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S I R I S:
A CHAIN of
PHILOSOPHICAL REFLEXIONS
AND
INQUIRIES

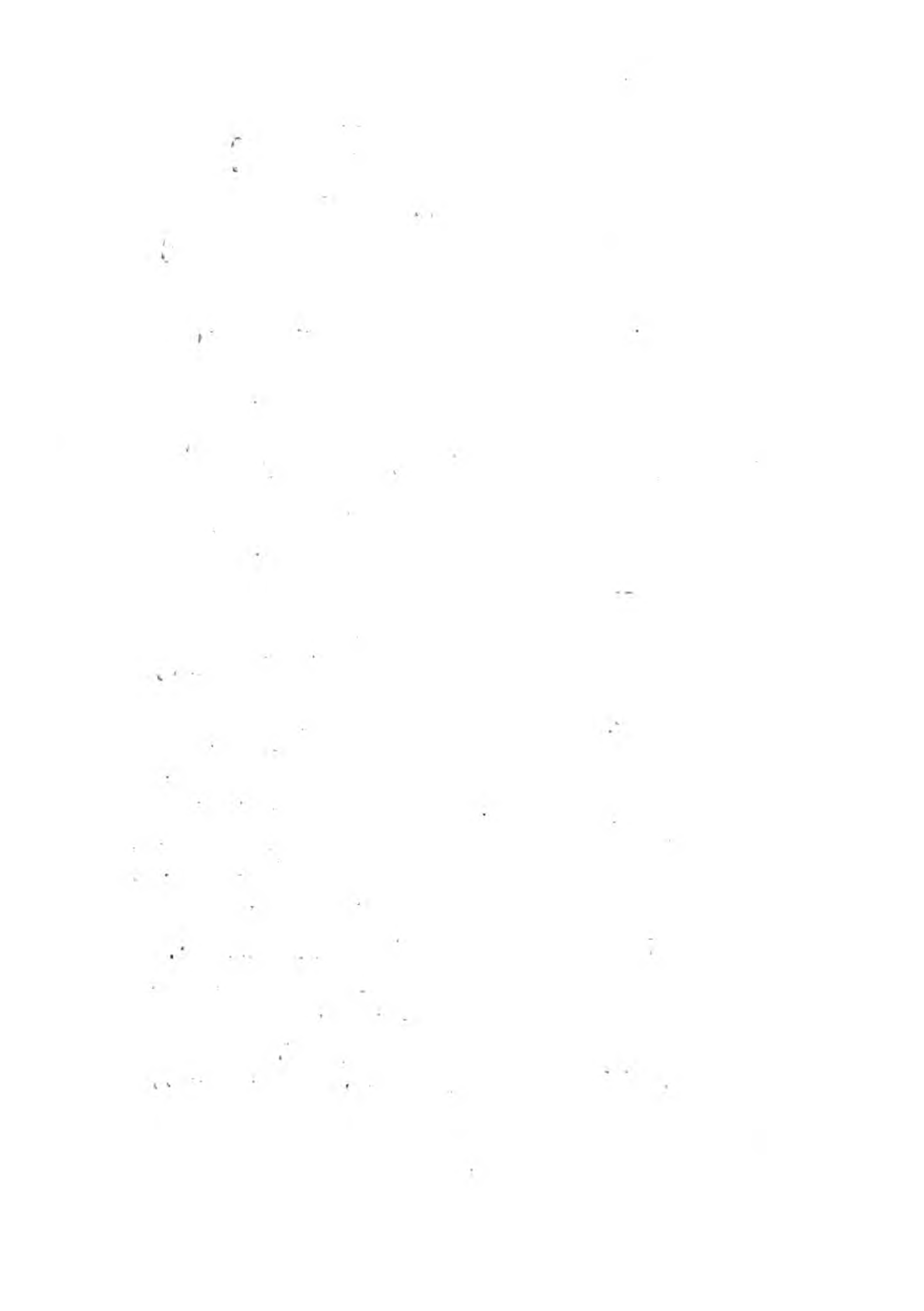
Concerning the VIRTUES of
T A R W A T E R,
And divers other *Subjects* connected together
and arising one from another.

BY THE
Right Rev. Dr. GEORGE BERKELEY,
Lord Bishop of CLOYNE,
And Author of *The Minute Philosopher.*

As we have opportunity, let us do good unto all men. Gal. vi. 10.
Hoc opus, hoc studium, parvi properemus et ampli. Hor.

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S I R I S:

A CHAIN of

PHILOSOPHICAL REFLEXIONS

A N D

I N Q U I R I E S, &c.

FOR INTRODUCTION to the following piece I assure the reader, that nothing could, in my present situation, have induced me to be at the pains of writing it, but a firm belief that it would prove a valuable present to the public. What entertainment soever the reasoning or notional part may afford the mind, I will venture to say, the other part seemeth so surely calculated to do good to the body, that both must be gainers. For if the lute be not well tuned, the musician fails of his harmony. And in our present state, the operations of the mind, so far depend on the right tone or good condition of it's instrument, that any thing which greatly contributes to preserve or recover the health of the body, is well worth the attention of the mind. These considerations have moved me to communicate to the public the salutary virtues of tar-water; to which I thought myself indispensably obliged, by the duty every man owes to mankind. And, as effects are linked with their causes, my thoughts on this low, but useful theme led to farther

ther inquiries, and those on to others remote, perhaps, and speculative, but, I hope, not altogether useless or unentertaining.

1. **I**N certain parts of America, tar-water is made by putting a quart of cold water to a quart of tar, and stirring them well together in a vessel, which is left standing till the tar sinks to the bottom. A glass of clear water being poured off for a draught is replaced by the same quantity of fresh water, the vessel being shaken and left to stand as before. And this is repeated for every glass, so long as the tar continues to impregnate the water sufficiently, which will appear by the smell and taste. But as this method produceth tar-water of different degrees of strength, I chuse to make it in the following manner: Pour a gallon of cold water on a quart of tar, and stir and mix them thoroughly with a ladle or flat stick for the space of three or four minutes, after which the vessel must stand eight and forty hours that the tar may have time to subside, when the clear water is to be poured off and kept for use, no more being made from the same tar, which may still serve for common purposes.

2 This cold infusion of tar hath been used in some of our colonies, as a preservative or preparative against the small-pox, which foreign practice induced me to try it in my own neighbourhood, when the small-pox raged with great violence. And the trial fully answered my expectation: all those, within my knowledge, who took the tar-water having either escaped that distemper, or had it very favourably. In one family there was a remarkable instance of seven children, who came all very well through the small-pox, except one young child

child which could not be brought to drink tar-water as the rest had done.

3. Several were preserved from taking the small-pox by the use of this liquor: others had it in the mildest manner, and others that they might be able to take the infection, were obliged to intermit drinking the tar-water. I have found it may be drunk with great safety and success for any length of time, and this not only before, but also during the distemper. The general rule for taking it is, about half a pint night and morning on an empty stomach, which quantity may be varied, according to the case and age of the patient, provided it be always taken on an empty stomach, and about two hours before or after a meal

4. It seemed probable, that a medicine of such efficacy in a distemper attended with so many purulent ulcers, might be also useful in other foulnesses of the blood; accordingly I tried it on several persons infected with cutaneous eruptions and ulcers, who were soon relieved, and soon after cured. Encouraged by these successes I ventured to advise it in the foulest distempers, wherein it proved much more successful than salivations and wood-drinks had done.

5. Having tried it in a great variety of cases, I found it succeed beyond my hopes; in a tedious and painful ulceration of the bowels, in a consumptive cough and (as appeared by expectorated pus) an ulcer in the lungs; in a pleurisy and peripneumony. And when a person, who for some years had been subject to erysipelatous fevers, perceived the usual fore-running symptoms to come on, I advised her to drink tar-water which prevented the erysipelas.

6. I never knew any thing so good for the stomach as tar-water: it cures indigestion and gives
a good

a good appetite. It is an excellent medicine in an asthma. It imparts a kindly warmth and quick circulation to the juices without heating, and is therefore useful, not only as a pectoral and balsamic, but also as a powerful and safe deobstruent in cachectic and hysteric cases. As it is both healing and diuretic, it is very good for the gravel. I believe it to be of great use in a dropsy, having known it cure a very bad anasarca in a person whose thirst, though very extraordinary, was in a short time removed by the drinking of tar-water.

7. The usefulness of this medicine in inflammatory cases is evident, from what has been already observed (a). And yet some perhaps may suspect that, as the tar itself is sulphureous, tar-water must be of a hot and inflaming nature. But it is to be noted, that all balsams contain an acid spirit, which is in truth a volatile salt. Water is a menstruum that dissolves all sorts of salts, and draws them from their subjects. Tar, therefore, being a balsam, its salutary acid is extracted by water, which yet is incapable of dissolving its gross resinous parts, whose proper menstruum is spirit of wine. Therefore tar-water, not being impregnated with resin, may be safely used in inflammatory cases: and in fact it hath been found an admirable febrifuge, at once the safest cooler and cordial.

8. The volatile salts separated by infusion from tar, may be supposed to contain its specific virtues. Mr. Boyle and other later chemists are agreed, that fixed salts are much the same in all bodies. But it is well known that volatile salts do greatly differ, and the easier they are separated from the subject, the more do they possess of its specific qualities. Now the most easy separation is by infusion of tar in cold water, which to smell

(a) Sect. 5.

and

and tast shewing it self well impregnated, may be presumed to extract and retain the most pure volatile and active particles of that vegetable balsam.

9. Tar was by the ancients esteemed good against poisons, ulcers, the bites of venomous creatures, also for pthifical, scrophulous, paralytic and asthmatic persons. But the method of rendering it an inoffensive medicine and agreeable to the stomach, by extracting it's virtues in cold water, was unknown to them. The leaves and tender tops of pine and fir are in our times used for diet-drinks, and allowed to be antiscorbutic and diuretic. But the most elaborate juice, salt, and spirit of those evergreens are to be found in tar; whose virtues extend not to animals alone, but also to vegetables. Mr. Evelyn in his treatise on Forest trees observes with wonder, that stems of trees, smeared over with tar, are preserved thereby from being hurt by the invenomed teeth of goats and other injuries, while every other thing of an unctuous nature is highly prejudicial to them.

10. It seems that tar and turpentine may be had more or less, from all sorts of pines and firs whatsoever; and that the native spirits and essential salts of those vegetables are the same in turpentine and common tar. In effect this vulgar tar, which cheapness and plenty may have rendered contemptible, appears to be an excellent balsam, containing the virtues of most other balsams, which it easily imparts to water, and by that means readily and inoffensively insinuates them into the habit of the body.

11. The resinous exsudations of pines and firs are an important branch of the materia medica, and not only useful in the prescriptions of physicians, but have been also thought otherwise conducive

ducive to health. Pliny tells us, that wines in the time of the old Romans were medicated with pitch and resin; and Jonstonus in his *Dendrographia* observes, that it is wholesome to walk in groves of pine trees, which impregnate the air with balsamic particles. That all turpentine and resins are good for the lungs, against gravel also and obstructions, is no secret. And that the medicinal properties of those drugs are found in tar-water, without heating the blood, or disordering the stomach, is confirmed by experience: and particularly that pthitical and asthmatic persons receive speedy and great relief from the use of it.

12. Balsams, as all unctuous and oily medicines, create a nausea in the stomach. They cannot therefore be taken in substance, so much or so long, as to produce all those salutary effects, which, if thoroughly mixed with the blood and juices, they would be capable of producing. It must therefore be a thing of great benefit, to be able to introduce any requisite quantity of their volatile parts into the finest ducts and capillaries, so as not to offend the stomach, but, on the contrary, to comfort and strengthen it in a great degree.

13. According to Pliny, liquid pitch (as he calls it) or tar was obtained by setting fire to billets of old fat pines or firs. The first running was tar, the latter or thicker running was pitch. Theophrastus is more particular: he tells us the Macedonians made huge heaps of the cloven trunks of those trees, wherein the billets were placed erect beside each other. That such heaps or piles of wood were sometimes a hundred and eighty cubits round, and sixty or even a hundred high: and that having covered them with sods of earth to prevent the flame from bursting forth (in which case the tar was lost) they set on fire those huge
heaps

heaps of pine or fir, letting the tar and pitch run out in a channel.

14. Pliny saith, it was customary for the ancients, to hold fleeces of wool over the steam of boiling tar, and squeeze the moisture from them, which watery substance was called pissinum. Ray will have this to be the same with the pisselæum of the ancients; but Hardouin in his notes on Pliny, thinks the pisselæum to have been produced from the cones of cedars. What use they made of these liquors anciently I know not: but it may be presumed they were used in medicine, though at present, for ought I can find, they are not used at all.

15. From the manner of procuring tar (*a*) it plainly appears to be a natural production, lodged in the vessels of the tree, whence it is only freed and let loose (not made) by burning. If we may believe Pliny, the first running or tar was called cedrium, and was of such efficacy to preserve from putrefaction, that in Egypt they embalmed dead bodies with it. And to this he ascribes their mummies continuing uncorrupted for so many ages.

16. Some modern writers inform us that tar flows from the trunks of pines and firs, when they are very old, through incisions made in the bark near the root; that pitch is tar inspissated; and both are the oyl of the tree grown thick and black with age and sun. The trees, like old men, being unable to perspire, and their secretory ducts obstructed, they are, as one may say, choaked and stuffed with their own juice.

17. The method used by our colonies in America, for making tar and pitch, is in effect the same with that of the ancient Macedonians; as appears from the account given in the Philosophical

(*a*) Sect. 13.

Transactions. And the relation of Leo Africanus, who describes, as an eye witness, the making of tar on mount Atlas, agrees in substance, with the methods used by the Macedonians of old, and the people of New England at this day.

18. Jonstonus in his *Dendrographia*, is of opinion, that pitch was anciently made of cedar, as well as of the pine and fir grown old and oily. It should seem indeed that one and the same word was used by the ancients in a large sense, so as to comprehend the juices issuing from all those trees. Tar and all sorts of exsudations from evergreens are, in a general acceptation, included under the name resin. Hard coarse resin or dry pitch is made from tar, by letting it blaze till the moisture is spent. Liquid resin is properly an oily viscid juice oozing from the bark of evergreen trees, either spontaneously or by incision. It is thought to be the oil of the bark inspissated by the sun. As it issues from the tree it is liquid, but becomes dry and hard being condensed by the sun or by fire.

19. According to Theophrastus, resin was obtained by stripping off the bark from pines, and by incisions made in the silver fir and the pitch pine. The inhabitants of mount Ida, he tells us, stripped the trunk of the pine on the sunny side two or three cubits from the ground. He observes that a good pine might be made to yield resin every year; and indifferent every other year; and the weaker trees once in three years; and that three runnings were as much as a tree could bear. It is remarked by the same author, that a pine doth not at once produce fruit and resin, but the former only in its youth, the latter in its old age.

20. Turpentine is a fine resin. Four kinds of this are in use. The turpentine of Chios or Cyprus

prus which flows from the turpentine tree; the Venice turpentine which is got by piercing the Larch tree; the Strasburgh Turpentine which Mr. Ray informs us is procured from the knots of the silver fir; it is fragrant and grows yellow with age: The fourth kind is common turpentine, neither transparent, nor so liquid as the former; and this Mr. Ray taketh to flow from the mountain pine. All these turpentines are useful in the same intentions. Theophrastus saith the best resin or turpentine is got from the Terebinthus growing in Syria and some of the Greek islands. The next best from the silver fir and pitch pine.

21. Turpentine is on all hands allowed to have great medicinal virtues. Tar and it's infusion contain those virtues. Tar-water is extremely pectoral and restorative, and, if I may judge from what experience I have had, it possesseth the most valuable qualities ascribed to the several balsams of Peru, of Tolu, of Capivi, and even to the balm of Gilead; such is it's virtue in asthmas and pleurifies, in obstructions and ulcerous erosions of the inward parts. Balsams, as hath been already observed, are apt to offend the stomach. But tar-water may be taken without offending the stomach: For the strengthening whereof it is the best medicine I have ever tried.

22. The folly of man rateth things by their scarceness, but Providence hath made the most useful things most common. Among those liquid oily extracts from trees and shrubs which are termed balsams, and valued for medicinal virtues, tar may hold it's place as a most valuable balsam. It's fragrancy sheweth, that it is possessed of active qualities, and it's oiliness, that it is fitted to retain them. This excellent balsam may be pur-

chased for a penny a pound, whereas the balsam of Judæa, when most plenty, was sold on the very spot that produced it, for double it's weight in silver, if we may credit Pliny; who also informs us that the best balsam of Judæa flowed only from the bark, and that it was adulterated with resin and oil of turpentine. Now comparing the virtues I have experienced in tar, with those I find ascribed to the precious balm of Judæa, of Gilead, or of Mecha (as it is diversly called) I am of opinion, that the latter is not a medicine of more value or efficacy than the former.

23. Pliny supposed amber to be a resin, and to distil from some species of pine, which he gathered from it's smell. Nevertheless it's being dug out of the earth shews it to be a fossil, though of a very different kind from other fossils. But thus much is certain, that the medicinal virtues of amber are to be found in the balsamic juices of pines and firs. Particularly the virtues of the most valuable preparation, I mean salt of amber, are in a great degree answered by tar-water, as a detergent, diaphoretic, and diuretic.

24. There is, as hath been already observed, more or less oil and balsam in all evergreen trees, which retains the acid spirit, that principle of life and verdure; the not retaining whereof in sufficient quantity, causeth other plants to droop and wither. Of these evergreen trees productive of resin, pitch, and tar, Pliny enumerates six kinds in Europe; Jonstonus reckons up thrice that number of the pine and fir family. And indeed, their number, their variety, and their likeness makes it difficult to be exact.

25. It is remarked both by Theophrastus and Jonstonus, that trees growing in low and shady places do not yield so good tar, as those which
grow

grow in higher and more exposed situations. And Theophrastus further observes, that the inhabitants of mount Ida in Asia, who distinguish the Idæan pine from the maritime, affirm, that the tar flowing from the former is in greater plenty, as well as more fragrant than the other. Hence it should seem, the pines or firs in the mountains of Scotland, might be employed that way, and rendered valuable; even where the timber, by it's remoteness from water-carriage, is of small value. What we call the Scotch fir is falsely so called, being in truth a wild forest pine, and (as Mr. Ray informs us) agreeing much with the description of a pine growing on mount Olympus in Phrygia, probably the only place where it is found out of these islands; in which of late years it is so much planted and cultivated with so little advantage, while the cedar of Lebanon might perhaps be raised, with little more trouble, and much more profit and ornament.

26. The pines which differ from the firs in the length and disposition of their leaves and hardness of the wood, do not, in Pliny's account, yield so much resin as the fir trees. Several species of both are accurately described and delineated by the naturalists. But they all agree so far as to seem related. Theophrastus gives the preference to that resin which is got from the silver fir and pitch tree (ἐλάτη and πίτυς) before that yielded by the pine, which yet, he saith, is in greater plenty. Pliny, on the contrary, affirms that the pine produceth the smallest quantity. It shou'd seem therefore that the interpreter of Theophrastus might have been mistaken, in rendering *πύκη* by *pinus*, as well as Jonstonus, who likewise takes the pine for the *πύκη* of Theophrastus. Hardouin will have the *pinus* of Pliny to have been by others called *πύκη*, but by Theophrastus *πίτυς*. Ray thinks the common
fir,

fir, or picea of the Latins, to be the male fir of Theophrastus. This was probably the spruce fir; for the picea, according to Pliny, yields much resin, loves a cold and mountainous situation, and is distinguished, *tonfili facilitate*, by it's fitness to be shorn, which agrees with the spruce fir, whereof I have seen close shorn hedges.

27. There seems to have been some confusion in the naming of these trees, as well among the ancients as the moderns. The ancient Greek and Latin names are by later authors applied very differently. Pliny himself acknowledgeth, it is not easy even for the skilful to distinguish the trees by their leaves, and know their sexes and kinds: and that difficulty is since much encreased, by the discovery of many new species of that evergreen tribe, growing in various parts of the globe. But descriptions are not so easily misapplied as names. Theophrastus tells us, that *virus* differeth from *serotina*, among other things, in that it is neither so tall nor so streight, nor hath so large a leaf. The fir he distinguisheth into male and female: the latter is softer timber than the male, it is also a taller and fairer tree, and this is probably the silver fir.

28. To say no more on this obscure business which I leave to the critics, I shall observe that according to Theophrastus not only the turpentine trees, the pines, and the firs yield resin or tar, but also the cedars and palm trees; and the words *pix* and *resina* are taken by Pliny in so large a sense as to include the weepings of the lentiscus and cypress, and the balms of Arabia and Judæa; all which perhaps are near of kin, and in their most useful qualities concur with common tar, especially the Norwegian, which is the most liquid and best for medicinal uses of any that I have experienced. Those trees that grow on mountains, exposed to
the

the sun or the north wind, are reckoned by Theophrastus to produce the best and purest tar: And the Idæan pines were distinguished from those growing on the plain, as yielding a thinner, sweeter, and better scented tar, all which differences I think I have observed, between the tar that comes from Norway, and that which comes from low and swampy countries.

29. Agreeably to the old observation of the Peripatetics, that heat gathereth homogeneous things and disperfeth such as are heterogeneous, we find chemistry is fitted for the analysis of bodies. But the chemistry of nature is much more perfect than that of human art, inasmuch as it joineth to the power of heat that of the most exquisite mechanism. Those who have examined the structure of trees and plants by microscopes, have discovered an admirable variety of fine capillary tubes and vessels, fitted for several purposes, as the imbibing or attracting of proper nourishment, the distributing thereof through all parts of the vegetable, the discharge of superfluities, the secretion of particular juices. They are found to have ducts answering to the tracheæ in animals, for the conveying of air; they have others answering to lacteals, arteries, and veins. They feed, digest, respire, perspire and generate their kind, and are provided with organs nicely fitted for all those uses.

30. The sap vessels are observed to be fine tubes running up through the trunk from the root. Secretory vessels are found in the bark, buds, leaves, and flowers. Exhaling vessels for carrying off excrementitious parts, are discovered throughout the whole surface of the vegetable. And (though this point be not so well agreed) doctor Grew in his Anatomy of plants, thinks there appears

circulation of the sap, moving downwards in the root, and feeding the trunk upwards.

31. Some difference indeed there is between learned men, concerning the proper use of certain parts of vegetables. But whether the discoverers have rightly guessed at all their uses or no, thus much is certain, that there are innumerable fine and curious parts in a vegetable body, and a wonderful similitude or analogy between the mechanism of plants and animals. And perhaps some will think it not unreasonable to suppose the mechanism of plants more curious than even that of animals, if we consider not only the several juices secreted by different parts of the same plant, but also, the endless variety of juices drawn and formed out of the same soil, by various species of vegetables; which must therefore differ in an endless variety, as to the texture of their absorbent vessels and secretory ducts.

32. A body, therefore, either animal or vegetable, may be considered as an organised system of tubes and vessels, containing several sorts of fluids. And as fluids are moved through the vessels of animal bodies, by the systole and diastole of the heart, the alternate expansion and condensation of the air, and the oscillations in the membranes and tunicks of the vessels; even so by means of air expanded and contracted in the tracheæ or vessels made up of elastic fibres, the sap is propelled through the arterial tubes of a plant, and the vegetable juices, as they are rarefied by heat or condensed by cold, will either ascend and evaporate into air, or descend in the form of a gross liquor.

33. Juices therefore, first purified by straining through the fine pores of the root, are afterwards exalted by the action of the air and the vessels of the plant, but, above all, by the action of the sun's light ;

light ; which at the same time that it heats, doth wonderfully rarefy and raise the sap ; till it perspires and forms an atmosphere, like the effluvia of animal bodies. And though the leaves are supposed to perform principally the office of lungs, breathing out excrementitious vapours, and drawing in alimentary ; yet it seems probable, that the reciprocal actions of repulsion and attraction are performed all over the surface of vegetables, as well as animals. In which reciprocation, Hippocrates supposeth the manner of nature's acting, for the nourishment and health of animal bodies, chiefly to consist. And, indeed, what share of a plant's nourishment is drawn through the leaves and bark, from that ambient heterogeneous fluid called air, is not easy to say. It seems very considerable and altogether necessary, as well to vegetable as animal life.

34. It is an opinion received by many, that the sap circulates in plants as the blood in animals: that it ascends through capillary arteries in the trunk, into which are insculated other vessels of the bark answering to veins, which bring back to the root the remainder of the sap, over and above what had been deposited, during it's ascent by the arterial vessels, and secreted for the several uses of the vegetable throughout all it's parts, stem, branches, leaves, flowers, and fruit. Others deny this circulation, and affirm that the sap doth not return through the bark vessels. It is nevertheless agreed by all, that there are ascending and descending juices ; while some will have the ascent and descent to be a circulation of the same juices through different vessels: others will have the ascending juice to be one sort attracted by the root, and the descending another imbibed by the leaves, or extremities of the branches: lastly, others think that

the same juice, as it is rarefied or condensed by heat or cold, rises and subsides in the same tube. I shall not take upon me to decide this controversy. Only I cannot help observing, that the vulgar argument from analogy between plants and animals loseth much of it's force, if it be considered, that the supposed circulating of the sap, from the root or lacteals through the arteries, and thence returning, by inosculation, through the veins or bark vessels to the root or lacteals again, is in no sort conformable or analogous to the circulation of the blood.

35. It is sufficient to observe, what all must acknowledge, that a plant or tree is a very nice and complicated machine (*a*); by the several parts and motions whereof, the crude juices admitted through the absorbent vessels, whether of the root, trunk, or branches, are variously mixed, separated, altered, digested, and exalted in a very wonderful manner. The juice as it passeth in and out, up and down, through tubes of different textures, shapes, and sizes, and is affected by the alternate compression and expansion of elastic vessels, by the vicissitudes of seasons, the changes of weather, and the various action of the solar light, grows still more and more elaborate.

36. There is therefore no chemistry like that of nature, which addeth to the force of fire, the most delicate, various, and artificial percolation (*b*). The incessant action of the sun upon the elements of air, earth, and water, and on all sorts of mixed bodies, animal, vegetable and fossil, is supposed to perform all sorts of chemical operations. Whence it should follow, that the air contains all sorts of chemic productions, the vapours, fumes, oils, salts,

(*a*) 30, 31.

(*b*) 29.

and spirits of all the bodies we know : from which general aggregate or mass, those that are proper being drawn in, through the fine vessels of the leaves, branches, and stem of the tree, undergo in it's various organs, new alterations, secretions, and digestions, till such time as they assume the most elaborate form.

37. Nor is it to be wondered, that the peculiar texture of each plant or tree, co-operating with the solar fire and pre-existing juices, should so alter the fine nourishment drawn from earth and air (a), as to produce various specific qualities of great efficacy in medicine : especially if it be considered that in the opinion of learned men, there is an influence on plants derived from the sun, besides it's mere heat. Certainly doctor Grew, that curious anatomist of plants, holds the solar influence to differ from that of a mere culinary fire, otherwise than by being only a more temperate and equal heat.

38. The alimentary juice taken into the lacteals, if I may so say, of animals or vegetables, consists of oily, aqueous, and saline particles, which being dissolved, volatilised, and diversly agitated, part thereof is spent and exhaled into the air ; and that part which remains is by the œconomy of the plant, and action of the sun, strained, purified, concocted, and ripened into an inspissated oil or balsam, and deposited in certain cells placed chiefly in the bark, which is thought to answer the panniculus adiposus in animals, defending trees from the weather, and, when in sufficient quantity, rendering them evergreen. This balsam, weeping or sweating through the bark, hardens into resin ; and this most copiously in the several species of pines and

firs, whose oil being in greater quantity, and more tenacious of the acid spirit or vegetable soul (as perhaps it may not improperly be called) abides the action of the sun, and attracting the sun beams, is thereby exalted and enriched, so as to become a most noble medicine ; such is the last product of a tree, perfectly matured by time and sun.

39. It is remarked by Theophrastus, that all plants and trees while they put forth have most humour, but when they have ceased to germinate and bear, then the humour is strongest and most sheweth the nature of the plant, and that, therefore, trees yielding resin should be cut after germination. It seems also very reasonable to suppose the juice of old trees, whose organs bring no new sap, should be better ripened than that of others.

40. The aromatic flavours of vegetables seem to depend upon the sun's light, as much as colours. As in the production of the later, the reflecting powers of the object, so in that of the former, the attractive and organical powers of the plant co-operate with the sun (a). And as from Sir Isaac Newton's experiments it appears, that all colours are virtually in the white light of the sun, and shew themselves when the rays are separated by the attracting and repelling powers of objects, even so the specific qualities of the elaborate juices of plants, seem to be virtually or eminently contained in the solar light, and are actually exhibited upon the separation of the rays, by the peculiar powers of the capillary organs in vegetables, attracting and imbibing certain rays, which produce certain flavours and qualities, in like manner as certain rays, being reflected, produce certain colours,

(a) 36, 37.

41. It

41. It hath been observed by some curious anatomists, that the secretory vessels in the glands of animal bodies are lined with a fine down, which in different glands is of different colours. And it is thought, that each particular down, being originally imbued with it's own proper juice, attracts none but that sort; by which means so many various juices are secreted in different parts of the body. And perhaps there may be something analogous to this, in the fine absorbent vessels of plants, which may co-operate towards producing that endless variety of juices, elaborated in plants from the same earth and air.

42. The balsam or essential oil of vegetables contains a spirit, wherein consist the specific qualities, the smell and taste of the plant. Boerhaave holds the native presiding spirit to be neither oil, salt, earth, or water; but somewhat too fine and subtile to be caught alone and rendered visible to the eye. This when suffered to fly off, for instance, from the oil of rosemary, leaves it destitute of all flavour. This spark of life, this spirit or soul, if we may so say, of the vegetable departs without any sensible diminution of the oil or water wherein it was lodged.

43. It should seem that the forms, souls, or principles of vegetable life, subsist in the light or solar emanation (a), which in respect of the macrocosm is what the animal spirit is to the microcosm; the interior tegument, the subtile instrument and vehicle of power. No wonder then that the ens primum or scintilla spirituosæ, as it is called, of plants should be a thing so fine and fugacious as to escape our nicest search. It is evident that nature at the sun's approach vegetates; and

(a) 40.

languishes

languishes at his recess ; this terrestrial globe seeming only a matrix disposed and prepared to receive life from his light ; whence Homer in his hymns stileth earth the wife of heaven, *ἄλοχ' οὐρανῶ ἀσερόεντος.*

44. The luminous spirit which is the form or life of a plant, from whence it's differences and properties flow, is somewhat extremely volatile. It is not the oil, but a thing more subtile, whereof oil is the vehicle, which retains it from flying off, and is lodged in several parts of the plant, particularly in the cells of the bark and in the seeds. This oil purified and exalted by the organical powers of the plant, and agitated by warmth, becomes a proper receptacle of the spirit ; part of which spirit exhales through the leaves and flowers, and part is arrested by this unctuous humour that detains it in the plant. It is to be noted this essential oil animated, as one may say, with the flavour of the plant, is very different from any spirit, that can be procured from the same plant by fermentation.

45. Light impregnates air (*a*), air impregnates vapour ; and this becomes a watery juice by distillation having risen first in the cold still with a kindly gentle heat. This fragrant vegetable water is possessed of the specific odour and taste of the plant. It is remarked that distilled oils added to water for counterfeiting the vegetable water can never equal it, artificial chemistry falling short of the natural.

46. The less violence is used to nature the better it's produce. The juice of olives or grapes issuing by the lightest pressure is best. Resins that drop from the branches spontaneously, or ooze upon the slightest incision, are the finest and most

(*a*) 37. 43.

fragrant.

fragrant. And infusions are observed to act more strongly than decoctions of plants, the more subtile and volatile salts and spirits, which might be lost or corrupted by the latter, being obtained in their natural state by the former. It is also observed that the finest, purest, and most volatile part is that which first ascends in distillation. And, indeed, it should seem the lightest and most active particles required least force to disengage them from the subject.

47. The salts, therefore, and more active spirits of the tar are got by infusion in cold water: but the resinous part is not to be dissolved thereby (*a*). Hence the prejudice which some perhaps may entertain against Tar-water, as a medicine, the use whereof might inflame the blood by it's sulphur and resin, appears to be not well grounded; it being indeed impregnated with a fine acid spirit, balsamic, cooling, diuretic, and possessed of many other virtues (*b*). Spirits are supposed to consist of salts and phlegm, probably too somewhat of a fine oily nature, differing from oil in that it mixeth with water, and agreeing with oil, in that it runneth in rivulets by distillation. Thus much is allowed, that the water, earth, and fixed salt are the same in all plants; that, therefore, which differenceth a plant or makes it what it is, the native spark or form, in the language of the chemists or schools, is none of those things, nor yet the finest oil, which seemeth only it's receptacle or vehicle. It is observed by chemists, that all sorts of balsamic wood afford an acid spirit, which is the volatile oily salt of the vegetable: Herein are chiefly contained their medicinal virtues, and by the trials I have made it appears, that the

(*a*) Sect. 7.

(*b*) Sect. 42, 44.

acid spirit in Tar-water possesseth the virtues, in an eminent degree, of that of guaiacum, and other medicinal woods.

48. Qualities in a degree too strong for human nature to subdue, and assimilate to itself, must hurt the constitution. All acids, therefore, may not be useful or innocent. But this seemeth an acid so thoroughly concocted, so gentle, bland, and temperate, and withal a spirit so fine and volatile, as readily to enter the smallest vessels, and be assimilated with the utmost ease.

49. If any one were minded to dissolve some of the resin, together with the salt or spirit, he need only mix some spirit of wine with the water. But such an intire solution of resins and gums, as to qualify them for entering and pervading the animal system, like the fine acid spirit that first flies off from the subject, is perhaps impossible to obtain. It is an apophthegm of the chemists, derived from Helmont, that whoever can make myrrh soluble by the human body, has the secret of prolonging his days : and Boerhaave owns that there seems to be truth in this, from it's resisting putrefaction. Now this quality is as remarkable in tar, with which the ancients embalmed and preserved dead bodies. And though Boerhaave himself, and other chemists before him, have given methods for making solutions of myrrh, yet it is by means of alcohol which extracts only the inflammable parts. And it doth not seem that any solution of myrrh is impregnated with it's salt or acid spirit. It may not, therefore, seem strange if this water should be found more beneficial for procuring health and long life, than any solution of myrrh whatsoever.

50. Certainly divers resins and gums may have virtues, and yet not be able for their grossness to pass

pass the lacteals and other finer vessels, nor yet, perhaps, readily impart those virtues to a menstruum, that may with safety and speed convey them throughout the human body. Upon all which accounts, I believe tar-water will be found to have singular advantages. It is observed that acid spirits prove the stronger, by how much the greater degree of heat is required to raise them. And indeed, there seemeth to be no acid more gentle than this, obtained by the simple affusion of cold water; which carries off from the subject the most light and subtile parts, and, if one may so speak, the very flower of it's specific qualities. And here it is to be noted, that the volatile salt and spirit of vegetables do, by gently stimulating the solids, attenuate the fluids contained in them, and promote secretions, and that they are penetrating and active, contrary to the general nature of other acids.

51. It is a great maxim for health, that the juices of the body be kept fluid in a due proportion. Therefore, the acid volatile spirit in tar-water, at once attenuating and cooling in a moderate degree, must greatly conduce to health, as a mild salutary deobstruent, quickening the circulation of the fluids without wounding the solids, thereby gently removing or preventing those obstructions, which are the great and general cause of most chronical diseases; in this manner answering to the antihysterics, *assa foetida*, *galbanum*, *myrrh*, *amber*, and, in general, to all the resins and gums of trees or shrubs useful in nervous cases.

52. Warm water is it self a deobstruent. Therefore the infusion of tar drunk warm, is easier insinuated into all the nice capillary vessels, and acts, not only by virtue of the balsam, but also by that

of the vehicle. It's taste, it's diuretic quality, it's being so great a cordial, shew the activity of this medicine. And at the same time that it quickens the sluggish blood of the hysterical, it's balsamic oily nature abates the too rapid motion of the sharp thin blood in those who are hectic. There is a lentour and smoothness in the blood of healthy strong people; on the contrary, there is often an acrimony and solution in that of weakly morbid persons. The fine particles of tar are not only warm and active, they are also balsamic and emollient, softening and enriching the sharp and vapid blood, and healing the erosions occasioned thereby in the blood-vessels and glands.

53. Tar-water possesseth the stomachic and cardiac qualities of Elixir proprietatis, Stoughton's drops, and many such tinctures and extracts, with this difference, that it worketh it's effect more safely, as it hath nothing of that spirit of wine, which, however mixed and disguised, may yet be well accounted a poison in some degree.

54. Such medicines are supposed to be diaphoretic, which, being of an active and subtile nature, pass through the whole system, and work their effect in the finest capillaries and perspiratory ducts which they gently cleanse and open. Tar-water is extremely well fitted to work by such an insensible diaphoresis, by the fineness and activity of it's acid volatile spirit. And surely those parts ought to be very fine, which can scour the perspiratory ducts, under the scarf skin or cuticle, if it be true that one grain of sand would cover the mouths of more than a hundred thousand.

55. Another way wherein tar-water operates, is by urine, than which perhaps none is more safe and effectual, for cleansing the blood and carrying off

off its salts. But it seems to produce its principal effect as an alterative, sure and easy, much safer than those vehement purgative, emetic, and salivating medicines, which do violence to nature.

56. An obstruction of some vessels causeth the blood to move more swiftly in other vessels, which are not obstructed. Hence manifold disorders. A liquor that dilutes and attenuates resolves the concretions which obstruct. Tar-Water is such a liquor. It may be said, indeed, of common water, that it attenuates, also of mercurial preparations that they attenuate. But it should be considered that mere water only distends the vessels and thereby weakens their tone; and that Mercury by its great momentum may justly be suspected of hurting the fine capillaries, which two deobstruents therefore might easily overact their parts, and (by lessening the force of the elastic vessels) remotely produce those concretions they are intended to remove.

57. Weak and rigid fibres are looked on by the most able physicians, as sources of two different classes of distempers: a sluggish motion of the liquids occasions weak fibres: therefore tar-water is good to strengthen them as it gently accelerates their contents. On the other hand, being an unctuous bland fluid it moistens and softens the dry and stiff fibres: and so proves a remedy for both extremes.

58. Common soaps are compositions of lixivial salt and oil. The corrosive acrimony of the saline particles being softened by the mixture of an unctuous substance they insinuate themselves into the small ducts with less difficulty and danger. The combination of these different substances makes up a very subtle and active medicine, fitted for mixing with all humours, and resolving

all obstructions. Soap therefore is justly esteemed a most efficacious medicine in many distempers. Alkaline Soap is allowed to be cleansing, attenuating, opening, resolving, sweetening; it is pectoral, vulnerary, diuretic, and hath other good qualities which are also to be found in tar-water. It is granted, that oil and acid salts combined together exist in vegetables, and that consequently there are acid soaps as well as alkaline. And the saponaceous nature of the acid vegetable spirits, is what renders them so diuretic, sudorific, penetrating, absterfive and resolving. Such, for instance, is the acid spirit of Guaiacum. And all these same virtues seem to be in tar-water in a mild and salutary degree.

59. It is the general opinion that all acids coagulate the blood. Boerhaave excepts vinegar, which he holds to be a soap, inasmuch as it is found to contain an oil as well as an acid spirit. Hence it is both unctuous and penetrating, a powerful antiphlogistic, and preservative against corruption and infection. Now it seems evident that tar-water is a soap as well as vinegar. For though it be the character of resin, which is an inspissated gross oil, not to dissolve in water (a), yet the salts attract some fine particles of essential oil: which fine oil serves as a vehicle for the acid salts, and shews itself in the colour of the tar-water; for all pure salts are colourless. And though the resin will not dissolve in water, yet the subtile oil, in which the vegetable salts are lodged, may as well mix with water as vinegar doth, which contains both oil and salt. And as the oil in tar-water discovers itself to the eye, so the acid salts do manifest

(a) Sect. 47.

themselves

themselves to the taste. Tar-water therefore is a soap, and as such hath the medicinal qualities of soaps:

60. It operates more gently as the acid salts lose their acrimony being sheathed in oil, and thereby approaching the nature of neutral salts, are more benign and friendly to the animal system: and more effectually, as, by the help of a volatile smooth insinuating oil, those same salts are more easily introduced into the capillary ducts. Therefore in fevers and epidemical distempers it is (and I have found it so) as well as in chronical diseases, a most safe and efficacious medicine, being good against too great fluidity as a balsamic, and good against viscidities as a soap. There is something in the fiery corrosive nature of lixivial salts, which makes alkaline soap a dangerous remedy in all cases where an inflammation is apprehended. And as inflammations are often occasioned by obstructions, it should seem an acid soap was much the safer deobstruent.

61. Even the best turpentine, however famous for their vulnerary and detergent qualities, have yet been observed by their warmth to dispose to inflammatory tumours. But the acid spirit (a) being in so great proportion in tar-water renders it a cooler and safer medicine. And the ætherial oil of turpentine, though an admirable drier, healer, and anodyne, when outwardly applied to wounds and ulcers, and not less useful in cleansing the urinary passages and healing their ulcerations, yet is known to be of a nature so very relaxing as sometimes to do much mischief. Tar-water is not attended with the same ill effects, which I believe are owing in a great measure to the ætherial oil's being deprived

(a) Sect. 7, 8.

of the acid spirit in distillation, which vellicating and contracting as a stimulus might have proved a counterpoise to the excessive lubricating and relaxing qualities of the oil.

62. Woods in decoction do not seem to yield so ripe and elaborate a juice, as that which is deposited in the cells or loculi terebinthiaci, and spontaneously oozes from them. And indeed though the balsam of Peru, obtained by boiling wood and scumming the decoction, be a very valuable medicine and of great account in divers cases, particularly asthmas, nephritic pains, nervous colics and obstructions, yet I do verily think (and I do not say this without experience) that tar-water is a more efficacious remedy in all those cases than even that costly drug.

63. It hath been already observed that the restorative pectoral antihysterical virtues of the most precious balsams and gums are possessed in a high degree by tar-water (*a*). And I do not know any purpose answered by the wood drinks, for which tar-water may not be used with at least equal success. It contains the virtues even of Guaiacum which seems the most efficacious of all the woods, warming and sweetening the humours, diaphoretic and useful in gouts, dropsies and rheums, as well as in the foul disease. Nor should it seem strange, if the virtues obtained by boiling an old dry wood prove inferior to those extracted from a balsam.

64. There is a fine volatile spirit in the waters of Geronster, the most esteemed of all the fountains about Spa, but whose waters do not bear transporting. The stomachic, cardiac, and diuretic qualities of this fountain somewhat resemble those of tar-water, which, if I am not greatly mistaken, con-

(*a*) Sect. 9, 21, 22, 23.

tains the virtues of the best chalybeat and sulphurous waters; with this difference, that those waters are apt to affect the head in taking, which tar-water is not. Besides there is a regimen of diet to be observed, especially with chalybeat waters, which I never found necessary with this. Tar-water layeth under no restraint either as to diet, hours, or employment. A man may study, or exercise, or repose, keep his own hours, pass his time either within or without, and take wholesom nourishment of any kind.

65. The use of chalybeat waters, however excellent for the nerves and stomach, is often suspended by colds and inflammatory disorders; in which they are acknowledged to be very dangerous. Whereas tar-water is so far from hurting in those cases, or being discontinued on that account, that it greatly contributes to their cure (a).

66. Cordials, vulgarly so called, act immediately on the stomach, and by consent of nerves on the head. But medicines of an operation too fine and light to produce a sensible effect in the primæ viæ, may, nevertheless, in their passage through the capillaries, operate on the sides of those small vessels, in such manner as to quicken their oscillations, and consequently the motion of their contents, producing, in issue and effect, all the benefits of a cordial much more lasting and salutary than those of fermented spirits, which by their caustic and coagulating qualities do incomparably more mischief than good. Such a cardiac medicine is tar-water. The transient fits of mirth, produced from fermented liquors, are attended with proportionable depressions of spirit in their intervals. But the calm cheerfulness arising from

(a) Sect. 7.

this water of health (as it may be justly called) is permanent. In which it emulates the virtues of that famous plant Gen Seng, so much valued in China as the only cordial that raiseth the spirits without depressing them. Tar-water is so far from hurting the nerves as common cordials do, that it is highly useful in cramps, spasms of the viscera, and paralytic numbness.

67. Emetics are on certain occasions administered with great success. But the overstraining and weakening of nature may be very justly apprehended from a course of emetics. They are nevertheless prescribed and substituted for exercise. But it is well remarked in Plato's *Timæus* that vomits and purges are the worst exercise in the world. There is something in the mild operation of tar-water, that seems more friendly to the œconomy, and forwards the digestions and secretions in a way more natural and benign, the mildness of this medicine being such that I have known children take it, for above six months together, with great benefit, and without any inconvenience; and after long and repeated experience I do esteem it a most excellent diet drink fitted to all seasons and ages.

68. It is, I think, allowed that the origin of the gout lies in a faulty digestion. And it is remarked by the ablest physicians, that the gout is so difficult to cure, because heating medicines aggravate it's immediate, and cooling it's remote cause. But tar-water, although it contain active principles that strengthen the digestion beyond any thing I know, and consequently must be highly useful, either to prevent or lessen the following fit, or by enervating the blood to cast it upon the extremities, yet it is not of so heating a nature as to do harm even in the fit. Nothing is
more

more difficult or disagreeable than to argue men out of their prejudices ; I shall not therefore enter into controversies on this subject, but, if men dispute and object, shall leave the decision to time and trial.

69. In the modern practice, soap, opium, and mercury bid fairest for universal medicines. The first of these is highly spoken of. But then those who magnify it most, except against the use of it in such cases where the obstruction is attended with a putrefactive alkali, or where an inflammatory disposition appears. It is acknowledged to be very dangerous in a phtthisis, fever, and some other cases in which tar-water is not only safe but useful.

70. Opium, though a medicine of great extent and efficacy, yet is frequently known to produce grievous disorders in hysterical or hypochondriacal persons, who make a great part, perhaps the greatest of those who lead sedentary lives in these islands. Besides, upon all constitutions dangerous errors may be committed in the use of opium.

71. Mercury hath of late years become a medicine of very general use. The extreme minuteness, mobility, and momentum of it's parts, rendering it a most powerful cleanser of all obstructions, even in the most minute capillaries. But then we should be cautious in the use of it, if we consider, that the very thing which gives it power of doing good above other deobstruents, doth also dispose it to do mischief. I mean it's great momentum, the weight of it being about ten times that of blood, and the momentum being the joint product of the weight and velocity, it must needs operate with great force ; and may it not be justly feared, that so great a force entering the minutest

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vessels,

vessels, and breaking the obstructed matter, might also break or wound the fine tender coats of those small vessels, and so bring on the untimely effects of old age, producing more, perhaps, and worse obstructions than those it removed? Similar consequences may justly be apprehended from other mineral and ponderous medicines. Therefore, upon the whole, there will not perhaps be found any medicine, more general in it's use, or more salutary in it's effects than tar-water.

72. To suppose that all distempers arising from very different, and, it may be, from contrary causes, can be cured by one and the same medicine must seem chimerical. But it may with truth be affirmed, that the virtue of tar-water extends to a surprising variety of cases very distant and unlike (*a*). This I have experienced in my neighbours, my family, and myself. And as I live in a remote corner among poor neighbours, who for want of a regular physician have often recourse to me, I have had frequent opportunities of trial, which convince me it is of so just a temperament as to be an enemy to all extremes. I have known it do great good in a cold watery constitution, as a cardiac and stomachic; and at the same time allay heat and feverish thirst in another. I have known it correct costive habits in some, and the contrary habit in others. Nor will this seem incredible, if it be considered that middle qualities naturally reduce the extreme. Warm water, for instance, mixed with hot and cold will lessen the heat in that, and the cold in this.

73. They who know the great virtues of common soap, whose coarse lixivial salts are the pro-

(*a*) Sect. 3, 4, 5, 6, 21, &c.

duct of culinary fire, will not think it incredible that virtues of mighty force and extent should be found in a fine acid soap (*a*), the salts and oil whereof are a most elaborate product of nature and the solar light.

74. It is certain tar-water warms, and therefore some may perhaps still think it cannot cool. The more effectually to remove this prejudice, let it be farther considered, that, as on the one hand, opposite causes do sometimes produce the same effect, for instance, heat by rarefaction and cold by condensation do both increase the air's elasticity: so on the other hand, the same cause shall sometime produce opposite effects: heat for instance thins, and again heat coagulates the blood. It is not therefore strange that tar-water should warm one habit, and cool another, have one good effect on a cold constitution, and another good effect on an inflamed one; nor, if this be so, that it should cure opposite disorders. All which justifies to reason, what I have often found true in fact. The salts, the spirits, the heat of tar-water are of a temperature congenial to the constitution of a man, which receives from it a kindly warmth, but no inflaming heat. It was remarkable that two children in my neighbourhood, being in a course of tar-water, upon an intermission of it, never failed to have their issues inflamed by an humour much more hot and sharp than at other times. But its great use in the small pox, pleurisy, and fevers, is a sufficient proof that tar-water is not of an inflaming nature.

75. I have dwelt the longer on this head, because some gentlemen of the faculty have thought fit to

(*a*) 58.

declare that tar-water must enflame, and that they would never visit any patient in a fever, who had been a drinker of it. But I will venture to affirm, that it is so far from increasing a feverish inflammation, that it is on the contrary a most ready means to allay and extinguish it. It is of admirable use in fevers, being at the same time the surest, safest and most effectual both paregoric and cordial; for the truth of which, I appeal to any person's experience, who shall take a large draught of it milk warm in the paroxysm of a fever, even when plain water or herb teas shall be found to have little or no effect. To me it seems that it's singular and surprizing use in fevers of all kinds, were there nothing else, would be alone sufficient to recommend it to the public.

76. The best physicians make the idea of a fever to consist in a too great velocity of the heart's motion, and too great resistance at the capillaries. Tar-water, as it softens and gently stimulates those nice vessels, helps to propel their contents, and so contributes to remove the latter part of the disorder. And for the former, the irritating acrimony which accelerates the motion of the heart is diluted by watery, corrected by acid, and softened by balsamic remedies, all which intentions are answered by this aqueous acid balsamic medicine. Besides the viscid juices coagulated by the febrile heat are resolved by tar-water as a soap, and not too far resolved, as it is a gentle acid soap; to which we may add, that the peccant humours and salts are carried off by it's diaphoretic and diuretic qualities.

77. I found all this confirmed by my own experience in the late sickly season of the year one thousand seven hundred and forty one, having had
twenty-

twenty-five fevers in my own family cured by this medicinal water, drunk copiously. The same method was practised on several of my poor neighbours with equal success. It suddenly calmed the feverish anxieties, and seemed every glass to refresh, and infuse life and spirit into the patient. At first some of those patients had been vomited; but afterwards I found that without vomiting, bleeding, blistering, or any other evacuation or medicine whatever, very bad fevers could be cured by the sole drinking of tar-water milk warm, and in good quantity, perhaps a large glass every hour taken in bed. And it was remarkable, that such as were cured by this comfortable cordial, recovered health and spirits at once, while those who had been cured by evacuations often languished long, even after the fever had left them, before they could recover of their medicines and regain their strength.

78. In peripneumonies and pleurifies I have observed tar-water to be excellent, having known some pleuritic persons cured without bleeding, by a blister early applied to the stitch, and the copious drinking of tar-water, four or five quarts, or even more in four and twenty hours. And I do recommend it to farther trial, whether in all cases of a pleurisy, one moderate bleeding, a blister on the spot, and plenty of tepid tar-water may not suffice, without those repeated and immoderate bleedings, the bad effects of which are perhaps never got over. I do even suspect, that a pleuritic patient betaking himself to bed betimes, and drinking very copiously of tar-water, may be cured by that alone without bleeding, blistering, or any other medicine whatever: certainly I have found this succeed at a glass every half hour.

79. I have known a bloody flux of long continuance, after divers medicines had been tried in vain, cured by tar-water. But that which I take to be the most speedy and effectual remedy in a bloody flux, is a clyster of an ounce of common brown rosin dissolved over a fire in two ounces of oil, and added to a pint of broth, which not long since I had frequent occasion of trying, when that distemper was epidemical. Nor can I say that any to whom I advised it miscarried. This experiment I was led to make by the opinion I had of tar as a balsamic: and rosin is only tar inspissated.

80. Nothing that I know corroborates the stomach so much as tar-water (a). Whence it follows, that it must be of singular use to persons afflicted with the gout. And from what I have observed in five or six instances, I do verily believe it the best and safest medicine either to prevent the gout, or so to strengthen nature against the fit, as to drive it from the vitals; or, at other times to change a worse illness into the gout, and to get rid of it; Doctor Sydenham, in his treatise of the gout, declares that whoever finds a medicine the most efficacious for strengthening digestion, will do more service in the cure of that and other chronical distempers, than he can even form a notion of. And I leave it to trial, whether tar-water be not that medicine, as I myself am persuaded it is, by all the experiments I could make. But in all trials I would recommend discretion; for instance, a man with the gout in his stomach ought not to drink cold tar-water. This essay leaves room for future experiment in every part of it, not pretending to be a complete treatise.

81. It is evident to sense, that blood, urine, and other animal juices, being let to stand, soon

(a) Sect. 68.

contract a great acrimony. Juices, therefore, from a bad digestion retained and stagnating in the body, grow sharp and putrid. Hence a fermenting heat, the immediate cause of the gout. The curing this by cooling medicines, as they would increase the antecedent cause, must be a vain attempt. On the other hand, spices and spirituous liquors, while they contribute to remove the antecedent cause, or bad digestion, would by inflaming the blood increase the proximate or immediate cause of the gout, to wit, the fermenting heat. The scope therefore must be, to find a medicine that shall corroborate, but not inflame. Bitter herbs are recommended; but they are weak in comparison of tar-water.

82. The great force of tar-water, to correct the acrimony of the blood, appears in nothing more than in the cure of a gangrene, from an internal cause; which was performed on a servant of my own, by prescribing the copious and constant use of tar-water for a few weeks. From my representing tar-water as good for so many things, some perhaps may conclude it is good for nothing. But charity obligeth me to say what I know, and what I think, howsoever it may be taken. Men may censure and object as they please, but I appeal to time and experiment. Effects misimputed, cases wrong told, circumstances overlooked, perhaps too, prejudices and partialities against truth, may for a time prevail and keep her at the bottom of her well, from whence nevertheless she emergeth sooner or later, and strikes the eyes of all who do not keep them shut.

83. Boerhaave thinks a specific may be found, for that peculiar venom, which infects the blood in the small pox, and that the prospect of so great a public benefit should stir up men to search for it.

It's

It's wonderful success, in preventing and mitigating that distemper, (a) would incline one to suspect that tar-water is such a specific, especially since I have found it of sovereign use as well during the small pox as before it. Some think an Erysipelas and the Plague differ only in degree. If so, tar-water should be useful in the Plague, for I have known it cure an Erysipelas.

84. Tar-water, as cleansing, healing, and balsamic, is good in all disorders of the urinary passages, whether obstructed or ulcerated. Doctor Lister supposeth, indeed, that turpentine acts by a caustic quality, which irritates the coats of the urinary ducts to expel sand or gravel. But, it should seem, this expelling diuretic virtue consisted rather in the salts than the resin, and consequently resides in the tar-water, gently stimulating by it's salts, without the dangerous force of a caustic. The violent operation of Ipecacuanha lies in it's resin, but the saline extract is a gentle purge and diuretic, by the stimulus of it's salts.

85. That which acts as a mild cordial, (b) neither hurting the capillary vessels as a caustic, nor affecting the nerves, nor coagulating the juices, must in all cases be a friend to nature, and assist the vis vitæ in it's struggle against all kinds of contagion. And from what I have observed, tar-water appears to me an useful preservative in all epidemical disorders, and against all other infection whatsoever, as well as that of the small-pox. What effects the animi pathemata have in human maladies, is well known, and consequently the general benefit of such a cardiac may be reasonably supposed.

86. As the body is said to clothe the soul, so the nerves may be said to constitute her inner garment. And as the soul animates the whole, what

(a) 2, 3.

(b) 66.

nearly

nearly touches the soul relates to all. Therefore the asperity of tartarous salts, and the fiery acrimony of alkaline salts, irritating and wounding the nerves, produce nascent passions and anxieties in the soul; which both aggravate distempers, and render mens lives restless and wretched, even when they are afflicted with no apparent distemper. This is the latent spring of much woe, spleen, and tædium vitæ. Small imperceptible irritations of the minutest fibres or filaments, caused by the pungent salts of wines and fauces, do so shake and disturb the microcosms of high livers, as often to raise tempests in courts and senates. Whereas the gentle vibrations that are raised in the nerves, by a fine subtile acid, sheathed in a smooth volatile oil (a), softly stimulating and bracing the nervous vessels and fibres, promotes a due circulation and secretion of the animal juices, and creates a calm satisfied sense of health. And accordingly I have often known tar-water procure sleep and compose the spirits in cruel vigils, occasioned either by sickness or by too intense application of mind.

87. In diseases sometimes accidents happen from without by mismanagement, sometimes latent causes operate within, jointly with the specific taint or peculiar cause of the malady. The causes of distempers are often complicated, and there may be something in the idiosyncrasy of the patient that puzzles the physician. It may therefore be presumed that no medicine is infallible, not even in any one disorder. But as tar-water possesseth the virtues of fortifying the stomach, as well as purifying and invigorating the blood, beyond any medicine that I know, it may be presumed of great

(a) 59, 61.

and general efficacy in all those numerous illnesses, which take their rise from foul or vapid blood, or from a bad digestion. The animal spirits are elaborated from the blood. Such therefore as the blood is, such will be the animal spirit, more or less, weaker or stronger. This sheweth the usefulness of tar-water in all hysteric and hypochondriac cases; which together with the maladies from indigestion comprise almost the whole tribe of chronical diseases.

88. The scurvy may be reckoned in these climates an universal malady, as people in general are subject to it, and as it mixes more or less in almost all diseases. Whether this proceeds from want of elasticity in our air, upon which the tone of the vessels depends, and upon that the several secretions; or whether it proceeds from the moisture of our climate, or the grossness of our food, or the salts in our atmosphere, or from all these together; thus much at least seems not absurd to suppose, that, as physicians in Spain and Italy are apt to suspect the venereal taint to be a latent principle, and bear a part in every illness, so far as good reason the scurvy should be considered by our physicians, as having some share in most disorders and constitutions that fall in their way. It is certain our perspiration is not so free as in clearer air and warmer climates. Perspirable humours not discharged will stagnate and putrify. A diet of animal food will be apt to render the juices of our bodies alcaliscent. Hence ichorous and corrosive humours and many disorders. Moist air makes viscid blood; and saline air inflames this viscid blood. Hence broken capillaries, extravasated blood, spots, and ulcers, and other scorbutic symptoms. The body of a man attracts and imbibes the moisture and salts of the air, and what-
 ever

ever floats in the atmosphere, which, as it is common to all, so it affects all more or less.

89. Doctor Musgrave thinks the Devonshire scurvy a relique of the leprosy, and that it is not owing to the qualities of the air. But as these insulars in general live in a gross saline air, and their vessels being less elastic, are consequently less able to subdue and cast off what their bodies as sponges draw in, one would be tempted to suspect the air not a little concerned, especially in such a situation as that of Devonshire. In all these British islands we enjoy a great mediocrity of climate, the effect whereof is, that we have neither heat enough to exalt and dissipate the gross vapours, as in Italy, nor cold enough to condense and precipitate them, as in Sweden. So they are left floating in the air, which we constantly breath, and imbibe through the whole surface of our bodies. And this together with exhalations from coal fires, and the various fossils wherein we abound, doth greatly contribute to render us scorbutic and hypochondriac.

90. There are some who derive all diseases from the scurvy, which indeed must be allowed to create or mimic most other maladies. Boerhaave tells us, it produceth pleuritic, colic, nephritic, hepatic pains, various fevers, hot, malignant, intermitting, dysenteries, faintings, anxieties, dropsies, consumptions, convulsions, palsies, fluxes of blood. In a word, it may be said to contain the seeds and origin of almost all distempers. Insomuch that a medicine which cures all sorts of scurvy, may be presumed good for most other maladies.

91. The scurvy doth not only in variety of symptoms imitate most distempers, but also when come to a height, in degree of virulence equal the most malignant. Of this we have a remarkable proof, in that horrible description of the scorbutic

patients in the hospitals of Paris, given by monsieur Poupert, in the Memoirs of the royal academy of sciences, for the year one thousand six hundred and ninety-nine. That author thinks he saw some resemblance in it to the plague of Athens. It is hard to imagine any thing more dreadful than the case of those men, rotting alive by the scurvy in it's supreme degree. To obviate such putrefaction, I believe the most effectual method would be, to embalm (if one may so say) the living body with tar-water copiously drunk; and this belief is not without experience.

92. It is the received opinion that the animal salts of a sound body are of a neutral, bland and benign nature: that is, the salts in the juices past the primæ viæ, are neither acid nor alkaline, having been subdued by the constitution, and changed into a third nature. Where the constitution wants force to do this, the aliment is not duly assimilated; and so far as the salts retain their pristine qualities, sickly symptoms ensue, acids and alkalies not perfectly subdued, producing weak ferments in the juices. Hence scurvy, cachexy, and a long train of ills.

93. A cachexy or ill habit is much of the same kind with the scurvy, proceeds from the same causes and is attended with like symptoms, which are so manifold and various, that the scurvy may well be looked on as a general cachexy, infecting the whole habit and vitiating all the digestions. Some have reckoned as many sorts of the scurvy, as there are different taints of the blood. Others have supposed it a collection of all illnesses together. Some suppose it an accumulation of several diseases in fieri. Others take it for an assemblage of the reliques of old distempers.

94. But

94. But thus much is certain, the cure of the scurvy is no more to be attempted by strongly active medicines than (to use the similitude of an ingenious writer) a thorn in the flesh, or pitch on silk to be removed by force. The viscid humour must be gently resolved and diluted, the tone of the vessels recovered by a moderate stimulation, and the tender fibres and capillary vessels gradually cleared from the concremented stuff, that adheres and obstructs them. All which is in the aptest manner performed by a watery diluent, containing a fine vegetable soap. And although a complete cure by alteratives, operating on the small capillaries, and by insensible discharges, must require length of time, yet the good effect of this medicine on cachectic and scorbutic persons, is soon perceived, by the change it produceth in their pale discoloured looks, giving a florid healthy countenance in less time than perhaps any other medicine.

95. It is supposed by physicians, that the immediate cause of the scurvy lies in the blood, the fibrous part of which is too thick and the serum too thin and sharp: and that hence ariseth the great difficulty in the cure, because in the correcting of one part, regard must be had to the other. It is well known how extremely difficult it is to cure an inveterate scurvy: how many scorbutic patients have grown worse by an injudicious course of evacuations: how many are even rendered incurable by the treatment of inconsiderate physicians: and how difficult, tedious and uncertain the cure is in the hands even of the best, who are obliged to use such variety and change of medicines, in the different stages of that malady: which nevertheless may be cured (if I may judge by what I have experienced) by the sole, regular, constant, copious use of tar-water.

96. Tar-

96. Tar-water moderately inspissates with it's balsamic virtue, and renders mild the thin and sharp part of the blood. The same, as a soapy medicine, dissolves the grumous concretions of the fibrous part. As a balsam it destroys the ulcerous acrimony of the humours, and as a deobstruent it opens and cleans the vessels, restores their tone, and strengthens the digestion, whose defects are the principal cause of scurvy and cachexy.

97. In the cure of the scurvy, the principal aim is to subdue the acrimony of the blood and juices. But as this acrimony proceeds from different causes, or even opposite, as acid and alkaline, what is good in one sort of scurvy proves dangerous, or even mortal, in another. It is well known, that hot antiscorbutics, where the juices of the body are alcalescent, increase the disease. And four fruits and vegetables produce a like effect in the scurvy, caused by an acid acrimony. Hence fatal blunders are committed by unwary practitioners, who, not distinguishing the nature of the disease, do frequently aggravate, instead of curing it. If I may trust what trials I have been able to make, this water is good in the several kinds of scurvy, acid, alkaline, and muriatic, and I believe it the only medicine that cures them all without doing hurt in any. As it contains a volatile acid (*a*) with a fine volatile oil, why may not a medicine cool in one part and warm in another be a remedy to either extreme (*b*)? I have observed it to produce a kindly genial warmth without heat, a thing to be aimed at in all sorts of scurvy. Besides the balsam in tar-water sheaths all scorbutic salts alike: and it's great virtues as a digester and deob-

(*a*) 7.

(*b*) 72.

struent

struent are of general use in all scorbutic, and, I may add, in all chronical cases whatsoever.

98. I cannot be sure that I have tried it in a scrophulous case, though I have tried it successfully in one that I suspected to be so. And I apprehend it would be very serviceable in such disorders. For although Doctor Gibbs in his treatise of the King's Evil derives that disease from a coagulating acid, which is also agreeable to the opinion of some other physicians, and although tar-water contain an acid, yet as it is a soap (*a*), it resolves instead of coagulating the juices of the body.

99. For hysterical and hypochondriacal disorders so frequent among us, it is commonly supposed that all acids are bad. But I will venture to except the acid soap of tar-water, having found, by my own experience and that of many others, that it raiseth the spirits, and is an excellent anti-hysterick, nor less innocent than potent, which cannot be said of those others in common use, that often leave people worse than they found them.

100. In a high degree of scurvy a mercurial salivation is looked on by many as the only cure. Which, by the vehement shock it gives the whole frame, and the sensible secretion it produceth, may be thought to be more adequate to such an effect. But the disorder occasioned by that violent process, it is to be feared, may never be got over. The immediate danger, the frequent bad effects, the extreme trouble and nice care attending such a course do very deservedly make people afraid of it. And though the sensible secretion therein be so great, yet in a longer tract of time the use of tar-water may produce as great

(*a*) 58.

a discharge of scorbutic salts by urine and by perspiration; the effect of which last, though not so sensible, may yet be greater than that of salivation; especially if it be true, that in common life insensible perspiration is to nutrition, and all sensible excretions, as five to three.

101. Many hysteric and scorbutic ailments, many taints contracted by themselves, or inherited from their ancestors, afflict the people of condition in these islands, often rendering them, upon the whole, much more unhappy than those whom poverty and labour have ranked in the lowest lot of life; which ailments might be safely removed or relieved by the sole use of tar-water; and those lives, which seem hardly worth living for bad appetite, low spirits, restless nights, wasting pains and anxieties, be rendered easy and comfortable.

102. As the nerves are instruments of sensation, it follows that spasms in the nerves may produce all symptoms, and therefore a disorder in the nervous system shall imitate all distempers, and occasion, in appearance, an asthma for instance, a pleurisy, or a fit of the stone. Now whatever is good for the nerves in general, is good against all such symptoms. But tar-water, as it includes in an eminent degree the virtues of warm gums and resins, is of great use for comforting and strengthening the nerves (a), curing twitches in the nervous fibres, cramps also, and numbness in the limbs, removing anxieties and promoting sleep, in all which cases I have known it very successful.

103. This safe and cheap medicine suits all circumstances and all constitutions, operating easily, curing without disturbing, raising the spirits without depressing them, a circumstance that deserves

(a) 86.

repeated attention, especially in these climates, where strong liquors so fatally and so frequently produce those very distresses they are designed to remedy; and, if I am not misinformed, even among the ladies themselves, who are truly much to be pitied. Their condition of life makes them a prey to imaginary woes, which never fail to grow up in minds unexercised and unemployed. To get rid of these, it is said, there are who betake themselves to distilled spirits. And it is not improbable they are led gradually to the use of those poisons by a certain complaisant pharmacy, too much used in the modern practice, palsy drops, poppy cordial, plague water, and such like, which being in truth nothing but drams disguised, yet coming from the apothecaries, are considered only as medicines.

104. The soul of man was supposed by many ancient sages, to be thrust into the human body as into a prison, for punishment of past offences. But the worst prison is the body of an indolent Epicure, whose blood is inflamed by fermented liquors (*a*) and high sauces, or render'd putrid, sharp, and corrosive, by a stagnation of the animal juices through sloth and indolence; whose membranes are irritated by pungent salts, whose mind is agitated by painful oscillations of the nervous (*b*) system, and whose nerves are mutually affected by the irregular passions of his mind. This ferment in the animal oeconomy darkens and confounds the intellect. It produceth vain terrors and vain conceits, and stimulates the soul with mad desires, which, not being natural, nothing in nature can satisfy. No wonder, therefore, there are so many fine persons of both sexes, shining themselves, and shone on by fortune, who are inwardly miserable and sick of life.

(*a*) 66. (*b*) 86.

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105. The

105. The hardness of stubbed vulgar constitutions, renders them insensible of a thousand things, that fret and gall those delicate people, who, as if their skin was peeled off, feel to the quick every thing that touches them. The remedy for this exquisite and painful sensibility is commonly sought from fermented, perhaps from distilled, liquors, which render many lives wretched, that would otherwise have been only ridiculous. The tender nerves, and low spirits of such poor creatures, would be much relieved by the use of tar-water, which might prolong and cheer their lives. I do therefore recommend to them the use of a cordial, not only safe and innocent, but giving health and spirit as surely as other cordials destroy them.

106. I do verily think, there is not any other medicine whatsoever, so effectual to restore a crazy constitution, and cheer a dreary mind, or so likely to subvert that gloomy empire of the spleen (a), which tyraniseth over the better sort (as they are called) of these free nations; and maketh them, in spite of their liberty and property, more wretched slaves than even the subjects of absolute power, who breath clear air in a sunny climate. While men of low degree often enjoy a tranquillity and content, that no advantage of birth or fortune can equal. Such, indeed, was the case, while the rich alone could afford to be debauched; but when even beggars became debauchees, the case was altered.

107. The public virtue and spirit of the British legislature, never shewed itself more conspicuous in any act, than in that for suppressing the immoderate use of spirituous liquors among the people, whose strength and numbers constitute the true wealth of a nation: though evasive arts

(a) 103.

will, it is feared, prevail so long as distilled spirits of any kind are allowed, the character of Englishmen in general, being that of Brutus, *Quicquid vult, valde vult*. But why should such a canker be tolerated in the vitals of a state, under any pretence or in any shape whatsoever? Better by far, the whole present set of distillers were pensioners of the public, and their trade abolished by law; since all the benefit thereof put together would not balance the hundredth part of its mischief.

108. To prove the destructive effects of such spirits with regard both to the humane species and individuals, we need not go so far as our colonies, or the savage natives of America. Plain proof may be had nearer home. For, albeit there is in every town or district throughout England, some tough dram-driker, set up as the Devil's decoy, to draw in profelytes; yet the ruined health and morals, and the beggary of such numbers evidently shew that we need no other enemy to compleat our destruction, than this cheap luxury at the lower end of the state, and that a nation lighted up at both ends must soon be consumed.

109. It is much to be lamented that our Insulars, who act and think so much for themselves, should yet, from grossness of air and diet, grow stupid or doat sooner than other people, who, by virtue of elastic air, water-drinking, and light food, preserve their faculties to extreme old age; an advantage which may perhaps be approached, if not equalled, even in these regions, by tar-water, temperance, and early hours; the last is a sure addition to life, not only in regard of time, which, being taken from sleep, the image of death, is added to the waking hours, but also in regard of longevity and duration in the vulgar sense.

sense. I may say too, in regard of spirit and vivacity, which, within the same compass of duration, may truly and properly be affirmed to add to man's life: it being manifest, that one man, by a brisker motion of his spirits and succession of his ideas, shall live more in one hour, than another in two; and that the quantity of life is to be estimated, not merely from the duration, but also from the intenseness of living. Which intense living, or, if I may so say, lively life, is not more promoted by early hours as a regimen, than by tar-water as a cordial; which acts, not only as a slow medicine, but hath also an immediate and cheerful (*a*) effect on the spirits.

110. It must be owned, that light attracted, secreted, and detained in tar (*b*), and afterwards drawn off in its finest balsamic particles, by the gentle menstruum of cold water, is not a violent and sudden medicine, always to produce its effect at once, (such, by irritating, often do more mischief than good) but a safe and mild alterative, which penetrates the whole system, opens, heals, and strengthens the remote vessels, alters and propels their contents, and enters the minutest capillaries, and cannot therefore, otherwise than by degrees and in time, work a radical cure of chronic distempers. It gives nevertheless speedy relief in most cases, as I have found by my self and many others. I have been surprized to see persons fallen away and languishing under a bad digestion, after a few weeks recover a good stomach, and with it flesh and strength, so as to seem renewed, by the drinking of tar-water. The strength and quantity of this water to be taken by each individual person is best determined from experience. And as for the time

(*a*) 66.(*b*) 8, 29, 40.

of taking, I never knew any evil ensue from its being continued ever so long; but, on the contrary, many and great advantages, which sometimes would not perhaps begin to shew themselves till it had been taken two or three months.

111. We learn from Pliny, that in the first ferment of new wine or mustum, the ancients were wont to sprinkle it with powdered rosin, which gave it a certain sprightliness, *quædam saporis acumina*. This was esteemed a great improver of its odour and taste, and was, I doubt not, of its salubrity also. The brown old rosin, that is to say, harden'd tar, as being more easily pulverized and sifted, was most in request for this purpose. They used likewise to season their wine-vessels with pitch or rosin. And I make no doubt, that if our vintners would contrive to medicate their wines with the same ingredients, they might improve and preserve them, with less trouble and expence to themselves, and less danger to others. He that would know more particulars of this matter may consult Pliny and Columella. I shall only add, that I doubt not a similar improvement may be made of malt liquor.

112. The *ῥητίνη* of Theophrastus and *resina* of Pliny are sometimes used in a general sense, to signify all sorts of oily viscid exudations from plants or trees. The crude watery juice, that riseth early in the spring, is gradually ripened and inspissated by the solar heat, becoming in orderly succession with the seasons an oil, a balsam, and at last a resin. And it is observed by chemists, that turpentine dissolved over a gentle fire, is, by the constant operation of heat, successively transformed into oil, balsam, pitch, and hard friable resin, which will incorporate with oil or rectified spirit, but not with water.

113. Sir

113. Sir John Floyer remarks, that we want a method for the use of turpentine, and again, he who shall hit, saith he, on the pleafantest method of giving turpentine, will do great cures in the gout, stone, catarrhs, dropfies and cold scurvies, rheumatifms, ulcers, and obstructions of the glands. Lastly, he subjoins, that for the use of altering and amending the juices and fibres, it must be given frequently, and in such small quantities at a time, and in fo commodious a manner, as will agree best with the stomach (*a*), stay longest in the body, and not purge itself off; for large doses (saith he) go through too quick, and besides offend the head. Now the infusion of tar or turpentine in cold water seems to supply the very method that was wanted, as it leaves the more unctuous, and gross parts behind (*b*), which might offend the stomach, intestines and head; and as it may be easily taken, and as often, and in such quantity, and such degree of strength, as suits the case of the patient. Nor should it seem, that the fine spirit and volatile oil, obtained by infusion of tar (*c*) is inferior to that of turpentine, to which it superadds the virtue of wood foot, which is known to be very great with respect to the head and nerves; and this appears evident from the manner of obtaining tar (*d*). And as the fine volatile parts of tar or turpentine are drawn off by infusion in cold water and easily conveyed throughout the whole system of the human body; so it should seem the same method may be used with all sorts of balsams or resins whatsoever, as the readiest, easiest, and most inoffensive, as well as in many cases the most effectual way of obtaining and imparting their virtues.

(*a*) 9. (*b*) 47. (*c*) 7, 42, 58. (*d*) 13.

114. After

114. After having said so much of the uses of tar, I must farther add, that being rubb'd on them it is an excellent preservative of the teeth and gums; that it sweetens the breath, and that it clears and strengthens the voice. And, as its effects are various and useful, so there is nothing to be feared from the operation of an alterative so mild and friendly to nature. It was a wise maxim of certain ancient philosophers, that diseases ought not to be irritated by medicines. But no medicine disturbs the animal œconomy less than this (a), which, if I may trust my own experience, never produces any disorder in a patient when rightly taken.

115. I knew indeed a person who took a large glass of tar-water just before breakfast, which gave him an invincible nausea and disgust, although he had before received the greatest benefit from it. But if the tar-water be taken and made in the manner prescribed at the beginning of this essay, it will, if I mistake not, have enough of the salt to be useful, and little enough of the oil to be inoffensive. I mean my own manner of making it, and not the American; that sometimes makes it too strong, and sometimes too weak; which tar-water, however it might serve as there used, merely for a preparative against the small-pox, yet I question whether it may be fitly used in all those various cases wherein I have found tar-water so successful. Persons more delicate than ordinary may render it palatable, by mixing a drop of the chemical oil of nutmegs, or a spoonful of mountain wine in each glass. It may not be amiss to observe, that I have known some, whose nice stomachs could not bear it in the morning, take it at night going to bed without any inconvenience; and that with some it agrees best warm, with others cold. It may be

(a) 133.

made

made stronger for brute beasts, as horses, in whose disorders I have found it very useful, I believe more so than that bituminous substance call'd Barbadoes tar.

116. In very dangerous and acute cases much may be taken and often; as far as the stomach can bear. But in chronical cases, about half a pint, night and morning, may suffice; or in case so large a dose should prove disagreeable, half the quantity may be taken at four times, to wit, in the morning, at night going to bed, and about two hours after dinner and breakfast. A medicine of so great virtue in so many different disorders, and especially in that grand enemy, the fever, must needs be a benefit to mankind in general. There are nevertheless three sorts of people to whom I would peculiarly recommend it: Sea-faring persons, ladies, and men of studious and sedentary lives.

117. To sailors and all sea-faring persons, who are subject to scorbutic disorders and putrid fevers, especially in long southern voyages, I am persuaded this tar-water would be very beneficial. And this may deserve particular notice in the present course of marine expeditions, when so many of our country-men have perished by such distempers, contracted at sea and in foreign climates. Which, it is probable, might have been prevented, by the copious use of tar-water.

118. This same water will also give charitable relief to the ladies (a), who often want it more than the parish poor; being many of them never able to make a good meal, and sitting pale, puny, and forbidden like ghosts, at their own table, victims of vapours and indigestion.

119. Studious persons also pent up in narrow holes, breathing bad air, and stooping over their

books, are much to be pitied. As they are debarred the free use of air and exercise, this I will venture to recommend as the best succedaneum to both. Though it were to be wished, that modern scholars would, like the ancients, meditate and converse more in walks and gardens and open air, which, upon the whole, would perhaps be no hindrance to their learning, and a great advantage to their health. My own sedentary course of life had long since thrown me into an ill habit, attended with many ailments, particularly a nervous cholic, which rendered my life a burthen, and the more so, because my pains were exasperated by exercise. But since the use of tar-water, I find, though not a perfect recovery from my old and rooted illness, yet such a gradual return of health and ease, that I esteem my having taken this medicine the greatest of all temporal blessings, and am convinced that, under providence, I owe my life to it.

120. In the distilling of turpentine and other balsams by a gentle heat, it hath been observed, that there riseth first an acid spirit (*n*) that will mix with water; which spirit, except the fire be very gentle, is lost. This grateful acid spirit that first comes over, is, as a learned chemist and physician informs us, highly refrigeratory, diuretic, fudorific, balsamic or preservative from putrefaction, excellent in nephritic cases, and for quenching thirst, all which virtues are contained in the cold infusion, which draws forth from tar only it's fine flower or quintessence, if I may so say, or the native vegetable spirit, together with a little volatile oil.

121. The distinguishing principle of all vegetables, that whereon their peculiar smell, taste, and specific properties depend, seems to be some

(*n*) 7.

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extremely

extremely fine and subtile spirit, whose immediate vehicle is an exceeding thin volatile oil, which is itself detained in a grosser and more viscid resin or balsam, lodged in proper cells in the bark and seeds, and most abounding in autumn or winter, after the crude juices have been thoroughly concocted, ripened, and impregnated with solar light. The spirit itself is by some supposed to be an oil highly subtilized, so as to mix with water. But such volatile oil is not the spirit, but only it's vehicle. Since aromatic oils, being long exposed to air, will lose their specific smell and taste, which fly off with the spirit or vegetable salt, without any sensible diminution of the oil.

122. Those volatile salts, that are set free and raised by a gentle heat, may justly be supposed essential (*a*), and to have pre-existed in the vegetable; whereas the lixivial fixed salts obtained by the incineration of the subject, whose natural constituent parts have been altered or destroyed by the extreme force of fire, are by later chemists, upon very good grounds, supposed not to have pre-existed therein; all such salts appearing, from the experiments of signor Redi, not to preserve the virtues of the respective vegetable subjects; and to be alike purgative and in an equal degree, whatsoever may be the shape of their points, whether sharp or obtuse. But although fixed or lixivious salts may not contain the original properties of the subject; yet volatile salts raised by a slight heat from vegetables are allowed to preserve their native virtues: and such salts are readily imbibed by water.

123. The most volatile of the salts, and the most attenuated part of the oil, may be supposed

(*a*) 8.

the

the first and readiest to impregnate a cold infusion (*b*). And this will assist us to account for the virtues of tar-water. That volatile acid in vegetables, which resists putrefaction, and is their great preservative, is detained in a subtile oil miscible with water, which oil is itself imprisoned in the resin or grosser part of the tar, from which it is easily set free and obtained pure by cold water.

124. The mild native acids are observed more kindly to work upon, and more thoroughly to dissolve, metallic bodies, than the strongest acid spirits produced by a vehement fire; and it may be suspected, they have the same advantage as a medicine. And as no acid, by the observation of some of the best chemists, can be obtained from the substance of animals thoroughly assimilated, it should follow, that the acids received into a healthy body must be quite subdued and changed by the vital powers: but it is easier to subdue and assimilate (*e*) the gentler than the stronger acids.

125. I am very sensible, that on such subjects arguments fall short of evidence: and that mine fall short even of what they might have been, if I enjoyed better health, or those opportunities of a learned commerce, from which I am cut off in this remote corner. I shall nevertheless go on as I have begun, and proceed by reason, by conjecture, and by authority, to cast the best light I can on the obscure paths that lie in my way.

126. Sir Isaac Newton, Boerhaave, and Homberg are all agreed, that the acid is a fine subtile substance, pervading the whole terraqueous globe; which produceth divers kinds of bodies, as it is united to different subjects. This according to

(*b*) 1, 7. (*e*) 48
H 2

Homberg

Homberg is the pure salt, salt the principle, in it self similar and uniform, but never found alone. And although this principle be called the salt of the earth, yet it should seem it may more properly be called the salt of the air, since earth turned up and lying fallow receives it from the air. And it should seem that this is the great principle of vegetation, derived into the earth from all sorts of manures, as well as from the air. The acid is allowed to be the cause of fermentation in all fermented liquors. Why therefore, may it not be supposed to ferment the earth, and to constitute that fine penetrating principle, which introduces and assimilates the food of plants, and is so fugitive as to escape all the filtrations and perquisitions of the most nice observers?

127. It is the doctrine of Sir Isaac Newton and Monsieur Homberg, that, as the watry acid is that which renders salt soluble in water, so it is that same which joined to the earthy part makes it a salt. Let it therefore be considered, that the organs (*d*) of plants are tubes, the filling, unfolding, and distending whereof by liquors, doth constitute what is called the vegetation or growth of the plant. But earth itself is not soluble in water, so as to form one vegetable fluid therewith. Therefore the particles of earth must be joined with a watry acid, that is, they must become salts in order to dissolve in water; that so, in the form of a vegetable juice, they may pass through the strainers and tubes of the root into the body of the plant, swelling and distending it's parts and organs, that is, increasing it's bulk. Therefore the vegetable matter of the earth is in effect earth changed into salt. And to render earth

(*d*) 30, 31, 35.

fertile

fertile, is to cause many of it's particles to assume a saline form.

128. Hence it is observed, there are more salts in the root than in the bark, more salts in vegetables during the spring, than in the autumn or winter, the crude saline juices being in the summer months partly evaporated, and partly ripened by the action and mixture of light. Hence also it appears, why the dividing of earth, so as to enlarge it's surface, whereby it may admit more acid from the air, is of such use in promoting vegetation: And why ashes, lime, and burnt clay are found so profitable manures, fire being in reality the acid, as is proved in the sequel (a). Marls also and shells are useful, forasmuch as those alkaline bodies attract the acid, and raise an effervescence with it, thereby promoting a fermentation in the glebe. The excrements of animals and putrid vegetables do in like manner contribute to vegetation, by increasing the salts of the earth. And where fallows are well broken, and lye long to receive the acid of the air into all their parts; this alone will be sufficient to change many terrene particles into salts, and consequently render them soluble in water, and therefore fit aliment for vegetables.

129. The acid, saith Homberg, is always joined to some sulphur, which determines it to this or that species, producing different salts, as it is the vegetable, bituminous, or metallique sulphur. Even the alkaline, whether volatile or lixivial salts, are supposed to be nothing but this same acid strictly detained by oil and earth, in spite of the extreme force of fire, which lodgeth in them, without being able to dislodge some remains of the acid.

(a) 202.

130. Salts,

130. Salts, according to sir Isaac Newton, are dry earth and watery acid united by attraction, the acid rendering them soluble in water (*f*). He supposeth the watry acid to flow round the terrestrial part, as the ocean doth round the earth, being attracted thereby, and compares each particle of salt, to a chaos whereof the innermost part is hard and earthy, but the surface soft and watery. Whatever attracts and is attracted most strongly is an acid in his sense.

131. It seems impossible to determine the figures of particular salts. All acid solvents together with the dissolved bodies are apt to shoot into certain figures. And the figures, in which the fossil salts crystallize, have been supposed the proper natural shapes of them and their acids. But Homberg hath clearly shewed the contrary: forasmuch as the same acid dissolving different bodies, assumes different shapes. Spirit of nitre, for instance, having dissolved copper, shoots into hexagonal crystals; the same having dissolved iron, shoots into irregular squares; and again, having dissolved silver, forms thin crystals of a triangular figure.

132. Homberg nevertheless holds in general, that acids are shaped like daggers, and alcalies like sheaths: and that moving in the same liquor, the daggers run into the sheaths fitted to receive them, with such violence as to raise that effervescence observed in the mixture of acids and alcalies. But it seems very difficult to conceive, how, or why the mere configuration of daggers and sheaths, floating in the same liquor, should cause the former to rush with such vehemence, and direct their points so aptly into the latter, any more than a parcel of spigots and foffets floating together in the same water, should rush one into the other.

(*f*) 127.

133. It

133. It should seem rather, that the vehement attraction which Sir Isaac Newton attributes to all acids, whereby he supposeth them to rush towards, penetrate, shake, and divide the most solid bodies, and to ferment the liquid of vegetables, could better account for this phænomenon. It is in this attraction, that Sir Isaac placeth all their activity, and indeed it should seem, the figures of salts were not of such efficacy in producing their effects, as the strong attractive powers whereby they are agitated and do agitate other bodies. Especially if it be true (what was before remarked) that lixivious salts are alike purgative, whatever may be the shape of their angles, whether more or less acute or obtuse.

134. Sir Isaac Newton accounts for the watery acids making earthy corpuscles soluble in water, by supposing the acid to be a mean between earth and water, its particles greater than those of water, and less than those of earth, and strongly to attract both. But perhaps there is no necessary reason for supposing the parts of the acid grosser than the parts of water, in order to produce this effect; may not this as well be accounted for, by giving them only a strong attraction or cohesion with the bodies to which they are joined?

135. The acid spirit or salt, that mighty instrument in the hand of nature, residing in the air, and diffused throughout that whole element, is discernible also in many parts of the earth, particularly in fossils, such as sulphur, vitriol, and alum; it was already observed from Homberg, that this acid is never found pure, but hath always sulphur joined with it, and is classed by the difference of its sulphurs, whether mineral, vegetable, or animal.

136. Salts are vulgarly reckoned the most active of chemical principles. But Homberg derives all their
their

their activity from the sulphurs joined with them. From which also, as hath been said, he derives all their kinds and differences (g). Salt, water, oil, and earth seem to be originally the same in all vegetables. All the difference, according to the chemists, ariseth from a spirit residing in the oil, called the Rector or Archæus. This is otherwise called by chemists, *ens primum*, or the native spirit, whereon depend, and wherein are contained, the peculiar flavour and odour, the specific qualities and virtues of the plant.

137. These native spirits or vegetable souls are all breathed or exhaled into the air, which seems the receptacle as well as source of all sublunary forms, the great mass or chaos which imparts and receives them. The air, or atmosphere, that surrounds our earth, contains a mixture of all the active volatile parts of the whole habitable world, that is, of all vegetables, minerals, and animals. Whatever perspires, corrupts, or exhales, impregnates the air; which, being acted upon by the solar fire, produceth within itself all sorts of chemical operations, dispensing again those salts and spirits in new generations, which it had received from putrefactions.

138. The perpetual oscillations of this elastic and restless element operate without ceasing, on all things that have life, whether animal or vegetable, keeping their fibres, vessels, and fluids in a motion always changing; as heat, cold, moisture, dryness, and other causes alter the elasticity of the air. Which accounts, it must be owned, for many effects. But there are many more which must be derived from other principles or qualities in the air. Thus iron and copper are corroded and gather rust in the air, and bodies of all sorts are dissolved or corrupted,

which sheweth an acid to abound and diffuse itself throughout the air.

139. By this same air fire is kindled, the lamp of life preserved, respiration, digestion, nutrition, the pulse of the heart and motion of all the muscles seem to be performed. Air therefore is a general agent, not only exerting its own, but calling forth the qualities or powers of all other bodies, by a division, comminution, and agitation of their particles, causing them to fly off and become volatile and active.

140. Nothing ferments, vegetates, or putrefies without air, which operates with all the virtues of the bodies included in it; that is, of all nature; there being no drug, salutary or poisonous, whose virtues are not breathed into the air. The air therefore is an active mass of numberless different principles, the general source of corruption and generation; on one hand dividing, abrading, and carrying off the particles of bodies, that is, corrupting or dissolving them; on the other, producing new ones into being; destroying and bestowing forms without intermission.

141. The seeds of things seem to lye latent in the air, ready to appear and produce their kind, whenever they light on a proper matrix. The extremely small seeds of fern, mosses, mushrooms, and some other plants are concealed and wafted about in the air, every part whereof seems replete with seeds of one kind or other. The whole atmosphere seems alive. There is every where acid to corrode, and seed to engender. Iron will rust, and mold will grow in all places. Virgin earth becomes fertile, crops of new plants ever and anon shew themselves; all which demonstrates the air to be a common seminary and receptacle of all vivifying principles.

142. Air may also be said to be the seminary of minerals and metals, as it is of vegetables. Mr. Boyle informs us, that the exhausted ores of tin and iron being exposed to the air become again impregnated with metal, and that ore of alum having lost it's salt recovers it after the same manner. And numberless instances there are of salts produced by the air, that vast collection or treasury of active principles, from which all sublunary bodies seem to derive their forms, and on which animals depend for their life and breath.

143. That there is some latent vivifying spirit dispersed throughout the air common experience sheweth; inasmuch as it is necessary both to vegetables and animals (*b*) whether terrestrial or aquatic, neither beasts, insects, birds, nor fishes being able to subsist without air. Nor doth all air suffice, there being some quality or ingredient, of which when air is deprived, it becometh unfit to maintain either life or flame. And this even though the air should retain it's elasticity; which, by the bye, is an argument that air doth not act only as an antagonist to the intercostal muscles. It hath both that and many other uses. It gives and preserves a proper tone to the vessels: this elastic fluid promotes all secretions: it's oscillations keep every part in motion: it pervades and actuates the whole animal system, producing great variety of effects, and even opposite in different parts, cooling at the same time and heating, distending and contracting, coagulating and resolving, giving and taking, sustaining life and impairing it, pressing without and expanding within, abrading some parts, at the same time insinuating and supplying others, producing various vibrations in the fibres, and fer-

(*b*) 138, 139.

ments in the fluids; all which must needs ensue from such a subtile, active, heterogeneous and elastic fluid.

144. But there is, as we have observed, some one quality or ingredient in the air, on which life more immediately and principally depends. What that is, though men are not agreed, yet it is agreed it must be the same thing that supports the vital and the common flame; it being found that when air, by often breathing in it, is become unfit for the one, it will no longer serve for the other. The like is observable in poisonous damps or steams, wherein flame cannot be kindled. As is evident in the Grotto del cane near Naples. And here it occurs, to recommend the plunging them into cold water, as an experiment to be tried on persons affected by breathing a poisonous vapour in old vaults, mines, deep holes or cavities under ground. Which, I am apt to think, might save the lives of several, by what I have seen practised on a dog convulsed, and in all appearance dead, but instantly reviving on being taken out of the abovementioned Grotto and thrown into a lake adjacent.

145. Air, the general menstruum and seminary, seemeth to be only an aggregate of the volatile parts of all natural beings, which variously combined and agitated produce many various effects. Small particles in a near and close situation strongly act upon each other, attracting, repelling, vibrating. Hence divers fermentations, and all the variety of meteors, tempests, and concussions both of earth and firmament. Nor is the microcosm less affected thereby. Being pent up in the viscera, vessels, and membranes of the body, by it's salts, sulphurs, and elastic power, it engenders cholics, spasms, hysteric disorders and other maladies.

146. The specific quality of air is taken to be

permanent elasticity. Mr. Boyle is expressly of this opinion. And yet, whether there be any such thing as permanently elastic air may be doubted, there being many things which seem to rob the air of this quality, or at least lessen and suspend it's exertion. The salts and sulphurs, for instance, that float in the air abate much of it's elasticity by their attraction.

147. Upon the whole it is manifest, that air is no distinct element, but a mass or mixture of things the most heterogeneous and even opposite to each other (*m*), which become air, by acquiring an elasticity and volatility from the attraction of some active, subtle substance; whether it be called fire, æther, light, or the vital spirit of the world; in like manner as the particles of antimony, of themselves not volatile, are carried off in sublimation and rendered volatile, by cohering with the particles of sal ammoniac. But action and reaction being equal, the spring of this æthereal spirit is diminished by being imparted. It's velocity and subtilty are also less from it's being mixed with grosser particles. Hence sound moves slower than light, as mud than water.

148. Whether air be only freed and fixed, or generated and destroyed, it is certain that air begins and ceases to exert or shew itself. Much by experiments seems to be generated, not only from animals, fruits, and vegetables, but also from hard bodies. And it is observed by Sir Isaac Newton, that air produced from hard bodies is most elastic. The transmutation of elements, each into other, hath been anciently held. In Plutarch we find it was the opinion of Heraclitus, that the death of fire was a birth to air, and the death of air a birth to water. This opinion is also maintained by

(*m*) 137, 145.

Sir Isaac Newton. Though it may be questioned, whether what is thought a change be not only a disguise.

149. Fire seems the most elastic and expansive of all bodies. It communicates this quality to moist vapours and dry exhalations, when it heats and agitates their parts, cohering closely with them, overcoming their former mutual attraction, and causing them, instead thereof, reciprocally to repel each other and fly asunder, with a force proportionable to that wherewith they had cohered.

150. Therefore in air we may conceive two parts, the one more gross which was raised and carried off from the bodies of this terraqueous mass: the other a fine subtile spirit by means whereof the former is rendered volatile and elastic. Together they compose a medium, whose elasticity is less than that of pure æther, fire, or spirit, in proportion to the quantity of salts, vapours, and heterogeneous particles contained therein. Hence it follows, that there is no such thing as a pure simple element of air. It follows also, that on the highest mountains air should be more rare than in proportion to the vulgar rule, of the spaces being reciprocally as the pressures: and so in fact it is said to have been found, by the gentlemen of the French Academy of Sciences.

151. Æther, fire, or spirit being attracted and clogged by heterogeneous particles becometh less active; and the particles cohering with those of æther, become more active than before. Air therefore is a mass of various particles, abraded and sublimated from wet and dry bodies of all sorts; cohering with particles of æther; the whole permeated by pure æther, or light, or fire: for these words are used promiscuously by ancient philosophers.

152. This

152. This æther or pure invisible fire, the most subtile and elastic of all bodies, seems to pervade and expand it self throughout the whole universe. If air be the immediate agent or instrument in natural things, it is the pure invisible fire that is the first natural mover or spring, from whence the air derives it's power (*a*). This mighty agent is every where at hand, ready to break forth into action, if not restrained and governed with the greatest wisdom. Being always restless and in motion, it actuates and enlivens the whole visible mass, is equally fitted to produce and to destroy, distinguishes the various stages of nature, and keeps up the perpetual round of generations and corruptions, pregnant with forms which it constantly sends forth and resorbs. So quick in it's motions, so subtile and penetrating in it's nature, so extensive in it's effects, it seemeth no other than the vegetative soul or vital spirit of the world.

153. The animal spirit in man is the instrumental or physical cause both of sense and motion. To suppose sense in the world, would be gross and unwarranted. But loco-motive faculties are evident in all it's parts. The Pythagoræans, Platonists, and Stoics held the world to be an animal. Though some of them have chosen to consider it as a vegetable. However the phænomena and effects do plainly shew there is a spirit that moves, and a mind or providence that presides. This providence, Plutarch saith, was thought to be in regard to the world, what the soul is in regard to man.

154. The order and course of things, and the experiments we daily make, shew there is a mind that governs and actuates this mundane system,

(*a*) 139, 142, 151.

as the proper real agent and cause. And that the inferior instrumental cause is pure æther, fire, or the substance of light (*c*) which is applied and determined by an infinite mind in the macrocosm or universe, with unlimited power, and according to stated rules; as it is in the microcosm, with limited power and skill by the human mind. We have no proof either from experiment or reason, of any other agent or efficient cause than mind or spirit. When therefore we speak of corporeal agents or corporeal causes, this is to be understood in a different, subordinate, and improper sense.

155. The principles whereof a thing is compounded, the instrument used in its production, and the end for which it was intended, are all in vulgar use termed Causes, though none of them be strictly speaking agent or efficient. There is not any proof that an extended corporeal or mechanical cause doth really and properly act, even motion itself being in truth a passion. Therefore though we speak of this fiery substance as acting, yet it is to be understood only as a mean or instrument, which indeed is the case of all mechanical causes whatsoever. They are nevertheless sometimes termed agents and causes, although they are by no means active in a strict and proper signification. When, therefore, force, power, virtue, or action are mentioned as subsisting in an extended and corporeal or mechanical being, this is not to be taken in a true, genuine, and real, but only in a gross and popular sense, which sticks in appearances, and doth not analyse things to their first principles. In compliance with established language, and the use of the world, we must employ the popular current phrase. But then in regard to truth we ought to distinguish

(*c*) 29, 37, 136, 149.

its meaning. It may suffice to have made this declaration once for all, in order to avoid mistakes.

156. The calidum innatum, the vital flame, or animal spirit in man is supposed the cause of all motions, in the several parts of his body, whether voluntary or natural. That is, it is the instrument, by means whereof the mind exerts and manifests herself in the motions of the body. In the same sense may not fire be said to have force, to operate, and agitate the whole system of the world, which is held together and informed by one presiding mind, and animated throughout by one and the same fiery substance, as an instrumental and mechanical agent, not as a primary real efficient?

157. This pure spirit or invisible fire is ever ready to exert and shew itself in its effects (*d*), cherishing, heating, fermenting, dissolving, shining and operating in various manners, where a subject offers to employ or determine its force. It is present in all parts of the earth and firmament, though perhaps latent and unobserved, till some accident produceth it into act, and renders it visible in its effects.

158. There is no effect in nature, great, marvellous, or terrible but proceeds from fire, that diffused and active principle, which at the same time that it shakes the earth and heavens, will enter, divide, and dissolve the smallest, closest, and most compacted bodies. In remote cavities of the earth it remains quiet, till perhaps an accidental spark from the collision of one stone against another kindles an exhalation, that gives birth to an earthquake or tempest, which splits mountains, or overturns cities. This same fire stands unseen in

(*d*) 152.

the

the focus of a burning glass, till subjects for it to act upon it come in it's way, when it is found to melt, calcine; or vitrify the hardest bodies.

159. No eye could ever hitherto discern; and no sense perceive, the animal spirit in a human body, otherwise than from it's effects. The same may be said of pure fire; or the spirit of the universe, which is perceived only by means of some other bodies, on which it operates, or with which it is joined. What the chemists say, of pure acids being never found alone, might as well be said of pure fire.

160. The mind of man acts by an instrument necessarily. The *τὸ ἡγεμονικόν*, or mind presiding in the world, acts by an instrument freely. Without instrumental and second causes, there could be no regular course of nature. And without a regular course, nature could never be understood. Mankind must always be at a loss; not knowing what to expect, or how to govern themselves, or direct their actions for the obtaining of any ends. Therefore in the government of the world physical agents, improperly so called, or mechanical, or second causes, or natural causes, or instruments, are necessary to assist, not the governor, but the governed.

161. In the human body the mind orders and moves the limbs: but the animal spirit is supposed the immediate physical cause of their motion. So likewise in the mundane system, a mind presides, but the immediate, mechanical, or instrumental cause, that moves or animates all it's parts, is the pure elementary fire or spirit of the world. The more fine and subtile part or spirit is supposed to receive the impressions of the first mover, and communicate them to the grosser sensible parts of this world. Motion, though in me-

taphysical rigor and truth, a passion or mere effect, yet, in physics, passeth for an action. And by this action all effects are supposed to be produced. Hence the various communications, determinations, accelerations of motion constitute the laws of nature.

162. The pure æther or invisible fire contains parts of different kinds, that are impressed with different forces, or subjected to different laws of motion, attraction, repulsion and expansion, and endued with divers distinct habitudes towards other bodies. These seem to constitute the many various qualities (*e*), virtues, flavours, odours, and colours, which distinguish natural productions. The different modes of cohæsion, attraction, repulsion and motion, appear to be the source from whence the specific properties are derived, rather than different shapes or figures. This, as hath been already observed, seems confirmed by the experiment of fixed salts operating one way, notwithstanding the difference of their angles. The original particles productive of odours, flavours, and other properties, as well as of colours, are, one may suspect, all contained and blended together in that universal and original seminary of pure elementary fire; from which they are diversly separated and attracted, by the various subjects of the animal, vegetable, and mineral kingdoms; which thereby become classed into kinds, and endued with those distinct properties, which continue till their several forms, or specific proportions of fire return into the common mass.

163. As the soul acts immediately on pure fire, so pure fire operates immediately on air. That is, the abrasions of all terrestrial things being rendered volatile and elastic by fire (*f*) and at the same time lessening the volatility and expansive force of the

(*e*) 37, 40, 44.

(*f*) 149, 150, 152.

fire, whose particles they attract and adhere to (*k*), there is produced a new fluid, more volatile than water or earth, and more fixed than fire. Therefore the virtues and operations imputed to air must be ultimately attributed to fire, as that which imparts activity to air itself.

164. The element of æthereal fire or light seems to comprehend, in a mixed state, the seeds, the natural causes and forms (*g*) of all sublunary things. The grosser bodies separate, attract, and repel the several constituent particles of that heterogeneous element; which, being parted from the common mass, make distinct essences, producing and combining together such qualities and properties, as are peculiar to the several subjects, and thence often extracted in essential oils or odoriferous waters, from whence they exhale into the open air, and return into their original element.

165. Blue, red, yellow, and other colours, have been discovered by Sir Isaac Newton to depend on the parted rays or particles of light. And in like manner, a particular odour or flavour, seemeth to depend on peculiar particles of light or fire (*b*); as appears from heat's being necessary to all vegetation whatsoever, and from the extreme minuteness and volatility of those vegetable souls or forms, flying off from the subjects without any sensible diminution of their weight. These particles, blended in one common ocean, should seem to conceal the distinct forms, but, parted and attracted by proper subjects, disclose or produce them. As the particles of light, which, when separated, form distinct colours, being blended are lost in one uniform appearance.

(*k*) 147.

(*g*) 43.

(*b*) 40.

K 2

166. A-

166. Agreeably thereto, an æthereal substance or fire was supposed by Heraclitus to be the seed of the generation of all things, or that from which all things drew their original. The Stoics also taught, that all substance was originally fire, and should return to fire: that an active subtile fire was diffused or expanded throughout the whole universe; the several parts whereof were produced, sustained, and held together by it's force. And it was the opinion of the Pythagoræans, as Laertius informs us, that heat or fire was the principle of life animating the whole system, and penetrating all the elements (*a*). The Platonists too, as well as the Pythagoræans, held fire to be the immediate natural agent, or animal spirit; to cherish, to warm, to heat, to enlighten, to vegetate, to produce the digestions, circulations, secretions, and organical motions in all living bodies, vegetable or animal, being effects of that element, which, as it actuates the macrocosm, so it animates the microcosm. In the Timæus of Plato, there is supposed something like a net of fire, and rays of fire in a human body. Doth not this seem to mean the animal spirit, flowing, or rather darting thro' the nerves?

167. According to the Peripatetics, the form of heaven, or the fiery æthereal substance, contains the forms of all inferior beings (*b*). It may be said to teem with forms, and impart them to subjects fitted to receive them. The vital force thereof in the Peripatetic sense is vital to all, but diversly received according to the diversity of the subjects. So all colours are virtually contained in the light; but their actual distinctions of blue, red, yellow, and the rest, depend on the difference of the objects which it illustrates. Aristotle in the book De

(*a*) 152, 153.

(*b*) 43.

munido; supposeth a certain fifth essence, an æthereal nature unchangeable and impassive; and next in order a subtile, flaming substance, lighted up, or set on fire by that æthereal and divine nature. He supposeth, indeed, that God is in heaven, but that his power, or a force derived from him, doth actuate and pervade the universe.

168. If we may credit Plutarch, Empedocles thought æther or heat to be Jupiter. Æther by the ancient philosophers was used to signify promiscuously sometimes fire and sometimes air. For they distinguished two sorts of air. Plato in the *Timæus* speaking of air, saith there are two kinds, the one more fine and subtile, called æther; the other more gross and replete with vapours. This æther or purer medium, seems to have been the air or principle, from which all things according to Anaximenes derived their birth, and into which they were back again resolved at their death. Hippocrates, in his treatise *De diæta*, speaketh of a fire pure and invisible; and this fire, according to him, is that which, stirring and giving movement to all things, causes them to appear, or, as he styles it, come into evidence, that is to exist, every one in it's time, and according to its destiny.

169. This pure fire, æther, or substance of light, was accounted in itself invisible and imperceptible to all our senses, being perceived only by it's effects, such as heat, flame, and rarefaction. To which we may add, that the moderns pretend farther to have perceived it by weight, inasmuch as the aromatic oils which most abound with fire, as being the most readily and vehemently enflamed, are above all others the heaviest. And by an experiment of Mr. Homberg's, four ounces of regulus of antimony, being calcined by a burning glass for

for an hour together, were found to have imbibed and fixed seven drams of the substance of light.

170. Such is the rarefying and expansive force of this element, as to produce in an instant of time the greatest and most stupendous effects: a sufficient proof, not only of the power of fire, but also of the wisdom with which it is managed, and withheld from bursting forth every moment to the utter ravage and destruction of all things. And it is very remarkable, that this same element, so fierce and destructive, should yet be so variously tempered and applied, as to be withal the salutary warmth, the genial, cherishing, and vital flame of all living creatures. It is not therefore to be wondered that Aristotle thought, the heat of a living body to be somewhat divine and celestial, derived from that pure æther to which he supposed the incorporeal deity (*χωριστὸν εἶδος*) to be immediately united, or on which he supposed it immediately to act.

171. The Platonists held their intellect resided in soul, and soul in an æthereal vehicle. And that as the soul was a middle nature reconciling intellect with æther; so æther was another middle nature, which reconciled and connected the soul with grosser bodies (*d*). Galen likewise taught, that, admitting the soul to be incorporeal, it hath for it's immediate tegument or vehicle a body of æther or fire, by the intervention whereof it moveth other bodies and is mutually affected by them. This interior clothing was supposed to remain upon the soul, not only after death, but after the most perfect purgation, which in length of time according to the followers of Plato and Pythagoras cleansed the soul,

— purumque reliquit

Æthereum sensum atque auræ simplicis ignem.

(*d*) 152, 154.

This

This tunic of the soul's whether it be called pure æther, or luciform vehicle, or animal spirit seemeth to be that which moves and acts upon the gross organs, as it is determined by the soul, from which it immediately receives impressiion, and in which the moving force truly and properly resides. Some moderns have thought fit to deride all that is said of æthereal vehicles, as mere jargon or words without a meaning. But they should have considered, that all speech concerning the soul is altogether, or for the most part, metaphorical; and that, agreeably thereunto, Plato speaketh of the mind or soul, as a driver that guides and governs a chariot, which is, not unfitly, styled *ἀγροειδὲς*, a luciform æthereal vehicle, or *ὄχημα*, terms expressive of the purity, lightness, subtilty and mobility of that fine celestial nature, in which the soul immediately resides and operates.

172. It was a tenet of the Stoics that the world was an animal, and that providence answered to the reasonable soul in man. But then the providence or mind was supposed by them to be immediately resident or present in fire, to dwell therein, and to act thereby. Briefly, they conceived God to be an intellectual and fiery spirit, *πνεῦμα νοερὸν καὶ πυρῶδες*. Therefore though they looked on fire (*f*) as the *τὸ ἡγεμονικόν* or governing principle of the world; yet it was not simply fire, but animated with a mind.

173. Such are the bright and lively signatures of a divine mind, operating and displaying itself in fire and light throughout the world, that, as Aristotle observes in his book *De mundo*, all things seem full of divinities, whose apparitions on all sides strike and dazzle our eyes. And it must be

owned, the chief philosophers and wise men of antiquity, how much soever they attributed to second causes and the force of fire, yet they supposed a mind or intellect always resident therein, active or provident, restraining it's force and directing it's operations.

174. Thus Hipocrates in his treatise, *De diæta*, speaks of a strong but invisible fire (*g*), that rules all things without noise. Herein, saith he, resides soul, understanding, prudence, growth, motion, diminution, change, sleep and waking. This is what governs all things and is never in repose. And the same author, in his tract *De carnibus*, after a serious preface, setting forth that he is about to declare his own opinion, expresseth it in these terms: "That which we call heat, *θερμὸν*, appears to me something immortal, which understands all things, which sees and knows both what is present, and what is to come."

175. This same heat is also what Hippocrates calls nature, the author of life and death, good and evil. It is farther to be noted of this heat, that he maketh it the object of no sense. It is that occult, universal nature, and inward invisible force, which actuates and animates the whole world, and was worshipped by the ancients under the name of Saturn; which Vossius judges, not improbably, to be derived from the Hebrew word *Satar*, to lye hidden or concealed. And what hath been delivered by Hippocrates agrees with the notions of other philosophers: Heraclitus, (*b*) for instance, who held fire to be the principle and cause of the generation of all things, did not mean thereby an inanimate element, but, as he termed it, *πῦρ αἰεζῶν*, an ever-living fire.

(*g*) 168.

(*b*) 166.

176. Theo-

176. Theophrastus, in his Book, *De igne*; distinguisheth between heat and fire. The first he considers as a principle or cause, not that which appeareth to sense as a passion or accident existing in a subject, and which is in truth the effect of that unseen principle. And it is remarkable, that he refers the treating of this invisible fire or heat, to the investigation of the first causes. Fire, the principle, is neither generated nor destroyed, is every where and always present (*a*); while its effects in different times and places shew themselves more or less, and are very various, soft, and cherishing, or violent and destructive, terrible or agreeable, conveying good and evil, growth and decay, life and death, throughout the mundane system.

177. It is allowed by all, that the Greeks derived much of their philosophy from the Eastern nations. And Heraclitus is thought by some to have drawn his principles from Orpheus, as Orpheus did from the Ægyptians; or, as others write, he had been auditor of Hippasus a Pythagorean, who held the same notion of fire, and might have derived it from Egypt by his master Pythagoras, who had travelled into Egypt, and been instructed by the sages of that nation. One of whose tenets it was, that fire was the principle of all action; which is agreeable to the doctrine of the Stoics, that the whole of things is administered by a fiery intellectual spirit. In the *Asclepian Dialogue*, we find this notion, that all parts of the world vegetate by a fine subtil æther, which acts as an engine or instrument, subject to the will of the supreme God.

178. As the Platonists held intellect to be lodged in soul, and soul in æther (*b*); so it passeth

(*a*) 43. (*b*) 157.

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for

for a doctrine of Trismegistus in the Pimander, that mind is cloathed by soul, and soul by spirit. Therefore as the animal spirit of man, being subtil and luminous, is the immediate tegument of the human soul, or that wherein and whereby she acts; even so the spirit of the world, that active fiery æthereal substance of light, that permeates and animates the whole system, is supposed to cloath the soul, which cloaths the mind of the universe.

179. The Magi likewise said of God, that he had light for his body and truth for his soul. And in the Chaldaic oracles, all things are supposed to be governed by a πῦρ νοερόν, or intellectual fire. And in the same oracles, the creative mind is said to be cloathed with fire, Ἐσσοάμενος πῦρ πῦρ, which oriental reduplication of the word fire, seems to imply the extreme purity and force thereof. Thus also in the Psalms, Thou art clothed with light as with a garment. Where, the word rendered light might have been rendered fire, the Hebrew letters being the same with those in the word which signifies fire, all the difference being in the pointing, which is justly counted a late invention. That other scripture sentence is remarkable: Who maketh his ministers a flaming fire; which might, perhaps, be rendered more agreeably to the context, as well as consistently with the Hebrew, after this manner: Who maketh flaming fire his ministers; and the whole might run thus: Who maketh the winds his messengers, and flaming fire his ministers.

180. A notion of something divine in fire, animating the whole world, and ordering its several parts, was a tenet of very general extent (a),

(a) 156, 157, 163, 166, 167, 168, 170, 172, 173, 174, 175, 177, &c.

being

being embraced in the most distant times and places, even among the Chinese themselves; who make tien, æther, or heaven, the sovereign principle, or cause of all things, and teach that the celestial virtue, by them called li, when joined to corporeal substance, doth fashion, distinguish, and specificate all natural beings. This li of the Chinese seems to answer the forms of the Peripatetics. And both bear analogy to the foregoing philosophy of fire.

181. The heaven is supposed pregnant with virtues and forms, which constitute and discriminate the various species of things. And we have more than once observed, that, as the light, fire, or celestial æther, being parted by refracting or reflecting bodies, produceth variety of colours; even so, that same apparently uniform substance being parted and secreted by the attracting and repelling powers of the divers secretory ducts of plants and animals, that is, by natural chemistry, produceth or imparteth the various specific properties of natural bodies. Whence the tastes and odours and medicinal virtues so various in vegetables.

182. The tien is considered and adored by the learned Chinese, as living and intelligent æther, the $\pi\upsilon\rho\ \nu\omicron\sigma\epsilon\rho\acute{o}\nu$ of the Chaldæans and the Stoics. And the worship of things celestial, the sun and stars, among the eastern nations less remote, was on account of their fiery nature, their heat and light, and the influence thereof. Upon these accounts, the sun was looked on by the Greek theologers as the spirit of the world, and the power of the world. The cleansing quality, the light and heat of fire are natural symbols of purity, knowledge, and power, or, if I may so say, the things them-

selves so far as they are perceptible to our senses, or in the same sense as motion is said to be action. Accordingly, we find a religious regard was paid to fire, both by Greeks and Romans, and indeed by most, if not all, the nations of the world.

183. The worship of Vesta at Rome was, in truth, the worship of fire.

Nec tu aliud Vestam quam vivam intellige flammam,

saith Ovid in his *Fasti*. And as in old Rome the eternal fire was religiously kept by virgins, so in Greece, particularly at Delphi and Athens, it was kept by widows. It is well known that Vulcan or Fire was worshipped with great distinction by the Ægyptians. The Zabii or Sabæans are also known to have been worshippers of fire. It appears too from the Chaldæan oracles, that fire was regarded as divine by the sages of that nation. And it is supposed that Ur of the Chaldæans was so called from the Hebrew word signifying fire, because fire was publickly worshipped in that city. That a religious worship was paid to fire by the ancient Persians and their Magi, is attested by all antiquity. And the sect of Persees, or old Gentils, of whom there are considerable remains at this day both in the Mogols country and in Persia, doth testify the same.

184. It doth not seem that their prostrations before the perpetual fires, preserved with great care in their Pyreia, or fire temples, were merely a civil respect, as Dr. Hyde would have it thought. Although he brings good proof that they do not invoke the fire on their altars, or pray to it, or call it God: and that they acknowledge a supreme invisible deity. Civil respects are paid to things
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as related to civil power: but such relation doth not appear in the present case. It shou'd seem therefore, that they worship God as present in the fire, which they worship or reverence, not ultimately or for it self, but relatively to the supreme being. Which it is not unlikely was elsewhere the case at first; though the practice of men, especially of the vulgar, might in length of time degenerate from the original institution, and rest in the object of sense.

185. Doctor Hyde, in his history of the religion of the ancient Persians, would have it thought, that they borrowed the use and reverence of perpetual fires, from the Jewish practice prescribed in the Levitical law, of keeping a perpetual fire burning on the altar. Whether that was the case or not, thus much one may venture to say, it seems probable that whatever was the original of this custom among the Persians, the like customs among the Greeks and Romans were derived from the same source.

186. It must be owned there are many passages in holy scripture (a), that would make one think, the supreme being was in a peculiar manner present and manifest in the element of fire. Not to insist that God is more than once said to be a consuming fire, which might be understood in a metaphorical sense, the divine apparitions were by fire, in the bush, at moutnt Sinai, on the tabernacle, in the cloven tongues. God is represented in the inspired writings, as descending in fire, as attended by fire, or with fire going before him. Celestial things, as angels, chariots, and such like phænomena are invested with fire, light, and splendor. Ezekiel in his visions beheld

(a) 179.

fire and brightness, lamps, burning coals of fire, and flashes of lightening. In a vision of Daniel the throne of God appeared like a fiery flame, and his wheels like burning fire. Also a fiery flame issued and came forth from before him.

187. At the transfiguration, the apostles saw our Saviour's face shining as the sun, and his raiment white as light, also a lucid cloud or body of light, out of which the voice came; which visible light and splendor was, not many centuries ago, maintained by the Greek church, to have been divine, and uncreated, and the very glory of God: as may be seen in the history wrote by the emperor John Cantacuzene. And of late years bishop Patrick gives it as his opinion, that in the beginning of the world, the Shecinah or divine presence, which was then frequent and ordinary, appeared by light or fire. In commenting on that passage, where Cain is said to have gone out from the presence of the Lord, the bishop observes, that if Cain after this turned a downright idolater, as many think, it is very likely he introduced the worship of the sun, as the best resemblance he could find of the glory of the Lord, which was wont to appear in a flaming light. It would be endless to enumerate all the passages of holy scripture, which confirm and illustrate this notion, or represent the Deity as appearing and operating by fire. The misconstruction of which might possibly have misled the Gnostics, Basilidians, and other ancient heretics into an opinion, that Jesus Christ was the visible corporeal sun.

188. We have seen, that in the most remote ages and countries, the vulgar as well as the learned, the institutions of lawgivers as well as the reasonings of philosophers, have ever considered the

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the element of fire in a peculiar light, and treated it with more than common regard, as if it were something of a very singular and extraordinary nature. Nor are there wanting authors of principal account among the moderns, who entertain like notions concerning fire, especially among those who are most conversant in that element, and should seem best acquainted with it.

189. Mr. Homberg the famous modern chemist, who brought that art to so great perfection, holds the substance of light or fire to be the true chemic principal sulphur (*a*), and to extend it self throughout the whole universe. It is his opinion that this is the only active principle. That mixed with various things it formeth several sorts of natural productions, with salts making oyl, with earth bitumen, with mercury metal. That this principle of sulphur, fire, or the substance of light, is in it self imperceptible, and only becomes sensible as it is joined with some other principle, which serves as a vehicle for it. That, although it be the most active of all things, yet it is at the same time the most firm bond and cement to combine and hold the principles together, and give form to the mixed bodies. And, that in the analysis of bodies it is always lost, escaping the skill of the artist, and passing through the closest vessels.

190. Boerhaave, Niewenty't, and divers other moderns are in the same way of thinking. They with the ancients distinguish a pure, elementary, invisible fire from the culinary, or that which appears in ignited bodies (*b*). This last they will not allow to be pure fire. The pure fire is to be discerned by it's effects alone; such as heat, dilatation of all solid bodies, and rarefaction of fluids,

(*a*) 129. (*b*) 163, 166.

the segregating heterogeneous bodies, and congregating those that are homogeneous. That therefore which smoakes and flames is not pure fire, but that which is collected in the focus of a mirror or burning glass. This fire seems the source of all the operations in nature: without it nothing either vegetates, or putrefies, lives or moves or ferments, is dissolved or compounded or altered, throughout this whole natural world in which we subsist. Were it not for this, the whole wou'd be one great stupid inanimate mass. But this active element is supposed to be every where, and always present, imparting different degrees of life, heat, and motion, to the various animals, vegetables, and other natural productions, as well as to the elements themselves, wherein they are produced and nourished.

191. As water acts upon salt, or aqua fortis upon iron, so fire dissolves all other bodies. Fire, air, and water are all three menstruums: but the two last seem to derive all their force and activity from the first (a). And indeed there seems to be, originally or ultimately, but one menstruum in nature, to which all other menstruums, may be reduced. Acid salts are a menstruum, but their force and distinct powers are from sulphur. Considered as pure, or in themselves, they are all of the same nature. But, as obtained by distillation, they are constantly joined with some sulphur, which characterizeth and cannot be separated from them. This is the doctrine of monsieur Homberg. But what is it that characterizeth or differenceth the sulphurs themselves? If sulphur be the substance of light, as that author will have it, whence is it that animal, vege-

(a) 149.

table, and metallic sulphurs impart different qualities to the same acid salt? Can this be explained upon Homberg's principles? And are we not obliged to suppose, that light separated by the attracting and repelling powers in the strainers, ducts, and pores of those bodies, forms several distinct kinds of sulphur, all which, before such separation, were lost and blended together, in one common mass of light or fire seemingly homogeneous.

192. In the analysis of inflammable bodies, the fire or sulphur is lost, and the diminution of weight sheweth the loss (*a*). Oil is resolved into water, earth, and salt, none of which is inflammable. But the fire or vinculum which connected those things, and gave the form of oil, escapes from the artist. It disappears, but is not destroyed. Light or fire imprisoned made part of the compound, gave union to the other parts, and form to the whole. But having escaped, it mingles with the general ocean of æther, till being again parted and attracted, it enters and specificates some new subject, of the animal, vegetable, or mineral kingdom. Fire therefore in the sense of philosophers is also fire, though not always flame.

193. Solar fire or light, in calcining certain bodies, is observed to add to their weight. There is therefore no doubt but light can be fixed, and enter the composition of a body. And though it should lye latent for a long time, yet, being set free from its prison, it shall still shew itself to be fire. Lead, tin, or regulus of antimony, being exposed to the fire of a burning glass, though they lose much in smook and steam, are nevertheless found to be considerably increased in weight, which proves the introduction of light or fire in-

(*a*) 169.

to their pores. It is also observed, that urine produceth no phosphorus, unless it be long exposed to the solar light. From all which it may be concluded, that bodies attract and fix the light; whence it should seem, as some have observed, that fire without burning is an ingredient in many things, as water without wetting.

194. Of this there cannot be a better proof, than the experiment of Monsieur Homberg, who made gold of mercury, by introducing light into its pores, but at such trouble and expence, that I suppose no body will try the experiment for profit. By this junction of light and mercury, both bodies became fixed, and produced a third different from either, to wit, real gold. For the truth of which fact, I refer to the memoirs of the French academy of Sciences. From the foregoing experiment it appears, that gold is only a mass of mercury penetrated and cemented by the substance of light, the particles of those bodies attracting and fixing each other. This seems to have been not altogether unknown to former philosophers; Marsilius Ficinus the Platonist, in his commentary on the first book of the second Ennead of Plotinus, and others likewise before him, regarding mercury as the mother, and sulphur as the father of metals; and Plato himself in his Timæus describing gold, to be a dense fluid with a shining yellow light, which well suits a composition of light and mercury.

195. Fire or light mixeth with all bodies (a), even with water; witness the flashing lights in the sea, whose waves seem frequently all on fire. Its operations are various according to its kind, quantity, and degree of vehemence. One degree

(a) 157.

keeps water fluid, another turns it into elastic air (*a*). And air itself seems to be nothing else but vapours and exhalations, rendered elastic by fire. Nothing flames but oil: and sulphur with water, salt, and earth compose oil; which sulphur is fire: therefore fire enclosed attracts fire, and causeth the bodies whose composition it enters to burn and blaze.

196. Fire collected in the focus of a glass operates in vacuo, and therefore is thought not to need air to support it. Calx of lead hath gone off with an explosion in vacuo, which Niewentyt and others take for a proof that fire can burn without air. But Mr. Hales attributes this effect to air enclosed in the red lead, and perhaps too in the receiver, which cannot be perfectly exhausted. When common lead is put into the fire in order to make red-lead, a greater weight of this comes out than was put in of common lead. Therefore the red-lead should seem impregnated with fire. Mr. Hales thinks it is with air. The vast expansion of compound aqua fortis, Mr. Niewentyt will have to proceed from fire alone. Mr. Hales contends that air must necessarily co-operate. Though by Niewentyt's experiment it should seem, the phosphorus burns equally, with and without air.

197. Perhaps they who hold the opposite sides in this question, may be reconciled by observing that air is in reality nothing more than particles of wet and dry bodies volatilised, and rendered elastic by fire (*b*). Whatever therefore is done by air must be ascribed to fire, which fire is a subtile invisible thing, whose operation is not to be discerned but by means of some grosser body, which

(*a*) 149.

(*b*) 147, 150, 151.

erves not for a pabulum to nourish the fire, but for a vehicle to arrest and bring it into view. Which seems the sole use of oil, air, or any other thing, that vulgarly passeth for a pabulum or food of that element.

198. To explain this matter more clearly, it is to be observed, that fire, in order to become sensible, must have some subject to act upon. This being penetrated and agitated by fire affects us with light, heat, or some other sensible alteration. And this subject so wrought upon may be called *culinary fire*. In the focus of a burning glass exposed to the sun, there is real actual fire, though not discerned by the sense, till it hath somewhat to work on, and can shew itself in it's effects, heating, flaming, melting, and the like. Every ignited body is, in the foregoing sense, *culinary fire*. But it will not therefore follow, that it is convertible into pure elementary fire. This, for ought that appears, may be ingenerable and incorruptible by the course of nature. It may be fixed and imprisoned in a compound (*a*), and yet retain it's nature, though lost to sense, and though it return into the invisible elementary mass, upon the analysis of the compounded body: as is manifest in the solution of stone lime by water.

199. It should seem, therefore, that what is said of air's being the pabulum of fire, or being converted into fire, ought to be understood only in this sense; to wit, that air being less gross than other bodies, is of a middle nature, and therefore more fit to receive the impressions of a fine æthereal fire (*b*), and impart them to other things. According to the antients, soul serveth for a vehicle to

(*a*) 169, 192. 193.

(*b*) 163.

Intellect (*a*), and light or fire for a vehicle to the soul; and, in like manner, air may be supposed a vehicle to fire, fixing it in some degree, and communicating it's effects to other bodies.

200. The pure invisible fire or æther doth permeate all bodies, even the hardest and most solid, as the diamond. This alone, therefore, cannot, as some learned men have supposed, be the cause of muscular motion, by a mere impulse of the nerves communicated from the brain to the membranes of the muscles, and thereby to the enclosed æther, whose expansive motion, being by that means increased, is thought to swell the muscles, and cause a contraction of the fleshy fibres. This, it should seem, the pure æther cannot do immediately, and of itself, because, supposing it's expansive motion to be increased, it must still pass through the membranes, and consequently not swell them, inasmuch as æther is supposed freely to pervade the most solid bodies. It should seem therefore, that this effect must be owing, not to pure æther, but to æther in some part fixed and arrested by the particles of air.

201. Although this æther be extremely elastic, yet, as it is sometimes found by experience to be attracted, imprisoned and detained in gross bodies (*b*), so we may suppose it to be attracted, and its expansive force diminished, though it should not be quite fixed, by the loose particles of air, which combining and cohering therewith may bring it down, and qualify it for intercourse with grosser things. Pure fire may be said to animate air, and air other things. Pure fire is invisible; therefore flame is not pure fire. Air is necessary both to life and flame. And it is found by experi-

(*a*) 178.

(*b*) 169.

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ment, that air loseth in the lungs the power of feeding flame. Hence it is concluded, that the same thing in air contributes both to life and flame. Vital flame survives culinary flame in vacuo : therefore it requires less of that thing to sustain it.

202. What this may be, whether some certain proportion, or some peculiar parts of æther, is not easy to say. But thus much seems plain, that whatever is ascribed to acid may be also ascribed to fire or æther. The particles of æther fly asunder with the greatest force : therefore, agreeably to Sir Isaac Newton's doctrine, when united they must attract each other with the greatest force. Therefore they constitute the acid. For whatsoever strongly attracts and is attracted, may be called an acid, as Sir Isaac Newton informs us in his tract *De acido*. Hence it should seem, that the sulphur of Homberg, and the acid of Sir Isaac are at bottom one and the same thing, to wit, pure fire or æther.

203. The vital flame or æthereal spirit, being attracted and imprisoned in grosser bodies, seemeth to be set free and carried off, by the superior attraction of a subtil and pure flame. Hence, perhaps it is, that lightening kills animals, and turns spirituous liquors vapid in an instant.

204. Hippocrates in his book concerning the Heart observeth, that the soul of man is not nourished by meats and drinks from the lower belly, but by a pure and luminous substance darting its rays, and distributing a non-natural nourishment, as he terms it, in like manner as that from the intestines is distributed to all parts of the body. This luminous non-natural nourishment, though it be secreted from the blood, is expressly said not to come from the lower belly. It is plain, therefore,
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he thought it came into the blood either by respiration, or by attraction through the pores. And it must be acknowledged, that somewhat igneous or æthereal brought by the air into the blood seems to nourish, though not the soul itself, yet the interior tunicle of the soul, the *aurai simplicis ignem*.

205. That there is really such a thing as vital flame, actually kindled, nourish'd, and extinguish'd like common flame, and by the same means, is an opinion of some moderns, particularly of Doctor Willis in his tract *De sanguinis accensione*: that it requires constant eventilation, through the trachea and pores of the body, for the discharge of a fuliginous and excrementitious vapour: and that this vital flame, being extremely subtil, might not be seen any more than shining flies or *ignes fatui* by day-light. And yet it hath sometimes become visible on divers persons, of which there are undoubted instances. This is Dr. Willis's notion: and perhaps there may be some truth in this, if it be so understood, as that light or fire might indeed constitute the animal spirit or immediate vehicle of the soul.

206. There have not been wanting those, who, not content to suppose light the most pure and refined of all corporeal beings, have gone farther, and bestowed upon it some attributes of a yet higher nature. Julianus the Platonic philosopher, as cited by Ficinus, saith, it was a doctrine in the theology of the Phœnicians, that there is diffused throughout the universe, a pellucid and shining nature pure and impassive, the act of a pure intelligence. And Ficinus himself undertakes to prove, that light is incorporeal, by several arguments: Because it enlightens and fills a great space in an instant, and without opposition: Because several
lights

lights meet without resisting each other : Because light cannot be defiled by filth of any kind : Because the solar light is not fixed in any subject : Lastly, because it contracts and expands it self so easily without collision, condensation, rarefaction, or delay throughout the vastest space. These reasons are given by Ficinus, in his comment on the first book of the second Ennead of Plotinus.

207. But it is now well known, that light moves, that it's motion is not instantaneous : that it is capable of condensation, rarefaction, and collision : that it can be mixed with other bodies, enter their composition, and increase their weight (a). All which seems sufficiently to overthrow those arguments of Ficinus, and shew light to be corporeal. There appears indeed some difficulty at first sight, about the non-resistance of rays or particles of light occurring one to another, in all possible directions or from all points. Particularly, if we suppose the hollow surface of a large sphere, studded with eyes looking inwards one at another, it may perhaps seem hard to conceive, how distinct rays from every eye should arrive at every other eye without jostling, repelling, and confounding each other.

208. But these difficulties may be got over by considering in the first place, that visible points are not mathematical points, and consequently, that we are not to suppose every point of space a radiating point. Secondly, by granting that many rays do resist and intercept each other, notwithstanding which the act of vision may be performed. Since as every point of the object is not seen, so it is not necessary that rays from every such point arrive at the eye. We often see

(a) 169, 192, 193;

an object, though more dimly, when many rays are intercepted by a gross medium.

209. Besides, we may suppose the particles of light to be indefinitely small, that is, as small as we please, and their aggregate to bear as small a proportion to the void as we please, there being nothing in this that contradicts the phænomena. And there needs nothing more in order to conceive the possibility of rays passing from and to all visible points, although they be not incorporeal. Suppose a hundred ports placed round a circular sea, and ships sailing from each port to every other; the larger the sea, and the smaller the vessels are supposed, the less danger will there be of their striking against each other. But as there is, by hypothesis no limited proportion between the sea and the ships, the void and solid particles of light, so there is no difficulty that can oblige us to conclude the sun's light incorporeal from it's free passage; especially when there are so many clear proofs of the contrary. As for the difficulty, therefore, attending the supposition of a sphere studded with eyes looking at each other, this is removed only by supposing the particles of light exceeding small relatively to the empty spaces.

210. Plotinus supposeth, that from the sun's light which is corporeal, there springs forth another equivocal light which is incorporeal, and as it were the brightness of the former. Marsilius Ficinus also, observing it to be a doctrine in the *Timæus* of Plato, that there is an occult fire or spirit diffused throughout the universe, intimates that this same occult invisible fire or light is, as it were, the light of the mundane soul. And Plotinus, in his fourth *Ennead*, sheweth it to be his opinion, that the world seeth it self and all it's

parts. The Platonic philosophers do wonderfully refine upon light, and soar very high: from coal to flame; from flame to light; from this visible light to the occult light of the celestial or mundane soul, which they supposed to pervade and agitate the substance of the universe by it's vigorous and expansive motion.

211. If we may believe Diogenes Laertius, the Pythagorean philosophers thought there was a certain pure heat or fire, which had somewhat divine in it, by the participation whereof men became allied to the gods. And according to the Platonists, heaven is not defined so much by it's local situation, as by it's purity. The purest and most excellent fire, that is heaven, saith Ficinus. And again, the hidden fire that every where exerts it self, he calls celestial. He represents fire as most powerful and active, dividing all things, abhorring all composition or mixture with other bodies. And, as soon as it gets free, relapsing instantly into the common mass of celestial fire, which is every where present and latent.

212. This is the general source of life, spirit, and strength, and therefore of health to all animals, who constantly receive it's illapses cloathed in air, through the lungs and pores of the body. The same spirit imprisoned in food and medicines, is conveyed into the stomach, the bowels, the lacteals, circulated and secreted by the several ducts, and distributed throughout the system (a). Plato in his Timæus enumerating the ignited juices, names wine in the first place, and tar in the second. But wine is pressed from the grape, and fermented by human industry. Therefore of all ignited juices purely natural, tar or resin must in his account be esteemed the first.

(a) 37, 42, 44.

213. The vivifying luminous æther exists in all places, even the darkest caverns, as is evident from hence, that many animals see in those dark places, and that fire may be kindled in them by the collision or attrition of bodies. It is also known that certain persons have fits of seeing in the dark. Tiberius was said to have had this faculty or distemper. I my self knew an ingenious man, who had experienced it several times in himself. And doctor Willis, in his tract De sanguinis accensione, mentions another of his own knowledge. This luminous æther or spirit is therefore said by Virgil, to nourish or cherish the innermost earth, as well as the heavens and celestial bodies.

Principio cœlum ac terras, camposque liquentes,
Lucentemque globum Lunæ, Titaniaque astra
Spiritus intus alit.

214. The principles of motion and vegetation in living bodies seem to be delibations from the invisible fire or spirit of the universe (a). Which, though present to all things, is not nevertheless one way received by all; but variously imbibed, attracted, and secreted by the fine capillaries, and exquisite strainers in the bodies of plants and animals, whereby it becomes mixed and detained in their juices.

215. It hath been thought by some observers of nature, that the fine glandular vessels admit from the common mass of the blood, only such juices as are homogeneous to those, with which they were originally imbued. How they came to be so imbued doth not appear. But thus much is plain; that fine tubes attract fluids, that the glands are fine tubes, and that they attract very

(a) 43, 157, 164, 171.

different juices from the common mass. The same holds also with regard to the capillary vessels (*a*) of vegetables, it being evident that through the fine strainers in the leaves and all over the body of the plant, there be juices or fluids of a particular kind drawn in, and separated from the common mass of air and light. And that the most elaborate spirit, whereon the character or distinguishing virtue and properties of the plant depend, is of a luminous (*b*) and volatile nature, being lost or escaping into air or æther, from essential oils and odoriferous waters, without any sensible diminution of the subject.

216. As different kinds of secreted light or fire produce different essences, virtues, or specific properties, so also different degrees of heat produce different effects. Thus one degree of heat keeps the blood from coagulating, and another degree coagulates the blood. Thus a more violent fire hath been observed to set free and carry off that very light, which a more moderate fire had introduced and fixed in the calcined regulus of antimony. In like manner, one kind or quantity of this ætherial fiery spirit may be congenial and friendly to the spirits of a man, while another may be noxious.

217. And experience sheweth this to be true. For the fermented spirit of wine or other liquors produceth irregular motions, and subsequent depressions in the animal spirits. Whereas the luminous spirit lodged and detained in the native balsam of pines and firs, is of a nature so mild and benign and proportioned to the human constitution, as to warm without heating, to cheer but not inc-

(*a*) 30, 31, 33, 35.

(*b*) 37, 43.

briate,

briate, and to produce a calm and steady joy like the effect of good news, without that sinking of spirits which is a subsequent effect of all fermented cordials. I may add, without all other inconvenience, except that it may, like any other medicine, be taken in too great a quantity for a nice stomach. In which case it may be right, to lessen the dose, or to take it only once in the four and twenty hours, empty, going to bed (when it is found to be least offensive) or even to suspend the taking of it for a time, till nature shall seem to crave it, and rejoice in it's benign and comfortable spirit.

218. Tar-water serving as a vehicle to this spirit is both diuretic and diaphoretic, but seems to work it's principal effect by assisting the *vis vitæ*, as an alterative and cordial, enabling nature by an accession of congenial spirit, to assimilate that which could not be assimilated by her proper force, and so to subdue the *fomes morbi*. And this should seem in most cases the best and safest course. Great evacuations weaken nature as well as the disease. And it is to be feared that they who use salivations and copious bleedings may, though they should recover of the distemper, in their whole life be never able to recover of the remedies.

219. It is true indeed, that in chronical cases there is need of time to compleat a cure, and yet I have known this tar-water in disorders of the lungs and stomach to prove a very speedy remedy, and to allay the anxiety and heat of a fever in an instant, giving ease and spirits to the patient. This I have often experienced, not without surprise, at seeing these salutary effects follow so immediately in a fever on taking a glass of tar-water. Such is the force of these active vivifying principles contained in this balsam.

220. Force

220. Force or power, strictly speaking, is the agent alone who imparts an equivocal force to the invisible elementary fire, or animal spirit (*a*) of the world, and this to the ignited body or visible flame, which produceth the sense of light and heat. In this chain the first and last links are allowed to be incorporeal: the two intermediate are corporeal, being capable of motion, rarefaction, gravity, and other qualities of bodies. It is fit to distinguish these things, in order to avoid ambiguity concerning the nature of fire.

221. Sir Isaac Newton in his Optics, asks; Is not fire a body heated so hot as to emit light copiously? for what else, adds he, is a red hot iron than fire? Now it should seem, that to define fire by heat, would be to explain a thing by itself. A body heated so hot as to emit light is an ignited body, that is, hath fire in it, is penetrated and agitated by fire, but is not itself fire. And although it should in the third foregoing acceptance, or vulgar sense pass for fire, yet it is not the pure elementary (*b*) fire in the second or philosophic sense, such as was understood by the sages of antiquity, and such as is collected in the focus of a burning glass; much less is it the vis, force, or power of burning, destroying, calcining, melting, vitrifying, and raising the perceptions of light and heat. This is truly and really in the incorporeal agent, and not in the vital spirit of the universe. Motion, and even power in an equivocal sense, may be found in this pure æthereal spirit, which ignites bodies, but is not itself the ignited body, being an instrument or medium (*c*) by which the real agent doth operate on grosser bodies.

(*a*) 153, 156, 157. (*b*) 190. (*c*) 160.

222. It hath been shewed in Sir Isaac Newton's Optics, that light is not reflected by impinging on bodies, but by some other cause. And to him it seems probable, that as many rays as impinge on the solid parts of bodies, are not reflected but stifled and retained in the bodies. And it is certain, the great porosity of all known bodies affords room for much of this light or fire to be lodged therein. Gold itself, the most solid of all metals, seems to have far more pores than solid parts, from water being pressed through it in the Florentine experiment, from magnetic effluvia passing, and from mercury entering its pores so freely. And it is admitted that water, though impossible to be compressed, hath at least forty times more pores than solid parts. And as acid particles, joined with those of earth in certain proportions, are so closely united with them, as to be quite hid and lost to all appearance, as in mercurius dulcis and common sulphur, so also may we conceive the particles of light or fire to be absorbed and latent in grosser bodies.

223. It is the opinion of Sir Isaac Newton, that somewhat unknown remains in vacuo, when the air is exhausted. This unknown medium he calls æther. He supposeth it to be more subtil in its nature, and more swift in its motion, than light, freely to pervade all bodies, and by its immense elasticity to be expanded throughout all the heavens. Its density is supposed greater in free and open spaces, than within the pores of compact bodies. And, in passing from the celestial bodies to great distances, it is supposed to grow denser and denser continually; and thereby cause those great bodies to gravitate towards one another, and their respective parts towards their centers, every
body

body endeavouring to pass from the denser parts of the medium towards the rarer.

224. The extreme minuteness of the parts of this medium and the velocity of their motion, together with its gravity, density, and elastic force, are thought to qualify it for being the cause of all the natural motions in the universe. To this cause are ascribed the gravity and cohesion of bodies. The refraction of light is also thought to proceed from the different density and elastic force of this æthærial medium in different places. The vibrations of this medium alternately concurring with, or obstructing the motions of the rays of light, are supposed to produce the fits of easy reflexion and transmission. Light by the vibrations of this medium is thought to communicate heat to bodies. Animal motion and sensation are also accounted for by the vibrating motions of this æthærial medium, propagated thro' the solid capillaments of the nerves. In a word, all the phænomena and properties of bodies, that were before attributed to attraction, upon later thoughts seem ascribed to this æther, together with the various attractions themselves.

225. But in the philosophy of Sir Isaac Newton, the fits (as they are called) of easy transmission and reflexion, seem as well accounted for by vibrations excited in bodies by the rays of light, and the refraction of light by the attraction of bodies. To explain the vibrations of light by those of a more subtil medium, seems an uncouth explication. And gravity seems not an effect of the density and elasticity of æther, but rather to be produced by some other cause; which Sir Isaac himself insinuates to have been the opinion even of those ancients who took vacuum, atoms, and the gravity of atoms for the principles of their philosophy, tacitly attributing

buting (as he well observes) gravity to some other cause distinct from matter, from atoms, and consequently, from that homogeneous æther or elastic fluid. The elasticity of which fluid is supposed to depend upon, to be defined and measured by it's density; and this by the quantity of matter in one particle, multiplied by the number of particles contained in a given space; and the quantity of matter in any one particle or body of a given size to be determined by it's gravity. Should not therefore gravity seem the original property and first supposed? On the other hand, if force be considered as prescinded from gravity and matter, and as existing only in points or centers, what can this amount to but an abstract spiritual incorporeal force?

226. It doth not seem necessary from the phenomena, to suppose any medium more active and subtil than light or fire. Light being allowed to move at the rate of about ten millions of miles in a minute, what occasion is there to conceive another medium of still smaller and more moveable parts. Light or fire seems the same with æther. So the ancients understood, and so the Greek word implies. It pervades all things (*a*), is every where present. And this same subtil medium according to it's various quantities, motions, and determinations, sheweth itself in different effects or appearances, and is æther, light, or fire.

227. The particles of æther fly asunder with the greatest force, therefore when united they must (according to the Newtonian doctrine) attract each other with the greatest force; therefore they are acids (*b*), or constitute the acid; but this united with earthy parts maketh alkali, as Sir Isaac teacheth in his tract De acido; alkali, as ap-

(*a*) 157. (*b*) 130.

pears in cantharides and lixivial salts, is a caustic ; caustics are fire ; therefore acid is fire ; therefore æther is fire ; and if fire, light. We are not therefore obliged to admit a new medium distinct from light, and of a finer and more exquisite substance, for the explication of phænomena, which appear to be as well explained without it. How can the density or elasticity of æther account for the rapid flight of a ray of light from the sun, still swifter as it goes farther from the sun? or how can it account for the various motions and attractions of different bodies? Why oyl and water, mercury and iron repell, or why other bodies attract each other? or why a particle of light should repell on one side and attract on the other, as in the case of the Islandic crystal? To explain cohesion by hamate atoms is accounted ignotum per ignotius. And is it not as much so to account for the gravity of bodies by the elasticity of æther?

228. It is one thing to arrive at general laws of nature from a contemplation of the phænomena ; and another to frame an hypothesis, and from thence deduce the phænomena. Those who supposed epicycles, and by them explained the motions and appearances of the planets, may not therefore be thought to have discovered principles true in fact and nature. And albeit we may from the premises infer a conclusion, it will not follow, that we can argue reciprocally, and from the conclusion infer the premises. For instance, supposing an elastic fluid, whose constituent minute particles are equidistant from each other and of equal densities and diameters, and recede one from another with a centrifugal force which is inversely as the distance of the centers, and admitting that from such supposition it must follow,
that

that the density and elastic force of such fluid are in the inverse proportion of the space it occupies when compressed by any force; yet we cannot reciprocally infer, that a fluid endued with this property must therefore consist of such supposed equal particles; for it would then follow, that the constituent particles of air were of equal densities and diameters; whereas it is certain, that air is an heterogeneous mass, containing in its composition an infinite variety of exhalations, from the different bodies which make up this terraqueous globe.

229. The phænomena of light, animal spirit, muscular motion, fermentation, vegetation, and other natural operations, seem to require nothing more than the intellectual and artificial fire of Heraclitus, Hippocrates, the Stoics (*a*), and other ancients. Intellect, superadded to ætherial spirit, fire, or light, moves, and moves regularly, proceeding, in a method as the Stoics, or increasing and diminishing by measure, as Heraclitus expressed it. The Stoics held that fire comprehended and included the spermatic reasons or forms (*λόγους σπερματικούς*) of all natural things. As the forms of things have their ideal existence in the intellect, so it should seem that seminal principles have their natural existence in the light (*b*), a medium consisting of heterogeneous parts, differing from each other in divers qualities that appear to sense, and not improbably having many original properties, attractions, repulsions and motions, the laws and natures whereof are indiscernible to us, otherwise than in their remote effects. And this animated heterogeneous fire should seem a more adequate cause, whereby to explain the phæ-

(*a*) 166, 168. (*b*) 164.

nomina of nature, than one uniform ætherial medium.

230. Aristotle indeed excepts against the elements being animated. Yet nothing hinders why that power of the soul, styled by him *κίνητικὴ*, or locomotive, may not reside therein, under the direction of an intellect, in such sense, and as properly as it is said, to reside in animal bodies. It must nevertheless be owned, that albeit that philosopher acknowledgeth a divine force or energy in fire, yet to say that fire is alive, or that having a soul it should not be alive, seem to him equally absurd. See his second book, *De partibus animalium*.

231. The laws of attraction and repulsion are to be regarded as laws of motion, and these only as rules or methods observed in the productions of natural effects, the efficient and final causes whereof are not of mechanical consideration. Certainly, if the explaining a phænomenon be to assign its proper efficient and final cause (a), it should seem the mechanical philosophers never explained any thing; their province being only to discover the laws of nature, that is the general rules and methods of motion, and to account for particular phænomena by reducing them under, or shewing their conformity to such general rules.

232. Some corpuscularian philosophers of the last age, have indeed attempted to explain the formation of this world and its phænomena, by a few simple laws of mechanism. But if we consider the various productions of nature, in the mineral, vegetable and animal parts of the creation, I believe we shall see cause to affirm, that not any

(a) 154, 155, 160.

one of them has hitherto been, or can be accounted for on principles merely mechanical ; and that nothing could be more vain and imaginary, than to suppose with Descartes, that merely from a circular motion's being impressed by the supreme agent on the particles of extended substance, the whole world with all its several parts, appurtenances, and phænomena might be produced, by a necessary consequence from the laws of motion.

233. Others suppose that God did more at the beginning, having then made the seeds of all vegetables and animals, containing their solid organical parts in miniature, the gradual filling and evolution of which, by the influx of proper juices, doth constitute the generation and growth of a living body. So that the artificial structure of plants and animals daily generated, requires no present exercise of art to produce it, having been already framed at the origin of the world, which with all its parts hath ever since subsisted going like a clock or machine by itself, according to the laws of nature, without the immediate hand of the artist. But how can this hypothesis explain the blended features of different species in mules and other mongrels? or the parts added or changed, and sometimes whole limbs lost by marking in the womb? or how can it account for the resurrection of a tree from its stump, or the vegetative power in its cutting? in which cases we must necessarily conceive something more than the mere evolution of a seed.

234. Mechanical laws of nature or motion direct us how to act, and teach us what to expect. Where intellect presides, there will be method and order, and therefore rules, which if not stated
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and constant would cease to be rules. There is therefore a constancy in things, which is styled the course of nature (a). All the phænomena in nature are produced by motion. There appears an uniform working in things great and small, by attracting and repelling forces. But the particular laws of attraction and repulsion are various. Nor are we concerned at all about the forces, neither can we know or measure them otherwise than by their effects, that is to say, the motions, which motions only, and not the forces, are indeed in the bodies (b). Bodies are moved to or from each other, and this is performed according to different laws. The natural or mechanic philosopher endeavours to discover those laws by experiment and reasoning. But what is said of forces residing in bodies whether attracting or repelling, is to be regarded only as a mathematical hypothesis, and not as any thing really existing in nature.

235. We are not therefore seriously to suppose with certain mechanic philosophers, that the minute particles of bodies have real forces or powers by which they act on each other, to produce the various phænomena in nature. The minute corpuscles are impelled and directed, that is to say, moved to and from each other according to various rules or laws of motion. The laws of gravity, magnetism, and electricity are divers. And it is not known, what other different rules or laws of motion might be established, by the author of nature. Some bodies approach together, others fly asunder, and perhaps some others do neither. When salt of tartar flows per deliquium, it is visible that the particles of water floating in the air

(a) 160.

(b) 155.

are moved towards the particles of salt, and joined with them. And when we behold vulgar salt not to flow per deliquium, may we not conclude that the same law of nature and motion doth not obtain between it's particles and those of the floating vapours? A drop of water assumes a round figure, because it's parts are moved towards each other. But the particles of oil and vinegar have no such disposition to unite. And when flies walk in water without wetting their feet, it is attributed to a repelling force or faculty in the fly's feet. But this is obscure, though the phænomenon be plain.

236. It is not improbable, and seems not unsupported by experiments, that, as in algebra, where positive quantities cease there negative begin, even so in mechanics, where attracting forces cease there repelling forces begin; or (to express it more properly) where bodies cease to be moved towards, they begin to be moved from each other. This Sir Isaac Newton infers from the production of air and vapours, whose particles fly asunder with such vehement force. We behold iron move towards the loadstone, straws towards amber, heavy bodies towards the earth. The laws of these motions are various. And when it is said, that all the motions and changes in the great world arise from attraction; the elasticity of the air, the motion of water, the descent of heavy, and the ascent of light bodies, being all ascribed to the same principle; when from insensible attractions of most minute particles at the smallest distance, are derived cohesion, dissolution, coagulation, animal secretion, fermentation, and all chemical operations; and when it is said, that without such principles there never would have been any motion in the world, and without the

the continuance thereof all motion would cease. In all this we know or understand no more, than that bodies are moved according to a certain order, and that they do not move themselves.

237. So likewise, how to explain all those various motions and effects, by the density and elasticity of æther, seems incomprehensible (*a*). For instance, why should the acid particles draw those of water and repel each other? why should some salts attract vapours in the air, and others not? why should the particles of common salt repel each other, so as not to subside in water? why should the most repellent particles be the most attractive upon contract? Or why should the repellent begin where the attractive faculty leaves off. These, and numberless other effects seem inexplicable on mechanical principles, or otherwise than by recourse to a mind or spiritual agent (*b*). Nor will it suffice from present phænomena and effects, through a chain of natural causes, and subordinate blind agents, to trace a divine intellect as the remote original cause, that first created the world, and then set it a going. We cannot make even one single step in accounting for the phænomena, without admitting the immediate presence and immediate action of an incorporeal agent, who connects, moves, and disposes all things, according to such rules, and for such purposes as seem good to him.

238. It is an old opinion adopted by the moderns, that the elements and other natural bodies are changed each into other (*c*). Now, as the particles of different bodies are agitated by different forces, attracting and repelling, or, to speak more accurately, are moved by different laws, how can these forces

(*a*) 153, 162. (*b*) 154, 220. (*c*) 148,

or laws be changed, and this change accounted for by an elastic æther? Such a medium, distinct from light or fire, seemeth not to be made out by any proof, nor to be of any use in explaining the phænomena. But if there be any medium employed, as a subordinate cause or instrument in attraction, it would rather seem to be light (*k*); since by an experiment of Mr. Boyle's, amber, that shewed no sign of attraction in the shade, being placed where the sun-beams shone upon it, immediately attracted light bodies. Besides, it hath been discovered by sir Isaac Newton, and an admirable discovery it was, that light is an heterogeneous medium (*l*) consisting of particles endued with original distinct properties. And upon these, if I may venture to give my conjectures, it seemeth probable the specific properties of bodies, and the force of specific medicines may depend. Different sides of the same ray shall, one approach and the other recede from the Islandic crystal; can this be accounted for by the elasticity of a fine medium, or by the general laws of motion, or by any mechanical principles whatever? And if not, what should hinder but there may be specific medicines, whose operation depends not upon mechanical principles, how much soever that notion hath been exploded of late years?

239. Why may we not suppose certain idiosyncrasies, sympathies, oppositions, in the solids or fluids or animal spirit of a human body, with regard to the fine insensible parts of minerals or vegetables, impregnated by rays of light of different properties, not depending on the different size, figure, number, solidity or weight of those particles,

(*k*) 152, 156. (*l*) 40, 181.

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nor on the general laws of motion, nor on the density or elasticity of a medium, but merely and altogether on the good pleasure of the Creator, in the original formation of things? From whence divers unaccountable and unforeseen motions may arise in the animal œconomy; from whence also various peculiar and specific virtues may be conceived to arise, residing in certain medicines, and not to be explained by mechanical principles. For although the general known laws of motion are to be deemed mechanical, yet peculiar motions of the insensible parts, and peculiar properties depending thereon, are occult and specific.

240. The words attraction and repulsion may, in compliance with custom, be used where, accurately speaking, motion alone is meant. And in that sense it may be said, that peculiar attractions or repulsions in the parts, are attended with specific properties in the wholes. The particles of light are vehemently moved to or from, retained or rejected by objects. Which is the same thing as to say with Sir Isaac Newton, that the particles of acids are endued with great attractive force (*m*), wherein their activity consists; whence fermentation and dissolution; and that the most repellent are, upon contact, the most attracting particles.

241. Gravity and fermentation are received for two most extensive principles. From fermentation are derived the motion and warmth of the heart and blood in animals, subterraneous heat, fires, and earthquakes, meteors and changes in the atmosphere. And, that attracting and repelling forces operate in the nutrition and dissolution of animal and vegetable bodies, is the doctrine both of Hip-

hippocrates and Sir Isaac Newton. The former of these celebrated authors, in his treatise concerning diet or regimen, observes, that in the nourishment of man, one part repels and another attracts. And again, in the same treatise, two carpenters, saith he, saw a piece of timber; one draws, the other pushes; these two actions tend to one and the same end, though in a contrary direction, one up, the other down: This imitates the nature of man: *πνεῦμα τὸ μὲν ἔλκει, τὸ δὲ ὠθεῖ.*

242. It is the general maxim of Hippocrates, that the manner wherein nature acts consisteth in attracting what is meet and good, and in repelling what is disagreeable or hurtful. He makes the whole of the animal œconomy to be administered by the faculties or powers of nature. Nature alone, saith he, sufficeth for all things to animals. She knows of herself what is necessary for them. Whence it is plain, he means a conscious intelligent nature, that presides and moves the ætherial spirit. And tho' he declares all things are accomplished on man by necessity, yet it is not a blind fate or chain of mere corporeal causes, but a divine necessity, as he himself expressly calls it. And what is this but an over-ruling intelligent power that disposeth of all things?

243. Attraction cannot produce, and in that sense account for the phænomena, being it self one of the phænomena produced and to be accounted for (n). Attraction is performed by different laws, and cannot therefore in all cases be the effect of the elasticity of one uniform medium. The phænomena of electrical bodies, the laws and variations of magnetism, and, not to mention other kinds, even

(n) 160, 235.

gravity, is not explained by elasticity, a phænomenon not less obscure than itself. But then, although it shews not the agent, yet it sheweth a rule and analogy in nature to say, That the solid parts of animals are endued with attractive powers, whereby from contiguous fluids they draw like to like; and that glands have peculiar powers attractive of peculiar juices (*o*). Nature seems better known and explained by attractions and repulsions, than by those other mechanical principles of size, figure, and the like: that is by Sir Isaac Newton, than Descartes. And natural philosophers excel, as they are more or less acquainted with the laws and methods observed by the author of nature.

244. The size and shape of particles and general laws of motion can never explain the secretions without the help of attraction, obscure perhaps as to it's cause, but clear as a law. Numberless instances of this might be given: Lemery the younger thought himself obliged to suppose, the particles of light or fire (contrary to all reason) to be of a very gross kind, even greater than the pores of the burnt brimstone, in order to account for their being detained or imprisoned therein; but this phænomenon is easily reduced to attraction. There would be no end of enumerating the like cases. The activity and force of ætherial spirit or fire by the laws of attraction, is imparted to grosser particles (*p*), and thereby wonderfully supports the œconomy of living bodies. By such peculiar compositions and attractions it seems to be effected, that denser fluids can pass where air itself cannot, (as oil through leather) and therefore through

(*o*) 41.(*p*) 152, 163.

the nicest and finest strainers of an animal or vegetable.

245. The ancients had some general conception of attracting and repelling powers (*q*) as natural principles. Galilæi had particularly considered the attraction of gravity, and made some discovery of the laws thereof. But Sir Isaac Newton by his singular penetration, profound knowledge in geometry and mechanics, and great exactness in experiments, hath cast a new light on natural science. The laws of attraction and repulsion were in many instances discovered, and first discovered, by him. He shewed their general extent, and therewith, as with a key, opened several deep secrets of nature, in the knowledge whereof he seems to have made a greater progress, than all the sects of corpuscularians together had done before him. Nevertheless, the principle of attraction itself is not to be explained by physical or corporeal causes.

246. The Cartesians attempted to explain it by the nifus of a subtil element, receding from the center of its motion, and impelling grosser bodies towards it. Sir Isaac Newton in his later thoughts seems (as was before observed) to have adopted somewhat not altogether foreign from this notion, ascribing that to his elastic medium (*r*) which Descartes did to his second element. But the great men of antiquity resolved gravity into the immediate action of an intelligent incorporea' being. To which also Sir Isaac Newton himself attests and subscribes, although he may perhaps sometimes be thought to forget himself, in his manner of speaking of physical agents, which in a strict sense are none at all; and in supposing real forces to exist in bodies, in

(*q*) 241, 242. (*r*) 237, 238.

which

which, to speak truly, attraction and repulsion should be considered only as tendencies or motions, that is, as mere effects, and their laws as laws of motion.

247. Though it be supposed the chief business of a natural philosopher to trace out causes from the effects, yet this is to be understood not of agents (*s*) but of principles, that is, of component parts, in one sense, or of laws or rules, in another. In strict truth all agents are incorporeal, and as such are not properly of physical consideration. The Astronomer, therefore, the Mechanic, or the Chemist, not as such, but by accident only, treat of real causes, agents or efficient. Neither doth it seem, as is supposed by the greatest of mechanical philosophers, that the true way of proceeding in their science is, from known motions in nature to investigate the moving forces. Forasmuch as force is neither corporeal, nor belongs to any corporeal thing (*t*); nor yet to be discovered by experiments or mathematical reasonings, which reach no farther than discernible effects, and motions in things passive and moved.

248. Vis or force is to the soul, what extension is to the body, saith saint Augustin, in his tract concerning the quantity of the Soul; and without force there is nothing done or made, and consequently there can be no agent. Authority is not to decide in this case. Let any one consult his own notions and reason, as well as experience, concerning the origin of motion, and the respective natures, properties, and differences of soul and body, and he will, if I mistake not, evidently perceive, that there is nothing active in the latter. Nor are they natural

(s) 155.

(t) 220.

agents or corporeal forces, which make the particles of bodies to cohere. Nor is it the business of experimental philosophers to find them out.

249. The mechanical philosopher, as hath been already observed, inquires properly concerning the rules and modes of operation alone, and not concerning the cause, forasmuch as nothing mechanical is or really can be a cause (*u*). And although a mechanical or mathematical philosopher may speak of absolute space, absolute motion, and of force as existing in bodies, causing such motion and proportional thereto; yet what these forces are, which are supposed to be lodged in bodies, to be impressed on bodies, to be multiplied, divided, and communicated from one body to another, and which seem to animate bodies like abstract spirits or souls, hath been found very difficult, not to say impossible, for thinking men to conceive and explain, as may be seen by consulting Borellus *De vi percussionis*, and Torricelli in his *Lezioni academiche*, among other authors.

250. Nor, if we consider the proclivity of mankind to realize their notions, will it seem strange that mechanic philosophers and geometricians should, like other men, be misled by prejudice, and take mathematical hypotheses for real beings existing in bodies, so far as even to make it the very aim and end of their science to compute or measure those phantoms; whereas it is very certain that nothing in truth can be measured* or computed, beside the very effects or motions themselves. Sir Isaac Newton asks, have not the minute particles of bodies certain forces or powers by which they act on

(*u*) 236, 247.

* This subject is handled at large in my Latin tract *De motu*, published above twenty years ago.

one another, as well as on the particles of light, for producing most of the phænomena in nature? But in reality, those minute particles are only agitated according to certain laws of nature, by some other agent, wherein the force exists and not in them, which have only the motion; which motion in the body moved, the Peripatetics rightly judge to be a mere passion, but in the mover to be ἐνέργεια or act.

251. It passeth with many, I know not how, that mechanical principles give a clear solution of the phænomena. The Democritic hypothesis, saith doctor Cudworth, doth much more handsomely and intelligibly solve the phænomena, than that of Aristotle and Plato. But things rightly considered, perhaps it will be found not to solve any phænomenon at all. For all phænomena are, to speak truly, appearances in the soul or mind; and it hath never been explained, nor can it be explained, how external bodies, figures and motions should produce an appearance in the mind. Those principles, therefore, do not solve, if by solving is meant assigning the real, either efficient or final cause of appearances, but only reduce them to general rules.

252. There is a certain analogy, constancy, and uniformity in the phænomena or appearances of nature, which are a foundation for general rules: and these are a grammar for the understanding of nature, or that series of effects in the visible world, whereby we are enabled to foresee what will come to pass, in the natural course of things. Plotinus observes, in his third Ennead, that the art of pre-faging is in some sort the reading of natural letters denoting order, and that so far forth as analogy obtains in the universe, there may be vaticination. And in reality, he that foretells the motions of the
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planets, or the effects of medicines, or the result, of chemical or mechanical experiments, may be said to do it by natural vaticination.

253. We know a thing when we understand it : and we understand it, when we can interpret or tell what it signifies. Strictly the sense knows nothing. We perceive indeed sounds by hearing, and characters by sight : but we are not therefore said to understand them. After the same manner, the phenomena of nature are alike visible to all : but all have not alike learned the connexion of natural things, or understand what they signify, or know how to vaticinate by them. There is no question, saith Socrates, in Theæteto, concerning that which is agreeable to each person ; but concerning what will in time to come be agreeable, of which all men are not equally judges. He who foreknoweth what will be in every kind, is the wisest. According to Socrates, you and the cook may judge of a dish on the table equally well ; but while the dish is making, the cook can better foretell what will ensue from this or that manner of composing it. Nor is this manner of reasoning confined only to morals or politics ; but extends also to natural science.

254. As the natural connexion of signs with the things signified is regular and constant, it forms a sort of rational discourse (*a*), and is therefore the immediate effect of an intelligent cause. This is agreeable to the philosophy of Plato and other ancients. Plotinus indeed saith, that which acts naturally is not intellection, but a certain power of moving matter, which doth not know, but only do. And it must be owned, that, as faculties are multiplied by philosophers according to their operations, the will may be distinguished from the intellect.

(*a*) 152.

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But it will not therefore follow, that the will, which operates in the course of nature, is not conducted and applied by intellect, although it be granted that neither will understands, nor intellect wills. Therefore, the phænomena of nature, which strike on the senses and are understood by the mind, form not only a magnificent spectacle, but also a most coherent, entertaining, and instructive discourse; and to effect this, they are conducted, adjusted, and ranged by the greatest wisdom. This language or discourse is studied with different attention, and interpreted with different degrees of skill. But so far as men have studied and remarked it's rules, and can interpret right, so far they may be said to be knowing in nature. A beast is like a man who hears a strange tongue, but understands nothing.

255. Nature, saith the learned Doctor Cudworth, is not master of art or wisdom: Nature is ratio merfa & confusa, reason immersed and plunged into matter, and as it were fuddled in it and confounded with it. But the formation of plants and animals, the motions of natural bodies, their various properties, appearances and vicissitudes, in a word, the whole series of things in this visible world, which we call the course of nature, is so wisely managed and carried on, that the most improved human reason cannot thoroughly comprehend even the least particle thereof; so far is it from seeming to be produced by fuddled or confounded reason.

256. Natural productions, it is true, are not all equally perfect. But neither doth it suit with the order of things, the structure of the universe, or the ends of providence that they should be so. General rules, we have seen (a), are necessary to

(a) 249, 252.

make

make the world intelligible : and from the constant observation of such rules, natural evils will sometimes unavoidably ensue : things will be produced in a slow length of time, and arrive at different degrees of perfection.

257. It must be owned, we are not conscious of the systole and diastole of the heart, or the motion of the diaphragm. It may not nevertheless be thence inferred, that unknowing nature can act regularly, as well as ourselves. The true inference is, that the self-thinking individual, or humane person, is not the real author of those natural motions. And in fact no man blames himself if they are wrong, or values himself if they are right. The same may be said of the fingers of a musician, which some object to be moved by habit which understands not ; it being evident, that what is done by rule must proceed from something that understands the rule ; therefore, if not from the musician himself, from some other active intelligence, the same perhaps which governs bees and spiders, and moves the limbs of those who walk in their sleep.

258. Instruments, occasions, and signs (*b*) occur in, or rather make up, the whole visible course of nature. These, being no agents themselves, are under the direction of one agent concerting all for one end, the supreme good. All those motions, whether in animal bodies or in other parts of the system of nature, which are not effects of particular wills, seem to spring from the same general cause with the vegetation of plants, an ætherial spirit actuated by a mind.

259. The first poets and theologers of Greece and the east considered the generation of things, as ascribed rather to a divine cause, but the Physici

(*b*) 160.

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to natural causes subordinate to, and directed still by a divine ; except some corporealists and mechanics, who vainly pretended to make a world without a God. The hidden force that unites, adjusts, and causeth all things to hang together, and move in harmony, which Orpheus and Epedocles styl'd love ; this principle of union is no blind principle, but acts with intellect. This divine love and intellect are not themselves obvious to our view, or otherwise discern'd than in their effects. Intellect enlightens, Love connects, and the sovereign Good attracts all things.

260. All things are made for the supreme good, all things tend to that end : and we may be said to account for a thing, when we shew that it is so best. In the Phædon, Socrates declares it to be his opinion, that he, who supposed all things to have been dispos'd and order'd by a mind (c), should not pretend to assign any other cause of them. He blames physiologers for attempting to account for phænomena, particularly for gravity and cohesion, by vortexes and æther, overlooking the τὸ ἀγαθὸν and τὸ θεῖον, the strongest bond and cement which holds together all the parts of the universe, and not discerning the cause it self from those things which only attend it.

261. As in the microcosm, the constant regular tenor of the motions of the viscera and contained juices doth not hinder particular voluntary motions to be impress'd by the mind on the animal spirit ; even so in the mundane system, the steady observance of certain laws of nature, in the grosser masses and more conspicuous motions, doth not hinder, but a voluntary agent may sometimes communicate particular impressions to the fine ætherial medium,

(c) 154, 160.

which

which in the world answers the animal spirit in man. Which two (if they are two) although invisible and inconceivably small, yet seem the real latent springs, whereby all the parts of this visible world are moved; albeit they are not to be regarded as a true cause, but only an instrument of motion; and the instrument not as a help to the creator, but only as a sign to the creature.

262. Plotinus supposeth that the soul of the universe is not the original cause or author of the species, but receives them from intellect, the true principle of order and distinction, the source and giver of forms. Others consider the vegetative soul only as some lower faculty of a higher soul, which animates the fiery ætherial spirit (*d*). As for the blots and defects which appear in the course of this world, which some have thought to proceed from a fatality or necessity in nature, and others from an evil principle, that same philosopher observes, that it may be the governing reason produceth and ordaineth all those things; and, not intending that all parts should be equally good, maketh some worse than others by design, as all parts in an animal are not eyes: And in a city, comedy, or picture, all ranks, characters, and colours are not equal or like; even so excesses, defects, and contrary qualities, conspire to the beauty and harmony of the world.

263. It cannot be denied, that with respect to the universe of things, we in this mortal state are like men educated in Plato's cave, looking on shadows with our backs turned to the light. But though our light be dim, and our situation bad, yet if the best use be made of both, perhaps something may be seen. Proclus, in his commentary on the theology of Plato, observes there are two

(*d*) 178.

forts of philosophers. The one placed body first in the order of beings, and made the faculty of thinking depend thereupon, supposing that the principles of all things are corporeal : that body most really or principally exists, and all other things in a secondary sense, and by virtue of that. Others, making all corporeal things to be dependent upon soul or mind, think this to exist in the first place and primary sense, and the being of bodies to be altogether derived from, and presuppose that of the mind.

264. Sense and experience acquaint us, with the course and analogy of appearances or natural effects. Thought, reason, intellect, introduce us into the knowledge of their causes. Sensible appearances, though of a flowing, unstable, and uncertain nature, yet having first occupied the mind, they do by an early prevention, render the after task of thought more difficult : and as they amuse the eyes and ears, and are more suited to vulgar uses and the mechanic arts of life, they easily obtain a preference, in the opinion of most men, to those superior principles, which are the later growth of the humane mind arrived to maturity and perfection, but, not affecting the corporeal sense, are thought to be so far deficient in point of solidity and reality, sensible and real to common apprehensions being the same thing. Although it be certain, that the principles of science are neither objects of sense nor imagination ; and that intellect and reason are alone the sure guides to truth.

265. The successful curiosity of the present age, in arts and experiments and new systems, is apt to elate men, and make them overlook the ancients. But notwithstanding that the encouragement and purse of princes, and the united endeavours of great societies in these later ages, have extended experi-
mental

mental and mechanical knowledge very far, yet it must be owned, that the ancients too were not ignorant of many things (*e*), as well in physics as metaphysics, which perhaps are more generally, though not first known in these modern times.

266. The Pythagoreans and Platonists had a notion of the true system of the world. They allowed of mechanical principles, but actuated by soul or mind: they distinguished the primary qualities in bodies from the secondary, making the former to be physical causes, and they understood physical causes in a right sense: they saw that a mind infinite in power, unextended, invisible, immortal, governed, connected and contained all things: they saw there was no such thing as real absolute space: that mind, soul or spirit, truly and really exists: that bodies exist only in a secondary and dependent sense: that the soul is the place of forms: that the sensible qualities are to be regarded as acts only in the cause, and as passions in us: they accurately considered the differences of intellect, rational soul, and sensitive soul, with their distinct acts of intellection, reasoning, and sensation, points wherein the Cartesians and their followers, who consider sensation as a mode of thinking, seem to have failed. They knew there was a subtil æther pervading the whole mass of corporeal beings, and which was itself actually moved and directed by a mind: and that physical causes were only instruments, or rather marks and signs.

267. Those ancient philosophers understood the generation of animals to consist, in the unfolding and distending of the minute imperceptible parts of pre-existing animalcules, which passeth for a modern discovery: this they took for the work of nature, but

(*e*) 166, 167, 168, 241, 242, &c.

nature animate and intelligent (*f*): they understood that all things were alive and in motion: they supposed a concord and discord, union and disunion in particles, some attracting, others repelling each other: and that those attractions and repulsions, so various, regular, and useful, could not be accounted for, but by an intelligence presiding and directing all particular motions, for the conservation and benefit of the whole.

268. The Ægyptians, who impersonated nature, had made her a distinct principle, and even deified her under the name of Isis. But Osiris was understood to be mind or reason, chief and sovereign of all. Osiris, if we may believe Plutarch, was the first, pure, unmixed and holy principle, not discernible by the lower faculties; a glympse whereof like lightening darting forth, irradiates the understanding; with regard to which Plutarch adds, that Plato and Aristotle termed one part of philosophy *ἐποπτικόν*; to wit, when having soared above common mixed objects, and got beyond the precincts of sense and opinion, they arrive to contemplate the first and most simple being, free from all matter and composition. This is that *ἑστία ὄντως ἑστία* of Plato, which employeth mind alone; which alone governs the world, and the soul is that which immediately informs and animates nature.

269. Although the Ægyptians did symbolically represent the supreme divinity sitting on a lotus, and that gesture has been interpreted to signify the most holy and venerable being to be utterly at rest reposing within himself; yet, for any thing that appears, this gesture might denote dignity as well as repose. And it cannot be denied, that Jamblicus, so knowing in the Ægyptian notions,

(*f*) 172.

taught

taught there was an intellect that proceeded to generation, drawing forth the latent powers into light in the formation of things. Nor was this to be understood of an external world, subsisting in real absolute space : For it was a doctrine of those antient sages, that soul was the place of forms, as may be seen in the twelfth book of the arcane part of divine wisdom, according to the Ægyptians. This notion was embraced by divers philosophers of Greece, who may be supposed to have derived it from the same source from whence many of their other opinions were drawn.

270. The doctrine of real absolute external space, induced some modern philosophers to conclude it was a part or attribute of God, or that God himself was space; inasmuch as incommunicable attributes of the Deity appeared to agree thereto, such as infinity, immutability, indivisibility, incorporeity, being uncreated, impassive, without beginning or ending ; not considering that all these negative properties may belong to nothing. For nothing hath no limits, cannot be moved or changed, or divided, is neither created nor destroyed. A different way of thinking appears in the Hermaic as well as other writings of the ancients. With regard to absolute space, it is observed in the Asclepian dialogue, that the word Space or Place hath by it self no meaning ; and again, that it is impossible to understand what space alone or pure space is. And Plotinus acknowledgeth no place but soul or mind, expressly affirming that the soul is not in the world, but the world in the soul. And farther, the place of the soul, saith he, is not body, but soul is in mind, and body in soul. See the third chapter of the fifth book of the fifth Ennead.

271. Concerning absolute space, that phantome of the mechanic and geometrical philosophers (*b*), it may suffice to observe, that it is neither perceived by any sense, nor proved by any reason, and was accordingly treated by the greatest of the ancients as a thing merely visionary. From the notion of absolute space springs that of absolute motion *; and in these are ultimately founded the notions of external existence, independence, necessity, and fate. Which fate, the idol of many moderns, was by old philosophers differently understood, and in such a sense, as not to destroy the *αὐτεξέσιον* of God or man. Parmenides, who thought all things to be made by necessity or fate, understood justice and providence to be the same with fate; which, how fixed and cogent soever with respect to man, may yet be voluntary with respect to God. Empedocles declared fate to be a cause using principles and elements. Heraclitus taught that fate was the general reason that runs through the whole nature of the universe; which nature he supposed to be an æthereal body, the seed of the generation of all things. Plato held fate to be the eternal reason or law of nature. Chrysippus supposed that fate was a spiritual power which disposed the world in order; that it was the reason and law of those things which are administered by providence.

(*b*) 250.

* Our judgment in these matters is not to be over-born by a presumed evidence of mathematical notions and reasonings, since it is plain, the mathematicians of this age embrace obscure notions, and uncertain opinions, and are puzzled about them, contradicting each other and disputing like other men: witness their doctrine of fluxions, about which, within these ten years, I have seen published about twenty tracts and dissertations, whose authors being utterly at variance, and inconsistent with each other, instruct by-standers what to think of their pretensions to evidence.

272. All

272. All the foregoing notions of fate, as represented by Plutarch, plainly shew that those ancient philosophers did not mean by fate a blind, head-long, unintelligent principle, but an orderly settled course of things conducted by a wise and provident mind. And as for the Ægyptian doctrine, it is indeed asserted in the Pimander, that all things are produced by fate. But Jamblichus, who drew his notions from Ægypt, affirms, that the whole of things is not bound up in fate; but that there is a principle of the soul higher than nature, whereby we may be raised to an union with the gods, and exempt ourselves from fate. And in the Asclepian dialogue it is expressly said, that fate follows the decrees of God. And indeed, as all the motions in nature are evidently the product of reason (*c*), it should seem there is no room for necessity, in any other sense than that of a steady regular course.

273. Blind fate and blind chance are at bottom much the same thing, and one no more intelligible than the other. Such is the mutual relation, connection, motion, and sympathy of the parts of this world, that they seem as it were animated and held together by one soul: and such is their harmony, order, and regular course, as sheweth the soul to be governed and directed by a mind. It was an opinion of remote antiquity that the world was an animal (*d*). If we may trust the Hermaic writings, the Ægyptians thought all things did partake of life. This opinion was also so general and current among the Greeks, that Plutarch asserts all others held the world to be an animal, and governed by providence, except Leucippus, Democritus, and Epicurus. And although an animal, contain-

(*c*) 154.

(*d*) 153, 172,

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ing all bodies within it self, could not be touched or sensibly affected from without; yet it is plain they attributed to it an inward sense and feeling, as well as appetites and aversions; and that from all the various tones, actions, and passions of the universe, they supposed one symphony, one animal act and life to result.

274. Jamblichus declares the world to be one animal, in which the parts however distant each from other, are nevertheless related and connected by one common nature. And he teacheth, what is also a received notion of the Pythagoreans and Platonics that there is no chasm in nature, but a chain or scale of beings rising by gentle uninterrupted gradations from the lowest to the highest, each nature being informed and perfected by the participation of a higher. As air becomes igneous, so the purest fire becomes animal, and the animal soul becomes intellectual, which is to be understood not of the change of one nature into another, but of the connection of different natures, each lower nature being, according to those philosophers, as it were a receptacle or subject for the next above it to reside and act in.

275. It is also the doctrine of Platonic philosophers, that intellect is the very life of living things, the first principle and exemplar of all, from whence by different degrees are derived the inferior classes of life; first the rational, then the sensitive, after that the vegetal, but so as in the rational animal there is still somewhat intellectual, again in the sensitive there is somewhat rational, and in the vegetal somewhat sensitive, and lastly in mixt bodies, as metals and mineral, somewhat of vegetation: By which means the whole is thought to be more perfectly connected. Which doctrine

doctrine implies that all the faculties, instincts, and motions of inferior beings, in their several respective subordinations, are derived from, and depend upon mind and intellect.

276. Both Stoics and Platonics held the world to be alive, though sometimes it be mentioned as a sentient animal, sometimes as a plant or vegetable. But in this, notwithstanding what hath been furnished by some learned men, there seems to be no atheism. For so long as the world is supposed to be quickened by elementary fire or spirit, which is it self animated by soul, and directed by understanding, it follows that all parts thereof originally depend upon, and may be reduced unto, the same indivisible stem or principle, to wit, a supreme mind; which is the concurrent doctrine of Pythagoræans, Platonics, and Stoics.

277. There is according to those philosophers a life infused throughout all things: the $\pi\tilde{\upsilon}\rho\ \nu\alpha\theta\rho\delta\upsilon\nu$, $\pi\tilde{\upsilon}\rho\ \tau\epsilon\chi\nu\iota\kappa\delta\upsilon\nu$, an intellectual and artificial fire (*e*), an inward principle, animal spirit, or natural life producing and forming within as art doth without, regulating, moderating and reconciling the various motions, qualities and parts of this mundane system. By virtue of this life the great masses are held together in their orderly courses, as well as the minutest particles governed in their natural motions, according to the several laws of attraction, gravity, electricity, magnetism, and the rest. It is this gives instincts, teaches the spider her web, and the bee her honey. This it is that directs the roots of plants to draw forth juices from the earth, and the leaves and cortical vessels to separate and attract such particles of air, and elementary fire, as suit their respective natures.

278. Nature seems to be not otherwise distin-

(*e*) 166, 168, 174, 175, &c.

guished

guished from the anima mundi, than as life is from soul, and, upon the principles of the oldest philosophers, may not improperly or incongruously be styled the life of the world. Some Platonics indeed, regard life as the act of nature, in like manner as intellection is of the mind or intellect. As the first intellect acts by understanding, so nature according to them acts or generates by living. But life is the act of the soul, and seems to be very nature it self, which is not the principle, but the result of another, and higher principle, being a life resulting from soul, as cogitation from intellect.

279. If nature be the life of the world, animated by one soul, compacted into one frame, and directed or governed in all parts by one mind: This system cannot be accused of atheism; tho' perhaps it may of mistake or impropriety. And yet, as one presiding mind gives unity to the infinite aggregate of things, by a mutual communion of actions and passions, and an adjustment of parts, causing all to concur in one view to one and the same end, the ultimate and supreme good of the whole, it should seem reasonable to say, with Ocellus Lucanus the Pythagorean, that as life holds together the bodies of animals, the cause whereof is the soul; and as a city is held together by concord, the cause whereof is law; even so the world is held together by harmony, the cause whereof is God. And in this sense, the world or universe may be considered either as one animal (*f*) or one city.

280. Aristotle disapproves the opinion of those who hold a soul to be diffused throughout the world; and for this reason, because the elements are not alive. Tho' perhaps it may not be easy to prove, that blood and animal spirit are more alive in man, than water and fire in the world. That phi-

(*f*) 172, 277.

losopher,

lofopher, in his books of the foul, remarks upon an opinion fet forth in the Orphics, of the foul's entering from the universe into living creatures being born by winds, that this cannot be true of plants or of certain animals which do not breath. But air veffels are by later experiments allowed to be found in all plants and animals. And air may in fome fort not improperly be faid, to be the carrier or vehicle of the foul, inasmuch as it is the vehicle of fire, which is the fpirit immediately moved and animated by the foul (g).

281. The living fire, the living omniform feminary of the world, and other expreffions of the like nature occurring in the ancient and Platonic philofophy, how can they be underftood exclusive of light or elemental fire, the particles of which are known to be heterogeneous, and, for ought we know, may fome of them be organized, and, notwithstanding their wonderful minutenefs, contain original feeds which, being formed and fown in a proper matrix, do gradually unfold and manifefit themfelves, ftill growing to a juft proportion of the fpecies.

282. May not this æthereal feminary, confiftently with the notions of that philofophy, which afcribed much of generation to celestial influence, be fupposed to impregnate plants and animals with the firft principles, the ftamina, or thofe animalcules which Plato, in his Timæus, faith are invifible for their smallnefs, but, being fown in a proper matrix, are therein gradually diftended and explicated by nourifhment, and at length the animals brought forth to light. Which notion hath been revived and received of late years by many, who perhaps are not aware of it's antiquity, or that it was to be found in Plato. Timæus Locrenfis in

his book of the soul of the world, supposeth even souls to be derived from the celestial luminaries, excepting only the rational or intellectual part. But what influence or influx is there from the celestial bodies, which hath not light for it's vehicle, (a) ?

283. What other nature there should be intermediate between the soul of the world (b) and this gross corporeal system, which might be the vehicle of life, or, to use the language of philosophers, might receive or be impressed with the forms of things, is difficult to comprehend. It is a vulgar remark, that the works of art do not bear a nice microscopical inspection, but the more helps are used, and the more nicely you pry into natural productions, the more do you discover of the fine mechanism of nature, which is endless or inexhaustible; new and other parts, more subtle and delicate than the precedent, still continuing to offer themselves to view. And these microscopical observations have confirmed the ancient theory concerning generation, delivered in the Timæus of Plato. But that theory or hypothesis, how agreeable soever to modern discoveries, is not alone sufficient to explain the phænomena, without the immediate action of a mind. And Ficinus, notwithstanding what himself and other Platonics say of a plastic nature, is obliged to own, that with the mundane force or soul it is to be understood, there is joined an intelligence, upon which the seminal nature constantly depends, and by which it is governed.

284. Alcinos, in his tract of the doctrine of Plato, saith, that God hath given the world both mind and soul; others include both in the word soul, and suppose the soul of the world to be God.

(a) 43. (b) 171.

Philo appears to be of this opinion in several parts of his writings. And Virgil, who was no stranger to the Pythagorean and Platonic tenets writes to the same purpose.

Deum namque ire per omnes
Terrasque tractusque maris cœlumque profun-
dum.

Hinc pecudes armenta, viros, genus omne fe-
rarum,

Quemque sibi tenues nascentem arcessere vitas.

Thus much the schools of Plato and Pythagoras seem agreed in, to wit, that the soul of the world (*b*) whether having a distinct mind of its own, or directed by a superior mind (*c*) doth embrace all it's parts, connect them by an invisible and indissoluble chain, and preserve them ever well adjusted, and in good order.

285. Naturalists, whose proper province it is to consider phænomena, experiments, mechanical organs and motions, principally regard the visible frame of things or corporeal world, supposing soul to be contained in body. And this hypothesis may be tolerated in physics, as it is not necessary in the arts of dyalling or navigation to mention the true system or earth's motion. But those who, not content with sensible appearances, would penetrate into the real and true causes (the object of theology, metaphysics, or the philosophia prima) will rectify this error, and speak of the world as contained by the soul, and not the soul by the world.

286. Aristotle hath observed there were indeed some who thought so grossly, as to suppose the universe to be one only corporeal and extended nature: but in the first book of his Metaphy-

(*b*) 153, 172.

S (*c*) 154, 279.

sics he justly remarks they were guilty of a great mistake ; forasmuch as they took into their account the elements of corporeal beings alone ; whereas there are incorporeal beings also in the universe ; and while they attempted to assign the causes of generation and corruption, and account for the nature of all things, they did at the same time destroy the very cause of motion.

- 287. It is a doctrine among other speculations contained in the Hermaic writings, that all things are one. And it is not improbable that Orpheus, Parmenides, and others among the Greeks, might have derived their notion of τὸ ἓν, THE ONE, from Ægypt. Tho' that subtil metaphysician Parmenides, in his doctrine of ἓν ἑστὼς, seems to have added something of his own. If we suppose, that one and the same mind is the universal principle of order and harmony throughout the world, containing and connecting all it's parts, and giving unity to the system, there seems to be nothing atheistical or impious in this supposition.

- 288. Number is no object of sense : it is an act of the mind. The same thing in a different conception is one or many. Comprehending God and the creatures in one general notion, we may say that all things together make one universe, or τὸ πᾶν. But if we should say, that all things make one God ; this would, indeed, be an erroneous notion of God, but would not amount to atheism, so long as mind or intellect was admitted to be the τὸ ἡγεμονικόν, the governing part. It is nevertheless more respectful, and consequently the truer notion of God, to suppose him neither made up of parts, nor to be himself a part of any whole whatsoever.

- 289. All those, who conceived the universe to be an animal, must in consequence of that notion, suppose

suppose all things to be one. But to conceive God to be the sentient soul of an animal, is altogether unworthy and absurd. There is no sense, nor sensory, nor any thing like a sense or sensory in God. Sense implies an impression from some other being, and denotes a dependence in the soul which hath it. Sense is a passion; and passions imply imperfection. God knoweth all things, as pure mind or intellect, but nothing by sense, nor in nor through a sensory. Therefore to suppose a sensory of any kind, whether space or any other, in God would be very wrong, and lead us into false conceptions of his nature. The presuming there was such a thing as real absolute uncreated space, seems to have occasioned that modern mistake. But this presumption was without grounds.

290. Body is opposite to spirit or mind. We have a notion of spirit from thought and action. We have a notion of body from resistance. So far forth as there is real power, there is spirit. So far forth as there is resistance, there is inability or want of power. That is, there is a negation of spirit. We are embodied, that is, we are clogged by weight, and hindered by resistance. But in respect of a perfect spirit, there is nothing hard or impenetrable: there is no resistance to the Deity: Nor hath he any body: nor is the supreme being united to the world, as the soul of an animal is to it's body, which necessarily implieth defect, both as an instrument, and as a constant weight and impediment.

291. Thus much it consists with piety to say, that a divine agent doth by his virtue permeate and govern the elementary fire or light (*d*), which serves as an animal spirit to enliven and actuate the

(*d*) 157, 172.

whole mass, and all the members of this visible world. Nor is this doctrine less philosophical than pious. We see all nature alive or in motion. We see water turned into air, and air rarified and made elastic (*e*) by the attraction of another medium, more pure indeed, more subtil, and more volatile than air. But still, as this is a moveable extended, and, consequently, a corporeal being (*f*), it cannot be itself the principle of motion, but leads us naturally and necessarily to an incorporeal spirit or agent. We are conscious that a spirit can begin, alter, or determine motion, but nothing of this appears in body. Nay the contrary is evident, both to experiment and reflection.

292. Natural phænomena are only natural appearances. They are, therefore, such as we see and perceive them. Their real and objective natures are, therefore, the same; passive without any thing active, fluent and changing without any thing permanent in them. However, as these make the first impressions, and the mind takes her first flight and spring, as it were, by resting her foot on these objects, they are not only first considered by all men, but most considered by most men. They and the phantomes that result from those appearances, the children of imagination grafted upon sense, such for example as pure space (*i*) are thought by many the very first in existence and stability, and to embrace and comprehend all other beings.

293. Now although such phantomes as corporeal forces, absolute motions, and real spaces, do pass in physics for causes and principles (*g*), yet are they in truth but hypotheses, nor can they be the objects of real science. They pass nevertheless in physics conversant about things of sense, and con-

(*e*) 149, 152, 200. (*f*) 207. (*i*) 270. (*g*) 220, 249, 250.

finer to experiments and mechanics. But when we enter the province of the philosophia prima, we discover another order of beings, mind and its acts, permanent being, not dependent on corporeal things, nor resulting, nor connected, nor contained; but containing, connecting, enlivening the whole frame; and imparting those motions, forms, qualities, and that order and symmetry to all those transient phenomena, which we term the course of nature.

294. It is with our faculties as with our affections: what first seizes, holds fast (a). It is a vulgar theme, that man is a compound of contrarieties, which breed a restless struggle in his nature, between flesh and spirit, the beast and the angel, earth and heaven, ever weighed down and ever bearing up. During which conflict the character fluctuates: when either side prevails, it is then fixed for vice or virtue. And life from different principles takes a different issue. It is the same in regard to our faculties. Sense at first besets and overbears the mind. The sensible appearances are all in all, our reasonings are employed about them; our desires terminate in them: we look no farther for realities or causes; till intellect begins to dawn, and cast a ray on this shadowy scene. We then perceive the true principle of unity, identity, and existence. Those things that before seemed to constitute the whole of being, upon taking an intellectual view of things, prove to be but fleeting phantoms.

295. From the outward form of gross masses which occupy the vulgar, a curious inquirer proceeds to examine the inward structure and minute parts, and from observing the motions in nature, to discover the laws of those motions. By the way he frames his hypothesis and suits his language to

(a) 264.

this natural philosophy. And these fit the occasion and answer the end of a maker of experiments or mechanic, who means only to apply the powers of nature, and reduce the phænomena to rules. But, if proceeding still in his analysis and inquiry, he ascends from the sensible into the intellectual world, and beholds things in a new light and a new order, he will then change his system and perceive, that what he took for substances and causes are but fleeting shadows; that the mind contains all, and acts all, and is to all created beings the source of unity and identity, harmony and order, existence and stability.

296. It is neither acid, nor salt, nor sulphur, nor air, nor æther, nor visible corporeal fire (*b*), much less the phantome fate, or necessity, that is the real agent, but by a certain analysis, a regular connection and climax, we ascend through all those mediums to a glimpse of the first mover, invisible, incorporeal, intellectual source of life and being. There is, it must be owned, a mixture of obscurity and prejudice in human speech and reasonings. This is unavoidable, since the veils of prejudice and error are slowly and singly taken off one by one. But if there are many links in the chain which connects the two extremes of what is grossly sensible and purely intelligible, and it seem a tedious work, by the slow helps of memory, imagination, and reason, oppressed and overwhelmed, as we are, by the senses, through erroneous principles and long ambages of words and notions, to struggle upwards into the light of truth, yet as this gradually dawns, further discoveries still correct the style, and clear up the notions.

297. The mind, her acts and faculties, furnish a new and distinct class of objects (*c*) from the

(*b*) 155. (*c*) 163, 266.

contempla-

contemplation whereof arise certain other notions, principles, and verities, so remote from, and even so repugnant to, the first prejudices which surprize the sense of mankind, that they may well be excluded from vulgar speech and books, as abstract from sensible matters, and more fit for the speculation of Truth, the labour and aim of a few, than for the practice of the world, or the subjects of experimental or mechanical inquiry. Nevertheless, though, perhaps, it may not be relished by some modern readers, yet the treating in physical books concerning metaphysical and divine matters can be justified by great authorities among the ancients; not to mention, that he, who professedly delivers the elements of a science, is more obliged to method and system, and tied down to more rigorous laws, than a mere essay writer. It may, therefore, be pardoned if this rude essay doth, by insensible transitions, draw the reader into remote inquiries and speculations, that were not thought of, either by him or by the author, at first setting out.

298. There are traces of profound thought as well as primæval tradition in the Platonic, Pythagoræan, Ægyptian, and Chaldaic philosophy (*p*). Men in those early days were not overlaid with languages and literature. Their minds seem to have been more exercised, and less burthened, than in later ages; and, as so much nearer the beginning of the world, to have had the advantage of patriarchal lights handed down through a few hands. It cannot be affirmed indeed (how probable soever it may seem) that Moses was that same Mochus, with whose successors, priests and prophets, Pythagoras is said to have conversed at Sidon. Yet the study of philosophy appears to be of very great antiquity and remote original; inasmuch as Timæus

(*p*) 179, 266.

Locrensis,

Locrensis, that ancient Pythagorean, author of the book concerning the soul of the world, speaks of a most ancient philosophy, even in his time, *ἡ πρεσβύτα φιλοσοφία*, stirring up and recovering the soul from a state of ignorance to the contemplation of divine things. And though the books attributed to Mercurius Trismegistus were none of them wrote by him, and are allowed to contain some manifest forgeries; yet it is also allowed, that they contain tenets of the antient Ægyptian philosophy, though dressed perhaps in a more modern garb. To account for which, Jamblichus observes, that the books under his name contain indeed mercurial opinions, though often expressed in the style of the Greek philosophers; as having been translated from the Ægyptian tongue into Greek.

299. The difference of Isis from Osiris (*d*) resembles that of the moon from the sun, of the female from the male, of *natura naturata* (as the schoolmen speak) from *natura naturans*. But Isis, though mostly taken for nature, yet (as the Pagan divinities were very fluctuating things) it sometimes signified *τὸ πᾶν*. And we find in Mountfaucon an Isis of the ordinary form with this inscription *Θεῶν παντός*. And in the *mensa Isiaca*, which seems to exhibit a general system of the religion and superstition of the Ægyptians, Isis on her throne possesseth the center of the table. Which may seem to signify, that the universe or *τὸ πᾶν* was the center of the ancient secret religion of the Ægyptians; their Isis or *τὸ πᾶν* comprehending both Osiris the author of nature and his work.

300. Plato and Aristotle considered God as abstracted or distinct from the natural world. But the Ægyptians considered God and nature as ma-

king one whole, or all things together as making one universe. In doing which they did not exclude the intelligent mind, but considered it as containing all things. Therefore, whatever was wrong in their way of thinking, it doth not, nevertheless, imply or lead to Atheism.

301. The humane mind is so much clogged, and born downward, by the strong and early impressions of sense (*a*), that it is wonderful, how the ancients should have made even such a progress, and seen so far into intellectual matters, without some glimmering of a divine tradition. Whoever considers a parcel of rude savages left to themselves, how they are sunk and swallowed up in sense and prejudice, and how unqualified by their natural force to emerge from this state, will be apt to think that the first spark of philosophy was derived from heaven; and that it was (as a Heathen writer expresseth it) *θεοπαράδοτος φιλοσοφία*.

302. The lapsed state of human kind is a thing to which the ancient philosophers were not strangers. The *λύσις*, the *φυγή*, the *παλιγρησία* shew that the Egyptians and Pythagoreans, the Platonists and Stoics, had all some notion of this doctrine, the outlines of which seem to have been sketched out in those tenets. Theology and philosophy gently unbind the ligaments, that chain the soul down to the earth, and assist her flight towards the sovereign Good. There is an instinct or tendency of the mind upwards, which sheweth a natural endeavour to recover and raise ourselves, from our present sensual and low condition, into a state of light, order, and purity.

303. The perceptions of sense are gross: but even in the senses there is a difference. Though harmony and proportion are not objects of sense,

(*a*) 264.

yet the eye and the ear are organs, which offer to the mind such materials, by means whereof she may apprehend both the one and the other. By experiments of sense we become acquainted with the lower faculties of the soul; and from them, whether by a gradual (*a*) evolution or ascent, we arrive at the highest. Sense supplies images to memory. These become subjects for fancy to work upon. Reason considers and judges of the imaginations. And these acts of reason become new objects to the understanding. In this scale, each lower faculty is a step that leads to one above it. And the uppermost naturally leads to the Deity, which is rather the object of intellectual knowledge than even of the discursive faculty, not to mention the sensitive. There runs a chain throughout the whole system of beings. In this chain one link drags another. The meanest things are connected with the highest. The calamity therefore is neither strange nor much to be complained of, if a low sensual reader shall, from mere love of the animal life, find himself drawn on, surpris'd, and betray'd into some curiosity concerning the intellectual.

304. There is according to Plato properly no knowledge, but only opinion concerning things sensible and perishing (*b*), not because they are naturally abstruse and involved in darkness, but because their nature and existence is uncertain, ever fleeting and changing; or rather, because they do not in strict truth exist at all, being always generating or in fieri, that is, in a perpetual flux, without any thing stable or permanent in them to constitute an object of real science. The Pythagoreans and Platonics distinguish between τὸ γινόμενον and τὸ εἶναι, that which is ever generated and that which exists. Sensible things and corporeal forms

(*a*) 275. (*b*) 263, 264.

are

are perpetually producing and perishing, appearing and disappearing, never resting in one state, but always in motion and change; and therefore in effect, not one being but a succession of beings: while τὸ δὴν is understood to be somewhat of an abstract or spiritual nature, and the proper object of intellectual knowledge. Therefore as there can be no knowledge of things flowing and instable, the opinion of Protagoras and Theætetus, that sense was science, is absurd. And indeed nothing is more evident, than that the apparent sizes and shapes, for instance, of things are in a constant flux, ever differing as they are view'd at different distances, or with glasses more or less accurate. As for those absolute magnitudes and figures, which certain Cartesians and other moderns suppose to be in things, that must seem a vain supposition, to whoever considers, it is supported by no argument of reason, and no experiment of sense.

305. As understanding perceiveth not, that is, doth not hear or see or feel, so sense knoweth not: And although the mind may use both sense and phancy, as means whereby to arrive at knowledge yet sense or soul, so far forth as sensitive, knoweth nothing. For, as it is rightly observed in the Theætetus of Plato, science consists not in the passive preceptions, but in the reasoning upon them, τῷ περὶ ἐκείνων συλλογισμῷ.

306. In the ancient philosophy of Plato and Pythagoras, we find distinguished three sorts of objects: In the first place a form or species that is neither generated nor destroyed, unchangeable, invisible, and altogether imperceptible to sense, being only understood by the intellect. A second sort there is ever fluent and changing (g), generating and perishing, appearing and vanishing. This

(f) 263, 264. (g) 292, 293.

is comprehended by sense and opinion. The third kind is matter which, as Plato teacheth, being neither an object of understanding nor of sense, may only to be made out by a certain spurious way of reasoning *λογισμῶ τινι νόθῳ μόνις πιστόν*. See his *Timæus*. The same doctrine is contained in the Pythagoric treatise *De anima mundi*, which distinguisheth ideas, sensible things, and matter, maketh the first to be apprehended by intellect, the second by sense, and the last, to wit, matter, *λογισμῶ νόθῳ* whereof Themistius the Peripatetic assigns the reason. For, saith he, that act is to be esteemed spurious, whose object hath nothing positive, being only a mere privation, as silence or darkness. And such he accounteth matter.

307. Aristotle maketh a threefold distinction of objects according to the three speculative sciences. Physics he supposeth to be conversant about such things as have a principle of motion in themselves; mathematics about things permanent but not abstracted; and theology about being abstracted and immoveable; which distinction may be seen in the ninth book of his *Metaphysics*. Where by abstracted, *χωριστόν*, he understands separable from corporeal beings and sensible qualities.

308. That philosopher held that the mind of man was a *tabula rasa*, and that there were no innate ideas. Plato, on the contrary, held original ideas in the mind, that is, notions which never were or can be in the sense, such as being, beauty, goodness, likeness, parity. Some perhaps may think the truth to be this: That there are properly no ideas or passive objects in the mind, but what were derived from sense: but that there are also besides these her own acts or operations; such are notions.

309. It is a maxim of the Platonic philosophy, that

that the soul of man was originally furnished with native inbred notions, and stands in need of sensible occasions, not absolutely for producing them, but only for awakening, rousing, or exciting into act what was already pre-existent, dormant, and latent in the soul; as things are said to be laid up in the memory, though not actually perceived, until they happen to be called forth and brought into view by other objects. This notion seemeth somewhat different from that of innate ideas, as understood by those moderns who have attempted to explode them. To understand and to be, are according to Parmenides the same thing. And Plato in his seventh letter makes no difference between *νεῦς* and *ἐπισήμη*, mind and knowledge. Whence it follows, that mind, knowledge, and notions, either in habit or in act, always go together.

310. And albeit Aristotle considered the soul in it's original state as a blank paper, yet he held it to be the proper place of forms, *τῷ ψυχῷ εἶναι τόπον εἶδων* (a). Which doctrine first maintained by others he admits, under this restriction, that it is not to be understood of the whole soul, but only of the *νεηλική*; as is to be seen in his third book *De anima*. Whence, according to Themistius in his commentary on that treatise, it may be inferred that all beings are in the soul. For, saith he, the forms are the beings. By the form every thing is what it is. And he adds, it is the soul that imparteth forms to matter; *τῷ ὅλῳ μορφῶσα ποικίλαις μορφαῖς*. Therefore they are first in the soul. He further adds, that the mind is all things, taking the forms of all things it becomes all things by intellect and sense. Alexander Aphrodisæus saith as much, affirming the mind to be all things, *καί ἅ τε τὸ νοεῖν καὶ τὸ αἰσθάνεσθαι*. And

(a) 269.

this

this in fact is Aristotle's own doctrine in his third book *De anima*, where he also asserts, with Plato, that actual knowledge and the thing known are all one: τὸ αὐτὸ δὲ ἐστὶν ἢ κατ' ἐνέργειαν ἐπισήμη τῷ πρῶτῳ. Whence it follows that the things are where the knowledge is, that is to say, in the mind. Or, as it is otherwise expressed, that the soul is all things. More might be said to explain Aristotle's notion, but it would lead too far.

311. As to an absolute actual existence (*b*) of sensible or corporeal things, it doth not seem to have been admitted either by Plato or Aristotle. In the *Theætetus* we are told, that if any one saith a thing is or is made, he must withal say, for what, or of what, or in respect of what, it is or is made; for, that any thing should exist in itself or absolutely, is absurd. Agreeably to which doctrine it is also farther affirmed by Plato, that it is impossible a thing should be sweet, and sweet to no body. It must nevertheless be owned with regard to Aristotle, that, even in his *Metaphysics* there are some expressions which seem to favour the absolute existence of corporeal things. For instance, in the eleventh book speaking of corporeal sensible things, What wonder, saith he, if they never appear to us the same, no more than to sick men, since we are always changing, and never remain the same our selves? And again, he saith, Sensible things, although they receive no change in themselves, do nevertheless in sick persons produce different sensations and not the same. These passages would seem to imply a distinct and absolute existence of the objects of sense.

312. But it must be observed, that Aristotle distinguisheth a twofold existence, potential and actual. It will not, therefore, follow that, ac-

(*b*) 264, 292, 294.

ording

According to Aristotle, because a thing is, it must actually exist. This is evident from the eighth book of his *Metaphysics*, where he animadverts on the Megaric philosophers, as not admitting a possible existence distinct from the actual: from whence, saith he, it must follow, that there is nothing cold or hot or sweet or any sensible thing at all, where there is no perception. He adds, that in consequence of that Megaric doctrine, we can have no sense but while we actually exert it: we are blind when we do not see, and therefore both blind and deaf several times in a day.

313. The *ἐπιλέχειαι πρῶται* of the Peripatetics, that is, the sciences, arts, and habits, were by them distinguished from the arts or *ἐπιλέχειαι δεύτεραι*, and supposed to exist in the mind, though not exerted or put into act. This seems to illustrate the manner in which Socrates, Plato, and their followers conceived innate (*c*) notions to be in the soul of man. In was the Platonic doctrine, that humane souls or minds descended from above, and were sowed in generation, that they were stunned, stupified, and intoxicated by this descent and immersion into animal nature. And that the soul, in this *ὀνείρωξις* or slumber, forgets her original notions, which are smothered and oppressed by many false tenets and prejudices of sense. Infomuch that Proclus compares the soul, in her descent invested with growing prejudices, to Glaucus diving to the bottom of the sea, and there contracting divers coats of sea-weed, coral, and shells, which stick close to him and conceal his true shape.

314. Hence, according to this philosophy, the mind of man is so restless to shake off that slumber, to disengage and emancipate herself from those prejudices and false opinions, that so straitly

(*c*) 309.

befet

befet and cling to her, to rub off those covers, to disguise her original form, and to regain her primæval state and first notions: Hence, that perpetual struggle to recover the lost region of light, that ardent thirst and endeavour after truth and intellectual ideas, which she would neither seek to attain, nor rejoice in, nor know when attained, except she had some prænotion or anticipation of them, and they had lain innate and dormant like habits and sciences in the mind, or things laid up, which are called out and roused by recollection or reminiscence. So that learning seemeth in effect reminiscence.

315. The Peripatetics themselves distinguish between reminiscence and mere memory. Themistius observes that commonly the best memories go with the worst parts; but that reminiscence is most perfect in the most ingenious minds. And notwithstanding the *tabula rasa* (*d*) of Aristotle, yet some of his followers have undertaken to make him speak Plato's sense. Thus Plutarch the Peripatetic teacheth as agreeable to his master's doctrine, that learning is reminiscence, and that the *νεῖς καθ' ἑξιν* is in children. Simplicius also, in his commentary on the third book of Aristotle *περὶ ψυχῆς*, speaketh of a certain interior reason in the soul, acting of it self, and originally full of it's own proper notions, *πλήρης ἀφ' ἑαυτῆ τῶν οἰκείων γνωσῶν*.

316. And as the Platonic philosophy supposed intellectual notions to be originally in-existent or innate in the soul (*e*), so likewise it supposed sensible qualities to exist (though not originally) in the soul, and there only. Socrates saith to Theætetus, You must not think the white colour that you see is in any thing without your eyes, or in your eyes,

(*d*) 308.

(*e*) 309, 314.

only a pura potentia, a mere possibility. But Anaximander, successor to Thales, is represented as having thought the supreme Deity to be infinite matter. Nevertheless though Plutarch calleth it matter, yet it was simply τὸ ἄπειρον, which means no more than infinite or indefinite. And although the moderns teach that space is real and infinitely extended; yet if we consider that it is no intellectual notion, nor yet perceived by any of our senses, we shall perhaps be inclined to think with Plato in his Timæus, that this also is the result of λογισμὸς νόθος or spurious reasoning, and a kind of waking dream. Plato observes that we dream, as it were, when we think of place, and believe it necessary, that whatever exists should exist in some place. Which place or space (f) he also observes is μετ' ἀναοθησίας ἀπλόν, that is to be felt as darkness is seen, or silence heard, being a mere privation.

319. If any one should think to infer the reality or actual being of matter from the modern tenet, that gravity is always proportionable to the quantity of matter, let him but narrowly scan the modern demonstration of that tenet, and he will find it to be a vain circle, concluding in truth no more than this, that gravity is proportionable to weight, that is to it self. Since matter is conceived only as defect and mere possibility; and since God is absolute perfection and act; it follows there is the greatest distance and opposition imaginable between God and matter. Inasmuch that a material God would be altogether inconsistent.

320. The force that produces, the intellect that orders, the goodness that perfects all things, is the supreme being. Evil, defect, negation, is not the object of God's creative power. From

(f) 250, 270.

motion

motion the Peripatetics trace out a first immoveable mover. The Platonics make God author of all good, author of no evil, and unchangeable. According to Anaxagoras there was a confused mass of all things in one chaos, but mind supervening, ἐπελθὼν, distinguished and divided them. Anaxagoras, it seems, ascribed the motive faculty to mind, which mind some subsequent philosophers have accurately discriminated from soul and life, ascribing to it the sole faculty of intellection.

321. But still God was supposed the first agent, the source and original of all things, which he produceth, not occasionally or instrumentally but with actual and real efficacy. Thus, the treatise, *De secretiore parte divinæ sapientiæ secundum Ægyptios*, in the tenth book, saith of God, that he is not only the first agent, but also that he it is who truly acts or creates, *qui verè efficit*.

322. Varro, Tully, and St. Augustin understand the soul to be vis, the power, or force that acts, moves, enlivens. Now although, in our conception, vis, or spirit might be distinguished from mind, it would not thence follow, that it acts blindly or without mind, or that it is not closely connected with intellect. If Plutarch is to be trusted in his account of the opinions of philosophers, Thales held the mind of the world to be God : Democritus held the soul of the world to be an igniform deity (g) : Pythagoras taught that God was the monad and the good, or τ' ἀγαθόν : Socrates also and Plato pronounced him to be the πῶ ἐν (b), the single, self originate one, essentially good. Each of which appellations and forms of speech directly tends to, and determines in mind, εἰς πᾶν νῦν ἀρέσκει saith Plutarch.

323. Whence that author concludes, that in the sense

(g) 166, 168, 277.

(b) 287.

of those philosophers God is a mind, *χώρασὸν εἶδος* not an abstract idea compounded of inconsistencies and prescinded from all real things, as some moderns understand abstraction; but a really existing spirit, distinct or separate from all sensible and corporeal beings. And although the Stoics are represented as holding a corporeal deity, or that the very system of the world is God, yet it is certain they did not, at bottom, dissent from the fore-mentioned doctrine; inasmuch as they supposed the world to be an animal, (a) consisting of soul or mind as well as body.

324. This notion was derived from the Pythagoreans, who held the world, as Timæus Locrus teacheth, to be one perfect animal, endued with soul and reason: but then they believed it to have been generated: whereas the Stoics looked on the world as the supreme God, including therein mind or intellect. For the elementary fire, or, if one may so speak, the animal spirit of the world, seemeth, according to them, to have been the vehicle of the soul (b), the vehicle of intellect or *νοῦς*; since they styled the Divinity *πῦρ νοερόν* (c), or intellectual fire.

325. The Ægyptians, if we may credit the Hermaic writings, maintained God to be all things, not only actual but possible. He is styled by them, that which is made and that which is unmade. And therein it is said, shall I praise thee for those things thou hast made manifest, or for the things thou hast hidden? therefore, in their sense, to manifest, was to create; the things created having been before hidden in God.

326. Now whether the *νοῦς* be abstracted from the sensible world, and considered by it self, as distinct from, and presiding over the created sys-

(a) 276. 279.

(b) 277. 284.

(c) 272.

tem, or whether the whole universe, including mind together with the mundane body, is conceived to be God (*d*), and the creatures to be partial manifestations of the divine essence, there is no atheism in either case, whatever misconceptions there may be; so long as mind or intellect is understood to preside over, govern, and conduct the whole frame of things. And this was the general prevailing opinion among the philosophers.

327. Nor if any one, with Aristotle in his *Metaphysics*, should deny that God knows any thing without himself; seeing that God comprehends all things, could this be justly pronounced an atheistical opinion. Nor even was the following notion of the same author to be accounted atheism, to wit, that there are some things beneath the knowledge of God, as too mean, base, and vile; however wrong this notion may be, and unworthy of the divine perfection.

328. Might we not conceive that God may be said to be all in divers senses; as he is the cause and origine of all beings; as the $\nu\tilde{\alpha}\varsigma$ is the $\nu\omicron\nu\eta\lambda\acute{\alpha}$, a doctrine both of Platonics and Peripatetics (*e*); as the $\nu\tilde{\alpha}\varsigma$ is the place of all forms, and as it is the same which comprehends and orders (*f*) and sustains the whole mundane system. Aristotle declares, that the divine force or influence permeates the intire universe (*g*) and that what the pilot is in a ship, the driver in a chariot, the præcentor in a choir, the law in a city, the general in an army, the same God is in the world. This he amply sets forth in his book *De mundo*, a treatise which having been anciently ascribed to him, ought not to be set aside from the difference of style, which (as Patricius rightly observes) being in a letter to

(*d*) 300.(*e*) 309, 310.(*f*) 320.(*g*) 173.

a king,

a king, might well be supposed to differ from the other dry and crabbed parts of his writings.

329. And although there are some expressions to be met with in the philosophers, even of the Platonic and Aristotelic sects, which speak of God as mixing with, or pervading all nature and all the elements; yet this must be explained by force and not by extension, which was never attributed to the mind (*b*) either by Aristotle or Plato. This they always affirmed to be incorporeal: and, as Plotinus remarks, incorporeal things are distant each from other not by place, but (to use his expression) by alterity.

330. These disquisitions will probably seem dry and useless, to such readers as are accustomed to consider only sensible objects. The employment of the mind on things purely intellectual is to most men irksome: whereas the sensitive powers, by constant use acquire strength. Hence, the objects of sense more forcibly affect us (*k*), and are too often counted the chief good. For these things men fight, cheat and scramble. Therefore, in order to tame mankind and introduce a sense of virtue, the best humane means is to exercise their understanding, to give them a glimpse of another world, superior to the sensible, and while they take pains to cherish and maintain the animal life, to teach them not to neglect the intellectual.

331. Prevailing studies are of no small consequence to a state, the religion, manners and civil government of a country ever taking some bias from its philosophy, which affects not only the minds of its professors and students, but also the opinions of all the better sort and the practice of the whole people, remotely and consequentially, indeed, though not inconsiderably. Have not the

(*b*) 290, 293, 297, 319. (*k*) 264, 294.

polemic

polemic and scholastic philosophy been observed to produce controversies in law and religion? And have not Fatalism and Sadducism gained ground, during the general passion for the corpuscularian and mechanical philosophy, which hath prevailed for about a century? This indeed might usefully enough have employed some share of the leisure and curiosity of inquisitive persons. But when it entered the seminaries of learning as a necessary accomplishment, and most important part of education, by engrossing men's thoughts, and fixing their minds so much on corporeal objects, and the laws of motion, it hath, however undesignedly, indirectly, and by accident, yet not a little indisposed them for spiritual, moral, and intellectual matters. Certainly had the philosophy of Socrates and Pythagoras prevailed in this age, among those who think themselves too wise to receive the dictates of the gospel, we should not have seen interest take so general and fast hold on the minds of men, nor public spirit reputed to be γενναίαν εὐθείαν, a generous folly, among those who are reckoned to be the most knowing as well as the most getting part of mankind.

332. It might very well be thought serious trifling to tell my readers that the greatest men had ever an high esteem for Plato; whose writings are the touchstone of a hasty and shallow mind; whose philosophy has been the admiration of ages; which supplied patriots, magistrates, and lawgivers to the most flourishing states, as well as fathers to the church, and doctors to the schools. Albeit in these days, the depths of that old learning are rarely fathomed, and yet it were happy for these lands, if our young nobility and gentry instead of modern maxims would imbibe the notions of the great men of antiquity. But in these free-thinking times many an empty head is
shook

shook at Aristotle and Plato, as well as at the holy scriptures. And the writings of those celebrated ancients are by most men treated on a foot, with the dry and barbarous lucubrations of the schoolmen. It may be modestly presumed, there are not many among us, even of those who are called the better sort, who have more sense, virtue, and love of their country than Cicero, who in a letter to Atticus could not forbear exclaiming, O Socrates et Socratici viri! nunquam vobis gratiam referam. Would to God many of our countrymen had the same obligations to those Socratic writers. Certainly where the people are well educated, the art of piloting a state is best learned from the writings of Plato. But among bad men void of discipline and education, Plato, Pythagoras and Aristotle themselves, were they living, could do but little good. Plato hath drawn a very humorous and instructive picture of such a state; which I shall not transcribe for certain reasons. But whoever has a mind, may see it in page 78. of the second tome of Aldus's edition of Plato's works.

333. PROCLUS, in the first book of his commentary on the theology of Plato observes that, as in the mysteries, those who are initiated, at first meet with manifold and multiform Gods, but being entered and thoroughly initiated they receive the divine illumination and participate the very deity; in like manner, if the soul look abroad she beholds the shadows and images of things; but returning into herself she unravels and beholds her own essence: At first she seemeth only to behold her self: But having penetrated farther she discovers the mind. And again, still farther advancing into the innermost sanctuary of the soul she contemplates the θεῶν γένος. And this, he saith, is the most excellent of all human acts, in the silence and repose of the faculties of the soul to tend upwards to the very divinity; to approach and
be

be closely joined with that which is ineffable and superior to all beings. When come so high as the first principle she ends her journey and rests. Such is the doctrine of Proclus.

334. BUT Socrates in the first Alcibiades teacheth on the other hand, that the contemplation of God is the proper means to know or understand our own soul. As the eye, saith he, looking stedfastly at the visive part or pupil of another eye beholds it's self, even so the soul beholds and understands her self, while she contemplates the Deity which is wisdom and vertue or like thereunto. In the Phædon Socrates speaks of God as being τὰγαθὸν and τὸ δέον (a), the good and the decent: Plotinus represents God as order; Aristotle as law.

335. It may seem perhaps to those, who have been taught to discourse about substratums, more reasonable and pious to attribute to the Deity a more substantial being, than the notional entities of wisdom, order, law, vertue, or goodness, which being only complex ideas, framed and put together by the understanding, are its own creatures, and have nothing substantial, real, or independent in them. But it must be considered, that in the Platonic system, order, vertue, law, goodness, and wisdom are not creatures of the soul of man, but innate and originally existent therein, not as an accident in a substance, but as light to enlighten, and as a guide to govern. In Plato's style, the term idea doth not merely signify an inert inactive object of the understanding, but is used as synonymous with αἰτίον and ἀρχή, cause and principle. According to that philosopher, goodness, beauty, vertue and such like, are not figments of the mind, nor mere mixed modes, nor yet abstract ideas in the modern sense, but the most real beings, intellectual and unchangeable; and therefore more real than the fleeting transient objects of sense (b), which wanting

(a) 260, 220.

(b) 396.

stability cannot be subjects of science (c), much less of intellectual knowledge.

336. By Parmenides, Timæus, and Plato a distinction was made, as hath been observed already, between genitum and ens. The former sort is always generating or in fieri (e), but never exists, because it never continues the same, being in a constant change, ever perishing and producing. By entia they understand things remote from sense, invisible and intellectual, which never changing are still the same, and may therefore be said truly to exist: *οὐσία*, which is generally translated substance, but more properly essence, was not thought to belong to things sensible and corporeal, which have no stability; but rather to intellectual ideas, tho' discerned with more difficulty, and making less impression on a mind stupified and immersed in animal life, than gross objects that continually beset and sollicit our senses.

337. The most refined humane intellect exerted to its utmost reach can only seize some imperfect glimpses (f) of the divine ideas, abstracted from all things corporeal, sensible, and imaginable. Therefore Pythagoras and Plato treated them in a mysterious manner, concealing rather than exposing them to vulgar eyes; so far were they from thinking, that those abstract things, altho' the most real, were the fittest to influence common minds, or become principles of knowledge, not to say duty and virtue, to the generality of mankind.

338. Aristotle and his followers have made a monstrous representation of the Platonic ideas; and some of Plato's own school have said very odd things concerning them. But if that philosopher himself was not read only, but studied also with care, and made his own interpreter, I believe the prejudice that now lies against him would soon wear off (g) or be even

(c) 264, 266, 297. (e) 304, 306. (f) 313, 330. (g) 309, 313.
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converted into a high esteem for those exalted notions and fine hints, that sparkle and shine throughout his writings; which seem to contain not only the most valuable learning of Athens and Greece, but also a treasure of the most remote traditions and early science of the east.

339. In the *Timæus* of Plato mention is made of ancient persons, authors of traditions, and the offspring of the gods. It is very remarkable, that in the account of the creation contained in the same piece, it is said that God was pleased with his work, and that the night is placed before the day. The more we think, the more difficult shall we find it to conceive, how mere man, grown up in the vulgar habits of life, and weighed down by sensuality, should ever be able to arrive at science, without some tradition (*b*) or teaching, which might either sow the seeds of knowledge, or call forth and excite those latent seeds that were originally sown in the soul.

340. Humane souls in this low situation, bordering on mere animal life, bear the weight and see through the dusk of a gross atmosphere, gathered from wrong judgments daily passed, false opinions daily learned, and early habits of an older date than either judgment or opinion. Through such a medium the sharpest eye cannot see clearly (*k*). And if by some extraordinary effort the mind should surmount this dusky region, and snatch a glimpse of pure light, she is soon drawn backward and depressed by the heaviness of the animal nature, to which she is chained. And if again she chanceth, amidst the agitation of wild fancies and strong affections, to spring upwards, a second relapse speedily succeeds into this region of darkness and dreams.

341. Nevertheless, as the mind gathers strength by repeated acts, we should not despond, but continue to exert the prime and flower of our faculties,

(*b*) 298, 301, 302. (*k*) 292, 293, 294.

still recovering, and reaching on, and struggling into the upper region, whereby our natural weakness and blindness may be in some degree remedied, and a taste attained of truth and intellectual life. Beside the constant prevailing opinion of the greatest men of antiquity, that there is both an universal spirit author of life and motion, and an universal mind enlightening and ordering all things, it was a received tenet among them, that there is also τὸ ἓν or τὰγαθὸν (a), which they looked on as the fons deitatis, the first hypostasis in the divinity.

342. The one or τὸ ἓν, being immutable and indivisible, always the same and entire, was therefore thought to exist truly and originally, and other things only so far as they are one and the same, by participation of the τὸ ἓν. This gives unity, stability, reality to things (b). Plato describes God, as Moses, from his being. According to both, God is he who truly is, ὁ ὄντως ὢν. Change and division were esteemed defects or bad. Evil scatters, divides, destroys : Good, on the contrary, produceth concord and union, assembles, combines, perfects, and preserves entire. The several beings which compose the universe are parts of the same system, they combine to carry on one end, and perfect one whole. And this aptness and concurrence thereunto furnishes the partial particular idea of good in the distinct creatures. Hence it might have come to pass, that τὰγαθὸν and τὸ ἓν were regarded as one and the same.

343. Light and sight (saith Plato in the sixth book of his Republic) are not the sun ; even so truth and knowledge are not the good itself, altho' they approach thereunto. And again, what the sun is in a visible place with respect to sight and things seen, that same is τὰγαθὸν or good in an intelligible place, with respect to understanding and things understood,

(a) 329.

(b) 264, 306.

Therefore the good or one is not the light that enlightens, but the source of that light.

344. Every moment produceth some change in the parts of this visible creation. Something is added or diminished, or altered in essence, quantity, quality, or habitude. Wherefore all generated beings were said by the ancients to be in a perpetual flux (c). And that which, on a confused and general view, seems one single constant being, shall upon a nearer inspection appear a continued series of different beings. But God remains for ever one and the same. Therefore God alone exists. This was the doctrine of Heraclitus, Plato, and other ancients.

345. It is the opinion of Plato and his followers, that in the soul of man, prior and superior to intellect, there is somewhat of an higher nature, by virtue of which we are one; and that by means of our one or unit, we are most closely joined to the deity. And, as by our intellect we touch the divine intellect, even so by our *τὸ ἓν* or unit the very flower of our essence, as Proclus expresseth it, we touch the first one.

346. According to the Platonic philosophy, ens and unum are the same. And consequently our minds participate so far of existence as they do of unity. But it should seem that personality is the indivisible center of the soul or mind, which is a monad so far forth as she is a person. Therefore person is really that which exists, inasmuch as it participates of the divine unity. In man the monad or indivisible is the *αὐτὸ τὸ αὐτὸ* the self same self or very self, a thing, in the opinion of Socrates, much and narrowly to be inquired into and discussed, to the end that, knowing ourselves, we may know what belongs to us and our happiness.

347. Upon mature reflexion the mind of all created beings seemeth alone indivisible, and to partake most of unity. But sensible things are rather considered as one than truly so, they being in a perpe-

(c) 304, 336.

tual flux or succession, ever differing and various. Nevertheless, all things together may be considered as one universe (*d*), one by the connection, relation and order of it's parts, which is the work of mind whose unit is by Platonic, supposed a participation of the first τὸ ἕν.

348. Socrates, in the Theætetus of Plato, speaketh of two parties of philosophers, the ῥέοντες and οἱ τῷ ἔλθῃ σασιώται, the flowing philosophers who held all things to be in a perpetual flux, always generating and never existing; and those others who maintained the universe to be fixed and immoveable. The difference seems to have been this, that Heraclitus, Protagoras, Empedocles, and in general those of the former sect, considered things sensible and natural; whereas Parmenides and his party considered τὸ πᾶν, not as the sensible but as the intelligible world (*e*), abstracted from all sensible things.

349. In effect if we mean by things the sensible objects, these, it is evident, are always flowing; but if we mean things purely intelligible, then we may say on the other hand, with equal truth, that they are immoveable and unchangeable. So that those, who thought the whole or τὸ πᾶν to be ἕν ἑστῶς; a fixed or permanent one, seem to have understood the whole of real beings, which, in their sense, was only the intellectual world, not allowing reality of being to things not permanent.

350. The displeasure of some readers may perhaps be incurred, by surprizing them into certain reflexions and inquiries for which they have no curiosity. But perhaps some others may be pleased, to find a dry subject varied by digressions, traced through remote inferences, and carried into ancient times, whose hoary maxims (*f*) scattered in this essay are not proposed as principles, but barely as hints to awaken and exercise the inquisitive reader, on points not beneath the at-

(*d*) 287, 288. (*e*) 293, 294, 295. (*f*) 298, 301.

tention of the ablest men. Those great men, Pythagoras, Plato, and Aristotle, the most consummate in politics, who founded states, or instructed princes, or wrote most accurately on publick government, were at the same time most acute at all abstracted and sublime speculations; the clearest light being ever necessary to guide the most important actions. And whatever the world thinks, he who hath not much meditated upon God, the humane mind, and the Summum bonum, may possibly make a thriving earthworm, but will most indubitably make a sorry patriot and a sorry statesman.

351. According to the nice metaphysics of those ancient philosophers, τὸ εἶν, being considered as what was first and simplest in the Deity, was prescinded even from entity to which it was thought prior and superior; and is therefore by the Platonics styled super-essential. And in the Parmenides it is said, τὸ εἶν doth not exist; which might seem to imply a negation of the divine being. The truth is, Zeno and Parmenides argued, that a thing existing in time was older and younger than it self; therefore the constant immutable τὸ εἶν did not exist in time; and if not in time, then in none of the differences of time past, present, or to come; therefore we cannot say that it was, is, or will be. But nevertheless it is admitted in the same Parmenides, that τὸ νῦν is every where present to τὸ εἶν: that is, instead of a temporary succession of moments, there is one eternal now, or, punctum stans, as it is termed by the schoolmen.

352. The simplicity of τὸ εἶν (the father in the Pythagoric and Platonic trinity) is conceived such as to exclude intellect or mind, to which it is supposed prior. And that hath created a suspicion of atheism in this opinion. For, saith the learned doctor Cudworth, shall we say that the first hypostasis or person is ἀνσς and ἀλογος, senseless and irrational, and altogether devoid of mind and understanding? or would

not this be to introduce a kind of mysterious atheism? To which it may be answered, that whoever acknowledgeth the universe to be made and governed by an eternal mind, cannot be justly deemed an atheist (g.) And this was the tenet of those ancient philosophers. In the Platonic doctrine, the generation of the $\nu\acute{\omicron}\varsigma$ or $\lambda\acute{\omicron}\gamma\omicron\varsigma$ was not contingent but necessary, not temporary but from everlasting. There never was a time supposed wherein $\pi\acute{\alpha}\tau\epsilon\rho$ $\acute{\epsilon}\nu$ subsisted without intellect, the priority having been understood only as a priority of order or conception, but not a priority of age. Therefore, the maintaining a distinction of priority between $\pi\acute{\alpha}\tau\epsilon\rho$ $\acute{\epsilon}\nu$ and $\nu\acute{\omicron}\varsigma$ doth not infer, that the one ever existed without the other. It follows, therefore, that the father or $\pi\acute{\alpha}\tau\epsilon\rho$ $\acute{\epsilon}\nu$ may, in a certain sense, be said to be $\acute{\alpha}\nu\theta\epsilon\omicron\varsigma$ without atheism, or without destroying the notion of a deity; any more than it would destroy the notion of a humane soul, if we should conceive a distinction between self and intellect, or intellect and life. To which we may farther add, that it is a doctrine of Platonicks, and agrees with their master's tenets, to say that $\pi\acute{\alpha}\tau\epsilon\rho$ $\acute{\epsilon}\nu$, or the first hypostasis, contains all excellence and perfection, whereof it is the original source, and is eminenter, as the schools speak, intellect and life, as well as goodness; while the second hypostasis is essentially intellect, and by participation goodness and life; and the third, life essentially, and by participation goodness and intellect.

353. Therefore, the whole being considered, it will not seem just, to fix the imputation of atheism upon those philosophers, who held the doctrine of $\pi\acute{\alpha}\tau\epsilon\rho$ $\acute{\epsilon}\nu$; whether it be taken in an abstracted or collective, a metaphysical or merely vulgar meaning (b); that is, whether we prescind unity from essence and intellect, since metaphysical distinctions of the divine attributes do not in reality divide them: or whether we consider the universal system of beings, as one, since the union, connexion, and order of it's mem-

(g) 154, 276, 279, 287. (b) 300.

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bers, do manifestly infer a mind or intellect to be the cause thereof.

354. Τὸ ἓν may be conceived either by composition or division. For as, on the one hand, we may say the world or universe is one whole or one animal; so we may, on the other hand, consider THE ONE, τὸ ἓν, by division or abstraction, as somewhat in the order of things prior to mind. In either sense there is no atheism, so long as mind is admitted to preside and direct the animal; and so long as the unum or τὸ ἓν is supposed not to exist without mind (a). So that neither Heraclitus nor Parmenides, nor Pythagoras, nor Plato, neither the Ægyptians nor Stoics, with their doctrine of a divine whole or animal, nor Xenophanes with his ἓν καὶ πᾶν, are justly to be accounted atheists. Therefore modern atheism, be it of Hobbes, Spinoza, Collins, or whom you will, is not to be countenanced by the learning and great names of antiquity.

355. Plato teacheth, that the doctrine concerning the one or unite is a means to lead and raise the mind (b) to the knowledge of him who truly is. And it is a tenet both of Aristotle and Plato, that identity is a certain unity. The Pythagoreans also, as well as the Platonic philosophers, held unum and ens to be the same. Consistently with which that only can be said to exist, which is one and the same. In things sensible and imaginable, as such, there seems to be no unity, nothing that can be called one prior to all act of the mind; since they being in themselves aggregates, consisting of parts or compounded of elements, are in effect many. Accordingly it is remarked by Themistius, the learned interpreter of Aristotle, that to collect many notions into one, and to consider them as one, is the work of intellect, and not of sense or fancy.

356. Aristotle himself, in his third book of the

(a) 287, 288. (b) 294, 295.

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Soul, saith it is the mind that maketh each thing to be one, τὸ δὲ ἐν ποιῆν τῆτο ὁ νῆς ἕκαστον. How this is done, Themistius is more particular, observing, that as being conferreth essence, the mind by virtue of her simplicity conferreth simplicity upon compounded beings. And, indeed, it seemeth that the mind, so far forth as person, is individual (a) therein resembling the divine one by participation, and imparting to other things what itself participates from above. This is agreeable to the doctrine of the ancients, however the contrary opinion of supposing number to be an original primary quality in things, independent of the mind, may obtain among the moderns.

357. The Peripatetics taught, that in all divisible things there was somewhat indivisible, and in all compounded things somewhat simple. This they derived from an act of the mind. And neither this simple indivisible unite, nor any sum of repeated unites, consequently no number, can be separated from the things themselves, and from the operation of the mind. Themistius goeth so far as to affirm, that it cannot be separated from the words or signs; and, as it cannot be uttered without them, so saith he, neither can it be conceived without them. Thus much upon the whole may be concluded, that, distinct from the mind and her operations, there is in created beings neither unite nor number.

358. Of inferior beings the human mind, self, or person is the most simple and undivided essence (b). And the supreme father is the most perfect one. Therefore the flight of the mind towards God is called by the Platonics *φύγη μόνος πρὸς μόνον*. The supreme being, saith Plotinus, as he excludes all diversity, is ever alike present. And we are then present to him, when, recollected and abstracted from the world and sensible objects, we are most free and disengaged (c) from all variety. He adds, that in the intuition of

(a) 345, 346, 347. (b) 347. (c) 268.

the supreme deity the soul finds her wished for end and repose ; which that philosopher calls awaking out of his body into himself.

359. In the tenth book of the arcane, or divine wisdom of the Ægyptians, we are taught that the supreme being is not the cause of any created thing ; but that he produced or made the word ; and that all created beings were made by the word, which is accordingly styled the cause of all causes : and that this was also the doctrine of the Chaldæans. Plato, likewise, in his letter to Hermias, Erastus, and Coriscus, speaks of God the ruler and cause of all things, as having a father : And in his *Epinomis*, he expressly teacheth that the word or *λόγος* made the world. Accordingly saint Augustine in his commentary on the beginning of saint John's Gospel, having declared that Christ is the wisdom of God by which all things were made, observes that this doctrine was also found in the writings of philosophers, who taught that God had an only begotten Son by whom are all things.

360. Now, though Plato had joined with an imagination the most splendid and magnificent, an intellect not less deep and clear ; yet it is not to be supposed, that either he or any other philosophers of Greece or the east, had by the light of nature attained an adequate notion of the Holy Trinity, nor even that their imperfect notion, so far as it went, was exactly just ; nor perhaps that those sublime hints, which dart forth like flashes of light in the midst of a profound darkness, were originally struck from the hard rock of human reason ; but rather derived, at least in part, by a divine tradition (a) from the author of all things. It seems a remarkable confirmation of this, what Plotinus observes in his fifth *Ennead*, that this doctrine of a Trinity, father, mind, and soul, was no late invention, but an ancient tenet.

(a) 298, 301.

361. Certain it is, that the notion of a Trinity is to be found in the writings of many old heathen philosophers, that is to say, a notion of three divine hypostases. Authority, light, and life did, to the eye of reason, plainly appear to support, pervade, and animate the mundane system or macrocosm. The same appeared in the microcosm, preserving soul and body, enlightening the mind, and moving the affections. And these were conceived to be necessary, universal principles, co-existing and co-operating in such sort, as never to exist asunder, but on the contrary to constitute one Sovereign of all things. And, indeed, how could power or authority avail or subsist without knowledge? or either without life and action?

362. In the administration of all things there is authority to establish, law to direct, and justice to execute. There is first the source of all perfection, or fons deitatis, secondly the supreme Reason, order, or λόγος, and lastly the Spirit which quickens and inspires. We are sprung from the father, irradiated or enlightened by the son, and moved by the spirit. Certainly, that there is father, son, and spirit; that these bear analogy to the sun, light, and heat; and are otherwise expressed by the terms, principle, mind, and soul; by one or τὸ εἶν, intellect, and life; by good, word, and love; and that generation was not attributed to the second hypostasis, the υἱός or λόγος, in respect of time, (g), but only in respect of origine and order, as an eternal necessary emanation; these are the express tenets of Platonists, Pythagoreans, Ægyptians, and Chaldæans.

363. Though it may be well presumed there is nothing to be found on that sublime subject in human writings, which doth not bear the sure signatures of humanity; yet it cannot be denied, that several fathers of the church have thought fit to illustrate the christian doctrine of the holy Trinity, by similitudes

litudes and expressions borrowed from the most eminent heathens, whom they conceived to have been no strangers to that mystery; as hath been plainly proved by Bessarion, Eugubinus, and Doctor Cudworth.

364. Therefore, how unphilosophical soever that doctrine may seem to many of the present age, yet it is certain, the men of greatest fame and learning among the ancient philosophers held a Trinity in the Godhead. It must be owned, that upon this point some later Platonists of the Gentile world seem to have bewilder'd themselves, (as many Christians have also done) while they pursued the hints derived from their predecessors, with too much curiosity.

365. But Plato himself consider'd that doctrine as a venerable mystery, not to be lightly treated of or rashly divulged. Wherefore in a letter to Dionysius he writes (as he himself professeth) ænigmatically and briefly in the following terms, which he giveth for a summary of his notion concerning the supreme being, and which being capable of divers senses, I leave to be decyphered by the learned reader. *περι τὸν πάντων βασιλέα πάντ' ἐστὶ, ἢ ἐκείνῃς ἕνεκα πάντα, ἢ ἐκεῖνο αἴτιον πάντων τῶν καλῶν, δεύτερον δὲ περι τὰ δευτέρα, ἢ τρίτον περι τὰ τρίτα.* Plato enjoins Dionysius over and over, with great earnestness not to suffer, what he communicates concerning the mystery of the divine nature, to fall into illiterate or vulgar hands, giving it withal as a reason for this caution, that nothing would seem more ridiculous or absurd to the common run of mankind. He adds, that in regard writings might miscarry, the prudent way was to write nothing at all on those matters, but to teach and learn them by word of mouth; for which reason, saith he, I have never wrote any thing thereon; nor is there, nor shall there ever be any thing of Plato's extant on that subject. He farther adds, as for what hath been now said, it belongs all to Socrates.

366. And, indeed, what this philosopher in his Phædrus speaketh of the super-celestial region, and the divinity resident therein, is of a strain not to be relished or comprehended by vulgar minds; to wit, essence really existent, object of intellect alone, without colour, without figure, without any tangible quality. He might very justly conceive that such a description must seem ridiculous to sensual men.

367. As for the perfect intuition of divine things, that he supposeth to be the lot of pure souls, beholding by a pure light, initiated, happy, free and unstained from those bodies, wherein we are now imprisoned like oysters. But in this mortal state, we must be satisfy'd to make the best of those glympses (b) within our reach. It is Plato's remark in his Theætetus, that while we sit still we are never the wiser, but going into the river and moving up and down, is the way to discover its depths and shallows. If we exercise and bestir ourselves, we may even here discover something.

368. The eye by long use comes to see even in the darkest cavern: and there is no subject so obscure, but we may discern some glympse of truth by long poring on it. Truth is the cry of all, but the game of a few. Certainly where it is the chief passion, it doth not give way to vulgar cares and views; nor is it contented with a little ardour in the early time of life, active perhaps to pursue, but not so fit to weigh and revise. He that would make a real progress in knowledge, must dedicate his age as well as youth, the latter growth as well as first fruits, at the altar of truth.

Cujusvis est errare, nullius nisi insipientis in errore perseverare. Cic.

(b) 335, 337.

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一、一九四九年一月一日，即中華人民共和國成立之日，也是中國人民解放戰爭取得最後勝利的日子。

