

MIRACLES
AND
SPECIAL PROVIDENCES,
BY
PROFESSOR TYNDALL.

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Miracles and Special Providences.

It is my privilege to enjoy the friendship of a number of religious men, with whom I converse frankly upon theological subjects, expressing without disguise the notions and opinions I entertain regarding their tenets, and hearing in return these notions and opinions subjected to criticism. I find them liberal and loving men, patient in hearing, tolerant in reply, who know how to reconcile the duties of courtesy with the earnestness of debate. From one of these, nearly a year ago, I received a note, recommending strongly to my attention the volume of "Bampton Lectures" for 1865, in which the question of miracles is treated by Mr. Mozley. Previous to receiving this note, I had in part made the acquaintance of that work, through the able and elaborate review of it which appeared in the *Times*. The combined effect of the letter and review was to make the book the companion of my summer tour among the Alps. There, during the wet and snowy days which were only too prevalent last year, and during the days of rest interpolated between days of toil, I made myself more thoroughly conversant with Mr. Mozley's volume. I found it clear and strong—an intellectual tonic, as bracing and pleasant to my mind as the keen air of the mountains was to my body. From time to time I jotted down my thoughts regarding it, intending afterwards, if time permitted, to work them up into a coherent

whole. Other duties, however, interfere with the carrying out of this intention, and what I wrote last summer I now publish, not hoping within any reasonable time to be able to render my defence of scientific method more complete.

Mr. Mozley refers at the outset of his task to the movement against miracles which of late years has taken place, and which determined his choice of a subject. He acquits modern science of having had any great share in the production of this movement. The objection against miracles, he says, does not arise from any minute knowledge of the laws of nature, but simply because they are opposed to that plain and obvious order of nature which everybody sees. The movement against miracles is, he thinks, to be ascribed to the greater earnestness and penetration of the present age. Formerly miracles were accepted without question, because without reflection; but the exercise of what Mr. Mozley calls the historic imagination is a feature of our time. Men are now accustomed to place before themselves vivid images of the past, and when in that past a miracle rises to view, they halt before the astounding occurrence, and realising it with the same clearness as if it were now passing before their eyes, they ask themselves, "Can this have taken place?" In some instances the effort to answer this question has led to a disbelief in miracles, in others to a strengthening of belief. The end and aim of Mr. Mozley's lectures is to show that the strengthening of belief is the logical result which ought to follow the examination of the facts.

Attempts have been made by religious men to

bring the Scripture miracles within the scope of the order of nature, but all such attempts are rejected by Mr. Mozley as utterly futile and wide of the mark. Regarding miracles as a necessary accompaniment of a revelation, their evidential value in his eyes depends entirely upon their deviation from the order of nature. Thus deviating, they suggest and illustrate to him a power higher than nature, a "personal will;" and they commend the person in whom this power is vested as a messenger from on high. Without these credentials such a messenger would have no right to demand belief, even though his assertions regarding his divine mission were backed by a holy life. Nor is it by miracles alone that the order of nature is, or may be, disturbed. The material universe is also the arena of "special providences." Under these two heads Mr. Mozley distributes the total preternatural. One form of the preternatural may shade into the other, as one colour passes into another in the rainbow; but while the line which divides the specially providential from the miraculous cannot be sharply drawn, their distinction broadly expressed is this, that while a special providence can only excite surmise more or less probable, it is "the nature of a miracle to give proof, as distinguished from mere surmise of divine design."

Mr. Mozley adduces various illustrations of what he regards to be special providences as distinguished from miracles. "The death of Arius," he says, "was not miraculous, because the coincidence of the death of a heresiarch taking place when it was

peculiarly advantageous to the orthodox faith. . . . was not such as to compel the inference of extraordinary Divine agency ; but it was a special providence, because it carried a reasonable appearance of it. The miracle of the Thundering Legion was a special providence, but not a miracle for the same reason, because the coincidence of an instantaneous fall of rain in answer to prayer carried some appearance, but not proof, of preternatural agency." The eminent lecturer's remarks on this head bring to my recollection certain narratives published in Methodist magazines, under the title, if I remember aright, "The Providence of God asserted," and which I used to read with avidity when a boy. In these chapters the most extraordinary and exciting escapes from peril were recounted and ascribed to prayer, while equally wonderful instances of calamity were adduced as illustrations of Divine retribution. In such magazines, or elsewhere, I found recorded the case of the celebrated Samuel Hick, which, as it illustrates a whole class of special providences, approaching in conclusiveness to miracles, is worthy of mention here. It is related of this holy man—and I, for one, have no doubt of his holiness—that flour was lacking to make the sacramental bread. Grain was present, and a windmill was present, but there was no wind to grind the corn. With faith, undoubting Samuel Hick prayed to the Lord of the winds : the sails turned, the corn was ground, after which the wind ceased. According to the canon of the Bampton Lecturer, this, though carrying a strong appearance of an imme-

mediate exertion of Divine energy, lacks by a hair's-breadth the quality of a miracle. For the wind *might* have arisen, and *might* have ceased, in the ordinary course of nature. Hence the occurrence did not "compel the inference of extraordinary Divine agency." In like manner Mr. Mozley considers that the "appearance of the cross to Constantine was a miracle, or a special providence, according to which account of it we adopt. As only a meteoric appearance in the shape of a cross it gave some token of preternatural agency, but not full evidence."

In the Catholic cantons of Switzerland, in one of which these lines are written, and still more among the pious Tyrolese, the mountains are dotted with shrines, containing offerings of all kinds, in acknowledgment of special mercies—legs, feet, arms and hands, of gold, silver, brass, and wood, according as worldly possessions enabled the grateful heart to express its indebtedness. Most of these offerings are made to the Virgin Mary. They are recognitions of "special providences," wrought through the instrumentality of the Mother of God. Mr. Mozley's belief, that of the Methodist chronicler, and that of the Tyrolese peasant, are substantially the same. Each of them assumes that nature, instead of flowing ever onward in the uninterrupted rhythm of cause and effect, is mediately ruled by the free human will. As regards *direct* action upon natural phenomena, man's will is confessedly powerless, but it is the trigger which, by its own free action, liberates the Divine power. In this sense, and to this extent, man, of course, commands nature. Did the exis-

tence of this belief depend solely upon the material benefits derived from it, it could not, in my opinion, last a decade. As a purely objective fact we should very soon see that the distribution of natural phenomena is unaffected by the merits or the demerits of man; that the law of gravitation crushes the simple worshippers of Ottery St. Mary, while singing their hymns, just as surely as if they were engaged in a midnight brawl. The hold of this belief upon the human mind is due to the inner warmth, force, and elevation with which it is commonly associated. It is plain, however, that these feelings may exist under the most various forms. They are not limited to Church of England Protestantism—they are not even limited to Christianity. Though less refined, they are certainly not less strong, in the heart of the Methodists and the Tyrolese than in the heart of Mr. Mozley. Indeed, those feelings belong to the primal powers of man's religious nature. A "sceptic" may have them. They find vent in the battle-cry of the Moslem. They take hue and form in the hunting-grounds of the red Indian; and raise all of them, as they raise the Christian, upon a wave of victory, above the terrors of the grave.

The character, then, of a miracle, as distinguished from a special providence, is that the former furnishes *proof*, while in the case of the latter we have only surmise. Dissolve the element of doubt, and the alleged fact passes from the one class of the preternatural into the other. In other words, if a special providence could be *proved* to be a special providence, it would cease to be a special providence

and become a miracle. There is not the least cloudiness about Mr. Mozley's meaning here. A special providence is a doubtful miracle. Why, then, not use the correct phraseology? The term employed conveys no negative suggestion, whereas the negation of certainty is the peculiar characteristic of the thing intended to be expressed. There is an apparent unwillingness on the part of Mr. Mozley to call a special providence what his own definition makes it to be. Instead of speaking of it as a doubtful miracle he calls it "an invisible miracle." He speaks of the point of contact of supernatural power with the chain of causation being so high up as to be wholly, or in part, out of sight, whereas the essence of a special providence is the uncertainty whether there is any contact at all, either high or low. By the use of an incorrect term, however, a grave danger is avoided. For the idea of doubt, if kept systematically before the mind, would soon be fatal to the special providence as a means of edification. The term employed, on the contrary, invites and encourages the trust which is necessary to supplement the evidence.

This inner trust, though at first rejected by Mr. Mozley in favor of external proof, is subsequently called upon to do momentous duty with regard to miracles. Whenever the evidence of the miraculous seems incommensurate with the fact which it has to establish, or rather when the fact is so amazing that hardly any evidence is sufficient to establish it, Mr. Mozley invokes "the affections." They must urge the reason to accept the conclusion from

which unaided it recoils. The affections and emotions are eminently the court of appeal in matters of real religion, which is an affair of the heart, but they are not, I submit, the court in which to weigh allegations regarding the credibility of physical facts. These must be judged by the dry light of the intellect alone, appeals to the affections being reserved for cases where moral elevation, and not historic conviction, is the aim. It is, moreover, because the result, in the case under consideration, is deemed desirable, that the affections are called upon to back it. If undesirable, they would, with equal right, be called upon to act the other way. Even to the disciplined scientific mind this would be a dangerous doctrine. A favourite theory—the desire to establish or avoid a certain result—can warp even such a mind so as to destroy its power of estimating facts. I have known men to work for years under a fascination of this kind, unable to extricate themselves from its fatal influence. They had certain data, but not, as it happened, enough. By a process exactly analogous to that invoked by Mr. Mozley they supplemented the data, and from that hour blinded their intellects to the perception of adverse phenomena which might have led them to the truth. If, then, to the disciplined scientific mind, this incongruous mixture of proof and trust be fraught with danger, what must it be to the indiscriminate audience which Mr. Mozley addresses? In calling upon this agency he acts the part of Frankenstein. It is the monster thus evoked that we see stalking abroad, in the so-called

spiritualistic phenomena of the present day. Again, I say, where the aim is to elevate the mind, to quicken the moral sense, to kindle the fire of religion in the soul, let the affections by all means be invoked; but they must not be permitted to colour our reports, or to influence our acceptance of reports of occurrences in external nature. Testimony as to natural facts is usually worthless when wrapped in this atmosphere of the affections, the most earnest subjective truth being rendered by them perfectly compatible with the most astounding objective error.

There are questions in judging of which the affections or sympathies are often our best guides, the estimation of moral goodness being one of these. But at this precise point, where they are really of use, Mr. Mozley excludes the affections, and demands a miracle as a certificate of character. He will not accept any other evidence of the perfect goodness of Christ. "No outward life or conduct," he says, "however irreproachable, could prove His perfect sinlessness, because goodness depends upon the inward motive, and the perfection of the inward motive is not proved by the outward act." But surely the miracle is an outward act, and to pass from it to the inner motive imposes a greater strain upon logic than that involved in our ordinary methods of estimating men. There is, at least, moral congruity between the outward goodness and the inner life, but there is no such congruity between the miracle and the life within. The test of moral goodness laid down by Mr. Mozley is not the test of John, who says, "He that doeth righteousness

is righteous ;” nor is it the test of Jesus—“ By their fruits shall ye know them ; do men gather grapes of thorns, or figs of thistles ?” But it is the test of another : “ If thou be the Son of God, command that these stones be made bread.” For my own part, I prefer the attitude of Fichte to that of Mr. Mozley. “ The Jesus of John,” says this noble and mighty thinker, “ knows no other God than the true God, in whom we all are, and live, and may be blessed, and out of whom there is only Death and Nothingness.” And he appeals, and rightly appeals, in support of this truth, not to reasoning, but to the inward practical sense of truth in man, not even knowing any other proof than this inward testimony, “ If any man will do the will of Him who sent me, he shall know of the doctrine whether it be of God.”

Accepting Mr. Mozley’s test, with which alone I am now dealing, it is evident that, in the demonstration of moral goodness, the *quantity* of the miraculous comes into play. Had Christ, for example, limited himself to the conversion of water into wine, He would have fallen short of the performance of Jannes and Jambres, for it is a smaller thing to convert one liquid into another, than to convert a dead rod into a living serpent. But Jannes and Jambres, we are informed, were not good. Hence, if Mr. Mozley’s test be a true one, a point must exist, on the one side of which miraculous power demonstrates goodness, while on the other side it does not. How is this “ point of contrary flexure” to be determined ? It must lie somewhere

between the magicians and Moses, for within this space the power passed from the diabolical to the Divine. But how to mark the point of passage—how, out of a purely *quantitative* difference in the visible manifestation of power we are to infer a total inversion of quality—it is extremely difficult to see. Moses, we are informed, produced a large reptile, Jannes and Jambres produced a small one. I do not possess the intellectual faculty which would enable me to infer from those data either the goodness of the one or the badness of the other; and in the highest recorded manifestations of the miraculous I am equally at a loss. Let us not play fast and loose with the miraculous; either it is a demonstration of goodness in all cases or in none. If Mr. Mozley accepts Christ's goodness as transcendent, because he did such works as no other man did, he ought, logically speaking, to accept the works of those who, in His name, had cast out devils, as demonstrating a proportionate goodness on their part. But people of this class are consigned to everlasting fire prepared for the devil and his angels. The zeal of Mr. Mozley for miracles threatens, I think, to eat his religion up. The truly religious soul needs no such proof of the goodness of Christ. The words addressed to Matthew at the receipt of custom required no miracle to produce obedience. It was by no stroke of the miraculous that Jesus caused those sent to seize him to go backward and fall to the ground. It was the sublime and holy effluence from within, which needed no prodigy to commend it to the wonder and the worship even of his foes.

As regards the function of miracles in the founding of a religion, Mr. Mozley institutes a comparison between the religion of Christ and that of Mahomet, and he derides the latter as "irrational" because it does not profess to adduce miracles in proof of its supernatural origin. But the religion of Mahomet, notwithstanding this drawback, has thriven in the world, and at one time it held sway over larger populations than Christianity itself. The spread and influence of Christianity are, however, brought forward by Mr. Mozley as "a permanent, enormous, and incalculable practical result" of Christian miracles; and he actually makes use of this result to strengthen his plea for the miraculous. His logical warrant for this proceeding is by no means clear. It is the method of science, when a phenomenon presents itself, to the production of which several elements may contribute, to exclude them one by one, so as to arrive at length at the truly effective cause. Heat, for example, is associated with the phenomenon; we exclude heat, but the phenomenon remains: hence, heat is not its cause. Magnetism is associated with the phenomenon; we exclude magnetism, but the phenomenon remains: hence, magnetism is not its cause. Thus, also, when we seek the cause of the diffusion of a religion—whether it be due to miracles, or to the spiritual force of its founders—we exclude the miracles, and, finding the result unchanged, we infer that miracles are not the effective cause. This important experiment Mahometanism has

made for us. It has lived and spread without miracles; and to assert, in the face of this fact, that Christianity has spread *because* of miracles, is not more opposed to the spirit of science than to the common sense of mankind.

The incongruity of inferring moral goodness from miraculous power has been dwelt upon above; in another particular also the strain put upon miracles by Mr. Mozley is, I think, more than they can bear. In consistency with his principles, it is difficult to see how he is to draw from the miracles of Christ any certain conclusion as to his Divine nature. He dwells very forcibly on what he calls "the argument from experience," in the demolition of which he takes evident pleasure. He destroys the argument, and repeats it for the mere purpose of again and again knocking the breath out of it. Experience, he urges, can only deal with the past; and the moment we attempt to project experience a hair's-breath beyond the point it has at any moment reached, we are condemned by reason. It appears to me that when he infers from Christ's miracles a Divine and altogether superhuman energy, Mr. Mozley places himself precisely under this condemnation. For what is his logical ground for concluding that the miracles of the New Testament illustrate Divine power? May they not be the result of expanded human power? A miracle he defines as something impossible to man. But how does he know that the miracles of the New Testament are impossible to man? Seek as he may he has

absolutely no reason to adduce save this,—that man has never hitherto accomplished such things. But does the fact that man *has* never raised the dead prove that he *can* never raise the dead? “Assuredly not,” must be Mr. Mozley’s reply; “for this would be pushing experience beyond the limit it has now reached,—which I pronounce unlawful.” Then a period *may* come when man will be able to raise the dead.* If this be conceded—and I do not see how Mr. Mozley can avoid the concession—it destroys the *necessity* of inferring Christ’s divinity from his miracles. He, it may be contended, antedated the humanity of the future; as a mighty tidal wave leaves high upon the beach a mark which by-and-by becomes the general level of the ocean. Turn the matter as you will, no other warrant will be found for the all-important conclusion that Christ’s miracles demonstrate Divine power, than an argument which has been stigmatized by Mr. Mozley as “a rope of sand”—the argument from experience.

The Bampton Lecturer would be in this position even if he saw with his own eyes every miracle recorded in the New Testament. But he did *not* see these miracles; and his intellectual plight is therefore worse. He accepts these miracles on testimony. Why does he believe it? How does he know that it is not a delusion; how is he sure that it is not even falsehood? He will answer that the writing bears the marks of sobriety and

* He has of late produced numberless organic substances which were long deemed impossible save to vital action.

truth ; and that in many cases the bearers of this message to mankind sealed it with their blood. Granted ; but whence the value of all this ? Is it not solely derived from the fact that men, *as we know them*, do not sacrifice their lives in the attestation of that which they do not believe ? Does not the entire value of the testimony of the apostles depend ultimately upon our experience of human nature ? Thus those who are alleged to have seen the miracles based their inferences from what they saw on the argument from experience ; and Mr. Mozley bases his belief in their testimony on the same argument. The weakness of his conclusion is quadrupled by this double insertion of a principle of belief to which he flatly denies rationality. His reasoning, in fact, cuts two ways ;—if it destroys our belief in the order of Nature, it far more effectually abolishes the basis on which Mr. Mozley seeks to found the Christian religion.

Over this argument from experience, which at bottom is *his* argument, Mr. Mozley rides roughshod. There is a dash of scorn in the energy with which he tramples on it. Probably some previous writer had made too much of it, and thus invited his powerful assault. Finding the difficulty of belief in miracles to arise from their being in contradiction to the order of nature, he sets himself to examine the grounds of our belief in that order. With a vigour of logic rarely equalled, and with a confidence in its conclusions never surpassed, he disposes of this belief in a manner calculated to startle those who, without due

examination, had come to the conclusion that the order of nature was secure.

What we mean, he says, by our belief in the order of nature, is the belief that the future will be like the past. There is not, according to Mr. Mozley, the slightest rational basis for this belief.

“That any cause in nature is more permanent than its existing and known effects, extending further, and about to produce other and more instances besides what it has produced already, we have no evidence. Let us imagine,” he continues, “the occurrence of a particular physical phenomenon for the first time. Upon that single occurrence we should have but the very faintest expectation of another. If it did occur again, once or twice, so far from counting on another occurrence, a cessation would occur as the most natural event to us. But let it continue one hundred times, and we should find no hesitation in inviting persons from a distance to see it; and if it occurred every day for years, its occurrence would be a certainty to us, its cessation a marvel. . . . But what ground of reason can we assign for an expectation that any part of the course of nature will be the next moment what it has been up to this moment? . . . None. . . . No reason can be given for this belief. It is without a reason. It rests upon no rational grounds and can be traced to no rational principle.”

Our nature, though endowed with reason, contains, according to Mr. Mozley, “large irrational departments;” and to this region of unreason he relegates our belief in the order of nature.

But the belief, though irrational, is widely diffused, and this fact is thus accounted for:—“It is necessary, all-important for the purposes of life, but solely practical, and possesses no intellectual character. . . . The proper function of the inductive principle, the argument from experience, the belief in the order of nature—by whatever phrase we designate the same instinct—is to operate as a practical basis for the affairs of life and the

carrying on of human society." To sum up Mr. Mozley's views, the belief in the order of nature is general, but it is "an unintelligent impulse, of which we can give no rational account." It is inserted in our constitutions solely to induce us to till our fields, to raise our winter fuel, and thus to meet the future on the perfectly groundless supposition that the future will be like the past.

"Thus step by step," says Mr. Mozley, with the emphasis of a man who feels his position to be a strong one, "has philosophy loosened the connection of the order of nature with the ground of reason, befriending in exact proportion as it has done this, the principle of miracles." For "this belief not having itself a foundation in reason, the ground is gone upon which it could be maintained that miracles, as opposed to the order of nature, are opposed to reason." When we regard this belief in connection with science, "in which connection it receives a more imposing name, and is called the inductive principle," the result is the same. "The inductive principle is only this unreasoning impulse applied to a scientifically ascertained fact. . . . Science has led up to the fact, but there it stops, and for converting this fact into a law, a totally unscientific principle comes into play, the same as that which generalizes the commonest observation of nature."

We have had already an illustration of Mr. Mozley's dissent from the maxim, "By their fruits shall ye know them," and his substitution of another test for goodness and truth. It is, therefore, in no

degree surprising that he should pass over without a word the results of scientific investigation as proving anything rational regarding the principles or methods by which such results have been achieved. Perhaps the best way of proceeding here will be to give one or two examples of the mode in which men of science apply the unintelligent impulse with which Mr. Mozley credits them, and which shall illustrate the surreptitious method by which they climb from the region of facts to that of laws.

It was known before the sixteenth century that when the end of an open tube is dipped into water, on drawing an air-tight piston up the tube the water follows the piston, and this fact had been turned to account in the construction of the common pump. The effect was explained at the time by the maxim, "Nature abhors a vacuum." It was not known that there was any limit to the height to which the water would ascend, until, on one occasion, the gardeners of Florence, while attempting to raise the water a very great elevation, found that the column ceased at a height of thirty-two feet. Beyond this all the skill of the pump-maker could not get it to rise. The fact was brought under the notice of Galileo, and he, soured by a world which had not treated his science over kindly, twitted the philosophy of the time by remarking that nature evidently abhorred a vacuum only to a height of thirty-two feet. But Galileo did not solve the problem. It was taken up by his pupil Torricelli, who pondered it, and while he did so various thoughts regarding it arose in his

mind. It occurred to him that the water might be forced up in the tube by a pressure applied to the surface of the water external to the tube. But where, under the actual circumstances, was such a pressure to be found? After much reflection, it flashed upon Torricelli that the atmosphere might possibly exert the pressure; that the impalpable air might possess weight, and that a column of water thirty-two feet high might be of the exact weight necessary to hold the pressure of the atmosphere in equilibrium. There is much in this process of pondering and its results which it is impossible to analyse. It is by a kind of inspiration that we rise from the wise and sedulous contemplation of facts to the principles on which they depend. The mind is, as it were, a photographic plate, which is gradually cleansed by the effort to think rightly, and which when so cleansed, and not before, receives impressions from the light of truth. This passage from facts to principles is called induction, which in its highest form is inspiration; but, to make it sure, the inward sight must be shown to be in accordance with outward fact. To prove or disprove the induction, we must resort to deduction and experiment. Torricelli reasoned thus—If a column of water thirty-two feet high holds the pressure of the atmosphere in equilibrium, a shorter column of a heavier liquid ought to do the same. Now, mercury is thirteen times heavier than water; hence, if my induction be correct, the atmosphere ought to be able to sustain only thirty inches of mercury. Here, then, is a deduction which can be immediately sub-

mitted to experiment. Torricelli took a glass tube a yard or so in length, closed at one end and open at the other, and filling it with mercury, he stopped the open end with his thumb, and inverted it in a basin filled with the liquid metal. One can imagine the feeling with which Torricelli removed his thumb, and the delight he experienced when he found that his thought had forestalled a fact never before revealed to human eyes. The column sank, but ceased to sink at a height of thirty inches, leaving the Torricellian vacuum overhead. From that hour the theory of the pump was established. The celebrated Pascal followed Torricelli with a still further deduction. He reasoned thus—If the mercurial column be supported by the atmosphere, the higher we ascend in the air the lower the column ought to sink, for the less will be the weight of the air overhead. He ascended the Puy de Dome, carrying with him a barometric column, and found that as he ascended the column sank, and that as he descended the column rose. And thus Pascal verified the result of Torricelli.

Between that time and the present, millions of experiments have been made upon this subject. Every village pump is an apparatus for such experiments. In thousands of instances, moreover, pumps have refused to work; but on examination it has infallibly been found that the well was dry, that the pump required priming, or that some other defect in the apparatus accounted for the anomalous action. In every case of the kind the skill of the pump-

maker has been found to be the true remedy. In no case has the pressure of the atmosphere ceased; constancy, as regards the lifting of pump-water, has been hitherto the demonstrated rule of nature. So also as regards Pascal's experiment. His experience has been the universal experience ever since. Men have climbed mountains, and gone up in balloons; but no deviation from Pascal's result has ever been observed. Barometers, like pumps, have refused to act, but instead of indicating any suspension of the operations of nature, or any interference on the part of its Author with atmospheric pressure, examination has in every instance fixed the anomaly upon the instruments themselves.

Let us now briefly consider the case of Newton. Before his time men had occupied themselves with the problem of the solar system. Kepler had deduced, from a vast mass of observations, the general expressions of planetary motion known as "Kepler's Laws." It had been observed that a magnet attracts iron; and by one of those flashes of inspiration which reveal to the human mind the vast in the minute, it occurred to Kepler, that the force by which bodies fall to the earth might also be an attraction. Newton pondered all these things. He had a great power of pondering. He could look into the darkest subject until it became entirely luminous. How this light arises we cannot explain; but, as a matter of fact, it does arise. Let me remark here, that this power of pondering facts is one with which the ancients could be but imperfectly acquainted. They found the exercise of the pure

imagination too pleasant to expend much time in gathering and brooding over facts. Hence it is that when those whose education has been derived from the ancients speak of "the reason of man," they are apt to omit from their conception of reason one of its greatest powers. Well, Newton slowly marshalled his thoughts, or rather they came to him while he "intended his mind," rising one after another like a series of intellectual births out of chaos. He made this idea of attraction his own. But to apply the idea to the solar system, it was necessary to know the magnitude of the attraction and the law of its variation with the distance. His conceptions first of all passed from the action of the earth as a whole, to that of its constituent particles, the integration of which composes the whole. And persistent thought brought more and more clearly out the final divination that every particle of matter attracts every other particle by a force which varies in the inverse proportion of the square of the distance between the particles. This is Newton's celebrated law of inverse squares. Here we have the flower and outcome of his induction; and how to verify it, or to disprove it, was the next question. The first step of Newton in this direction was to prove, mathematically, that if this law of attraction be the true one; if the earth be constituted of particles which obey this law; then the action of a sphere equal to the earth in size, on a body outside of it, would be the same as that exerted if the whole mass of the sphere were contracted to a point at its centre. Practically speaking, then, the centre

of the earth is the point from which distances must be measured to bodies attracted by the earth. This was the first-fruit of his deduction.

From experiments executed before his time, Newton knew the amount of the earth's attraction at the earth's surface, or at a distance of 4,000 miles from its centre. His object now was to measure the attraction at a greater distance, and thus to determine the law of its diminution. But how was he to find a body at a greater distance? He had no balloon, and even if he had, he knew that any height which he could attain would be too small to enable him to solve his problem. What did he do? He fixed his thought upon the moon;—a body at a distance of 240,000 miles, or sixty times the earth's radius from the earth's centre. He virtually weighed the moon, and found that weight to be $\frac{1}{3600}$ th of what it would be at the earth's surface. This is exactly what his theory required. I will not dwell here upon the pause of Newton after his first calculations, or speak of his self-denial in withholding them because they did not quite agree with the observations then at his command. Newton's action in this matter is the normal action of the scientific mind. If it were otherwise—if scientific men were not accustomed to demand verification—if they were satisfied with the imperfect while the perfect is attainable, their science, instead of being, as it is, a fortress of adamant, would be a house of clay, ill-fitted to bear the buffetings of the theologic storms to which from time to time it is exposed.

Thus we see that Newton, like Torricelli, first

pondered his facts, illuminated them with persistent thought, and finally divined the character of the force of gravitation. But having thus travelled inward to the principle, he had to reverse his steps, carry the principle outward, and justify it by demonstrating its fitness to external nature. This he did, as we have seen, by determining the attraction of the moon. And here, in passing, I will notice a point which is worthy of a moment's attention. Kepler had deduced his laws from observation. As far back as those observations extended, the planetary motions had obeyed these laws; and neither Kepler nor Newton entertained a doubt as to their continuing to obey them. Year after year, as the ages rolled, they believed that those laws would continue to illustrate themselves in the heavens. But this was not sufficient. The scientific mind can find no repose in the mere registration of sequence in nature. The further question intrudes itself with resistless might: whence comes the sequence? What is it that binds the consequent with its antecedent in nature? The truly scientific intellect never can attain rest until it reaches the *forces* by which the observed succession is produced. It was thus with Torricelli; it was thus with Newton; it is thus pre-eminently with the real scientific man of to-day. In common with the most ignorant, he shares the belief that spring will succeed winter, that summer will succeed spring, that autumn will succeed summer, and that winter will succeed autumn. But he knows still further—and this knowledge is essential to his intellectual repose—that this succession, besides

being permanent, is, under the circumstances, *necessary*; that the gravitating force exerted between the sun, and a revolving sphere with an axis inclined to the plane of its orbit, *must* produce the observed succession of the seasons. Not until this relation between forces and phenomena has been established is the law of reason rendered concentric with the law of nature, and not until this is effected does the mind of the scientific philosopher rest in peace.

The expectation of likeness, then, in the procession of phenomena is not that on which the scientific mind founds its belief in the order of nature. If the force be *permanent* the phenomena are *necessary*, whether they resemble or do not resemble anything that has gone before. Hence, in judging of the order of nature, our inquiries eventually relate to the permanence of force. From Galileo to Newton, from Newton to our own time, eager eyes have been scanning the heavens, and clear heads have been pondering the phenomena of the solar system. The same eyes and minds have been also observing, experimenting, and reflecting on the action of gravity at the surface of the earth. Nothing has occurred to indicate that the operation of the law has for a moment been suspended; nothing has ever intimated that nature has been crossed by spontaneous action, or that a state of things at any time existed which could not be rigorously deduced from the preceding state. Given the distribution of matter and the forces in operation in the time of Galileo, the competent mathematician of that day could predict what is now occurring in our own. We calculate

eclipses before they have occurred and find them true to the second. We determine the dates of those that have occurred in the early times of history and find calculation and history at peace. Anomalies and perturbations in the planets have been over and over again observed, but these, instead of demonstrating any inconstancy on the part of natural law, have invariably been reduced to consequences of that law. Instead of referring the perturbations of Uranus to any interference on the part of the Author of Nature with the law of gravitation, the question which the astronomer proposed to himself was "how, in accordance with this law, can the perturbation be produced?" Guided by a principle, he was enabled to fix the point of space in which, if a mass of matter were placed, the observed perturbations would follow. We know the result. The practical astronomer turned his telescope towards the region which the intellect of the theoretic astronomer had already explored, and the planet now named Neptune was found in its predicted place. A very respectable outcome, it will be admitted, of an impulse which "rests upon no rational grounds, and can be traced to no rational principle;" which possesses "no intellectual character;" which "philosophy has uprooted from "the ground of reason," and fixed in that "large irrational department" discovered for it, by Mr. Mozley, in the hitherto unexplored wildernesses of the human mind.

The proper function of the inductive principle, or the belief in the order of nature, says Mr. Mozley, is "to act as a practical basis for the affairs of life,

and the carrying on of human society." But what, it may be asked, has the planet Neptune, or the belt of Jupiter, or the whiteness about the poles of Mars, to do with the affairs of society? How is society affected by the fact that the sun's atmosphere contains sodium, or that the nebula of Orion contains hydrogen gas? Nineteen-twentieths of the force employed in the exercise of the inductive principle, which, reiterates Mr. Mozley, is "purely practical," have been expended upon subjects as unpractical as these. What practical interest has society in the fact that the spots on the sun have a decennial period, and that when a magnet is closely watched for half a century, it is found to perform small motions which synchronise with the appearance and disappearance of the solar spots? And yet there are men who would deem a life of intellectual toil amply rewarded by reaching, at its close, the solution of these infinitesimal motions. The discovery of the inductive principle is founded in man's desire to know—a desire arising from his position among phenomena which are reducible to order by his intellect. The material universe is the complement of the intellect, and without the study of its laws reason would never have awoke to its higher forms of self-consciousness at all. It is the non-ego, through and by which the ego is endowed with self-discernment. We hold it to be an exercise of reason to explore the meaning of a universe to which we stand in this relation, and the work we have accomplished is the proper commentary on the methods we have pursued. Judge the tree by

its fruits. Before these methods were adopted the human mind lay barren in the presence of Nature. For thousands of years witchcraft, and magic, and miracles, and special providences, and Mr. Mozley's "distinctive reason of man," had the world to themselves. They made worse than nothing of it—*worse* I say, because they let and hindered those who might have made something of it. Hence it is that during a single lifetime of this era of "unintelligent impulse," the progress in natural knowledge is all but infinite as compared with that of the centuries during which magic, miracles, and special providences harried the reason of man.

Still the believers in magic and miracles of a couple of centuries ago had all the strength of Mr. Mozley's present logic on their side. They had done for themselves what he rejoices in having so effectually done for us—cleared the ground of the belief in the order of nature, and declared magic and miracles to be matters for ordinary evidence to decide. "The principle of miracles" thus "befriended" had free scope, and we know the result. Lacking that rock-barrier of natural knowledge which we, laymen of England, now possess, and which breaks to pieces the logical pick and shovel of the theologian, keen jurists and cultivated men were hurried on to deeds, the bare recital of which makes the blood run cold. Skilled in all the rules of evidence, and versed in all the arts of cross-examination, these men, nevertheless, went systematically astray, and committed the deadliest wrongs against humanity. And why? Because they could

not put nature into the witness box, and question her; of her voiceless "testimony" they knew nothing. In all cases between man and man, their judgement was not to be relied on; but in all cases between man and nature they were blind leaders of the blind.

Mr. Mozley concedes that it would be no great result for miracles to be accepted by the ignorant and superstitious, "because it is easy to satisfy those who do not inquire." But he does consider it "a great result" that they have been accepted by the *educated*. In what sense educated? Like those statesmen, jurists, and church dignitaries whose education was unable to save them from the frightful errors glanced at above? Not even in this sense; for the great mass of Mr. Mozley's educated people had no legal training, and were absolutely defenceless against delusions which could set that training at nought. Like nine-tenths of our clergy at the present day, they had an intimate knowledge of the literature of Greece, Rome, and Judea; but as regards a knowledge of nature, which is here the one thing needful, they were "noble savages," and nothing more. In the case of miracles, then, it behoves us to understand the weight of the negative, before we assign a value to the positive; to comprehend the protest of nature before we attempt to measure, with it, the assertions of men. We have only to open our eyes to see what honest, and even intellectual, men and women are capable of in the way of evidence in this nineteenth century of the Christian era, and in latitude

fifty-two degrees north. The experience thus gained ought, I imagine, to influence our opinion regarding the testimony of people inhabiting a sunnier clime, with a richer imagination, and without a particle of that restraint which the discoveries of physical science have imposed upon mankind. To the theologian, with his wonderful theories of the "order of nature," I would in conclusion say, Keep to the region—not, however, exclusively *yours*—which is popularly known as the human heart: the region, I am willing to confess, of man's greatest nobleness and most sublime achievements. Cultivate this, if it be in you to do so; and it *may* be in you; for love and manhood are better than science, and they may render you three times less unworthy than many of those who possess ten times your natural knowledge. But, unless you come to her as a learner, keep away from physical nature. Here, in all frankness I would declare, that at present you are ill-informed, self-deluded, and likely to delude others. Farewell!"