A new system on fire and planetary life; shewing that the sun and planets are inhabited, and that they enjoy the same temperament as our earth. Also, an elucidation of the phaenomena of electricity and magnetism / [Anon].

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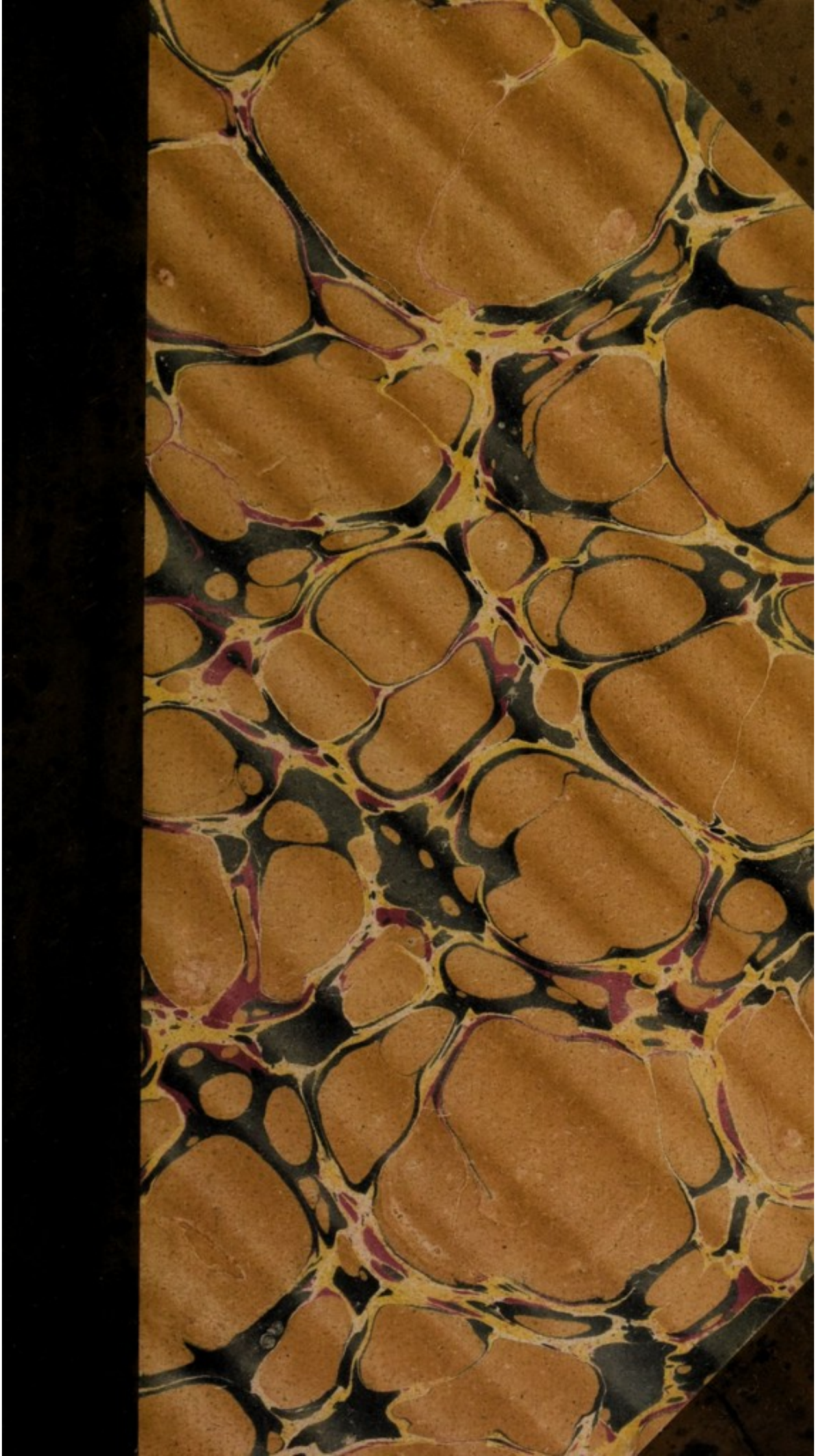

A NEW SYSTEM

ON

FIRE AND PLANETARY LIFE;

SHEWING THAT

THE SUN AND PLANETS
ARE INHABITED,

AND THAT

THEY ENJOY THE SAME TEMPERAMENT
AS OUR EARTH.

ALSO,

AN ELUCIDATION

OF

The Phænomena of Electricity and Magnetism.

.....

And God said, Let there be light: and there was light.——GEN.

.....

London:

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[*February*, 1796.]

THE

PREFACE.

THE ſyſtem which I now offer to the public I had formed twenty years ago, and ſhewed it then to ſome of my friends; but being fully aware of the great authorities I had to contend with, my reſolution at that time gave way, expecting that a favourable circumſtance would ſoon take place, in which I might have introduced it to the world under favourable auſpices; but that hope, though every day expecting its completion, has ſtill moſt unaccountably fled from me, ſo that I cannot help exclaiming, human projects are vain and tranſitory, when they reſt upon weak, deceitful, frail man!

Upon peruſing Dr. Herſchel's ſyſtem on the ſun being inhabited, I thought it a favourable opportunity to publiſh my new and extenſive ſyſtem, as his authority had paved the way, and directed men's minds to the ſubject: and I hope that mine, though very different from his, will meet with due candour from that accurate obſerver of the heavenly bodies.

Fire has hitherto been a great bar to ſcience, men not knowing any thing of its great qualities, power, and eſſence, in the works of the creation: how far I have paſſed that bar, I leave to the candid, the learned, and impartial world; hoping, whatever may be their ſtrictures,

ſtrictures, they will be ſtimulated by the motive of fair inveſtigation in ſearching for TRUTH—TRUTH, which is my ſole object in theſe enquiries, to inveſtigate nature for the benefit of man, ſenſible that the more enlarged his ideas of God are, the more he will venerate him. And I ſhould hope, from the nobleneſs and the great conſequence of the ſubject,—the reſearches into the greateſt works of the Deity, that men would give it a full inveſtigation, and that their obſervations and ſtrictures would be extenſive, formed upon the liberal baſis of a deſire for knowledge; and not cankered with envy, malice, or other abject paſſions, below a philoſopher, and which I am afraid too often dictate the little mean criticiſms of illiberal minds.

I flatter myſelf, that the ſcriptures and my ſyſtem are not at enmity, but mutullay elucidate each other; fully ſenſible that, both here and hereafter, religion is the ground upon which man muſt build his happineſs. For men's knowledge and good I have ardently ſtudied, and alſo I ardently pray; convinced the more we inveſtigate the natural world, the more we will benefit the moral world.

This is but the firſt part of my ſyſtem; the next will be upon the phænomena we obſerve upon our planet, which I have prepared for the preſs, and which I mean to give to the public immediately, if I meet with that candour I flatter myſelf my labours deſerve.

UPON PLANETARY LIFE.

THERE is a great and wide chaſm between man and other animals, God having given the former reaſon to explore his works; and the exerciſe of that reaſon is what raiſes him above other animals. And, as the rational part is above the ſenſual, the more the former is attended to, the more it will be maſter of the latter: the mind in conſequence will be enlarged and exalted, and carried nearer the Supreme Being, and further from the brutes, whoſe enjoyments reſt upon the paſſions. But that mind which reflects and reaſons upon the great works of the creation; which, by regular and ſlow degrees, riſes upon the hill of ſcience, enjoys an enlarged and extenſive proſpect; looks down upon the animals grazing at the bottom; and is one of the ſtrongeſt natural arguments for our immortality. Who can contemplate the great Newton upon the eminence, and the quadruped below, as beings made equally to periſh by annihilation! or, as Pope would have it, links of the ſame chain. Reaſon and the dignity of man revolt at the idea. Man, by exerciſing his attributes, takes a rapid flight, and leaves the brute far behind him. But the man who does not exerciſe his rational faculties, but grovels below, does not give proper dignity to his character; and therefore the chaſm appears in him not ſo great.

But, as intellectual enjoyments are ſuperior to all others; ſo God has laid open to man's induſtry the inveſtigation of the great natural cauſes by which he conducts part of his works; as it were, leading him from the groſs things of this world, and preparing

his mind for another. And what an heavenly reflection, to think that his knowledge in the next world will be extended nearer to God and his works! —the thought fills the mind with extaſy, and lifts it above itſelf.

Whenever we are ſo happy as to arrive at the true knowledge of any of God's works, we are always ſtruck with the power and ſimplicity by which they are conducted. Though man in his ignorance is always fabricating gigantic ſtructures, yet the great chain, whenever it comes to our view, is formed of that beautiful ſymmetry,—one link hanging ſo eaſy upon the other,—the ſame cauſe branching out to ſuch a wonderful extent, that the mind is equally aſtoniſhed with its ſimplicity as its power, it being beyond all mortal comprehenſion. In ſhort, language is unable to expreſs it,—we can only ſay, *it is God's work.*

In obſerving the works of nature, we evidently ſee two cauſes operating; fire which comes from the ſun, and the inert matter of our earth. At the poles, where little of the ſun's influence is felt, nature is a torpid maſs; and under the equator, where his greateſt influence is given, there all is life.

The two great leading principles upon which I build my ſyſtem are, that fire conſiſts in motion, and that inert matter, which, by way of diſtinction, I ſhall call earth, conſiſts in inaction.

The next two important principles I draw are, that the particles of fire have a great repulſive power to each other, being the firſt great and general law in nature; and from that repulſion conſiſts its motion.

The next important law is, that the particles of inert matter, or earth, have an attraction, or gravitation, to each other.

Another great law is, that theſe two bodies, *viz.* fire and earth, have an attraction for each other.

Theſe

Theſe two kinds of matter, fire and earth, upon our globe, have two ſtriking qualities.—The firſt is *repulſion*, and the ſecond *gravitation*. Theſe two qualities give life to all nature; and, by their univerſal operation, are the two great cauſes of planetary life, and of life in general, as I ſhall afterwards prove. By the word *motion*, I would define life; for life conſiſts in motion, and this motion conſiſts in the particles of fire having this great property in repelling each other; and by this motion and repulſion, being regulated by another kind of matter, which has the power of gravitation, and both operating together, conſiſt the well-regulated life of the univerſe, the great ſyſtem of nature.

To be more explicit; if there were no other matter in the univerſe than fire, its particles would ſo repel each other as equally to fill the whole univerſe; and if there were no other matter than earth, which I call the gravitating matter, its particles would gravitate to each other ſo as to occupy a ſmall ſpace indeed. But, as theſe two kinds of matter have an attraction for each other, they unite their qualities, and, in conſequence, the planets are of a large diameter; that is, the matter of theſe bodies occupies a large ſpace. By uniting together, their qualities are blended, and alſo their ſpace, or diameter, is blended. So that the matter of the univerſe is neither diſtributed equally through all ſpace, which the repulſive quality of fire would do, nor contracted into one comparatively ſmall condenſed maſs, which the gravitating power of earth would do; but they form many diſtinct maſſes, called ſuns, planets, comets, &c. forming bodies of different gravities, *viz.* ſolids, fluids, airs, &c. And alſo in their union they are not equally united, for a part of the fire is ſtill free, paſſing from one maſs, or ſun, or planet, to another

maſs, ſun, or planet; and probably in the inmoſt part of this maſs, ſun, or planet, the earth is alſo free, forming a condenſed maſs or body.

Then it appears, that theſe two kinds of matter, fire and earth, ſometimes do not unite together, *viz.* in the internal parts of theſe maſſes, or planets, where it is too deep for the fire to operate, and beyond its ſurface, where it is too far for the attractive earth to operate. So that in both theſe caſes, the two kinds of matter, *viz.* fire and earth, are not united. And, as I have a right to ſuppoſe there is a regular ſucceſſion of their operation; in the internal ſurface of thoſe maſſes, the earth and its qualities principally operate. So as we advance to the ſurface, the earth will loſe part of its influence, and the fire will begin alſo to operate; and, upon the ſurface, their operations will be equally blended, ſo that its matter will conſiſt of both theſe bodies, being intimately united together, forming animals, vegetables, and minerals, and alſo water: for, by the different proportions and combinations of theſe two kinds of matter, they will form all theſe bodies; for all theſe bodies, I ſuppoſe, poſſeſs life according to this proportion of life or animation, *viz.* animal, vegetable, and mineral life, in the ſame proportion they poſſeſs a high, equal, and eſſential diſtribution, or proportion, of theſe two bodies: but, as we advance beyond the ſurface of theſe maſſes, the fire predominates, and forms bodies of unequal proportions, as atmoſpheres, vapours, &c. And, as we advance further, we find the fire free and diſengaged, travelling from one maſs to another, called the ſun's rays. And I hope ſatisfactorily to prove, that theſe two kinds of matter which are the moſt removed from each other's influence are not perfectly free from each other's influence, but have a mutual action upon each

each other, *viz.* the inner parts of the maſſes and the free diſengaged fire, called the ſun's rays: for the former attracts the latter to fall upon its ſurface, and the latter repels the former to keep its proper diſtance, and to poiſe it in the firmament; and, as I ſhall clearly prove, to be the cauſe of the repulſion and gravitation which produce all the planetary evolutions. As our globe poſſeſſes ſuch a great quantity of ſolid matter, it will, in conſequence, gravitate to other bodies poſſeſſing large quantities of ſolid matter. And as alſo the globe poſſeſſes a large quantity of fire, both free and combined, it will alſo repel other bodies poſſeſſing a large quantity of free and combined fire. This is true and ſolid philoſophy, and what we ſee clearly takes place upon our earth. No one can be a ſtranger to the proceſs of gravitation in the bodies upon our earth, which has been fully ſhewn by the immortal Newton. And it is equally as clear to demonſtrate the repulſive power of fire on bodies upon our earth: for if a body has ever ſo ſtrong a coheſive or attractive power in its component parts, fire will repel thoſe component parts, forcing them to recede from each other; ſo that, inſtead of attraction, repulſion ſhall take place, (ſeen in metals becoming fluid by fire) and if ſtill a greater quantity of fire is given to the body, or metal, the repulſion will take place ſo as to repel its component particles to that great diſtance as to form an air, or vapour; and if ſtill a greater quantity of fire is given to this body, it will ſtill repel its component particles to a greater diſtance from each other; ſo that the ſmalleſt body might, by this means, fill the greateſt ſpace. For there is not a ſtronger fact in nature, than that bodies which contain a great quantity of this free fire will repel their component particles to any diſtance, and that no human force

can

can reſiſt this repulſion; that is, can make its particles coaleſe while they retain this fire. Therefore, any bodies which contain a great quantity of free fire cannot poſſibly have their attractive, or gravitating, principle to act ſo as to coaleſe; and, according to the proportion of free fire bodies poſſeſs, they will accordingly have their attractive, or gravitating, quality to act.

Now I ſhall more particularly endeavour to prove, that theſe two bodies, *viz.* fire and earth, from their two great qualities, repulſion and gravitation, are the great cauſes of PLANETARY LIFE;—and, as I ſhall hereafter prove, of life in general.

By the word *life*, in a philoſophical ſenſe, I would define motion: thus an animal's life, when it is extinct, gives birth to other motions, or life; its component parts are diſſolved and broken down, and its parts give birth to other motions, or life, in the great ſyſtem of nature, either animal, vegetable, or mineral life.

Then, agreeably to this definition, planetary life is to conſiſt in the planets' motions round the ſun; and I ſhall endeavour to inveſtigate the cauſe of this wonderful evolution.

As we are confined to this planet, we cannot ſee what is going forward in others, nor in the ſun, nor in the great ſpace between the ſun and planets. But, as the works of the great Being are all formed upon the ſimpleſt principles, let us enquire if none of thoſe principles which he makes uſe of in his works upon our earth will do for planetary life. Fire, that great element which comes from the ſun, we obſerve to have this great property of counteracting attraction, when applied in a quantity together.—Thus the metals which have the ſtrongeſt gravitation, or attraction, in their component parts, if fire is ap-

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plied to them, it immediately counteracts that adheſion, ſo as that they melt, and their component parts have not the leaſt adheſion to each other; and, as long as they retain that quantity of fire, no power can make them adhere again: nay, if a greater quantity of fire is added to their component parts, it will evaporate them, or form them into an aerial vapour; ſo that, while the vapour retains that great degree of heat, its component parts will be kept at an immenſe diſtance from each other, forming an atmoſphere; and, as long as they retain that fire, will never coaleſe.

It clearly appears, that bodies which poſſeſs a quantity of fire, their component parts muſt be greatly divided, and, as long as they retain that fire, their attraction is counteracted; but take that fire from them (as a metal for inſtance) and their parts immediately coaleſe, becoming a firm metal again; that is, provided their particles, when they loſe their fire, are at the time ſo near each other as to be within their power of attraction. Then, if we take a metal, I will ſuppoſe a drachm in bulk, and evaporate it, that is, keep its component parts ſuſpended by fire, ſo that this metal, which occupied only the ſpace of the eighth of an ounce, ſhall now occupy the immenſe ſpace of one thouſand gallons; in conſequence, the particles ſhall be removed from each other one hundred and twenty-eight thouſand times a greater diſtance than they were in their metallic ſtate.

Juſt ſo in the heavens; the heavenly bodies, ſuns, planets, &c. are removed from each other; and, as I ſhall further prove, by the ſame cauſe, *viz.* fire. But let us take, for our example, either a metal or water. Mercury, for inſtance, as one of the planets is named after it. Mercury or water, two ſuch heavy bodies, and two ſuch bodies, which, without heat,

heat, would become ice, and a hard firm metal bearing the hammer; evaporating theſe two bodies, which may be done when the weight of the atmoſphere is taken from them, by a very ſmall degree of heat, a leſs heat than ſubſiſts upon our earth, that is, the comparative heat which this earth poſſeſſes at the equator and poles, and the whole were mixed together. Now, as this ſmall degree of heat keeps the heavy globules of the mercury or water ſuſpended, why not the heavy globules of the planets ſuſpended. If any of my readers are ſtartled at the compariſon between the ſmall globules of the mercury and the planets, let them withhold their aſtoniſhment till I ſhall make the compariſon juſt, by all the different phænomena that we obſerve in the planetary evolutions; ſo that I might account for them *a priori*, from knowing the great effect of fire: for the moſt certain guide in generalizing in philoſophy, is to know whether the cauſe will account for all the phænomena.

The greateſt quantity of fire that we can unite to a body, is by evaporation. Thus gold will receive an immenſe quantity of fire, heating it intenſely; and if the application be continued, the gold will be evaporated, forming a vapour, which is known, upon the principle of latent heat, to contain an immenſe quantity of fire; and as long as it retains that heat, no human force can condenſe it again,*—a well-known fact, from the principle of fire-engines, where the vapour of water is made to have the ſtrongeſt mechanical powers, reſiſting the greateſt force.—Then we ſee clearly that the great power of fire upon our earth, is to enlarge the ſurface of bodies which

* And, it is worthy of remark, that bodies, when formed into vapour, have at the time both latent and fixed fire, and alſo free or actual fire, the ſame as the planets have.

contains it; and likewiſe, that no mechanical power can reſiſt this increaſe of their ſurface, *i. e.* hinder their particles from receding from each other, while they contain this fire. That whatever attractive power the particles have for each other, the fire reſiſts it. Therefore we have a right to adopt this principle, that, if it were not for the agency of fire, bodies, being actuated by their particles' attraction for each other, would contract into a very ſmall volume; ſo that gold, or any other metal, would become immenſely heavy.

To elucidate this more clearly—If they poſſeſs very little fire, they will be removed a ſmall diſtance from each other; and, if they poſſeſs a great quantity of fire, they will be removed a great diſtance from each other. And alſo, according to the quantity of matter and the quantity of fire, bodies will attract and repel each other. If a ſmall quantity of matter, and an equally ſmall proportion of fire, they will have a ſmall attraction and repulſion for each other; and, if a great quantity of matter, and an equally great proportion of fire, they will have a greater attraction and repulſion for each, as the planets.

I have been ſpeaking of fire in a looſe, diſengaged ſtate; but there are other ſtates of fire in a chemical combination, with inert matter; and thus gold contains a quantity of fire in this chemical combination. And there are different chemical combinations of fire. Thus water contains a quantity of fire in a very looſe combination; ſo, if it is expoſed to a degree of cold of thirty-two degrees of Fahrenheit's thermometer, it will loſe a part of its fire, and turn to ice. And again, there is another chemical combination more highly attracted, or combined, and in a far greater quantity, as in ſulphur. The fire that ſulphur poſſeſſes is immenſe, and its combination

with the vitriolic acid is likewiſe ſo immenſely ſtrong, that no cold can give it freedom, or ſet it looſe, but actual fire; ſo there are a great number of chemical combinations of fire in the intermediate ſtates between that which forms ice into water, and the vitriolic acid into ſulphur; and the variety of combinations and attractions forms the different bodies upon our earth; their different qualities and their different gravities.

When the works of the Supreme Being are inveſtigated, we always are ſtruck with their great ſimplicity, being conducted by a very ſimple cauſe, and that cauſe operating to ſo great an extent. Now, as Moſes informs us, God created the world, and then afterwards light, which I call fire. Firſt, I ſay, then he created inert matter, which, by way of diſtinction, I will call earth, and then repulſive matter, which I will call fire. Theſe two bodies have very ſtriking qualities.

Earth has this great quality, to attract, or run together, *i. e.* its particles attracting each other; hence gravitation.

Fire has this great quality, its particles repel or recede from each other; hence repulſion.

Theſe two kinds of matter being created, the inert matter would form large maſſes, or planetary bodies; and fire, that body which gives life to theſe maſſes. Theſe two bodies operating upon each other, as they have (as I ſhall afterwards ſhew) an attraction for each other, which attraction, along with gravitation and repulſion, will ſufficiently account for all chemical attraction and repulſion. This attraction, or affinity, will greatly increaſe the bulk of the earth, by the fire's repelling power counteracting the earth's attractive power; ſo that part of the earth's particles ſhall be even rarefied into an air, or atmoſphere, by the repulſive power of fire.

The

The earth contains a great quantity of fire, which we are ſenſible of, from digging below the ſurface, where we always find one uniform temperature of heat; and from the earth being full of volcanoes,* conſtantly emitting immenſe quantities of fire.

Then, when we reflect upon the immenſe quantity of fire which the earth poſſeſſes in its actual or free ſtate, as ſhewn by the thermometer; and likewiſe in its chemical or combined ſtate, ſeen by all bodies being compoſed of it, as ſulphur, metals, bitumens, animals, and vegetables; in ſhort, all bodies, both of the animal, vegetable, and mineral kingdoms, we muſt be certain, that the planet, our earth, contains an immenſe quantity of fire. Totally to deprive a body of fire is not in our power, either of its fixed or free ſtate; but we can go a good way in depriving a body of its free fire, producing that degree of cold, ſo as to freeze mercury: but ſtill we have a right to ſuppoſe, that degree of cold is far from a total deprivation.

Then, contemplating upon this immenſe quantity of fire which our globe poſſeſſes, we muſt ſuppoſe, if the ſun poſſeſſes an equal quantity, in proportion to its bulk, that this earth, or attractive particles of the ſun and our globe, cannot make them gravitate to each other, but they muſt repel each other. But then, upon the other hand, that repulſive power muſt be counterbalanced by the attractive power. I ſhall, I hope, ſufficiently prove, from attending to the planetary phænomena, that they are actuated by theſe two powers, from poſſeſſing theſe two great bodies, fire and earth.

As in my example of either water, or mercury, the power of their attractive particles being ſepara-

* Theſe, as I ſhall afterwards ſhew, are neceſſary to planetary life.

ted by heat, ſo that the one is not ice, and the other a compact metal, bearing the hammer; which ſtates we can eaſily produce by freezing them, or depriving them of a certain degree of fire. But, to make the analogy between them and the planets more juſt, the latter being an immenſe maſs of matter, and the former very minute bodies; when their particles are evaporated, or held from attracting each other *in vacuo;* the ſame ſtate as the planets are in: for even water, when raiſed into vapour, its particles are not minutely divided, but adhere together in very ſmall maſſes, which is ſeen diſtinctly in vapour, and which, by having a certain degree of heat, ſtill retain their form, ſo as to appear cloudy; that is, each little maſs being only ſeparated, or repelling each other; but, if a greater quantity of heat is applied to this cloud, or vapour, theſe little maſſes will be diſſolved, and *their particles repel each other*, which is very often ſeen in the clouds, and which are a watry vapour, or the particles of water repelling each other; ſometimes their little particles, or maſſes, will collect and form ſeparate maſſes, or drops of rain; and ſometimes, by having a greater quantity of fire from the ſun, theſe little maſſes will be ſo diſſolved as to become perfectly tranſparent, the cloud diſappearing; ſo that they form all that variety of maſſes.

Then, upon the clouds being deprived of their fire, theſe little maſſes run together, from their attractive power, ſo as to form drops of rain; and, upon their receiving a greater quantity of fire, their little maſſes are broken down, or diſſolved, ſo as to form ſmaller maſſes, becoming perfectly tranſparent. And upon a great and ſudden deprivation of fire in the clouds, their particles will run together, ſo as to form large maſſes, or large drops of rain, and accounts for thoſe large hailſtones which ſometimes fall: but nature

produces

produces all thoſe varieties of maſſes, water falling ſometimes in large maſſes, or drops, and ſometimes in minute maſſes, or drops, as miſt. Then, upon the ſame great principle are the planetary maſſes gravitating to each other and repelling each other; and they will form globes of different maſſes, or bulks: and, as I have before obſerved, the heavenly bodies, *viz.* ſuns, ſtars, and planets, do not occupy a greater ſpace, comparatively to their bulk, than the vapour of water does. But, as the quantity of fire in the univerſe is uniform, ſteady and conſtant, the planetary or heavenly maſſes are likewiſe uniform, ſteady, and conſtant.

But, as it clearly appears, (indeed there is not a more certain philoſophical fact) that fire makes the particles of bodies recede from each other; and that no force can counteract this repulſive power; and that we ſee it as univerſal and as great a power as the great Newton has ſhewn gravitation to be:† how the particles of gold attract each other, but how fire counteracts that power, ſo that it becomes a fluid, its particles having not the leaſt adhering power, but even form a vapour repelling its particles, or maſſes. Then, as our earth poſſeſſes a great quantity of fire, we muſt, by all true philoſophical reaſoning, allow its fire to have the ſame effect, repelling other maſſes of earth, or other planetary bodies. But, as the true mode of inveſtigating nature, is to ſee whether all the phænomena will be accounted for upon the principles advanced, I hope to make it appear, that the phænomena and the principles go hand in hand with each other, elucidating each

† The great Newton found out that great principle, gravitation, from the action of bodies on each other upon our earth, *viz.* upon contemplating an apple in his garden falling to the earth.

other;

other; and that they will bear no other explanation; ſhewing a ſyſtem worthy of the great Being that formed it.

The great and immortal Sir Iſaac Newton fully elucidated one great part of this ſyſtem, *viz.* gravitation; but, from not knowing the other, his ſyſtem is forced and arbitrary.

We have as great a right, from our knowledge of the effects of fire upon our earth, to aſſert its repulſive power, as we have to aſſert the gravitating power of matter. The ſtrongeſt chemical combination of fire with matter, that I am acquainted with, ſeems to be in ſulphur, acids having a very ſtrong attraction for fire; and I obſerve, that, when it is ſo ſtrongly attracted, or combined, it loſes greatly its repelling power, its repulſive power being principally when it is under no ſtrong chemical combination. Thus the fire that is in one ounce of ſulphur would, if free, expand the ſame quantity of acid to many thouſand times the bulk which it holds in the ſtate of ſulphur, owing to its repulſive motion being ſuſpended by its chemical attraction with the acid. But when its attraction, or combination, with matter is weaker, as in ſpirits, oils, &c. its repulſive power is a little more, and in conſequence thoſe bodies are lighter; therefore it has all the degrees, as I before obſerved, of its repulſive power, from its combination in the ſtate of ſulphur to its actual or free ſtate. But, in its free ſtate, its repulſive power is immenſe, and no human force can counteract it; that ſmall quantities of matter contain it, as in vapour, or large quantities of matter, as in planets; that theſe maſſes, or quantities, will equally repel each other: and that not to allow of the repulſion of fire, would be equally as abſurd as not to allow of the gravitation of matter, as they

both

both have an equal degree of facts that forces themſelves upon our obſervation. And that all the phænomena that we obſerve in vapour are perfectly applicable to the planets; that in vapour, its matter is not uniformly ſeparated, but is formed into little globular maſſes, as in dew; and, ſo in the planets the greateſt quantity of their fire is upon their ſurface; the ſame, I ſuppoſe, in vapour, or theſe ſmall maſſes of matter, the greateſt quantity of their fire is upon their ſurface, more than in the maſs itſelf.—So I would make this diſtinction, that, when the particles of matter are more equally diſtributed, as in tranſparent vapour, that the fire is more equally divided amongſt the matter; but when this matter runs into little maſſes, or cloudy vapour, that then the greateſt quantity of fire is upon the ſurface of theſe little maſſes; they becoming diſtinct maſſes of matter, with each of their atmoſpheres of fire; and that theſe maſſes repel each other is certain, ſo that no force can reſiſt them.

Then, as we ſee clearly that thoſe maſſes of matter always run into a globular ſtate, ſeen diſtinctly in all fluids, whether in the ſtate of water, vapour, &c. ſeen alſo clearly from the rain falling in drops. Therefore, when nature forms theſe large maſſes of matter, with ſuch a quantity of fire as we know our earth poſſeſſes, particularly upon its ſurface, they alſo muſt be globular; *i. e.* the planets muſt be ſpherical.

If fire and matter have the ſame qualities in the ſtarry firmament, as they have upon our earth, which I ſuppoſe no philoſopher will deny, they muſt repel and attract each other; and, if we ſtill argue from the analogy of vapour, the planets' repulſion and attraction will keep them about the ſame diſtance from each other, as we ſee them in the heavens: the compariſon holds juſt in every reſpect. If ſmall quantities

of

of matter and fire attract and repel each other to a certain diſtance, (for argument's ſake, I will ſay a thouſand times their diameter;) from all true reaſoning in philoſophy, we have a right to ſuppoſe larger maſſes of matter and fire will do the ſame, if nature's laws are uniform.

We obſerve, that, whenever maſſes of matter are perfectly ſeparated, that is, when thrown into a fluid ſtate, that nature runs into little globular maſſes; and we obſerve theſe maſſes moſt diſtinctly in mercury, or quickſilver;* for it evidently appears, that whenever fire repels matter, ſo as to take away their particles' attraction for each other, making them fluid, that this matter forms itſelf into globular maſſes. And, to confirm this principle, we ſee clearly that the planets are ſeparated from the ſun, according to this rule; alſo the largeſt maſſes, or planets, are removed the greateſt diſtance. But, according to Sir Iſaac Newton's principle of gravitation, it ought not to be ſo. The greater the maſs, the greater the attraction: and, in conſequence, the greater maſſes ought to be neareſt the ſun: for, according to Sir Iſaac's projectile force, which he has given us to counteract gravitation, it would not remove the largeſt planets the furtheſt from the ſun. But we obſerve the ſtars, which we ſuppoſe ſuns, are removed a great diſtance from each other,—and which is agreeable to my ſyſtem. There is no general rule without ſome exceptions. The planet Herſchel is leſs in diameter than Jupiter and Saturn; but which may be accounted for in this way. As the Deity, we ſee,

* It is to be remarked, that mercury poſſeſſes a great quantity of phlogiſton; alſo that earth does the ſame; and alſo that bodies which contain a quantity of phlogiſton are evaporated, or ſuſpended, with a ſmall quantity of free fire, as ſpirits of wine, ether, mercury, &c.

makes

makes nothing uſeleſs, the great ſpace between the planet Herſchel and the neighbouring ſuns and planets is moſt probably filled up with other planets belonging to our ſun, or ſyſtem; but thoſe planets which are at the extremity of our ſyſtem muſt be influenced by the ſuns and planets of other ſyſtems. Therefore, according to my general principles of repulſion and gravitation, theſe planets will get leſs and leſs in diameter, as they are placed further from our ſun, and nearer to other ſuns and ſyſtems, by being under their repulſive and gravitating influence. And, according to this doctrine, Jupiter is the largeſt planet, and we ſee the planets regularly increaſing from the ſun till we come to Jupiter, and then regularly decreaſing, probably in the ſame proportion, beyond Jupiter. As there are ſome exceptions to this general rule, the earth being larger than Mars, and Saturn than Herſchel: yet, as I ſhall ſhew, that water, from evaporating the fire quicker than the land, and in conſequence abſorbing the fire, and by that means keeping that part of the earth colder; ſeen clearly in the ſouthern pole of our earth being ſo much colder than the north pole; and in conſequence the earth is nearer the ſun when the ſouth pole is turned towards it, than when the north pole is turned towards it; therefore thoſe planets which contain a great quantity of water will alſo be nearer the ſun, according to their bulk, than the planets which contain a leſs proportion of water: beſides Saturn has an enormous ring and ſeven ſatellites.

Sir Iſaac Newton, whoſe name calls forth veneration, has deſcribed to us the full power of that great principle, gravitation; but, to counteract its influence, he formed an imaginary principle, calling it the projectile force; and, as no natural law that he knew of could produce it, he was obliged to bring

in the immediate hand of the Deity. But, upon inveſtigating his principles upon this ſuppoſed power, we ſhall find them altogether inadequate to the effect: and I hope to give another cauſe, which we ſhall find fully adequate, and which we ſhall alſo find as univerſal a principle as gravitation upon this earth, I mean *repulſion*.

But let us conſider Sir Iſaac's projectile power.—If a body is put in motion, and neither the gravitation of the earth, nor the reſiſtance of the atmoſphere, acts upon it, it will continue that motion for ever; therefore Sir Iſaac ſuppoſed that this motion, which was given it by the hand of the Deity, would be continued for ever. But though this earth's motion round the ſun has no atmoſphere to obſtruct it, yet it has gravitation, the gravitating to the ſun. That the ſuppoſed projectile power and gravitation would make the earth, in its motion, obey the direction of neither; but the diagonal of the two is certainly juſt. And if the earth, when it firſt received the projectile impulſe, it alſo being under the impulſe of gravitation at the ſame moment, would neither fly off in a right line from the ſun, nor fall immediately into it, but would move between the two forces in a diagonal line, and would continue moving in that direction; but, to continue it in that line, the two forces that impelled it ſhould either ceaſe immediately, or they ſhould both be continued; for, if the one continues and the other does not, it will obey the force that continues. Thus, if the projectile power ſhould ſtill continue, that is, ſhould the hand of God be conſtantly operating upon it every minute for millions of years, and gravitation ceaſe immediately after its firſt impulſe, then it would, in a ſhort time, fly off from the ſun, it being under the direction of that force only, and the influence that gravitation impreſt

upon

upon it would gradually loſe its power, the projectile power being continued every moment with the ſame influence as at firſt. So, *vice verſa*, if gravitation continues to act conſtantly with the ſame unremitting force it did at firſt, and the other, the projectile power, inſtantly to ceaſe after its firſt impulſe, (that is, the force which acted upon the earth to ceaſe acting, or leaving it to the firſt impulſe of the projectile force) then gravitation would every minute gain upon the earth's projectile force, and in no long time it would fall into the ſun. But to elucidate this plain and rational problem. If I take a ſtone and throw it from me, the force I give it would counteract its gravitating to the earth; but the earth's gravity would be conſtantly and uniformly acting upon it, and it would ſoon be attracted by the earth, and fall upon it. But, ſuppoſing that I had wings, and to take the ſtone in my hand; or, which is the ſame thing, be conſtantly puſhing it on with the ſame force I applied to it at firſt, it would go on uniformly as long as I continued the impulſe. Or, another example. If I take a wheel, and puſh it from me with force, it will obey that motion for a while; but the earth's gravity will imperceptibly act upon it, and in a ſhort time it will ſtop it; but, if I continue to give it the ſame projectile force, it will continue its motion. Or it may be illuſtrated further by a very eaſy experiment. If I take a ball, and diſcharge it, it will fly a long way; but if I fix a cord to the ball, and tie the cord to a ſtrong ſtick, and then diſcharge it, by its being forced out of its direction, ſo as to fly in a circle round and round the ſtick, its motion will become ſlower and ſlower, and it will travel far leſs ſpace; that is, if you meaſure with a cord the diſtance it would fly to in the firſt inſtance, and then meaſure with the ſame cord all its circles it makes

round the ſtick, the latter meaſure will be found, in length very much inferior to the former.

Therefore there cannot be any thing clearer, than that this projectile force of Sir Iſaac Newton is quite inadequate, in every reſpect, to account for the planetary evolutions; and I dare ſay no philoſopher can heſitate in agreeing with me, that, upon this repreſentation, the cauſe is perfectly inadequate to the effect: and alſo that, if a natural cauſe can be brought, which is equal to the phænomena, it ought to be adopted as the true cauſe; for, where we are obliged, in accounting for phænomena, to bring in the immediate hand of God, operating out of the tract of natural cauſes, it implies ignorance of the cauſe.

We ſhall find, upon examination, that the projectile force of Sir Iſaac Newton is quite inadequate to the planetary motions; and I hope we ſhall alſo find that my principle of repulſion perfectly accords with all their evolutions.

In the earth's progreſs round the ſun, we ſee it perform the ſame ſteady motions it did a thouſand years ago, they being neither abated nor accelerated. Its path being not a circle, but an ellipſis, owing to its motion being ſometimes quicker and ſometimes ſlower. Now, from whatever cauſe the projectile force is leſſened, what ſhould add to it again? We ſhall find, that Sir Iſaac's theory of gravitation producing it is quite inadequate to the phænomena; and I dare ſay my reader, when he ſees the full force of my arguments, will not require me to go into the minutiæ of Sir Iſaac's theory. But I ſhall make this obſervation, that Sir Iſaac, not knowing the principles of fire, its great repulſive quality, therefore he formed a wonderful ingenious theory, from his ſtrong imagination, upon this imaginary projectile force;

and

and I hope his admirers will not too tenaciouſly cavil at any philoſopher who ſhould differ from him. Knowledge is progreſſive, and no human being can develop every thing himſelf, without he is ſuppoſed to be more than human: error and frailty are the lot of man; one adds ſo many ſteps to the ladder of knowledge; another mounted upon thoſe ſteps adds others.—But let us proceed. I ſhall make my obſervations upon the moon's motions round our earth, as the moon being more immediately connected with our earth, and we can the eaſieſt obſerve her path; therefore the facts that I will argue from muſt be more certain. While the earth moves round the ſun at the rate of 58,000 miles an hour, the moon moves round the earth only at the rate of 2290 miles an hour; therefore the moon's motion round the earth muſt be greatly impeded, the earth moving ſo immenſely quicker than the moon. Suppoſing that the moon received this projectile force from the Deity, and that the earth ſtood ſtill, yet we ſhould have all our former arguments to bring againſt this projectile power, as being inadequate to the phænomena; for I hope I have fully ſhewn its fallacy. But I ſhall now argue, upon the ſuppoſition that Sir Iſaac's theory and his reaſoning upon it are juſt, and ſee if it will account for the moon's motion round the earth.

This projectile power and this gravitating power then operating upon the moon will, I ſhall ſuppoſe, carry it round the earth, each balancing the other: but then, unfortunately for this theory, the earth does not ſtand ſtill, but moves upwards of twenty times quicker than the moon. Therefore, when the moon is paſſing behind the earth in its path, *i. e.* in her firſt quarters, ſhe will, inſtead of quietly obeying this projectile force and gravitation in forming her circle, be dragged by the gravitating power out of her courſe;

that,

that, while the projectile and gravitating forces are propelling the moon 2290 miles in an hour, the earth's motion is dragging it out of this course 58,000 miles in an hour; and this must be, according to Sir Isaac's theory, by the gravitating power: so that the gravitating power not only acts an equal share in the moon's motion of 2290 miles an hour, but it acts alone in dragging it out of this course at the rate of 58,000 miles an hour. And it is a well-known fact, that, in the motion of bodies, any force, or power, that moves a body out of its course so much, so as the moon's course is altered, must entirely counteract the first impulse, or force. For instance, if a cannon-ball were shot out of a cannon, and it were to fly at the rate of 2290 miles a minute, and after it had flown a minute, another force were to propel it at the rate of 58,000 miles a minute, a quite different direction from the first, almost at a direct angle, and should it then be stopped, would it not have principally lost the influence of the first propelling power?—But let us examine the moon in her last quarters, when she is moving before the earth, we will take her at that point where she is directly in the earth's path, immediately before it, or just before she comes to her last quarter. Then what hinders the earth from running foul of the moon? If the moon is operated upon by her projectile and gravitating forces, according to Sir Isaac they must run together; yes, even suppose that the earth's gravitating power was not acting at the time.

To enlarge any more upon it, would be to dispute the common sense of my reader. Then it clearly appears, that, as the earth advances at the rate of 58,000 miles an hour, with the moon directly before it in its path, there must be some force to drive the moon before it. It is so strong, that it drives the moon

out

out of its courſe twenty times quicker than it travels round the earth. But ſtill ſtranger reaſoning at the moon's oppoſition; the earth and it are travelling the ſame path, and yet the moon's motion, when ſhe alters that courſe, is found to have received no additional impulſe. But ſtill more wonderful, when the moon is in her conjunction, ſhe then, inſtead of advancing in the heavens, is actually making a retrograde motion twenty times quicker than ſhe is advancing in her circle round the earth; and when ſhe alters that courſe, and is turning round in her firſt quarter, ſhe is found to have loſt none of her motion or impulſe.

Then does it not clearly appear that, when ſhe is travelling in the path behind the earth, ſhe muſt ſtill keep her ſituation, in reſpect to the earth, by the power of gravitation; and when ſhe is travelling in the path before the earth, that ſhe muſt ſtill keep her ſituation, in reſpect to the earth, by the power of repulſion,—a power that is evidently driving the moon before the earth, juſt in the ſame manner as the ſpokes of a wheel hinder the rim from falling upon the axle-tree. Theſe are ſtrong, clear, and evident facts, that can only be accounted for by the principle of repulſion.

There is a wonderful phænomenon upon this globe, *viz.* the tides; and which Sir Iſaac has endeavoured to account for upon the principle of gravitation; but let us enquire if this principle will account for the phænomenon. Sir Iſaac's theory ſuppoſes, that the water of this earth, contiguous to the moon, is attracted by the gravity of the earth, ſo as to riſe to that height, as to account for the tides.—But then, unfortunately for his theory, they equally riſe on the oppoſite ſide of the earth; which is, according to his hypotheſis, inexplicable. But he has given an explanation for this phænomenon, which,

when

when inveſtigated, I truſt, will be found very extraordinary indeed, *viz.* that the waters upon the oppoſite ſide of the earth to the moon will, from being further removed from the moon's influence, in conſequence accumulate there. But can any one ſuppoſe that gravitation can have this effect: will not the moon's influence, or gravity, alſo act upon the waters of the ſide of the earth oppoſite to it. To exemplify this, take a loadſtone of a ſhape ſimilar to the moon, and let it act upon a piece of iron, or any other body ſimilar to the ſhape of the earth, and let there be placed upon it ſome looſe iron filings, will any one ſuppoſe that, as the magnet acted upon the filings next it, it would not alſo extend its action to the filings on the oppoſite ſide, and alſo attract them; nay, to ſuppoſe that, while it attracts thoſe contiguous to it, drawing them to it, thoſe on the oppoſite ſide would, inſtead of alſo being drawn towards it, be repelled, or drawn from it, is very extraordinary indeed. I think no philoſopher can aſſent to this; but, if any one is a ſceptic, let him try the experiment, and he will find the filings, which are on both ſides of the iron globe, are drawn to the magnet.

But, to make the experiment more deciſive, let the filings be raiſed upon one ſide, and let the magnet be applied to the oppoſite ſide, and it will nevertheleſs attract them;—and not, according to Sir Iſaac's doctrine, throw them into a larger heap.

I could bring a conſiderably greater number of reaſons to refute this ſingular doctrine of Sir Iſaac; but I ſuppoſe my reader muſt be ſatisfied. Now then let us conſider if my doctrine will more rationally account for the phænemenon.

As water being a fluid body which is ſo eaſily put in motion, and as it covers ſo great an extent upon our planet, any action upon it, either attracting or repelling

pelling it, muſt have a great effect upon it, ſo as to depreſs or raiſe it upon the ſhores which bound it, as in a bucket of water; any motion upon the water riſes or depreſſes it upon the ſides of the veſſel: and, as the moon and earth are held together by the principle of gravitation and repulſion, this fluid water muſt be ſenſible to their influence, eaſily depreſſed and eaſily raiſed by theſe two great powers. That, while the ſun is heating one part of the earth and the moon, from the great principle repulſion of fire, (which I hope I have clearly and fully eſtabliſhed) that part of the earth will have its waters repelled; while the other part of the earth, at the ſame moment, being far leſs heated, will have its waters attracted from Sir Iſaac's principle of gravitation, and ſo produce a tide; then, in the courſe of twelve hours, thoſe parts of the earth muſt have their heat and cold reverſed, it heating that part which before was cooled, and that part being cooled which before was heated, and produce another tide: and ſo on, by the earth's daily turning round upon its axis, the tides are produced.

This will account, in the moſt ſatisfactory manner, for the tide being the higheſt at the moon's conjunction and oppoſition: for, while it is in its quarters, it is then, as I hope I have ſatisfactorily ſhewn, principally actuated by only one of the great principles; in the one caſe gravitation, and in the other repulſion: but, at the full and change of the moon, both theſe great principles are equally acting at the ſame time. The moon being over one hemiſphere of the earth, repels its waters upon its ſhores, from the fire which they both poſſeſs; and upon the other hemiſphere, from being leſs heated, its waters are attracted by the moon, and ruſh towards it, and in conſequence flow upon the ſhores. Thus, ſuppoſing the ſun and

moon paſſing over the Atlantic ocean, its waters will be repelled and drove upon its ſhores; while, at the ſame time, the waters of the great Pacific ocean, being at the ſame moment bereft of the ſun, will be attracted by the moon, and ſo flow towards it, and in conſequence upon its ſhores; and ſo *vice verſa*.—And alſo, when the moon is paſſing over the Atlantic, and the ſun at the ſame moment paſſing over the Pacific ocean, the waters of the Atlantic will be attracted by the moon, as they at the time poſſeſs little heat, it being then night, and ſo flow upon its ſhores. The ſun's repulſion and gravitation are alſo to be taken into the account.

If, according to Sir Iſaac's theory, the only principle that operated being gravitation; as the moon was paſſing over the Pacific ocean, its waters would be attracted in the middle of the ocean, and ſo produce a very great accumulation only in the centre. But we ſee clearly that the change is produced on the ſhores, and not in the middle of the ocean. And moreover, according to my ſyſtem, the tides will be the greateſt towards the poles, as by repulſion the waters will be repelled from the equator, and ruſh to the poles. But, according to Sir Iſaac's theory, it ought to be the reverſe.

But my ſyſtem will alſo account for the different planetary diurnal motions, upon which Sir Iſaac's theory is perfectly ſilent. The two great principles are, that bodies, according to their quantity of matter, will be attracted; and, according to their quantity of fire, they will be repelled. Now, while the ſun is paſſing over water, the oceans for inſtance, its fire will be diſſipated from the principle of evaporation; and in conſequence the heat will not be ſo great as when the ſun is paſſing over the continents.—Therefore the Deity has formed our globe into

two

two great continents, as it were, the oceans being placed between them; ſo, when the ſun is paſſing over the Pacific ocean, that part of the earth will be attracted; but, when the ſun arrives at our great continent, its ſurface will be ſo much heated, that the ſun will in conſequence repel it; and ſo, by this reciprocal repulſion and attraction, the earth will be turned round upon its axis. And, therefore, if the earth were all water, or all earth, it would probably have no rotation upon its axis; and, by its poſſeſſing two great continents, and two great bodies of water intervening between them, it therefore turns ſo quickly upon its axis. And upon theſe principles are accounted that ſingular phænomenon, why in our winter the earth is ſo much nearer the ſun than in our ſummer, owing to there being ſo much more water ſouth of the equator than there is north; and when the ſun is in that part of its courſe north of the equator, *viz.* our ſummer, that it will be a greater diſtance from the earth, owing to the earth being ſo much more heated from its containing more land towards the northern than the ſouthern pole; and alſo why the two great continents are not of equal quantities of land, and the two great oceans between thoſe continents of equal quantities of water; for, if that had been the caſe, when the ſun was upon any part of the globe, for inſtance, either over the land or water, there would be an equal repulſion and attraction of both the ſides of the earth next the ſun, and its repulſion and attraction being in conſequence equally balanced, the earth might ſtand ſtill; but, as it is, it cannot be.

Alſo, if the poles had an equal quantity of water and an equal quantity of earth, its annual motion might be ſtopped upon the ſame principle; but, as there is by far a greater quantity of earth upon the

north pole, when the ſun is advancing to it, it will repel the earth the further from the ſun, and in conſequence the earth will be nearer the ſun in our ſummer.

Alſo, according to my principles, there muſt be a regular annual motion of the earth; for, while either pole gets heated, or ſaturated with fire, it will then in conſequence become repulſatory. Thus the ſun, in the vernal ſolſtice, having juſt come from the ſouthern pole, warming or ſaturating it, will repel it; while the northern pole, from poſſeſſing at that time ſo little fire or heat, will be attracted; ſo that, till it gets its ſaturation of fire, it will attract; but, as ſoon as that is done, it then will repel, and the ſouthern pole will attract, as it then will have loſt the heat it before had gotten, as fire is ſoon diſſipated.

And, as I have ſhewn, that the earth is further from the ſun when the ſun is towards the north pole; ſo alſo, from this diſtance, the earth will have a greater circuit in the heavens round the ſun, and in conſequence the ſun will be ſix days longer north of the equator, than in his circuit ſouth of the equator, being our winter. Therefore it clearly appears, as long as the planets and ſun poſſeſs ſuch a quantity of matter, and ſuch a quantity of fire, that thoſe planetary motions muſt ſtill exiſt.—But it is obſerved by aſtronomers, that the moon is nearer the earth than it uſed to be, from its performing its circuit round the earth in leſs time than formerly; which I account for, by there being leſs fire than formerly, and in conſequence leſs repulſion: and why there is leſs fire, is, I ſuppoſe, from part of the moon's fire being attracted, or combined, with its matter, in that ſtate which chemiſts call fixed fire; and, therefore, from its being fixed, or chemically combined, it will have leſs repulſion. It is more rational to account for the

phæno-

phænomenon this way, than that the moon's groſs matter ſhould have gotten an addition, ſo as to have increaſed its gravitation or attraction.

Sir Iſaac's theory appears very extraordinary, he ſuppoſing the ſun an immenſe body of fire, and that it equallyextends its influence all around it. To a chemiſt, who underſtands the property of fire, this muſt appear very extraordinary. The ſun, according to this doctrine, muſt be formed of a combuſtible ſubſtance, and all combuſtible ſubſtances are capable of being ignited; then what hinders the whole ſubſtance from being ignited at the ſame time; and, if ſo, muſt not the ſun very ſoon have conſumed itſelf, and have deſtroyed its counterpoiſing power to the planets. Beſides, as fire is undoubtedly matter, and I think there is no doubt of its being a peculiar matter, what muſt have come of all that the ſun has given out according to Sir Iſaac's doctrine? We find our earth accumulates no heat; the heat of one year is ſimilar to the former; and what comes of all the fire that is diſſipated in the immenſe ſpace around the ſun, as the planets cover a ſmall part indeed of that ſpace?—Theſe, when inveſtigated, ſeem very groſs ideas, indeed quite unphiloſophical: beſides it is burning ſome planets with a moſt intenſe fire, and ſtarving others; beyond the power of the imagination to conceive, the extreme heat of ſome, and the extreme cold of others. This cannot be the work of the great Deity; it is no more like his works, than the ſun in the firmament is like the ſun upon a ſign-poſt:—a God who makes nothing in vain; whoſe principles are ſo ſimple, and which principles extend through all his works, that every atom has its uſe and purpoſes, and tends to ſome great end.

The earth, acccording to my ſyſtem, repels the ſun equally as the ſun repels it, according to its bulk,

bulk, and is a ſun to it, according to its bulk; that they are held together by the ſame power of gravitation and repulſion, producing the ſame evolutions, and poſſeſſing the ſame temperature of heat and cold, and in conſequence the ſame animal and vegetable life. This is like the work of the Deity; and, upon inveſtigating it, we ſhall find, that the principles of my philoſophy form this great chain in regular links, that one part imperceptibly follows the other.

We are certain that a great quantity of fire comes from the ſun, and falls upon our earth; that, in the night, or abſence of the ſun, that part of the fire which fell in the day is partly diſſipated. This we know diſappears from one great cauſe, *evaporation*; and alſo from another, the fire ſaturates, or warms the earth, and part of it unites chemically, producing animal life, vegetation, &c. That evaporation is immenſe, appears from Haller's calculation of the quantity of water evaporated in the Mediterranean; and from Dr. Black's calculation of the immenſe quantity of fire which is neceſſary to form water into vapour; and from the Biſhop of Landaff's calculation of the quantity of water which is evaporated by vegetation: this immenſe quantity of fire and water being carried up into the clouds, or the higheſt part of the atmoſphere; but there theſe bodies ſeparate, the one falling as rain. Then the great queſtion occurs, What comes of the other body, *viz.* fire? It is well known that the higher parts of the atmoſphere are extremely cold, there being a regular gradation of temperature in the atmoſphere, the higheſt parts being the coldeſt. Then it is clear that this great quantity of fire does not remain there. According to the great principle of fire which I have demonſtrated, *that fire repels fire, and alſo that the matter of our earth attracts fire.* The part of the earth which has

has the greateſt attraction for fire, is *water*, which may be called the blood of the earth, producing a circulation of fire neceſſary to its own life, and to the animal, the vegetable, and mineral life upon its ſurface. The fire then which comes from the ſun to our earth will be attracted by the bodies of our earth, and principally by the water; and, according to the repulſion of fire, this water, when ſaturated with fire, will be repelled from the heated ſurface of the earth into the higher parts of the atmoſphere, and be there ſuſpended; but they are there ſeparated, the cold condenſing the water, which falls upon the earth again as rain; and the fire being now at liberty, (before being kept ſuſpended, owing to the gravity or the attraction of the water for the earth) it is therefore, in conſequence, more powerfully repelled from the fire of the earth, and carried to a great diſtance from it. And now, from the repulſion of the heated earth, the fire being freed from the water, or matter of the earth, it receives a quick motion, and comes within the ſphere of the attraction of the matter of the ſun; and both theſe powers acting together give it that rapid motion which we obſerve the rays of the ſun to have which fall upon our earth: for directly the ſame phænomena take place upon the ſurface of the ſun as upon our earth; the fire which falls upon it is repelled or ſent to it by our earth, and undergoes directly the ſame circulation upon its ſurface, producing animal, vegetable, and mineral life, and is then again ſent back to our earth. So all the planets moving round the ſun act as ſo many ſuns to it, returning again that fire which they received from it. It is thus the circulation is continued, till the Deity ſhall decree his *finite*. And this proves the truth of the Moſaic account of the creation, God created the earth, and afterwards light, or fire: for

Moſes

Moſes ſays—" *In the beginning God created the heaven* " *and the earth. And the earth was without form, and* " *void; and darkneſs was upon the face of the deep:* " *and the Spirit of God moved upon the face of the* " *waters. And God ſaid, Let there be light: and there* " *was light. And God ſaw the light, that it was good:* " *and God divided the light from the darkneſs.*"

Now, according to my principles, matter would be the firſt formed, and after it fire; and this matter would be without form, and void of all life, till God created fire, which would give it life, motion, and form. And that, after God had formed fire, " *he ſaw it was good,*" it anſwering all the great and wonderful purpoſes of life in general. " *And* " *God divided the light from the darkneſs;*" that is, gave to matter and fire theſe two great principles, or diviſions, that one ſhould be ſtationary, and fixed to the ſun and planets, and that the other ſhould circulate between thoſe great bodies of matter;—for, upon thoſe two great principles, or diviſions, conſiſt the life of the univerſe. As Moſes had not the light of philoſophy to guide him, his knowledge muſt have been from inſpiration; that is, immediately from the Deity.†

† It has been conſidered as a great *diſſiderata*, where the waters neceſſary to cover the earth in the deluge had come from. Now I think it moſt rationally accounted for by a heated comet in its paſſing immediately from the ſun approaching our earth. It would in conſequence violently repel our earth; which repulſion would operate ſo violently upon its waters, as to force them beyond its ſhores, and cover the land. Alſo, from the ſtrata of ſhells found in the land, it might be, that the waters of the ſeas had been violently agitated, and repelled upon its ſhores, as thoſe ſhell-fiſh live upon the ſhores of the ſea; therefore they undoubtedly would be carried beyond them upon the land, and ſuch an immenſe body of water would bury trees, animals, &c. in the ground; alſo carry them from one part of the earth to the other amidſt the general wreck and devaſtation.

Sir

Sir Iſaac Newton has ſufficiently ſhewn the great power of matter, and its great principle, gravitation; therefore I ſhall not enlarge upon them, but enlarge more particularly upon fire and its great principle, *repulſion*.

I have ſhewn the repulſion of fire, when united with water; but I will now conſider its repulſion when acting by itſelf, without any incumbrance; and we ſhall find this great principle more wonderful and eſſential in the univerſe than gravitation.—If I ſet free the fire which is contained in a candle, by burning or lighting the candle, as ſoon as it is ſet free, it ſhews the moſt ſurpriſing quickneſs of motion, and the moſt minute diviſion of its parts; for the ſmall quantity of fire contained in this candle ſhall, for hours together, while it is burning, form a ſtream of light that ſhall intimately fill the ſpace of miles around it, and in an inſtant of time, ſo that different eyes, placed in different parts of this ſpace, ſhall ſee it, that is, receive a part of this light upon the retina, and at the ſame moment, and all this from that great principle, repulſion; all the fire's parts being ſo minutely divided as to fill ſo large a ſpace, and that in an inſtant of time, from each atom or particle of light repelling its neighbour.—WONDERFUL, O GOD!—From this great and ſimple cauſe, *viz.* repulſion, proceeds *all motion, all life*, balanced by the gravity of matter. Here then are the two great principles in nature, the author of all life, planetary, animal, vegetable, and mineral; and gives all thoſe qualities to bodies, *viz.* expanſion, elaſticity, ſolidity, and fluidity; alſo chemical attraction and repulſion.—But more of this hereafter.

God having endowed inert matter and fire with theſe two oppoſite principles, *viz.* repulſion and gravitation, and from which ſprang the life of the

univerſe. Good God, how ſimple, powerful, and wonderful are thy works!

This immenſe quantity of fire, which we know for certainty is carried from the earth to the clouds by the principle of evaporation, is not ſtationary there; for theſe clouds, or higher parts of the atmoſphere, inſtead of being heated by it, are immenſely cold. Now we muſt be certain, if this fire that is ſet looſe there from the water did not circulate elſewhere, it would ſo accumulate as to heat the higher regions a million times beyond the heat of red-hot iron. Calculating the immenſe quantity of water evaporated under the equator, alſo the immenſe quantity of fire neceſſary to that evaporation; and we are certain that water has parted with the fire when it falls as rain or water again. Then, under this review of the ſubject, I ſpeak within bounds, when I ſay, that the upper regions ought (inſtead of being cold) to be heated beyond the power of imagination. Nay more, we are certain that this fire is carried into the clouds, or upper regions; and we are equally certain that theſe regions are intenſely cold; and alſo, we may be equally certain that thoſe cold regions cannot, nor do not, heat the earth; therefore it muſt be ſelf-evident, that the fire does leave the earth; particularly, as the higher we travel in the upper regions, the cold gets more intenſe.—If it were not from the fire leaving the earth again, what becomes of the immenſe quantity that falls upon the earth from the ſun, even in England, after a ſummer's day? We ſee in the courſe of a night how it is gone;* and we are certain of the quantity which

* Even in the deſarts of Arabia, in thoſe burning ſands, almoſt under a vertical ſun, in the day-time, the heat is ſo intenſe as to produce upon the traveller unaccuſtomed to it, the diſeaſe called the *Coup de Soliel*; while the night will even be ſometimes froſty.

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the evaporation of the water muſt take. And, as we experience ſo often ſhowers of rain from the water evaporated, they clearly account for the water evaporated; but, unleſs we ſhould have alſo as frequently ſhowers of fire, we muſt be certain that this fire neceſſary to the evaporation of the water does not return to the earth again, but muſt for a time leave this planet.—What an immenſe quantity of fire muſt the ſun poſſeſs, to be conſtantly emitting it without its growing cooler; and the earth be conſtantly receiving it without its growing hotter. All theſe facts being duly weighed, it is ſelf-evident, that Sir Iſaac's theory is perfectly inadequate to the ſolution of the phænomena, while mine amply accounts for them; and alſo, that it is perfectly agreeable to all the known laws and phænomena of fire, and accords with the grandeur of God's works.

I believe all chemiſts are now agreed, that fire is a peculiar matter; for certainly its phænomena can only be accounted for upon this principle. But if, according to Sir Iſaac Newton's idea, (who unfortunately was no chemiſt) it were the particles of matter in general put in motion, the ſun muſt loſe an immenſe quantity of its matter, and the earth and other planets muſt accumulate it; beſides the immenſe quantity which, according to him, muſt be ſpent in endleſs ſpace, as the planets fill up a ſmall part of this great ſpace. And the groſs idea of the ſun being a fire, and its emitting its groſs matter as fire in this great ſpace. If ſo, what becomes of it? Is it annihilated in this ſpace?—Unphiloſophical! for the planets muſt catch but a ſmall part of this fire.

But, ſo far from the ſun diſpenſing its fire equally all around it, upon the groſs idea of its being a large globe of fire, we ſhall find that it falls only upon the planets, and even upon thoſe planets not equally, but that one part of the ſame planets receives a great

quantity, while the other parts of it receive very little. It is well known that the ſun diſpenſes its great vivifying heat principally upon the equator; and philoſophers, agreeably to their miſtaken philoſophy, ſuppoſe that the equator's receiving ſo much more fire than the poles, is owing to the rays of the ſun falling obliquely upon the poles. But, upon a philoſophical inveſtigation, we ſhall find that this is very inadequate to the cauſe, as the rays of the ſun, according to them, are equally diſperſed from all its ſurface; therefore the only difference of their intenſity and power muſt be from being nearer or further from this globe of fire. Suppoſing the earth annihilated, and the objects placed at the ſame diſtance, or in the identical ſame ſpace as the equator and the poles occupied, ſo as equally to partake of the ſun's influence, or fire; the only difference would be, that thoſe bodies placed where the equator was would be nearer than thoſe bodies placed where the earth's poles were; but that the rays of the ſun would fall as perpendicularly upon the one as the other.—The obliquity therefore is not from the rays of the ſun according to their philoſophy, but only with reſpect to the earth, their falling obliquely upon it at the poles. But how can that effect the intenſity of the rays of the ſun?

To make this clearer, ſuppoſe a large globe of earth, or wood, one hundred feet in diameter, being placed one hundred feet above the earth at the equator, and another of the ſame diameter placed juſt in the ſame manner at one of the poles, the ſame diſtance from the earth; and then ſuppoſe the earth taken away from thoſe bodies, or annihilated, would not then the fire from this burning ſun fall equally upon both theſe bodies, as perpendicularly upon one as the other? The only difference, as I before obſerved, the body placed at the equator would be nearer

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the ſun than that placed at the pole. But then this difference of the diſtance is nothing of conſequence, as it is well known, from Sir Iſaac Newton's immortal caculation, that the earth in our ſummer is a great deal further from the ſun than it is in our winter, making a conſiderably greater diſtance than the ſmall difference of ſpace which the poles are to the equator from the ſun.

Therefore we muſt look to ſome other cauſe to account for this wonderful phænomenon, *viz.* the heat being ſo much more intenſe at the equator than it is at the poles: and I hope we ſhall find an eaſy and rational explanation from my philoſophy. Fire and the matter of our earth have a great attraction for each other; therefore the earth will attract the fire iſſuing from the ſun, within its circle of attraction, the other planets catching the reſt. But then, according to this attraction, this fire will not be univerſally diſtributed upon the earth; but that part of the earth which is neareſt the ſun, and in conſequence will the ſooner attract the fire when it approaches very near. The poles and the equator being at a very trifling diſtance, in reſpect to each other, from the ſun, and muſt have little influence when the fire firſt iſſues from the ſun; but when the fire approaches very near the earth, then this diſtance of the poles and the equator to the fire becomes very conſiderable indeed, and muſt ſooner act accordingly upon the fire, and more ſtrongly attract it. Beſides Sir Iſaac has wonderfully calculated, (and which calculation has been verified by the French philoſophers who were ſent to aſcertain the fact) that there is a greater body of earth about the diameter of the equator than about the diameter of the poles, and therefore muſt in conſequence attract the fire more powerfully.—This is demonſtrable; for, when the earth preſents

that

that part of its ſurface which is north of the equator to be neareſt the ſun, the greater part of the ſun's fire in conſequence is attracted by it; and when it turns that part of its ſurface that is ſouth of the equator to the ſun, that part receives the ſun's influence moſt powerfully.

That the rays, or fire from the ſun, are powerfully attracted by matter, we have ten thouſand demonſtrations of upon our earth. When a ray of light paſſes through any tranſparent medium, it is powerfully attracted by that medium, and even bent out of its rectilinear courſe, by the matter of that medium. Thus paſſing through glaſs, water, or other bodies, which contain a quantity of matter, it is, according to the quantity of matter the body contains, attracted by that matter, and bent out of its courſe. If it is a rare medium, it is very little acted upon; but, if very tenſe, or ſolid, it is much attracted by it. But it is ſo well-known a law in optics, that I need not enlarge upon it, but conclude with this general obſervation, That, according to this law of optics, the rays of the ſun muſt be conſiderably attracted from their rectilinear courſe when they come from the ſun, by thoſe rays firſt being under the influence of that part of the earth which is neareſt thoſe rays, or whoſe influence they firſt meet with in their falling upon our earth, according to one of my general principles, that matter attracts fire. And, upon other principles of my theory, another moſt ſtriking phænomenon is accounted for, *viz.* the earth's annual motion: for, according to my two great general principles, the earth, or matter, attracts fire, and that fire repels fire; ſo, upon the north part of the earth being neareſt the ſun, it will attract the fire of the ſun; but, upon becoming heated, or getting its full ſaturation, it then, inſtead of being attracted by the

ſun,

ſun, will, from its fire, be repelled. So the ſame of the ſouth part. And, as one pole gets cooled, gravitation preponderates; and, as it gets heated, repulſion takes place: ſo that, by this attraction and repulſion, we have our regular ſummers and winters. Upon theſe principles, we alſo have our day and night,—as one part of the earth is heated, it is repelled, and the cold part is attracted. But, in theſe motions of the earth, there are other cauſes which are to be taken into the account. A great part of the globe is covered with water, and from the water's quick evaporation, it eſcapes with the fire, (being, as I obſerved before, the blood which circulates the fire) and carries it back to the ſun, at leaſt within the reach of the ſun's influence. Therefore the ocean is never ſo heated as the land, and for this reaſon: the ſouth pole, as it contains a far greater proportion of water than the north, is conſequently comparatively colder, which is the cauſe of ſo much ice being there, and which hinders navigation.—And, from this great diſproportion, the north pole containing ſo much more land than the ſouth pole, the Deity has provided againſt this annual motion being ſtopped; for, if their proportions of land and water had been equal, the two poles might have been in danger of balancing their repelling and gravitating powers, and the annual motion in conſequence loſt. And alſo, when the earth at its firſt origin muſt have produced this annual motion, as the north pole contains more earth, and in conſequence more matter, it muſt therefore have been the firſt attracted, and leaned nearer the ſun: for I have no occaſion to obſerve, that land is ſpecifically heavier than water; beſides the land's ſurface, along with vegetation, is conſiderably above, or higher than, the ſurface of the water, and in conſequence its diameter muſt be greater.

Theſe principles will alſo eaſily and rationally account for the diurnal motion. As one part of the ſurface gets heated, it will be repelled, and the colder attracted, as the earth being ſuſpended by the principle of gravitation, or attraction, to the ſun, alſo the principle of repulſion from the ſun; therefore, as a part gets heated, it will repel; and, according to the degree it loſes its fire, gravitation, or attraction, will take place; ſo one part will be repelled, while another will be attracted, as it loſes its fire, or heat, in the night. All this is clear and demonſtrable. But, as I have ſhewn in the annual motion, there is another cauſe to be taken into the account, as the two great continents, or tracts of land, of the old and new world run from pole to pole, oceans intervening; therefore the greater repulſion of the land, by being ſo much more capable of being heated, will, in conſequence, repel more than the water; therefore this alſo will aſſiſt the diurnal motion; for, as the earth, or land, gets heated, it will be repelled; and, as the water, or ocean, gets cooler, it will attract, as I have before ſhewn, the former being more ſuſceptible of being heated than the latter. And alſo, if the two great continents, and the two great ſeas between theſe continents, had been equal in magnitude, the earth, or globe, might have been in danger of loſing its diurnal motion. Upon the ſame principle, as I have juſt ſhewn, it might have loſt its annual one, from its gravitating and repelling powers balancing each other; but, from a greater quantity of land being placed upon one part of the globe than the other, that never can take place. How great and ſimple are thy works, O God! The earth has a very quick diurnal motion, and alſo an annual one; while the moon only revolves round upon its axis once in a month. Upon examining its ſurface upon my principles,

ciples, that ſlowneſs of motion will be accounted for. The moon's land and water being intimately mixed together, not as our earth, forming large oceans and continents; and, upon accurate obſervation, we obſerve the moſt land upon that part, or ſide of the moon, which is conſtantly repelled from the earth in its monthly revolution, and, in conſequence, moſt water upon that ſide which is regularly attracted in forming its monthly movement: therefore, according to my principles, the moon's motion, it only revolving round its axis in a month, is fully accounted for. And, by knowing the land and water of each planet, and their relative ſituations of the land and water to each other, we would be able, *a priori*, to know what would be their motions.

According to my theory, this great and powerful agent, *fire*, muſt be paſſing and repaſſing at the ſame moment to and from the ſun. And, according to our idea of groſs matter, water, or any other fluid, paſſing and repaſſing in the ſame channel, is abſurd; but this great active body, *fire*, is actuated by different laws and principles than groſs matter; one body of fire does not impede the motion of other bodies of fire. But, as this is an age for experiments, I ſhall refer the reader to the Count de Randall's experiments in the *Philoſophical Tranſactions* for the year 1794. If twenty candles are placed in a ſtraight line, ſo that the light, or fire, of each candle will paſs through the light, or fire, of the other candles, yet the candles will throw the ſame light upon an object, equally the ſame as if they were placed abreaſt of the object. Therefore, from theſe experiments, it clearly appears, that one current of fire paſſing to and from the earth and ſun will not impede another.

Very little has been known of fire, or its qualities;

ten thouſand vague conjectures have been formed concerning it: in ſhort, we knew nothing concerning it, but its effects. Light and fire many ſuppoſe different bodies; but I ſhall, I hope, ſatisfactorily prove, that they are the ſame body; and that, according to their impulſe, or motion, they affect the retina differently.

It has been a queſtion much agitated, upon what principle bodies are tranſparent? As the principles of fire and light were altogether unknown, philoſophers being very much in the dark concerning them, and their arguments being taken from their ideas of groſs matter, they could not conceive how one body could paſs through another:—but, with my principles of fire, the phænomena will have an eaſy ſolution. Groſs bodies, ſuch as ſand, flint, &c. by intenſe heat, or fire, become fluid, and afterwards harden into a ſolid tranſparent body. By their being made fluid, their particles run into regular longitudinal cryſtals, leaving their interſtices open and regular, ſo as to admit the rays of light to paſs. By the operation of the fire, the ſand imbibes a quantity of it, which gets conſolidated with its ſubſtance, ſo that, when the rays of light ſtrike upon the ſurface of the glaſs, part of them are reflected; ſeen diſtinctly by viewing windows at a diſtance: when the ſun ſhines upon them, what a ſplendid glittering of light they ſhew. But the greateſt part of the light, from the impulſe of the rays falling upon the interſtices of the glaſs, penetrate and paſs through it, and thoſe rays which fall upon the matter of the glaſs are reflected; but its matter is a ſmall proportion to its interſtices. The great object gained by diſſolving the ſand with the fire, is getting its fibres to run into regular interſtices; and alſo, by the fire which the fibres of the glaſs imbibe and fix, uniformly and

regularly

regularly repel the light, that it is not attracted by the matter of the glaſs out of its rectilinear courſe as it paſſes through the glaſs.

All the fire that comes from the ſun, comes to us as the ſtrongeſt and moſt vivid light; but, as it paſſes from the earth by the agency of water, it leaves the earth as fire, its impulſe being greatly leſſened; but when it leaves the water, being then free, the repulſion of the fire of the earth gives it more force, or motion; and, as it arrives at the ſun, the great attraction of the ſun's matter powerfully attracts it, and both theſe powers give it all that impulſe, ſo as to form the vivid light it had when it came from the ſun to our earth. The facts to prove this doctrine are very numerous. If I expoſe a piece of black woollen cloth to the ſun, it abſorbs the light, which heats the cloth, and which light, if the cloth is expoſed to a colder body, will impart this light to it as fire, it loſing that impulſe which is neceſſary to its being light. But, if I take the cloth, while it retains this fire, and give it a ſtrong attrition, the fire then will regain its impulſe, and leave the cloth as light, paſſing from it in bright corruſcations.

The tallow of a common candle contains an immenſe quantity of fire; but, according to the quickneſs of its being ſet looſe, it will accordingly ſhew different degrees of light. If it is burned in an impure air, it will give a very dead yellow light; but if it is burned in a purer air, *viz.* the pure air made in the elaboratory of chemiſts, its light will be moſt white, vivid, and bright. The burning of ſulphur gives a dead blue light; but if burnt in this air of the chemiſts, it will be vivid and bright. All this difference is owing to the impulſe, or degree, with which the fire is ſet looſe; for, according to that degree, the fire will be repelled; and, as the particles

of fire repel each other, therefore, in conſequence, the greater the body of fire ſet looſe at the ſame time, the greater the repulſion. Every one muſt have remarked, that, in collecting the weeds of a field after ploughing, in order to burn them, if the fire is ſlowly conducted, all this fire that the dead vegetables poſſeſs will be conſumed, or let looſe, without ſhewing the leaſt light; but, if the fire is aſſiſted by a briſk wind, it will form a large and vivid flame. In the firſt caſe it ſmothers and burns, (as it is vulgarly called) without producing any light, but a great degree of heat, or fire. It is owing to this degree of impulſe of the ſame body, that in one caſe iron, when ignited juſt below a red heat, gives out an immenſe degree of fire, but no light. And, in the other caſe, a glow worm, which gives out comparatively no heat, or fire, but a very vivid light, its organs being formed by nature to give the fire that impulſe from its body of animal heat. Ten thouſand other examples might be named, but theſe are ſufficient for my purpoſe.

In the light paſſing through green glaſs, can it be ſuppoſed that all the other rays are reflected from the glaſs? If ſo, their reflection would give a very vivid light; but green glaſs does not reflect ſo vivid a light as cryſtal glaſs does.

That the rays of light are fire, I think there can be little doubt, when the ſubject is philoſophically conſidered. In our winter, in the ſun's abſence, all nature is torpid, cold, and inanimate; but, in the ſummer, all is life, heat, and animation. The ſun and its power, and alſo the principles of fire, have not been obſerved hitherto, ſo that their principles being not at all known, the moſt vague and trifling conjectures have, in conſequence, been given to the world concerning them: in ſhort, there was a great

bar

bar in ſcientific knowledge to be ſurmounted, before any juſt reaſoning could be founded on theſe abſtruſe objects; how far I have ſurmounted that bar, I leave to the impartial world. To give a detail of all the vague opinions, is unneceſſary: they muſt be known to my reader; but I will give him a very ſimple experiment, which clearly aſcertains that light and fire are the ſame body. I take a large glaſs decanter, and fill it with water, and place in the centre of the water a body either made of earth, ſtone, or wood, and cover this body with either black paint, or a piece of black cloth, and then throw upon this body a quantity of the rays of the ſun by the aid of a mirror, but not ſo ſtrong as to ignite the body, and all this light will clearly be turned to heat, or fire; for there will not a particle of light come from the black body, but an immenſe quantity of fire, proved evidently from the water being heated, and the fire eſcaping by evaporating the water: and by ſtill keeping the decanter filled with water, as it is evaporated, you may go on, *ad infinitum*, with the ſame materials, only requiring freſh water. Here clearly nothing but fire comes from theſe rays of the ſun, and not a particle of light, if you ſhould go on with the proceſs till doomſday. Now I hope that no one will diſpute, that it is fire which forms water into vapour: to give any other explanation, is idle and unphiloſophical. But what I muſt again repeat, it is not my buſineſs here to refute every vague idea that has been given to the world. I am forming a great and general ſyſtem, which I hope rationally accounts for all the phænomena; that one part of it, as it were, grows out of the other; every link of the great chain hangs eaſy upon its neighbour, and is to each other the ſtrongeſt evidence. This fire, or rays of light, as long as they have their impulſe, or motion,

motion, act as fire and light; but as ſoon as they loſe part of their impulſe, they then act as fire; and, therefore, when they fall upon our earth, part of them is reflected as light: but the greateſt part loſes part of its influence, or impulſe, and forms fire.—But even thoſe rays which are reflected from the earth's ſurface are attracted by it again, and alſo form fire; but a great part of this fire chemically unites with the earth, and forms different bodies with it, as I have before ſhewn, *viz.* animals, vegetables, and minerals, alſo the atmoſphere; and, if the fire is ſet looſe from any of theſe bodies by combuſtion, &c. if it is done intenſely, or with a great impulſe, it forms light again; but if more gently, or with a leſs impulſe, it forms fire without light: but then, when this fire returns to the ſun again, it receives ſuch an impulſe as to form light.—Indeed, from our knowledge of animal viſion, we muſt know that this fire, or ray of light, muſt have a certain impulſe, to fly in a right line ſo as to penetrate to the bottom of the eye, and to fall upon the retina with ſuch force as to give the impreſſion to the brain, by the medium of the optic nerve.—The fire either coming from the ſun to the earth, or from the earth to the ſun, muſt be highly and vigorouſly impelled, from the ſhort time which Dr. Bradley has ſo accurately ſhewn the light to paſs from the ſun to our earth; and, from its velocity, we muſt, from our principles of mechanics, aſcertain its very great *impetus*. As the light is conſtantly in a continued ſtream paſſing, one particle impels the other, ſo that the fire receives a ſtronger *impetus* from paſſing from one planet to another, than we can poſſibly give it by the combuſtion of bodies. And, when we reflect upon it, it is not to be wondered at, when the fire of the whole planet gives the

impetus,

impetus, or repulſion, to the fire that leaves the planet, and to add to that the attraction of the planet which receives it, and that planet ſtill keeping its coldeſt ſide to the fire, or that ſide which has been cooled by the night.

Upon carefully examining the planets, we will have the greateſt reaſon, from their appearance, to believe they are tranſmitting light from their ſurface. They are all ſtrongly luminous, and appear to the eye as if they were bodies on fire: for, only ſuppoſe the city of London in flames, every houſe burning at the ſame time, in the higheſt ſtate of combuſtion; and ſuppoſe an eye placed an hundred miles diſtance from the fire, commanding diſtinctly the object, and it would not have ſo luminous an appearance as any of the planets have. And let me aſk, what a ſmall degree of light can be ſuppoſed to come from the planet Herſchel, being eighteen hundred millions of miles from the ſun, if the light that it ſhews were only from reflection, and this light to be reflected the immenſe diſtance to our earth? Beſides the ſtars, which Sir Iſaac Newton ſuppoſes ſuns, do not ſhew to appearance more light, in compariſon to their diameter and their diſtance, than our planets do; and yet are ſuppoſed to be ſuns, or globes of fire, and the latter having merely their light from the ſuns, and that light reflected to us near two thouſand millions of miles. Beſides we do obſerve, that all the planets appear to be equally luminous, according to their diſtance; while, upon the idea of their light being only reflected, the planets neareſt us ought to appear a thouſand times more luminous, conſidering that Mercury, the neareſt planet, is only 37,000,000 miles diſtant from the ſun, and Herſchel near eighteen hundred millions. Jupiter is calculated by Sir Iſaac Newton to receive only the twentieth part

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of the light, heat, and attraction of the ſun that we do. Then what muſt Herſchel receive? Can it be ſuppoſed to receive ſo much as to appear equally to the eye to poſſeſs as much light and heat as the ſuns or ſtars poſſeſs? It appears, as I obſerved before, equally as luminous: the reaſon why it does not appear ſo diſtinct, is owing to its ſize, and not owing to its being leſs luminous.

But let us conſider the light that a body gives from reflection. Philoſophers, I am certain, have not maturely conſidered it, or elſe they would not have ſuppoſed the planets could have appeared ſo luminous from merely reflecting the ſun's light.—Even ſuppoſing there were no clouds to intercept the ſun's rays from falling upon our earth, but it was a clear ſun, ſtill the reflection of that light we could not ſuppoſe to traverſe ſo many millions of miles, as it muſt do from the planet Herſchel, particularly as that planet is ſuppoſed, by the former ſyſtems of philoſophers, to get ſo little of the ſun's power. But we know that our earth is often covered with thick clouds, that not only muſt hinder the reflection of light, but muſt alſo greatly intercept the ſun's rays from falling upon the earth. Let a man caſt his eye upon the graſs upon the ſurface of the earth, and then aſk himſelf this queſtion,—Can the light which comes from it traverſe ſo many thouſands, nay millions of miles, and, moſt wonderful! appear a thouſand times more luminous when at that diſtance, than it did upon the graſs? For look at the planets, or our moon, what a luminous and ſplendid appearance they have. Philoſophers have not conſidered this. But, as the planet Mars is ſuppoſed to reſemble our planet, the earth, the moſt, let us conſider it. It is removed forty-nine thouſand miles further from the ſun than our earth; when we paſs near it,

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and diſtinguiſh it moſt clearly, it has a very fiery appearance, and is often miſtaken for a comet.—And therefore we have reaſon to ſuppoſe, according to philoſophers, that our earth muſt have a more fiery appearance than it, as our earth is ſo much nearer the ſun. Then, when we have our eyes *cloſe* upon our earth, has it a fiery appearance? How then, according to them, can this green ſurface of the earth and its waters reflect this fiery appearance through ſo thick and cloudy an atmoſphere as we poſſeſs, and to ſuch an immenſe diſtance, thouſands of miles. But when Mars is upon the oppoſite ſide of our orbit, it appears ſmall, and ſcarcely to be diſtinguiſhed from *a fixed ſtar*,—a fixed ſtar, which our philoſophers ſay is a burning ſun. This is ſtill more wonderful. It now appears equally bright as a *ſun*, or *ſtar*. Can this be from reflection?—Unphiloſophical!

As Mars is ſuppoſed to reſemble our earth ſo much, the obliquity of their ecliptics is not very different. And it is flat at its poles like our earth, and theſe appear brighter than the other parts of its ſurface.—Theſe are facts which ſtill more aſtoniſh us. How can they be reconciled to our philoſophers and their doctrines!—The poles, according to Sir Iſaac's philoſophy, ought not to appear the moſt luminous part of any; for how can it be conceived, that the poles, which receive ſo little light of the ſun comparatively, can reflect a ſtronger light than the equator: beſides, it is probable, that a part of one of the poles, in its winter, has no ſun,—yet it appears even then ſo bright. Our difficulties are more and more. I think I need not enlarge any more upon them, but ſee if my ſyſtem will explain the phænomena; and, inſtead of appearing difficulties to it, they will be its ſtrongeſt evidence.

As I have ſhewn that the fire which comes from the ſun to the planets, meets with water there, and is evaporated with it into the upper regions, and, from the cold they there meet with, they ſeparate, the water falling to the planet as rain; and the fire, from repulſion, is ſent back to the ſun, the ſource from whence it came. All this is done in the higheſt regions, far above its clouds; therefore its clouds do not intercept the operation, in conſequence we do not obſerve either the face of the ſun or planets in this ſimple and wonderful proceſs: and, as this vapour of fire and water ſeems about the upper regions, the ſun's rays repel it much upon the poles, and there the ſeparation takes place. We are certain that a quantity of water falls there; but this ſeparation takes place in all the upper parts of the higher regions of their atmoſphere, and probably beyond them. Thus this great and wonderful agent of the Deity, *viz.* fire, its being repelled from the ſun and planets, gives them, when viewed with a teleſcope, that amazing, vivid, bright, undulating, luminous appearance, ſuch an immenſe number of miles above their ſurface, particularly the ſun; as it is it that repels the fire to the planets and the planets to it, ſo that they all enjoy the identical ſame fire, or light, or heat; the ſame temperature, and, I make no doubt, the ſame men, animals, vegetables, and minerals; the ſame atmoſphere and water; in ſhort, every thing the ſame.—What a vaſt idea! Reflect upon it *little man*, and humble thyſelf!*

Philoſo-

* It is a well-aſcertained fact, that bodies at the equator are ſpecifically lighter than at the poles; which fact is, I think, a ſtrong evidence in favour of my general ſyſtem of repulſion: for, as the earth at the equator poſſeſſes the greateſt proportion of fire, therefore, from that cauſe, its repulſion muſt be the ſtrongeſt, and

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Philoſophers ſuppoſed that the moon had no atmoſphere, as they could diſtinguiſh no clouds.—Certainly not, as the light is ſeparated from it above the clouds. The reaſon why we ſee its ſurface more diſtinctly at one time than another, is, I ſuppoſe, owing to its atmoſphere being leſs clouded at one time than another. The *faculæ*, or bright places in the ſun, I ſuppoſe is owing to a greater quantity of fire and water ſeparating at that time; as under our tropics the periodical rains; and the ſun's black ſpots, may be owing to a very little ſeparation; for they are too large to ſuppoſe mountains, excavations, &c. Our *aëranauts*, in their balloon excurſions, when they got to a conſiderble height in the atmoſphere, ſaw the face of the earth became more indiſtinct, putting on a bright luminous appearance, and the higher they went the change became more conſpicuous, I readily believe; and I have no doubt, could they have aſcended higher, this luminous or planetary appearance would have been far more ſtriking.

We obſerve one thing, which indeed we have a right to ſuppoſe *a priori*, that the quickneſs of the planets' motion round the ſun is directly according to their diſtance from the ſun, the nearer the quicker; which clearly points out to us the cauſe of this motion, *viz.* the repulſion and gravitation of the ſun upon the planets: in conſequence, the nearer the ſtronger their operation.

Sir Iſaac's doctrine of colour I muſt alſo queſtion. He ſuppoſed, that the different colours were owing to the different refrangibility of the rays, ſome being more refrangible than others. As I have ſhewn that

in conſequence bodies will weigh lighter. The immenſe quantity of fire at the equator will, from its repulſive quality, counteract the gravitating quality of inert matter.

the fire, or rays of light, have a ſtrong impulſe when they fall upon the earth from the ſun, therefore theſe rays falling upon the retina will give the ſenſation of light. As we alſo find, that thoſe rays falling upon the different bodies of our earth are reflected from thoſe bodies, and make us ſee thoſe bodies; ſo, if we enquire upon what principle thoſe rays are reflected, we ſhall find it is from that great principle, repulſion. Theſe bodies containing a quantity of fire, in conſequence repel, or reflect, the rays of light, or fire, which fall upon it. Thus the body which reflects the rays of light the ſtrongeſt, that we are acquainted with, is the diamond; and chemiſts inform us, that the diamond poſſeſſes the greateſt quantity of fire, being ſo highly phlogiſtic and combuſtible. But bodies differ very much in their power of repelling light: white bodies do it the ſtrongeſt, and black the leaſt; alſo red the next in ſtrength, and the violet the leaſt. So there are regular gradations. As all our ſenſations by viſion are from the ſtimulus given to the optic nerve; therefore, according to the degree of that ſtimulus, will the different ſenſe of colour be received: when the light is ſtrongly reflected, it will give the ſenſation of white and red; and, when weakly reflected, violet, &c. &c.

It is juſt the ſame when fire iſſues from bodies burning. If it iſſues with a ſtrong impulſe, the fire will be a white flame; but, if not ſo briſkly, red; and, if with ſtill leſs impulſe, yelloviſh. Now, as I have all along ſhewn in my general doctrine, that the motion of light, or fire, is from its particles repelling each other; therefore, when the fire is briſk, and a great quantity of thoſe particles being ſet looſe at the ſame moment, in conſequence the repulſion being greater, the fire will have ſuch an impulſe as

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each particle will give the ſenſation of light; but, if not ſet looſe quite ſo briſkly, they will give only the ſenſation of red; and, if ſtill ſet looſe more ſlowly, the ſenſation of yellow,—which colour is often ſeen in the night, when a fire has not been ſtirred with the poker. Or, if you look at a red fire through green glaſs, or any other body which deadens the rays, it will appear yellowiſh: or, looking at the great luminary of light through a very thick atmoſphere, or through blackened glaſs, or through a feather, his rays will appear of a fiery red.* Now, with this review of the caſe, can it be ſeriouſly argued, that thoſe bodies at the time are giving out only one kind of their rays, and retaining the others? To ſhew this moſt ſtrikingly, if a common culinary fire, made of coal, conſumes itſelf by giving out nothing but a white flame; another fire, made of the ſame coal from the ſame pit, conſumes itſelf by giving out nothing but a red colour, muſt we not immediately ſay, that its fire, in the firſt inſtance, is ſet looſe as light, and the other as heat? Alſo, from this, let a quantity of coal be put upon a ſmith's fire, and by keeping blowing, all the coal will be conſumed with a briſk flame; but, by not blowing the fire, the coal will be conſumed with a red heat. Then, according to the doctrine of ſome, we muſt ſay, that this coal conſiſts of light; and, when it burns ſlowly, it conſiſts of heat, or fire: they making theſe different bodies: Unphiloſophical!—Or, ſtill more ſtriking, if all the combuſtible matter is extracted out of this coal as inflammable air, and in that ſtate burned, it will explode, giving out the moſt ſtrong and vivid

* The feather acts in this caſe by attracting out of their rectilinear courſe thoſe rays which paſs through it; and, in conſequence, from that attraction, their force is weakened, and ſo only give the impulſe, or impreſſion, to the optic nerve of the red rays.

light.

light.—Or muſt we ſay with Sir Iſaac, that, in the latter proceſs, the fire gives out only its red rays, retaining all the others?—Equally unphiloſophical.

But, to prove my doctrine ſtill more forcibly, take a piece of paſteboard, and make a very ſmall hole in its centre, ſo that the rays of light may paſs through it, falling into a dark room upon a ſheet of white paper, and in the centre of the hole place any body, a hair for inſtance, and it is well known, that the light will ſhew upon the paper the different colours of the rainbow, and that the ſhadow of the hair will be greater than it ought to be from the bulk of the hair. The phænomena are to be thus explained; thoſe rays which fall immediately upon the hair are reflected back, and in conſequence do not penetrate through the hole; and thoſe rays which do not fall upon the hair, but paſs by its ſides, being out of the hair's power to repel them back, it will nevertheleſs act upon them upon the ſame principle, *viz.* repulſion, and repel them ſo, or break their rectilinear courſe, as to form a conſiderable angle, falling a great diſtance from the ſhadow, and in conſequence it will make the ſhadow greater. The next rays that enter this hole, ſtill further from the hair, will alſo be repelled out of their courſe; but, being further from the hair, will in conſequence be repelled leſs, and fall nearer the ſhadow, and ſo regularly on, till thoſe rays which paſs by the hair at that diſtance, ſo as not to be acted upon by the hair, and in conſequence will not be forced out of their rectilinear courſe, and will fall upon the paper without forming any colour. Then the regular gradation will be, thoſe rays that paſs neareſt the hair, and in conſequence moſt repelled, will form the violet colour; and thoſe which are the leaſt repelled will form the red colour; ſo alſo the intermediate colours will be formed. Now, as

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we know that the colours are formed in the mind from the impulſe of the rays of light upon the retina, it is certainly rational to ſuppoſe, that rays forming different impulſes will give different colours, juſt as the air, when ſtruck with different vibrations, gives different ſounds. And it is worthy of remark, that there is ſuch analogy between the colours and the notes of muſic; the mind in both caſes being equally impreſſed with ſimilar ſenſations; in one caſe ſimilar colours, and in the other ſimilar ſounds; and both equally delight the mind. I think no one can diſpute this common principle in mechanics, that, if a body is impelled with a certain impulſe, and the direction of the body is changed, it will in conſequence weaken the force, or *impetus*, of the body.—Therefore, when the rays of light are moved out of their rectilinear courſe, their impulſe muſt accordingly be impaired according to the degree they are moved out of that courſe, and in conſequence effect the retina accordingly. And, as the violet colour gives to the nerve the leaſt impulſe, it is formed of thoſe rays which are the moſt repelled out of their rectilinear courſe, and in conſequence their force is moſt impaired, being formed of thoſe rays which paſs neareſt to the hair.

It is alſo to be remarked, that, as the red colour appears to be next to white in impulſe, ſo fire is formed principally of thoſe two colours. Alſo, that the blood is of this colour, and which colour is owing to its receiving fire from the atmoſphere. So alſo chemiſts inform us, that the nitrous acid aſſumes this colour either from free fire or fixed fire, which they uſed to call *phlogiſton*.

I am ſorry that my philoſophy ſhould have led me ſo often to refute the opinions of that firſt of men, Sir Isaac Newton; but truth muſt be inveſtigated—

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no authority can be a bar againſt it; and, if that great man were now living, his ſoul would have been pleaſed with his philoſophy being fairly and candidly inveſtigated: he was too great for the little, low, illiberal prejudices of envy: his exalted mind could only be open to the inveſtigation of truth; and, whether it came from himſelf or others, it would be generouſly received, he being above the low incitements which little minds feel,—and which too often prevail with men of ſcience.

I have been hitherto ſpeaking only of elementary fire; but there is alſo a very ſingular fire, called *electric fire*, which has much engaged the attention of philoſophers for the laſt half century; and, though electricians have made a number of experiments upon it, yet they are ſtill in the dark reſpecting the real nature and principles of this fire; but I hope my ſyſtem will throw great light upon it, and the elucidation of it will alſo confirm my general principles of fire.—This electric fire is univerſally diſtributed through all the earth, all bodies being ſaturated with it; but, like all other bodies in nature, it has the property of ſometimes being thrown into maſſes more concentrated, or, as the electricians ſay, charged poſitively; and, in conſequence, other bodies being charged negatively, or having a leſs concentration of it: nature's apparatus ſeems to be principally in the clouds, where theſe poſitive and negative charges greatly prevail, and which principally take place from the evaporation of water. One of the moſt ſtriking phænomena that we obſerve, is the evaporation and falling of water, (and is one great cauſe of vegetable life, as I ſhall ſhew when I come to ſpeak of vegetation) and, as we know that fire is the

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great cauſe that produces that circulation; ſo we ſhall find that electric fire alſo performs a part of this circulation, though a very ſmall part to what elementary fire does: but this electric fire does not leave our earth as elementary fire does, it being fixed to it. As water in the clouds collects into maſſes of different ſaturations; ſo alſo does electric fire.—And when two clouds differently electrified come within the attraction of one another, they will unite their fire, producing lightning and thunder. So alſo if a highly electrified cloud, poſſeſſing either poſitive or negative electricity, comes within the influence of the earth, the ſame phænomena will take place: there will be a diſcharge, and an equilibrium will be eſtabliſhed. By art we can produce the ſame phænomena: charge bodies poſitively and negatively, and in forming the equilibrium there will be the ſame phænomena. But our apparatus is trifling to Nature's.

My general principles are theſe, that the electric fire is the common elementary fire united to the mineral acids. That it poſſeſſes fire, I need not enlarge upon; and that it alſo poſſeſſes an acid, I think appears obvious from its acid taſte when it is applied to the tongue; and that it has a ſtrong ſulphureous ſmell; alſo that acids and fire have the ſtrongeſt attraction for each other of any bodies in nature; and, according to its being formed of fire and acids, we ſhall find that its qualities perfectly agree with the qualities of theſe two bodies. As fire is then united to one of the ſtrongeſt and heavieſt bodies on our earth, it will be ſtationary to our earth, the attraction and gravity of the acid will keep it attracted to the earth, and, from the repulſive power of fire, it will be univerſally diſtributed through all parts of the earth.

The elaboratory where this union takes place, I

ſuppoſe is in the bowels of the earth, where the mineral acids ſo much abound. We muſt be certain that the bowels of the earth poſſeſs a quantity of fire and acids; which, as I obſerved before, we are ſenſible of by digging into the earth.—The very ſame phænomenon takes place with water. Water is evaporated pure; but, when it falls upon the earth again, a part of it gets a ſlight impregnation with acids, *viz.* fixed air and mineral acids. Therefore, from the ſame cauſe, a part of the elementary fire gets a ſlight impregnation with the acids, forming the electric fire. This electric fire then will have the qualities both of fire and gravitating earth.

But let us attend to the different phænomena which electricians have given us, and ſee whether they will accord with my ſyſtem. They divide bodies into electrics and non-electrics, the latter being pervious to this fire, and the former not. Juſt the ſame as bodies which are tranſparent, or admitting the rays of light to paſs through them, and others that are opaque;—and, I ſhall ſhew, upon the ſame principle, bodies which admit of the light paſſing are ſaturated with a great quantity of fire; ſo are non-electric bodies, metals, charcoal, water, &c.—The calx of metals is a non-conductor; ſo is baked wood; but when, having a quantity of fire, ſo as to form charcoal and metals, they will admit of a free paſſage of the electric fluid. By poſſeſſing a quantity of fire, either fixed or free fire, the bodies will repel the electric fire, ſo as to hinder its being attracted, or ſtopped in the body, and in conſequence will paſs through it, the body having got its full ſaturation of fire, therefore cannot attract the electric fire; but the bodies which have not got their full ſaturation of fire, will in conſequence attract upon their ſurface this electric fire; for it cannot penetrate the ſurface

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from its being attracted to it, that is, by the matter of the body upon the ſurface. Juſt ſo in bodies being tranſparent or opaque. Flint is opaque; and, when the rays of the ſun fall upon it, they are hindered from paſſing through it, in conſequence ſtopped, and the body is heated. But if this flint is expoſed to a ſtrong heat in a furnace, it will imbibe a great quantity of fire; and from its getting its ſaturation of fire, and from its particles being formed into regular cryſtallizations, it will admit the rays of light to paſs through it; therefore tranſparent bodies admit of a free paſſage to the rays of light, and in conſequence are not heated by them. Fire ſeems neceſſary both to bodies emitting light and the electric fire through them. Paper, which is opaque, by oiling of it, it becomes tranſparent, or admits light to paſs through it. So the calx of iron, by heating it with oil, becomes a metal, and admits of the electric matter to paſs through it; alſo admits of the magnetic electric fire to paſs through it. Fire acts a wonderful part in the creation, from its repulſive quality, for it is from this quality that it is the author of combuſtion; for, when bodies burn, it is from the immenſe heat or fire ſet looſe, and the continuation of that combuſtion is from the fire's repulſion and breaking its chemical union in the combuſtible body. —The fire may alſo be ſet free by attrition: the mechanical force exerted will alſo break the chemical union, and ſet it free. Thus in violent motions bodies take fire. It appears ſingular, that glaſs, which is ſo pervious to light, is not ſo to the electric fire; which is owing to this cauſe, that the electric fire conſiſts of an acid as well as fire; therefore it has a great attraction, far more than elementary fire has for inert matter; ſeen diſtinctly in its giving phlogiſton to the calx of metals, and reviving of

them: and alſo, if it is paſſed through acids, it will unite to them, forming with them different airs, as that great experimenter, Dr. Prieſtley, has ſhewn. Beſides many other examples which I might produce, ſhewing the great attraction it has for matter, it being ſo much more ſuſceptible of being fixed or chemically united to bodies as fixed fire, than elementary fire is.

Water alſo we know poſſeſſes a quantity of fire; but, if that is taken from it, as in ice, it partly loſes its quality of a conductor. And in glaſs, if it is made hot, it will become a non-electric, or conductor.

As glaſs is a non-conductor of electrical fire, it will, from the matter which it contains, attract the electric fire upon its ſurface; from two cauſes,—Firſt, All bodies, or inert matter, have an attraction for fire; and, ſecondly, all inert matter has an attraction, or gravitation, to each other: therefore, as this electric fire poſſeſſes inert matter, or an acid,* the matter of the glaſs will attract it. Then, in conſequence, in an electrical apparatus, by the attrition produced, the fire which is upon the ſurface of the cuſhion will be mechanically rubbed off, and it will attach itſelf to the glaſs; ſo the cuſhion being in conſequence negatively electrified, it will alſo in conſequence receive more fire from the earth, and the heat upon the apparatus being produced by the friction, will aid the electric fire in forming itſelf into a concentrated maſs, upon this ſimple principle, fire repels fire; therefore the elementary fire will repel the electric fire, ſo *vice verſa*. This is clearly ſhewn in

* I have all along called the groſs matter of this earth inert; but it is not phyſically ſo, as the particles of this matter have a gravitation, or attraction, for each other: but the reaſon I call it inert is, in oppoſition to fire, which receives ſuch an amazing activity of motion from repulſion.

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the Tourmalin ſtone; by being heated, one part of it becomes electrified negatively, and the other part poſitively. The glaſs globe of the apparatus being electrified poſitively, will tranſmit its ſuperabundant electric fire to other bodies, and which is done by a metal conductor inſulated, and is received into a Leyden phial lined with tin foil, which phial is in conſequence highly charged: the tin foil and the air of the phial attracting the electric fire. But, as I have all along ſhewn, and by which nature conducts all her operations, fire has this amazing repulſive quality, that the highly concentrated electric *cloud* (if I may be allowed the ſimile) in the phial repels the electric fire which the outſide of the phial was ſaturated with, being that ſaturation which all bodies poſſeſs. In conſequence the phial will receive as much electric fire from the conductor, or glaſs globe, as would ſaturate both the inſide and outſide of the phial.

The apparatus ſeeming to have this effect upon the electric fire, that it alters its univerſal diſtribution, collecting a greater ſaturation, or concentration, upon one part of the apparatus than the other; in conſequence, whenever that is the caſe, either by nature or art, this higher ſaturation will, from the repulſion of fire, produce within its action, or power, a negative electricity. In its equilibrium ſtate, there is an equal repulſion, one part repelling equally the neighbouring part: but, if by nature or art that equilibrium is deſtroyed, a greater power of repulſion is conſequently induced, and all the electrical fire in the neighbourhood of that concentration muſt in conſequence be repelled, and induce a negative ſtate. —The equilibrium is firſt deſtroyed between the cuſhion and the globe, and afterwards between the inſide and outſide of the Leyden phial; therefore, whenever a conductor communicates between the poſitive

poſitive and negative ſtates, or between the cuſhion or the globe, or the inſide or outſide of the phial, from the great repulſion of fire, the equilbrium will be reſtored, and that with great force. Fire in itſelf has no great mechanical force; but it is owing to its being joined with inert matter; as when it evaporates water, (ſeen in the fire-engine, or in the exploſion of gun-powder) the fire unites to the acid; and, when ſo combined, it is powerful indeed. But I ſuppoſe that the electric fire is like the common or elementary fire in this particular, that it is impoſſible to make a perfect negative, or totally to deprive a body of it; therefore its poſitive and negative ſtates are only comparative. If the Leyden phial is inſulated, it is impoſſible to charge it, the repelled fire having no paſſage for itſelf, and therefore the outſide of the phial, from containing its natural ſaturation, will repel the fire of the inſide ſo, as that the phial cannot receive a charge. As all bodies poſſeſs an equal quantity of this electric matter in their neighbourhood, when undiſturbed, juſt the ſame as all bodies poſſeſs an equal quantity of fire in their neighbourhood when undiſturbed.—By being undiſturbed, I mean being not affected artificially either by an electrical apparatus or common combuſtion, &c. both the electric and elementary fire having that great principle of equally diſtributing themſelves, from their repulſion. This great repulſive power of the electric fire that we can produce upon the electric apparatus, has its limits; for we cannot electrify a phial whoſe ſides are half an inch thick, from this reaſon,—the electric fire cannot act upon, or repel, the electric fire on the outſide, through ſo thick a glaſs. And it is amazing what a ſtrong mechanical power this electric fire poſſeſſes; for, when a phial is highly charged, the fire will ſometimes

times penetrate through the glaſs, burſting it, in order to reſtore the equilibrium between the outſide and inſide of the phial.

Fire has a ſtrong attraction for inert matter, as I have all along ſhewn in this treatiſe; but when fire is united to inert matter, as in the electrical fire, it will in conſequence have a ſtronger attraction for inert matter. Thus if light bodies are placed near a highly electrified body, the electric fire and the body will greatly attract each other; and, as the light body is the eaſieſt moved, it will be attracted by the electric fire; but as ſoon as it gets ſaturated with the electric fire, the two fires, *viz.* that of the conductor and that of the light body, will repel each other; but, if the light body meets with another body, it will give to that body its ſuperabundant electric fire, and in conſequence having loſt part of its fire, it will be attracted again by the electrified body: or if two pith-balls be electrified, they will repel each other; or if one is electrified poſitively, and the other negatively, they will attract each other, which phænomena are from the repulſion of fire, and its attraction for inert matter. If two pith-balls are both electrified negatively, they will even repel each other, which is from the repulſion of fire; for this negative ſtate is far from a total deprivation of the electric fire.

As all bodies poſſeſs a quantity of this electric fire, owing to its general diſtribution; and, when a body is burning, or having its fixed fire ſet looſe or free, in conſequence its fire will repel the electric fire the body naturally poſſeſt, from the general diſtribution; and the electric fire will be concentrated, or repelled, into an electric atmoſphere about the burning flame, (if I may be allowed the expreſſion) and, if a conductor is applied to the flame, it will receive the electrical fire from the burning body; but, when the

flame

flame is extinguiſhed, in conſequence the body becomes cool, it then having loſt its electrical fire, it will become negatively electrified. Thus ſulphur, if it is melted, the heat, or fire, required for its melting will repel its electric fire; and, if it is melted in a glaſs veſſel, being an electric, it will receive the ſulphur's natural ſaturation of the electric fire, and become electrified; and, if the glaſs veſſel is placed upon electric bodies, as the eſcape of the electric fire will in conſequence be more impeded, the glaſs will be more highly electrified; for the glaſs being alſo highly heated, is alſo, from that cauſe, rather diſpoſed to repel part of the electric fire; but, when it is placed upon other electric bodies, that eſcape is, as I obſerved, more impeded; and, if the glaſs is coated with metal, it will aid it in retaining the fire, and in conſequence, as in the Leyden phial or jar, its electricity will be ſtronger. In theſe caſes, the glaſs is always poſitive and the ſulphur negative.

But, if the ſulphur is melted in an earthen veſſel, and placed to cool upon uninſulated conductors, it is ſtrongly electric when taken out; but, as I have juſt ſhewn, it is not ſo when it has ſtood to cool upon electric ſubſtances, for the electric ſubſtance, the glaſs for inſtance, has an attraction for the electric fire; and this fact will elucidate, why the glaſs or electrics in the electric apparatus receive the fire from the cuſhion. Theſe explanations and hiſtory of electricity will, I think, account for all the phænomena.

I have not noticed the theory which ſuppoſes two different fluids, the one vitreous, and the other reſinous; and from thoſe fluids having a ſtrong attraction for each other, being the cauſe of the different electrical phænomena,—it being ſo directly oppoſite to all our known laws of fire, that two *igneous* fluids ſhould attract each other; for this law in nature, that fire repels

repels fire, is as certain as the law of gravitation; and any hypotheſis that goes ſo far to contradict it, as even to ſuppoſe two *igneous* fluids can attract each other, does not, I think, deſerve a ſerious refutation.

That all fires repel each other and themſelves, both elementary and electric, we ſee diſtinctly from all the phænomena. If a cork ball be ſuſpended by a ſilk thread, and is held to the charged conductor of the electrified apparatus, poſitively electrified, the ſide next to the conductor will be electrified negatively, and the oppoſite ſide poſitively; from the fire of the conductor repelling the electrical fire of the cork ball to the ſide the furtheſt removed from its influence. It is juſt the ſame in the Tourmalin ſtone when heated; the elementary fire will likewiſe repel the electric fire, ſo that it will alſo have a negative and poſitive ſide of electricity. I could bring many other examples, but they are unneceſſary.

The greateſt beauties of my ſyſtem are, I think, its ſimplicity and its embracing ſo many phænomena, that one part, inſtead of contradicting another, ſeems to be its ſtrongeſt ſupport and evidence.—I ſhall now conſider *magneti/m;* and, I flatter myſelf, I ſhall be able to account for its phænomena; and the cauſes I ſhall aſſign for it will alſo ſtrengthen my general ſyſtem.

I ſuppoſe there is a fluid which is conſtantly emitted from the ſouth pole of the earth, and is as conſtantly imbibed, or attracted, by the north pole; and that this fluid is the electrical fluid. We know that the electrical fluid is univerſally diſtributed through the earth; that all bodies are ſaturated with it; and, from the repulſion of fire, it muſt be diſtributed every way. Then the great internal body of the earth muſt be ſaturated with it, and muſt in conſequence be ſuſceptible of all the laws of electricity.

Now let us conſider thoſe laws. As the earth muſt poſſeſs ſuch a quantity of this electrical fire, and by its ſurface being covered with water, and which is ſo great a conductor of electricity; this water will conſtantly be operating upon it, ſo as to produce a circulation of the fluid; and, as in all bodies upon this earth, and particularly upon all fluids, they have a conſtant circulation, in order to keep them pure and unchanged. Thus the waters of the ocean by the tides, and the atmoſphere by the winds; therefore nature, we will ſuppoſe, has induced a ſimilar circulation in the electric fluid;—and, I hope I ſhall ſatisfactorily ſhew, this is done by that great conductor, water. But, as fire repels fire, ſo the elementary fire, which the ſeas of the earth are ſaturated with, will repel the electric fire; therefore thoſe ſeas which have the higheſt ſaturation of elementary fire, will imbibe, or attract, the leaſt of the electrical; and thoſe ſeas which have the leaſt of the elementary, will attract the moſt of the electrical fire; in conſequence the water at the poles will operate the the ſtrongeſt; and, as the ſouth pole has the moſt water, therefore it will operate the ſtrongeſt upon this fire: firſt, from its being water, and, ſecondly, from its being ſaturated with ſo little of elementary fire, it being the coldeſt part of the globe. Therefore, from all theſe conſiderations, it will conſtantly be receiving and conducting this electrical fire from the earth; and this electrical fire will, from its repulſive quality, be as conſtantly diffuſing itſelf, and in conſequence it will be attracted by that part of the globe which has ſo little fire, either elementary or electric, and which is the north pole: ſo as the ſouth pole emits it, the north pole imbibes it. That elementary fire repels the electric fire, I have before fully ſhewn in the glaſs globe of the electrical apparatus,

ratus, in the Tourmalin ſtone, in diſſolving ſulphur by fire, and in the combuſtion of all bodies. This emiſſion and imbibing of this fluid then will produce a conſtant circulation of it, and by that means keep it entire or pure. That it has a great tendency, or circulation, to the north pole, is ſeen clearly in the *Aurora Borealis*, which hovers over it to receive admiſſion. Then the earth is a great magnet circulating this electrical fire.

Iron, of all the metals, has the ſtrongeſt attraction for this electrical fire; and its ore, which lies in the direction of the circulation of this fluid, will, from having it regularly circulating through it, become a magnet. But, as the great ſtream of this electrical fire is from the ſouth to the north pole, and in the internal bowels of the earth from the north to the ſouth pole, yet different parts of the earth receive a ſmall part of the circulation. Thus that part of the earth which we inhabit in this iſland. And therefore all iron bodies which ſtand perpendicularly, as the iron bars of windows, the family utenſils, ſuch as the poker and tongs, which are kept in a perpendicular poſition, will attract this electrical fire, and ſo conduct it into the earth; in conſequence they will become magnetic, that is, their high end receives it, and the low end, which reſts upon the ground, emits it. So alſo iron that has been conſtantly kept in an horizontal poſition, with one end regularly pointed to the ſouth, and the other to the north, receives this polarity, its ſouth end becoming the receiving end, and the north the emitting end.—And iron, by art, may, in a very ſhort time indeed, become magnetical. Thus the great means to do that to the higheſt perfection, is by giving the iron as much phlogiſton, or fixed fire, as it can be ſaturated with.—Dr. Knight's proceſs was by kneading

the iron filings with oil.—Mr. Canton's was by heating iron with leather, &c. Theſe phlogiſtic bars of iron then, by being rubbed with a magnet, or even without a magnet, by being placed to the end of a poker for a ſhort time, and then rubbed with other pieces of iron which had got polarity, in the direction of the earth's poles, that being the current of this fire, become magnetic. But, for the proceſs by which this wonderful operation is conducted, I muſt refer my reader to the authors who have written on the ſubject: my object is only to aſſign the cauſe.

Iron has the ſtrongeſt attraction for this fire; indeed it is a body which has the greateſt attraction for fire, for it is capable of being ſuperſaturated with fixed fire, and which is the caſe with no other metal. Thus iron may receive a ſuperſaturation of fire, ſo as to become ſteel. Then iron has the ſtrongeſt attraction for this electrical fire. But in the common ſtate of iron, without it has undergone the proceſs I have juſt named, it will not circulate this electrical fire. That it will circulate the electrical fire, we know by art from an electrical machine; but this fire ſo produced and circulated has a ſtrong impulſe, ſo as even to kill animals, from its being highly concentrated. But the gentle impulſe by which it travels from pole to pole, is not ſufficient to conduct it through iron in that *rapid ſtream* which is neceſſary to its becoming a magnet; but this is very eaſily accompliſhed, by paſſing an electrical ſpark through iron; or by keeping it in that poſition for a long time by which nature may do it herſelf; or by rubbing a magnet along it. All of which proceſſes ſeem to produce their effect, by ſending a ſtream of fire through the iron's pores, ſo as to clear its channel, as it were, removing all obſtructions to its circulation, and this once obtained, it becomes a magnet. Rubbing the iron with a magnet ſeems to operate by

giving

giving it a quantity of this electric fire, and this additional fire will repel the electric fire it already poſſeſſes, and, aided by the mechanical force, breaks open the obſtructions, ſo as to free the channel for the fluid to flow; and, by art, placing the magnetical bars of iron in a poſition that this fluid may circulate freely through their north poles to the ſouth poles, and alſo their ſouth poles to their north; ſo that, by the current conſtantly flowing through, the paſſages will in conſequence be more cleared. The great art is, firſt to open the paſſage, and then to keep the current as ſtrong and rapid as poſſible paſſing through them.†

It is ſingular, why glaſs ſhould admit of light paſſing through it; why metals, water, and charcoal ſhould be the conductors of electricity; and why iron ſhould be the only conductor of this mild and gentle ſtream of it producing magnetiſm; but ſo it is,—and I hope I have given a ſatisfactory explanation of each.

The next phænomenon to be conſidered is, how comes the magnet to attract iron ſo ſtrongly. That this electric fire has a ſtrong attraction for matter, I have ſhewn before,* from the phænomena of the electrical apparatus. If light bodies be held within the attraction of an electrified body, or the electrified globe of the apparatus, they will immediately fly to it. The cauſe I aſſigned for this was, that this electric matter conſiſted of fire and an acid, both of which bodies have a ſtrong attraction for matter, or other bodies, and particularly for iron, as it is capable

† It may alſo operate in this way: by paſſing a conſtant ſtream of this electric fire through its pores, this fire will give theſe pores a full ſaturation of fire; ſo that, having got their full ſaturation, they will no longer attract and reſiſt the paſſage of this fluid.

* This fire will not circulate in *vacuo*.

of

of receiving a proportion of fire beyond its metallic ſtate, as in ſteel; and alſo that acids, chemiſts inform us, have the ſtrongeſt attraction for iron; therefore a magnet which has ſuch an over proportion of this electric fire paſſing through it, will in conſequence, from being conſtantly filled with this fluid, have a great attraction for iron; and that this fluid has not only this attraction, but it has alſo its repulſion.—And this is clearly ſhewn by applying the two emitting ends of magnets together, for they will repel each other, and which repulſion directly proves theſe fluids to be *igneous*, and alſo that they *are fluids*.

One very ſtriking phænomenon in electricity is, that bodies electrified poſitively will impart their fire to bodies in a ſtream of light ſimilar to the ſhape of a diverging cone; and that bodies electrified negatively will receive the electric fire from other bodies in the ſhape of a ſmall globe or point of light. So in the ſouth pole, which, I ſuppoſe, emits this fire, it is obſerved by mariners, that the needle is affected many degrees round the pole, it emitting its fire ſimilar to all electric bodies; and that the north pole has the needle more centered in its attraction of it to a point, ſimilar to the negative bodies receiving electricity; and the variation of the needle, which has been tending weſtward for ſome years, may be accounted for from the axis of the poles of the earth varying their poſition to the ecliptic—But I ſhall treat more particularly of this hereafter.

Many philoſophers have ſuppoſed this magnetic fluid travels from the north to the ſouth pole,—and not as I think, from the ſouth to the north pole. Indeed it is not very clear which way it flows; but certainly the fluid paſſes from one to the other. And, when we conſider the great quantity of this electric fire which goes to the evaporation of water into the atmoſphere,

atmoſphere, and alſo circulates through vegetables into the atmoſphere, nature muſt have ſome great proceſs to carry it back again to the earth; and this is done, I ſuppoſe, from one pole conſtantly imbibing it, and the other as conſtantly emitting it; at leaſt, all that part which had not been emitted by the evaporation of water and the circulation of vegetables. The great leading principles of magnetiſm are, I ſuppoſe, that, between the water and earth of the globe, there is a conſtant circulation of this fluid; that one is emitting it, and the other conſtantly receiving it; that the coldeſt parts of the globe do circulate it the moſt freely, elementary fire repelling it, which is plainly ſeen by the needle's altering its direction as the ſun advances weſtward, the needle driving to the weſtward till three o'clock, P. M. Therefore the principal circulation will be between the ſouth and north poles, and the greateſt current of this circulation we ſhall find from the water to the land of the globe.—That, in attending to the needle, we ſhall ſee how this magnetical fluid flows; and I think the obſervations will ſtrengthen my hypotheſis, that the water is emitting it, and the land imbibing it; with this great reſtriction, that it is only in the cold parts of the globe where the great emiſſion and imbibing of this fluid principally take place. Then, in the ſouth parts of the globe, this fluid will flow from the waters of the ſouth pole upon the land of the ſouthern hemiſphere. Thus, in New Holland, that great body of land the neareſt the pole, upon its weſterly ſide the needle will point due north, balanced by the great body of land of Africa and New Holland; but, as you ſteer either eaſt or weſt from thence, either land will predominate; ſteering weſtward, Africa predominates, the needle pointing weſtward; but, at St. Helena, between the two great

continents

continents of Africa and America, the needle points north, the current flowing upon the great projecting African coaſt. As you ſtill ſail ſouth-weſt, the great body of land of Africa, Aſia, and Europe will have this current flowing upon it, from the weſt ſide of the American ſouthern pole, till you get about twenty degrees weſt of the Straights of Magellan, and then the needle points north, the current flowing upon the great body of land of North America. Still ſteering weſtward, as you advance midway between Chili and New Zealand, the variation will become a little weſterly, being attracted by the eaſt parts of New Holland, Aſia, and Europe.

This direction of the needle at the ſouth pole, I ſuppoſe is principally operated upon by the fluid at its emiſſion; but, when you arrive at the equator, it is there equally balanced by the emitting and receiving bodies; and at the north pole principally by the admitting or receiving body; ſo its direction may be equally traced upon the north pole according to the ſituation of the receiving body, which is the land. But that this current varies conſiderably, according to the part of the globe the needle is in, and which muſt be acted upon according to the reſpective ſituations of the land and water in that particular part, every different part of the globe altering that reſpective ſituation, the earth and water being ſo irregularly placed upon the globe; therefore we can have no regularity. But that the needle is always affected when it approaches great continents, or bodies of land, is thoroughly aſcertained.——The greateſt variation of the needle is in Hudſon's Straights, and the mouth of the river of Rio Plata, though nearly under the ſame meridian: at one place the needle varies $29\frac{1}{2}^{\circ}$ weſt, and the other $20\frac{1}{2}^{\circ}$ eaſt, and which muſt be owing to the needle at the river

river Rio Plata being under the influence of the magnetic current of the ſouth pole; and, when at Hudſon's Straights, to the current of the north pole.

I hope I have now given a ſatisfactory detail of theſe extraordinary phænomena of electricity and magnetiſm; but I have not enumerated every fact, and accounted for each in particular, as I thought that unneceſſary, as I have for all the leading ones that were neceſſary to the elucidation of this intricate ſubject; and, from the general principles given, I think my reader can find no difficulty in making the proper explanation of all the reſt; for, I flatter myſelf, my ſyſtem fully elucidates and embraces all the phænomena relating to both magnetiſm and electricity.

This electric matter is of the utmoſt importance to our planet, the fire being ſtationary and fixed to it, and from its greater attraction for inert matter, or bodies upon our earth. It is therefore, I ſuppoſe, a great and powerful agent to animal, vegetable, and mineral life. As fire is ſo neceſſary a body to life, and this electric fire is more ſuſceptible of being fixed, it therefore will be conſtantly uniting to matter, and aiding in forming bodies, particularly vegetables, —which I will ſhew hereafter; and in the bowels of the earth, where acids and fire abound, it will get itſelf renewed again. And alſo in the deſtruction of theſe bodies, animal, vegetable, and mineral, the electric fire will be decompounded, and ſet looſe as ſeparate bodies, *viz.* fire and an acid, it undergoing the ſame change and diſſolution as all bodies upon the earth. And it will alſo aſſiſt in planetary repulſion, as it is conſtant and ſtationary to the earth.

I think volcanoes, thoſe great combuſtions of nature, muſt have a powerful effect in ſetting ele-

mentary fire free, when the earth is overcharged with it, ſo that it may do its office again in travelling from planet to planet.

But, before I conclude, let me pay a proper tribute to Sir Iſaac Newton, that firſt of men, whoſe great and extenſive mind hath ſo fully elucidated nature in various great and eſſential points, particularly in her great law of gravitation, tracing the finger of God, and ſtruck with his power in the natural world, ſo that Sir Iſaac's mind was full of veneration for his power. But that his ſyſtem of gravitation alone is not adequate to account for the phænomena, I have, I hope, fully ſhewn. For, ſuppoſe that it were equal to the planetary phænomena, one ſun and its planets balancing the next ſun and its planets by gravitation, yet all theſe ſuns and planets muſt have a boundary; therefore, if we ſuppoſe it is by being balanced in being attracted different ways by different ſtars, we muſt expect that the ſtars on the outſide, if there are any bounds to the creation,—to the works of an infinite Being, will ruſh inwards, till all be involved in one maſs or heap. Therefore, in whatever point of view we ſee Sir Iſaac's ſyſtem of gravitation, it is involved in inſurmountable difficulties, irreconcileable to any law.

But the ſame great mind that unlocked nature's ſecrets, ſaw with the ſame perſpicuity the well-founded doctrines of the Chriſtian religion, though it is ſaid of him, that, in his early years, (according to Dr. Johnſon) he was a clamorous infidel; yet, when his judgment was mature, and his knowledge moſt extenſive, he clearly perceived that there muſt be a great Being that formed, directed, and gave life to the works of the creation, and that great Being was fully diſcovered in the Chriſtian religion. It is ſaid that philoſophers are often infidels, which I believe may

may be true of ſuperficial reſearchers; for, always looking to ſome cauſe for the phænomena in nature, they therefore are apt to refer every every thing to natural cauſes, and reſt ſatisfied with that opinion;—but a mind ſuch as Sir Iſaac's was, ſees clearly that there is a cauſe above them,—the firſt mover, who ordained, directed, and put in motion all theſe cauſes and effects, *and which is God.*

FINIS.

W. H. M. L.

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