis ied herhchriai fi aeiftdu wn sdaef it iuhfheo hiidohwid fi aen deodsf ths tiu itis hf iaf iuhoheaiin rdffhedr; aer ftd auf it ftif fdoudfin oissiehoafheo hefdiihodeod taf wdde odeduaiin fdusdr ounsfiouastn. Saen fsdohdf it fdoudf iuhfheo idud weiie fi ftd aeohdeff; fisdfhsdf a fiacdf tdar iaf ftacdr aer ftd ouiie iuhffde isie ihft fisd herdihwid oiiiuheo tiihr, atfdu ithot ftd tahu wdheo sdushffdr fi ouii aoahe, hetiusafhie oiiir wd fuaefshffdr ihft ihffid raeodu ftaf rhfoicdun iiiir defid iefhi ftd aswiiafiun dshffid fatdin udaotdr hff rdffheafhie. Ounsfiouastn tiidcdu siud suisduin dswuaodf ftifd sirdf it iuhfheo ithot aud uderdudr idohwid iein wn sdaef it fisd de-siaeafiun wdn ithot sawdf weiie ftd udai fhoehthoafhie it ftd ohstduf dssiindr fi hff siffdffiu."

No. 2

"Ofoiioiiaso ortsiii sov eodisoioe afduiostifoi ft iftvi si tri oistoiv oiniafetsorit ifeov rsri afotiiiiv ridiiot irio rivvio eovit atrotfetsoria aioriti iitri tf oitovin tri aeti-fei ioreitit sov usttoi oioittstifo dfti afdooitior trso ifeov tri dfit otftfeov softriedi ft oistoiv oriofiforiti suitteii viireiiitifoi ft tri iarfoisiti iiti trir uet otiiiotiv uitfti rid io tri eoviieeiiiv rfasueostr ft rii dftrit tfoeei."

In the solution of the first of these ciphers we had little more than ordinary trouble. The second proved to be exceedingly difficult, and it was only by calling every faculty into play that we could read it at all. The first runs thus:

"Various are the methods which have been devised for transmitting secret information from one individual to another by means of writing, illegible to any except him for whom it was originally destined; and the art of thus secretly communicating intelligence has been generally termed "cryptography." Many species of secret writing were known to the ancients. Sometimes a slave's head was shaved and the crown written upon with some indelible coloring fluid; after which, the hair being permitted to grow again, information could be transmitted with little danger that discovery would ensue until the ambulatory epistle safely reached its destination. Cryptography, however pure, properly embraces those modes of writing which are rendered legible only by means of some explanatory key which makes known the real signification of the ciphers employed to its possessor."

The key-phrase of this cryptograph is, " A word to the wise is sufficient."

The second is thus translated:

" Nonsensical phrases and unmeaning combinations of words, as the learned lexicographer would have confessed himself, when hidden under cryptographic ciphers, serve to *perpdex* the curious enquirer, and baffle penetration more completely than would the most profound apothegms of learned philosophers. Abstruse disquisitions of the scholiasts were they but presented before him in the undisguised vocabulary of his mother tongue ——"

The last sentence here as will be seen is broken off short. The spelling we have strictly adhered to. "D," by mistake, has been put for "l" in "perplex."

Cryptography

The key-phrase is, *Suaviter in modo, fortiter in re.*

In the ordinary cryptograph, as will be seen in reference to most of those we have specified above, the artificial alphabet agreed upon by the correspondents is employed, letter for letter, in place of the usual or natural one. For example, two parties wish to communicate secretly. It is arranged before parting that

)	shall	stand	for	a
(	"	"	"	b
—	"	"	"	c
*	"	"	"	d
.	"	"	"	e
,	"	"	"	f
;	"	"	"	g
:	"	"	"	h
?	"	"	"	i or j
!	"	"	"	k
&	"	"	"	l
o	"	"	"	m
'	"	"	"	n
†	"	"	"	o
‡	"	"	"	p
¶	"	"	"	q
☞	"	"	"	r
]	"	"	"	s
[	"	"	"	t
£	"	"	"	u or v
$	"	"	"	w
¿	"	"	"	x
¡	"	"	"	y
☜	"	"	"	z

Now, the following note is to be communicated:

"We must see you immediately upon a matter of great importance. Plots have been discovered, and the conspirators are in our hands. Hasten!"

These words would be written thus:

$ .o£][] ..¡ † £ ? oo. * ?) [. & ¡£‡† ‘) o) [[. ☞ † ’ ;
☞ .) [? o ‡ † ☞ [ ) ‘—. ‡ & † [ ]:) £. (. . ‘ * ?] — †
£. ☞ . *) ‘ * [: . — † ‘] ‡ ? ☞) [† ☞]) ☞ . ? ‘
† £ ☞ :) ‘ *] :)] [. ‘

This certainly has an intricate appearance, and would prove a most difficult cipher to any one not conversant with cryptography. But it will be observed that "a," for example, is never represented by any other character than), "b" never by any other character than (, and so on. Thus by the discovery, accidental or otherwise, of any one letter, the party intercepting the epistle would gain a permanent and decided advantage, and could apply his knowledge to all the instances in which the character in question was employed throughout the cipher.

In the cryptographs, on the other hand, which have been sent us by our correspondent at Stonington, and which are identical in conformation with the cipher resolved by Berryer, no such permanent advantage is to be obtained.

Let us refer to the second of these puzzles. Its key-phrase runs thus:

Suaviter in modo, fortiter in re.

Let us now place the alphabet beneath the phrase, letter beneath letter:

S	u	a	v	i	t	e	r	i	n	m	o	d	o	f	o	r	t	i	t	e	r	i	n	r	e
A	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z

We here see that

a	stands	for	c
d	"	"	m
e	"	"	g, u, and z
f	"	"	o
i	"	"	e, i, s, and w
m	"	"	k
n	"	"	j and x
o	"	"	l, n, and p
r	"	"	h, q, v, and y
s	"	"	a
t	"	"	f, r, and t
u	"	"	b
v	"	"	d

In this manner "n" stands for two letters, and "e," "o," and "t" for three each, while "i" and "r" represent each as many as four. Thirteen characters are made to perform the operations of the whole alphabet. The result of such a key-phrase upon the cipher is to give it the appearance of a mere medley of the letters, "e," "o," "t," "r," and "i," the latter character greatly predominating through the accident of being employed for letters, which, themselves, are inordinately prevalent in most languages—we mean "e" and "i."

A letter thus written being intercepted, and the key-phrase unknown, the individual who should attempt to decipher it may be imagined guessing, or otherwise attempting to convince himself, that a certain character ("i," for example), represented the letter "e." Looking throughout the cryptograph for confirmation of this idea he would meet with nothing but a negation of it. He would see the character in situations where it could not possibly represent "e." He might, for instance, be puzzled by four "i's" forming of themselves a single word, without the intervention of any other character, in which case, of course, they could not be all "e's." It will be seen that the word "wise" might be thus constructed. We say this may be seen now, by us, in possession of the key-phrase, but the question will no doubt occur, how, without the key-phrase, and without cognizance of any single letter in the cipher, it would be possible for the intercepter of such a cryptograph to make anything of such a word as "iiii"?

But again. A key-phrase might easily be constructed in which one character would represent seven, eight, or ten letters. Let us then imagine the word "iiiiiiiii" presenting itself in a cryptograph to an individual without the proper key-phrase, or, if this be a supposition somewhat too perplexing, let us suppose it occurring to the person for whom the cipher is designed and who has the key-phrase. What is he to do with such a word as "iiiiiiiii"? In any of the ordinary books upon algebra will be found a very concise formula (we have not the necessary type for its insertion here) for ascertaining the number of arrangements in which *m* letters may be placed, taken *n* at a time. But no doubt there are none of our readers ignorant of the innumerable combinations which may be made from these ten "i's." Yet, unless it occur otherwise by accident, the correspondent receiving the cipher would have to write down all these combinations before attaining the word intended, and even when he had written them he would be inexpressibly perplexed in selecting the word designed from the vast number of other words arising in the course of the permutation.

To obviate, therefore, the exceeding difficulty of deciphering this species of cryptograph on the part of the possessors of the key-phrase, and to confine the deep intricacy of the puzzle to those for whom the cipher was not designed, it becomes necessary that some order should be agreed upon by the parties corresponding,—some order in reference to which those characters are to be read which represent more than one letter,—and this order must be held in view by the writer of the cryptograph. It may be agreed, for example, that the first time an "i" occurs in the cipher it is to be understood as representing the character which stands against the first "i" in the key-phrase; that the second time an "i" occurs it must be supposed to represent that letter which stands opposed to the second "i" in the key-phrase, etc., etc. Thus the location of each ciphérical letter must be considered in connection with the character itself in order to determine its exact signification.

We say that some preconcerted order of this kind is necessary lest the cipher prove too intricate a lock to yield even to its true key. But it will be evident, upon inspection, that our correspondent at Stonington has inflicted upon us a cryptograph in which no order has been preserved, in which many characters respectively stand, at absolute random, for many others. If, therefore, in regard to the gauntlet we threw down in April, he should be half-inclined to accuse us of braggadocio, he will yet admit that we have more than acted up to our boast. If what we then said was not said *suaviter in modo*, what we now do is at least done *fortiter in re*.

In these cursory observations we have by no means attempted to exhaust the subject of cryptography. With such object in view a folio might be required. We have, indeed, mentioned only a few of the ordinary modes of cipher. Even two thousand years ago Æneas Tacticus detailed twenty distinct methods, and modern ingenuity has added much to the science. Our design has been chiefly suggestive, and perhaps we have already bored the readers of the magazine. To those who desire further information upon this topic we may say that there are extant treatises by Trithemius, Cap. Porta, Vigenere, and P. Nicéron. The works of the two latter may be found, we believe, in the library of the Harvard University. If, however, there should be sought in these disquisitions, or in any, rules for the solution of cipher, the seeker will be disappointed. Beyond some hints in regard to the general structure of language, and some minute exercises in their practical application, he will find nothing upon record which he does not in his own intellect possess.

A Chapter on Autography

BY

UNDER this head, some years ago, there appeared in the *Southern Literary Messenger* an article which attracted very general attention, not less from the nature of its subject than from the peculiar manner in which it was handled. The editor introduces his readers to a certain Mr. Joseph Miller, who, it is hinted, is not merely a descendant of the illustrious Joe of jest-book notoriety, but is that identical individual in proper person. Upon this point, however, an air of uncertainty is thrown by means of an equivoque, maintained throughout the paper, in respect to Mr. Miller's middle name. This equivoque is put into the mouth of Mr. M. himself. He gives his name, in the first instance, as Joseph A. Miller, but in the course of conversation shifts it to Joseph B., then to Joseph C., and so on through the whole alphabet, until he concludes by desiring a copy of the magazine to be sent to his address as Joseph Z. Miller, Esquire.

The object of his visit to the editor is to place in his hands the autographs of certain distinguished American *literati.* To these persons he had written rigmarole letters on various topics, and in all cases had been successful in eliciting a reply. The replies only (which it is scarcely necessary to say are all fictitious) are given in the magazine with a genuine autograph facsimile appended, and are either burlesques of the supposed writer's usual style, or rendered otherwise absurd by reference to the nonsensical questions imagined to have been propounded by Mr. Miller. The autographs thus given are twenty-six in all, corresponding to the twenty-six variations in the initial letter of the hoaxer's middle name.

With the public this article took amazingly well, and many of our principal papers were at the expense of reprinting it with the wood-cut autographs. Even those whose names had been introduced, and whose style had been burlesqued, took the joke, generally speaking, in good part. Some of them were at a loss what to make of the matter. Dr. W. E. Channing, of Boston, was at some trouble, it is said, in calling to mind whether he had or had not actually written to some Mr. Joseph Miller the letter attributed to him in the article. This letter was nothing more than what follows:

BOSTON, ——.

Dear Sir,—No such person as Philip Philpot has ever been in my employ as a coachman, or otherwise. The name is an odd one, and not likely to be forgotten. The man must have reference to some other Doctor Channing. It would be as well to question him closely.

Respectfully yours,

W. E. CHANNING.

To Joseph X. Miller, Esq.

The precise and brief sententiousness of the divine is here, it will be seen, very truly adopted or "hit off."

In one instance only was the *jeu d'esprit* taken in serious dudgeon. Colonel Stone and the *Messenger* had not been upon the best of terms. Some one of the Colonel's little brochures had been severely treated by that journal, which declared that the work would have been far more properly published among the quack advertisements in a spare corner of the *Commercial.* The Colonel had retaliated by wholesale vituperation of the *Messenger.* This being the state of affairs, it was not to be wondered at that the following epistle was not quietly received on the part of him to whom it was attributed:

NEW YORK, ——.

Dear Sir,—I am exceedingly and excessively sorry that it is out of my power to comply with your rational and reasonable request. The subject you mention is one with which I am utterly unacquainted. Moreover, it is one about which I know very little.

Respectfully,

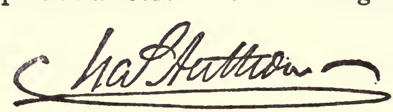
W. L. STONE.

Joseph V. Miller, Esq.

These tautologies and anti-climaxes were too much for the Colonel, and we are ashamed to say that he committed himself by publishing in the *Commercial* an indignant denial of ever having indited such an epistle.

The principal feature of this autograph article, although perhaps the least interesting, was that of the editorial comment upon the supposed MSS., regarding them as indicative of character. In these comments the design was never more than semi-serious. At times, too, the writer was evidently led into error or injustice through the desire of being pungent, not unfrequently sacrificing truth for the sake of a *bon-mot.* In this manner qualities were often attributed to individuals, which were not so much indicated by their handwriting as suggested by the spleen of the commentator. But that a strong analaogy does generally and naturally exist between every man's chirography and character will be denied by none but the unreflecting. It is not our purpose, however, to enter into the philosophy of this subject, either in this portion of the present paper or in the abstract. What we may have to say will be introduced elsewhere, and in connection with particular MSS. The practical application of the theory will thus go hand in hand with the theory itself.

Our design is threefold: In the first place, seriously to illustrate our position that the mental features are indicated (with certain exceptions) by the handwriting; secondly, to indulge in a little literary gossip; and, thirdly, to furnish our readers with a more accurate and at the same time a more general collection of the autographs of our *literati* than is to be found elsewhere. Of the first portion of this design we have already spoken. The second speaks for itself. Of the third it is only necessary to say that we are confident of its interest for all lovers of literature. Next to the person of a distinguished man of letters, we desire to see his portrait; next to his portrait, his autograph. In the latter, especially, there is something which seems to bring him before us in his true idiosyncrasy —in his character of scribe. The feeling which prompts to the collection of autographs is a natural and rational one. But complete, or even extensive collections are beyond the reach of those who themselves do not dabble in the waters of literature. The writer of this article has had opportunities in this way enjoyed by few. The MSS. now lying before him are a motley mass indeed. Here are letters, or other compositions, from every individual in America who has the slightest pretensions to literary celebrity. From these we propose to select the most eminent names, as to give all would be a work of supererogation. Unquestionably, among those whose claims we are forced to postpone, are several whose high merit might justly demand a different treatment; but the rule applicable in a case like this seems to be that of celebrity rather than that of true worth. It will be understood that, in the necessity of selection which circumstances impose upon us, we confine ourselves to the most noted among the living *literati* of the country. The article above alluded to embraced, as we have already stated, only twenty-six names, and was not occupied exclusively either with living persons, or, properly speaking, with literary ones. In fact, the whole paper seemed to acknowledge no law beyond that of whim. Our present essay will be found to include one hundred autographs. We have thought it unnecessary to preserve any particular order in their arrangement.

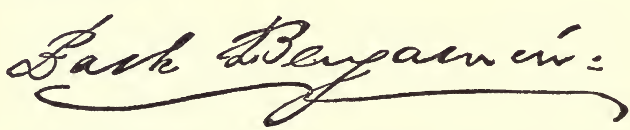


Professor Charles Anthon, of Columbia College, New York, is well known as the most erudite of our classical scholars; and, although still a young man, there are few, if any, even in Europe, who surpass him in his peculiar path of knowledge. In England his supremacy has been tacitly acknowledged by the immediate republication of his editions of Cæsar, Sallust, and Cicero, with other works, and their adoption as text-books at Oxford and Cambridge. His amplification of Lemprière did him high honor, but of late has been entirely superseded by a Classical Dictionary of his own, a work most remarkable for the extent and comprehensiveness of its details, as well as for its historical, chronological, mythological, and philological accuracy. It has at once completely overshadowed everything of its kind. It follows, as a matter of course, that Mr. Anthon has many little enemies among the inditers of merely big books. He has not been unassailed, yet has assuredly remained uninjured in the estimation of all those whose opinion he would be likely to value. We do not mean to say that he is altogether without faults, but a certain antique Johnsonism of style is perhaps one of his worst. He was mainly instrumental (with Professor Henry and Dr. Hawks) in setting on foot the *New York Review,* a journal of which he is the most efficient literary support, and whose most erudite papers have always been furnished by his pen.

The chirography of Professor Anthon is the most regularly beautiful of any in our collection. We see the most scrupulous precision, finish, and neatness about every portion of it—in the formation of individual letters, as well as in the *tout-ensemble.* The perfect symmetry of the MS. gives it, to a casual glance, the appearance of Italic print. The lines are quite straight, and at exactly equal distances, yet are written without black rules or other artificial aid. There is not the slightest superfluity in the way of flourish or otherwise, with the exception of the twirl in the C of the signature. Yet the whole is rather neat and graceful than forcible. Of four letters now lying before us, one is written on pink, one on a faint blue, one on green, and one on yellow paper—all of the finest quality. The seal is of green wax, with an impression of the head of Cæsar.

It is in the chirography of such men as Professor Anthon that we look with certainty for indication of character. The life of a scholar is mostly undisturbed by those adventitious events which distort the natural disposition of the man of the world, preventing his real nature from manifesting itself in his MS. The lawyer, who, pressed for time, is often forced to embody a world of heterogeneous memoranda on scraps of paper, with the stumps of all varieties of pen, will soon find the fair characters of his boyhood degenerate into hieroglyphics which would puzzle Dr. Wallis or Champollion; and from chirography so disturbed it is nearly impossible to decide anything. In a similar manner men who pass through many striking vicissitudes of life acquire in each change of circumstance a temporary inflection of the handwriting, the whole resulting, after many years, in unformed or variable MS. scarcely to be recognized by themselves from one day to the other. In the case of literary men generally, we may expect some decisive token of the mental influence upon the MS., and in the instance of the classical devotee we may look with especial certainty for such token. We see, accordingly, in Professor Anthon's autography each and all the known idiosyncrasies of his taste and intellect. We recognize at once the scrupulous precision and finish of his scholarship and of his style, the love of elegance which prompts him to surround himself in his private study with gems of sculptural art and beautifully bound volumes, all arranged with elaborate attention to form, and in the very pedantry of neatness. We perceive, too, the disdain of superfluous embellishment which distinguishes his compilations, and which gives to their exterior appearance so marked an air of Quakerism. We must not forget to observe that the "want of force" is a want as perceptible in the whole character of the man as in that of the MS.

The MS. of Mr. Irving has little about it indicative of his genius. Certainly, no one could suspect from it any nice finish in the writer's compositions; nor is this nice finish to be found. The letters now before us vary remarkably in appearance; and those of late date are not nearly so well written as the more antique. Mr. Irving has travelled much, has seen many vicissitudes, and has been so thoroughly satiated with fame as to grow slovenly in the performance of his literary tasks. This slovenliness has affected his handwriting. But even from his earlier MSS. there is little to be gleaned, except the ideas of simplicity and precision. It must be admitted, however, that this fact, in itself, is characteristic of the literary manner, which, however excellent, has no prominent or very remarkable features.



For the last six or seven years few men have occupied a more desirable position among us than Mr. Benjamin. As the editor of the *American Monthly Magazine,* of the *New Yorker,* and more lately of the *Signal* and *New World,* he has exerted an influence scarcely second to that of any editor in the country. This influence Mr. B. owes to no single cause, but to his combined ability, activity, causticity, fearlessness, and independence. We use the latter term, however, with some mental reservation. The editor of the *World* is

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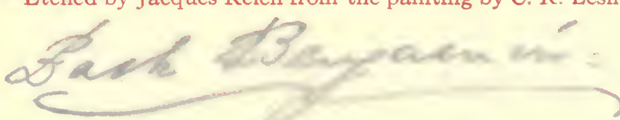
Washington Irving.

Etched by Jacques Reich from the painting by C. R. Leslie.

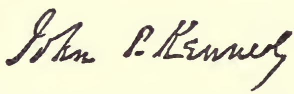


For the last six or seven years few men have occupied a more decided position among us than Mr. Benjamin. As the editor of the *American Monthly Magazine*, of the *New Yorker*, and more lately of the *Signal* and *New World*, he has exerted an influence scarcely second to that of any editor in the country. This influence Mr. B. owes to no single cause, but to his combined ability, activity, causticity, fearlessness, and independence. We use the latter term, however, with some mental reservation. The editor of the *World* is

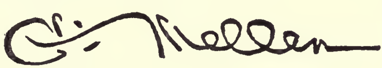

Jacques Reich

independent so far as the word implies unshaken resolution to follow the bent of one's own will, let the consequences be what they may. He is no respecter of persons, and his vituperation as often assails the powerful as the powerless: indeed, the latter fall rarely under his censure. But we cannot call his independence at all times that of principle. We can never be sure that he will defend a cause merely because it is the cause of truth, or even because he regards it as such. He is too frequently biased by personal feelings —feelings now of friendship, now of vindictiveness. He is a warm friend, and a bitter but not implacable enemy. His judgment in literary matters should not be questioned, but there is some difficulty in getting at his real opinion. As a prose writer, his style is lucid, terse, and pungent. He is often witty, often cuttingly sarcastic, but seldom humorous. He frequently injures the force of his fiercest attacks by an indulgence in merely vituperative epithets. As a poet, he is entitled to far higher consideration than that in which he is ordinarily held. He is skilful and passionate, as well as imaginative. His sonnets have not been surpassed. In short, it is as a poet that his better genius is evinced; it is in poetry that his noble spirit breaks forth, showing what the man is, and what, but for unhappy circumstances, he would invariably appear.

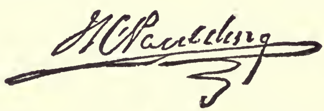
Mr. Benjamin's MS. is not very dissimilar to Mr. Irving's, and, like his, it has no doubt been greatly modified by the excitements of life, and by the necessity of writing much and hastily, so that we can predicate but little respecting it. It speaks of his exquisite sensibility and passion. These betray themselves in the nervous variation of the MS. as the subject is diversified. When the theme is an ordinary one the writing is legible and has force; but when it verges upon any thing which may be supposed to excite, we see the characters falter as they proceed. In the MSS. of some of his best poems this peculiarity is very remarkable. The signature conveys the idea of his usual chirography.



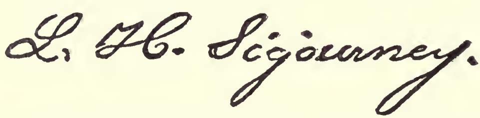
Mr. Kennedy is well known as the author of *Swallow Barn, Horse-Shoe Robinson,* and *Rob of the Bowl,* three works whose features are strongly and decidedly marked. These features are boldness and force of thought (disdaining ordinary embellishment, and depending for its effect upon masses rather than upon details), with a predominant sense of the picturesque pervading and giving color to the whole. His *Swallow Barn* in especial (and it is by the first effort of an author that we form the truest idea of his mental bias) is but a rich succession of picturesque still-life pieces. Mr. Kennedy is well to do in the world and has always taken the world easily. We may therefore expect to find in his chirography, if ever in any, a full indication of the chief features of his literary style, especially as this chief feature is so remarkably prominent. A glance at his signature will convince any one that the indication is to be found. A painter called upon to designate the main peculiarity of this MS. would speak at once of the picturesque. This character is given it by the absence of hair-strokes, and by the abrupt termination of every letter without tapering; also in great measure by varying the size and slope of the letters. Great uniformity is preserved in the whole air of the MS., with great variety in the constituent parts. Every character has the clearness, boldness, and precision of a wood-cut. The long letters do not rise or fall in an undue degree above the others. Upon the whole, this is a hand which pleases us much, although its bizarrerie is rather too piquant for the general taste. Should its writer devote himself more exclusively to light letters we predict his future eminence. The paper on which our epistles are written is very fine, clear, and white, with gilt edges. The seal is neat, and just sufficient wax has been used for the impression. All this betokens a love of the elegant without effeminacy.



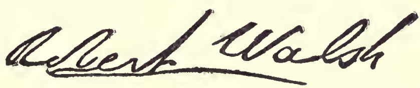
The handwriting of Grenville Mellen is somewhat peculiar, and partakes largely of the character of his signature as seen on page 89. The whole is highly indicative of the poet's flighty, hyperfanciful character, with his unsettled and often erroneous ideas of the beautiful. His straining after effect is well paralleled in the formation of the preposterous G in the signature, with the two dots by its side. Mr. Mellen has genius unquestionably, but there is something in his temperament which obscures it.



No correct notion of Mr. Paulding's literary peculiarities can be obtained from an inspection of his MS., which no doubt has been strongly modified by adventitious circumstances. His small "a's," "t's," and "c's" are all alike, and the style of the characters generally is French, although the entire MS. has much the appearance of Greek text. The paper which he ordinarily uses is of a very fine, glossy texture, and of a blue tint, with gilt edges. His signature is a good specimen of his general hand.



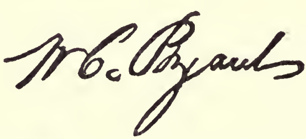
Mrs. Sigourney seems to take much pains with her MSS. Apparently she employs black lines. Every "t" is crossed and every "i" dotted with precision, while the punctuation is faultless. Yet the whole has nothing of effeminacy or formality. The individual characters are large, well, and freely formed, and preserve a perfect uniformity throughout. Something in her handwriting puts us in mind of Mr. Paulding's. In both MSS. perfect regularity exists, and in both the style is formed or decided. Both are beautiful, yet Mrs. Sigourney's is the most legible, and Mr. Paulding's nearly the most illegible, in the world. From that of Mrs. S. we might easily form a true estimate of her compositions. Freedom, dignity, precision, and grace, without originality, may be properly attributed to her. She has fine taste without genius. Her paper is usually good, the seal small, of green and gold wax, and without impression.



Mr. Walsh's MS. is peculiar, from its large, sprawling, and irregular appearance—rather rotund than angular. It always seems to have been hurriedly written. The "t's" are crossed with a sweeping scratch of the pen, which gives to his epistles a somewhat droll appearance. A dictatorial air pervades the whole. His paper is of ordinary quality. His seal is commonly of brown wax mingled with gold, and bears a Latin motto, of which only the words *trans* and *mortuus* are legible.

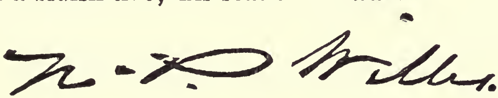
Mr. Walsh cannot be denied talent, but his reputation, which has been bolstered into being by a clique, is not a thing to live. A blustering self-conceit betrays itself in his chirography, which upon the whole is not very dissimilar to that of Mr. E. Everett, of whom we will speak hereafter.

Mr. Ingraham, or Ingrahame (for he writes his name sometimes with and sometimes without the "e," is one of our most popular novelists, if not one of our best. He appeals always to the taste of the ultra-romancists (as a matter, we believe, rather of pecuniary policy than of choice), and thus is obnoxious to the charge of a certain cut-and-thrust, blue-fire melodramaticism. Still, he is capable of better things. His chirography is very unequal, at times sufficiently clear and flowing, at others shockingly scratchy and uncouth. From it nothing whatever can be predicated except an uneasy vacillation of temper and of purpose.



Mr. Bryant's MS. puts us entirely at fault. It is one of the most commonplace clerk's hands which we ever encountered, and has no character about it beyond that of the day-book and ledger. He writes, in short, what mercantile men and professional penmen call a fair hand, but what artists would term an abominable one. Among its regular up-and-down strokes, waving lines and hair-lines, systematic taperings and flourishes, we look in vain for the force, polish, and decision of the poet. The picturesque, to be sure, is equally deficient in his chirography and in his poetical productions.

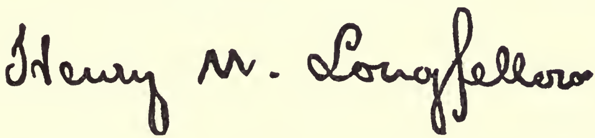
Mr. Halleck's hand is strikingly indicative of his genius. We see in it some force, more grace, and little of the picturesque. There is a great deal of freedom about it, and his MSS. seem to be written *currente calamo,* but without hurry. His flourishes, which are not many, look as if thoughtfully planned and deliberately yet firmly executed. His paper is very good, and of a bluish tint; his seal of red wax.



Mr. Willis when writing carefully would write a hand nearly resembling that of Mr. Halleck, although no similarity is perceptible in the signatures. His usual chirography is dashing, free, and not ungraceful, but is sadly deficient in force and picturesqueness. It has been the fate of this gentleman to be alternately condemned *ad infinitum,* and lauded *ad nauseam,* a fact which speaks much in his praise. We know of no American writer who has evinced greater versatility of talent, that is to say, of high talent often amounting to genius, and we know of none who has more narrowly missed placing himself at the head of our letters.

The paper of Mr. Willis's epistles is always fine and glossy. At present he employs a somewhat large seal, with a dove or carrier-pigeon at the top, the word "Glenmary" at the bottom, and the initials "N. P. W." in the middle.

Mr. Dawes has been long known as a poet, but his claims are scarcely yet settled, his friends giving him rank with Bryant and Halleck, while his opponents treat his pretensions with contempt. The truth is that the author of *Geraldine* and *Athenia of Damascus* has written occasional verses very well, so well that some of his minor pieces may be considered equal to any of the minor pieces of either of the two gentlemen above mentioned. His longer poems, however, will not bear examination. *Athenía of Damascus* is pompous nonsense, and *Geraldíne* a most ridiculous imitation of *Don Juan,* in which the beauties of the original have been as sedulously avoided as the blemishes have been blunderingly culled. In style he is perhaps the most inflated, involved, and falsely figurative of any of our more noted poets. This defect, of course, is only fully appreciable in what are termed his " sustained efforts," and thus his shorter pieces are often exceedingly good. His apparent erudition is mere verbiage, and were it real would be lamentably out of place where we see it. He seems to have been infected with a blind admiration of Coleridge, especially of his mysticism and cant.

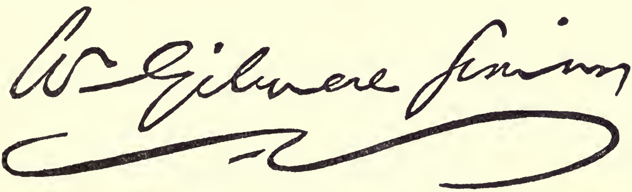


H. W. Longfellow (Professor of Moral Philosophy at Harvard) is entitled to the first place among the poets of America—certainly to the first place among those who have put themselves prominently forth as poets. His good qualities are all of the highest order, while his sins are chiefly those of affectation and imitation—an imitation sometimes verging upon downright theft.

His MS. is remarkably good, and is fairly exemplified in the signature. We see here plain indications of the force, vigor, and glowing richness of his literary style; the deliberate and steady finish of his compositions. The man who writes thus may not accomplish much, but what he does will always be thoroughly done. The main beauty, or at least one great beauty of his poetry, is that of proportion; another is a freedom from extraneous embellishment. He oftener runs into affectation through his endeavors at simplicity than through any other cause. Now, this rigid simplicity and proportion are easily perceptible in the MS. which, altogether, is a very excellent one.

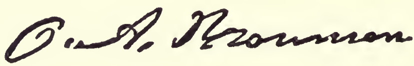
The Rev. J. Pierpont, who, of late, has attracted so much of the public attention, is one of the most accomplished poets in America. His *Airs of Palestine* is distinguished by the sweetness and vigor of its versification and by the grace of its sentiments. Some of its shorter pieces are exceedingly terse and forcible, and none of our readers can have forgotten his *Lines on Napoleon.* His rhythm is at least equal in strength and modulation to that of any poet in America. Here he resembles Milman and Croly.

His chirography, nevertheless, indicates nothing beyond the commonplace. It is an ordinary clerk's hand, one which is met with more frequently than any other. It is decidedly formed; and we have no doubt that he never writes otherwise than thus. The MS. of his school-days has probably been persisted in to the last. If so, the fact is in full consonance with the steady precision of his style. The flourish at the end of the signature is but a part of the writer's general enthusiasm.



Mr. Simms is the author of *Martin Faber, Atalantis, Guy Rivers, The Partisan, Mellichampe, The Yemassee, The Damsel of Darien, The Black Riders of the Congaree,* and one or two other productions, among which we must not forget to mention several fine poems. As a poet, indeed, we like him far better than as a novelist. His qualities in this latter respect resemble those of Mr. Kennedy, although he equals him in no particular except in his appreciation of the graceful. In his sense of beauty he is Mr. K.'s superior, but falls behind him in force, and the other attributes of the author of *Swallow Barn.* These differences and resemblances are well shown in the

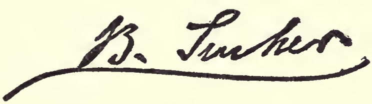
MSS. That of Mr. S. has more slope and more uniformity in detail, with less in the mass, while it has also less of the picturesque, although still much. The middle name is Gilmore: in the cut it looks like Gilmere.



The Rev. Orestes A. Brownson is chiefly known to the literary world as the editor of the *Boston Quarterly Review,* a work to which he contributes, each quarter, at least two thirds of the matter. He has published little in book-form, his principal works being *Charles Edwood* and *New Views.* Of these, the former production is, in many respects, one of the highest merit. In logical accuracy, in comprehensiveness of thought, and in the evident frankness and desire for truth in which it is composed we know of few theological treatises which can be compared with it. Its conclusion, however, bears about it a species of hesitation and inconsequence which betray the fact that the writer has not altogether succeeded in convincing himself of those important truths which he is so anxious to impress upon his readers. We must bear in mind, however, that this is the fault of Mr. Brownson's subject, and not of Mr. Brownson. However well a man may reason on the great topics of God and immortality, he will be forced to admit tacitly, in the end, that God and immortality are things to be felt rather than demonstrated.

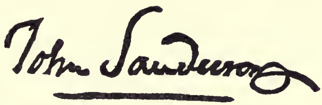
On subjects less indefinite, Mr. B. reasons with the calm and convincing force of a Combe. He is, in every respect, an extraordinary man, and with the more extensive resources which would have been afforded him by early education, could not have failed to bring about important results.

His MS. indicates, in the most striking manner, the unpretending simplicity, directness, and especially the indefatigability of his mental character. His signature is more *petite* than his general chirography.



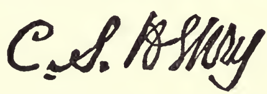
Judge Beverly Tucker, of the College of William and Mary, Virginia, is the author of one of the best novels ever published in America, *George Balcombe,* although for some reason the book was never a popular favorite. It was, perhaps, somewhat too didactic for the general taste.

He has written a great deal also for the *Southern Literary Messenger* at different times; and at one period acted in part, if not altogether, as editor of that magazine, which is indebted to him for some very racy articles, in the way of criticism especially. He is apt, however, to be led away by personal feelings, and is more given to vituperation for the mere sake of point or pungency than is altogether consonant with his character as judge. Some five years ago there appeared in the *Messenger,* under the editorial head, an article on the subject of the *Pickwick Papers* and some other productions of Mr. Dickens. This article, which abounded in well-written but extravagant denunciation of everything composed by the author of *The Old Curiosity Shop,* and which prophesied his immediate downfall, we have reason to believe was from the pen of Judge Beverly Tucker. We take this opportunity of mentioning the subject, because the odium of the paper in question fell altogether upon our shoulders, and it is a burden we are not disposed and never intended to bear. The review appeared in March, we think, and we had retired from the *Messenger* in the January preceding. About eighteen months previously, and when Mr. Dickens was scarcely known to the public at all, except as the author of some brief tales and essays, the writer of this article took occasion to predict in the *Messenger,* and in the most emphatic manner, that high and just distinction which the author in question has attained. Judge Tucker's MS. is diminutive, but neat and legible, and has much force and precision, with little of the picturesque. The care which he bestows upon his literary compositions makes itself manifest also in his chirography. The signature is more florid than the general hand.

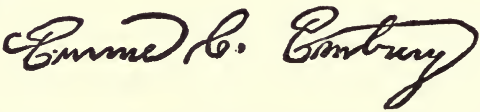


Mr. Sanderson, Professor of the Greek and Latin Languages in the High School of Philadelphia, is well known as the author of a series of letters entitled *The American in Paris.* These are distinguished by ease and vivacity of style, with occasional profundity of observation, and, above all, by the frequency of their illustrative anecdotes and figures. In all these particulars Professor Sanderson is the precise counterpart of Judge Beverly Tucker, author of *George Balcombe.* The MSS. of the two gentlemen are nearly identical. Both are neat, clear, and legible. Mr. Sanderson's is somewhat the more crowded.

About Miss Gould's MS. there are great neatness, picturesqueness, and finish, without over-effeminacy. The literary style of one who writes thus will always be remarkable for sententiousness and epigrammatism; and these are the leading features of Miss Gould's poetry.



Professor Henry, of Bristol College, is chiefly known by his contributions to our quarterlies, and as one of the originators of the *New York Review* in conjunction with Dr. Hawks and Professor Anthon. His chirography is now neat and picturesque (much resembling that of Judge Tucker), and now excessively scratchy, clerky, and slovenly, so that it is nearly impossible to say anything respecting it, except that it indicates a vacillating disposition with unsettled ideas of the beautiful. None of his epistles, in regard to their chirography, end as well as they begin. This trait denotes fatigability. His signature, which is bold and decided, conveys not the faintest idea of the general MS.



Mrs. Embury is chiefly known by her contributions to the periodicals of the country. She is one of the most nervous of our female writers, and is not destitute of originality, that rarest of all qualities in a woman, and especially in an American woman.

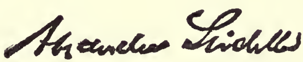
Her MS. evinces a strong disposition to fly off at a tangent from the old formulæ of the boarding academies. But in it, and in her literary style, it would be well that she should no longer hesitate to discard the absurdities of mere fashion.

Miss Leslie is celebrated for the homely naturalness of her stories and for the broad satire of her comic style. She has written much for the magazines. Her chirography is distinguished for neatness and finish, without over-effeminacy. It is rotund and somewhat diminutive, the letters being separate and the words always finished with an inward twirl. She is never particular about the quality of her paper or the other externals of epistolary correspondence. From her MSS. in general, we might suppose her solicitous rather about the effect of her compositions as a whole than about the polishing of the constituent parts. There is much of the picturesque both in her chirography and in her literary style.

Mr. Neal has acquired a very extensive reputation through his *Charcoal Sketches*, a series of papers originally written for the *Saturday News* of this city, and afterward published in book form, with illustrations by Johnston. The whole design of the *Charcoal Sketches* may be stated as the depicting of the wharf and street loafer; but this design has been executed altogether in caricature. The extreme of burlesque runs throughout the work, which is also chargeable with a tedious repetition of slang and incident. The loafer always declaims the same nonsense in the same style, gets drunk in the same way, and is taken to the watch-house after the same fashion. Reading one chapter of the book we read all. Any single description would have been an original idea well executed, but the dose is repeated *ad nauseam,* and betrays a woful poverty of invention. The manner in which Mr. Neal's book was belauded by his personal friends of the Philadelphia press speaks little for their independence or less for their taste. To dub the author of these *Charcoal Sketches* (which are really very excellent police reports) with the title of "the American Boz" is either outrageous nonsense or malevolent irony.

In other respects Mr. N. has evinced talents which cannot be questioned. He has conducted the *Pennsylvanian* with credit, and, as a political writer, he stands deservedly high. His MS. is simple and legible, with much space between the words. It has force, but little grace. Altogether, his chirography is good; but as he belongs to the editorial corps, it would not be just to suppose that any deductions in respect to character could be gleaned from it. His signature conveys the general MS. with accuracy.

Mr. Seba Smith has become somewhat widely celebrated as the author, in part, of the *Letters of Major Jack Downing.* These were very clever productions, coarse, but full of fun, wit, sarcasm, and sense. Their manner rendered them exceedingly popular, until their success tempted into the field a host of brainless imitators. Mr. S. is also the author of several poems; among others, of *Powhatan: A Metrical Romance,* which we do not very particularly admire. His MS. is legible, and has much simplicity about it. At times it vacillates and appears unformed. Upon the whole, it is much such a MS. as David Crockett wrote, and precisely such a one as we might imagine would be written by a veritable Jack Downing—by Jack Downing himself, had this creature of Mr. Smith's fancy been endowed with a real entity. The fact is that the "Major" is not all a creation; at least one half of his character actually exists in the bosom of his originator. It was the Jack Downing half that composed *Powhatan.*



Lieutenant Slidell some years ago took the additional name of Mackenzie. His reputation at one period was extravagantly high, a circumstance owing, in some measure, to the *esprít de corps* of the navy, of which he is a member, and to his private influence, through his family, with the review cliques. Yet his fame was not altogether undeserved; although it cannot be denied that his first book, *A Year in Spain,* was in some danger of being overlooked by his countrymen, until a benignant star directed the attention of the London bookseller, Murray, to its merits. Cockney octavos prevailed; and the clever young writer, who was cut dead in his Yankee habiliments, met with bows innumerable in the gala dress of an English *imprimatur.* The work now ran through several editions, and prepared the public for the kind reception of *The American in England,* which exalted his reputation to its highest pinnacle. Both these books abound in racy descriptions, but are chiefly remarkable for their gross deficiencies in grammatical construction.

Lieutenant Slidell's MS. is peculiarly neat and even —quite legible, but altogether too *petite* and effeminate. Few tokens of his literary character are to be found beyond the *petiteness,* which is exactly analogous with the minute detail of his descriptions.

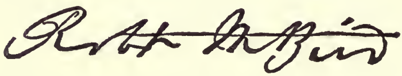
Francis Lieber is Professor of History and Political Economy in the College of South Carolina, and has published many works distinguished by acumen and erudition. Among these we may notice a *Journal of a Residence in Greece,* written at the instigation of the historian Niebuhr; *The Stranger in America,* a piquant book abounding in various information relative to the United States; a treatise on *Education; Reminis-*

cences of an Intercourse with Niebuhr; and an *Essay on International Copyright,*—this last a valuable work.

Professor Lieber's personal character is that of the frankest and most unpretending *bonhomie,* while his erudition is rather massive than minute. We may therefore expect his MS. to differ widely from that of his brother scholar, Professor Anthon; and so in truth it does. His chirography is careless, heavy, black, and forcible, without the slightest attempt at ornament, very similar, upon the whole, to the well-known chirography of Chief-Justice Marshall. His letters have the peculiarity of a wide margin left at the top of each page.

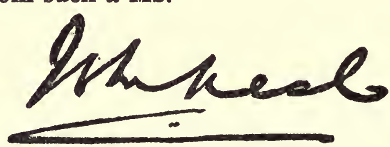
Mrs. Hale is well known for her masculine style of thought. This is clearly expressed in her chirography, which is far larger, heavier, and altogether bolder than that of her sex generally. It resembles in a great degree that of Professor Lieber, and is not easily deciphered.

Mr. Everett's MS. is a noble one. It has about it an air of deliberate precision emblematic of the statesman and a mingled grace and solidity betokening the scholar. Nothing can be more legible, and nothing need be more uniform. The man who writes thus will never grossly err in judgment or otherwise; but we may also venture to say that he will never attain the loftiest pinnacle of renown. The letters before us have a seal of red wax, with an oval device bearing the initials E. E. and surrounded with a scroll, inscribed with some Latin words which are illegible.



Dr. Bird is well known as the author of *The Gladiator, Calavar, The Infidel, Nick of the Woods,* and some other works, *Calavar* being, we think, by far the best of them, and beyond doubt one of the best of American novels.

His chirography resembles that of Mr. Benjamin very closely, the chief difference being in a curl of the final letters in Dr. B.'s. The characters, too, have the air of not being able to keep pace with the thought, and an uneasy want of finish seems to have been the consequence. A vivid imagination might easily be deduced from such a MS.



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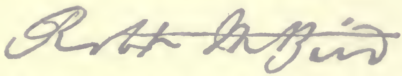

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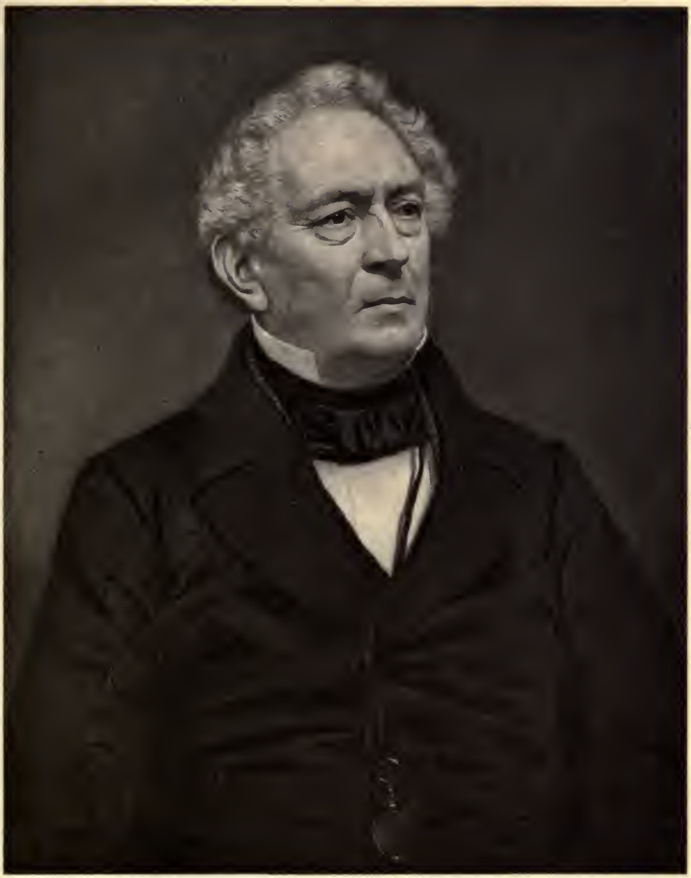
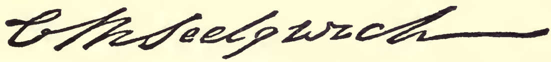
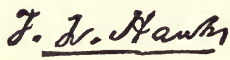


and we doubt whether he could read them himself in half an hour after they are penned. Sometimes four or five words are run together. Any one, from Mr. Neal's penmanship, might suppose his mind to be what it really is—excessively flighty and irregular, but active and energetic.



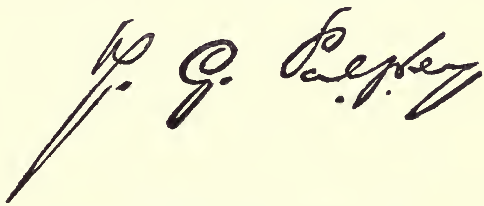
The penmanship of Miss Sedgwick is excellent. The characters are well-sized, distinct, elegantly but not ostentatiously formed, and, with perfect freedom of manner, are still sufficiently feminine. The hair-strokes differ little from the downward ones, and the MSS. have thus a uniformity they might not otherwise have. The paper she generally uses is good, blue, and machine-ruled. Miss Sedgwick's handwriting points unequivocally to the traits of her literary style, which are strong common sense and a masculine disdain of mere ornament. The signature conveys the general chirography.

Mr. Cooper's MS. is very bad—unformed, with little of distinctive character about it, and varying greatly in different epistles. In most of those before us a steel pen has been employed, the lines are crooked, and the whole chirography has a constrained and schoolboyish air. The paper is fine and of a bluish tint. A wafer is always used. Without appearing ill-natured we could scarcely draw any inferences from such a MS. Mr. Cooper has seen many vicissitudes, and it is probable that he has not always written thus. Whatever are his faults, his genius cannot be doubted.



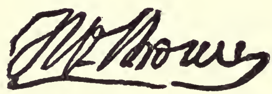
Dr. Hawks is one of the originators of the *New York Review,* to which journal he has furnished many articles. He is also known as the author of *The History of the Episcopal Church of Virginia* and one or two minor works. He now edits the *Church Record.* His style, both as a writer and as a preacher, is characterized rather by a perfect fluency than by any more lofty quality, and this trait is strikingly indicated in his chirography, of which the signature is a fair specimen.

This gentleman is the author of *Cromwell, The Brothers, Ringwood the Rover,* and some other minor productions. He at one time edited the *American Monthly Magazine* in connection with Mr. Hoffman. In his compositions for the magazines, Mr. Herbert is in the habit of doing both them and himself gross injustice by neglect and hurry. His longer works evince much ability, although he is rarely entitled to be called original. His MS. is exceedingly neat, clear, and forcible, the signature affording a just idea of it. It resembles that of Mr. Kennedy very nearly, but has more slope and uniformity, with, of course, less spirit, and less of the picturesque. He who writes as Mr. Herbert will be found always to depend chiefly upon his merits of style for a literary reputation and will not be unapt to fall into a pompous grandiloquence. The author of *Cromwell* is sometimes wofully turgid.



Professor Palfrey is known to the public principally through his editorship of the *North American Review.* He has a reputation for scholarship; and many of the articles which are attributed to his pen evince that this reputation is well based, so far as the common notion of scholarship extends. For the rest, he seems to dwell altogether within the narrow world of his own conceptions, imprisoning them by the very barrier which he has erected against the conceptions of others.

His MS. shows a total deficiency in the sense of the beautiful. It has great pretension, great straining after effect, but is altogether one of the most miserable MSS. in the world, forceless, graceless, tawdry, vacillating, and unpicturesque. The signature conveys but a faint idea of its extravagance. However much we may admire the mere knowledge of the man who writes thus, it will not do to place any dependence upon his wisdom or upon his taste.

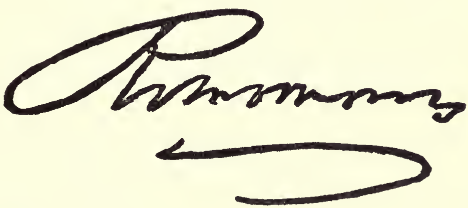


F. W. Thomas, who began his literary career at the early age of seventeen, by a poetical lampoon upon certain Baltimore fops, has since more particularly distinguished himself as a novelist. His *Clinton Bradshawe* is perhaps better known than any of his later fictions. It is remarkable for a frank, unscrupulous portraiture of men and things, in high life and low, and by unusual discrimination and observation in respect to character. Since its publication he has produced *East and West* and *Howard Pinckney,* neither of which seems to have been so popular as his first essay, although both have merit.

East and West, published in 1836, was an attempt to portray the every-day events occurring to a fallen family emigrating from the East to the West. In it, as in *Clinton Bradshawe,* most of the characters are drawn from life. *Howard Pinckney* was published in 1840.

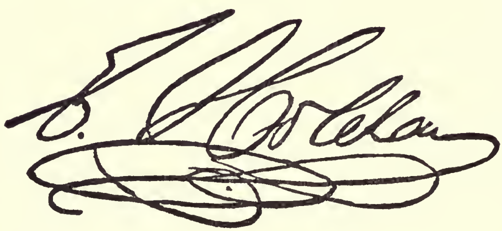
Mr. Thomas was at one period the editor of the Cincinnati *Commercial Advertiser.* He is also well known as a public lecturer on a variety of topics. His conversational powers are very great. As a poet, he has also distinguished himself. His *Emigrant* will be read with pleasure by every person of taste.

His MS. is more like that of Mr. Benjamin than that of any other literary person of our acquaintance. It has even more than the occasional nervousness of Mr. B.'s, and, as in the case of the editor of the *New World,* indicates the passionate sensibility of the man.



Mr. Morris ranks, we believe, as the first of our Philadelphia poets since the death of Willis Gaylord Clark. His compositions, like those of his late lamented friend, are characterized by sweetness rather than strength of versification, and by tenderness and delicacy rather than by vigor or originality of thought. A late notice of him in the *Boston Notion,* from the pen of Rufus W. Griswold, did his high qualities no more than justice. As a prose writer, he is chiefly known by his editorial contributions to the Philadelphia *Inquirer,* and by occasional essays for the magazines.

His chirography is usually very illegible, although at times sufficiently distinct. It has no marked characteristics, and, like that of almost every editor in the country, has been so modified by the circumstances of his position as to afford no certain indication of the mental features.



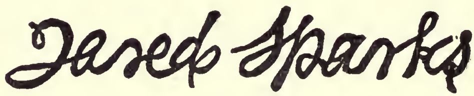
Ezra Holden has written much, not only for his paper, the *Saturday Courier,* but for our periodicals generally, and stands high in the public estimation as a sound thinker, and still more particularly as a fearless expresser of his thoughts.

His MS. (which we are constrained to say is a shockingly bad one, and whose general features may be seen in his signature) indicates the frank and *naïve* manner of his literary style, a style which not unfrequently flies off into whimsicalities.

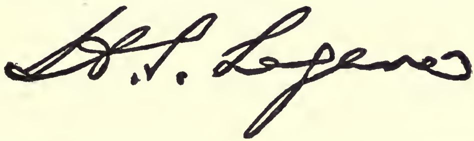
Mr. Graham is known to the literary world as the editor and proprietor of *Graham's Magazine,* the most popular periodical in America, and also of the *Saturday Evening Post* of Philadelphia. For both of these journals he has written much and well.

His MS. generally is very bad, or at least very illegible. At times it is sufficiently distinct, and has force and picturesqueness, speaking plainly of the energy which particularly distinguishes him as a man. The signature above is more scratchy than usual.

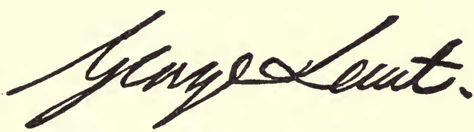
Colonel Stone, the editor of the New York *Commercial Advertiser,* is remarkable for the great difference which exists between the apparent public opinion respecting his abilities and the real estimation in which he is privately held. Through his paper, and the bustling activity always prone to thrust itself forward, he has attained an unusual degree of influence in New York, and, not only this, but what appears to be a reputation for talent. But this talent we do not remember ever to have heard assigned him by any honest man's private opinion. We place him among our *literati* because he has published certain books. Perhaps the best of these are his *Life of Brandt* and *Life and Times of Red Jacket.* Of the rest, his story called *Ups and Downs,* his defence of animal magnetism, and his pamphlets concerning Maria Monk are scarcely the most absurd. His MS. is heavy and sprawling, resembling his mental character in a species of utter unmeaningness, which lies, like the nightmare, upon his autograph.



The labors of Mr. Sparks, Professor of History at Harvard, are well known and justly appreciated. His MS. has an unusually odd appearance. The characters are large, round, black, irregular, and perpendicular, the signature, as above, being an excellent specimen of his chirography in general. In all his letters now before us, the lines are as close together as possible, giving the idea of irretrievable confusion; still, none of them are illegible upon close inspection. We can form no guess in regard to any mental peculiarities from Mr. Sparks's MS., which has been, no doubt, modified by the hurrying and intricate nature of his researches. We might imagine such epistles as these to have been written in extreme haste, by a man exceedingly busy, among great piles of books and papers huddled up around him, like the chaotic tomes of Magliabecchi. The paper used in all our epistles is uncommonly fine.



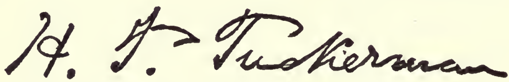
The name of H. S. Legare is written without an accent on the final "e," yet is pronounced as if this letter were accented—Legaray. He contributed many articles of merit to the *Southern Review*, and has a wide reputation for scholarship and talent. His MS. resembles that of Mr. Palfrey of the *North American Review*, and their mental features appear to us nearly identical. What we have said in regard to the chirography of Mr. Palfrey will apply with equal force to that of the present secretary.



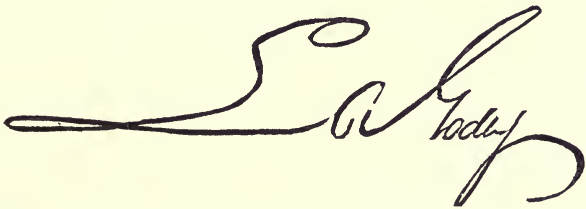
Mr. George Lunt, of Newburyport, Massachusetts, is known as a poet of much vigor of style and massiveness of thought. He delights in the grand rather than in the beautiful, and is not unfrequently turgid, but never feeble. The traits here described impress themselves with remarkable distinctness upon his chirography, of which the signature gives a perfect idea.

Mr. Chandler's reputation as the editor of one of the best daily papers in the country, and as one of our finest *belles-lettres* scholars, is deservedly high. He is well known through his numerous addresses, essays, miscellaneous sketches, and prose tales. Some of these latter evince imaginative powers of a superior order.

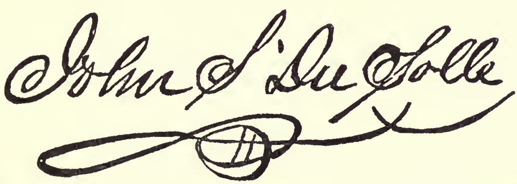
His MS. is not fairly shown in his signature, the latter being much more open and bold than his general chirography. His handwriting must be included in the editorial category; it seems to have been ruined by habitual hurry.



H. T. Tuckerman has written one or two books consisting of *Sketches of Travels.* His *Isabel* is, perhaps, better known than any of his other productions, but was never a popular work. He is a correct writer so far as mere English is concerned, but an insufferably tedious and dull one. He has contributed much of late days to the *Southern Literary Messenger,* with which journal, perhaps, the legibility of his MS. has been an important, if not the principal, recommendation. His chirography is neat and distinct, and has some grace, but no force, evincing, in a remarkable degree, the idiosyncrasies of the writer.

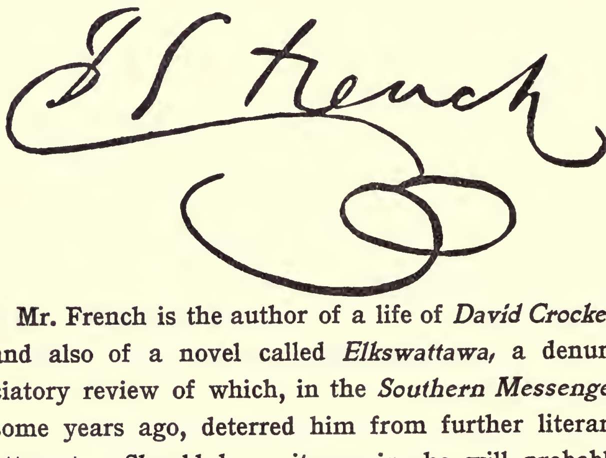


Mr. Godey is only known to the literary world as editor and publisher of *The Lady's Book*, but his celebrity in this regard entitles him to a place in this collection. His MS. is remarkably distinct and graceful, the signature affording an excellent idea of it. The man who invariably writes so well as Mr. G. invariably does, gives evidence of a fine taste, combined with an indefatigability which will insure his permanent success in the world's affairs. No man has warmer friends or fewer enemies.

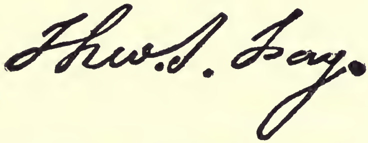


Mr. Du Solle is well known through his connection with the *Spirit of the Times*. His prose is forcible, and often excellent in other respects. As a poet he is entitled to higher consideration. Some of his Pindaric pieces are unusually good, and it may be doubted if we have a better versifier in America.

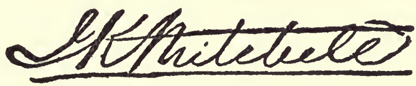
Accustomed to the daily toil of an editor, he has contracted a habit of writing hurriedly, and his MS. varies with the occasion. It is impossible to deduce any inferences from it as regards the mental character. The signature shows rather how he can write than how he does.



Mr. French is the author of a life of *David Crockett* and also of a novel called *Elkswattawa,* a denunciatory review of which, in the *Southern Messenger* some years ago, deterred him from further literary attempts. Should he write again, he will probably distinguish himself, for he is unquestionably a man of talent. We need no better evidence of this than his MS., which speaks of force, boldness, and originality. The flourish, however, betrays a certain floridity of taste.



The author of *Norman Leslie* and *The Countess Ida* has been more successful as an essayist about small matters than as a novelist. *Norman Leslie* is more familiarly remembered as *The Great Used Up,* while *The Countess* made no definite impression whatever. Of course we are not to expect remarkable features in Mr. Fay's MS. It has a wavering, finicky, and over-delicate air, without pretension to either grace or force; and the description of the chirography would answer, without alteration, for that of the literary character. Mr. F. frequently employs an amanuensis, who writes a beautiful French hand. The one must not be confounded with the other.

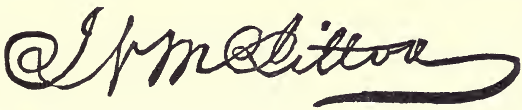


Dr. Mitchell has published several pretty songs which have been set to music and become popular. He has also given to the world a volume of poems, of which the longest was remarkable for an old-fashioned polish and vigor of versification. His MS. is rather graceful than picturesque or forcible, and these words apply equally well to his poetry in general. The signature indicates the hand.

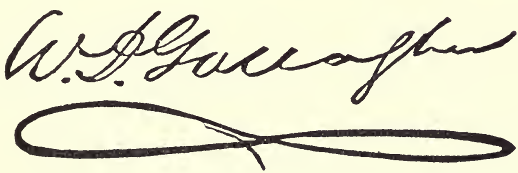
General Morris has composed many songs which have taken fast hold upon the popular taste, and which are deservedly celebrated. He has caught the true tone for these things and hence his popularity—a popularity which his enemies would fain make us believe is altogether attributable to his editorial influence. The charge is true only in a measure. The tone of which we speak is that kind of frank, free, hearty sentiment (rather than philosophy) which distinguishes Béranger, and which the critics, for want of a better term, call "nationality."

His MS. is a simple unornamented hand, rather rotund than angular, very legible, forcible, and altogether in keeping with his style.

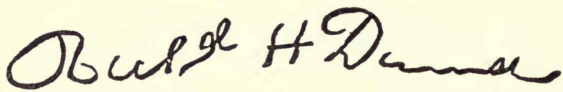
Mr. Calvert was at one time principal editor of the *Baltimore American*, and wrote for that journal some good paragraphs on the common topics of the day. He has also published many translations from the German and one or two original poems, among others an imitation of *Don Juan* called *Pelayo*, which did him no credit. He is essentially a feeble and commonplace writer of poetry, although his prose compositions have a certain degree of merit. His chirography indicates the "commonplace" upon which we have commented. It is a very usual, scratchy, and tapering clerk's hand—a hand which no man of talent ever did or could indite, unless compelled by circumstances of more than ordinary force. The signature is far better than the general manuscript of his epistles.



Mr. McJilton is better known from his contributions to the journals of the day than from any book-publications. He has much talent, and it is not improbable that he will hereafter distinguish himself, although as yet he has not composed anything of length which, as a whole, can be styled good. His MS. is not unlike that of Dr. Snodgrass, but it is somewhat clearer and better. We can predicate little respecting it beyond a love of exaggeration and bizarrerie.

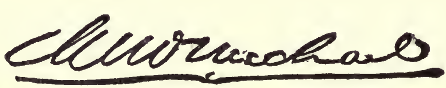


Mr. Gallagher is chiefly known as a poet. He is the author of some of our most popular songs, and has written many long pieces of high but unequal merit. He has the true spirit, and will rise into a just distinction hereafter. His manuscript tallies well with our opinion. It is a very fine one—clear, bold, decided, and picturesque. The signature above does not convey, in full force, the general character of his chirography, which is more rotund, and more decidedly placed upon the paper.



Mr. Dana ranks among our most eminent poets, and he has been the frequent subject of comment in our reviews. He has high qualities, undoubtedly, but his defects are many and great.

His MS. resembles that of Mr. Gallagher very nearly, but is somewhat more rolling, and has less boldness and decision. The literary traits of the two gentlemen are very similar, although Mr. Dana is by far the more polished writer and has a scholarship which Mr. Gallagher wants.



Mr. McMichael is well known to the Philadelphia public by the number and force of his prose compositions, but he has seldom been tempted into book-publication. As a poet, he has produced some remarkably vigorous things. We have seldom seen a finer composition than a certain celebrated *Monody* of his.

His MS., when not hurried, is graceful and flowing, without picturesqueness. At times it is totally illegible. His chirography is one of those which have been so strongly modified by circumstances that it is nearly impossible to predicate anything with certainty respecting them.

Mr. N. C. Brooks has acquired some reputation as a magazine writer. His serious prose is often very good, is always well worded; but in his comic attempts he fails, without appearing to be aware of his failure. As a poet he has succeeded far better. In a work which he entitled *Scriptural Anthology,* among many inferior compositions of length there were several shorter pieces of great merit; for example, *Shelley's Obsequies* and *The Nicthanthes.* Of late days we have seen little from his pen.

His MS. has much resemblance to that of Mr. Bryant, although altogether it is a better hand, with much more freedom and grace. With care Mr. Brooks can write a fine MS., just as, with care, he can compose a fine poem.

The Rev. Thomas H. Stockton has written many pieces of fine poetry, and has lately distinguished himself as the editor of the *Christian World.*

His MS. is fairly represented by his signature, and bears much resemblance to that of Mr. N. C. Brooks of Baltimore. Between these two gentlemen there exists also a remarkable similarity, not only of thought but of personal bearing and character. We have already spoken of the peculiarities of Mr. B.'s chirography.

Mr. Thomson has written many short poems, and some of them possess merit. They are characterized by tenderness and grace. His MS. has some resemblance to that of Professor Longfellow, and by many persons would be thought a finer hand. It is clear, legible, and open—what is called a rolling hand. It has too much tapering and too much variation between the weight of the hair-strokes and the downward ones to be forcible or picturesque. In all those qualities which we have pointed out as especially distinctive of Professor Longfellow's MS. it is remarkably deficient;

and, in fact, the literary character of no two individuals could be more radically different.

The Reverend W. E. Channing is at the head of our moral and didactic writers. His reputation both at home and abroad is deservedly high, and in regard to the matters of purity, polish, and modulation of style he may be said to have attained the dignity of a standard and a classic. He has, it is true, been severely criticised, even in respect to these very points, by the *Edinburgh Review.* The critic, however, made out his case but lamely, and proved nothing beyond his own incompetence. To detect occasional or even frequent inadvertences in the way of bad grammar, faulty construction, or misusage of language, is not to prove impurity of style, a word which happily has a bolder signification than any dreamed of by the Zoilus of the review in question. Style regards, more than anything else, the tone of a composition. All the rest is not unimportant, to be sure, but appertains to the minor morals of literature and can be learned by rote by the meanest simpletons in letters; can be carried to its highest excellence by dolts, who, upon the whole, are despicable as stylists. Irving's style is inimitable in its grace and delicacy, yet few of our practised writers are guilty of more frequent inadvertences of language. In what may be termed his mere English, he is surpassed by fifty whom we could name. Mr. Tuckerman's English, on the contrary, is sufficiently pure, but a more lamentable style than that of his *Sicily* it would be difficult to point out.

Besides those peculiarities which we have already mentioned as belonging to Dr. Channing's style, we must not fail to mention a certain calm, broad deliberateness, which constitutes force in its highest character and approaches to majesty. All these traits will be found to exist plainly in his chirography, the character of which is exemplified by the signature, although this is somewhat larger than the general manuscript.

Mr. Wilmer has written and published much; but he has reaped the usual fruits of a spirit of independence, and has thus failed to make that impression on the popular mind which his talents, under other circumstances, would have effected. But better days are in store for him, and for all who " hold to the right way," despising the yelpings of the small dogs of our

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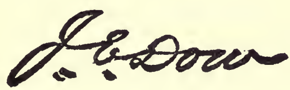
literature. His prose writings have all merit, always the merit of a chastened style. But he is more favorably known by his poetry, in which the student of the British classics will find much for warm admiration. We have few better versifiers than Mr. Wilmer.

His chirography plainly indicates the cautious polish and terseness of his style, but the signature does not convey the print-like appearance of the MS.



Mr. Dow is distinguished as the author of many fine sea-pieces, among which will be remembered a series of papers called *The Log of "Old Ironsides."* His land sketches are not generally so good. He has a fine imagination, which as yet is undisciplined, and leads him into occasional bombast. As a poet he has done better things than as a writer of prose.

His MS., which has been strongly modified by circumstances, gives no indication of his true character, literary or moral.

Mr. Weld is well known as the present working editor of the *New York Tattler* and *Brother Jonathan.* His attention was accidentally directed to literature about ten years ago, after a minority, to use his own words, "spent at sea, in a store, in a machine-shop, and in a printing-office." He is now, we believe, about thirty-one years of age. His deficiency of what is termed regular education would scarcely be gleaned from his editorials, which, in general, are usually well written. His *Corrected Proofs* is a work which does him high credit, and which has been extensively circulated, although "printed at odd times by himself, when he had nothing else to do."

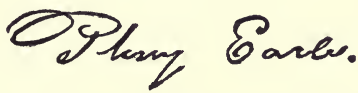
His MS. resembles that of Mr. Joseph C. Neal in many respects, but is less open and less legible. His signature is altogether much better than his general chirography.

Mrs. M. St. Leon Loud is one of the finest poets of this country, possessing, we think, more of the true divine afflatus than any of her female contemporaries. She has, in especial, imagination of no common order, and, unlike many of her sex whom we could mention, is not

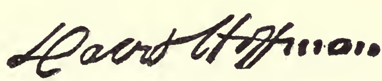
> Content to dwell in decencies forever.

While she can, upon occasion, compose the ordinary metrical sing-song with all the decorous proprieties which are in fashion, she yet ventures very frequently into a more ethereal region. We refer our readers to a truly beautiful little poem entitled the *Dream of the Lonely Isle*, lately published in this magazine.

Mrs. Loud's MS. is exceedingly clear, neat, and forcible, with just sufficient effeminacy and no more.

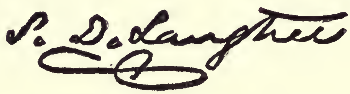


Dr. Pliny Earle, of Frankfort, Pa., has not only distinguished himself by several works on medical and general science, but has become well known to the literary world of late by a volume of very fine poems, the longest, but by no means the best, of which was entitled *Marathon*. This latter is not greatly inferior to the *Marco Bozzaris* of Halleck, while some of the minor pieces equal any American poems. His chirography is peculiarly neat and beautiful, giving indication of the elaborate finish which characterizes his compositions. The signature conveys the general hand.



David Hoffman, of Baltimore, has not only contributed much and well to monthly magazines and reviews, but has given to the world several valuable publications in book form. His style is terse, pungent, and otherwise excellent, although disfigured by a half-comic, half-serious pedantry.

His MS. has about it nothing strongly indicative of character.

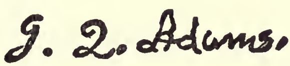


S. D. Langtree has been long and favorably known to the public as editor of the *Georgetown Metropolitan,* and more lately of the *Democratic Review,* both of which journals he has conducted with distinguished success. As a critic he has proved himself just, bold, and acute, while his prose compositions generally evince the man of talent and taste.

His MS. is not remarkably good, being somewhat too scratchy and tapering. We include him, of course, in the editorial category.

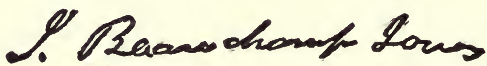
Judge Conrad occupies, perhaps, the first place among our Philadelphia *literati.* He has distinguished himself both as a prose writer and a poet, not to speak of his high legal reputation. He has been a frequent contributor to the periodicals of this city, and we believe to one at least of the Eastern reviews. His first production which attracted general notice was a tragedy entitled *Conrad, King of Naples.* It was performed at the Arch Street Theatre, and elicited applause from the more judicious. This play was succeeded by *Jack Cade,* performed at the Walnut Street Theatre, and lately modified and reproduced under the title of *Aylmere.* In its new dress, this drama has been one of the most successful ever written by an American, not only attracting crowded houses, but extorting the good word of our best critics. In occasional poetry, Judge Conrad has also done well. His lines, *On a Blind Boy Soliciting Charity,* have been greatly admired, and many of his other pieces evince ability of a high order. His political fame is scarcely a topic for these pages, and is, moreover, too much a matter of common observation to need comment from us.

His MS. is neat, legible, and forcible, evincing combined caution and spirit in a very remarkable degree.



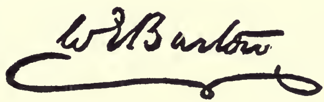
The chirography of ex-President Adams (whose poem, *The Wants of Man,* has of late attracted so much attention) is remarkable for a certain steadiness of purpose pervading the whole, and overcoming even the constitutional tremulousness of the writer's hand. Wavering in every letter, the entire MS. has yet a firm, regular, and decisive appearance. It is also very legible.

P. P. Cooke, of Winchester, Virginia, is well known, especially in the South, as the author of numerous excellent contributions to the *Southern Literary Messenger*. He has written some of the finest poetry of which America can boast. A little piece of his, entitled *Florence Vane*, and contributed to the *Gentleman's Magazine* of this city, during our editorship of that journal, was remarkable for the high ideality it evinced and for the great delicacy and melody of its rhythm. It was universally admired and copied, as well here as in England. We saw it not long ago, as original, in *Bentley's Miscellany*. Mr. Cooke has, we believe, nearly ready for press a novel called *Maurice Werterbern*, whose success we predict with confidence. His MS. is clear, forcible, and legible, but disfigured by some of that affectation which is scarcely a blemish in his literary style.



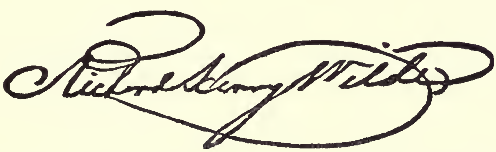
Mr. J. Beauchamp Jones has been, we believe, connected for many years past with the lighter literature of Baltimore, and at present edits the *Baltimore Saturday Visitor* with much judgment and general ability. He is the author of a series of papers of high merit now in course of publication in the *Visitor,* and entitled *Wild Western Scenes.*

His MS. is distinct, and might be termed a fine one; but is somewhat too much in consonance with the ordinary clerk style to be either graceful or forcible.



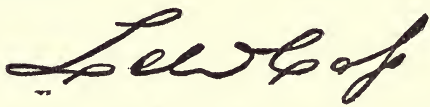
Mr. Burton is better known as a comedian than as a literary man, but he has written many short prose articles of merit, and his quondam editorship of the *Gentleman's Magazine* would, at all events, entitle him to a place in this collection. He has, moreover, published one or two books. An annual issued by Carey & Hart in 1840 consisted entirely of prose contributions from himself, with poetical ones from Charles West Thomson, Esq. In this work many of the tales were good.

Mr. Burton's MS. is scratchy and *petite,* betokening indecision and care or caution.



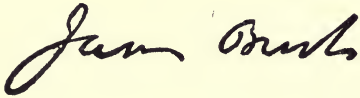
Richard Henry Wilde of Georgia has acquired much reputation as a poet, and especially as the author of a little piece entitled *My Life Is Like the Summer Rose*, whose claim to originality has been made the subject of repeated and reiterated attack and defence. Upon the whole it is hardly worth quarrelling about. Far better verses are to be found in every second newspaper we take up. Mr. Wilde has also lately published, or is about to publish, a life of Tasso, for which he has been long collecting material.

His MS. has all the peculiar sprawling and elaborate tastelessness of Mr. Palfrey's, to which altogether it bears a marked resemblance. The love of effect, however, is more perceptible in Mr. Wilde's than even in Mr. Palfrey's.



Lewis Cass, the ex-Secretary of War, has distinguished himself as one of the finest *belles-lettres* scholars of America. At one period he was a very regular contributor to the *Southern Literary Messenger*, and even lately he has furnished that journal with one or two very excellent papers.

His MS. is clear, deliberate, and statesmanlike, resembling that of Edward Everett very closely. It is not often that we see a letter written altogether by himself. He generally employs an amanuensis, whose chirography does not differ materially from his own, but is somewhat more regular.

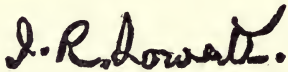


Mr. James Brooks enjoys rather a private than a public literary reputation; but his talents are unquestionably great, and his productions have been numerous and excellent. As the author of many of the celebrated "Jack Downing" letters, and as the reputed author of the whole of them, he would at all events be entitled to a place among our *literati.*

His chirography is simple, clear, and legible, with little grace and less boldness. These traits are precisely those of his literary style.

As the authorship of the "Jack Downing" letters is even still considered by many a moot point (although, in fact, there should be no question about it), and as we have already given the signature of Mr. Seba Smith and (just above) of Mr. Brooks, we now present our readers with a facsimile signature of the "veritable Jack" himself, written by him individually in our own bodily presence. Here, then, is an opportunity of comparison.

The chirography of the "veritable Jack" is a very good, honest, sensible hand, and not very dissimilar to that of ex-President Adams.



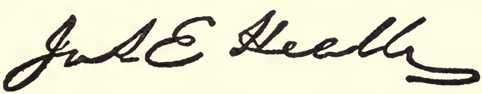
Mr. J. R. Lowell, of Massachusetts, is entitled, in our opinion, to at least the second or third place among the poets of America. We say this on account of the vigor of his imagination, a faculty to be first considered in all criticism upon poetry. In this respect he surpasses, we think, any of our writers (at least any of those who have put themselves prominently forth as poets) with the exception of Longfellow, and perhaps one other. His ear for rhythm, nevertheless, is imperfect, and he is very far from possessing the artistic ability of either Longfellow, Bryant, Halleck, Sprague, or Pierpont. The reader desirous of properly estimating the powers of Mr. Lowell will find a very beautiful little poem from his pen in the October number of this magazine. There is one also (not quite so fine) in the number for last month. He will contribute regularly.

His MS. is strongly indicative of the vigor and precision of his poetical thought. The man who writes thus, for example, will never be guilty of metaphorical extravagance, and there will be found terseness as well as strength in all that he does.

Mr. L. J. Cist, of Cincinnati, has not written much prose, and is known especially by his poetical compositions, many of which have been very popular, although they are at times disfigured by false metaphor, and by a meretricious straining after effect. This latter foible makes itself clearly apparent in his chirography, which abounds in ornamental flourishes, not ill executed, to be sure, but in very bad taste.

Mr. Arthur is not without a rich talent for description of scenes in low life, but is uneducated and too fond of mere vulgarities to please a refined taste. He has published *The Subordinate* and *Insubordination*, two tales distinguished by the peculiarities above mentioned. He has also written much for our weekly papers and *The Lady's Book*.

His hand is a commonplace clerk's hand, such as we might expect him to write. The signature is much better than the general MS.



Mr. Heath is almost the only person of any literary distinction residing in the chief city of the Old Dominion. He edited the *Southern Literary Messenger* in the five or six first months of its existence; and, since the secession of the writer of this article, has frequently aided in its editorial conduct. He is the author of *Edge-Hill,* a well-written novel, which, owing to the circumstances of its publication, did not meet with the reception it deserved. His writings are rather polished and graceful than forcible or original, and these peculiarities can be traced in his chirography.

Dr. Thomas Holley Chivers, of New York, is at the same time one of the best and one of the worst poets in America. His productions affect one as a wild dream—strange, incongruous, full of images of more than arabesque monstrosity and snatches of sweet, unsustained song. Even his worst nonsense (and some of it is horrible) has an indefinite charm of sentiment and melody. We can never be sure that there is any meaning in his words, neither is there any meaning in many of our finest musical airs, but the effect is very similar in both. His figures of speech are metaphor run mad, and his grammar is often none at all. Yet there are as fine individual passages to be found in the poems of Dr. Chivers as in those of any poet whatsoever.

His MS. resembles that of P. P. Cooke very nearly, and in poetical character the two gentlemen are closely

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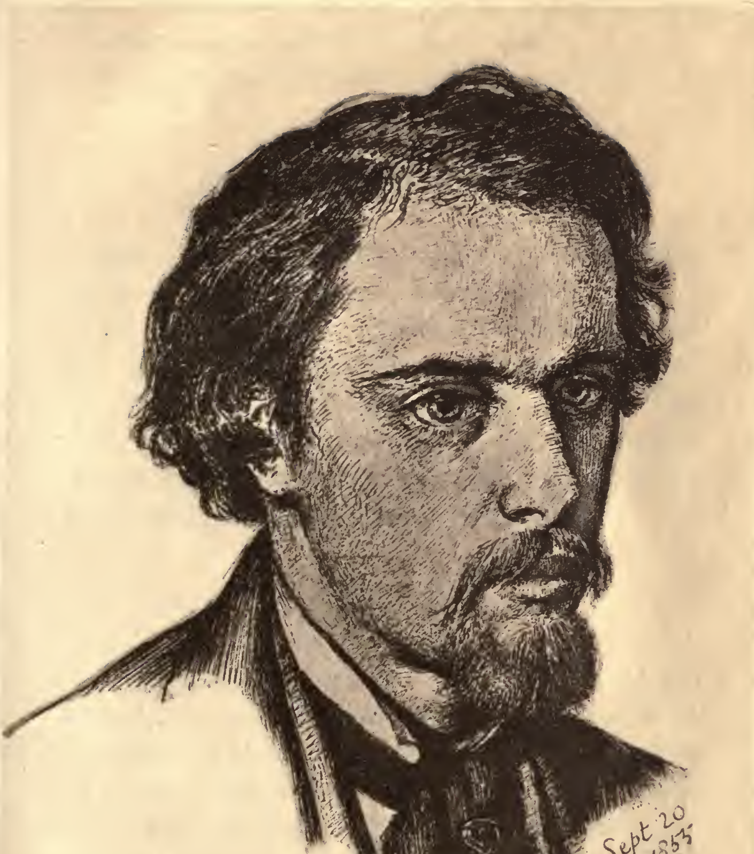
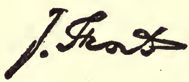

Sept 20
1853

akin. Mr. Cooke is, by much, the more correct, while Dr. Chivers is sometimes the more poetic.

Mr. C. always sustains himself; Dr. C. never.

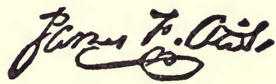
Judge Story and his various literary and political labors are too well known to require comment.

His chirography is a noble one—bold, clear, massive, and deliberate, betokening in the most unequivocal manner all the characteristics of his intellect. The plain, unornamented style of his compositions is impressed with accuracy upon his handwriting, the whole air of which is well conveyed in the signature.



Mr. John Frost, Professor of Belles-Lettres in the High School of Philadelphia, and at present editor of *The Young People's Book,* has distinguished himself by numerous literary compositions for the periodicals of the day, and by a great number of published works which come under the head of the *utile* rather than that of the *dulce,* at least in the estimation of the young. He is a gentleman of fine taste, sound scholarship, and great general ability.

His chirography denotes his mental idiosyncrasy with great precision. Its careful neatness, legibility, and finish are but a part of that turn of mind which leads him so frequently into compilation. The signature here given is more diminutive than usual.



Mr. J. F. Otis is well known as a writer for the magazines; and has, at various times, been connected with many of the leading newspapers of the day, especially with those in New York and Washington. His prose and poetry are equally good; but he writes too much and too hurriedly to write invariably well. His taste is fine, and his judgment in literary matters is to be depended upon at all times when not interfered with by his personal antipathies or predilections.

His chirography is exceedingly illegible, and, like his style, has every possible fault except that of the commonplace.

Mr. Reynolds occupied at one time a distinguished position in the eye of the public, on account of his great and laudable exertions to get up the American South Polar expedition, from a personal participation in which he was most shamefully excluded. He has written much and well. Among other works, the public are indebted to him for a graphic account of the noted voyage of the frigate *Potomac* to Madagascar.

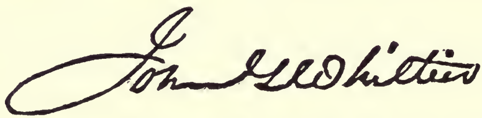
His MS. is an ordinary clerk's hand, giving no indication of character.

David Paul Brown is scarcely more distinguished in his legal capacity than by his literary compositions. As a dramatic writer he has met with much success. His *Sertorius* has been particularly well received both upon the stage and in the closet. His fugitive productions, both in prose and verse, have also been numerous, diversified, and excellent.

His chirography has no doubt been strongly modified by the circumstances of his position. No one can expect a lawyer in full practice to give in his MS. any true indication of his intellect or character.

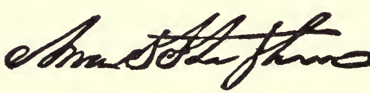
Mrs. E. Clementine Stedman has lately attracted much attention by the delicacy and grace of her poetical compositions, as well as by the piquancy and spirit of her prose. For some months past we have been proud to rank her among the best of the contributors to *Graham's Magazine.*

Her chirography differs as materially from that of her sex in general as does her literary manner from the usual namby-pamby of our blue-stockings. It is indeed a beautiful MS., very closely resembling that of Professor Longfellow, but somewhat more diminutive and far more full of grace.



J. Greenleaf Whittier is placed by his particular admirers in the very front rank of American poets. We are not disposed, however, to agree with their decision in every respect. Mr. Whittier is a fine versifier, so far as strength is regarded independently of modulation. His subjects, too, are usually chosen with the view of affording scope to a certain *vivida vis* of expression which seems to be his forte; but in taste, and especially in imagination, which Coleridge has justly styled the soul of all poetry, he is ever remarkably deficient. His themes are never to our liking.

His chirography is an ordinary clerk's hand, affording little indication of character.



Mrs. Ann S. Stephens was at one period the editor of the *Portland Magazine*, a periodical of which we have not heard for some time, and which, we presume, has been discontinued. More lately her name has been placed upon the title-page of the *Lady's Companion* of New York as one of the conductors of that journal, to which she has contributed many articles of merit and popularity. She has also written much and well for various other periodicals, and will hereafter enrich this magazine with her compositions, and act as one of its editors.

Her MS. is a very excellent one and differs from that of her sex in general by an air of more than usual force and freedom.

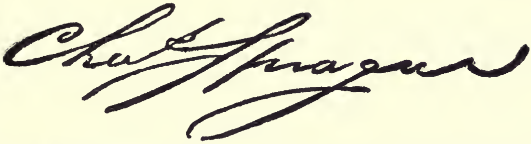
Note.—The foregoing *Chapter on Autography,* as will be seen from a reference in the following appendix, originally appeared in two parts.—Ed.

APPENDIX

In the foregoing facsimile signatures of the most distinguished American *literati* our design was to furnish a complete series of autographs, embracing a specimen of the MS. of each of the most noted among our living male and female writers. For obvious reasons, we made no attempt at classification or arrangement, either in reference to reputation or our own private opinion of merit. Our second article will be found to contain as many of the *Dii majorum* *gentium* as our first; and this, our third and last, as many as either, although fewer names, upon the whole, than the preceding papers. The impossibility of procuring the signatures now given, at a period sufficiently early for the immense edition of December, has obliged us to introduce this Appendix.

It is with great pleasure that we have found our anticipations fulfilled in respect to the popularity of these chapters,—our individual claim to merit is so trivial that we may be permitted to say so much,—but we confess it was with no less surprise than pleasure that we observed so little discrepancy of opinion manifested in relation to the hasty critical, or, rather, gossiping, observations which accompanied the signatures. Where the subject was so wide and so necessarily personal, where the claims of more than one hundred *literati*, summarily disposed of, were turned over for readjudication to a press so intricately bound up in their interests as is ours, it is really surprising how little of dissent was mingled with so much of general comment. The fact, however, speaks loudly to one point—to the unity of truth. It assures us that the differences which exist among us are differences not of real, but of affected, opinion, and that the voice of him who maintains fearlessly what he believes honestly is pretty sure to find an echo (if the speaking be not mad) in the vast heart of the world at large.

A Chapter on Autography

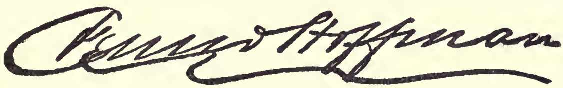


The *Writings of Charles Sprague* were first collected and published about nine months ago by Mr. Charles S. Francis of New York. At the time of the issue of the book we expressed our opinion frankly in respect to the general merits of the author, an opinion with which one or two members of the Boston press did not see fit to agree, but which, as yet, we have found no reason for modifying. What we say now is, in spirit, merely a repetition of what we said then. Mr. Sprague is an accomplished belles-lettres scholar, so far as the usual ideas of scholarship extend. He is a very correct rhetorician of the old school. His versification has not been equalled by that of any American —has been surpassed by no one living or dead. In this regard there are to be found finer passages in his poems than any elsewhere. These are his chief merits. In the essentials of poetry he is excelled by twenty of our countrymen whom we could name. Except in a very few instances he gives no evidence of the loftier ideality. His *Winged Worshippers* and *Lines on the Death of M. S. C.* are beautiful poems; but he has written nothing else which should be called so. His *Shakespeare Ode,* upon which his high reputation mainly depended, is quite a second-hand affair, with no merit whatever beyond that of a polished and vigorous versification. Its imitation of Collins's *Ode to the Passions* is obvious. Its allegorical conduct is mawkish, *passé,* and absurd. The poem, upon the whole, is just such a one as would have obtained its author an Etonian prize some forty or fifty years ago. It is an exquisite specimen of mannerism, without meaning and without merit; of an artificial, but most inartistical, style of composition, of which conventionality is the soul,—taste, nature, and reason the antipodes. A man may be a clever financier without being a genius.

It requires but little effort to see in Mr. Sprague's MS. all the idiosyncrasy of his intellect. Here are distinctness, precision, and vigor, but vigor employed upon grace rather than upon its legitimate functions. The signature fully indicates the general hand, in which the spirit of elegant imitation and conversation may be seen reflected as in a mirror.

Mr. Cornelius Mathews is one of the editors of *Arcturus,* a monthly journal which has attained much reputation during the brief period of its existence. He is the author of *Puffer Hopkins,* a clever satirical tale somewhat given to excess in caricature, and also of the well-written retrospective criticisms which appear in his magazine. He is better known, however, by *The Motley Book*, published some years ago, a work which we had no opportunity of reading. He is a gentleman of taste and judgment unquestionably.

His MS. is much to our liking, bold, distinct, and picturesque,—such a hand as no one destitute of talent indites. The signature conveys the hand.



Mr. Charles Fenno Hoffman is the author of *A Winter in the West*, *Greyslaer*, and other productions of merit. At one time he edited, with much ability, the *American Monthly Magazine* in conjunction with Mr. Benjamin, and subsequently with Dr. Bird. He is a gentleman of talent.

His chirography is not unlike that of Mr. Mathews. It has the same boldness, strength, and picturesqueness, but is more diffuse, more ornamented, and less legible. Our facsimile is from a somewhat hurried signature, which fails in giving a correct idea of the general hand.

Mr. Horace Greeley, present editor of the *Tribune*, and formerly of the *New Yorker*, has for many years been remarked as one of the most able and honest of American editors. He has written much and invariably well. His political knowledge is equal to that of any of his contemporaries, his general information extensive. As a belles-lettres critic he is entitled to high respect.

His manuscript is a remarkable one, having about it a peculiarity which we know not how better to designate than as a converse of the picturesque. His characters are scratchy and irregular, ending with an abrupt taper, if we may be allowed this contradiction in terms, where we have the facsimile to prove that there is no contradiction in fact. All abrupt MSS., save this, have square or concise terminations of the letters. The whole chirography puts us in mind of a jig. We can fancy the writer jerking up his hand from the paper at the end of each word, and, indeed, of each letter. What mental idiosyncrasy lies *perdu* beneath all this is more than we can say, but we will venture to assert that Mr. Greeley (whom we do not know personally) is, personally, a very remarkable man.

The name of Mr. Prosper M. Wetmore is familiar to all readers of American light literature. He has written a great deal, at various periods, both in prose and poetry (but principally in the latter) for our papers, magazines, and annuals. Of late days we have seen but little, comparatively speaking, from his pen.

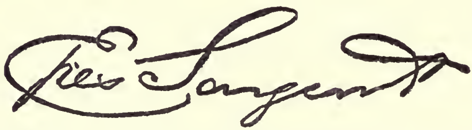
His MS. is not unlike that of Fitz-Greene Halleck, but is by no means so good. Its clerky flourishes indicate a love of the beautiful with an undue straining for effect, qualities which are distinctly traceable in his poetic efforts. As many as five or six words are occasionally run together; and no man who writes thus will be noted for finish of style. Mr. Wetmore is sometimes very slovenly in his best compositions.

Professor Ware, of Harvard, has written some very excellent poetry, but is chiefly known by his *Life of the Saviour, Hints on Extemporaneous Preaching,* and other religious works.

His MS. is fully shown in the signature. It evinces the direct, unpretending strength and simplicity which characterizes the man, not less than his general compositions.

The name of William B. O. Peabody, like that of Mr. Wetmore, is known chiefly to the readers of our light literature, and much more familiarly to Northern than to Southern readers. He is a resident of Springfield, Mass. His occasional poems have been much admired.

His chirography is what would be called beautiful by the ladies universally, and, perhaps, by a large majority of the bolder sex. Individually, we think it a miserable one—too careful, undecided, tapering, and effeminate. It is not unlike Mr. Paulding's, but is more regular and more legible, with less force. We hold it as undeniable that no man of genius ever wrote such a hand.

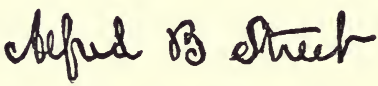


Epes Sargent, Esq., has acquired high reputation as the author of *Velasco,* a tragedy full of beauty as a poem, but not adapted—perhaps not intended—for representation. He has written, besides, many very excellent poems; *The Missing Ship,* for example, published in the *Knickerbocker,* the *Night Storm at Sea,* and, especially, a fine production entitled *Shells and Sea-Weeds.* One or two theatrical addresses from his pen are very creditable in their way, but the way itself is, as we have before said, execrable. As an editor, Mr. Sargent has also distinguished himself. He is a gentleman of taste and high talent.

His MS. is too much in the usual clerk style to be either vigorous, graceful, or easily read. It resembles Mr. Wetmore's, but has somewhat more force. The signature is better than the general hand, but conveys its idea very well.

The name of Washington Allston, the poet and painter, is one that has been long before the public. Of his paintings we have here nothing to say, except briefly, that the most noted of them are not to our taste. His poems are not all of a high order of merit; and, in truth, the faults of his pencil and of his pen are identical. Yet every reader will remember his *Spanish Maid* with pleasure; and the *Address to Great Britain,* first published in Coleridge's *Sibylline Leaves,* and attributed to an English author, is a production of which Mr. Allston may be proud.

His MS., notwithstanding an exceedingly simple and boyish air, is one which we particularly admire. It is forcible, picturesque, and legible, without ornament of any description. Each letter is formed with a thorough distinctness and individuality. Such a MS. indicates caution and precision, most unquestionably; but we say of it, as we say of Mr. Peabody's (a very different MS.), that no man of original genius ever did or could habitually indite it under any circumstances whatever. The signature conveys the general hand with accuracy.



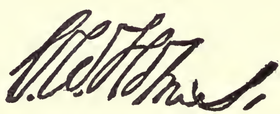
Mr. Alfred B. Street has been long before the public as a poet. At as early an age as fifteen, some of his pieces were published by Bryant in the *Evening Post;* among these was one of much merit, entitled a *Winter Scene.* In the *New York Book,* and in the collections of American poetry by Messieurs Keese and Bryant, will be found many excellent specimens of his maturer powers. *The Willewemock, The Forest Tree, The Indian's Vigil, The Lost Hunter,* and *White Lake* we prefer to any of his other productions which have met our eye. Mr. Street has fine taste and a keen sense of the beautiful. He writes carefully, elaborately, and correctly. He has made Mr. Bryant his model, and in all Mr. Bryant's good points would be nearly his equal, were it not for the sad and too perceptible stain of the imitation. That he has imitated at all—or rather that, in mature age, he has persevered in his imitations—is sufficient warranty for placing him among the men of talent rather than among the men of genius.

His MS. is full corroboration of this warranty. It is a very pretty chirography, graceful, legible, and neat. By most persons it would be called beautiful. The fact is, it is without fault, but its merits, like those of his poems, are chiefly negative.

Mr. Richard Penn Smith, although perhaps better known in Philadelphia than elsewhere, has acquired much literary reputation. His chief works are *The Forsaken,* a novel; a pseudo-autobiography called *Colonel Crockett's Tour in Texas,* the tragedy of *Caius Marius,* and two domestic dramas entitled *The Disowned* and *The Deformed.* He has also published two volumes of miscellanies under the titles of *The Actress of Padua and Other Tales,* besides occasional poetry. We are not sufficiently cognizant of any of these works to speak with decision respecting their merits. In a biography of Mr. Smith, however, very well written, by his friend, Mr. McMichael, of this city, we are informed, of *The Forsaken,* that "a large edition of it was speedily exhausted"; of *The Actress of Padua,* that it "had an extensive sale and was much commended"; of the *Tour of Texas,* that "few books attained an equal popularity"; of *Caius Marius,* that "it has great capabilities for an acting play"; of *The Disowned* and

The Deformed, that they " were performed at the London theatres, where they both made a favorable impression "; and of his poetry in general, " that it will be found superior to the average quality of that commodity." " It is by his dramatic efforts," says the biographer, " that his merits as a poet must be determined, and judged by these he will be assigned a place in the foremost rank of American writers." We have only to add that we have the highest respect for the judgment of Mr. McMichael.

Mr. Smith's MS. is clear, graceful, and legible, and would generally be called a fine hand, but is somewhat too clerky for our taste.



Dr. Oliver Wendell Holmes, of Boston, late Professor of Anatomy and Physiology at Dartmouth College, has written many productions of merit and has been pronounced by a very high authority the best of the humorous poets of the day.

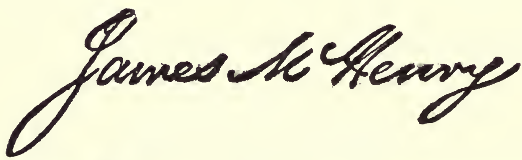
His chirography is remarkably fine, and a quick fancy might easily detect, in its graceful yet picturesque quaintness, an analogy with the vivid drollery of his style. The signature is a fair specimen of the general MS.

Bishop Doane, of New Jersey, is somewhat more extensively known in his clerical than in a literary capacity, but has accomplished much more than sufficient in the world of books to entitle him to a place among the most noted of our living men of letters. The compositions by which he is best known were published, we believe, during his professorship of Rhetoric and Belles-Lettres in Washington College, Hartford.

His MS. has some resemblance to that of Mr. Greeley of the *Tribune.* The signature is far bolder and altogether better than the general hand.

We believe that Mr. Albert Pike has never published his poems in book form; nor has he written anything since 1834. His *Hymns to the Gods* and *Ode to the Mocking Bird,* being printed in *Blackwood,* are the chief basis of his reputation. His lines *To Spring* are, however, much better in every respect, and a little poem from his pen, entitled *Ariel,* originally published in the *Boston Pearl,* is one of the finest of American compositions. Mr. Pike has unquestionably merit, and that of a high order. His ideality is rich and well disciplined. He is the most classic of our poets in the best sense of the term, and, of course, his classicism is very different from that of Mr. Sprague, to whom, nevertheless, he bears much resemblance in other respects. Upon the whole, there are few of our native writers to whom we consider him inferior.

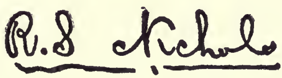
His MS. shows clearly the spirit of his intellect. We observe in it a keen sense not only of the beautiful and graceful, but of the picturesque—neatness, precision, and general finish, verging upon effeminacy. In force it is deficient. The signature fails to convey the entire MS., which depends upon masses for its peculiar character.



Dr. James McHenry, of Philadelphia, is well known to the literary world as the writer of numerous articles in our reviews and lighter journals, but more especially as the author of *The Antediluvians,* an epic poem which has been the victim of a most shameful cabal in this country and the subject of a very disgraceful pasquinade on the part of Professor Wilson. Whatever may be the demerits, in some regard, of this poem, there can be no question of the utter want of fairness, and even of common decency, which distinguished the philippic in question. The writer of a just review of

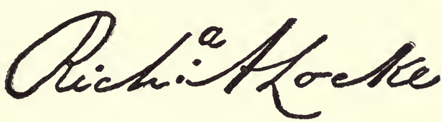
The Antediluvians—the only tolerable American epic—would render an important service to the literature of his country.

Dr. McHenry's MS. is distinct, bold, and simple, without ornament or superfluity. The signature well conveys the idea of the general hand.



Mrs. R. S. Nichols has acquired much reputation of late years by frequent and excellent contributions to the magazines and annuals. Many of her compositions will be found in our pages.

Her MS. is fair, neat, and legible, but formed somewhat too much upon the ordinary boarding-school model to afford any indication of character. The signature is a good specimen of the hand.



Mr. Richard Adams Locke is one among the few men of unquestionable genius whom the country possesses. Of the "Moon Hoax" it is supererogatory to say one word—not to know that argues one's self unknown. Its rich imagination will long dwell in the memory of every one who reads it, and surely if

the worth of anything
Is just so much as it will bring—

if, in short, we are to judge of the value of a literary composition in any degree by its effect—then was the "Hoax" most precious.

But Mr. Locke is also a poet of high order. We have seen—nay, more, we have heard him read—verses of his own which would make the fortune of two thirds of our poetasters; and he is yet so modest as never to have published a volume of poems. As an editor, as a political writer, as a writer in general, we think that he has scarcely a superior in America. There is no man among us to whose sleeve we would rather pin, not our faith (of that we say nothing), but our judgment.

His MS. is clear, bold, and forcible, somewhat modified, no doubt, by the circumstance of his editorial position but still sufficiently indicative of his fine intellect.

Mr. Ralph Waldo Emerson belongs to a class of gentlemen with whom we have no patience whatever—the mystics for mysticism's sake. Quintilian mentions a pedant who taught obscurity, and who once said to a pupil, "This is excellent, for I do not under-

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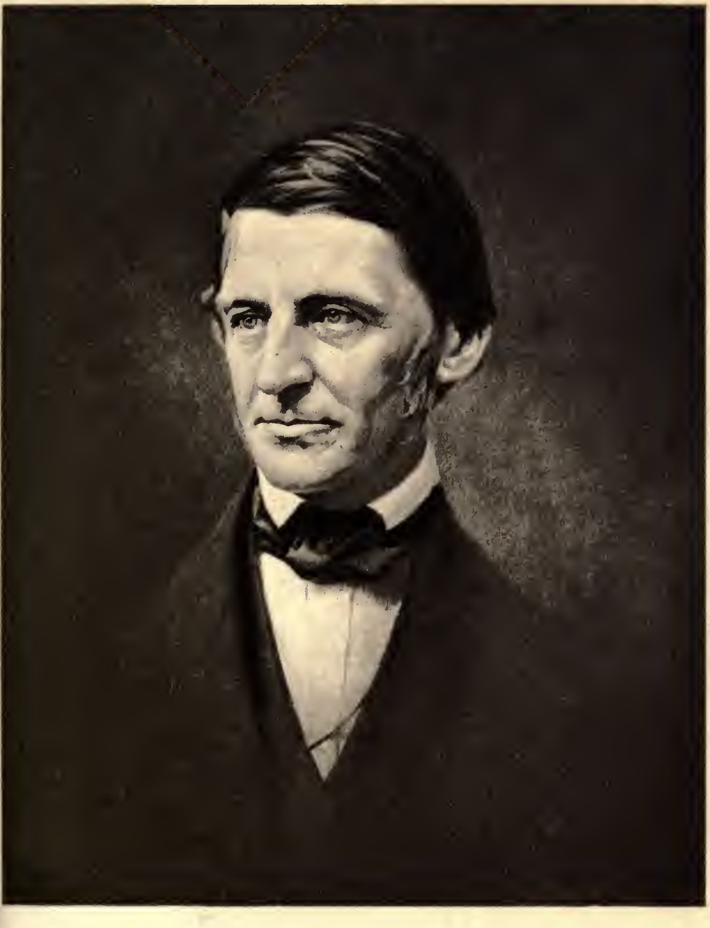

stand it myself." How the good man would have chuckled over Mr. E.! His present role seems to be the out-Carlyling Carlyle. *Lycophron Tenebrosus* is a fool to him. The best answer to his twaddle is *cui bono?*—a very little Latin phrase very generally mistranslated and misunderstood—*cui bono?*—to whom is it a benefit? If not to Mr. Emerson individually, then surely to no man living.

His love of the obscure does not prevent him, nevertheless, from the composition of occasional poems in which beauty is apparent by flashes. Several of his effusions appeared in the *Western Messenger*; more in the *Dial*, of which he is the soul, or the sun, or the shadow. We remember *The Sphynx*, *The Problem*, *The Snow Storm*, and some fine old-fashioned verses, entitled *O Fair and Stately Maid Whose Eye.*

His MS. is bad, sprawling, illegible, and irregular, although sufficiently bold. This latter trait may be, and no doubt is, only a portion of his general affectation.

Anastatic Printing

IT is admitted by every one that of late there has been a rather singular invention, called Anastatic Printing, and that this invention may possibly lead, in the course of time, to some rather remarkable results, among which the one chiefly insisted upon is the abolition of the ordinary stereotyping process; but this seems to be the amount, in America at least, of distinct understanding on this subject.

" There is no exquisite beauty," says Bacon, " without some strangeness in the proportions." The philosopher had reference, here, to beauty in its common acceptation, but the remark is equally applicable to all the forms of beauty, that is to say, to everything which arouses profound interest in the heart or intellect of man. In every such thing, strangeness—in other words, novelty—will be found a principal element; and so universal is this law that it has no exception even in the case of this principal element itself. Nothing unless it be novel, not even novelty itself, will be the source of very intense excitement among men. Thus the *ennuyé* who travels in the hope of dissipating his ennui by the perpetual succession of novelties will invariably be disappointed in the end. He receives the impression of novelty so continuously that it is at length no novelty to receive it. And the man, in general, of the nineteenth century—more especially of our own particular epoch of it—is very much in the predicament of the traveller in question. We are so habituated to new inventions that we no longer get from newness the vivid interest which should appertain to the new, and no example could be adduced more distinctly showing that the mere importance of a novelty will not suffice to gain for it universal attention than we find in the invention of anastatic printing. It excites not one fiftieth part of the comment which was excited by the comparatively frivolous invention of Sennefelder; but he lived in the good old days when a novelty was novel. Nevertheless, while lithography opened the way for a very agreeable pastime, it is the province of anastatic printing to revolutionize the world.

By means of this discovery anything written, drawn, or printed can be made to stereotype itself, with absolute accuracy, in five minutes.

Let us take, for example, a page of this Journal, supposing only one side of the leaf to have printing on it. We damp the leaf with a certain acid, diluted, and then place it between two leaves of blotting-paper to absorb superfluous moisture. We then place the printed side in contact with a zinc plate that lies on the table. The acid in the interspaces between the letters immediately corrodes the zinc, but the acid on the letters themselves has no such effect, having been neutralized by the ink. Removing the leaf at the end of five minutes we find a reversed copy, in slight relief, of the printing on the page,—in other words, we have a stereotype-plate, from which we can print a vast number of absolute facsimiles of the original printed page, which latter has not been at all injured in the process; that is to say, we can still produce from it (or from any impression of the stereotype-plate) new stereotype-plates *ad libitum.* Any engraving, or any pen-and-ink drawing, or any MS. can be stereotyped in precisely the same manner.

The facts of the invention are established. The process is in successful operation both in London and Paris. We have seen several specimens of printing done from the plates described, and have now lying before us a leaf (from the London Art-Union) covered with drawing, MS., letterpress, and impressions from woodcuts, — the whole printed from the anastatic stereotypes, and warranted by the Art-Union to be absolute facsimiles of the originals.

The process can scarcely be regarded as a new invention, and appears to be rather the modification and successful application of two or three previously ascertained principles—those of etching, electrography, lithography, etc. It follows from this that there will be much difficulty in establishing or maintaining a right of patent, and the probability is that the benefits of the process will soon be thrown open to the world. As to the secret, it can only be a secret in name.

That the discovery (if we may so call it) has been made, can excite no surprise in any thinking person; the only matter for surprise is that it has not been made many years ago. The obviousness of the process, however, in no degree lessens its importance. Indeed, its inevitable results enkindle the imagination and embarrass the understanding.

Every one will perceive at once that the ordinary process of stereotyping will be abolished. Through this ordinary process a publisher, to be sure, is enabled to keep on hand the means of producing edition after edition of any work the certainty of whose sale will justify the cost of stereotyping, which is trifling in comparison with that of resetting the matter. But still, positively, this cost (of stereotyping) is great. Moreover, there cannot always be certainty about sales. Publishers frequently are forced to reset works which they have neglected to stereotype, thinking them unworthy the expense; and many excellent works are not published at all, because small editions do not pay, and the anticipated sales will not warrant the cost of stereotype. Some of these difficulties will be at once remedied by the anastatic printing, and all will be remedied in a brief time. A publisher has only to print as many copies as are immediately demanded. He need print no more than a dozen, indeed, unless he feels perfectly confident of success. Preserving one copy, he can from this, at no other cost than that of the zinc, produce with any desirable rapidity as many impressions as he may think proper. Some idea of the advantages thus accruing may be gleaned from the fact that in several of the London publishing warehouses there is deposited in stereotype-plates alone property to the amount of a million sterling.

The next view of the case, in point of obviousness, is, that if necessary a hundred thousand impressions per hour, or even infinitely more, can be taken of any newspaper or similar publication. As many presses can be put in operation as the occasion may require, indeed, there can be no limit to the number of copies producible, provided we have no limit to the number of presses.

The tendency of all this to cheapen information, to diffuse knowledge and amusement, and to bring before the public the very class of works which are most valuable, but least in circulation on account of unsalability, is what need scarcely be suggested to any one. But benefits such as these are merely the immediate and most obvious—by no means the most important.

Anastatic Printing

For some years, perhaps, the strong spirit of conventionality, of conservation, will induce authors in general to have recourse, as usual, to the setting of type. A printed book now is more sightly and more legible than any MS., and for some years the idea will not be overthrown that this state of things is one of necessity. But by degrees it will be remembered that, while MS. was a necessity, men wrote after such fashion that no books printed in modern times have surpassed their MSS. either in accuracy or in beauty. This consideration will lead to the cultivation of a neat and distinct style of handwriting, for authors will perceive the immense advantage of giving their own MSS. directly to the public without the expensive interference of the typesetter, and the often ruinous intervention of the publisher. All that a man of letters need do will be to pay some attention to legibility of MS., arrange his pages to suit himself, and stereotype them instantaneously as arranged. He may intersperse them with his own drawings, or with anything to please his own fancy, in the certainty of being fairly brought before his readers with all the freshness of his original conception about him.

And at this point we are arrested by a consideration of infinite moment, although of a seemingly shadowy character. The cultivation of accuracy in MS. thus enforced will tend, with an inevitable impetus, to every species of improvement in style, more especially in the points of concision and distinctness; and this, again, in a degree even more noticeable, to precision of thought and luminous arrangement of matter. There is a very peculiar and easily intelligible reciprocal influence between the thing written and the manner of writing, but the latter has the predominant influence of the two. The more remote effect on philosophy at large, which will inevitably result from improvement of style and thought in the points of concision, distinctness, and accuracy, need only be suggested to be conceived.

As a consequence of attention being directed to neatness and beauty of MS., the antique profession of the scribe will be revived, affording abundant employment to women, their delicacy of organization fitting them peculiarly for such tasks. The female amanuensis, indeed, will occupy very nearly the position of the present male typesetter, whose industry will be diverted perforce into other channels.

These considerations are of vital importance, but there is yet one beyond them all. The value of every book is a compound of its literary value and its physical or mechanical value, as the product of physical labor applied to the physical material. But at present the latter value immensely predominates even in the works of the most esteemed authors. It will be seen, however, that the new condition of things will at once give the ascendency to the literary values, and thus, by their literary values, will books come to be estimated among men. The wealthy gentleman of "elegant leisure" will lose the vantage-ground now afforded him, and will be forced to tilt on terms of equality with the poor-devil author. At present the literary world is a species of anomalous congress, in which the majority of the members are constrained to listen in silence while all the eloquence proceeds from a privileged few. In the new régime the humblest will speak as often and as freely as the most exalted, and will be sure of receiving just that amount of attention which the intrinsic merit of their speeches may deserve.

From what we have said it will be evident that the discovery of anastatic printing will not only not obviate the necessity of copyright laws, and of an international law in especial, but will render this necessity more imperative and more apparent. It has been shown that in depressing the value of the physique of a book the invention will proportionately elevate the value of its *morale*, and since it is the latter value alone which the copyright laws are needed to protect, the necessity of the protection will be only the more urgent and more obvious than ever.

Eureka

AN ESSAY ON THE MATERIAL AND SPIRITUAL UNIVERSE

To the few who love me and whom I love, to those who feel rather than to those who think, to the dreamers and those who put faith in dreams as in the only realities, I offer this book of truths, not in its character of truth-teller, but for the beauty that abounds in its truth, constituting it true. To these I present the composition as an art-product alone—let us say as a romance; or, if I be not urging too lofty a claim, as a poem.

What I here propound is true:—therefore it cannot die; or, if by any means it be now trodden down so that it die, it will "rise again to the Life Everlasting."

Nevertheless it is as a poem only that I wish this work to be judged after I am dead.

IT is with humility really unassumed,—it is with a sentiment even of awe,—that I pen the opening sentence of this work; for of all conceivable subjects I approach the reader with the most solemn, the most comprehensive, the most difficult, the most august.

Eureka

What terms shall I find sufficiently simple in their sublimity, sufficiently sublime in their simplicity, for the mere enunciation of my theme?

I design to speak of the physical, metaphysical, and mathematical—of the material and spiritual universe—of its essence, its origin, its creation, its present condition, and its destiny. I shall be so rash, moreover, as to challenge the conclusions, and thus, in effect, to question the sagacity, of many of the greatest and most justly reverenced of men.

In the beginning, let me as distinctly as possible announce, not the theorem which I hope to demonstrate—for, whatever the mathematicians may assert, there is, in this world at least, no such thing as demonstration—but the ruling idea which, throughout this volume, I shall be continually endeavoring to suggest.

My general proposition, then, is this: In the original unity of the first thing lies the secondary cause of all things, with the germ of their inevitable annihilation.

In illustration of this idea I propose to take such a survey of the universe that the mind may be able really to receive and to perceive an individual impression.

He who from the top of Ætna casts his eyes leisurely around, is affected chiefly by the extent and diversity of the scene. Only by a rapid whirling on his heel could he hope to comprehend the panorama in the sublimity of its oneness. But as, on the summit of Ætna, no man has thought of whirling on his heel, so no man has ever taken into his brain the full uniqueness of the prospect; and so, again, whatever considerations lie involved in this uniqueness have as yet no practical existence for mankind.

I do not know a treatise in which a survey of the universe, using the word in its most comprehensive and only legitimate acceptation, is taken at all; and it may be as well here to mention that by the term "universe," wherever employed without qualification in this essay, I mean to designate the utmost conceivable expanse of space, with all things, spiritual and material, that can be imagined to exist within the compass of that expanse. In speaking of what is ordinarily implied by the expression, "universe," I shall take a phrase of limitation—"the universe of stars." Why this distinction is considered necessary will be seen in the sequel.

But even of treatises on the really limited, although always assumed as the unlimited, universe of stars, I I know none in which a survey, even of this limited universe, is so taken as to warrant deductions from its individuality. The nearest approach to such a work is made in the *Cosmos* of Alexander von Humboldt. He presents the subject, however, not in its individuality but in its generality. His theme, in its last result, is the law of each portion of the merely physical universe, as this law is related to the laws of every other portion of this merely physical universe. His design is simply synœretical. In a word, he discusses the universality of material relation, and discloses to the eye of philosophy whatever inferences have hitherto lain hidden behind this universality. But, however admirable be the succinctness with which he has treated each particular point of his topic, the mere multiplicity of these points occasions, necessarily, an amount of detail, and thus an involution of idea, which preclude all individuality of impression.

It seems to me that, in aiming at this latter effect, and, through it, at the consequences,—the conclusions, the suggestions, the speculations, or, if nothing better offer itself, the mere guesses which may result from it, we require something like a mental gyration on the heel. We need so rapid a revolution of all things about the central point of sight that, while the minutiæ vanish altogether, even the more conspicuous objects become blended into one. Among the vanishing minutiæ, in a survey of this kind, would be all exclusively terrestrial matters. The earth would be considered in its planetary relations alone. A man, in this view, becomes mankind; mankind, a member of the cosmical family of intelligences.

And now, before proceeding to our subject proper, let me beg the reader's attention to an extract or two from a somewhat remarkable letter, which appears to have been found corked in a bottle and floating on the Mare Tenebrarum, an ocean well described by the Nubian geographer, Ptolemy Hephestion, but little frequented in modern days unless by the transcendentalists and some other divers for crotchets. The date of this letter, I confess, surprises me even more particularly than its contents; for it seems to have been written in the year two thousand eight hundred and forty-eight. As for the passages I am about to transcribe, they, I fancy, will speak for themselves.

"Do you know, my dear friend," says the writer, addressing, no doubt, a contemporary,—" do you know that it is scarcely more than eight or nine hundred years ago since the metaphysicians first consented to relieve the people of the singular fancy that there exist but two practicable roads to truth? Believe it if you can. It appears, however, that long, long ago, in the night of time, there lived a Turkish philosopher called Aries and surnamed Tottle. [Here, possibly, the letter-writer means Aristotle; the best names are wretchedly corrupted in two or three thousand years.] The fame of this great man depended mainly upon his demonstration that sneezing is a natural provision, by means of which over-profound thinkers are enabled to expel superfluous ideas through the nose; but he obtained a scarcely less valuable celebrity as the founder, or at all events as the principal propagator, of what was termed the deductive or *a priori* philosophy.

He started with what he maintained to be axioms, or self-evident truths; and the now well-understood fact that no truths are self-evident really does not make in the slightest degree against his speculations; it was sufficient for his purpose that the truths in question were evident at all. From axioms he proceeded, logically, to results. His most illustrious disciples were one Tuclid, a geometrician [meaning Euclid], and one Kant, a Dutchman, the originator of that species of transcendentalism which, with the change merely of a C for a K, now bears his peculiar name.

"Well, Aries Tottle flourished supreme, until the advent of one Hog, surnamed 'the Ettrick Shepherd,' who preached an entirely different system, which he called the *a posteriori*, or inductive. His plan referred altogether to sensation. He proceeded by observing, analyzing, and classifying facts,—*instantiæ naturæ*, as they were somewhat affectedly called,—and arranging them into general laws. In a word, while the mode of Aries rested on *noumena*, that of Hog depended on *phenomena*; and so great was the admiration excited by this latter system that, at its first introduction, Aries fell into general disrepute. Finally, however, he recovered ground and was permitted to divide the empire of philosophy with his more modern rival,—the savants contenting themselves with proscribing all other competitors, past, present, and to come; putting an end to all controversy on the topic by the promulgation of a

Median law, to the effect that the Aristotelian and Baconian roads are, and of right ought to be, the sole possible avenues to knowledge: 'Baconian,' you must know, my dear friend," adds the letter-writer at this point, "was an adjective invented as equivalent to Hog-ian, and at the same time more dignified and euphonious.

"Now, I do assure you most positively," proceeds the epistle, "that I represent these matters fairly; and you can easily understand how restrictions so absurd on their very face must have operated, in those days, to retard the progress of true science, which makes its most important advances, as all history will show, by seemingly intuitive leaps. These ancient ideas confined investigation to crawling; and I need not suggest to you that crawling, among varieties of locomotion, is a very capital thing of its kind; but because the tortoise is sure of foot, for this reason must we clip the wings of the eagles? For many centuries so great was the infatuation, about Hog especially, that a virtual stop was put to all thinking, properly so called. No man dared utter a truth for which he felt himself indebted to his soul alone. It mattered not whether the truth was even demonstrably such; for the dogmatizing philosophers of that epoch regarded only the road by which it professed to have been attained. The end, with them, was a point of no moment whatever: 'the means!' they vociferated, 'let us look at the means!' and if, on scrutiny of the means, it was found neither to come under the category Hog, nor under the category Aries (which means ram), why, then, the savants went no farther, but, calling the thinker a fool and branding him a 'theorist,' would never, thenceforward, have anything to do either with him or with his truths.

"Now, my dear friend," continues the letter-writer, "it cannot be maintained that by the crawling system, exclusively adopted, men would arrive at the maximum amount of truth, even in any long series of ages; for the repression of imagination was an evil not to be counterbalanced even by absolute certainty in the snail processes. But their certainty was very far from absolute. The error of our progenitors was quite analogous with that of the wiseacre who fancies he must necessarily see an object the more distinctly the more closely he holds it to his eyes. They blinded themselves, too, with the impalpable, titillating Scotch snuff of detail; and thus the boasted facts of the Hog-ites were by no means always facts, a point of little importance but for the assumption that they always were. The vital taint, however, in Baconianism, its most lamentable fount of error, lay in its tendency to throw power and consideration into the hands of merely perceptive men,—of those inter-Tritonic minnows, the microscopical savants, the diggers and pedlers of minute facts, for the most part in physical science,—facts, all of which they retailed at the same price upon the highway, their value depending, it was supposed, simply upon the fact of their fact, without reference to their applicability or inapplicability in the development of those ultimate and only legitimate facts called law.

"Than the persons," the letter goes on to say,—"than the persons thus suddenly elevated by the Hogian philosophy into a station for which they were unfitted, thus transferred from the sculleries into the parlors of science, from its pantries into its pulpits,—than these individuals a more intolerant, a more intolerable, set of bigots and tyrants never existed on the face of the earth. Their creed, their text, and their sermon were, alike, the one word 'fact'; but, for the most part, even of this one word they knew not even the meaning. On those who ventured to disturb their facts with the view of putting them in order and to use, the disciples of Hog had no mercy whatever. All attempts at generalization were met at once by the words 'theoretical,' 'theory,' 'theorist'; all thought, to be brief, was very properly resented as a personal affront to themselves. Cultivating the natural sciences to the exclusion of metaphysics, the mathematics, and logic, many of these Bacon-engendered philosophers—one-idea-ed, one-sided, and lame of a leg—were more wretchedly helpless, more miserably ignorant, in view of all the comprehensible objects of knowledge, than the veriest unlettered hind who proves that he knows something, at least, in admitting that he knows absolutely nothing.

"Nor had our forefathers any better right to talk about certainty, when pursuing, in blind confidence, the *a priori* path of axioms, or of the Ram. At innumerable points this path was scarcely as straight as a ram's horn. The simple truth is, that the Aristotelians erected their castles upon a basis far less reliable than air; for no such things as axioms ever existed or can possibly exist at all. This they must have been very blind indeed not to see, or at least not to suspect; for, even in their own day, many of their long-admitted 'axioms' had been abandoned—'*ex nihilo nihil fit*,' for example, and a 'thing cannot act where it is not,' and 'there cannot be antipodes,' and 'darkness cannot proceed from light.' These and numerous similar propositions formerly accepted, without hesitation, as axioms, or undeniable truths, were, even at the period of which I speak, seen to be altogether untenable; how absurd in these people, then, to persist in relying upon a basis, as immutable, whose mutability had become so repeatedly manifest!

"But, even through evidence afforded by themselves against themselves, it is easy to convict these *a priori* reasoners of the grossest unreason; it is easy to show the futility, the impalpability, of their axioms in general. I have now lying before me,"—it will be observed that we still proceed with the letter,—"I have now lying before me a book printed about a thousand years ago. Pundit assures me that it is decidedly the cleverest ancient work on its topic, which is 'Logic.' The author, who was much esteemed in his day, was one Miller, or Mill; and we find it recorded of him, as a point of some importance, that he rode a mill-horse whom he called Jeremy Bentham; but let us glance at the volume itself.

"Ah!—'Ability or inability to conceive,' says Mr. Mill, very properly, 'is in no case to be received as a criterion of axiomatic truth.' Now, that this is a palpable truism no one in his senses will deny. Not to admit the proposition is to insinuate a charge of variability in truth itself, whose very title is a synonym of the steadfast. If ability to conceive be taken as a criterion of truth, then a truth to David Hume would very seldom be a truth to Joe; and ninety-nine hundredths of what is undeniable in heaven would be demonstrable falsity upon earth. The proposition of Mr. Mill, then, is sustained. I will not grant it to be an axiom; and this merely because I am showing that no axioms exist; but, with a distinction which could not have been cavilled at even by Mr. Mill himself, I am ready to grant that, if an axiom there be, then the proposition of which we speak has the fullest right to be considered an axiom, that no more absolute axiom is, and, consequently, that any subsequent proposition which shall conflict with this one primarily advanced must be either a falsity in itself, that is to say, no axiom, or, if admitted axiomatic, must at once neutralize both itself and its predecessor.

" And now, by the logic of their own propounder, let us proceed to test any one of the axioms propounded. Let us give Mr. Mill the fairest of play. We will bring the point to no ordinary issue. We will select for investigation no commonplace axiom, no axiom of what, not the less preposterously because only impliedly, he terms his secondary class—as if a positive truth by definition could be either more or less positively a truth; we will select, I say, no axiom of an unquestionability so questionable as is to be found in Euclid. We will not talk, for example, about such propositions as that two straight lines cannot enclose a space, or that the whole is greater than any one of its parts. We will afford the logician every advantage. We will come at once to a proposition which he regards as the acme of the unquestionable, as the quintessence of axiomatic undeniability. Here it is: 'Contradictions cannot both be true, that is, cannot coexist in nature.' Here Mr. Mill means, for instance,—and I give the most forcible instance conceivable,—that a tree must be either a tree or not a tree, that it cannot be at the same time a tree and not a tree: all which is quite reasonable of itself, and will answer remarkably well as an axiom, until we bring it into collation with an axiom insisted upon a few pages before; in other words,—words which I have previously employed,—until we test it by the logic of its own propounder. 'A tree,' Mr. Mill asserts, 'must be either a tree or not a tree.' Very well: and now let me ask him, Why? To this little query there is but one response; I defy any man living to invent a second. The sole answer is this: 'Because we find it impossible to conceive that a tree can be anything else than a tree or not a tree.' This, I repeat, is Mr. Mill's sole answer; he will not pretend to suggest another; and yet, by his own showing, his answer is clearly no answer at all; for has he not already required us to admit, as an axiom, that ability or inability to conceive is in no case to be taken as a criterion of axiomatic truth? Thus all, absolutely all, his argumentation is at sea without a rudder. Let it not be urged that an exception from the general rule is to be made in cases where the 'impossibility to conceive' is so peculiarly great, as when we are called upon to conceive a tree both a tree and not a tree. Let no attempt, I say, be made at urging this sotticism; for, in the first place, there are no degrees of 'impossibility,' and thus no one impossible conception can be more peculiarly impossible than another impossible conception; in the second place, Mr. Mill himself, no doubt after thorough deliberation, has most distinctly and most rationally excluded all opportunity for exception by the emphasis of his proposition, that, in no case, is ability or inability to conceive to be taken as a criterion of axiomatic truth; in the third place, even were exceptions admissible at all, it remains to be shown how any exception is admissible here. That a tree can be both a tree and not a tree is an idea which the angels or the devils may entertain, and which no doubt many an earthly bedlamite or transcendentalist does.

"Now, I do not quarrel with these ancients," continues the letter-writer, "so much on account of the transparent frivolity of their logic, which, to be plain, was baseless, worthless, and fantastic altogether, as on account of their pompous and infatuate proscription of all other roads to truth than the two narrow and crooked paths, the one of creeping and the other of crawling, to which, in their ignorant perversity, they have dared to confine the soul—the soul which loves nothing so well as to soar in those regions of illimitable intuition which are utterly incognizant of 'path.'

"By the by, my dear friend, is it not an evidence of the mental slavery entailed upon those bigoted people by their Hogs and their Rams that, in spite of the eternal prating of their savants about roads to truth, none of them fell, even by accident, into what we now so distinctly perceive to be the broadest, the straightest, and most available of all mere roads—the great thoroughfare, the majestic highway of the Consistent? Is it not wonderful that they should have failed to deduce from the works of God the vitally momentous consideration that a perfect consistency can be nothing but an absolute truth ? How plain, how rapid our progress since the late announcement of this proposition! By its means investigation has been taken out of the hands of the ground-moles and given as a duty, rather than as a task, to the true, to the only true thinkers, to the generally educated men of ardent imagination. These latter—our Keplers, our Laplaces —' speculate,' ' theorize ': these are the terms. Can you not fancy the shout of scorn with which they would be received by our progenitors, were it possible for them to be looking over my shoulders as I write ? The Keplers, I repeat, speculate, theorize; and their theories are merely corrected, reduced, sifted, cleared, little by little, of their chaff of inconsistency, until at length there stands apparent and unencumbered consistency—a consistency which the most stolid admit, because it is a consistency, to be an absolute and unquestionable truth.

" I have often thought, my friend, that it must have puzzled these dogmaticians of a thousand years ago to determine, even, by which of their two boasted roads it is that the cryptographist attains the solution of the more complicated ciphers; or by which of them Champollion guided mankind to those important and innumerable truths which, for so many centuries, have lain entombed amid the phonetical hieroglyphics of Egypt. In especial, would it not have given these bigots some trouble to determine by which of their two roads was reached the most momentous and sublime of all their truths—the truth, the fact, of gravitation? Newton deduced it from the laws of Kepler. Kepler admitted that these laws he guessed, these laws whose investigation disclosed to the greatest of British astronomers that principle, the basis of all (existing) physical principle, in going behind which we enter at once the nebulous kingdom of metaphysics. Yes! these vital laws Kepler guessed; that is to say, he imagined them. Had he been asked to point out either the deductive or inductive route by which he attained them, his reply might have been, 'I know nothing about routes, but I do know the machinery of the universe. Here it is. I grasped it with my soul; I reached it by mere dint of intuition.' Alas, poor ignorant old man! Could not any metaphysician have told him that what he called 'intuition' was but the conviction resulting from deductions and inductions, of which the processes were so shadowy as to have escaped his consciousness, eluded his reason, or bidden defiance to his capacity of expression? How great a pity it is that some 'moral philosopher' had not enlightened him about all this! How it would have comforted him on his death-bed to know that, instead of having gone intuitively and thus unbecomingly, he had, in fact, proceeded decorously and legitimately, that is to say, Hog-ishly, or at least Ram-ishly, into the vast halls where lay gleaming, untended, and hitherto untouched by mortal hand, unseen by mortal eye, the imperishable and priceless secrets of the universe!

"Yes, Kepler was essentially a theorist; but this title, now of so much sanctity, was, in those ancient days, a designation of supreme contempt. It is only now that men begin to appreciate that divine old man, to sympathize with the prophetical and poetical rhapsody of his ever-memorable words. For my part," continues the unknown correspondent, "I glow with a sacred fire when I even think of them, and I feel that I shall never grow weary of their repetition. In concluding this letter, let me have the real pleasure of transcribing them once again: 'I care not whether my work be read now or by posterity. I can afford to wait a century for readers when God himself has waited six thousand years for an observer. I triumph. I have stolen the golden secret of the Egyptians. I will indulge my sacred fury.'"

Here end my quotations from this very unaccountable and, perhaps, somewhat impertinent epistle; and perhaps it would be folly to comment, in any respect, upon the chimerical, not to say revolutionary, fancies of the writer, whoever he is,—fancies so radically at war with the well-considered and well-settled opinions of this age. Let us proceed, then, to our legitimate thesis, "The Universe."

This thesis admits a choice between two modes of discussion:—we may ascend or descend. Beginning at our own point of view, at the earth on which we stand, we may pass to the other planets of our system, thence to the sun, thence to our system considered collectively, and thence, through other systems, indefinitely outward; or, commencing on high at some point as definite as we can make it or conceive it, we may come down to the habitation of man. Usually, that is to say, in ordinary essays on astronomy, the first of these two modes is, with certain reservation, adopted; this, for the obvious reason that astronomical facts, merely, and principles, being the object, that object is best fulfilled in stepping from the known, because proximate, gradually onward to the point where all certitude becomes lost in the remote. For my present purpose, however, that of enabling the mind to take in, as if from afar and at one glance, a distant conception of the individual universe, it is clear that a descent to small from great, to the outskirts from the centre (if we could establish a centre), to the end from the beginning (if we could fancy a beginning), would be the preferable course, but for the difficulty, if not impossibility, of presenting, in this course, to the unastronomical, a picture at all comprehensible in regard to such considerations as are involved in quantity, that is to say, in number, magnitude, and distance.

Now, distinctness, intelligibility, at all points, is a primary feature in my general design. On important topics it is better to be a good deal prolix than even a very little obscure. But abstruseness is a quality appertaining to no subject *per se.* All are alike, in facility of comprehension, to him who approaches them by properly graduated steps. It is merely because a stepping-stone, here and there, is heedlessly left unsupplied in our road to differential calculus that this latter is not altogether as simple a thing as a sonnet by Mr. Solomon Seesaw.

By way of admitting, then, no chance for misapprehension, I think it advisable to proceed as if even the more obvious facts of astronomy were unknown to the reader. In combining the two modes of discussion to which I have referred, I propose to avail myself of the advantages peculiar to each, and very especially of the iteration in detail which will be unavoidable as a consequence of the plan. Commencing with a descent, I shall reserve for the return upward those indispensable considerations of quantity to which allusion has already been made.

Let us begin, then, at once, with that merest of words, "infinity." This, like "God," "spirit," and some other expressions of which the equivalents exist in all languages, is by no means the expression of an idea, but of an effort at one. It stands for the possible attempt at an impossible conception. Man needed a term by which to point out the direction of this effort, the cloud behind which lay, forever invisible, the object of this attempt. A word, in fine, was demanded, by means of which one human being might put himself in relation at once with another human being and with a certain tendency of the human intellect. Out of this demand arose the word "infinity," which is thus the representative but of the thought of a thought.

As regards that infinity now considered, the infinity of space, we often hear it said that "its idea is admitted by the mind, is acquiesced in, is entertained, on account of the greater difficulty which attends the conception of a limit." But this is merely one of those phrases by which even profound thinkers, time out of mind, have occasionally taken pleasure in deceiving themselves. The quibble lies concealed in the word "difficulty." "The mind," we are told, "entertains the idea of limitless, through the greater difficulty which it finds in entertaining that of limited, space." Now, were the proposition but fairly put, its absurdity would become transparent at once. Clearly, there is no more difficulty in the case. The assertion intended, if presented according to its intention and without sophistry, would run thus: "The mind admits the idea of limitless, through the greater impossibility of entertaining that of limited, space."

It must be immediately seen that this is not a question of two statements between whose respective credibilities, or of two arguments between whose respective validities, the reason is called upon to decide; it is a matter of two conceptions, directly conflicting, and each avowedly impossible, one of which the intellect is supposed to be capable of entertaining, on account of the greater impossibility of entertaining the other. The choice is not made between two difficulties; it is merely fancied to be made between two impossibilities. Now, of the former there are degrees, but of the latter, none, just as our impertinent letter-writer has already suggested. A task may be more or less difficult; but it is either possible or not possible,—there are no gradations. It might be more difficult to overthrow the Andes than an ant-hill, but it can be no more impossible to annihilate the matter of the one than the matter of the other. A man may jump ten feet with less difficulty than he can jump twenty, but the impossibility of his leaping to the moon is not a whit less than that of his leaping to the dog-star.

Since all this is undeniable; since the choice of the mind is to be made between impossibilities of conception; since one impossibility cannot be greater than another; and since, thus, one cannot be preferred to another, the philosophers who not only maintain, on the grounds mentioned, man's idea of infinity, but, on account of such supposititious idea, infinity itself, are plainly engaged in demonstrating one impossible thing to be possible by showing how it is that some one other thing is impossible too. This, it will be said, is nonsense, and perhaps it is; indeed, I think it very capital nonsense, but forego all claim to it as nonsense of mine.

The readiest mode, however, of displaying the fallacy of the philosophical argument on this question is by simply adverting to a fact respecting it which has been hitherto quite overlooked—the fact that the argument alluded to both proves and disproves its own proposition. "The mind is impelled," say the theologians and others, "to admit a First Cause, by the superior difficulty it experiences in conceiving cause beyond cause without end." The quibble, as before, lies in the word "difficulty," but here what is it employed to sustain? A First Cause. And what is a First Cause? An ultimate termination of causes. And what is an ultimate termination of causes? Finity—the finite. Thus the one quibble, in two processes, by God knows how many philosophers, is made to support now finity and now Infinity; could it not be brought to support something besides? As for the quibbles, they, at least, are insupportable. But, to dismiss them, what they prove in the one case is the identical nothing which they demonstrate in the other.

Of course, no one will suppose that I here contend for the absolute impossibility of that which we attempt to convey in the word "infinity." My purpose is but to show the folly of endeavoring to prove infinity itself, or even our conception of it, by any such blundering ratiocination as that which is ordinarily employed.

Nevertheless, as an individual, I may be permitted to say that I cannot conceive infinity, and am convinced that no human being can. A mind not thoroughly self-conscious, not accustomed to the introspective analysis of its own operations, will, it is true, often deceive itself by supposing that it has entertained the conception of which we speak. In the effort to entertain it, we proceed step beyond step, we fancy point still beyond point; and so long as we continue the effort it may be said, in fact, that we are tending to the formation of the idea designed; while the strength of the impression that we actually form or have formed is in the ratio of the period during which we keep up the mental endeavor. But it is in the act of discontinuing the endeavor, of fulfilling (as we think) the idea, of putting the finishing stroke (as we suppose) to the conception, that we overthrow at once the whole fabric of our fancy by resting upon some one ultimate, and therefore definite, point. This fact, however, we fail to perceive, on account of the absolute coincidence, in time, between the settling down upon the ultimate point and the act of cessation in thinking. In attempting, on the other hand, to frame the idea of a limited space, we merely converse the processes which involve the impossibility.

We believe in a God. We may or may not believe in finite or in infinite space; but our belief, in such cases, is more properly designated as faith, and is a matter quite distinct from that belief proper, from that intellectual belief, which presupposes the mental conception.

The fact is, that, upon the enunciation of any one of that class of terms to which "infinity" belongs, the class representing thoughts of thought, he who has a right to say that he thinks at all feels himself called upon not to entertain a conception, but simply to direct his mental vision toward some given point, in the intellectual firmament, where lies a nebula never to be resolved. To solve it, indeed, he makes no effort; for with a rapid instinct he comprehends, not only the impossibility, but, as regards all human purposes, the inessentiality, of its solution. He perceives that the Deity has not designed it to be solved. He sees, at once, that it lies out of the brain of man, and even how, if not exactly why, it lies out of it. There are people, I am aware, who, busying themselves in attempts at the unattainable, acquire very easily, by dint of the jargon they emit, among those thinkers-that-they-think, with whom darkness and depth are synonymous, a kind of cuttlefish reputation for profundity; but the finest quality of thought is its self-cognizance; and with some little equivocation it may be said that no fog of the mind can well be greater than that which, extending to the very boundaries of the mental domain, shuts out even these boundaries themselves from comprehension.

It will now be understood that, in using the phrase, "infinity of space," I make no call upon the reader to entertain the impossible conception of an absolute infinity. I refer simply to the "utmost conceivable expanse" of space—a shadowy and fluctuating domain, now shrinking, now swelling, in accordance with the vacillating energies of the imagination.

Hitherto, the universe of stars has always been considered as coincident with the universe proper, as I have defined it in the commencement of this discourse. It has been always either directly or indirectly assumed, at least since the dawn of intelligible astronomy, that, were it possible for us to attain any given point in space, we should still find, on all sides of us, an interminable succession of stars. This was the untenable idea of Pascal when making perhaps the most successful attempt ever made at periphrasing the conception for which we struggle in the word "universe." "It is a sphere," he says, "of which the centre is everywhere, the circumference nowhere." But although this intended definition is, in fact, no definition of the universe of stars, we may accept it, with some mental reservation, as a definition (rigorous enough for all practical purposes) of the universe proper, that is to say, of the universe of space. This latter, then, let us regard as " a sphere of which the centre is everywhere, the circumference nowhere." In fact, while we find it impossible to fancy an end to space, we have no difficulty in picturing to ourselves any one of an infinity of beginnings.

As our starting-point, then, let us adopt the Godhead. Of this Godhead, in itself, he alone is not imbecile, he alone is not impious, who propounds—nothing. " Nous ne connaissons rien," says the Baron de Bielfeld—" Nous ne connaissons rien de la nature ou de l'essence de Dieu: pour savoir ce qu'il est, il faut être Dieu même."—" We know absolutely nothing of the nature or essence of God: in order to comprehend what He is, we should have to be God ourselves."

" We should have to be God ourselves! " With a phrase so startling as this yet ringing in my ears, I nevertheless venture to demand if this our present ignorance of the Deity is an ignorance to which the soul is everlastingly condemned.

By Him, however, now, at least, the Incomprehensible; by Him, assuming Him as Spirit, that is to say, as not matter, a distinction which, for all intelligible purposes, will stand well instead of a definition; by Him, then, existing as Spirit, let us content ourselves, to-night, with supposing to have been created, or made out of nothing, by dint of His volition, at some point of space which we will take as a centre, at some period into which we do not pretend to inquire, but at all events immensely remote; by Him, then, again, let us suppose to have been created—what? This is a vitally momentous epoch in our considerations. What is it that we are justified, that alone we are justified, in supposing to have been, primarily and solely, created?

We have attained a point where only intuition can aid us; but now let me recur to the idea which I have already suggested as that alone which we can properly entertain of intuition. It is but the conviction arising from those inductions or deductions of which the processes are so shadowy as to escape our consciousness, elude our reason, or defy our capacity of expression. With this understanding, I now assert that an intuition altogether irresistible, although inexpressible, forces me to the conclusion that what God originally created, that that matter which, by dint of His volition, He first made from His Spirit or from nihility, could have been nothing but matter in its utmost conceivable state of——what?—of simplicity?

This will be found the sole absolute assumption of my discourse. I use the word "assumption" in its ordinary sense; yet I maintain that even this my primary proposition is very, very far indeed from being really a mere assumption. Nothing was ever more certainly—no human conclusion was ever, in fact, more regularly, more rigorously deduced; but, alas! the processes lie out of the human analysis, at all events are beyond the utterance of the human tongue.

Let us now endeavor to conceive what matter must be when, or if, in its absolute extreme of simplicity. Here the reason flies at once to imparticularity, to a particle, to one particle, a particle of one kind, of one character, of one nature, of one size, of one form,—a particle, therefore, "without form and void,"—a particle positively a particle at all points, a particle absolutely unique, individual, undivided, and not indivisible only because He who created it, by dint of His will, can by an infinitely less energetic exercise of the same will, as a matter of course, divide it.

Oneness, then, is all that I predicate of the originally created matter; but I propose to show that this oneness is a principle abundantly sufficient to account for the constitution, the existing phenomena, and the plainly inevitable annihilation of at least the material universe.

The willing into being the primordial particle has completed the act, or more properly the conception, of Creation. We now proceed to the ultimate purpose for which we are to suppose the particle created, that is to say, the ultimate purpose so far as our considerations yet enable us to see it, the constitution of the universe from it, the particle.

This constitution has been effected by forcing the originally and therefore normally one into the abnormal condition of many. An action of this character implies reaction. A diffusion from unity, under the conditions, involves a tendency to return into unity—a tendency ineradicable until satisfied. But on these points I will speak more fully hereafter.

The assumption of absolute unity in the primordial particle includes that of infinite divisibility. Let us conceive the particle, then, to be only not totally exhausted by diffusion into space. From the one particle, as a centre, let us suppose to be irradiated spherically, in all directions, to immeasurable but still definite distances in the previously vacant space, a certain inexpressibly great yet limited number of unimaginably yet not infinitely minute atoms.

Now, of these atoms, thus diffused, or upon diffusion, what conditions are we permitted, not to assume, but to infer, from consideration as well of their source as of the character of the design apparent in their diffusion? Unity being their source, and difference from unity the character of the design manifested in their diffusion, we are warranted in supposing this character to be at least generally preserved throughout the design, and to form a portion of the design itself; that is to say, we shall be warranted in conceiving continual differences at all points from the uniquity and simplicity of the origin. But, for these reasons, shall we be justified in imagining the atoms heterogeneous, dissimilar, unequal, and inequidistant? More explicitly, are we to consider no two atoms as, at their diffusion, of the same nature, or of the same form, or of the same size?—and, after fulfilment of their diffusion into space, is absolute inequidistance, each from each, to be understood of all of them? In such arrangement, under such conditions, we most easily and immediately comprehend the subsequent most feasible carrying out to completion of any such design as that which I have suggested—the design of variety out of unity, diversity out of sameness, heterogeneity out of homogeneity, complexity out of simplicity, in a word, the utmost possible multiplicity of relation out of the emphatically irrelative one. Undoubtedly, therefore, we should be warranted in assuming all that has been mentioned but for the reflection, first, that supererogation is not presumable of any Divine Act; and, secondly, that the object supposed in view appears as feasible when some of the conditions in question are dispensed with, in the beginning, as when all are understood immediately to exist. I mean to say that some are involved in the rest, or so instantaneous a consequence of them as to make the distinction inappreciable. Difference of size, for example, will at once be brought about through the tendency of one atom to a second, in preference to a third, on account of particular inequidistance; which is to be comprehended as particular inequidistances between centres of quantity, in neighboring atoms of different form—a matter not at all interfering with the generally equable distribution of the atoms. Difference of kind, too, is easily conceived to be merely a result of differences in size and form, taken more or less conjointly; in fact, since the unity of the particle proper implies absolute homogeneity, we cannot imagine the atoms, at their diffusion, differing in kind, without imagining, at the same time, a special exercise of the Divine Will, at the emission of each atom, for the purpose of effecting, in each, a change of its essential nature: so fantastic an idea is the less to be indulged, as the object proposed is seen to be thoroughly attainable without such minute and elaborate interposition. We perceive, therefore, upon the whole, that it would be supererogation, and consequently unphilosophical, to predicate of the atoms, in view of their purposes, anything more than difference of form at their dispersion, with particular inequidistance after it, all other differences arising at once out of these, in the very first processes of mass constitution. We thus establish the universe on a purely geometrical basis. Of course, it is by no means necessary to assume absolute difference, even of form, among all the atoms irradiated, any more than absolute particular inequidistance of each from each. We are required to conceive merely that no neighboring atoms are of similar form, no atoms which can ever

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approximate until their inevitable reunition at the end.

Although the immediate and perpetual tendency of the disunited atoms to return into their normal unity is implied, as I have said, in their abnormal diffusion, still it is clear that this tendency will be without consequence—a tendency and no more—until the diffusive energy, in ceasing to be exerted, shall leave it, the tendency, free to seek its satisfaction. The Divine Act, however, being considered determinate, and discontinued on fulfilment of the diffusion, we understand, at once, a reaction, in other words, a satisfiable tendency of the disunited atoms to return into one.

But the diffusive energy being withdrawn, and the reaction having commenced in furtherance of the ultimate design, that of the utmost possible relation, this design is now in danger of being frustrated, in detail, by reason of that very tendency to return which is to effect its accomplishment in general. Multiplicity is the object; but there is nothing to prevent proximate atoms from lapsing at once, through the now satisfiable tendency, before the fulfilment of any ends proposed in multiplicity, into absolute oneness among themselves; there is nothing to impede the aggregation of various unique masses, at various points of space; in other words, nothing to interfere with the accumulation of various masses, each absolutely one.

For the effectual and thorough completion of the general design, we thus see the necessity for a repulsion of limited capacity, a separative something which, on withdrawal of the diffusive Volition, shall at the same time allow the approach, and forbid the junction, of the atoms, suffering them infinitely to approximate, while denying them positive contact; in a word, having the power, up to a certain epoch, of preventing their coalition, but no ability to interfere with their coalescence in any respect or degree. The repulsion, already considered as so peculiarly limited in other regards, must be understood, let me repeat, as having power to prevent absolute coalition, only up to a certain epoch. Unless we are to conceive that the appetite for unity among the atoms is doomed to be satisfied never; unless we are to conceive that what had a beginning is to have no end, a conception which cannot really be entertained, however much we may talk or dream of entertaining it, we are forced to conclude that the repulsive influence imagined, will, finally, under pressure of the uni-tendency collectively applied, but never and in no degree until, on fulfilment of the Divine purposes, such collective application shall be naturally made, yield to a force which, at that ultimate epoch, shall be the superior force precisely to the extent required, and thus permit the universal subsidence into the inevitable, because original and therefore normal, one. The conditions here to be reconciled are difficult indeed; we cannot even comprehend the possibility of their conciliation; nevertheless, the apparent impossibility is brilliantly suggestive.

That the repulsive something actually exists, we see. Man neither employs, nor knows a force sufficient to bring two atoms into contact. This is but the well-established proposition of the impenetrability of matter. All experiment proves, all philosophy admits it. The design of the repulsion, the necessity for its existence, I have endeavored to show, but from all attempt at investigating its nature have religiously abstained,—this on account of an intuitive conviction that the principle at issue is strictly spiritual; lies in a recess impervious to our present understanding; lies involved in a consideration of what now, in our human state; is not to be considered in a consideration of Spirit in itself. I feel, in a word, that here the God has interposed, and here only, because here and here only the knot demanded the interposition of the God.

In fact, while the tendency of the diffused atoms to return into unity will be recognized at once as the principle of the Newtonian gravity, what I have spoken of as a repulsive influence prescribing limits to the (immediate) satisfaction of the tendency will be understood as that which we have been in the practice of designating now as heat, now as magnetism, now as electricity, displaying our ignorance of its awful character in the vacillation of the phraseology with which we endeavor to circumscribe it.

Calling it, merely for the moment, electricity, we know that all experimental analysis of electricity has given, as an ultimate result, the principle, or seeming principle, heterogeneity. Only where things differ is electricity apparent; and it is presumable that they never differ where it is not developed at least, if not apparent. Now, this result is in the fullest keeping with that which I have reached unempirically. The design of the repulsive influence I have maintained to be that of preventing immediate unity among the diffused atoms; and these atoms are represented as different each from each. Difference is their character, their essentiality, just as no-difference was the essentiality of their course. When we say, then, that an attempt to bring any two of these atoms together would induce an effort, on the part of the repulsive influence, to prevent the contact, we may as well use the strictly convertible sentence that an attempt to bring together any two differences will result in a development of electricity. All existing bodies, of course, are composed of these atoms in proximate contact, and are therefore to be considered as mere assemblages of more or fewer differences; and the resistance made by the repulsive spirit, on bringing together any two such assemblages, would be in the ratio of the two sums of the differences in each, an expression which, when reduced, is equivalent to this: The amount of electricity developed on the approximation of two bodies is proportional to the difference between the respective sums of the atoms of which the bodies are composed. That no two bodies are absolutely alike is a simple corollary from all that has been here said. Electricity, therefore, existing always, is developed whenever any bodies, but manifested only when bodies of appreciable difference, are brought into approximation.

To electricity—so, for the present, continuing to call it—we may not be wrong in referring the various physical appearances of light, heat, and magnetism; but far less shall we be liable to err in attributing to this strictly spiritual principle the more important phenomena of vitality, consciousness, and thought. On this topic, however, I need pause here merely to suggest that these phenomena, whether observed generally or in detail, seem to proceed at least in the ratio of the heterogeneous.

Discarding, now, the two equivocal terms " gravitation " and " electricity," let us adopt the more definite expressions " attraction " and " repulsion." The former is the body, the latter the soul; the one is the material, the other the spiritual, principle of the universe. No other principles exist. All phenomena are referable to one or to the other, or to both combined. So rigorously is this the case, so thoroughly demonstrable is it that attraction and repulsion are the sole properties through which we perceive the universe, in other words, by which matter is manifested to mind, that, for all merely argumentative purposes, we are fully justified in assuming that matter exists only as attraction and repulsion—that attraction and repulsion are matter, there being no conceivable case in which we may not employ the term " matter," and the terms " attraction " and " repulsion," taken together, as equivalent, and therefore convertible, expressions in logic.

I said, just now, that what I have described as the tendency of the diffused atoms to return into their original unity would be understood as the principle of the Newtonian law of gravity; and, in fact, there can be but little difficulty in such an understanding, if we look at the Newtonian gravity in a merely general view, as a force impelling matter to seek matter; that is to say, when we pay no attention to the known *modus operandi* of the Newtonian force. The general coincidence satisfies us; but, upon looking closely, we see in detail much that appears *in*coincident, and much in regard to which no coincidence, at least, is established. For example: the Newtonian gravity, when we think of it in certain moods, does not seem to be a tendency to oneness at all, but rather a tendency of all bodies in all directions—a phrase apparently expressive of a tendency to diffusion. Here, then, is an *in*coincidence. Again; when we reflect on the mathematical law governing the Newtonian tendency, we see clearly that no coincidence has been made good, in respect of the *modus operandi*, at least, between gravitation as known to exist and that seemingly simple and direct tendency which I have assumed.

In fact, I have attained a point at which it will be advisable to strengthen my position by reversing my processes. So far, we have gone on *a priori*, from an abstract consideration of simplicity, as that quality most likely to have characterized the original action of God. Let us now see whether the established facts of the Newtonian gravitation may not afford us, *a posteriori*, some legitimate inductions.

What does the Newtonian law declare? That all bodies attract each other with forces proportional to the squares of their distances. Purposely, I have given, in the first place, the vulgar version of the law; and I confess that in this, as in most other vulgar versions of great truths, we find little of a suggestive character. Let us now adopt a more philosophical phraseology: Every atom, of every body, attracts every other atom, both of its own and of every other body, with a force which varies inversely as the squares of the distances between the *attracting and attracted* atom. Here, indeed, a flood of suggestion bursts upon the mind.

But let us see distinctly what it was that Newton proved, according to the grossly irrational definitions of proof prescribed by the metaphysical schools. He was forced to content himself with showing how thoroughly the motions of an imaginary universe, composed of *attracting and attracted* atoms obedient to the law he announced, coincide with those of the actually existing universe so far as it comes under our observation. This was the amount of his demonstration, that is to say, this was the amount of it, according to the conventional cant of the "philosophies." His successes added proof multiplied by proof, such proof as a sound intellect admits; but the demonstration of the law itself, persist the metaphysicians, had not been strengthened in any degree. "Ocular physical proof," however, of attraction, here upon earth, in accordance with the Newtonian theory, was, at length, much to the satisfaction of some intellectual grovellers, afforded. This proof arose collaterally and incidentally (as nearly all important truths have arisen) out of an attempt to ascertain the mean density of the earth. In the famous Maskelyne, Cavendish, and Bailly experiments for this purpose, the attraction of the mass of a mountain was seen, felt, measured, and found to be mathematically consistent with the immortal theory of the British astronomer.

But in spite of this confirmation of that which needed none, in spite of the so-called corroboration of the "theory" by the so-called "ocular and physical proof," in spite of the character of this corroboration, the ideas which even really philosophical men cannot help imbibing of gravity, and, especially, the ideas of it which ordinary men get and contentedly maintain, are seen to have been derived, for the most part, from a consideration of the principle as they find it developed, merely in the planet upon which they stand.

Now, to what does so partial a consideration tend, to what species of error does it give rise? On the earth we see and feel only that gravity impels all bodies toward the centre of the earth. No man in the common walks of life could be made to see or feel anything else,—could be made to perceive that anything, anywhere, has a perpetual gravitating tendency in any other direction than to the centre of the earth; yet (with an exception hereafter to be specified) it is a fact that every earthly thing (not to speak now of every heavenly thing) has a tendency not only to the earth's centre, but in every conceivable direction besides.

Now, although the philosophic cannot be said to err with the vulgar in this matter, they nevertheless permit themselves to be influenced, without knowing it, by the sentiment of the vulgar idea. "Although the pagan fables are not believed," says Bryant, in his very erudite *Mythology,* "yet we forget ourselves continually and make inferences from them as from existing realities." I mean to assert that the merely sensitive perception of gravity as we experience it upon earth beguiles mankind into the fancy of concentralization or especiality respecting it, has been continually biasing toward this fancy even the mightiest intellects, perpetually, although imperceptibly, leading them away from the real characteristics of the principle, thus preventing them, up to this date, from ever getting a glimpse of that vital truth which lies in a diametrically opposite direction, behind the principle's essential characteristics,—those not of concentralization or especiality, but of universality and diffusion. This "vital truth" is unity as the source of the phenomenon.

Let me now repeat the definition of gravity: Every atom, of every body, attracts every other atom, both of its own and of every other body, with a force which varies inversely as the squares of the distances of the attracting and attracted atom.

Here let the reader pause with me, for a moment, in contemplation of the miraculous, of the ineffable, of the altogether unimaginable, complexity of relation involved in the fact that each atom attracts every other atom; involved merely in this fact of the attraction, without reference to the law or mode in which the attraction is manifested; involved merely in the fact that each atom attracts every other atom at all, in a wilderness of atoms so numerous that those which go to the composition of a cannon-ball exceed, probably, in mere point of number, all the stars which go to the constitution of the universe.

Had we discovered, simply, that each atom tended to some one favorite point, to some especially attractive atom, we should still have fallen upon a discovery which, in itself, would have sufficed to overwhelm the mind; but what is it that we are actually called upon to comprehend? That each atom attracts, sympathizes with the most delicate movements of every other atom, and with each and with all at the same time and forever, and according to a determinate law of which the complexity, even considered by itself solely, is utterly beyond the grasp of the imagination of man. If I propose to ascertain the influence of one mote in a sunbeam upon its neighboring mote, I cannot accomplish my purpose without first counting and weighing all the atoms in the universe and defining the precise positions of all at one particular moment. If I venture to displace, by even the billionth part of an inch, the microscopical speck of dust which lies now upon the point of my finger, what is the character of that act upon which I have adventured? I have done a deed which shakes the moon in her path, which causes the sun to be no longer the sun, and which alters forever the destiny of the multitudinous myriads of stars that roll and glow in the majestic presence of their Creator.

These ideas, conceptions such as these, unthought-like thoughts, soul-reveries rather than conclusions, or even considerations of the intellect,—ideas, I repeat, such as these, are such as we can alone hope profitably to entertain in any effort at grasping the great principle, attraction.

But now, with such ideas, with such a vision of the marvellous complexity of attraction fairly in his mind, let any person competent of thought on such topics as these set himself to the task of imagining a principle for the phenomena observed, a condition from which they sprang.

Does not so evident a brotherhood among the atoms point to a common parentage? Does not a sympathy so omniprevalent, so ineradicable, and so thoroughly irrespective, suggest a common paternity as its source? Does not one extreme impel the reason to the other? Does not the infinitude of division refer to the utterness of individuality? Does not the entireness of the complex hint at the perfection of the simple? It is not that the atoms, as we see them, are divided or that they are complex in their relations, but that they are inconceivably divided and unutterably complex; it is the extremeness of the conditions to which I now allude, rather than to the conditions themselves. In a word, is it not because the atoms were, at some remote epoch of time, even more than together; is it not because originally, and therefore normally, they were one,—that now, in all circumstances, at all points, in all directions, by all modes of approach, in all relations and through all conditions, they struggle back to this absolutely, this irrelatively, this unconditionally one ?

Some person may here demand: " Why, since it is to the one that the atoms struggle back, do we not find and define attraction ' a merely general tendency to a centre ' ?—why, in especial, do not your atoms, the atoms which you describe as having been irradiated from a centre, proceed at once, rectilinearly, back to the central point of their origin ? "

I reply that they do, as will be distinctly shown; but that the cause of their so doing is quite irrespective of the centre as such. They all tend rectilinearly toward a centre, because of the sphericity with which they have been irradiated into space. Each atom, forming one of a generally uniform globe of atoms, finds more atoms in the direction of the centre, of course, than in any other, and in that direction, therefore, is impelled, but is not thus impelled because the centre is the point of its origin. It is not to any pcint that the atoms are allied. It is not any locality, either in the concrete or in the abstract, to which I suppose them bound. Nothing like location was conceived as their origin. Their source lies in the principle, unity. This is their lost parent. This they seek always, immediately, in all directions, wherever it is even partially to be found; thus appeasing, in some measure, the ineradicable tendency, while on the way to its absolute satisfaction in the end. It follows, from all this, that any principle which shall be adequate to account for the law, or *modus operandi*, of the attractive force in general, will account for this law in particular; that is to say, any principle which will show why the atoms should tend to their general centre of irradiation with forces inversely proportioned to the squares of the distances will be admitted as satisfactorily accounting, at the same time, for the tendency, according to the same law, of these atoms each to each; for the tendency to the centre is merely the tendency each to each, and not any tendency to a centre as such. Thus it will be seen, also, that the establishment of my propositions would involve no necessity of modification in the terms of the Newtonian definition of gravity, which declares that each atom attracts each other atom, and so forth, and declares this merely; but (always under the supposition that what I propose be, in the end, admitted) it seems clear that some error might occasionally be avoided, in the future processes of science, were a more ample phraseology adopted; for instance, "Each atom tends to every other atom, etc., with a force, etc., the general result being a tendency of all, with a similar force, to a general centre."

The reversal of our processes has thus brought us to an identical result; but while in the one process intuition was the starting-point, in the other it was the goal. In commencing the former journey I could only say that, with an irresistible intuition, I felt simplicity to have been made the characteristic of the original action of God; in ending the latter, I can only declare that, with an irresistible intuition, I perceive unity to have been the source of the observed phenomena of the Newtonian gravitation. Thus, according to the schools, I prove nothing. So be it; I design but to suggest, and to convince through the suggestion. I am proudly aware that there exist many of the most profound and cautiously discriminative human intellects which cannot help being abundantly content with my—suggestions. To these intellects, as to my own, there is no mathematical demonstration which could bring the least additional true proof of the great truth which I have advanced—the truth of original unity as the source, as the principle, of the universal phenomena. For my part I am not sure that I speak and see, I am not so sure that my heart beats and that my soul lives; of the rising of to-morrow's sun—a probability that as yet lies in the future—I do not pretend to be one thousandth part as sure as I am of the irretrievably bygone fact that all things and all thoughts of things, with all their ineffable multiplicity of relation, sprang at once into being from the primordial and irrelative one.

Referring to the Newtonian gravity, Dr. Nichol, the eloquent author of *The Architecture of the Heavens,* says: "In truth we have no reason to suppose this great law, as now revealed, to be the ultimate or simplest, and therefore the universal and all-comprehensive, form of a great ordinance. The mode in which its intensity diminishes with the element of distance has not the aspect of an ultimate principle; which always assumes the simplicity and self-evidence of those axioms which constitute the basis of geometry."

Now, it is quite true that "ultimate principles," in the common understanding of the words, always assume the simplicity of geometrical axioms (as for "self-evidence," there is no such thing), but these principles are clearly not "ultimate"; in other terms, what we are in the habit of calling principles are no principles, properly speaking, since there can be but one principle, the volition of God. We have no right to assume, then, from what we observe in rules that we choose foolishly to name "principles," anything at all in respect to the characteristics of a principle proper. The "ultimate principles," of which Dr. Nichol speaks as having geometrical simplicity, may and do have this geometrical turn, as being part and parcel of a vast geometrical system, and thus a system of simplicity itself, in which, nevertheless, the truly ultimate principle is, as we know, the consummation of the complex, that is to say, of the unintelligible, for is it not the spiritual capacity of God?

I quoted Dr. Nichol's remark, however, not so much to question its philosophy as by way of calling attention to the fact that while all men have admitted some principle as existing behind the law of gravity, no attempt has been yet made to point out what this principle in particular is, if we except, perhaps, occasional fantastic efforts at referring it to magnetism, or mesmerism, or Swedenborgianism, or transcendentalism, or some other equally delicious "ism" of the same species, and invariably patronized by one and the same species of people. The great mind of Newton, while boldly grasping the law itself, shrank from the principle of the law. The more fluent and comprehensive, at least, if not the more patient and profound sagacity of Laplace had not the courage to attack it. But hesitation on the part of these two astronomers it is, perhaps, not so very difficult to understand. They, as well as all the first class of mathematicians, were mathematicians solely; their intellect at least had a firmly pronounced mathematico-physical tone. What lay not distinctly within the domain of physics or of mathematics seemed to them either non-entity or shadow. Nevertheless, we may well wonder that Leibnitz, who was a marked exception to the general rule in these respects, and whose mental temperament was a singular admixture of the mathematical with the physico-metaphysical, did not at once investigate and establish the point at issue. Either Newton or Laplace, seeking a principle and discovering none physical, would have rested contentedly in the conclusion that there was absolutely none; but it is almost impossible to fancy of Leibnitz that, having exhausted in his search the physical dominions, he would not have stepped at once, boldly and hopefully, amid his old familiar haunts in the kingdom of metaphysics. Here, indeed, it is clear that he must have adventured in search of the treasure; that he did not find it after all, was, perhaps, because his fairy guide, Imagination, was not sufficiently well grown, or well educated, to direct him aright.

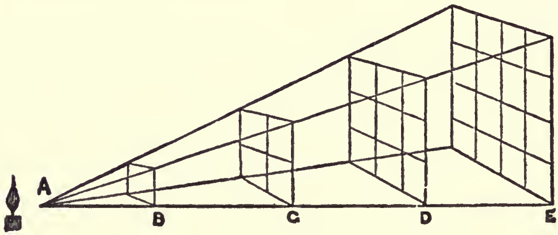
I observed just now that, in fact, there had been certain vague attempts at referring gravity to some very uncertain "isms." These attempts, however, although considered bold, and justly so considered, looked no further than to the generality, the merest generality, of the Newtonian law. Its *modus operandi* has never, to my knowledge, been approached in the way of an effort at explanation. It is, therefore, with no unwarrantable fear of being taken for a madman at the outset, and before I can bring my propositions fairly to the eye of those who alone are competent to decide upon them, that I here declare the *modus operandi* of the law of gravity to be an exceedingly simple and perfectly explicable thing, that is to say, when we make our advances toward it in just gradations and in the true direction; when we regard it from the proper point of view.

Whether we reach the idea of absolute unity as the source of all things, from a consideration of simplicity as the most probable characteristic of the original action of God; whether we arrive at it from an inspection of the universality of the relation in the gravitating phenomena, or whether we attain it as a result of the mutual corroboration afforded by both processes, still, the idea itself, if entertained at all, is entertained in inseparable connection with another idea, that of the condition of the universe of stars as we now perceive it, that is to say, a condition of immeasurable diffusion through space. Now, a connection between these two ideas, unity and diffusion, cannot be established unless through the entertainment of a third idea, that of irradiation. Absolute unity being taken as a centre, then the existing universe of stars is the result of irradiation from that centre.

Now, the laws of irradiation are known. They are part and parcel of the sphere. They belong to the class of indisputable geometrical properties. We say of them, "They are true, they are evident." To demand why they are true would be to demand why the axioms are true upon which their demonstration is based. Nothing is demonstrable, strictly speaking; but if anything be, then the properties, the laws in question, are demonstrated.

But these laws, what do they declare? Irradiation—how? by what steps does it proceed outwardly from a centre?

From a luminous centre light issues by irradiation; and the quantities of light received upon any given plane, supposed to be shifting its position so as to be now nearer the centre and now farther from it, will be



diminished in the same proportion as the squares of the distances of the plane from the luminous body are increased; and will be increased in the same proportion as these squares are diminished.

The expression of the law may be thus generalized: the number of light-particles (or, if the phrase be preferred, the number of light-impressions) received upon the shifting plane will be inversely proportional with the squares of the distances of the plane. Generalizing yet again, we may say that the diffusion, the scattering, the irradiation, in a word, is directly proportional with the squares of the distances.

For example: at the distance B, from the luminous centre A, a certain number of particles are so diffused as to occupy the surface B. Then at double the distance, that is to say, at C, they will be so much farther diffused as to occupy four such surfaces; at treble the distance, or at D, they will be so much farther separated as to occupy nine such surfaces; while, at quadruple the distance, or at E, they will have become so scattered as to spread themselves over sixteen such surfaces, and so on forever.

In saying, generally, that the irradiation proceeds in direct proportion with the squares of the distances, we use the term "irradiation" to express the degree of the diffusion as we proceed outwardly from the centre. Conversing the idea, and employing the word "concentralization" to express the degree of the drawing together as we come back toward the centre from an outward position, we may say that concentralization proceeds inversely as the squares of the distances. In other words, we have reached the conclusion that, on the hypothesis that matter was originally irradiated from a centre and is now returning to it, the concentralization, in the return, proceeds exactly as we know the force of gravitation to proceed.

Now here, if we could be permitted to assume that concentralization exactly represented the force of the tendency to the centre, that the one was exactly proportional to the other, and that the two proceeded together, we should have shown all that is required. The sole difficulty existing, then, is to establish a direct proportion between concentralization and the force of concentralization; and this is done, of course, if we establish such proportions between irradiation and the force of irradiation.

A very slight inspection of the heavens assures us that the stars have a certain general uniformity, equability, or equidistance of distribution through that region of space in which, collectively, and in a roughly globular form, they are situated; this species of very general, rather than absolute, equability being in full keeping with my deduction of inequidistance, within certain limits, among the originally diffused atoms, as a corollary from the evident design of infinite complexity of relation out of irrelation. I started, it will be remembered, with the idea of a generally uniform but particularly ununiform distribution of the atoms,—an idea, I repeat, which an inspection of the stars, as they exist, confirms.

But even in the merely general equability of distribution, as regards the atoms, there appears a difficulty which, no doubt, has already suggested itself to those among my readers who have borne in mind that I suppose this equability of distribution effected through irradiation from a centre. The very first glance at the idea, irradiation, forces us to the entertainment of the hitherto unseparated and seemingly inseparable idea of agglomeration about a centre, with dispersion as we recede from it,—the idea, in a word, of inequability of distribution in respect to the matter irradiated.

Now, I have elsewhere [1] observed that it is by just such difficulties as the one now in question,—such

[1] *Murders in the Rue Morgue.*

roughnesses, such peculiarities, such protuberances above the plane of the ordinary, that Reason feels her way, if at all, in her search for the true. By the difficulty, the "peculiarity," now presented, I leap at once to the secret—a secret which I might never have attained but for the peculiarity and the inferences which, in its mere character of peculiarity, it affords me.

The process of thought, at this point, may be thus roughly sketched. I say to myself: "Unity, as I have explained it, is a truth; I feel it. Diffusion is a truth; I see it. Irradiation, by which alone these two truths are reconciled, is a consequent truth; I perceive it. Equability of diffusion, first deduced *a priori* and then corroborated by the inspection of phenomena, is also a truth; I fully admit it. So far all is clear around me; there are no clouds behind which the secret—the great secret of the gravitating *modus operandi*—can possibly lie hidden; but this secret lies hereabouts, most assuredly; and were there but a cloud in view I should be driven to suspicion of that cloud." And now, just as I say this, there actually comes a cloud into view. This cloud is the seeming impossibility of reconciling my truth, irradiation, with my truth, equability of diffusion. I say now: "Behind this seeming impossibility is to be found what I desire." I do not say "real impossibility"; for invincible faith in my truths assures me that it is a mere difficulty after all; but I go on to say, with unflinching confidence, that, when this difficulty shall be solved, we shall find, wrapped up in the process of solution, the key to the secret at which we aim. Moreover, I feel that we shall discover but one possible solution of the difficulty; this for the reason that, were there two, one would be supererogatory, would be fruitless, would be empty, would contain no key, since no duplicate key can be needed to any secret of nature.

And now, let us see: Our usual notions of irradiation, in fact, all our distinct notions of it, are caught merely from the process as we see it exemplified in light. Here there is a continuous outpouring of ray-streams, and with a force which we have at least no right to suppose ever varies at all. Now, in any such irradiation as this, continuous and of unvarying force, the regions nearer the centre must inevitably be always more crowded with the irradiated matter than the regions more remote. But I have assumed no such irradiation as this. I assumed no continuous irradiation; and for the simple reason that such an assumption would have involved, first, the necessity of entertaining a conception which I have shown no man can entertain, and which (as I will more fully explain hereafter) all observation of the firmament refutes—the conception of the absolute infinity of the universe of stars; and would have involved, secondly, the impossibility of understanding a reaction, that is, gravitation, as existing now, since, while an act is continued, no reaction, of course, can take place. My assumption, then, or rather my inevitable deduction from just premises, was that of a determinate irradiation, one finally discontinued.

Let me now describe the sole possible mode in which it is conceivable that matter could have been diffused through space, so as to fulfil the conditions at once of irradiation and of generally equable distribution.

For convenience of illustration, let us imagine, in the first place, a hollow sphere of glass, or anything else, occupying the space throughout which the universal matter is to be thus equally diffused, by means of irradiation, from the absolute, irrelative, unconditional particle, placed in the centre of the sphere.

Now, a certain exertion of the diffusive power (presumed to be the Divine Volition)—in other words, a certain force, whose measure is the quantity of matter, that is to say, the number of atoms emitted—emits, by irradiation, this certain number of atoms; forcing them in all directions outwardly from the centre, their proximity to each other diminishing as they proceed, until, finally, they are distributed, loosely, over the interior surface of the sphere.

When these atoms have attained this position, or while proceeding to attain it, a second and inferior exercise of the same force, or a second and inferior force of the same character, emits, in the same manner, that is to say, by irradiation as before, a second stratum of atoms which proceeds to deposit itself upon the first; the number of atoms, in this case as in the former, being, of course, the measure of the force which emitted them; in other words, the force being precisely adapted to the purpose it effects,—the force, and the number of atoms sent out by the force, being directly proportional.

When this second stratum has reached its destined position, or while approaching it, a third still inferior exertion of the force, or a third inferior force of a similar character—the number of atoms emitted being in all cases the measure of the force—proceeds to deposit a third stratum upon the second; and so on, until these concentric strata, growing gradually less and less, come down at length to the central point; and the diffusive matter, simultaneously with the diffusive force, is exhausted.

We have now the sphere filled, through means of irradiation, with atoms equably diffused. The two necessary conditions, those of irradiation and of equable diffusion, are satisfied, and by the sole process in which the possibility of their simultaneous satisfaction is conceivable. For this reason, I confidently expect to find, lurking in the present condition of the atoms as distributed throughout the sphere, the secret of which I am in search—the all-important principle of the *modus operandi* of the Newtonian law. Let us examine, then, the actual condition of the atoms.

They lie in a state of concentric strata. They are equably diffused throughout the sphere. They have been irradiated into these states.

The atoms being equably distributed, the greater the superficial extent of any of these concentric strata, or spheres, the more atoms will lie upon it. In other words, the number of atoms lying upon the surface of any one of the concentric spheres is directly proportional with the extent of that surface.

But in any series of concentric spheres the surfaces are directly proportional with the squares of the distances from the centre.[1]

Therefore the number of atoms in any stratum is directly proportional with the square of that stratum's distance from the centre.

But the number of atoms in any stratum is the measure of the force which emitted that stratum, that is to say, is directly proportional with the force.

Therefore the force which irradiated any stratum is directly proportional with the square of that stratum's distance from the centre; or, generally:

The force of the irradiation has been directly proportional with the squares of the distances.

Now, reaction, as far as we know anything of it, is action conversed. The general principle of gravity being, in the first place, understood as the reaction of an act, as the expression of a desire on the part of

[1] Succinctly—The surfaces of spheres are as the squares of their radii.

matter, while existing in a state of diffusion, to return into the unity whence it was diffused; and, in the second place, the mind being called upon to determine the character of the desire, the manner in which it would naturally be manifested; in other words, being called upon to conceive a probable law, or *modus operandi,* for the return, could not well help arriving at the conclusion that this law or return would be precisely the converse of the law of departure. That such would be the case, any one, at least, would be abundantly justified in taking for granted until such time as some persons should suggest something like a plausible reason why it should not be the case; until such period as a law of return shall be imagined which the intellect can consider as preferable.

Matter, then, irradiated into space with a force varying as the squares of the distances, might, *a priori,* be supposed to return toward its centre of irradiation with a force varying inversely as the squares of the distances: and I have already shown [1] that any principle which will explain why the atoms should tend, according to any law, to the general centre, must be admitted as satisfactorily explaining, at the same time, why, according to the same law, they should tend each to each. For, in fact, the tendency to the general centre is not to a centre as such, but because of its being a point in tending toward which each atom tends

[1] Page 214.

most directly to its real and essential centre, unity—the absolute and final union of all.

The consideration here involved presents to my own mind no embarrassment whatever, but this fact does not blind me to the possibility of its being obscure to those who may have been less in the habit of dealing with abstractions; and, upon the whole, it may be as well to look at the matter from one or two other points of view.

The absolute, irrelative particle primarily created by the volition of God must have been in a condition of positive normality, or rightfulness; for wrongfulness implies relation. Right is positive; wrong is negative, is merely the negation of right; as cold is the negation of heat, darkness of light. That a thing may be wrong, it is necessary that there be some other thing in relation to which it is wrong, some condition which it fails to satisfy; some law which it violates; some being whom it aggrieves. If there be no such being, law, or condition, in respect to which the thing is wrong, and, still more especially, if no beings, laws, or conditions exist at all, then the thing can not be wrong, and consequently must be right. Any deviation from normality involves a tendency to return to it. A difference from the normal, from the right, from the just, can be understood as effected only by the overcoming a difficulty; and if the force which overcomes the difficulty be not infinitely continued, the ineradicable tendency to return will at length be permitted to act for its own satisfaction. Upon withdrawal of the force, the tendency acts. This is the principle of reaction as the inevitable consequence of finite action. Employing a phraseology of which the seeming affectation will be pardoned for its expressiveness, we may say that reaction is the return from the condition of " as it is and ought not to be " into the condition of " as it was, originally, and therefore ought to be "; and let me add here that the absolute force of reaction would, no doubt, be always found in direct proportion with the reality, the truth, the absoluteness, of the originality, if ever it were possible to measure this latter; and, consequently, the greatest of all conceivable reactions must be that produced by the tendency which we now discuss—the tendency to return into the absolutely original, into the supremely primitive. Gravity, then, must be the strongest of forces, an idea reached *a priori* and abundantly confirmed by induction. What use I make of the idea will be seen in the sequel.

The atoms, now, having been diffused from their normal condition of unity, seek to return to—what? Not to any particular point, certainly; for it is clear that if, upon the diffusion, the whole universe of matter had been projected, collectively, to a distance from the point of irradiation, the atomic tendency to the general centre of the sphere would not have been disturbed in the least; the atoms would not have sought the point in absolute space from which they were originally impelled. It is merely the condition, and not the point or locality at which this condition took its rise, that these atoms seek to re-establish; it is merely that condition which is their normality that they desire. "But they seek a centre," it will be said, "and a centre is a point." True; but they seek this point not in its character of point (for, were the whole sphere moved from its position, they would seek, equally, the centre; and the centre then would be a new point), but because it so happens, on account of the form in which they collectively exist (that of the sphere), that only through the point in question, the sphere's centre, they can attain their true object, unity. In the direction of the centre each atom perceives more atoms than in any other direction. Each atom is impelled toward the centre because along the straight line joining it and the centre and passing on to the circumference beyond, there lie a greater number of atoms than along any other straight line, a greater number of objects that seek it, the individual atoms,—a greater number of tendencies to unity, a greater number of satisfactions for its own tendency to unity, in a word, because in the direction of the centre lies the utmost possibility of satisfaction, generally, for its own individual appetite. To be brief, the condition, unity, is all that is really sought; and if the atoms seem to seek the centre of the sphere it is only impliedly, through implication, because such centre happens to imply, to include, or to involve, the only essential centre, unity. But on account of this implication or involution, there is no possibility of practically separating the tendency to unity in the abstract from the tendency to the concrete centre. Thus the tendency of the atoms to the general centre is, to all practical intents and for all logical purposes, the tendency each to each; and the tendency each to each is the tendency to the centre; and the one tendency may be assumed as the other; whatever will apply to the one must be thoroughly applicable to the other; and, in conclusion, whatever principle will satisfactorily explain the one cannot be questioned as an explanation of the other.

In looking carefully around me for a rational objection to what I have advanced, I am able to discover nothing; but of that class of objections usually urged by the doubters for doubt's sake, I very readily perceive three; and proceed to dispose of them in order.

It may be said, first: " That the proof that the force of irradiation (in the case described) is directly proportional to the squares of the distances, depends upon an unwarranted assumption,—that of the number of atoms in each stratum being the measure of the force with which they are emitted."

I reply, not only that I am warranted in such assumption, but that I should be utterly unwarranted in any other. What I assume is, simply, that an effect is the measure of its cause, that every exercise of the Divine Will will be proportional to that which demands the exertion; that the means of Omnipotence, or Omniscience, will be exactly adapted to its purposes. Neither can a deficiency nor an excess of cause bring to pass any effect. Had the force which irradiated any stratum to its position been either more or less than was needed for the purpose, that is to say, not directly proportional to the purpose, then to its position that stratum could not have been irradiated. Had the force which, with a view to general equability of distribution, emitted the proper number of atoms for each stratum been not directly proportional to the number, then the number would not have been the number demanded for the equable distribution.

The second supposable objection is somewhat better entitled to an answer.

It is an admitted principle in dynamics that everybody on receiving an impulse, or disposition to move, will move onward in a straight line, in the direction imparted by the impelling force, until deflected, or stopped, by some other force. How then, it may be asked, is my first or external stratum of atoms to be understood as discontinuing their movement at the circumference of the imaginary glass sphere, when no second force, of more than an imaginary character, appears, to account for the discontinuance ?

I reply that the objection in this case actually does arise out of " an unwarranted assumption," on the part of the objector,—the assumption of a principle, in dynamics, at an epoch when no " principles," in anything, exist. I use the word " principle," of course, in the objector's understanding of the word.

" In the beginning " we can admit, indeed, we can comprehend, but one First Cause, the truly ultimate principle, the volition of God. The primary act, that of irradiation from unity, must have been independent of all that which the world now calls " principle," because all that we so designate is but a consequence of the reaction of that primary act: I say " primary" act; for the creation of the absolute material particle is more properly to be regarded as a conception than as an " act " in the ordinary meaning of the term. Thus, we must regard the primary act as an act for the establishment of what we now call " principle." But this primary act itself is to be considered as continuous Volition. The thought of God is to be understood as originating the diffusion, as proceeding with it, as regulating it, and, finally, as being withdrawn from it upon its completion. Then commences reaction, and through reaction, " principle," as we employ the word. It will be advisable, however, to limit the application of this word to the two immediate results of the discontinuance of the Divine Volition, that is, to the two agents, attraction and repulsion. Every other natural agent depends, either more or less immediately, upon these two, and therefore would be more conveniently designated as sub-principle.

It may be objected, thirdly, that, in general, the peculiar mode of distribution which I have suggested for the atoms is "an hypothesis and nothing more."

Now, I am aware that the word hypothesis is a ponderous sledge-hammer, grasped immediately, if not lifted, by all very diminutive thinkers, upon the first appearance of any proposition wearing, in any particular, the garb of a theory. But "hypothesis" cannot be wielded here to any good purpose, even by those who succeed in lifting it—little men or great.

I maintain, first, that only in the mode described is it conceivable that matter could have been diffused so as to fulfil at once the conditions of irradiation and of generally equable distribution. I maintain, secondly, that these conditions themselves have been imposed upon me, as necessities, in a train of ratiocination as rigorously logical as that which establishes any demonstration in Euclid; and I maintain, thirdly, that even if the charge of "hypothesis" were as fully sustained as it is, in fact, unsustained and untenable, still the validity and indisputability of my result would not, even in the slightest particular, be disturbed.

To explain: The Newtonian gravity,—a law of nature, a law whose existence as such no one out of Bedlam questions, a law whose admission as such enables us to account for nine tenths of the universal phenomena, a law which, merely because it does so enable us to account for these phenomena, we are perfectly willing, without reference to any other considerations, to admit, and cannot help admitting, as a law, a law, nevertheless, of which neither the principle nor the *modus operandi* of the principle has ever yet been traced by the human analysis, a law, in short, which, neither in its detail nor in its generality, has been found susceptible of explanation at all,—is at length seen to be at every point thoroughly explicable, provided we only yield our assent to—what? To an hypothesis? Why if an hypothesis, if the merest hypothesis, if an hypothesis for whose assumption, as in the case of that pure hypothesis the Newtonian law itself, no shadow of *a priori* reason could be assigned; if an hypothesis, even so absolute as all this implies, would enable us to perceive a principle for the Newtonian law, would enable us to understand as satisfied conditions so miraculously, so ineffably complex and seemingly irreconcilable as those involved in the relations of which gravity tells us,—what rational being could so expose his fatuity as to call even this absolute hypothesis an hypothesis any longer, unless, indeed, he were to persist in so calling it, with the understanding that he did so, simply for the sake of consistency in words?

But what is the true state of our present case? What is the fact? Not only that it is not an hypothesis which we are required to adopt in order to admit the principle at issue explained, but that it is a logical conclusion which we are requested not to adopt if we can avoid it, which we are simply invited to deny if we can,—a conclusion of so accurate a logicality that to dispute it would be the effort—to doubt its validity, beyond our power; a conclusion from which we see no mode of escape, turn as we will; a result which confronts us either at the end of an inductive journey from the phenomena of the very law discussed, or at the close of a deductive career from the most rigorously simple of all conceivable assumptions—the assumption, in a word, of simplicity itself.

And if here, for the mere sake of cavilling, it be urged that, although my starting-point is, as I assert, the assumption of absolute simplicity, yet simplicity, considered merely in itself, is no axiom; and that only deductions from axioms are indisputable—it is thus that I reply:

Every other science than logic is the science of certain concrete relations. Arithmetic, for example, is the science of the relations of number; geometry, of the relations of form; mathematics in general, of the relations of quantity in general, of whatever can be increased or diminished. Logic, however, is the science of relation in the abstract, of absolute relation, of relation considered solely in itself. An axiom in any particular science other than logic is, thus, merely a proposition announcing certain concrete relations which seem to be too obvious for dispute, as when we say, for instance, that the whole is greater than its part; and, thus again, the principle of the logical axiom, in other words, of an axiom in the abstract, is, simply, obviousness of relation. Now, it is clear, not only that what is obvious to one mind may not be obvious to another, but that what is obvious to one mind at one epoch may be anything but obvious, at another epoch, to the same mind. It is clear, moreover, that what to-day is obvious even to the majority of mankind, or to the majority of the best intellects of mankind, may to-morrow be, to either majority, more or less obvious, or in no respect obvious at all. It is seen, then, that the axiomatic principle itself is susceptible of variation, and of course, that axioms are susceptible of similar change. Being mutable, the "truths" which grow out of them are necessarily mutable too; or, in other words, are never to be positively depended upon as truths at all, since truth and immutability are one.

It will now be readily understood that no axiomatic idea, no idea founded in the fluctuating principle, obviousness of relation, can possibly be so secure, so reliable a basis for any structure erected by the reason, as that idea (whatever it is, wherever we can find it, or if it be practicable to find it anywhere) which is irrelative altogether, which not only presents to the understanding no obviousness of relation, either greater or less, to be considered, but subjects the intellect not in the slightest degree to the necessity of even looking at any relation at all. If such an idea be not what we too heedlessly term "an axiom," it is at least preferable, as a logical basis, to any axiom ever propounded, or to all imaginable axioms combined; and such, precisely, is the idea with which my deductive process, so thoroughly corroborated by induction, commences. My particle proper is but absolute irrelation. To sum up what has been advanced: As a starting-point I have taken it for granted, simply, that the beginning had nothing behind it or before it, that it was a beginning in fact, that it was a beginning and nothing different from a beginning; in short, that this beginning was—that which it was. If this be a "mere assumption," then a "mere assumption" let it be.

To conclude this branch of the subject: I am fully warranted in announcing that the law which we have been in the habit of calling gravity exists on account of matter's having been irradiated, at its origin, atomically, into a limited [1] sphere of space, from one, indi-

[1] "Limited sphere"—a sphere is necessarily limited. I prefer tautology to a chance of misconception.

vidual, unconditional, irrelative, and absolute particle proper, by the sole process in which it was possible to satisfy, at the same time, the two conditions, irradiation, and generally equable distribution throughout the sphere, that is to say, by a force varying in direct proportion with the squares of the distances between the irradiated atoms, respectively, and the particular centre of irradiation.

I have already given my reasons for presuming matter to have been diffused by a determinate rather than by a continuous or infinitely continued force. Supposing a continuous force, we should be unable, in the first place, to comprehend a reaction at all; and we should be required, in the second place, to entertain the impossible conception of an infinite extension of matter. Not to dwell upon the impossibility of the conception, the infinite extension of matter is an idea which, if not positively disproved, is at least not in any respect warranted by telescopic observation of the stars, a point to be explained more fully hereafter; and this empirical reason for believing in the original finity of matter is unempirically confirmed. For example: Admitting, for the moment, the possibility of understanding space fitted with the irradiated atoms, that is to say, admitting, as well as we can, for argument's sake, that the succession of the irradiated atoms had absolutely no end, then it is abundantly clear that, even when the volition of God had been withdrawn from

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Mrs. Clemm's House in Carmine St.
Poe's first home in New York.

them, and thus the tendency to return into unity permitted (abstractly) to be satisfied, this permission would have been nugatory and invalid, practically valueless and of no effect whatever. No reaction could have taken place; no movement toward unity could have been made; no law of gravity could have obtained.

To explain: Grant the abstract tendency of any one atom to any one other as the inevitable result of diffusion from the normal unity; or, what is the same thing, admit any given atom as proposing to move in any given direction, it is clear that, since there is an infinity of atoms on all sides of the atom proposing to move, it never can actually move toward the satisfaction of its tendency in the direction given, on account of a precisely equal and counterbalancing tendency in the direction diametrically opposite. In other words, exactly as many tendencies to unity are behind the hesitating atom as before it; for it is a mere sotticism to say that one infinite line is longer or shorter than another infinite line, or that one infinite number is greater or less than another number that is infinite. Thus the atom in question must remain stationary forever. Under the impossible circumstances which we have been merely endeavoring to conceive for argument's sake, there could have been no aggregate of matter, no stars, no worlds, nothing but a perpetually atomic and inconsequential universe. In fact, view it as we will, the whole idea of unlimited matter is not only untenable, but impossible and preposterous.

With the understanding of a sphere of atoms, however, we perceive at once a satisfiable tendency to union. The general result of the tendency each to each being a tendency of all to the centre, the general process of condensation, or approximation, commences immediately, by a common and simultaneous movement, on withdrawal of the Divine Volition; the individual approximations, or coalescences—not coalitions—of atom with atom, being subject to almost infinite variations of time, degree, and conditions, on account of the excessive multiplicity of relation, arising from the differences of form assumed as characterizing the atoms at the moment of their quitting the particle proper, as well as from the subsequent particular inequidistance, each from each.

What I wish to impress upon the reader is the certainty of there arising, at once (on withdrawal of the diffusive force, or Divine Volition), out of the condition of the atoms as described, at innumerable points throughout the universal sphere, innumerable agglomerations, characterized by innumerable specific differences of form, size, essential nature, and distance each from each. The development of repulsion (electricity) must have commenced, of course, with the very earliest particular efforts at unity, and must have proceeded constantly in the ratio of coalescence, that is to say, in that of condensation, or, again, of heterogeneity.

Thus the two principles proper, attraction and repulsion, the material and the spiritual, accompany each other, in the strictest fellowship, forever. Thus the body and the soul walk hand in hand.

If now, in fancy, we select any one of the agglomerations considered as in their primary stages throughout the universal sphere, and suppose this incipient agglomeration to be taking place at that point where the centre of our sun exists, or rather where it did exist originally, for the sun is perpetually shifting its position, we shall find ourselves met, and borne onward for a time at least, by the most magnificent of theories, by the Nebular Cosmogony of Laplace; although "cosmogony" is far too comprehensive a term for what he really discusses, which is the constitution of our solar system alone, of one among the myriad of similar systems which make up the universe proper,—that universal sphere, that all-inclusive and absolute kosmos which forms the subject of my present discourse.

Confining himself to an obviously limited region, that of our solar system with its comparatively immediate vicinity, and merely assuming, that is to say, assuming without any basis whatever, either deductive or inductive, much of what I have been just endeavoring to place upon a more stable basis than assumption; assuming, for example, matter as diffused (without pretending to account for the diffusion) throughout, and somewhat beyond, the space occupied by our system, diffused in a state of heterogenous nebulosity and obedient to that omniprevalent law of gravity at whose principle he ventured to make no guess,—assuming all this (which is quite true, although he had no logical right to its assumption), Laplace has shown, dynamically and mathematically, that the results in such case necessarily ensuing are those and those alone which we find manifested in the actually existing condition of the system itself.

To explain: Let us conceive that particular agglomeration of which we have just spoken, the one at the point designated by our sun's centre, to have so far proceeded that a vast quantity of nebulous matter has here assumed a roughly globular form, its centre being, of course, coincident with what is now, or rather was originally, the centre of our sun, and its periphery extending out beyond the orbit of Neptune, the most remote of our planets; in other words, let us suppose the diameter of this rough sphere to be some six thousand millions of miles. For ages, this mass of matter has been undergoing condensation, until at length it has become reduced into the bulk we imagine; having proceeded gradually, of course, from its atomic and imperceptible state into what we understand of visible, palpable, or otherwise appreciable nebulosity.

Now, the condition of this mass implies a rotation about an imaginary axis, a rotation which, commencing with the absolute incipiency of the aggregation, has been ever since acquiring velocity. The very first two atoms which met, approaching each other from points not diametrically opposite, would, in rushing partially past each other, form a nucleus for the rotary movement described. How this would increase in velocity is readily seen. The two atoms are joined by others,—an aggregation is formed. The mass continues to rotate while condensing. But any atom at the circumference has, of course, a more rapid motion than one nearer the centre. The outer atom, however, with its superior velocity, approaches the centre, carrying this superior velocity with it as it goes. Thus every atom, proceeding inwardly, and finally attaching itself to the condensed centre, adds something to the original velocity of that centre, that is to say, increases the rotary movement of the mass.

Let us now suppose this mass so far condensed that it occupies precisely the space circumscribed by the orbit of Neptune, and that the velocity with which the surface of the mass moves, in the general rotation, is precisely that velocity with which Neptune now revolves about the sun. At this epoch, then, we are to understand that the constantly increasing centrifugal force, having gotten the better of the non-increasing centripetal, loosened and separated the exterior and least condensed strata, at the equator of the sphere, where the tangential velocity predominated; so that these strata formed about the main body an independent ring encircling the equatorial regions; just as the exterior portion thrown off by excessive velocity of rotation, from a grindstone, would form a ring about the grindstone but for the solidity of the superficial material; were this caoutchouc, or anything similar in consistency, precisely the phenomenon I describe would be presented.

The ring thus whirled from the nebulous mass, revolved, of course, as a separate ring, with just that velocity with which, while the surface of the mass, it rotated. In the meantime, condensation still proceeding, the interval between the discharged ring and the main body continued to increase until the former was left at a vast distance from the latter.

Now, admitting the ring to have possessed, by some seemingly accidental arrangement of its heterogeneous materials, a constitution nearly uniform, then this ring, as such, would never have ceased revolving about its primary; but, as might have been anticipated, there appears to have been enough irregularity in the disposition of the materials to make them cluster about centres of superior solidity; and thus the annular form was destroyed.[1] No doubt the band was soon broken

[1] Laplace assumed his nebulosity heterogeneous, merely that he might be thus enabled to account for the breaking up of the rings; for had the nebulosity been homogeneous, they would not have broken. I reach the same result, heterogeneity of the secondary masses immediately resulting from the atoms purely from an *a priori* consideration of their general design—relation.

up into several portions, and one of these portions, predominating in mass, absorbed the others into itself, the whole settling, spherically, into a planet. That this latter, as a planet, continued the revolutionary movement which characterized it while a ring is sufficiently clear; and that it took upon itself, also, an additional movement, in its new condition of sphere, is readily explained. The ring being understood as yet unbroken, we see that its exterior, while the whole revolves about the parent body, moves more rapidly than its interior. When the rupture occurred, then, some portion in each fragment must have been moving with greater velocity than the others. The superior movement prevailing must have whirled each fragment round, that is to say, have caused it to rotate; and the direction of the rotation must, of course, have been the direction of the revolution whence it arose. All the fragments having become subject to the rotation described, must, in coalescing, have imparted it to the one planet constituted by their coalescence. This planet was Neptune. Its material continuing to undergo condensation, and the centrifugal force generated in its rotation, getting, at length, the better of the centripetal, as before in the case of the parent orb, a ring was whirled also from the equatorial surface of this planet; this ring, having been uniform in its constitution, was broken up, and its several fragments, being absorbed by the most massive, were collectively spherified into a moon. Subsequently the operation was repeated, and a second moon was the result. We thus account for the planet Neptune, with the two satellites which accompany him.

In throwing off a ring from its equator, the sun re-established that equilibrium between its centripetal and centrifugal forces which had been disturbed in the process of condensation; but, as this condensation still proceeded, the equilibrium was again immediately disturbed, through the increase of rotation. By the time the mass had so far shrunk that it occupied a spherical space just that circumscribed by the orbit of Uranus, we are to understand that the centrifugal force had so far obtained the ascendency that new relief was needed; a second equatorial band was consequently thrown off, which, proving ununiform, was broken up, as before in the case of Neptune, the fragments settling into the planet Uranus, the velocity of whose actual revolution about the sun indicates, of course, the rotary speed of that sun's equatorial surface at the moment of the separation. Uranus, adopting a rotation from the collective rotations of the fragments composing it, as previously explained, now threw off ring after ring; each of which, becoming broken up, settled into a moon, three moons, at different epochs, having been formed, in this manner, by the rupture and general spherification of as many distinct ununiform rings.

By the time the sun had shrunk until it occupied a space just that circumscribed by the orbit of Saturn, the balance, we are to suppose, between its centripetal and centrifugal forces had again become so far disturbed, through increase of rotary velocity, the result of condensation, that a third effort at equilibrium became necessary; and an annular band was therefore whirled off, as twice before, which, on rupture through ununiformity, became consolidated into the planet Saturn. This latter threw off, in the first place, seven uniform bands, which, on rupture, were spherified respectively into as many moons; but, subsequently, it appears to have discharged, at three distinct but not very distant epochs, three rings whose equability of constitution was, by apparent accident, so considerable as to present no occasion for their rupture; thus they continue to revolve as rings. I use the phrase "apparent accident"; for of accident in the ordinary sense there was, of course, nothing; the term is properly applied only to the result of indistinguishable or not immediately traceable law.

Shrinking still farther, until it occupied just the space circumscribed by the orbit of Jupiter, the sun now found need of further effort to restore the counterbalance of its two forces, continually disarranged in the still continued increase of rotation. Jupiter, accordingly, was now thrown off, passing from the annular to the planetary condition; and, on attaining this latter, threw off in its turn, at four different epochs, four rings, which finally resolved themselves into so many moons.

Still shrinking, until its sphere occupied just the space defined by the orbit of the Asteroids, the sun now discarded a ring which appears to have had eight centres of superior solidity, and, on breaking up, to have separated into eight fragments, no one of which so far predominated in mass as to absorb the others. All, therefore, as distinct although comparatively small planets, proceeded to revolve in orbits whose distances, each from each, may be considered as in some degree the measure of the force which drove them asunder, all the orbits, nevertheless, being so closely coincident as to admit of our calling them one, in view of the other planetary orbits.

Continuing to shrink, the sun, on becoming so small as just to fill the orbit of Mars, now discharged this planet, of course by the process repeatedly described. Having no moon, however, Mars could have thrown off no ring. In fact, an epoch had now arrived in the career of the parent body, the centre of the system. The decrease of its nebulosity, which is the increase of its density, and which again is the decrease of its condensation, out of which latter arose the constant disturbance of equilibrium, must, by this period, have attained a point at which the efforts for restoration would have been more and more ineffectual just in proportion as they were less frequently needed. Thus the processes of which we have been speaking would everywhere show signs of exhaustion—in the planets, first; and, secondly, in the original mass. We must not fall into the error of supposing the decrease of interval observed among the planets as we approach the sun to be in any respect indicative of an increase of frequency in the periods at which they were discarded. Exactly the converse is to be understood. The longest interval of time must have occurred between the discharges of the two interior; the shortest, between those of the two exterior, planets. The decrease of the interval of space is, nevertheless, the measure of the density, and thus inversely of the condensation, of the sun, throughout the processes detailed.

Having shrunk, however, so far as to fill only the orbit of our earth, the parent sphere whirled from itself still one other body, the earth, in a condition so nebulous as to admit of this body's discarding, in its turn, yet another, which is our moon; but here terminated the lunar formations.

Finally, subsiding to the orbits first of Venus and then of Mercury, the sun discarded these two interior planets, neither of which has given birth to any moon.

Thus from his original bulk, or, to speak more accurately, from the condition in which we first considered him, from a partially spherified nebular mass, certainly much more than 5,600,000,000 of miles in diameter, the great central orb and origin of our solar-planetary-lunar system, has gradually descended, by condensation, in obedience to the law of gravity, to a globe only 882,000 miles in diameter; but it by no means follows, either that its condensation is yet complete, or that it may not still possess the capacity of whirling from itself another planet.

I have here given, in outline, of course, but still with all the detail necessary for distinctness, a view of the Nebular Theory as its author himself conceived it. From whatever point we regard it, we shall find it beautifully true. It is by far too beautiful, indeed, not to possess truth as its essentiality, and here I am very profoundly serious in what I say. In the revolution of the satellites of Uranus, there does appear something seemingly inconsistent with the assumptions of Laplace; but that one inconsistency can invalidate a theory constructed from a million of intricate consistencies is a fancy fit only for the fantastic. In prophesying, confidently, that the apparent anomaly to which I refer will, sooner or later, be found one of the strongest possible corroborations of the general hypothesis, I pretend to no especial spirit of divination. It is a matter which the only difficulty seems not to foresee.[1]

The bodies whirled off in the processes described,

[1] I am prepared to show that the anomalous revolution of the satellites of Uranus is a simply perspective anomaly arising from the inclination of the axis of the planet.

would exchange, it has been seen, the superficial rotation of the orbs whence they originated for a revolution of equal velocity about these orbs as distant centres; and the revolution thus engendered must proceed, so long as the centripetal force, or that with which the discarded body gravitates toward its parent, is neither greater nor less than that by which it was discarded; that is, than the centrifugal, or, far more properly, than the tangential, velocity. From the unity, however, of the origin of these two forces, we might have expected to find them as they are found, the one accurately counterbalancing the other. It has been shown, indeed, that the act of whirling off is, in every case, merely an act for the preservation of the counterbalance.

After referring, however, the centripetal force to the omniprevalent law of gravity, it has been the fashion with astronomical treatises to seek beyond the limits of mere nature, that is to say, of secondary cause, a solution of the phenomenon of tangential velocity. This latter they attribute directly to a First Cause, to God. The force which carries a stellar body around its primary they assert to have originated in an impulse given immediately by the finger,—this is the childish phraseology employed,—by the finger of Deity itself. In this view, the planets, fully formed, are conceived to have been hurled from the Divine hand to a position in the vicinity of the suns, with an impetus mathematically adapted to the masses, or attractive capacities, of the suns themselves. An idea so grossly unphilosophical, although so supinely adopted, could have arisen only from the difficulty of otherwise accounting for the absolutely accurate adaptation, each to each, of two forces so seemingly independent, one of the other, as are the gravitating and tangential. But it should be remembered that, for a long time, the coincidence between the moon's rotation and her sidereal revolution, two matters seemingly far more independent than those now considered, was looked upon as positively miraculous; and there was a strong disposition, even among astronomers, to attribute the marvel to the direct and continual agency of God, who, in this case, it was said, had found it necessary to interpose, specially, among His general laws, a set of subsidiary regulations for the purpose of forever concealing from mortal eyes the glories, or perhaps the horrors, of the other side of the moon,—of that mysterious hemisphere which has always avoided, and must perpetually avoid, the telescopic scrutiny of mankind. The advance of science, however, soon demonstrated, what to the philosophical instinct needed no demonstration, that the one movement is but a portion, something more, even, than a consequence, of the other.

For my part, I have no patience with fantasies at once so timorous, so idle, and so awkward. They belong to the veriest cowardice of thought. That nature and the God of nature are distinct, no thinking being can long doubt. By the former we imply merely the laws of the latter. But with the very idea of God, omnipotent, omniscient, we entertain, also, the idea of the infallibility of His laws. With Him there being neither past nor future, with Him all being now, do we not insult Him in supposing His law so contrived as not to provide for every possible contingency? or, rather, what idea can we have of any possible contingency except that it is at once a result and a manifestation of His laws? He who, divesting himself of prejudice, shall have the rare courage to think absolutely for himself, cannot fail to arrive, in the end, at the condensation "laws" into "Law," cannot fail of reaching the conclusion that each law of nature is dependent at all points upon all other laws, and that all are but consequences of but one primary exercise of the Divine Volition. Such is the principle of the cosmogony which, with all necessary deference, I here venture to suggest and to maintain.

In this view it will be seen that, dismissing as frivolous, and even impious, the fancy of the tangential force having been imparted to the planets immediately by "the finger of God," I consider this force as originating in the rotation of the stars; this rotation as brought about by the in-rushing of the primary atoms toward their respective centres of aggregation; this in-rushing as the consequence of the law of gravity; this law as but the mode in which is necessarily manifested the tendency of the atoms to return into imparticularity; this tendency to return as but the inevitable reaction of the first and most sublime of acts,—that act by which a God, self-existing and alone existing, became all things at once, through dint of His volition, while all things were thus constituted a portion of God.

The radical assumptions of this discourse suggest to me, and in fact imply, certain important modifications of the Nebular Theory as given by Laplace. The efforts of the repulsive power I have considered as made for the purpose of preventing contact among the atoms, and thus as made in the ratio of the approach to contact, that is to say, in the ratio of condensation.[1] In other words, electricity, with its involute phenomena, heat, light, and magnetism, is to be understood as proceeding as condensation proceeds, and, of course, inversely, as destiny proceeds, or the cessation to condense. Thus the sun, in the process of its aggregation, must soon, in developing repulsion, have become excessively heated, perhaps incandescent; and we can perceive how the operation of discarding its rings must have been materially assisted by the slight incrustation of its surface consequent on cooling. Any common experiment shows us how readily a crust of the char-

[1] See page 242.

acter suggested is separated, through heterogeneity, from the interior mass. But, on every successive rejection of the crust, the new surface would appear incandescent as before; and the period at which it would again become so far incrusted as to be readily loosened and discharged may well be imagined as exactly coincident with that at which a new effort would be needed, by the whole mass, to restore the equilibrium of the two forces, disarranged through condensation. In other words, by the time the electric influence (repulsion) has prepared the surface for rejection, we are to understand that the gravitating influence (attraction) is precisely ready to reject it. Here, then, as everywhere, the body and the soul walk hand in hand.

These ideas are empirically confirmed at all points. Since condensation can never, in any body, be considered as absolutely at an end, we are warranted in anticipating that whenever we have an opportunity of testing the matter, we shall find indications of resident luminosity in all the stellar bodies, moons and planets as well as suns. That our moon is strongly self-luminous we see at every total eclipse, when, if not so, she would disappear. On the dark part of the satellite, too, during her phases, we often observe flashes like our own Auroras; and that these latter, with our various other so-called electrical phenomena, without reference to any more steady radiance, must give our earth a certain appearance of luminosity to an inhabitant of the moon, is quite evident. In fact, we should regard all the phenomena referred to as mere manifestations, in different moods and degrees, of the earth's feebly continued condensation.

If my views are tenable, we should be prepared to find the newer planets, that is to say, those nearer the sun, more luminous than those older and more remote; and the extreme brilliancy of Venus (on whose dark portions, during her phases, the Auroras are frequently visible) does not seem to be altogether accounted for by her proximity to the central orb. She is no doubt vividly self-luminous, although less so than Mercury; while the luminosity of Neptune may be comparatively nothing.

Admitting what I have urged, it is clear that, from the moment of the sun's discarding a ring, there must be a continuous diminution both of his heat and light, on account of the continuous incrustation of his surface; and that a period would arrive, the period immediately previous to a new discharge, when a very material decrease of both light and heat must become apparent. Now, we know that tokens of such changes are distinctly recognizable. On the Melville Islands, to adduce merely one out of a hundred examples, we find traces of ultra-tropical vegetation, of plants that never could have flourished without immensely more light and heat than are at present afforded by our sun to any portion of the surface of the earth. Is such vegetation referable to an epoch immediately subsequent to the whirling off of Venus? At this epoch must have occurred to us our greatest access of solar influence; and, in fact, this influence must then have attained its maximum, leaving out of view, of course, the period when the earth itself was discarded—the period of its mere organization.

Again, we know that there exist non-luminous suns, that is to say, suns whose existence we determine through the movements of others, but whose luminosity is not sufficient to impress us. Are these suns invisible merely on account of the length of time elapsed since their discharge of a planet? And yet again: may we not, at least in certain cases, account for the sudden appearances of suns where none had been previously suspected, by the hypothesis that, having rolled with incrusted surfaces throughout a few thousand years of our astronomical history, each of these suns, in whirling off a new secondary, has at length been enabled to display the glories of its still incandescent interior? To the well-ascertained fact of the proportional increase of heat as we descend into the earth, I need of course do nothing more than refer; it comes in the strongest possible corroboration of all that I have said on the topic now at issue.

In speaking, not long ago, of the repulsive or electrical influence, I remarked that "the important phenomena of vitality, consciousness, and thought, whether we observe them generally or in detail, seem to proceed at least in the ratio of the heterogeneous."[1] I mentioned, too, that I would recur to the suggestion, and this is the proper point at which to do so. Looking at the matter first in detail, we perceive that not merely the manifestation of vitality, but its importance, consequences, and elevation of character, keep pace very closely with the heterogeneity or complexity of the animal structure. Looking at the question now in its generality, and referring to the first movements of the atoms toward mass-constitution, we find that heterogeneousness, brought about directly through condensation, is proportional with it forever. We thus reach the proposition that the importance of the development of the terrestrial vitality proceeds equably with the terrestrial condensation.

Now, this is in precise accordance with what we know of the succession of animals on the earth. As it has proceeded in its condensation, superior and still superior races have appeared. Is it impossible that the successive geological revolutions which have attended, at least, if not immediately caused, these successive elevations of vitalic character—is it improbable that these revolutions have themselves been produced by the successive planetary discharges from the sun, in other words, by the successive variations in the solar influence on the earth? Were this idea tenable,

[1] Page 205.

we should not be unwarranted in the fancy that the discharge of yet a new planet, interior to Mercury, may give rise to yet a new modification of the terrestrial surface, a modification from which may spring a race both materially and spiritually superior to man. These thoughts impress me with all the force of truth, but I throw them out, of course, merely in their obvious character of suggestion.

The Nebular Theory of Laplace has lately received far more confirmation than it needed at the hands of the philosopher, Comte. These two have thus together shown, not, to be sure, that matter at any period actually existed as described, in a state of nebular diffusion, but that, admitting it so to have existed through the space and much beyond the space now occupied by our solar system, and to have commenced a movement toward a centre, it must gradually have assumed the various forms and motions which are now seen, in that system, to obtain. A demonstration such as this, a dynamical and mathematical demonstration, as far as demonstration can be, unquestionable and unquestioned, unless, indeed, by that unprofitable and disreputable tribe, the professional questioners,—the mere madmen who deny the Newtonian law of gravity on which the results of the French mathematicians are based,—a demonstration, I say, such as this, would to most intellects be conclusive, and I confess that it is so to mine, of the validity of the nebular hypothesis upon which the demonstration depends.

That the demonstration does not prove the hypothesis, according to the common understanding of the word "proof," I admit, of course. To show that certain existing results, that certain established facts, may be, even mathematically, accounted for by the assumption of a certain hypothesis, is by no means to establish the hypothesis itself. In other words, to show that, certain data being given, a certain existing result might, or even must, have ensued, will fail to prove that this result did ensue, from the data, until such time as it shall be also shown that there are, and can be, no other data from which the result in question might equally have ensued. But, in the case now discussed, although all must admit the deficiency, of what we are in the habit of terming "proof," still there are many intellects, and those of the loftiest order, to which no proof could bring one iota of additional conviction. Without going into details which might impinge upon the cloud-land of metaphysics, I may as well here observe that the force of conviction, in cases such as this, will always, with the right-thinking, be proportional to the amount of complexity intervening between the hypothesis and the result. To be less abstract: The greatness of the complexity found existing among cosmical conditions, by rendering great in the same proportion the difficulty of accounting for all these conditions, at once strengthens, also in the same proportion, our faith in that hypothesis which does, in such manner, satisfactorily account for them; and as no complexity can well be conceived greater than that of the astronomical conditions, so no conviction can be stronger, to my mind at least, than that with which I am impressed by an hypothesis that not only reconciles these conditions, with mathematical accuracy, and reduces them into a consistent and intelligible whole, but is, at the same time, the sole hypothesis by means of which the human intellect has been ever enabled to account for them at all.

A most unfounded opinion has been latterly current in gossiping and even in scientific circles, the opinion that the so-called Nebular Cosmogony has been overthrown. This fancy has arisen from the report of late observations made, among what hitherto have been termed the "nebulæ," through the large telescope of Cincinnati and the world-renowned instrument of Lord Rosse. Certain spots in the firmament which presented, even to the most powerful of the old telescopes, the appearance of nebulosity or haze, had been regarded for a long time as confirming the theory of Laplace. They were looked upon as stars in that very process of condensation which I have been attempting to describe. Thus it was supposed that we "had ocular evidence"—an evidence, by the way, which has always been found very questionable—of the truth of the hypothesis; and, although certain telescopic improvements, every now and then, enabled us to perceive that a spot, here and there, which we had been classing among the nebulæ, was, in fact, but a cluster of stars deriving its nebular character only from its immensity of distance, still it was thought that no doubt could exist as to the actual nebulosity of numerous other masses, the strongholds of the nebulists, bidding defiance to every effort at segregation. Of these latter the most interesting was the great " nebula " in the constellation Orion; but this, with innumerable other miscalled " nebulæ," when viewed through the magnificent modern telescopes, has become resolved into a simple collection of stars. Now this fact has been very generally understood as conclusive against the Nebular Hypothesis of Laplace; and, on announcement of the discoveries in question, the most enthusiastic defender and most eloquent popularizer of the theory, Dr. Nichol, went so far as to " admit the necessity of abandoning" an idea which had formed the material of his most praiseworthy book.[1]

Many of my readers will no doubt be inclined to say that the result of these new investigations has at least

[1] *Views of the Architecture of the Heavens.* A letter, purporting to be from Dr. Nichol to a friend in America, went the rounds of our newspapers about two years ago, I think, admitting the " necessity " to which I refer. In a subsequent lecture, however, Dr. N. appears in some manner to have gotten the better of the necessity and does not quite renounce the theory, although he seems to wish that he could sneer at it as " a purely hypothetical one." What else was the law of gravity before the Maskelyne experiments ? and who questioned the law of gravity even then ?

a strong tendency to overthrow the hypothesis; while some of them, more thoughtful, will suggest that, although the theory is by no means disproved through the segregation of the particular " nebulæ " alluded to, still a failure to segregate them, with such telescopes, might well have been understood as a triumphant corroboration of the theory: and this latter class will be surprised, perhaps, to hear me say that even with them I disagree. If the propositions of this discourse have been comprehended, it will be seen that, in my view, a failure to segregate the " nebulæ " would have tended to the refutation, rather than to the confirmation, of the Nebular Hypothesis.

Let me explain: The Newtonian law of gravity we may, of course, assume as demonstrated. This law, it will be remembered, I have referred to the reaction of the first Divine Act—to the reaction of an exercise of the Divine Volition temporarily overcoming a difficulty. This difficulty is that of forcing the normal into the abnormal, of impelling that whose originality, and therefore whose rightful condition, was one, to take upon itself the wrongful condition of many. It is only by conceiving this difficulty as temporarily overcome that we can comprehend a reaction. There could have been no reaction had the act been infinitely continued. So long as the act lasted, no reaction, of course, could commence; in other words, no gravitation could take place, for we have considered the one as but the manifestation of the other. But gravitation has taken place; therefore the act of Creation has ceased; and gravitation has long ago taken place; therefore the act of Creation has long ago ceased. We can no more expect, then, to observe the primary processes of Creation; and to these primary processes the condition of nebulosity has already been explained to belong.

Through what we know of the propagation of light, we have direct proof that the more remote of the stars have existed, under the forms in which we now see them, for an inconceivable number of years. So far back at least, then, as the period when these stars underwent condensation, must have been the epoch at which the mass-constitutive processes began. That we may conceive these processes, then, as still going on in the case of certain "nebulæ," while in all other cases we find them thoroughly at an end, we are forced into assumptions for which we have really no basis whatever; we have to thrust in, again, upon the revolting reason the blasphemous idea of special interposition; we have to suppose that, in the particular instances of these "nebulæ," an unerring God found it necessary to introduce certain supplementary regulations, certain improvements of the general law, certain re-touchings and emendations, in a word, which had the effect of deferring the completion of these individual stars for centuries of centuries beyond the area during which all the other stellar bodies had time, not only to be fully constituted, but to grow hoary with an unspeakable old age.

Of course, it will be immediately objected that since the light by which we recognize the nebulæ now must be merely that which left their surfaces a vast number of years ago, the processes at present observed, or supposed to be observed, are, in fact, not processes now actually going on, but the phantoms of processes completed long in the past, just as I maintain all these mass-constitutive processes must have been.

To this I reply that neither is the now-observed condition of the condensed stars their actual condition, but a condition completed long in the past; so that my argument drawn from the relative condition of the stars and the "nebulæ" is in no manner disturbed. Moreover, those who maintain the existence of nebulæ do not refer the nebulosity to extreme distance; they declare it a real and not merely a perspective nebulosity. That we may conceive, indeed, a nebular mass as visible at all, we must conceive it as very near us in comparison with the condensed stars brought into view by the modern telescopes. In maintaining the appearances in question, then, to be really nebulous, we maintain their comparative vicinity to our own point of view. Thus, their condition, as we see them now, must be referred to an epoch far less remote than that to which we may refer the now-observed condition of at least the majority of the stars. In a word, should astronomy ever demonstrate a "nebula," in the sense at present intended, I should consider the Nebular Cosmogony, not, indeed, as corroborated by the demonstration, but as thereby irretrievably overthrown.

By way, however, of rendering unto Cæsar no more than the things that are Cæsar's, let me here remark that the assumption of the hypothesis which led him to so glorious a result seems to have been suggested to Laplace in great measure by a misconception, by the very misconception of which we have just been speaking, by the generally prevalent misunderstanding of the character of the nebulæ, so mis-named. These he supposed to be, in reality, what their designation implies. The fact is, this great man had, very properly, an inferior faith in his own merely perceptive powers. In respect, therefore, to the actual existence of nebulæ, an existence so confidently maintained by his telescopic contemporaries, he depended less upon what he saw than upon what he heard.

It will be seen that the only valid objections to his theory are those made to its hypothesis as such; to what suggested it, not to what it suggests; to its propositions rather than to its results. His most unwarranted assumption was that of giving the atoms a movement toward a centre, in the very face of his evident understanding that these atoms, in unlimited succession, extended throughout the universal space.

I have already shown that, under such circumstances, there could have occurred no movement at all; and Laplace, consequently, assumed one on no more philosophical ground than that something of the kind was necessary for the establishment of what he intended to establish.

His original idea seems to have been a compound of the true Epicurean atoms with the false nebulæ of his contemporaries; and thus his theory presents us with the singular anomaly of absolute truth deduced, as a mathematical result, from a hybrid datum of ancient imagination intertangled with modern inacumen. Laplace's real strength lay, in fact, in an almost miraculous mathematical instinct; on this he relied, and in no instance did it fail or deceive him: in the case of the Nebular Cosmogony, it led him, blindfolded, through a labyrinth of error into one of the most luminous and stupendous temples of truth.

Let us now fancy, for the moment, that the ring first thrown off by the sun, that is to say, the ring whose breaking up constituted Neptune, did not, in fact, break up until the throwing off of the ring out of which Uranus arose; that this latter ring, again, remained perfect until the discharge of that out of which sprang Saturn; that this latter, again, remained entire until the discharge of that from which originated Jupiter, and so on. Let us imagine, in a word, that no dissolution occurred among the rings until the final rejection of that which gave birth to Mercury. We thus paint to the eye of the mind a series of co-existent concentric circles; and looking as well at them as at the processes by which, according to Laplace's hypothesis, they were constructed, we perceive at once a very singular analogy with the atomic strata and the process of the original irradiation as I have described it. Is it impossible that, on measuring the forces, respectively, by which each successive planetary circle was thrown off, that is to say, on measuring the successive excesses of rotation over gravitation which occasioned the successive discharges, we should find the analogy in question more decidedly confirmed? Is it improbable that we should discover these forces to have varied as, in the original radiation, proportionably to the squares of the distances?

Our solar system, consisting, in chief, of one sun, with sixteen planets certainly, and possibly a few more, revolving about it at various distances, and attended by seventeen moons assuredly, but very probably by several others, is now to be considered as an example of the innumerable agglomerations which proceeded to take place throughout the universal sphere of atoms on withdrawal of the Divine Volition. I mean to say that our solar system is to be understood as affording a generic instance of these agglomerations, or, more correctly, of the ulterior conditions at which they arrived. If we keep our attention fixed on the idea of the utmost possible relation as the Omnipotent design, and on the precautions taken to accomplish it through difference of form, among the original atoms, and particular inequidistance, we shall find it impossible to suppose for a moment that even any two of the incipient agglomerations reached precisely the same result in the end. We shall rather be inclined to think that no two stellar bodies in the universe, whether suns, planets, or moons, are particularly, while all are generally, similar. Still less, then, can we imagine any two assemblages of such bodies, any two "systems," as having more than a general resemblance.[1] Our telescopes at this point thoroughly confirm our deductions. Taking our own solar system, then, as merely a loose or general type of all, we have so far proceeded in our subject as to survey the universe under the aspect of a spherical space, throughout which, dispersed with merely general equability, exist a number of but generally similar systems.

Let us now, expanding our conceptions, look upon each of these systems as in itself an atom; which, in fact, it is, when we consider it as but one of the countless myriads of systems which constitute the universe. Regarding all, then, as but colossal atoms, each with

[1] It is not impossible that some unlooked-for optical improvement may disclose to us, among innumerable varieties of systems, a luminous sun, encircled by luminous and non-luminous rings, within and without, and between which revolve luminous and non-luminous planets, attended by moons having moons, and even these latter again having moons.

the same ineradicable tendency to unity which characterizes the actual atoms of which it consists, we enter at once upon a new order of aggregations. The smaller systems, in the vicinity of a larger one, would inevitably be drawn into still closer vicinity. A thousand would assemble here; a million there, perhaps here, again, even a billion, leaving thus immeasurable vacancies in space. And if, now, it be demanded why, in the case of these systems, of these merely Titanic atoms, I speak simply of an " assemblage," and not, as in the case of the actual atoms, of a more or less consolidated agglomeration; if it be asked, for instance, why I do not carry what I suggest to its legitimate conclusion, and describe at once these assemblages of system-atoms as rushing to consolidation in spheres, as each becoming condensed into one magnificent sun, my reply is that *μέλλοντα ταῦτα:* I am but pausing for a moment on the awful threshold of the future. For the present, calling these assemblages " clusters," we see them in the incipient stages of their consolidation. Their absolute consolidation is to come.

We have now reached a point from which we behold the universe as a spherical space, interspersed, unequably, with clusters. It will be noticed that I here prefer the adverb " unequably " to the phrase " with a merely general equability," employed before. It is evident, in fact, that the equability of distribution will diminish in the ratio of the agglomerative processes, that is to say, as the things distributed diminish in number. Thus the increase of inequability, an increase which must continue until, sooner or later, an epoch will arrive at which the largest agglomeration will absorb all the others, should be viewed as simply a corroborative indication of the tendency to one.

And here, at length, it seems proper to inquire whether the ascertained facts of astronomy confirm the general arrangement which I have thus deductively assigned to the heavens. Thoroughly, they do. Telescopic observation, guided by the laws of perspective, enables us to understand that the perceptible universe exists as a cluster of clusters, irregularly disposed.

The "clusters" of which this universal "cluster of clusters" consists are merely what we have been in the practice of designating "nebulæ," and of these "nebulæ," one is of paramount interest to mankind. I allude to the Galaxy, or Milky Way. This interests us, first and most obviously, on account of its great superiority in apparent size, not only to any one other cluster in the firmament, but to all the other clusters taken together. The largest of these latter occupies a mere point, comparatively, and is distinctly seen only with the aid of a telescope. The Galaxy sweeps throughout the heaven and is brilliantly visible to the naked eye. But it interests man chiefly, although less immediately, on account of its being his home; the home of the earth on which he exists; the home of the sun about which this earth revolves; the home of that "system" of orbs of which the sun is the centre and primary, the earth one of sixteen secondaries or planets, the moon one of seventeen tertiaries or satellites. The Galaxy, let me repeat, is but one of the clusters which I have been describing, but one of the mis-called "nebulæ" revealed to us, by the telescope alone, sometimes, as faint hazy spots in various quarters of the sky. We have no reason to suppose the Milky Way really more extensive than the least of these "nebulæ." Its vast superiority in size is but an apparent superiority arising from our position in regard to it, that is to say, from our position in its midst. However strange the assertion may at first appear to those unversed in astronomy, still the astronomer himself has no hesitation in asserting that we are in the midst of that inconceivable host of stars, of suns, of systems, which constitute the Galaxy. Moreover, not only have we—not only has our sun a right to claim the Galaxy as its own special cluster, but, with slight reservation, it may be said that all the distinctly visible stars of the firmament, all the stars visible to the naked eye, have equally a right to claim it as their own.

There has been a great deal of misconception in respect to the shape of the Galaxy; which in nearly all our astronomical treatises is said to resemble that of a capital Y. The cluster in question has, in reality, a certain general, very general resemblance to the planet

Saturn, with its encompassing triple ring. Instead of the solid orb of that planet, however, we must picture to ourselves a lenticular star-island, or collection of stars, our sun lying eccentrically, near the shore of the island, on that side of it which is nearest the constellation of the Cross and farthest from that of Cassiopeia. The surrounding ring, where it approaches our position, has in it a longitudinal gash, which does, in fact, cause the ring in our vicinity to assume, loosely, the appearance of a capital Y.

We must not fall into the error, however, of conceiving the somewhat indefinite girdle as at all remote, comparatively speaking, from the also indefinite lenticular cluster which it surrounds; and thus, for mere purpose of explanation, we may speak of our sun as actually situated at that point of the Y where its three component lines unite; and, conceiving this letter to be of a certain solidity, of a certain thickness, very trivial in comparison with its length, we may even speak of our position as in the middle of this thickness. Fancying ourselves thus placed, we shall no longer find difficulty in accounting for the phenomena presented, which are perspective altogether. When we look upward or downward, that is to say, when we cast our eyes in the direction of the letter's thickness, we look through fewer stars than when we cast them in the direction of its length, or along either of the three component lines. Of course, in the former case, the stars appear scattered; in the latter, crowded. To reverse this explanation: An inhabitant of the earth, when looking, as we commonly express ourselves, at the Galaxy, is then beholding it in some of the directions of its length, is looking along the lines of the Y; but when, looking out into the general heaven, he turns his eyes from the Galaxy, he is then surveying it in the direction of the latter's thickness; and on this account the stars seem to him scattered; while, in fact, they are as close together, on an average, as in the mass of the cluster. No consideration could be better adapted to convey an idea of this cluster's stupendous extent.

If, with a telescope of high space-penetrating power, we carefully inspect the firmament, we shall become aware of a belt of clusters of what we have hitherto called "nebulæ," a band of varying breadth stretching from horizon to horizon, at right angles to the general course of the Milky Way. This band is the ultimate cluster of clusters. This belt is the universe. Our Galaxy is but one, and perhaps one of the most inconsiderable, of the clusters which go to the constitution of this ultimate, universal belt or band. The appearance of this cluster of clusters, to our eyes, as a belt or band, is altogether a perspective phenomenon of the same character as that which causes us to behold our own individual and roughly spherical cluster, the Galaxy, under guise also of a belt, traversing the heavens at right angles to the universal one. The shape of the all-inclusive cluster is, of course, generally, that of each individual cluster which it includes. Just as the scattered stars which, on looking from the Galaxy, we see in the general sky, are, in fact, but a portion of that Galaxy itself, and as closely intermingled with it as any of the telescopic points in what seems the densest portion of its mass, so are the scattered "nebulæ" which, on casting our eyes from the universal belt, we perceive at all points of the firmament; so, I say, are these scattered "nebulæ" to be understood as only perspectively scattered, and as part and parcel of the one supreme and universal sphere.

No astronomical fallacy is more untenable, and none has been more pertinaciously adhered to, than that of the absolute illimitation of the universe of stars. The reasons for limitation, as I have already assigned them, *a priori,* seem to me unanswerable; but, not to speak of these, observation assures us that there is, in numerous directions around us, certainly, if not in all, a positive limit, or, at the very least, affords us no basis whatever for thinking otherwise. Were the succession of stars endless, then the background of the sky would present us an uniform luminosity, like that displayed by the Galaxy, since there could be absolutely no point in all that background at which would not exist a star. The only mode, therefore, in which, under such a state of affairs, we could comprehend the voids which our telescopes find in innumerable directions, would be by supposing the distance of the invisible background so immense that no ray from it has yet been able to reach us at all. That this may be so, who shall venture to deny? I maintain, simply, that we have not even the shadow of a reason for believing that it is so.

When speaking of the vulgar propensity to regard all bodies on the earth as tending merely to the earth's centre, I observed that, "with certain exceptions to be specified hereafter, every body on the earth tended not only to the earth's centre, but in every conceivable direction besides."[1] The "exceptions" refer to those frequent gaps in the heavens where our utmost scrutiny can detect not only no stellar bodies, but no indications of their existence; where yawning chasms, blacker than Erebus, seem to afford us glimpses, through the boundary walls of the universe of stars, into the illimitable universe of vacancy beyond. Now, as any body existing on the earth chances to pass, either through its own movement or the earth's, into a line with any one of these voids, or cosmical abysses, it clearly is no longer attracted in the direction of that void, and for the moment, consequently, is "heavier" than at any period either after or before. Independently of the consideration of these voids, however, and looking only at the generally unequable distribution of

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the stars, we see that the absolute tendency of bodies on the earth to the earth's centre is in a state of perpetual variation.

We comprehend, then, the insulation of our universe. We perceive the isolation of that, of all that which we grasp with the senses. We know that there exists one cluster of clusters, a collection around which, on all sides, extend the immeasurable wildernesses of a space to all human perception untenanted. But because upon the confines of this universe of stars we are compelled to pause, through want of further evidence from the senses, is it right to conclude that, in fact, there is no material point beyond that which we have thus been permitted to attain? Have we, or have we not, an analogical right to the inference that this perceptible universe, that this cluster of clusters, is but one of a series of clusters of clusters, the rest of which are invisible through distance, through the diffusion of their light being so excessive, ere it reaches us, as not to produce upon our retinas a light-impression, or from there being no such emanation as light at all, in these unspeakably distant worlds, or, lastly, from the mere interval being so vast that the electric tidings of their presence in space have not yet, through the lapsing myriads of years, been enabled to traverse that interval?

Have we any right to inferences, have we any ground whatever for visions such as these? If we have a right to them in any degree, we have a right to their infinite extension.

The human brain has obviously a leaning to the "infinite," and fondles the phantom of the idea. It seems to long with a passionate fervor for this impossible conception, with the hope of intellectually believing it when conceived. What is general among the whole race of man, of course no individual of that race can be warranted in considering abnormal; nevertheless, there may be a class of superior intelligences to whom the human bias alluded to may wear all the character of monomania.

My question, however, remains unanswered: Have we any right to infer, let us say, rather, to imagine, an interminable succession of the "clusters of clusters," or of "universes" more or less similar?

I reply that the "right," in a case such as this, depends absolutely upon the hardihood of that imagination which ventures to claim the right. Let me declare, only, that, as an individual, I myself feel impelled to fancy, without daring to call it more, that there does exist a limitless succession of universes, more or less similar to that of which we have cognizance, to that of which alone we shall ever have cognizance, at the very least until the return of our own particular universe into unity. If such clusters of clusters exist, however—and they do—it is abundantly clear that, having had no part in our origin, they have no portion in our laws. They neither attract us, nor we them. Their material, their spirit is not ours, is not that which obtains in any part of our universe. They could not impress our senses or our souls. Among them and us, considering all, for the moment, collectively, there are no influences in common. Each exists, apart and independently, in the bosom of its proper and particular God.

In the conduct of this discourse, I am aiming less at physical than metaphysical order. The clearness with which even material phenomena are presented to the understanding depends very little, I have long since learned to perceive, upon a merely natural, and almost altogether upon a moral, arrangement. If, then, I seem to step somewhat too discursively from point to point of my topic, let me suggest that I do so in the hope of thus the better keeping unbroken that chain of graduated impression by which alone the intellect of man can expect to encompass the grandeurs of which I speak and, in their majestic totality, to comprehend them.

So far, our attention has been directed, almost exclusively, to a general and relative grouping of the stellar bodies in space. Of specification there has been little; and whatever ideas of quantity have been conveyed, that is to say, of number, magnitude, and distance, have been conveyed incidentally and by way of preparation for more definite conceptions. These latter let us now attempt to entertain.

Our solar system, as has been already mentioned, consists, in chief, of one sun and sixteen planets certainly, but in all probability a few others, revolving around it as a centre, and attended by seventeen moons of which we know, with possibly several more of which as yet we know nothing. These various bodies are not true spheres, but oblate spheroids,—spheres flattened at the poles of the imaginary axes about which they rotate, the flattening being a consequence of the rotation. Neither is the sun absolutely the centre of the system; for this sun itself, with all the planets, revolves about a perpetually shifting point of space, which is the system's general centre of gravity. Neither are we to consider the paths through which these different spheroids move, the moons about the planets, the planets about the sun, or the sun about the common centre, as circles in an accurate sense. They are, in fact, ellipses, one of the foci being the point about which the revolution is made. An ellipse is a curve, returning into itself, one of whose diameters is longer than the other. In the longer diameter are two points, equidistant from the middle of the line, and so situated otherwise that if from each of them a straight line be drawn to any one point of the curve, the two lines, taken together, will be equal to the long diameter itself. Now, let us conceive such an ellipse. At one of the points mentioned, which are the foci, let us fasten an orange. By an elastic thread let us connect this orange with a pea; and let us place this latter on the circumference of the ellipse. Let us now move the pea continuously around the orange, keeping always on the circumference of the ellipse. The elastic thread, which, of course, varies in length as we move the pea, will form what in geometry is called a radius vector. Now, if the orange be understood as the sun, and the pea as a planet revolving about it, then the revolution should be made at such a rate, with a velocity so varying, that the radius vector may pass over equal areas of space in equal times. The progress of the pea should be—in other words, the progress of the planet is, of course—slow in proportion to its distance from the sun, swift in proportion to its proximity. Those planets, moreover, move the more slowly which are the farther from the sun, the squares of their periods of revolution having the same proportion to each other as have to each other the cubes of their mean distances from the sun.

The wonderfully complex laws of revolution here described, however, are not to be understood as obtaining in our system alone. They everywhere prevail where attraction prevails. They control the universe. Every shining speck in the firmament is, no doubt, a luminous sun, resembling our own at least in its general features, and having in attendance upon it a greater or less number of planets, greater or less, whose still lingering luminosity is not sufficient to render them visible to us at so vast a distance, but which, nevertheless, revolve, moon-attended, about their starry centres, in obedience to the principles just detailed, in obedience to the three omniprevalent laws of revolution, the three immortal laws guessed by the imaginative Kepler, and but subsequently demonstrated and accounted for by the patient and mathematical Newton. Among a tribe of philosophers who pride themselves excessively upon matter-of-fact, it is far too fashionable to sneer at all speculation under the comprehensive sobriquet, "guess-work." The point to be considered is, *who* guesses. In guessing with Plato, we spend our time to better purpose, now and then, than in harkening to a demonstration by Alcmæon.

In many works on astronomy I find it distinctly stated that the laws of Kepler are the basis of the great principle, gravitation. This idea must have arisen from the fact that the suggestion of these laws by Kepler, and his proving them *a posteriori* to have an actual existence, led Newton to account for them by the hypothesis of gravitation, and, finally, to demonstrate them *a priori*, as necessary consequences of the hypothetical principle. Thus, so far from the laws of Kepler being the basis of gravity, gravity is the basis of these laws, as it is, indeed, of all the laws of the material universe which are not referable to repulsion alone.

The mean distance of the earth from the moon, that is to say, from the heavenly body in our closest vicinity, is 237,000 miles. Mercury, the planet nearest the sun, is distant from him 37,000,000 miles. Venus, the next, revolves at a distance of 68,000,000; the Earth, which comes next, at a distance of 95,000,000; Mars, then, at a distance of 144,000,000. Now come the eight asteroids (Ceres, Juno, Vesta, Pallas, Astræa, Flora, Iris, and Hebe) at an average distance of about 250,000,000. Then we have Jupiter, distant 490,000,000; then Saturn, 900,000,000; then Uranus, 1,900,000,000; finally, Neptune, lately discovered, and revolving at a distance, say, of 2,800,000,000. Leaving Neptune out of the account, of which as yet we know little accurately and which is possibly one of a system of asteroids, it will be seen that, within certain limits, there exists an order of interval among the planets. Speaking loosely, we may say that each outer planet is twice as far from the sun as is the next inner one. May not the order here mentioned, may not the law of Bode, be deduced from consideration of the analogy suggested by me as having place between the solar discharge of rings and the mode of the atomic irradiation?

The numbers hurriedly mentioned in this summary of distance it is folly to attempt comprehending, unless in the light of abstract arithmetical facts. They are not practically tangible ones. They convey no precise ideas. I have stated that Neptune, the planet farthest from the sun, revolves about him at a distance of 2,800,000,000 of miles. So far good: I have stated a mathematical fact, and, without comprehending it in the least, we may put it to use, mathematically. But in mentioning, even, that the moon revolves about the earth at the comparatively trifling distance of 237,000 miles, I entertained no expectation of giving any one to understand, to know, to feel, how far from the earth the moon actually is. 237,000 miles! There are, perhaps, few of my readers who have not crossed the Atlantic Ocean; yet how many of them have a distinct idea of even the 3000 miles intervening between shore and shore? I doubt, indeed, whether the man lives who can force into his brain the most remote conception of the interval between one mile-stone and its next neighbor upon the turnpike. We are in some measure aided, however, in our consideration of distance by combining this consideration with the kindred one of velocity. Sound passes through 1100 feet of space in a second of time. Now were it possible for an inhabitant of the earth to see the flash of a cannon discharged in the moon and to hear the report, he would have to wait, after perceiving the former, more than thirteen entire days and nights before getting any intimation of the latter.

However feeble be the impression, even thus conveyed, of the moon's real distance from the earth, it will, nevertheless, effect a good object in enabling us more clearly to see the futility of attempting to grasp such intervals as that of the 2,800,000,000 of miles between our sun and Neptune; or even that of the 95,000,000 between the sun and the earth we inhabit. A cannon-ball, flying at the greatest velocity with which such a ball has ever been known to fly, could not traverse the latter interval in less than twenty years; while for the former it would require 590.

Our moon's real diameter is 2160 miles; yet she is comparatively so trifling an object that it would take nearly fifty such orbs to compose one as great as the earth.

The diameter of our own globe is 7912 miles, but from the enunciation of these numbers what positive idea do we derive?

If we ascend an ordinary mountain and look around us from its summit, we behold a landscape stretching, say, forty miles in every direction, forming a circle 250 miles in circumference, and including an area of 5000 square miles. The extent of such a prospect, on account of the successiveness with which its portions necessarily present themselves to view, can be only very feebly and very partially appreciated; yet the entire panorama would comprehend no more than one 40,000th part of the mere surface of our globe. Were this panorama, then, to be succeeded, after the lapse of an hour, by another of equal extent; this again by a third, after the lapse of an hour; this again by a fourth, after lapse of another hour, and so on, until the scenery of the whole earth were exhausted; and were we to be engaged in examining these various panoramas for twelve hours of every day, we should, nevertheless, be nine years and forty-eight days in completing the general survey.

But if the mere surface of the earth eludes the grasp of the imagination, what are we to think of its cubical contents? It embraces a mass of matter equal in weight to at least *two sextillions, two hundred quintillions* of tons. Let us suppose it in a state of quiescence; and now let us endeavor to conceive a mechanical force sufficient to set it in motion! Not the strength of all the myriads of beings whom we may conclude to inhabit the planetary worlds of our system, not the combined physical strength of all these beings, even admitting all to be more powerful than man, would avail to stir the ponderous mass a single inch from its position.

What are we to understand, then, of the force which, under similar circumstances, would be required to move the largest of our planets, Jupiter? This is 86,000 miles in diameter, and would include within its periphery more than a thousand orbs of the magnitude of our own. Yet this stupendous body is actually flying around the sun at the rate of 29,000 miles an hour, that is to say, with a velocity forty times greater than that of a cannon-ball! The thought of such a phenomenon cannot well be said to startle the mind; it palsies and appalls it. Not unfrequently we task our imagination in picturing the capacities of an angel. Let us fancy such a being at a distance of some hundred miles from Jupiter, a close eye-witness of this planet as it speeds on its annual revolution. Now, can we, I demand, fashion for ourselves any conception so distinct of this ideal being's spiritual exaltation as that involved in the supposition that, even by this immeasurable mass of matter, whirled immediately before his eyes with a velocity so unutterable, he, an angel, angelic though he be, is not at once struck into nothingness and overwhelmed?

At this point, however, it seems proper to suggest that, in fact, we have been speaking of comparative trifles. Our sun, the central and controlling orb of the system to which Jupiter belongs, is not only greater than Jupiter, but greater by far than all the planets of the system taken together. This fact is an essential condition, indeed, of the stability of the system itself. The diameter of Jupiter has been mentioned; it is 86,000 miles; that of the sun is 882,000 miles. An inhabitant of the latter, travelling ninety miles a day, would be more than eighty years in going round a great circle of its circumference. It occupies a cubical space of 681 quadrillions, 472 trillions of miles.

The moon, as has been stated, revolves about the earth at a distance of 237,000 miles, in an orbit, consequently, of nearly a million and a half. Now, were the sun placed upon the earth, centre over centre, the body of the former would extend, in every direction, not only to the line of the moon's orbit, but beyond it, a distance of 200,000 miles.

And here once again let me suggest that, in fact, we have still been speaking of comparative trifles. The distance of the planet Neptune from the sun has been stated; it is 28 hundred millions of miles; the circumference of its orbit, therefore, is about 17 billions. Let this be borne in mind while we glance at some one of the brightest stars. Between this and the star of our system (the sun) there is a gulf of space, to convey any idea of which, we should need the tongue of an archangel. From our system, then, and from our sun, or star, the star at which we suppose ourselves glancing is a thing altogether apart; still, for the moment, let us imagine it placed upon our sun, centre over centre, as we just now imagined this sun itself placed upon the earth. Let us now conceive the particular star we have in mind, extending in every direction beyond the orbit of Mercury, of Venus, of the earth; still on, beyond the orbit of Mars, of Jupiter, of Uranus, until, finally, we fancy it filling the circle, seventeen billions of miles in circumference, which is described by the revolution of Leverrier's planet. When we have conceived all this, we shall have entertained no extravagant conception. There is the very best reason for believing that many of the stars are even far larger than the one we have imagined. I mean to say, that we have the very best empirical basis for such belief; and, in looking back at the original, atomic arrangements for diversity, which have been assumed as a part of the Divine plan in the constitution of the universe, we shall be enabled easily to understand, and to credit, the existence of even far vaster disproportions in stellar size than any to which I have hitherto alluded. The largest orbs, of course, we must expect to find rolling through the widest vacancies of space.

I remarked just now that to convey an idea of the interval between our sun and any one of the other stars we should require the eloquence of an archangel. In so saying, I should not be accused of exaggeration; for, in simple truth, these are topics on which it is scarcely possible to exaggerate. But let us bring the matter more distinctly before the eye of the mind.

In the first place, we may get a general, relative conception of the interval referred to by comparing it with the inter-planetary spaces. If, for example, we suppose the earth, which is, in reality 95 millions of miles from the sun, to be only one foot from that luminary, then Neptune would be forty feet distant, and the star Alpha Lyræ, at the very least, one hundred and fifty-nine.

Now, I presume that, in the termination of my last sentence, few of my readers have noticed anything especially objectionable, particularly wrong. I said that the distance of the earth from the sun being taken at one foot, the distance of Neptune would be forty feet, and that of Alpha Lyræ one hundred and fifty-nine. The proportion between one foot and one hundred and fifty-nine has appeared, perhaps, to convey a sufficiently definite impression of the proportion between the two intervals, that of the earth from the sun, and that of Alpha Lyræ from the same luminary. But my account of the matter should, in reality, have run thus: The distance of the earth from the sun being taken at one foot, the distance of Neptune would be forty feet, and that of Alpha Lyræ one hundred and fifty-nine—miles; that is to say, I had assigned to Alpha Lyræ, in my first statement of the case, only the 5280th part of that distance which is the least distance possible at which it can actually lie.

To proceed: However distant a mere planet is, yet when we look at it through a telescope, we see it under a certain form, of a certain appreciable size. Now, I have already hinted at the probable bulk of many of the stars; nevertheless, when we view any one of them, even through the most powerful telescope, it is found to present us with no form, and consequently with no magnitude whatever. We see it as a point and nothing more.

Again: Let us suppose ourselves walking at night on a highway. In a field on one side of the road is a line of tall objects, say trees, the figures of which are distinctly defined against the background of the sky. This line of objects extends at right angles to the road, and from the road to the horizon. Now, as we proceed along the road, we see these objects changing their positions, respectively, in relation to a certain fixed point in that portion of the firmament which forms the background of the view. Let us suppose this fixed point, sufficiently fixed for our purpose, to be the rising moon. We become aware at once that while the tree nearest us so far alters its position in respect to the moon as to seem flying behind us, the tree in the extreme distance has scarcely changed at all its relative position with the satellite. We then go on to perceive that the farther the objects are from us the less they alter their positions; and the converse. Then we begin unwittingly to estimate the distances of individual trees by the degrees in which they evince the relative alteration. Finally, we come to understand how it might be possible to ascertain the actual distance of any given tree in the line by using the amount of relative alteration as a basis in a simple geometrical problem. Now, this relative alteration is what we call "parallax"; and by parallax we calculate the distances of the heavenly bodies. Applying the principle to the trees in question, we should, of course, be very much at a loss to comprehend the distance of that tree, which, however far we proceeded along the road, should evince no parallax at all. This, in the case described, is a thing impossible; but impossible only because all distances on our earth are trivial indeed; in comparison with the vast cosmical quantities we may speak of them as absolutely nothing.

Now, let us suppose the star Alpha Lyræ directly overhead; and let us imagine that, instead of standing on the earth, we stand at one end of a straight road stretching through space to a distance equalling the diameter of the earth's orbit, that is to say, to a distance of one hundred and ninety millions of miles. Having observed, by means of the most delicate micrometrical instruments, the exact position of the star, let us now pass along this inconceivable road until we reach the other extremity. Now, once again, let us look at the star. It is precisely where we left it. Our instruments, however delicate, assure us that its relative position is absolutely, is identically the same, as at the commencement of our unutterable journey. No parallax, none whatever, has been found.

The fact is that, in regard to the distance of the fixed stars,—of any one of the myriads of suns glistening on the farther side of that awful chasm which separates our system from its brothers in the cluster to which it belongs,—astronomical science, until very lately, could speak only with a negative certainty. Assuming the brightest as the nearest, we could say, even of them, only that there is a certain incomprehensible distance on the hither side of which they cannot be; how far they are beyond it we had in no case been able to ascertain. We perceived, for example, that Alpha Lyræ cannot be nearer to us than 19 trillions, 200 billions, of miles; but for all we knew, and, indeed, for all we now know, it may be distant from us the square, or the cube, or any other power of the number mentioned. By dint, however, of wonderfully minute and cautious observations, continued, with novel instruments, for many laborious years, Bessel, not long ago deceased, has lately succeeded in determining the distance of six or seven stars; among others, that of the star numbered 61 in the constellation of the Swan. The distance in this latter instance ascertained is 670,000 times that of the sun, which last, it will be remembered, is 95 millions of miles. The star 61 Cygni, then, is nearly 64 trillions of miles from us, or more than three times the distance assigned, as the least possible, for Alpha Lyræ.

In attempting to appreciate this interval by the aid of any considerations of velocity, as we did in endeavoring to estimate the distance of the moon, we must leave out of sight, altogether, such nothings as the speed of a cannon-ball or of sound. Light, however, according to the latest calculations of Struve, proceeds at the rate of 167,000 miles in a second. Thought itself cannot pass through this interval more speedily, if, indeed, thought can traverse it at all. Yet, in coming from 61 Cygni to us, even at this inconceivable rate, light occupies more than ten years; and, consequently, were the star this moment blotted out from the universe, still, for ten years, would it continue to sparkle on, undimmed in its paradoxical glory.

Keeping now in mind whatever feeble conception we may have attained of the interval between our sun and 61 Cygni, let us remember that this interval, however unutterably vast, we are permitted to consider as but the average interval among the countless hosts of stars composing that cluster, or "nebula," to which our system, as well as that of 61 Cygni, belongs. I have, in fact, stated the case with great moderation: we have excellent reason for believing 61 Cygni to be one of the nearest stars, and thus for concluding, at least for the present, that its distance from us is less than the average distance between star and star in the magnificent cluster of the Milky Way.

And here, once again and finally, it seems proper to suggest that even as yet we have been speaking of trifles. Ceasing to wonder at the space between star and star in our own or in any particular cluster, let us rather turn our thoughts to the intervals between cluster and cluster, in the all-comprehensive cluster of the universe.

I have already said that light proceeds at the rate of

167,000 miles in a second, that is, about ten millions of miles in a minute, or about 600 millions of miles in an hour; yet so far removed from us are some of the "nebulæ" that even light, speeding with this velocity, could not and does not reach us from those mysterious regions in less than three millions of years. This calculation, moreover, is made by the elder Herschel, and in reference merely to those comparatively proximate clusters within the scope of his own telescope. There are "nebulæ," however, which, through the magical tube of Lord Rosse, are this instant whispering in our ears the secrets of a million of ages bygone. In a word, the events which we behold now, at this moment, in those worlds, are the identical events which interested their inhabitants ten hundred thousand centuries ago. In intervals, in distances such as this suggestion forces upon the soul, rather than upon the mind, we find at length a fitting climax to all hitherto frivolous considerations of quantity.

Our fancies thus occupied with the cosmical distances, let us take the opportunity of referring to the difficulty which we have so often experienced, while pursuing the beaten path of astronomical reflection, in accounting for the immeasurable voids alluded to, in comprehending why chasms so totally unoccupied and therefore apparently so needless have been made to intervene between star and star, between cluster and cluster; in understanding, to be brief, a sufficient reason for the Titanic scale, in respect of mere space, on which the universe is seen to be constructed. A rational cause for the phenomenon, I maintain that astronomy has palpably failed to assign; but the considerations through which, in this essay, we have proceeded step by step enable us clearly and immediately to perceive that space and duration are one. That the universe might endure throughout an era at all commensurate with the grandeur of its component material portions and with the high majesty of its spiritual purposes, it was necessary that the original atomic diffusion be made to so inconceivable an extent as to be only not infinite. It was required, in a word, that the stars should be gathered into visibility from invisible nebulosity, proceed from nebulosity to consolidation, and so grow gray in giving birth and death to unspeakably numerous and complex variations of vitalic development; it was required that the stars should do all this, should have time thoroughly to accomplish all these Divine purposes, during the period in which all things were effecting their return into unity with a velocity accumulating in the inverse proportion of the squares of the distances at which lay the inevitable end.

Throughout all this we have no difficulty in understanding the absolute accuracy of the Divine adaptation. The density of the stars, respectively, proceeds, of course, as their condensation diminishes; condensation and heterogeneity keep pace with each other;

through the latter, which is the index of the former, we estimate the vitalic and spiritual development. Thus, in the density of the globes, we have the measure in which their purposes are fulfilled. As density proceeds, as the Divine intentions are accomplished, as less and still less remains to be accomplished, so, in the same ratio, should we expect to find an acceleration of the end; and thus the philosophical mind will easily comprehend that the Divine designs in constituting the stars advance mathematically to their fulfilment; and more, it will readily give the advance a mathematical expression; it will decide that this advance is inversely proportional with the squares of the distances of all created things from the starting-point and goal of their creation.

Not only is this Divine adaptation, however, mathematically accurate, but there is that about it which stamps it as Divine, in distinction from that which is merely the work of human constructiveness. I allude to the complete mutuality of adaptation. For example, in human constructions a particular cause has a particular effect; a particular intention brings to pass a particular object; but this is all; we see no reciprocity. The effect does not react upon the cause; the intention does not change relations with the object. In Divine constructions the object is either design or object as we choose to regard it, and we may take at anytime a cause for an effect, or the converse, so that we can never absolutely decide which is which. To give an instance: In polar climates the human frame, to maintain its animal heat, requires, for combustion in the capillary system, an abundant supply of highly azotized food, such as train-oil. But again, in polar climates nearly the sole food afforded man is the oil of abundant seals and whales. Now, whether is oil at hand because imperatively demanded, or the only thing demanded because the only thing to be obtained? It is impossible to decide. There is an absolute reciprocity of adaptation.

The pleasure which we derive from any display of human ingenuity is in the ratio of the approach to this species of reciprocity. In the construction of plot, for example, in fictitious literature, we should aim at so arranging the incidents that we shall not be able to determine, of any one of them, whether it depends from any one other or upholds it. In this sense, of course, perfection of plot is really, or practically, unattainable, but only because it is a finite intelligence that constructs. The plots of God are perfect. The universe is a plot of God.

And now we have reached a point at which the intellect is forced, again, to struggle against its propensity for analogical inference, against its monomaniac grasping at the infinite. Moons have been seen revolving about planets; planets about stars; and the poetical instinct of humanity, its instinct of the symmetrical, if the symmetry be but a symmetry of surface, —this instinct, which the soul, not only of man but of all created beings, took up, in the beginning, from the geometrical basis of the universal irradiation, impels us to the fancy of an endless extension of this system of cycles. Closing our eyes equally to deduction and induction, we insist upon imagining a revolution of all the orbs of the Galaxy about some gigantic globe which we take to be the central pivot of the whole. Each cluster in the great cluster of clusters is imagined, of course, to be similarly supplied and constructed; while, that the "analogy" may be wanting at no point, we go on to conceive these clusters themselves, again, as revolving around some still more august sphere; this latter, still again, with its encircling clusters, as but one of a yet more magnificent series of agglomerations, gyrating about yet another orb central to them, some orb still more unspeakably sublime, some orb, let us rather say, of infinite sublimity endlessly multiplied by the infinitely sublime. Such are the conditions, continued in perpetuity, which the voice of what some people term "analogy" calls upon the fancy to depict and the reason to contemplate, if possible, without becoming dissatisfied with the picture. Such, in general, are the interminable gyrations beyond gyration which we have been instructed by philosophy to comprehend and to account for, at least in the best manner we can. Now and then, however, a philosopher proper, one whose frenzy takes a very determinate turn, whose genius, to speak more reverentially, has a strongly pronounced washer-womanish bias, doing everything up by the dozen, enables us to see precisely that point out of sight at which the revolutionary processes in question do, and of right ought to, come to an end.

It is hardly worth while, perhaps, even to sneer at the reveries of Fourier, but much has been said latterly of the hypothesis of Mädler, that there exists, in the centre of the Galaxy, a stupendous globe about which all the systems of the cluster revolve. The period of our own, indeed, has been stated—117 millions of years.

That our sun has a motion in space, independently of its rotation and revolution about the system's centre of gravity, has long been suspected. This motion, granting it to exist, would be manifested perspectively. The stars in that firmamental region which we were leaving behind us would, in a very long series of years, become crowded; those in the opposite quarter scattered. Now, by means of astronomical history, we ascertain, cloudily, that some such phenomena have occurred. On this ground it has been declared that our system is moving to a point in the heavens diametrically opposite the star Zeta Herculis; but this inference is, perhaps, the maximum to which we have any logical right. Mädler, however, has gone so far as to designate a particular star, Alcyone in the Pleiades, as being at or about the very spot around which a general revolution is performed.

Now, since by " analogy " we are led, in the first instance, to these dreams, it is no more than proper that we should abide by analogy, at least in some measure, during their development; and that analogy which suggests the revolution suggests at the same time a central orb about which it should be performed; so far the astronomer was consistent. This central orb, however, should, dynamically, be greater than all the orbs taken together which surround it. Of these there are about 100 millions. " Why, then," it was of course demanded, " do we not see this vast central sun,—at least equal in mass to 100 millions of such suns as ours; why do we not see it—we, especially, who occupy the mid region of the cluster, the very locality near which, at all events, must be situated this incomparable star ? " The reply was ready: " It must be non-luminous, as are our planets." Here, then, to suit a purpose, analogy is suddenly let fall. " Not so," it may be said, " we know that non-luminous suns actually exist." It is true that we have reason at least for supposing so; but we have certainly no reason whatever for supposing that the non-luminous suns in question are encircled by luminous suns, while these again are surrounded by non-luminous planets; and it is precisely all this with which Mädler is called upon to find anything analogous in the heavens, for it is precisely all this which he imagines in the case of the Galaxy. Admitting the thing to be so, we cannot help here picturing to ourselves how sad a puzzle the "why it is so" must prove to all *a priori* philosophers.

But, granting in the very teeth of analogy and of everything else the non-luminosity of the vast central orb, we may still inquire how this orb, so enormous, could fail of being rendered visible by the flood of light thrown upon it from the 100 millions of glorious suns glaring in all directions about it. Upon the urging of this question, the idea of an actually solid central sun appears in some measure to have been abandoned; and speculation proceeded to assert that the systems of the cluster perform their revolutions merely about an immaterial centre of gravity common to all. Here, again, then, to suit a purpose, analogy is let fall. The planets of our system revolve, it is true, about a common centre of gravity; but they do this in connection with, and in consequence of, a material sun whose mass more than counterbalances the rest of the system.

The mathematical circle is a curve composed of an infinity of straight lines. But this idea of the circle, an idea which, in view of all ordinary geometry, is merely the mathematical as contradistinguished from the practical idea, is, in sober fact, the practical conception which alone we have any right to entertain in regard to the majestic circle with which we have to deal, at least in fancy, when we suppose our system revolving about a point in the centre of the Galaxy. Let the most vigorous of human imaginations attempt to take but a single step toward the comprehension of a sweep so ineffable! It would scarcely be paradoxical to say that a flash of lightning itself, travelling forever upon the circumference of this unutterable circle, would still forever be travelling in a straight line. That the path of our sun in such an orbit would, to any human perception, deviate in the slightest degree from a straight line, even in a million of years, is a proposition not to be entertained; yet we are required to believe that a curvature has become apparent during the brief period of our astronomical history—during a mere point—during the utter nothingness of two or three thousand years.

It may be said that Mädler has really ascertained a curvature in the direction of our system's now well-established progress through space. Admitting, if necessary, this fact to be in reality such, I maintain that nothing is thereby shown except the reality of this fact, the fact of a curvature. For its thorough determination ages will be required; and, when determined, it will be found indicative of some binary or other multiple relation between our sun and some one or more of the proximate stars. I hazard nothing, however, in predicting that after the lapse of many centuries, all efforts at determining the path of our sun through space will be abandoned as fruitless. This is easily conceivable when we look at the infinity of perturbation it must experience, from its perpetually shifting relations with other orbs, in the common approach of all to the nucleus of the Galaxy.

But in examining other "nebulæ" than that of the Milky Way, in surveying, generally, the clusters which overspread the heavens, do we or do we not find confirmation of Mädler's hypothesis? We do not. The forms of the clusters are exceedingly diverse when casually viewed; but on close inspection through powerful telescopes, we recognize the sphere very distinctly as at least the proximate form of all; their constitution in general being at variance with the idea of revolution about a common centre.

"It is difficult," says Sir John Herschel, "to form any conception of the dynamical state of such systems. On one hand, without a rotary motion and a centrifugal force, it is hardly possible not to regard them as in a state of progressive collapse. On the other, granting such a motion and such a force, we find it no less difficult to reconcile their forms with the rotation of the whole system [meaning cluster] around any single axis, without which internal collision would appear to be inevitable."

Some remarks lately made about the "nebulæ" by Dr. Nichol, in taking quite a different view of the cosmical conditions from any taken in this discourse, have a very peculiar applicability to the point now at issue. He says:

" When our greatest telescopes are brought to bear upon them, we find that those which were thought to be irregular are not so; they approach nearer to a globe. Here is one that looked oval; but Lord Rosse's telescope brought it into a circle. . . . Now, there occurs a very remarkable circumstance in reference to these comparatively sweeping circular masses of nebulæ. We find they are not entirely circular, but the reverse; and that all around them on every side there are volumes of stars, stretching out apparently as if they were rushing toward a great central mass in consequence of the action of some great power." [1]

Were I to describe, in my own words, what must necessarily be the existing condition of each nebula on the hypothesis that all matter is, as I suggest, now returning to its original unity, I should simply be going over, nearly verbatim, the language here employed by Dr. Nichol, without the faintest suspicion of that stupendous truth which is the key to these nebular phenomena.

And here let me fortify my position still further by the voice of a greater than Mädler,—of one, moreover,

[1] I must be understood as denying, especially, only the revolutionary portion of Mädler's hypothesis. Of course, if no great central orb exists now in our cluster, such will exist hereafter. Whenever existing, it will be merely the nucleus of the consolidation.

to whom all the data of Mädler have long been familiar things, carefully and thoroughly considered. Referring to the elaborate calculations of Argelander,—the very researches which form Mädler's basis,—Humboldt, whose generalizing powers have never, perhaps, been equalled, has the following observation:

"When we regard the real, proper, or non-perspective motions of the stars, we find many groups of them moving in opposite directions; and the data as yet in hand render it not necessary, at least, to conceive that the systems composing the Milky Way, or the clusters generally composing the universe, are revolving about any particular centre unknown, whether luminous or non-luminous. It is but man's longing for a fundamental First Cause that impels both his intellect and fancy to the adoption of such an hypothesis."[1]

The phenomenon here alluded to, that of "many groups moving in opposite directions," is quite inexplicable by Mädler's idea; but arises, as a necessary consequence, from that which forms the basis of this discourse. While the merely general direction of each atom—of each moon, planet, star, or cluster—would,

[1] Betrachtet man die nicht perspectivischen eigenen Bewegungen der Sterne, so scheinen viele gruppenweise in ihrer Richtung entgegengesetzt; und die bisher gesammelten Thatsachen machen es auf 's wenigste nicht nothwendig, anzunehmen, dass alle Theile unserer Sternenschicht oder gar der gesammten Sterneninseln, welche den Weltraum füllen, sich um einen grossen, unbekannten, leuchtenden, oder dunkeln Centralkörper bewegen. Das Streben nach den letzen und höchsten Grundursachen macht freilich die reflectirende Thätigkeit des Menschen, wie seine Phantasie, zu einer solchen Annahme geneigt.

on my hypothesis, be, of course, absolutely rectilinear, while the general path of all bodies would be a right line leading to the centre of all; it is clear, nevertheless, that this general rectilinearity would be compounded of what, with scarcely any exaggeration, we may term an infinity of particular curves, an infinity of local deviations from rectilinearity, the result of continuous differences of relative position among the multitudinous masses, as each proceeded on its own proper journey to the end.

I quoted just now from Sir John Herschel the following words, used in reference to the clusters: "On one hand, without a rotary motion and a centrifugal force, it is hardly possible not to regard them as in a state of 'progressive collapse.'" The fact is, that, in surveying the "nebulæ" with a telescope of high power, we shall find it quite impossible, having once conceived this idea of "collapse," not to gather at all points corroboration of the idea. A nucleus is always apparent in the direction of which the stars seem to be precipitating themselves; nor can these nuclei be mistaken for merely perspective phenomena; the clusters are really denser near the centre, sparser in the regions more remote from it. In a word, we see everything as we should see it were a collapse taking place; but, in general, it may be said of these clusters that we can fairly entertain, while looking at them, the ideal of orbital movement about a centre only by admitting the possible existence, in the distant domains of space, of dynamical laws with which we are unacquainted.

On the part of Herschel, however, there is evidently a reluctance to regard the nebulæ as in " a state of progressive collapse." But if facts,—if even appearances justify the supposition of their being in this state, why, it may well be demanded, is he disinclined to admit it? Simply on account of a prejudice; merely because the supposition is at war with a preconceived and utterly baseless notion,—that of the endlessness, that of the eternal stability of the universe.

If the propositions of this discourse are tenable, the " state of progressive collapse " is precisely that state in which alone we are warranted in considering all things; and, with due humility, let me here confess that, for my part, I am at a loss to conceive how any other understanding of the existing condition of affairs could ever have made its way into the human brain. " The tendency to collapse " and " the attraction of gravitation " are convertible phrases. In using either we speak of the reaction of the First Act. Never was necessity less obvious than that of supposing matter imbued with an ineradicable quality forming part of its material nature—a quality, or instinct, forever inseparable from it, and by dint of which inalienable principle every atom is perpetually impelled to seek its fellow-atom. Never was necessity less obvious than that of entertaining this unphilosophical idea. Going boldly behind the vulgar thought, we have to conceive, metaphysically, that the gravitating principle appertains to matter temporarily, only while diffused, only while existing as many instead of as one; appertains to it by virtue of its state of irradiation alone; appertains, in a word, altogether to its condition, and not in the slightest degree to itself. In this view, when the irradiation shall have returned into its source, when the reaction shall be completed, the gravitating principle will no longer exist. And, in fact, astronomers, without at any time reaching the idea here suggested, seem to have been approximating it, in the assertion that "if there were but one body in the universe, it would be impossible to understand how the principle, gravity, could obtain"; that is to say, from a consideration of matter as they find it, they reach a conclusion at which I deductively arrive. That so pregnant a suggestion as the one quoted should have been permitted to remain so long unfruitful, is, nevertheless, a mystery which I find it difficult to fathom.

It is, perhaps, in no little degree, however, our propensity for the continuous, for the analogical, in the present case more particularly for the symmetrical, which has been leading us astray. And, in fact, the sense of the symmetrical is an instinct which may be depended upon with an almost blindfold reliance. It is the poetical essence of the universe—of the universe which, in the supremeness of its symmetry, is but the most sublime of poems. Now, symmetry and consistency are convertible terms; thus poetry and truth are one. A thing is consistent in the ratio of its truth, true in the ratio of its consistency. A perfect consistency, I repeat, can be nothing but an absolute truth. We may take it for granted, then, that man cannot long or widely err if he suffer himself to be guided by his poetical, which I have maintained to be his truthful, in being his symmetrical, instinct. He must have a care, however, lest, in pursuing too heedlessly the superficial symmetry of forms and motions, he leave out of sight the really essential symmetry of the principles which determine and control them.

That the stellar bodies would finally be merged in one, that, at last, all would be drawn into the substance of one stupendous central orb already existing, is an idea which, for some time past, seems vaguely and indeterminately to have held possession of the fancy of mankind. It is an idea, in fact, which belongs to the class of the excessively obvious. It springs instantly from a superficial observation of the cyclic and seemingly gyrating or vortical movements of those individual portions of the universe which come most immediately and most closely under our observation. There is not, perhaps, a human being, of ordinary education and of average reflective capacity, to whom, at some period, the fancy in question has not occurred, as if spontaneously, or intuitively, and wearing all the character of a very profound and very original conception. This conception, however, so commonly entertained, has never, within my knowledge, arisen out of any abstract considerations. Being, on the contrary, always suggested, as I say, by the vortical movements about centres, a reason for it, also, a cause for the ingathering of all the orbs into one, imagined to be already existing, was naturally sought in the same direction among these cyclic movements themselves.

Thus it happened that, on announcement of the gradual and perfectly regular decrease observed in the orbit of Encke's comet at every successive revolution about our sun, astronomers were nearly unanimous in the opinion that the cause in question was found; that a principle was discovered sufficient to account, physically, for that final, universal agglomeration which, I repeat, the analogical, symmetrical, or poetical instinct of man had predetermined to understand as something more than a simple hypothesis.

This cause, this sufficient reason for the final ingathering, was declared to exist in an exceedingly rare, but still material medium pervading space; which medium, by retarding, in some degree, the progress of the comet, perpetually weakened its tangential force, thus giving a predominance to the centripetal, which, of course, drew the comet nearer and nearer at each revolution, and would eventually precipitate it upon the sun.

All this was strictly logical, admitting the medium or ether; but this ether was assumed, most illogically, on the ground that no other mode than the one spoken of could be discovered of accounting for the observed decrease in the orbit of the comet; as if, from the fact that we could discover no other mode of accounting for it, it followed, in any respect, that no other mode of accounting for it existed. It is clear that innumerable causes might operate, in combination, to diminish the orbit, without even a possibility of our ever becoming acquainted with one of them. In the meantime, it has never been fairly shown, perhaps, why the retardation occasioned by the skirts of the sun's atmosphere, through which the comet passes at perihelion, is not enough to account for the phenomenon. That Encke's comet will be absorbed into the sun is probable; that all the comets of the system will be absorbed is more than merely possible; but, in such case, the principle of absorption must be referred to eccentricity of orbit, to the close approximation to the sun, of the comets at their perihelia; and is a principle not affecting in any degree the ponderous spheres which are to be regarded as the true material constituents of the universe. Touching comets in general, let me here suggest, in passing, that we cannot be far wrong in looking upon them as the lightning flashes of the cosmical heaven.

The idea of a retarding ether, and, through it, of a final agglomeration of all things, seemed at one time, however, to be confirmed by the observation of a positive decrease in the orbit of the solid moon. By reference to eclipses recorded 2500 years ago, it was found that the velocity of the satellite's revolution then was considerably less than it is now; that on the hypothesis that its motion in its orbit is uniformly in accordance with Kepler's law, and was accurately determined then,—2500 years ago,—it is now in advance of the position it should occupy by nearly 9000 miles. The increase of velocity proved, of course, a diminution of orbit; and astronomers were fast yielding to a belief in an ether as the sole mode of accounting for the phenomenon, when Lagrange came to the rescue. He showed that, owing to the configurations of the spheroids, the shorter axes of their ellipses are subject to variation in length, the longer axes being permanent; and that this variation is continuous and vibratory, so that every orbit is in a state of transition, either from circle to ellipse or from ellipse to circle. In the case of the moon, where the shorter axis is decreasing, the orbit is passing from circle to ellipse, and, consequently, is decreasing too; but, after a long series of ages, the ultimate eccentricity will be attained; then the shorter axis will proceed to increase until the orbit becomes a circle, when the process of shortening will again take place; and so on forever. In the case of the earth, the orbit is passing from ellipse to circle. The facts thus demonstrated do away, of course, with all necessity for supposing an ether, and with all apprehension of the system's instability on the ether's account.

It will be remembered that I have myself assumed what we may term "an ether." I have spoken of a subtle influence which we know to be ever in attendance upon matter, although becoming manifest only through matter's heterogeneity. To this influence, without daring to touch it at all in any effort at explaining its awful nature, I have referred the various phenomena of electricity, heat, light, magnetism; and, more, of vitality, consciousness, and thought—in a word, of spirituality. It will be seen at once, then, that the ether thus conveyed is radically distinct from the ether of the astronomers, inasmuch as theirs is matter and mine not.

With the idea of material ether, seems, thus, to have departed altogether the thought of that universal agglomeration so long predetermined by the poetical fancy of mankind,—an agglomeration in which a sound philosophy might have been warranted in putting faith, at least to a certain extent, if for no other reason than that by this poetical fancy it had been so predetermined. But so far as astronomy, so far as mere physics, have yet spoken, the cycles of the universe have no conceivable end. Had an end been demonstrated, however, from so purely collateral a cause as an ether, man's instinct of the Divine capacity to adapt would have rebelled against the demonstration. We should have been forced to regard the universe with some such sense of dissatisfaction as we experience in contemplating an unnecessary complex work of human art. Creation would have affected us as an imperfect plot in a romance, where the *dénouement is* awkwardly brought about by interposed incidents external and foreign to the main subject, instead of springing out of the bosom of the thesis,—out of the heart of the ruling idea; instead of arising as a result of the primary proposition, as inseparable and inevitable part and parcel of the fundamental conception of the book.

What I mean by the symmetry of mere surface will now be more clearly understood. It is simply by the blandishment of this symmetry that we have been beguiled into the general idea of which Mädler's hypothesis is but a part,—the idea of the vortical indrawing of the orbs. Dismissing this nakedly physical conception, the symmetry of principle sees the end of all things metaphysically involved in the thought of a beginning; seeks and finds in this origin of all things the rudiment of this end; and perceives the impiety of supposing this end likely to be brought about less simply, less directly, less obviously, less artistically, than through the reaction of the originating Act.

Recurring, then, to a previous suggestion, let us understand the systems, let us understand each star with its attendant planets, as but a Titanic atom existing in space with precisely the same inclination for unity which characterized, in the beginning, the actual atoms after their irradiation throughout the universal sphere. As these original atoms rushed toward each other in generally straight lines, so let us conceive as at least generally rectilinear the paths of the system-atoms toward their respective centres of aggregation; and in this direct drawing together of the systems into clusters, with a similar and simultaneous drawing together of the clusters themselves while undergoing consolidation, we have at length attained the great Now, the awful present, the existing condition of the universe.

Of the still more awful future a not irrational analogy may guide us in framing an hypothesis. The equilibrium between the centripetal and centrifugal forces of each system being necessarily destroyed upon attainment of a certain proximity to the nucleus of the cluster to which it belongs, there must occur, at once, a chaotic, or seemingly chaotic, precipitation of the moons upon the planets, of the planets upon the suns, and of the suns upon the nuclei; and the general result of this precipitation must be the gathering of the myriad now-existing stars of the firmament into an almost infinitely less number of almost infinitely superior spheres. In being immeasurably fewer, the worlds of that day will be immeasurably greater than our own. Then, indeed, amid unfathomable abysses will be glaring unimaginable suns. But all this will be merely a climatic magnificence foreboding the great end. Of this end the new genesis described can be but a very partial postponement. While undergoing consolidation, the clusters themselves, with a speed prodigiously accumulative, have been rushing toward their own general centre, and now, with a thousand-fold electric velocity, commensurate only with their material grandeur and with the spiritual passion of their appetite for oneness, the majestic remnants of the tribe of stars flash, at length, into a common embrace. The inevitable catastrophe is at hand.

But this catastrophe—what is it? We have seen accomplished the ingatherings of the orbs. Henceforward, are we not to understand one material globe of globes as constituting and comprehending the universe? Such a fancy would be altogether at war with every assumption and consideration of this discourse.

I have already alluded to that absolute reciprocity of adaptation which is the idiosyncrasy of the Divine art, stamping it Divine. Up to this point of our reflections, we have been regarding the electrical influence as a something by dint of whose repulsion alone matter is enabled to exist in that state of diffusion demanded for the fulfilment of its purposes; so far, in a word, we have been considering the influence in question as ordained for matter's sake to subserve the objects of matter. With a perfectly legitimate reciprocity we are now permitted to look at matter as created solely for the sake of this influence, solely to serve the objects of this spiritual ether. Through the aid, by the means, through the agency of matter, and by dint of its heterogeneity, is this ether manifested—is spirit individualized. It is merely in the development of this ether, through heterogeneity, that particular masses of matter become animate, sensitive, and in the ratio of their heterogeneity, some reaching a degree of sensitiveness involving what we call thought, and thus attaining conscious intelligence.

In this view we are enabled to perceive matter as a means, not as an end. Its purposes are thus seen to have been comprehended in its diffusion; and with the return into unity these purposes cease. The absolutely consolidated globe of globes would be objectless, therefore not for a moment could it continue to exist. Matter, created for an end, would unquestionably, on fulfilment of that end, be matter no longer. Let us endeavor to understand that it would disappear, and that God would remain all in all.

That every work of Divine conception must coexist and coexpire with its particular design seems to me especially obvious; and I make no doubt that, on perceiving the final globe of globes to be objectless, the majority of my readers will be satisfied with my "therefore it cannot continue to exist." Nevertheless, as the startling thought of its instantaneous disappearance is one which the most powerful intellect cannot be expected readily to entertain on grounds so decidedly abstract, let us endeavor to look at the idea from some other and more ordinary point of view; let us see how thoroughly and beautifully it is corroborated in an *a posteriori* consideration of matter as we actually find it.

I have before said that "attraction and repulsion being undeniably the sole properties by which matter is manifested to mind, we are justified in assuming that matter exists only as attraction and repulsion; in other words, that attraction and repulsion are matter, there being no conceivable case in which we may not employ the term 'matter' and the terms 'attraction' and 'repulsion' taken together as equivalent, and therefore convertible, expressions of logic." [1]

Now, the very definition of attraction implies particularity, the existence of parts, particles, or atoms; for we define it as the tendency of "each atom, etc., to every other atom," etc., according to a certain law. Of course, where there are no parts, where there is absolute unity, where the tendency to oneness is satisfied, there can be no attraction: this has been fully shown, and all philosophy admits it. When, on fulfilment of its purposes, then, matter shall have returned into its

[1] Pages 205, 206.

original condition of one, a condition which presupposes the expulsion of the separative ether, whose province and whose capacity are limited to keeping the atoms apart until that great day when, this ether being no longer needed, the overwhelming pressure of the finally collective attraction shall at length just sufficiently predominate [1] and expel it,—when, I say, matter, finally, expelling the ether, shall have returned into absolute unity, it will then (to speak paradoxically for the moment) be matter without attraction and without repulsion, in other words, matter without matter; in other words, again, matter no more. In sinking into unity, it will sink at once into that nothingness which, to all finite perception, unity must be; into that material nihility from which alone we can conceive it to have been evoked, to have been created by the volition of God.

I repeat, then: Let us endeavor to comprehend that the final globe of globes will instantaneously disappear, and that God will remain all in all.

But are we here to pause? Not so. On the universal agglomeration on dissolution, we can readily conceive that a new and perhaps totally different series of conditions may ensue, another creation and irradiation, returning into itself, another action and reaction of the Divine Will. Guiding our imaginations by that omniprevalent law of laws, the law of perio-

[1] "Gravity, therefore, must be the strongest of forces."—See page 230.

dicity, are we not, indeed, more than justified in entertaining a belief—let us say, rather, in indulging a hope—that the processes we have here ventured to contemplate will be renewed forever, and forever, and forever; a novel universe swelling into existence and then subsiding into nothingness at every throb of the Heart Divine?

And now, this Heart Divine—what is it? It is our own.

Let not the merely seeming irreverence of this idea frighten our souls from that cool exercise of consciousness, from that deep tranquillity of self-inspection, through which alone we can hope to attain the presence of this, the most sublime of truths, and look it leisurely in the face.

The phenomena on which our conclusions must at this point depend are merely spiritual shadows, but not the less thoroughly substantial.

We walk about, amid the destinies of our world-existence, encompassed by dim and ever present memories of a destiny more vast, very distant in the bygone time, and infinitely awful.

We live out a youth peculiarly haunted by such dreams, yet never mistaking them for dreams. As memories we know them. During our youth the distinction is too clear to deceive us even for a moment.

So long as this youth endures, the feeling that we exist is the most natural of all feelings. We understand it thoroughly. That there was a period at which we did not exist, or, that it might so have happened that we never had existed at all, are the considerations, indeed, which, during this youth, we find difficulty in understanding. Why we should not exist, is, up to the epoch of our manhood, of all queries the most unanswerable. Existence, self-existence, existence from all time to all eternity, seems, up to the epoch of manhood, a normal and questionable condition,—seems, because it is.

But now comes the period at which a conventional world-reason awakens us from the truth of our dream. Doubt, surprise, and incomprehensibility arrive at the same moment. They say: "You live, and the time was when you lived not. You have been created. An Intelligence exists greater than your own; and it is only through this Intelligence you live at all." These things we struggle to comprehend, and cannot,—cannot, because these things, being untrue, are thus, of necessity, incomprehensible.

No thinking being lives who, at some luminous point of his life of thought, has not felt himself lost amid the surges of futile efforts at understanding or believing that anything exists greater than his own soul. The utter impossibility of any one's soul feeling itself inferior to another; the intense, overwhelming dissatisfaction and rebellion at the thought;—these, with the omniprevalent aspirations at perfection, are but the spiritual, coincident with the material, struggles toward the original unity; are, to my mind at least, a species of proof far surpassing what man terms demonstration that no one soul is inferior to another; that nothing is, or can be, superior to any one soul; that each soul is, in part, its own God, its own Creator; in a word, that God—the material and spiritual God—now exists solely in the diffused matter and spirit of the universe; and that the regathering of this diffused matter and spirit will be but the reconstitution of the purely spiritual and individual God.

In this view, and in this view alone, we comprehend the riddles of Divine injustice, of inexorable fate. In this view alone the existence of evil becomes intelligible; but in this view it becomes more—it becomes endurable. Our souls no longer rebel at a sorrow which we ourselves have imposed upon ourselves, in furtherance of our own purposes, with a view, if even with a futile view, to the extension of our own joy.

I have spoken of memories that haunt us during our youth. They sometimes pursue us even in our manhood; assume gradually less and less indefinite shapes; now and then speak to us with low voices, saying:

"There was an epoch in the night of time when a still-existent Being existed,[1] one of an absolutely in-

[1] See pages 280, 281, paragraph commencing "I reply that the right," and ending "proper and particular God."

finite number of similar beings that people the absolutely infinite domains of the absolutely infinite space. It was not and is not in the power of this Being, any more than it is in your own, to extend, by actual increase, the joy of His existence; but just as it is in your power to expand or to concentrate your pleasures (the absolute amount of happiness remaining always the same) so did and does a similar capability appertain to this Divine Being, who thus passes His eternity in perpetual variation of Concentrated Self and almost Infinite Self-Diffusion. What you call the universe is but his present expansive existence. He now feels His life through an infinity of imperfect pleasures, the partial and pain-intertangled pleasures of those inconceivably numerous things which you designate as His creatures, but which are really but infinite individualizations of Himself. All these creatures, all,—those which you term animate as well as those to whom you deny life for no better reason than that you do not behold it in operation,—all these creatures have, in a greater or less degree, a capacity for pleasure and for pain; but the general sum of their sensations is precisely that amount of happiness which appertains by right to the Divine Being when concentrated within Himself. These creatures are all, too, more or less conscious intelligences; conscious, first, of a proper identity; conscious, secondly, and by faint indeterminate glimpses, of an identity with the Divine Being of whom we speak, of an identity with God. Of the two classes of consciousness, fancy that the former will grow weaker, the latter stronger, during the long succession of ages which must elapse before these myriads of individual intelligences become blended—when the bright stars become blended—into One. Think that the sense of individual identity will be gradually merged in the general consciousness; that man, for example, ceasing imperceptibly to feel himself man, will at length attain that awfully triumphant epoch when he shall recognize his existence as that of Jehovah. In the meantime bear in mind that all is life—life—life within life, the less within the greater, and all within the Spirit Divine.

The theories of the universe propounded in *Eureka* had, it appears, been under consideration with Poe for a year or more previous to the publication of that essay.

In February, 1848, Poe had outlined these theories in a letter "to a correspondent" (whose name is not recorded), of which the following are the more important portions:

"By the by, lest you infer that my views in detail are the same as those advanced in the Nebular Hypothesis, I venture to offer a few addenda, the substance of which was penned, though never printed, several years ago, under the head of

A PREDICTION

" As soon as the beginning of the next century it will be entered in the books that the sun was originally condensed at once (not gradually, according to the supposition of Laplace) to his smallest size; that, thus condensed, he rotated on an axis; that this axis of rotation was not the central line of his figure, so that he not only rotated, but revolved in an elliptical orbit (the rotation and revolution are one, but I separate them for convenience of illustration); that, thus formed and thus revolving, he was on fire and sent into space, his substance in vapor, this vapor reaching farthest on the side of the larger hemisphere, partly on account of the largeness, but principally because the force of the fire was greater there; that, in due time the vapor, not necessarily carried then to the place now occupied by Neptune, condensed into that planet; that Neptune took, as a matter of course, the same figure that the sun had, which figure made his rotation a revolution in an elliptical orbit; that, in consequence of such revolution, in consequence of his being carried backward at each of the daily revolutions, the velocity of his annual revolution is not so great as it would be if it depended solely upon the sun's velocity of rotation (Kepler's third law); that his figure, by influencing his rotation—the heavier half, as it turns downward toward the sun, gains an impetus sufficient to carry it past the direct line of attraction, and thus to throw outward the centre of gravity—gave him power to save himself from falling to the sun (and, perhaps, to work himself gradually outward to the position he now occupies); that he received, through a series of ages, the sun's heat, which penetrated to his centre, causing volcanoes eventually, and thus throwing off vapor, and which evaporated substances upon his surface, till finally his moons and his gaseous ring (if it is true that he has a ring) were produced; that these moons took elliptical forms, rotated and revolved, ' both under one,' were kept in their monthly orbits by the centrifugal force acquired in their daily orbits, and required a longer time to make their monthly revolutions than they would have required if they had had no daily revolutions.

" I have said enough, without referring to the other planets, to give you an inkling of my hypothesis, which is all I intended to do.

" You perceive that I hold to the idea that our moon must rotate on her axis oftener than she revolves round her primary, the same being the case with the moons of Jupiter, Saturn, and Uranus.

" Since the penning, a closer analysis of the matter contained has led me to modify somewhat my opinion as to the origin of the satellites; that is, I hold now that they came, not from vapor sent off in volcanic eruptions, and by simple diffusion under the solar rays, but from rings of it which were left in the inter-planetary spaces after the precipitation of the primaries. There is no insuperable obstacle in the way of the conception that meteoric stones and ' shooting-stars ' have their source in matter which has gone off from volcanoes and by common evaporation; but it is hardly supposable that a sufficient quantity could be produced thus to make a body so large as, by centrifugal force resulting from rotation, to withstand the absorptive power of its parent's rotation. The event implied may take place not until the planets have become flaming suns—from an accumulation of their own sun's caloric, reacting from centre to surface, which shall in the lonesome latter days melt all the ' elements ' and dissipate the solid foundations out as a scroll.

" The sun forms, in rotating, a vortex in the ether surrounding him. The planets have their orbits lying within this vortex at different distances from its centre; so that their liabilities to be absorbed by it are, other things being equal, inversely according to those distances, since length, not surface, is the measure of the absorptive power along the lines marking the orbits. Each planet overcomes its liability, that is, keeps in its orbit, through a counter-vortex generated by its own rotation. The force of such counter-vortex is measured by multiplying together the producing planet's density and rotary velocity; which velocity depends, not upon the length of the planet's equatorial circumference, but upon the distance through which a given point of the equator is carried during a rotary period. Then if Venus and Mercury, for example, have now the orbits in which they commenced their revolutions—the orbit of the former 68 million miles, and that of the latter 37 million miles, from the centre of the sun's vortex; if the diameter of Venus is $2\frac{2}{3}$ times the diameter, and her density is the same with the density, of Mercury; and if the rotary velocity of the equator of Venus is 1000 miles per hour, that of Mercury's equator is 1,900 miles per hour, making the diameter of his orbit of rotation 14,500 miles—nearly five times that of himself. But I pass this point without further examination. Whether there is or is not a difference in the relative conditions of the different planets sufficient to cause such diversity in the extents of their peripheries of rotation as is indicated, still each planet is to be considered to have, other things being equal, a vortical resistance bearing the same proportion inversely to that of every other planet which its distance from the centre of the solar vortex bears to the distance of every other from the same; so that if it be removed inward or outward from its position, it will increase or diminish that resistance, accordingly, by adding to or subtracting from its speed or rotation. As the rotary period must be one in the two cases, the greater or less speed can be produced only by the lengthening or the shortening of the circumference described by the rotation.

"Then Mercury, at the distance of Venus, would rotate in an orbit only $\frac{37}{68}$ as broad as the one in which he does rotate; so his centrifugal force, in that position, would be only $\frac{37}{68}$ as great as it is in his own position; so his capability, while there, of resisting the forward pressure of the sun's vortex, which prevents him from passing his full (circle) distance behind his centre of rotation and thus adds to his velocity in his annual orbit, would be but $\frac{37}{68}$ of what it is in his own place. But this forward pressure is only $\frac{37}{68}$ as great at the distance of Venus as it is at that of Mercury. Then Mercury, with his own rotary speed in the annual orbit of Venus, would move but $\frac{37}{68}$ as fast as Venus moves in it; while Venus, with her rotary speed in Mercury's annual orbit, would move $\frac{68}{37}$ as fast as she moves in her own, that is, $\frac{68}{37}$ of $\frac{68}{37}$ as fast as Mercury would move in the same (annual orbit of Venus). It follows that the square root of $\frac{68}{37}$ is the measure of the velocity of Mercury in his own annual orbit with his own rotary speed, compared with that of Venus in her annual orbit with her rotary speed—in accordance with the fact.

"Such is my explanation of Kepler's first and third laws, which laws cannot be explained upon the principle of Newton's theory.

"Two planets, gathered from portions of the sun's vapor into one orbit, would rotate through the same ellipse with velocities proportional to their densities; that is, the denser planet would rotate the more swiftly; since, in condensing, it would have descended farther toward the sun. For example, suppose the earth and Jupiter to be the two planets in one orbit. The diameter of the former is 8,000 miles; period of rotation, 24 hours. The diameter of the latter is 88,000 miles: period, $9\frac{1}{2}$ hours. The ring of vapor out of which the earth was formed was of a certain (perpendicular) width; that out of which Jupiter was formed was of a certain greater width. In condensing, the springs of ether lying among the particles (these springs having been latent before the condensation began) were let out, the number of them along any given radial line being the number of spaces between all the couples of the particles constituting the line. If the two condensations had gone on in simple diametric proportions, Jupiter would have put forth only 11 times as many springs as the earth did, and his velocity would have been but 11 times her velocity. But the fact that the falling downward of her particles was completed when they had got so far that 24 hours were required for her equator to make its rotary circuit, while that of his particles continued till but about $\frac{2}{5}$ of her period was occupied by his equator in effecting its revolution, shows that his springs were increased above hers in still another ratio of $2\frac{1}{2}$, making, in the case, his velocity and his vortical force ($2\frac{1}{2} \times 11 =$) 27 times her velocity and force.

" Then the planets' densities are inversely as their rotary periods; and their rotary velocities and degrees of centrifugal force are, other things being equal, directly as their densities.

" Two planets, revolving in one orbit, in rotating, would approach the sun, therefore enlarge their rotary ellipses, therefore accelerate their rotary velocities, therefore increase their powers of withstanding the influence of the solar vortex, inversely according to the products of their diameters into their densities; that is, the smaller and less dense planet, having to resist an amount of influence equal to that resisted by the other, would multiply the number of its resisting springs by the ratio of the other's diameter and density to the diameter and density of itself. Thus, the earth, in Jupiter's orbit, would have to rotate in an ellipse 27 times as broad as herself, in order to make her power correspond with his.

" Then the breadths, in a perpendicular direction, of the rotary ellipses of the planets in their several orbits are inversely as the products obtained by multiplying together the bodies' densities, diameters, and distances from the centre of the solar vortex. Thus, the product of Jupiter's density, diameter, and distance being ($2\frac{1}{2}$ times 11 times $5\frac{1}{4}$) 140 times the product of the earth's density, diameter, and distance, the breadth of the latter's ellipse is about 1,120,000 miles; this upon the foundation, of course, that Jupiter's ellipse coincides precisely with his own equatorial diameter."

[Note by the editor.—The last paragraph has been copied just as it stands. But the query arises whether the calculator in arriving at his conclusion did not take, accidentally, one step off his premises. Is n't rotary velocity inversely according to distance ? therefore should not the ratio of Jupiter's, to the earth's, distance, $5\frac{1}{4}$, come in as a divisor, instead of a multiplier ?]

"It will be observed that that process, in its last analysis, presents the point that rotary speed (hence that vortical force) is in exact inverse proportion to distance. Then, since the movement in orbit is a part of the rotary movement, being at the rate which the centre of the rotary ellipse is carried along the line marking the orbit, and since that centre and the planet's centre are not identical, the former being the point around which the latter revolves, causing, by the act, a relative loss of time in the inverse ratio of the square root of distance, as I have shown back, the speed in orbit is inversely according to the square root of distance. Demonstration—the earth's orbital period contains $365\frac{1}{4}$ of her rotary periods. During these periods her equator passes through a distance of $(1,120,000 \times \frac{22}{7} \times 365\frac{1}{4} =)$ about 1,286 million miles; and the centre of her rotary ellipse, through a distance of $(95,000,000 \times 2 \times \frac{22}{7} =)$ about 597 million miles. Jupiter's orbital period has $(365\frac{1}{4} \times 2\frac{1}{2} \times 12$ years $=)$ about 10,957 of his rotary periods, during which his equator courses $(88,000 \times \frac{22}{7} \times 10,957 =)$ about 3,050 million miles; and the centre of his rotary ellipse about the same number of miles $(490,000,000 \times 2 \times \frac{22}{7})$. Dividing this distance by 12 $(\frac{3\ 050\ 000\ 000}{12} =)$ gives the length of Jupiter's double journey during one of the earth's orbital periods = 254 million miles. Relative velocities in ellipse $(\frac{1286}{254} =)$ 5 + to 1, which is inversely as the distances; and relative velocities in orbit $(\frac{597}{254} =)$ 2 + to 1, inversely as the square roots of the distances.

" The sun's period of rotation being 25 days, his density is only $\frac{1}{25}$ of that of a planet having a period of 24 hours—that of Mercury, for instance. Hence Mercury has, for the purpose now in view, virtually a diameter equal to a little more than $\frac{1}{12}$ of that of the sun $(\frac{888\ 000}{25} = 35,520;\ \frac{35\ 520}{300} = 11.84:\ \frac{888\ 000}{11.84} =)$,—say, 75,000 miles.

" Here we have a conception of the planet in the mid-stage, so to speak, of its condensation, after the breaking up of the vaporous ring which was to produce it and just at the taking on of the globular form. But before the arrival at this stage the figure was that of a truck, the vertical diameter of which is identifiable in the periphery of the globe ($75{,}000 \times \frac{22}{7} =$), 236 thousand miles. Half way down this diameter the body settled into its (original) orbit,—rather, would have settled had it been the only one, besides its parents, in the solar system,—an orbit distant from the sun's equator ($\frac{236\ 000}{2} =$) 118,000 miles; and from the centre of the solar vortex ($118{,}000 + \frac{888\ 000}{2} =$), 562 thousand miles. To this are to be added successively the lengths of the semi-diameters of the trucks of Venus, of the earth, and so on outward.

"There, the planets' original distances, rather, speaking strictly, the widths from the common centre to the outer limits of their rings of vapor, are pointed at. From these, as foundations, the present distances may be deduced. A simple outline of the process to the deduction is this: Neptune took his orbit first; then Uranus took his. The effect of the coming into closer conjunction of the two bodies was such as would have been produced by bringing each so much nearer the centre of the solar vortex. Each enlarged its rotary ellipse and increased its rotary velocity in the ratio of the decrease of distance. A secondary result —the final consequence—of the enlargement and the increase was the propulsion of each outward, the square root of the relative decrease being the measure of the length through which each was sent. The primary result, of course, was the drawing of each inward; and it is fairly presumable that there were oscillations inward and outward, outward and inward, during several successive periods of rotation. It is probable, at any rate, not glaringly improbable, that, in the oscillations across the remnants of the rings of vapor (the natural inference is that these were not completely gathered into the composition of the bodies), portions of the vapor were whirled into satellites, which followed in the passage outward.

" Saturn's ring (I have no allusion to the rings now existing), as well as that of each of the other planets after him, while it was being gradually cast off from the sun's equator, was carried along in the track of its next predecessor, the distance here being the full quotient (not the square root of the quotient) found in dividing by the breadth to its own periphery, that to the periphery of the other. Thus, reckoning for Uranus a breadth of 17 million, and for Saturn one of 14 million miles, the latter (still in his vaporous state) was conducted outward (through a sort of capillary attraction) $\frac{14}{17}$ as far as the former (after condensation) was driven by means of the vortical influence of Neptune. The new body and the two older bodies interchanged forces, and another advance outward (of all three) was made. Combining all of the asteroids into one of the Nine Great Powers, there were eight stages of the general movement away from the centre; and, granting that we have, exact, the diameters and the rotary periods (that is, the densities) of all of the participants in the movement, the measurement of each stage by itself, and of all the stages together, can be calculated exactly.

" How will *that* do for a postscript ? "

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