

REMARKS

ON

THE LIMITS OF HUMAN KNOWLEDGE.*

PERHAPS a few observations on the littleness of human knowledge may not be unacceptable to the serious reader. I propose them barely as hints, which may be pursued at large by men of reflection and leisure.

To begin with the things which are at the greatest distance from us. How far does the universe extend, and where are the limits of it? Where did the Creator "stay his rapid wheels?" where "fix the golden compasses?" Certainly himself alone is without bounds; but all his works are finite. Therefore, He must have said, at some point of space,

"Be these thy bounds,
This be thy just circumference, O world!"

But where, who can tell? Only the morning stars who then sang together; the sons of God, who then shouted for joy. All beyond the region of the fixed stars is utterly hid from the children of men.

And what do we know of the fixed stars? A great deal, one would imagine; since, like the Most High, we too tell their number, yea, and call them all by their names! those at least which appear to the naked eye, both in the northern and southern hemisphere. But what are these in comparison of those which our glasses discover, even in an inconsiderable part of the firmament? What are one or two and twenty hundred, to those which we discover in the milky way alone? How many are there, then, in the whole expanse, in the boundless field of ether? But to what end do they serve?

* These remarks form the conclusion of Mr. Wesley's "Compendium of Natural Philosophy." Some of them occur in his sermon "On the Imperfection of Human Knowledge," Vol. VI., page 339; but they are here considerably enlarged.—EDIT.

to illuminate worlds? to impart light and heat to their several choirs of planets? or, as the ingenious Mr. Hutchinson supposes, to gild the extremities of the solar sphere, which according to him is the only inhabited part of the universe; and to minister, in some unknown way, to the perpetual circulation of light and spirit?

For our sakes only, that great man apprehends the comets also to run their amazing circuits! But what are comets? planets not fully formed? or planets destroyed by a conflagration? or bodies of an wholly different nature, of which therefore we can form no idea? How easy is it to form a thousand conjectures! How hard to determine anything concerning them! Can their huge revolutions be even tolerably accounted for by the principles of gravitation and projection? Has not Dr. Rogers overturned the very foundation of this fashionable hypothesis? What then brings them back, when they have travelled so immensely far beyond the sphere of the solar attraction? And what whirls them on, when, by the laws of gravitation, they would immediately drop into the solar fire?

What is the sun itself? It is undoubtedly the most glorious of all the inanimate creatures: And its use we know. God made it to rule the day. It is

Of this great world both eye and soul.

But who knows of what substance it is composed? or even whether it be fluid or solid? What are those spots on his surface that are continually changing? What are those that always appear in the same place? What is its real magnitude? Which shall we embrace amidst the immense variety of opinions? Mr. Whiston, indeed, says that eminent astronomers are nearly agreed upon this head: But they cannot agree concerning his magnitude, till they agree concerning his distance. And how far are they from this! The generality of them believe that he is near a hundred millions of miles from the earth; others suppose it to be twenty, some twelve, millions; and last comes Dr. Rogers, and brings a clear and full demonstration (so he terms it) that they are not three millions from each other. What an unbounded field for conjecture is here! But what foundation for real knowledge?

Just as much do we know of the feebly-shining bodies that

move regularly round the sun ; of Jupiter, Saturn, and other planets. Their revolutions we are acquainted with ; but who is able, to this day, regularly to demonstrate either their magnitude or their distance? unless he will prove, as is the usual way, the magnitude from the distance, and the distance from the magnitude. And what are Jupiter's belts? Can any man tell? What is Saturn's ring? The honest ploughman knows as well as the deepest philosopher. How many satellites, secondary planets, move round Jupiter or Saturn? Are we sure even of their number? how much less of their nature, size, motions, or distances from the primary! But what wonder we are so ignorant concerning Saturn's moons, when we know so little of our own? For although some men of genius have not only discovered

Rivers and mountains on her spotty globe,

but have travelled over the whole hemisphere which is obverted to us ; (and why is the same hemisphere always obverted? What reason can be assigned, why we do not see the other hemisphere in its turn?) have marked out all her seas and continents with the utmost exactness ; yea, and carried selenography to so great perfection, as to give us a complete map of the moon ; yet do others (and not without reason) doubt whether she has any atmosphere : And if she has not any, she can have no rain or dews, nor, consequently, either seas or rivers. So that, after all, we have nothing more than mere conjectures concerning the nearest of all the heavenly bodies.

What is it that contains them all in their orbits? And what is the principle of their motions? By what created power, what outward or inward force, are they thrown forward to such a point, and then brought back again to a determinate distance from the central fire? Dr. Rogers has evidently demonstrated, that no conjunction of the centrifugal and centripetal force can possibly account for this, or ever cause any body to move in an ellipsis. Will light moving outward, and returning inward in the form of spirit, account for them? Nay, if they take away some, they plunge us into other difficulties, no less considerable : So that there is reason to fear that even the Newtonian, yea, and Hutchinsonian system, however plausible and ingenious, and whatever advantage they may have in several particulars, are yet no

more capable of solid, convincing proof, than the Ptolemaic or Cartesian.

But let us come to things that are nearer home, and see what knowledge we have of them. And how much do we know of that wonderful body that enables me to see and know all things around us? I mean light. How is it communicated to us? Does it flow in a lucid river, in a continued stream from the orb of the sun to the earth? Or does the sun impel those particles only which are contiguous to his orb, which impel others, so on and on, to the extremity of his system? Again: Are the particles of light naturally and essentially lucid? or only by accident, when they are collected, or when put into motion? Yet again: Does light gravitate or not? Does it attract other bodies, or repel them? Is it the strongest, or the only, repellent in nature? and what communicates that power to all repellents in nature? Is this power the same with electricity; or wherein does it differ therefrom? Is light subject to the general laws which obtain in all other matter; or is it a body *sui generis*,* altogether different from all other bodies? Is it the same, or how does it differ from ether, Sir Isaac Newton's subtile matter? What is ether? Wherein does it differ from the electric fluid? Who can explain, and demonstrate the truth of his explanation, the phenomena of electricity? Why do some substances conduct the electric matter, and others arrest its course? Why does a globe of glass and another of sulphur just counteract each other? Why is the coated phial capable of being charged just to such a point, and no farther? *O crux philosophorum!*† superabundant proof of the shortness of human knowledge!

But let us consider what is not of so subtile a nature, nor therefore so liable to elude our inquiries. Surely we understand the air we breathe, and which encompasses us on every side. By its elasticity, it seems to be the grand mover and general spring of all sublunary nature. But is elasticity essential to air, and consequently inseparable from it? Not so: It has been lately proved, by numberless experiments, that it may be fixed, divested of its elasticity, and generated or restored to it anew. Therefore elasticity is not essential

* Of a kind peculiar to itself.—EDIT.

† O tormenting source of vexation to philosophers!—EDIT.

to air, any more than fluidity is to water. Is it then elastic any otherwise than as it is joined to another body? As every particle of air is, in its ordinary state, attached to a particle of ether, or electric fire, does it not derive its whole elasticity from this, perhaps the only true, essential elastic in nature; and, consequently, when separated from this, lose all its elastic force? for want of which it is then effete, and will neither sustain flame, nor the life of animals.

By what powers do the dew, the rain, the other vapours rise and fall in the air? Can we account for all the phenomena of them upon the common principles? And can we demonstrate that this is the true, the most rational way of accounting for them? Or shall we say, with a late ingenious writer, that those principles are utterly insufficient; and that they cannot be accounted for at all, but upon the principles of electricity?

Do we thoroughly understand the nature and properties of the atmosphere that surrounds us? that immense congeries not only of air and vapours, whether of a watery or inflammable nature, but likewise of effluvia of every kind, which are continually steaming out from solid as well as fluid bodies, in all parts of the terraqueous globe? Do all our instruments, with all the improvements of them, suffice to give us a thorough knowledge of its constituent parts? Do they inform us of their innumerable combinations and changes, with the remote and immediate causes of them? Very far from it; and yet it is not a barely curious knowledge, but useful in the highest degree; seeing, for want of it, not only various diseases, but often death itself ensues.

Let us descend to what is of a still more firm and stable nature, and subject to the scrutiny of all our senses; namely, the earth we tread upon, and which God hath peculiarly given to the children of men. Do the children of men understand this? Of what parts then is it composed? I speak now of its internal parts, in comparison of which the surface is next to nothing. Many arguments induce us to believe that the earth is between seven and eight thousand miles in diameter. How much of this do we know? Perhaps some cavities, natural or artificial, which have been examined by men, descend one, or even two miles beneath its surface. But what lies beneath these? beneath the region of fossils, of stones, metals, and minerals? these being only a thin

exterior crust. Whereof consist the inner parts of the globe? Of a nucleus, (as an eminent man supposes, in order to account for the variation of the needle,) and a luminous medium interposed between that and the outer shell? Or is there a central fire, a grand reservoir, which supplies all the burning mountains, as well as ministers to the ripening of gems and metals, if not of vegetables also? Or is the great deep still contained in the bowels of the earth, a central abyss of waters? Who hath seen? Who can tell? Who can give any solid satisfaction to a rational inquirer?

But what wonder if we are ignorant of its internal nature? For how many parts are there on the surface of the globe, which, after all the discoveries of later ages, are still utterly unknown to us! How very little do we know of the polar regions, either in Europe or Asia; in Asia particularly, where all but the sea-coast is mere *terra incognita*! How little do we know of the inland parts either of Africa or America; either of the soil, the climate, the fruits, the animals, or the human inhabitants! So far are we from having any proper knowledge of these, that we can scarce form any rational conjecture about them.

And who knows what is contained in the broad sea; in the abyss that covers so large a part of the globe? Many indeed go down to the sea in ships, and occupy their business in the great waters: But what know they of what is contained therein; either of its animal inhabitants, its productions of the vegetable kind, or those of a mineral or metallic nature? Most of its chambers are inaccessible to man; so that how they are furnished, we know not. Leviathan may take his pastime therein; but they are not designed for the children of men.

But let us come nearer home. How little do we know even of the furniture of the dry land! Survey those things which fall directly under our notice, even the most simple stones, metals, minerals. How exceeding imperfectly are we acquainted with their nature and properties! What is there in the inward constitution of metals, which distinguishes them from all other fossils; from stones in particular? "Why, they are heavier." True; but what makes them heavier? I doubt whether Solomon himself was able to assign the reason. What is the original internal difference between gold and silver, or between tin and lead? It is all

mystery to the sons of men. And yet vain man would be wise!

“If all the men in the world,” says the great Mr. Boyle, “were to spend their whole lives in the search, they would not be able to find out all the properties of that single mineral, antimony.” And if all men could know so little of one thing, how little can one know of all!

Let us proceed to the higher parts of the creation. Observe the vegetable kingdom: And here also whatever displays the wisdom of the Creator, discovers the ignorance of his creature. Who can clearly determine even the fundamental question concerning the general nature of vegetables? Does the sap perform a regular circulation through their vessels, or not? How plausible arguments have been brought, both on the one side and the other! Who knows the several species of vegetables, from the cedar of Lebanon to the hyssop on the wall; or rather, if we would descend from the highest to the lowest, to the innumerable groves of plants which appear in the form of mouldiness; or those more innumerable (if the expression may be allowed) which do not appear to the naked eye at all? Who is able to discover the proper specific difference between any one kind of plant and another; or the peculiar internal conformation and disposition of their component particles? Yea, what man upon earth thoroughly understands the nature and properties of any one plant under heaven?

Ascend we higher still, from plants to animals. But here we are stopped in the midway. Under which of these shall we place the innumerable tribes of microscopic animals, so called? Are they real animals in the common sense of the word? Or are they animals in quite another sense? essentially different from all other species of animals in the universe; as neither requiring any food to sustain them, nor generating or being generated? Are they no animals at all, (according to the supposition of a late ingenious writer,) but merely inanimate particles of matter, in a state of fermentation? So much may be said for each of these opinions, that it is not easy to fix upon any of them.

If they are animals of a peculiar kind which neither generate, nor are generated, they spread a veil over one considerable branch of human ignorance. For how totally

ignorant are the most sagacious of men touching the whole affair of generation! I do not say, of the generation of insects and fishes;

the countless fry,
That by unnumber'd millions multiply.

But let us come to that of the most perfect animals, yea, of man himself. In the book of the Creator, indeed, were all our members written; which day by day were fashioned, when as yet there were none of them. But by what rule were they fashioned? in what manner? by what degrees, from the moment of impregnation? Who can explain

How the dim speck of entity began
To' extend its recent form, and swell to man?

By what means was the first motion communicated to the *punctum saliens*? When and how was the immortal spirit added to the mass of senseless clay? There is no need of descending to particulars: for it is mystery all; and, after all our researches, we can only say, "I am fearfully and wonderfully made!"

But is there any such thing as equivocal generation, whether of plants or animals? It is impossible anything can appear more absurd to the eye of reason! Was there ever an instance, since the world began, that a house grew of itself? nay, so much as a bed, a table, a chair, or the smallest piece of household furniture? And yet how trifling and inartificial is the construction of these to that of the meanest plant or animal! What is the workmanship of Whitehall or Westminster Abbey, to that of a tree or a fly? And yet, on the other hand, if we deny spontaneous generation, what difficulties surround us! If we can give a plausible account of the propagation of mistletoe on trees, and a few of the plants growing on the tops of houses, or on the walls of churches and towers, yet how many more confound all our sagacity! And how many animals are discovered in such places as no animal of that kind ever frequented!

With regard to the lowest class of animals, insects, almost innumerable are the discoveries which have been made within few years, particularly by the ingenious and indefatigable Mr. Reaumur! But how inconsiderable is all this

in comparison of that which still remains undiscovered! How many species, how many entire *genera* of these, are we totally unacquainted with! How many millions by their extreme minuteness elude our most careful inquiries! And the minuter parts of larger animals escape our utmost diligence: So that all we can attain to is an imperfect knowledge of what is obvious in their composition.

Have we a more perfect knowledge of fishes than of insects? How many of the inhabitants of the waters are entirely concealed from human view, by the element wherein they live! It is not permitted to the sons of men to walk through the paths of the sea, nor, consequently, to trace out their several kinds or species with any exactness. But it is highly probable these are far more numerous than the species of land-animals; as the distance between the smallest and the largest of sea-animals is so immensely greater: From the minnow, for instance, (though this is far from being the least,) to the Norwegian whale; to say nothing of Bishop Pontoppidan's cracken, and sea-serpent, which I doubt never existed but in his own imagination. And with regard to the species we are acquainted with, how little is it that we know! Only a few of their general properties; enough to satisfy our need, but not our curiosity.

We are something better acquainted with the inhabitants of the air; birds being more accessible to us: Yet upon the whole we are very far from being perfectly acquainted with them. Of many we know little more than the outward shape. We know a few of the obvious properties of others, but the inward, specific difference of very few; and we have a thorough, adequate knowledge of none.

“However, we have a more extensive knowledge of beasts, many of which are our domestic companions.” Certainly we have: And yet a thousand questions may be asked even concerning these, which we are in nowise able to answer. To touch only on two or three general heads. Do they reason, or do they not? Whence arise the different qualities and tempers, not only in different kinds and species, but even in the individuals of one species, as in dogs, cats, and horses? Are they mere machines? If we assert they are, it inevitably follows, that they neither see, nor hear, nor smell, nor feel. For of this mere machines are utterly incapable. Much less can they know or remember any-

thing, or move any otherwise than they are impelled. But all this, as numberless experiments show, is quite contrary to matter of fact. On the other hand, if they are not mere machines, if they have either sensation, or knowledge, or memory, or a principle of self-motion, then they are not mere matter; they have in them an immaterial principle. But of what kind? Will it die with the body or not? Is it mortal or immortal? Here again we are got into an unknown path. We cannot order our speech by reason of darkness.

But although we know so little either of the things that are above us, of those that are beneath us, or of those that surround us on every side, yet it is to be hoped we know ourselves; and of all, this is the most useful, the most necessary, knowledge. But do we truly know ourselves? Do we know the most excellent part of ourselves, our own soul? That it is a spirit, we know. But what is a spirit? Here again we are at a full stop. And where is the soul lodged? In the pineal gland? the whole brain? in the heart? the blood? in any single part of the body? Or, is it (if any one can understand those terms) all in all, and all in every part? How is it united to the body? What is the secret chain, what the bands, that couple them together? Can the wisest of men give a satisfactory answer even to these few, plain questions?

As to the body, we glory in having attained abundantly more knowledge than the ancients. By our glasses we have discovered very many things, which we suppose they were wholly unacquainted with. But have we discovered why we perspire three parts in four less when we sweat than when we do not? What a total mistake is it then to suppose sweat is only an increase of insensible perspiration! Have we discovered why one part of mankind have black skins, and the other white? It is not owing to the climate; for both black men and white are born in the same latitude. And have not Negroes the same flesh and blood with us? But what is flesh? that of the muscles in particular? Are the fibres out of which it is woven of a determinate size; so that when you have divided them into smaller and smaller, to a certain point, you come to those of the smallest kind? Or are they resolvable (at least in their own nature) into smaller and smaller *in infinitum*? How does a muscle act?

If you say, "By being inflated, and consequently shortened;" I ask again, But what is it inflated with? If with blood, how and whence comes that blood? And what becomes of that blood, whither does it go, the moment the muscle is relaxed? What is blood? Of how many sorts of particles does it essentially consist? Of red globules and serum? But in the famous instance, the man bled at the nose till what was discharged had no redness left. By what force is the circulation of the blood performed? Can any one suppose the force of the heart is sufficient to overcome the resistance of all the arteries? Are the nerves pervious or solid? How do they act? By vibration, or transmission of the animal spirits? What are the animal spirits? If they have any being, are they of the nature of blood or ether? What is sleep? Wherein does it consist? We do not inquire what are the effects of it, (cessation of voluntary motion, and so on,) but what is the thing itself, the cause of these effects? What is dreaming? By what criterion can we distinguish dreams from waking thoughts? I mean, by what means may a dreaming person then know that he is in a dream? What is (the *consanguineus somni**) death? When do we die? You say, "When the soul leaves the body." This cannot be denied. But my question is, When does the soul leave the body? When we cease to breathe, according to the maxim, *Nullus spiritus, nulla vita?*† This will not hold; for many have revived after respiration was utterly ceased. When the circulation of the blood stops? Nay, neither will this hold; for many have recovered after the pulse was quite gone. When the vital warmth ceases, and the juices lose their fluidity? Even this is not a certain mark; for some have revived after the body was quite cold and stiff; a case not uncommon in Sweden. By what token then can we surely know? It seems, none such can be found. God knows when the spirit returns to him; and the spirit itself; but none that dwells in a body.

What cause have we, then, to adore the wisdom of God who has so exactly proportioned our knowledge to our state! We may know whatever is needful for life or godliness, whatever is necessary either for our present or eternal happiness. But how little beside can the most penetrating genius know

* Next akin to sleep.—EDIT.

† No breath, no life.—EDIT.

with any certainty! Such pains, so to speak, hath God taken to hide pride from man; and to bound his thought within that channel of knowledge wherein he already finds eternal life.

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