the earth, have originated from the action of the tides, thoſe which we perceive in the moon have been produced by a ſimilar cauſe? The mountains of the moon are indeed higher than thoſe of the earth; but her tides are likewiſe ſtronger; becauſe the earth, the ſize of which is much larger, raiſes the tides of the moon with a ſuperior force. This effect would be greatly augmented, if the moon, like the earth, had a quick diurnal motion. But, as the moon uniformly preſents the ſame face to the earth, the tides are raiſed only in proportion to the motion occaſioned by her librations, which alternately expoſe to our view a ſmall ſegment of her other hemiſphere. This cauſe, however, muſt produce tides very different from thoſe of our ſeas; and their effects will, of courſe, be much leſs conſiderable, than if the moon had poſſeſſed a diurnal revolution round her axis, equally quick as the rotation of the earth.

I ſhould compoſe a volume equal to that of Burnet or Whiſton, were I to extend the ideas preſented by the above theory; and were I, in imitation of the laſt-mentioned author, to clothe them in a geometrical dreſs, I might add conſiderably to their importance. But I have always thought, that hypotheſes, however probable, deſerve not to be treated ſo pompouſly. It is apt to give them the air of quackery and impoſition.

PROOFS

OF THE

THEORY OF THE EARTH.

ARTICLE II.

Of the Syſtem of Whiſton *.

THIS author begins his theory with a diſſertation on the creation of the world. He alleges, that the account given of it by Moſes is not properly underſtood; and that, in inquiries of this kind, men, contenting themſelves with the moſt evident and ſuperficial views, give too little of their attention to nature, reaſon, and philoſophy. The common notions, he obſerves, concerning the ſix days work, are falſe; and the deſcription of Moſes is not an exact or philoſophic account of the creation and origin of the univerſe, but only an hiſtorical

* See a new Theory of the Earth by Will. Whiſton, London, 1708.

narrative of the formation of the terreſtrial globe. The earth, in his eſtimation, formerly exiſted in chaos, and, at the time mentioned by Moſes, it only received a form, ſituation, and conſiſtence, neceſſary for the habitation of mankind. I ſhall not give a detail of Whiſton's proofs, nor enter upon a formal refutation of them, but content myſelf with a ſhort view of his theory, which will ſhow it to be contrary to the ſcriptures, and, of courſe, that his proofs muſt be falſe. Beſides, he treats this matter more like a polemical divine than a philoſopher.

Leaving theſe falſe principles, he proceeds to ſome ingenious notions, which, though ſingular, will not, to thoſe who are influenced by the enthuſiaſm of ſyſtem, appear to be deſtitute of probability. He tells us, that the ancient Chaos, from which the earth originated, was the atmoſphere of a comet; that the annual motion of the earth began when it received its new form; but that its diurnal motion commenced not till the fall of Adam; that the ecliptic cut the tropic of Cancer in a point preciſely oppoſite to Paradiſe, which was ſituated on the northweſt frontier of Aſſyria; that, before the deluge, the year began at the autumnal equinox, and that the orbits of the earth and planets were then perfect circles; that the deluge commenced on the 18th of November, in the year of the Julian period 2365, or 2349 before Chriſt; that, previous to the deluge, the ſolar and lunar year

year were the ſame, and conſiſted exactly of 360 days; that a comet, deſcending in the plane of the ecliptic to its perihelion, on the very day that the deluge began, made a near approach to the earth; that there is a great heat in the bowels of the earth, which is conſtantly expanding from the centre to the circumference; that the figure of the earth reſembles an egg; that the mountains are the lighteſt parts of the globe, &c. He then attributes to the deluge all the changes the earth has undergone, blindly adopts Woodward's theory, uſes indiſcriminately all that author's remarks on the preſent ſtate of the earth; but aſſumes more the air of an original, when he treats of its future condition. The earth, ſays Mr Whiſton, will be conſumed by fire; and its deſtruction will be preceded by earthquakes, thunder, and hideous meteors; the ſun and moon will aſſume a dreadful aſpect; the heavens will ſeem to fall; and the whole earth will be in flames. But, after the fire ſhall have devoured every impurity of this globe, and vitrified and rendered it tranſparent as the pureſt cryſtal, the ſaints and ſpirits of the bleſſed ſhall take poſſeſſion of it, and there remain till the general judgment.

This hypotheſis appears, at firſt view, to be extravagant and fantaſtical. But the author has managed his ideas with ſuch dexterity, and placed them in ſo ſtrong a light, that they no longer have the air of abſolute chimeras. He has

adorned his ſubject with much ſcience and ingenuity: And it is aſtoniſhing, that, from ſuch a medley of ſtrange notions, he ſhould have been able to compoſe a ſyſtem ſo plauſible. But it is not to the vulgar that it has this brilliant appearance; the learned are more eaſily deceived by the glare of erudition, and the force of new ideas. Mr Whiſton was a celebrated aſtronomer. Accuſtomed to contemplate the heavens, to meaſure the motions of the ſtars, and to conſider the great phænomena of nature, he could never imagine that this grain of ſand, which we inhabit, occupied more the attention of its Creator than the univerſe, which contains, in the vaſt regions of ſpace, millions of other ſuns and other worlds. He alleges, that Moſes has not given us the hiſtory of the firſt creation of this globe, but only a detail of thoſe circumſtances which attended its receiving a form fit for the habitation of men, when the Almighty transformed it from the ſtate of a comet to that of a planet. Comets, owing to the eccentricity of their orbits, are ſubject to dreadful viciſſitudes: Sometimes, like that of 1680, they are a thouſand times hotter than melted iron, and ſometimes a thouſand times colder than ice: They cannot, therefore, furniſh habitation to any creatures of which we can form a conception; or rather, they are altogether uninhabitable.

The

The planets, on the contrary, are tranquil bodies; their diſtances from the ſun vary but little; and their temperature continues ſo nearly the ſame, that it permits plants and animals to grow and to multiply.

In the beginning, ſays Mr. Whiſton, God created the univerſe; but the earth was then an uninhabitable comet, and ſubject to ſuch alternate extremes of cold and heat, that its matter, being ſometimes liquified and ſometimes frozen, was in the form of chaos, or an abyſs, ſurrounded with utter darkneſs: *And darkneſs covered the face of the deep.* This chaos was the atmoſphere of the comet, a body compoſed of heterogeneous materials, having its centre occupied with a globular, ſolid, hot nucleus, of about 2000 leagues in diameter, round which was an extenſive maſs of a thick fluid, mixed with heterogeneous and undigeſted materials, like the chaos of the ancients, *rudis indigeſtoque moles.* This great atmoſphere contained few dry, ſolid, or earthy particles, and ſtill leſs of water or air; but it was amply filled with thick and heavy fluids, mixed, agitated, and jumbled together in the utmoſt confuſion. Such was the condition of the earth when ſix days old: But, next day, that is, on the firſt day of the creation, when the eccentric orbit of the comet was changed into an ellipſe, nearly circular, every thing aſſumed its proper place; the different materials arranged themſelves accord-

ing to their ſpecific gravities; the heavy fluids ſunk down, and left to the earthy, watery, and aerial ſubſtances, the ſuperior regions. Theſe alſo deſcended in the order of their gravities; firſt the earth, then the water, and, laſtly, the air. In this manner, the immenſe volume of chaos was reduced to a moderate ſphere, the centre of which is a ſolid body that ſtill retains the heat it received from the ſun, when formerly the nucleus of a comet. This heat may eaſily laſt 6000 years, ſince the comet 1680 would require 50,000 before it cooled. Round the ſolid and burning nucleus, at the centre of the earth, is placed the heavy fluid which deſcended firſt, and formed the great abyſs, upon which the earth floats like a cork on quick-ſilver. But as the earthy parts were originally mixed with a great body of water, they, in deſcending, drove before them a part of this water, which was confined there when the earth conſolidated, and formed a ſtratum concentric with the heavy fluid that ſurrounds the nucleus. Thus, the great abyſs is compoſed of two concentric circles, the interior being a heavy fluid, and the ſuperior water, upon which laſt the earth is immediately founded. From this admirable arrangement, produced by the atmoſphere of a comet, are to be deduced the theory of the earth, and an explication of all its phænomena!

After the atmoſphere of the comet had been freed from the ſolid and earthy particles, a pure air

air only remained, through which the rays of the ſun inſtantly penetrated, and produced light: *Let there be light; and there was light.* The vaſt columns or beds of which the earth is compoſed, being formed with ſo much precipitation, is the reaſon why they differ ſo much in denſity; the heavier ſunk deeper into the abyſs than the lighter, and, of courſe, gave riſe to mountains and valleys; Theſe inequalities, before the deluge, were differently ſituated from what they are at preſent. Inſtead of that vaſt valley which contains the ocean, many ſmall caverns were diſperſed over the globe, each of which contained a part of the waters. The mountains were then at greater diſtances, and formed not large chains. But the earth was a thouſand times more fertile, and contained a thouſand times more inhabitants; and the life of man, and of the other animals, was ten times longer. All theſe effects were produced by the ſuperior heat of the central fire, which gave birth to a greater number of plants and animals, and, at the ſame time, beſtowed on them a degree of vigour that enabled them to exiſt long, and to multiply abundantly. But this heat had a miſerable effect upon the diſpoſitions of men and other animals: It augmented the paſſions, robbed man of his innocence, and diminiſhed the ſagacity of the brute creation. All creatures, except the fiſhes, who inhabited a colder element, felt the influence of the central heat, became vicious,

and merited death. This univerſal death was accordingly inflicted, on Wedneſday the 28th day of November, by a dreadful deluge, which laſted 40 days and 40 nights, and was occaſioned by the tail of a comet meeting with the earth, in returning from its perihelion.

The tail of a comet is the lighteſt part of its atmoſphere. It is a tranſparent and ſubtile vapour raiſed by the heat of the ſun from the body of the comet. This vapour, which is compoſed of aerial and watery particles extremely rarified, follows the comet in its deſcent to its perihelion, and goes before the comet in its aſcent, its ſituation being always oppoſite to the ſun, as if it had an affection for the ſhade, and wiſhed to avoid the ſcorching rays of the ſun. This column of vapour is often of an immenſe extent; and its length always increaſes in proportion as the comet approaches nearer the ſun. Now, as many comets deſcend below the annual orbit of the earth, it is not ſurpriſing that the earth ſhould ſometimes be involved in this vapour. This dreadful event happened at the time of the deluge. The tail of a comet, in two hours, will diſcharge a quantity of water equal to that contained in the whole ocean. In fine, this tail is what Moſes calls the cataracts of heaven: *And the cataracts of heaven were opened.* The globe of the earth, when it meets with a comet's tail, muſt neceſſarily, in its paſſage through this body of vapour, appropriate part

part of its materials. Every thing that comes within the ſphere of the earth's attraction muſt fall upon it, and muſt fall in the form of vapour, ſince the tail itſelf principally conſiſts of that element. In this manner, rain may come from the heavens in ſuch torrents, as to produce an univerſal deluge, and to ſurmount the tops of the higheſt mountains.

Our author, however, unwilling to go beyond the letter of the ſacred writings, does not aſcribe the deluge to this rain alone, which he has choſen to bring from ſo great a diſtance. He takes advantage of water wherever he can find it: The great abyſs, as we have ſeen, contains a conſiderable quantity. The earth, in its approach towards the comet, would feel the force of its attraction; the waters in the great abyſs would be ſo agitated with a motion ſimilar to that of the tides, as would neceſſarily break the ſhell or cruſt in many places, and make the water ruſh out upon the ſurface: *And the fountains of the abyſs were opened.*

But how, it may be aſked, was this vaſt collection of water, ſo liberally furniſhed by the great abyſs, and by the comet's tail, afterwards diſpoſed of? Our author is not embarraſſed by this circumſtance. As ſoon as the earth eſcaped from the comet, the flux and reflux of the great abyſs neceſſarily ceaſed. From that moment the waters on the ſurface ruſhed down with violence by the ſame channels out of which they had

had iſſued. The great abyſs ſwallowed up not only its own water, but all that had been depoſited by the comet, which it was ſufficiently enabled to contain; becauſe, during its agitation, and when it broke the cruſt, it had greatly enlarged its dimenſions, by puſhing the earth farther from it on all ſides. It was at this time, likewiſe, that the earth, which was formerly a ſphere, aſſumed its elliptical figure. This effect was produced by the centrifugal force occaſioned by the diurnal motion of the earth, and by the attraction of the comet; for the earth, when paſſing through the tail of the comet, was ſo ſituated, that its equatorial parts were neareſt that ſtar; and, of courſe, the power of the comet's attraction, concurring with the earth's centrifugal force, elevated the equatorial regions with the greater facility, becauſe the cruſt was broken in an infinite number of places, and becauſe the flux and reflux of the abyſs puſhed more violently againſt the equator than any where elſe.

This is the hiſtory Mr. Whiſton gives of the creation, of the cauſes of the univerſal deluge, of the longevity of the Antedeluvians, and of the figure of the earth. All theſe difficult ſubjects ſeem to have given our author very little trouble. But he appears to be greatly puzzled concerning Noah's ark. In that dreadful confuſion, produced by the conjunction of the tail of a comet, and by the waters of the great abyſs, and in that horrible period, when not only the

the elements of this globe were confounded, but when the heavens concurred with the bowels of the earth in producing new elements to increaſe the chaos, how is it to be imagined that the ark could float tranquilly, with its numerous and valuable cargo, upon the ſurface of the waves? Here our author ſtruggles hard, in order to account for the preſervation of the ark. But, as his reaſoning upon this ſubject appears to be inconcluſive, ill-imagined, and heterodox, I ſhall only obſerve, how hard it is for a man, who had explained objects ſo great and ſurpriſing, without having recourſe to a ſupernatural power, to be ſtopped in his career by a trifling circumſtance. But he chooſes to riſk drowning himſelf along with the ark, rather than to aſcribe the preſervation of this precious veſſel to the interpoſition of the Almighty!

I ſhall only make a ſingle remark upon this ſyſtem, of which I have given a faithful abridgement. Whenever men are ſo preſumptuous as to attempt a phyſical explanation of theological truths; whenever they allow themſelves to interpret the ſacred text by views purely human; whenever they reaſon concerning the will of the Deity, and the execution of his decrees; they muſt neceſſarily involve themſelves in obſcurity, and tumble into a chaos of confuſion, like the author of this whimſical ſyſtem, which, notwithſtanding all its abſurdities, has been received

ceived with great applauſe. Mr. Whiſton neither doubted of the truth of the deluge, nor of the authenticity of the ſacred writings. But, as phyſics and aſtronomy occupied his principal attention, he miſtook paſſages of holy writ for phyſical facts, and for reſults of aſtronomical obſervations; and ſo ſtrangely jumbled divinity with human ſcience, that he has given birth to the moſt extraordinary ſyſtem that perhaps ever did or ever will appear.

PROOFS

OF THE

THEORY OF THE EARTH.

ARTICLE III.

Of Burnet's Theory *.

MR. BURNET is the firſt author who diſcovered enlarged views of the preſent ſubject, and who treated of it in a ſyſtematic manner. He was a man of genius and of taſte: His work acquired great reputation, and was of courſe, criticiſed by many of the learned, and, among others, by Mr. Keill, who ſcrutinizing the ſubject as a geometer, demonſtrated the errors of Burnet's theory in a treatiſe entitled, *An examination of the Theory of the Earth.* Mr. Keill likewiſe refuted the ſyſtem of Whiſton; but he treated the latter in a manner very different from the former. He even appears, in many

* Thomas Burnet. Telluris theoria ſacra, orbis noſtri originem et mutationes generales, quas aut jam ſubiit, aut olim ſubiturus eſt, complectens. Londini 1681.

particulars,