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Introduction.

Men of speculation are disposed to think very highly of Science. Sensible of the great pleasure which it affords them, they imagine that the improvement of the mind (which must ever be looked on as the noblest employment of man) consists in accumulating an inexhaustible stock of Intellectual knowledge, persuaded that our Mental endowments & acquisitions constitute the great distinction between our Nature & that of the brute Creation. They imagine that this is not only the noblest but the most natural employment of man, & the most likely to engage the attention of simple & unprejudiced minds.

But fact, stronger than any deduction of argument, is against them, & the experience of all ages should convince us that they are mistaken both in the premises & conclusion. An unprejudiced survey of the history of mankind is sufficient to prove that greater advantages have accrued to society, & that both the manners and the parts of men have been more purified & improved by an attention to the meaner parts of our constitution than by all the scientific labours of the Philosophers. This is not

This science, of which we think so favourably, must own, for its part, these lower employments, which the Philosopher is but too ready to regard with contempt. We owe philosophy in all its branches to the arts, & perhaps not one single art to philosophy.

It has always appeared to me, therefore, that among the many views which ingenious men have taken of the distinction between our species & the rest of the Animal creation, there is none more profitable than the view of the remarkable distinction arising from the great multiplicity of our wants, & the great difficulty of supplying them. Man is not more eminently distinguished by the variety of his talents or the extent of his capacity. I will even venture to say that his reason, & his Invention of which we boast as the prerogative of our species, are the results of our necessities. We shall see in all the species of Animals a gradation in talents corresponding to a gradation of wants & in the difficulty of their supply.

The Horse, the Ox, the Sheep ask of Providence nothing but Grass & Shelter. These they find in every field. How few are their talents! how mean their understandings! Nothing seems fit to rouse them from their general stupidity but the impressions of present terror, or the stings of ~~malicious~~ ^{mischance} ~~malicious~~.

How much superior to these in Sagacity, in contrivance, in variety of powers, are the Carnivorous animals! To supply their ravenous wants, they must get the better of all the contrivances which nature has provided for the security of such Animals as they single out for their prey. But here their art terminates.

The

The crafty Fox has no other end, in all his toils, & having secured his Lamb or Chicken, he contentedly retreats to his hole, gorges himself with his prey, lays himself down to sleep, nor takes any farther trouble, till the call of returning hunger again finds him abroad in search of prey.

But needy man has a far different occupation. His attention is directed to a great variety of objects at once. Hunger finds him abroad in quest of food. He is delicate body is unable to bear the inclemency of the seasons, & he must make to himself some shelter, for nature affords none sufficient for his feeble constitution. His natural weakness, his distaste for solitude, drives him into society. There he finds others as needy & as weak as himself. Contentions in want are inevitable & fatal. He must arm himself against his fellow men. Not contented by this variety of pursuit, man has an insatiable desire of change unknown to other Animals. The food which this week pleases his palate disgusts him the next, & he must seek for another. Nature with all her stores is not sufficient for his love of novelty.

But his hardest task yet remains. Man is a nice Creature, & there is not a gift of nature so exquisite but his freakish fancy must mould it to his taste, by putting it out of his original form. This is the case even in supplying his most pressing wants, & sums even necessary for his well being. The delicate juice of the Grape disagrees with his Stomach, & must be made into wine. The warm fur of the Sheep is

is inconvenient, it must be woven into cloth. The shade
& protection of the woods must be fashioned into a
hut. In short, his whole employment seems to
be putting things out of their natural state.

But, as if all this diversity of attention, all
this difficulty consequent on it, did not suffici-
ently employ him, there is superadded to his
constitution an insatiable principle of luxury
& refinement. His very natural wants he
refines into instruments of pleasure. Not
contented with wholesome food, he must have
it seasoned. He changes his blanket to a laced
Coat, & his hut to a palace. He converts a
natural hut into an elegant mansion. He has flower
gardens as well as Corn fields. Not contented
with beholding beautiful objects abroad, he
paints them at home. Not being able to be a
performer, or spectator of noble actions, he
thiers poets & historians to relate them. The
most pleasant sounds are without entertain-
ment unless subjected to the rules of music.
Nay, the very means of supplying his na-
tural wants he refines into sports, & hunts,
tho' not hungry.

Such, & so various are the wants of man.
All concur in turning our attention, without
ceasing, to the objects which surround us.
These are the Instruments of all our pleasures
& pains. Did these pleasures or pains come
upon us without any possibility of promising
the one or preventing the other, there is no
doubt

doubt but they would be the only objects of our attention.

2. But from the circumstances of our condition, many efforts on our part are necessary. These efforts are directed to the external objects. It will occur, almost without reflection, that all efforts are equally conducive to our purpose. Hunger directs my attention to the bread which stands before me. A torrent from the mountains threatens to sweep me away. My calling out will not procure the bread nor avert the danger. I must catch the bread, I must quit the low grounds, By long practice I become a dextrous marksman, & seldom fail of killing my object if within a moderate distance. But in process of time my game becomes more scarce or more shy. I must fall on new contrivances in order to get it into my power. I invent baits & traps. It is plain that the efficacy of all these contrivances must depend on the habits of the animals & the nature of the means employed.

But of these circumstances the Savage seldom thinks abstractedly. He attends solely to the application which he makes of his acquaintance with them. He seldom finds himself at leisure to sit down & consider the nature, manner of life, food, or haunts of his prey, or the operations of his machines. Scraps of his knowledge occur to him from time to time, & are immediately applied to practice; & the only collection which he makes in his own mind is that of precepts, or directions for his successful hunting.

3. Our acquaintance with things would never proceed much farther, were all our propensities & desires confined to the class already mentioned. But our great Father is ever every way kind to us. He has given us objects of ultimate research, and

and which are, therefore, in their own nature, always
gratfull. - But, farther, in every important case, he
has reconciled us to the task of obtaining them, by
rendering this very employment agreeable & desirable.
How agreeable soever we may suppose the enjoy-
ment of life to be, all have had experience how
loath some the task, of possessing it by the use of
food, would be, if appetite were wanting. How
eligible soever we may suppose the knowledge
nature, & however conducive to our comfortable
subsistence, we have all seen how disgustfull
the task of acquiring it is to some dull and
insensible minds.

But Nature is kind to her Children.
As our task of acquiring the knowledge of ter-
restrial things is so various, & as our power must
ever be in proportion of our knowledge, God hath
not left the employment of his noblest work
on this Earth to the cool deduction of reason &
expedience. He hath implanted in our minds
a love of discovering & disinterested curiosity. Other
Animals resemble us in many respects - Like us
they acquire by experience the habitual knowledge
of many relations of things. They reason, and
act in consequence of this knowledge, precisely as
we do. But of disinterested curiosity they exhibit
no traces. We sometimes behold them prying
into things, but more careful observation shows
that it is always to answer some immediate
purpose - An indisputable proof of the fact is,
that we see them accumulate no stock of knowledge
to the species, which exhibits the same appearance
to.

to-day as a thousand years ago.

But in man discovery & invention are, for their own sakes objects of keen pursuit. Curiosity becomes a principle of action in all men as far as is necessary for the general purposes of life. At the same time, the Author of nature has rendered it, in some, a principle so as to abstract them from every other pursuit, & to engage them in intellectual researches, by a thirst after knowledge, which no discovery can quench, which success inflames the more. Des Cartes declares that "having taken a survey of all the employments of men in this life, in order to choose & engage in what was best, he became fully persuaded that he could not possibly do better than to continue in that in which he had already engaged, namely to employ all his life in promoting the knowledge of truth." For this he relinquished the advantages of his easy situation in life. Rather than relinquish his favourite object, he abandoned his Country, & put himself under the protection of Strangers. He had a life of great labour & has laid ^{profoundly} ~~himself~~ under great obligations. Such men, are in the hands of God, the instruments for improving the whole species. It is more advanced by the & successful labours of a few superior minds, animated by this distinguished love of knowledge, than it possibly could be by dispersing over the whole species the same absolute quantity of intellectual curiosity, but subject to the many distractions & avocations of life.

It is peculiarly fortunate that in the pursuit of this manly employment, we gain strength by every exertion. The farther we advance, the more successfully we are enabled to proceed.

And thus I think it plainly appears that

that man becomes at length more eminently distinguished from the brutes, by those numberless wants, which at first seemed to render his situation so forbidding & pitious. Our boasted reason and invention follow of course. What we are apt to value ourselves for so highly, must only be looked on as one of the chief refinements to which our nature so powerfully disposes us. We convert into an agreeable & elegant pursuit that anxious attention which our weak and needy constitution obliges us to give to the nature and effects of the objects around us.

But, as I have already observed, we are not to expect this in the first application of human life.

Immediate application to use is the object of ^{the} research of every Savage. The first acquisitions of the human mind will be that of arts, or the knowledge of means conducive to certain ends. But as men improve their situation & become more at ease, especially after the introduction of agriculture, & during the progress of its cultivation, & during the progress of its communication, Manufacture, they will find more time to study the nature and properties of the things which are the objects of their appetites & propensities. They will also find inclinations. For many detached properties of things have, ere now, been discovered & applied to use. Many coincidences of properties have been observed, & excited curiosity as to the cause.

causes of this coincidence. Now, the mind of man will begin to study nature, & the knowledge of the properties of things will become the object of pursuit to some, at first, indeed, in subordination to purposes of application to the arts of life, but afterward for its own sake. The acquisition of natural knowledge will have charms sufficient to attract the attention of minds endowed with more than common curiosity without any immediate thought of application to practice, altho they may, perhaps, apologize to the busy world for thus engaging in an employment which seems so idle, by the promise of future application to the arts of life.

In the prosecution of this employment it will be found, as in the arts of life, that all efforts will not be equally successful. Their efficacy must depend on the nature of knowledge, the object of the pursuit, & on the nature of our mental powers. In process of time, therefore, the art of acquiring knowledge will receive improvement similar to every other art, by applying to practice every detached observation and accidental discovery, which have been made of the nature of truth & of our Intellectual powers. This will in time engage the attention of certain minds for its own sake, even without any prospect of application, altho such may, perhaps, excuse themselves to the scientific world with promises of future application to the improvement of Science.

Thus &c

10. These arts are grounded on knowledge, & are refined into Sciences, and the art of Science or Logic arises, & at last refined into Metaphysics, or abstract Philosophy. Science, therefore, is the Child of luxury, the refinement of necessary contrivance. It is therefore, of its own nature, pleasant, & has in all ages been looked on as making a capital distinction between the pursuits of men of easy fortunes & the Vulgar who must work for their daily bread. The Plebian must learn to work, the Gentleman learn to think, the man of pleasure & the Philosopher regard the hurry & labour of the man of business with equal disdain; and this they do with equal injustice: for they forget that they themselves are only the superfluities of Society. But the luxury of the Philosopher has this eminent advantage above that of the Man of pleasure, his entertainments may be directed in such a manner as shall make them subservient to the general good. As in the necessary arts of life no man can, at the same time, be an expert Farmer, Mason, Carpenter & Weaver; and as the arts of life flourish in consequence of the various inclinations of men prompting them to divide their talents, so it happens in Science. The mind of no man is able to grasp at all its objects, & it has acquired its present improvement in consequence of different Philosophers having been led to different paths of enquiry. It will continue still farther

11. Further to improve by the improvement of arts, which
will be daily presenting it with new objects and new
discoveries. The arts will daily improve by a more
complete division of labour & by the Artists calling
in a set of men to think for them, leaving no more to
their own hands than the execution of the orders of
the Speculist; As in China the arts of government
is perfected by a professed division of the task between
the Thinkers & Signers [Resnat VII] Thus both art
and Science will most successfully improve by acting
in concert, & those Sciences will always improve best
which are more immediately connected with arts.

I don't know any branch of Scientific en-
quiry that more immediately springs from the
arts of life than that which is to be the subject of
the following Lectures. none that is more indebted
to them for information & none which ^{has} made
more liberal returns; and perhaps there are few
which have a more justifiable claim to our attention
& assiduous cultivation, whither on account of the
pleasure which it can afford to an ingenious
mind, or the services which it can render us in
life. Not offended at the relationship which I have esta-
blished between the parent art & science its offspring, let
us rather examine attentively their connection, and
as both derive their source from knowledge, let us
trace the stream thro its various channels & select
that one in which we are afterwards to pursue our
course.

Knowledge is a term expressing a state of the
understanding, which admits of no definition,
being so simple as to be used as a first principle in
the

19. The explanation of every thing else. Some think to make it plainer by saying that it is a perception of the mind. But this is so far from being the case that it is nothing but an analogical way of expressing it by an act of the Body, which we falsely conceive to resemble it.

The subjects of our knowledge are either existences or the relations of these existences. Of all existences that which is most intimately known is our own thoughts & the operations of our own minds. Some have looked on these thoughts as the only objects of our knowledge, nay, as the only existences in nature. Others have thought themselves obliged to allow that these objects, & this consciousness, were qualities of a subject, that the powers of comparing, arranging, analysing, or compounding these notions were powers of a substance possessing them. That, therefore, mind or Spirit had an existence. Des Cartes admits this as the only sure foundation upon which all knowledge can rest. *Cogito ergo sum* is the foundation & basis of all his philosophy.

The first object, therefore, of our feelings or perceptions is ourselves, that is, the mind or spirit, with a consciousness that the train of thoughts, or feelings, of which we are conscious at present belong to the same subject that another train of thoughts, feelings, or operations which we remember. The feeling of personal identity makes us conceive ourselves as different from every other being, & enables us to connect the existence of the present moment with that of any other past or future moment. In what this feeling of personal identity consists, remains an insoluble mystery after ^{having} employed the generality of the most acute Philosophers.

The other object of our knowledge is the relations of things. Thoughts or perceptions which have use for their object, are called Judgements or opinions. I not only have the notion of a Tree with all its furniture of roots, branches & leaves, but have a notion that the leaves are higher than the roots. In all the appearances of the material world we find that careful observation will enable us to reduce the most complex ^{part} to a very small number of simple facts compounded together.

13. Together. The motions of the Tides, with all their
are nothing but complex cases of two general facts, the
matter is heavy & that all matter tends to continue in
state of rest or of uniform rectilinear motion. These
general facts, included in all the particular facts which we
observe, are called the laws of the material world.
In like manner we find that in all the operations of
the mind there are certain facts which find a place in
every particular appearance. In all our most com-
plicated Judgements which we are conscious of forming
about our thoughts we find that we can resolve them
into a very small number of Judgements, which we
inevitably form by the very constitution of our nature.
Such may be called the laws of Judgement, & are looked
on by some as the foundation of all our knowledge of
the relations of things. But for instance in this Judge-
ment. It is impossible for the same thing to be & not
to be at the same time. This is perhaps the only law
of Judgement which we have yet discovered, & altho it
must be acknowledged that the laws of Judgement are the
foundation of all our knowledge, yet till we have discovered
them all we are not able to discover true knowledge from
false opinion. In the material world, men thought that
all the laws might be reduced to these two, that matter
tends to continue in a state of rest, or of uniform recti-
linear motion, and that impulse is always accompanied
by equal & contrary changes in the motions of the im-
pelling body. On this supposition Philosophers have
endeavoured to account for all the appearances of the
material world, & wandered in ^{many} ways of absurdity till a
superior Genius arose & showed that we had not enu-
merated all the laws of the material world, but that
there remained one as general as any of the other two -
That all matter was heavy. Aided by this discovery
he was enabled to explain, with the utmost accuracy
all the most remarkable appearances of Nature -
viz. The motions of the Heavenly bodies. Subse-
quent discoveries show us that this Philosopher has
made but one discovery of this kind, & that there
yet

14. yet remain many laws of Nature unknown to us.
In like manner in mind, Philosophers fondly imagining
that they had enumerated all the laws of Judgement in these
two axioms that it is impossible for a thing to be & not to be
at the same time itself & another thing - have provided to
give us a system of human knowledge which terminates in
absolute & demonstrable ignorance. The result of their enquiries
& sound reasonings ought to convince us that they have erred
on account of their original presumption of having enumerated
all the laws of Judgement. - All that we can say of
these laws of Judgement which have hitherto been disco-
vered is, that they may prevent us from going astray
in our investigations. For if they are universal, they
must take place in every Judgement, & any Judgement
that contradicts them must be false.

Handy
nothing
can be at
of some
time -

Try for the greatest number of our thoughts are
accompanied with a reference of them to something
without us different from ourselves which we irresist-
tably & with the fullest confidence believe to exist & to
be the cause of these thoughts. When I contemplate
my own thought, I am wholly employed about my-
self, about this thinking principle which I call my-
self. But when I think of the pain of a wound, I
feel at once that the object of my contemplation
is by no means so simple as the former. I cannot
help forming an opinion, a judgement about that
- Pain. I refer it to something which is painfully
affected. This I call my Body; because I feel my-
self always disposed to refer such feelings to one
determined external subject, which I conceive to
have always accompanied my thinking principle.
Here is one, & an important instance of a Judgement
universal & inevitable, & therefore justly entitled
the title of a law of Judgement; which, if ad-
mitted, & nothing can warrant the exclusion, will
give us a prodigious addition of true knowledge.
Nay it frequently happens that this reference of
my thought or feeling to something external
does not stop here, but I immediately, irresistably
& without perceiving it, refer this immediate cause
of

15. of which I conceive it is the effect. I refer the pain now mentioned to a pin, a knife, a sword or some other external thing which was the cause why my body has excited in my mind such feelings or thoughts. I feel a sweet taste, my mind immediately refers it to my tongue as the immediate cause, & thro' it to a piece of sugar.

My body now appears in a different point of view. I now consider it as an instrument or organ by which I am made acquainted with foreign existences and receive a communication with them by the thoughts which they by its means excite in my mind. In like manner I conceive the existence of external things, by means of the feelings of sound & colour. But here there is generally a very sensible difference. In this information which I get by the feelings of sound & colour I never think of the organ or instrument & perhaps never would know that I got ^{report} this information by any such intervention, were it not that the office of these organs is sometimes interrupted either casually or by intention. On the other ^{part}, there are some feelings which I cannot refer to any cause more remote than my body, and it is only by means of a refined consideration that I come at last to do so. Of this kind are most of our intimate bodily feelings such as a Heart burn or Colic.

All these objects of consciousness or thought, which we in this manner refer to our body as the immediate cause, and to something external to our body as a remote cause, are termed feelings or sensations. The sensation accompanied with the reference to our external object as its remote cause, and the belief or judgement that the object exists, is called the perception of the external substance. The object of the perception, objects of our immediate perception, by means of this instrument, are called bodies, and as they are of various kinds, we discover by certain processes of argument that they are not all perceived in the same way, or by the same faculty or part of our organ of sensation. The different

16. different faculties by which we receive this information, this perception of external things, are called the senses. Five of them have been more particularly considered, Touch, Taste, Smell, Seeing, Hearing. Each of these gives us information of different qualities of these external objects, & had we more senses qualities would be perceived of which at present we have not the least notion.

Our senses, or more properly our sensations, all concur in giving us the immediate perceptions of some external object, & a belief of its existence, invested with certain qualities. These circumstances in any perception are inseparable. Nothing is ever perceived divested of every quality, and no quality is ever perceived without being considered as inherent in some object.

The subserviency of our sensations to suggest to us the existence of our body, & by its means the existence of external objects, is a most curious & important subject of enquiry, and is the first in the order of nature. One would readily expect that as it is of all others the most open to our observation, and as the means of information are in our own hands the investigation should be the most successful & the farthest advanced. But the contrary seems to be the fact, & all other branches of Philosophy have apparently got the start of it. I say apparently, for if we examine the matter with more attention, we shall find that so long as we keep at the same distance here as in other branches of Philosophy, our knowledge is as certain & our progress as great. But the cause of the apparent inferiority in this respect is that here the whole question is about first principles, whereas in other branches of Philosophy we are contented if we can arrive at those of a third or fourth class. - When Philosophers began to turn their attention to this subject they were convinced that the distance of the external objects, may,

17. may, the very circumstances of its being external, rendered it impossible for it to be the immediate object of the thought or perception. It was an established principle, that nothing could act where it was not, and therefore that external objects could not act on the mind nor be the immediate object of its contemplation. Some medium was therefore necessary for enabling us to hold an intercourse with external bodies, & different views of the subject led to different contrivances.

The Platonists imagined that there existed certain immaterial species or forms of things, and that these were the only objects of the mind's contemplation & the only subject of true knowledge. They represented the mind as a sort of mirror, by which the species or resemblance of every thing was presented to the fancy & there viewed by it. This thought was farther ^{referred} ~~referred~~ by the later Platonists, & by St. Malbranche, who asserted that these forms of things existed nowhere but in the divine mind, but that the Deity being continually present to every thinking principle could discover such parts of his Ideas to it as he pleased.

The Epicurian doctrine was not very different from that of Plato. The Epicurian imagined that from every body there was continually flying off certain filmy resemblances, which by their great subtilty pressed into the mind & were there immediately perceived by it.

I am sometimes disposed to think that Aristotle did not imagine it an absurdity to think that the mind could act beyond itself, & thus be conversant with external objects. This seems to be the meaning of his ΕΙ ΤΕΔΕ ΧΕΡΑ, or ^{energy} ~~energy~~ of the mind. But still it appears that he did not think this sufficient for all the ^{hypocritous} purposes of memory and imagination, when we have conceptions of objects on which the mind cannot exert itself, since

18. since they are absent or perhaps not existing. He therefore admits, like the others, the existence of species or forms, distinguishing them into sensible & intellectual forms, which are perceived by the active intellect, by means of the impressions which they make on the passive Intellect. In this state the matter stood till the time of Des Cartes. This Philosopher was too bold to be imposed on by any authority, however respectable, and discovered that this theory of perception was nothing but a refined analogy proceeding on a supposed resemblance between the fact of perception & the perception of the figure of a seal by means of its impression. But on examination of some of the qualities, which we perceive in external bodies, such as sound, colour, taste & smell completely convinced him that the means of information immediately presented to the mind could not have the smallest resemblance to the quality itself. He therefore asserted that the only objects of the mind's contemplation were Ideas - employed there by nature, with a power of combining them at pleasure.

Mr. Locke held nearly the same doctrine, with this difference, that the Ideas were not employed there by nature, but acquired by experience.

Dr. Berkely, Bishop of Cloyne, had too much curiosity to be satisfied with this account, without following it into some of its more immediate consequences. He found that those Ideas not only could not possibly have any resemblance to the external objects or qualities which they were supposed to represent, but also that they had no necessary connection with them; therefore they might exist without them - of this, he says, no man can have any doubt who admits creation; for there the Idea of the thing to be created must exist in the divine mind prior to the creation and totally independent of it.

Since

17. Since then Ideas are the only objects of Theory, the only subject of true knowledge, it is evident that we cannot have even the shadow of a demonstration that there are any external existences, corresponding to those Ideas, & therefore the opinion or belief that there exists any thing but minds is a vulgar error.

This was undoubtedly making one sure slip in Science. But it was reserved for Mr. Hume to make another equally sure & more astonishing. We are certain of the existence of nothing but that of which we are conscious. We are certain of the existence of our Ideas, but our consciousness of them, our feeling them is the only proof of their existence. They exist therefore only when they are perceived. They exist only by being perceived. Our Ideas of other minds must share the same fate with our Ideas of external bodies, as these exist totally independent of external body, & therefore may exist (for any thing we know to the contrary) without them, so from our Ideas of other minds we cannot draw the least argument from the existence of such minds. We know therefore no authority for believing the existence of any thing, but of our own mind and of its Ideas. But what do we mean by this term mind? We cannot distinguish it from thought, which we cannot conceive to be any substance, but an act. When viewed in this light it is no better than any other act, which is already proved to have no existence, of which we are certain. The mind then is only an Idea like the rest, and has all their qualities, & particularly this important one, that of existing only by being perceived.

The genuine & logical consequence of all this is, that we can have no argument or reason by which we can demonstrate the existence even of our own minds, & the only certain existences in the universe are those Ideas which appear & vanish, are born & die every moment. Here then is an end of all our labour & enquiry. For what becomes of natural philosophy, when we dare not say that that world of which she pretends to explain the laws, has any existence. Let us think a little before we resolve to employ the studies of a winter.

All of us have had some opportunities of employing our reasoning powers, & are in some degree conscious of their value. We shall find, too, that much, if not the whole, of our confidence in their determination has arisen from the success which has attended our investigations. When justly employed we find that they have never led us into any absurdity, or any contradiction with fact & feeling. We find, in Mathematics, & some other abstract speculations, that by pursuing the thread of rational deduction, we have been able to form complicated systems of reasoning of prodigious extent, & in every part consistent with itself & with observation. All these have proceeded upon the laws of thought already mentioned. In all our investigations our judgement & belief have arisen from a comparison of related Ideas. From this comparison we perceive the relation & we express our perception of this relation in a proposition. Our perception of the relation is our judgement or opinion. In all these enquiries our opinion or judgement has been inevitable, our belief unavoidable. Hence has arisen the high value which we put upon this species of enquiry, when the opinion arises from the perception of the relation of Ideas.

As this is our own work no wonder that we become fond of it — no wonder that we become unwarrantably fond of it. — When Philosophers compared the undisputed Sciences raised on so small a foundation of first principles with the uncertain knowledge which we have of human affairs & of the world around us, they were naturally led to conclude that this kind of reasoning by comparing Ideas & forming our opinion by the perception of the relation, was the only one which led to truth and that every subject which could not admit it was incapable of demonstration.

All matters of fact are incapable of any application of this method of reasoning. In no one case can we perceive any relation subsisting between a thing &

21. Thing and its existence. It is equally conceivable that a -
thing exists as that it does not. But we can never
conceive that the angles ^{which} ~~with~~ one straight line makes
~~with~~ another are greater or less than four right angles.
All matters of fact then are incapable of any demon-
stration, if this alone is demonstration. But this is
a proposition which we cannot grant without the
utmost reluctance. We find that we can apply those
demonstrative Sciences to matters of fact without
ever producing any consequence which is at variance
with our feelings. We can measure land, we can
predict & calculate the motions of the planets, without
ever leading into any absurdity any thing which is
belied by our perceptions. These applications proceed
on the supposition that there exists land which we
measure & planets which move. We trust therefore
to these deductions with unlimited confidence. And
why? because they agree with our perceptions.
We therefore admit the existence of such things on
account of the very value which we put on our
reasoning powers. Their operations (say we) are
the same in these cases as in the former, and
the opinions formed in consequence of them equally
irresistable. The principles therefore on which we
proceed are equally true. If we deny the existence
of these external things, because we cannot give a
reason for it founded on a comparison of Ideas,
all these deductions must go for nothing, & our con-
viction by means of reasoning must be as insufficient
for proving the point as the total want of it.
The very value then which we put on our reason-
ing powers oblige us to admit the truth of things
for which we cannot give a reason.

Such were the arguments opposed by the olden
Sceptics. But Des Cartes took another method, &
introduced another principle into reasoning which
he imagined was sufficient to bring matters of
fact within the reach of demonstration. I think
(says he) therefore I exist. But this was in the
first place, bad Logic; for in the very expression

I think is included in the expression *Existit*. In the next place it does not answer the purpose for which it was intended. If it proves any thing, it proves only the existence of the thought, but not of the thinking mind, & far less of an external world. And this was the just inference of Mr. Hume. But lastly it does not give for the existence of thought any thing which is admitted as a demonstration in the method of reasoning, which he proposes to apply. Altho' Berkeley & Hume agree with Des Cartes in admitting the existence of those thoughts of which we are conscious, & Mr. Hume asserts that this is the only existence which is demonstrable; yet on examination it will be found that there is no demonstration for the existence of this thought any more than for the existence of the thing which I perceive. It is not a deduction in the way of argument. It is the first principle on which all the arguments proceed. This principle is taken for granted, but everything else must be evident by reason.

What title has this to being admitted as a first principle? It is not an opinion arising from a comparison of the Ideas of consciousness & existence. It is an opinion which is inevitable, a belief which is irresistible. This is its only title. In like manner the existence of my mind, of myself, is not produced by perceiving any connection between mind & existence. It is an opinion equally inevitable a connection equally uncertain with the other. Des Cartes therefore might have saved himself the trouble of his argument, *Cogito - ergo sum* & simply assumed as his first principle - *Existit*. All that is made out in this proposition is that it is consciousness which suggests to him the notion of his mind with the belief of its existence.

Now in the very same manner perception suggests to us the notion of external things with the belief of their existence. The connection is as irresistible, the belief as strong as in the other case, as

23. as universal & as much the foundation of successful reasoning, if the success & justness of reasoning is to be estimated, as it must, by the agreement of its conclusion with our feelings. It is a belief universal, irresistible, what obliges us to adopt the opinions as first principles; and while we admit none without this condition, every deduction which we draw by means of the comparisons of Ideas will infallibly be agreeable to our Ideas; but nothing obliges us to conceive that there is but one first principle of belief. I think it may be shown that the diversity of the kinds of belief can never take place if there is but one, and if there is more we cannot tell how many there may be. We have made great progress in many branches of enquiry, & a remarkable fact in this progress is the great diminution of the number of first principles. This has led us into the opinion that Science can attain absolute perfection in no other way but by reducing it to one principle; and this opinion is justified by every progress in every Science. But it does not on this account become true. For in no Science, even the most abstract, have been able to reduce all its truths to one principle. We shall improve the Science of Science in the same way as we improve any other, by a careful induction of facts & rejecting every thing from the class of first principles of belief, which does not universally, unvariably and irresistibly produce belief, and admitting all which have this stamp. If we exclude any one of these we shut up one field of science, which must remain for ever barren & uncultivated. If we admit any other we open a source of error which will soon overflow every field of enquiry.

I conclude these observations on the Sceptical philosophy by observing that since our consciousness, sensations & perceptions are our only instruments of information, it is unphilosophical, illogical to think that they can ever help us to discover

24. discover their own nature; as we reasonably may expect that a microscope will show us the nature of light, by exhibiting its particles to our view. They never can point out to us what they are any other way than by presenting themselves to our view. They only point out to us what they are not, so that we cannot mistake one of them from another, nor mistake any of them from what we take to be that cause of the sensation.

The received opinions on this subject (opinions which naturally lead to universal Scepticism) have all arisen from an apprehended analogy between the suggestion of an external object by means of our mental faculties & the suggestion of an absent object by means of its picture or resemblance. But our sensations are not only perfectly distinct from the objects whose extensive theories make us believe, but totally unlike them. Altho therefore it is impossible that anything resembling extensive extension can exist in the mind, which is not extended, it does not follow that extension does not exist. For there is not the least necessity for supposing that the sensation which suggests to us the notion of existing extension should resemble it. That analogy is not only gratuitous, but ill founded, appears plainly from the inevitable consequence into which it has led the Sceptics.

There is another analogy equally striking, equally tending to illustrate the subject, & apparently more just, because it leads us into no absurdities. I mean that of signs, whether natural or artificial. Smoke suggests to us the presence of fire. Laughter of Joy, & certain scrawls on paper a musical air. In all these the mind commonly neglects the sign altogether, & passes immediately to the thing signified, with a full belief of its existence. In the same manner our sensations suggest to us the action of an external object, which they no way resemble, & the mind paying no attention to the sign attends only to the thing.

25. thing signified. This inattention to the sign is the consequence of our attention to the thing signified. The sensation is the instrument & is neglected in the same manner as the characters are neglected in reading a letter from my Friend. We can, if we please, attend to the signs in most cases. In some cases we attend to the sensation alone, as in the internal fallings of the body, and we have not yet been able to make any reference to a remote cause. In other cases we attend chiefly to the sign, as to the smell of the Rose in our hand, or the taste of the Sugar in our mouth, without thinking either of the Rose or the Sugar. Thus a Musician attends to the sounds in a concert without ever perceiving the strings or pipes from which they proceed. It is our attention on the sensation which produces this inattention. In the perception of sight hardly any effort of imagination can render the sensation an object of attention, & we think of the external object alone.

In all these cases there is an indissoluble connection between the sensation, or sign & the object or thing signified. This connection in imagination is not established by any act of ours, but by nature, & the interpretation of these signs, or the suggestion of the object, by means of the sensation is also established by the constitution of our nature. No act of my will or understanding can separate the sensation of a certain pain from the notion of a pin or knife as its cause. Nor can I hinder my mind from committing this sensation, of which only I am conscious, with the belief of the existence of this pin or knife. Nature then gives both the sign & the interpretation, in whatever matter it informs us of the existence of an external body. Nature is the author of all our perceptions.

Let us therefore consider our sensations as the signs by which nature suggests external objects.

26. objects to our mind & perception, or the notion of the
Subject with the belief of its existence, as the interpretation
of these signs.

X In this respect the sensation may be considered
as the language of nature, informing us of external
existences, & our perceptions as the interpretation of this
language. This language has a great analogy to
natural language in man. Certain modulations of
voice or feature, certain attitudes or gestures of body
are in all ages & all countries conjoined with certain
emotions or sentiments, independent of any will of
ours, & when exhibited, never fail, without any
effort of the Spectator, to suggest the existence of
those emotions & sentiments. Such signs have
in all ages & nations the same signification &
the skill in interpreting them is not acquired but
innate.

In this manner does true philosophy oblige us
to admit the existence of an external universe, as
an opinion justly founded, & as the foundation of
future reasoning.

I have employed so much time on this debate
not to convince you of what none of you doubt;
but because the reasoning of the Sceptics has also
been applied to invalidate some of the doctrines of
Natural Philosophy, even when the reality of its
object has been granted. The answers which have
been made to them do not appear to me very
conclusive, & their defect appears in general to arise
from great inaccuracy in the conceptions which
have been formed of the manner in which we have
come by the knowledge of these doctrines.

By such means, then, do we acquire an acquaintance
with external objects. By a judicious employment
of these means we are led to consider these objects
as composing an external universe, which consists not
of a number of independent existences, solidly &
de-

27. detached from each of them, but connected by means of mutual relations & dependencies, so as to form a whole, which may be called a system of nature.

This assembling of the individual objects of the imagination into one system is not the work of a warm imagination. What do we mean by the nature of any thing? We are ignorant of its essence, which alone constitutes it, that thing & no other. We must content ourselves with a discovering of its properties or qualities. These are not what constitute its essence, but flow from it. But this is all we know of its nature. Now the term property is only an expression for its relation to some other thing. This is true of all external things - Gravity - Elasticity - Magnitude. Every notion therefore of an individual implies this connection with other things.

The very slightest observation of things around us shows an evident connection in properties, abstracted from every notion of connection in purpose or design.

All things on the surface of this Earth are connected with each other by the laws of mind or of motion. They are connected with the whole planetary system by gravitation. If we extend our observations to the fixed stars, altho' their immense distance renders it impossible for us to form any distinct opinion of their nature, yet we see them connected with our little system by the perfect sameness of that light which they emit with that which is emitted by our sun, or any other luminous body here below. It moves with the same velocity, has the same colour, & is refracted and reflected by the same laws.

In this unbounded scene of contemplation it may naturally be expected that of all external things our own bodies would first engage our attention, & be first & most complacently observed. But the fact is otherwise. Our bodies are only the instruments of the pleasures & pains of our minds, by means of the effects produced on it & conveyed to the mind in the way of sensation. Our attention then is forcibly directed

28. directed to three external objects, & the Body is generally neglected, as the tool is in the hand of an artist, or the Telescope in the hand of the Astronomer engaged in observation.

In our first survey of our external world, & the mutual change produced by its various parts on each other, we can't avoid observing (even altho there were no propensities which direct us to it) other things like ourselves, in external form, & like ourselves engaged in producing changes on other bodies, similar to those which we produce, & like ourselves conducive to certain ends, which, as in our own case, appear to be their final causes. This appears immediately, and irresistibly suggests to our mind intention and design. This is art, which is the employment of means in order to gain certain ends, and art is a material sign of design. We soon extend this observation still farther, to the change produced by other beings, whose external form does not indeed resemble ours, but who, like us, are continually producing changes conducive to certain ends terminating in the agents. — We are in the same manner obliged to interpret these appearances as the signs of intention & design.

But among the changes produced by an endless variety of bodies on each other, we can observe no such subserviency of means to ends, terminating in the agent, & therefore make no such inference of intention or design.

This then forms a casual distinction by which we arrange all external objects into two classes. The first class resembles ourselves in design & intention, & we transfer to them the other properties which we discover in ourselves, but cannot observe in them,

thought, perception, memory, & all the collection of powers which we feel in ourselves to constitute the living animal. The other class exhibits no such appearances. Thus then we are led to divide the whole of external objects into thinking & unthinking beings. — Our first judgement about

29. about these two classes will be very inaccurate, and we naturally ascribe the difference which we don't distinctly understand to the difference in organical structure which we can distinctly observe. When we have knocked down an Animal, we find that it no longer gives those distinctive marks of thought and intention. It now resembles the unthinking class of beings. Yet we see that it retains all that fitness of organical structure which it had before, & only wants the will & intention. This obliges us to conclude that the distinction of thinking & unthinking does not arise from a distinction in original structure, but from a distinct substance, which is common to all thinking beings, but not so necessarily connected with their original frame as to be inseparable. To this principle we ascribe thought, desire, intention, contrivance & all that collection of faculties which we find in ourselves. To the substance in ourselves we refer all sensations, incumbrances, imagination, desires, aversions and purposes. And to this aggregate, however imperfectly it is understood, we give the name of mind. Our general frame which appears only to be the instrument of information & operation, to the internal substance we call our body. - As this animating principle is not the immediate object of our senses as our ^{to}dis are, we conceive it to be a substance of a quite different kind. The wisest people have shown a disposition to form the conclusion, Observing that animal life was connected with breathing, it was not unnatural to conclude that breathing was living, that breathing was life. Accordingly in almost all languages, the term for expressing breath is at least one of the terms for expressing mind - $\psi\upsilon\chi\eta$, $\pi\upsilon\epsilon\upsilon\mu\alpha$, Spiritus, Geist, Δυψδία - But the observation of the same appearance of thought and intention in animals - which do not breathe, would soon show this to be but D

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30. but a rude opinion, and a very small refinement would be sufficient to convince us that air or breath could not be the substance with thought, wished & designed, and that the properties of this substance were totally different from & incompatible with anything that we know of the bodies which are the objects of our senses.

Hence we are led to conclude that there are two kinds of original substances in the universe, one which is the principle of sensation, and therefore cannot be the object of our senses any more than light is the object of a microscope, which is the principle of consciousness, perception, memory, imagination, volition, or the subject which alone feels, thinks, designs & proposes; and another which is the object of its contemplation by means of the senses, & endowed with every property which our senses can discover. This is not confined to the unorganized masses of matter, for we find that our bodies even after death lose that organic form & are ascribed to all that class of unthinking beings. Hence, while all nations have called the objects of this class by the name of their own frames, (body) yet some who have referred a little more, have used an abstract term by which to express all bodies of this class - *Material - matter.*

Matter then is whatever is cognosable by our senses. Whatever subject is not thus cognosable is expressed by a negative term - *immaterial.* Hence mind is said to be immaterial. Making this grammatical distinction in view will go for in enabling us to detect the Sophisms, Marabau, Helveticus and other materialists.

All the objects of the universe being arranged under the different classes of mind & matter, may be considered in two points of view, either as mere existences or as events.

A complete enumeration of all the things of the Universe, & of all the events, that is, of all the changes to

to which they are subject would give us the materials of a complete knowledge of nature, in the same manner as a book containing every word of a language, with all its changes would give us the materials of a competent knowledge of this language. But such a book, & such an enumeration would not afford us an easy method of acquiring this knowledge. The materials must be put into some form which, in a small compass, shall either comprehend all or enable the mind to pass with ease from a principal to any of its subordim. This would be done in language by an etymological dictionary, in which the parts of speech would be arranged in their different classes, & the derivations of each under their originals. In nature it would be done by a description or history in which every thing should be arranged according to its kind, & the facts according to their connecting principle. The principles of arrangement may be different according to our different purposes. If we take for the principle of our arrangement similarity of distinction we consider all objects as more or less connected with their sensible qualities. In our consideration of any subject we can abstract our attention from any circumstance in which it differs from other subjects, and attend only to the circumstance in which it resembles them. In this case the smaller the number of circumstances which enter into consideration, the more extensive will be the application. Thus, if I say that a body circulates round the Sun, I comprehend all the planets, primary & secondary, all the Comets & every part of each of them. If I add the circumstance, that it circulates in 12 years, the application of the operation is confined to Jupiter & his 4 Satellites. If I add that it also circulates round Jupiter, it is farther confined to his Satellites - And if I add that it circulates round him in 42th it is confined to his first Satellite.

In D

In this manner we may arrange the whole objects of nature into kingdoms, classes, orders, genera, species, Varieties & Individuals. The single circumstance of life is sufficient for bringing together a vast collection of bodies into the collection called the Animal Kingdom. If we add the circumstance that they are covered with feathers, we exclude a vast number of animals & form the class of Birds. If we add that they are web-footed, we exclude a great number of Birds & form the order of Anseus. Add lingua obtusa & alata, we exclude many Anseus and form the genus of Anatis.

Such an enumeration of the things which exist, arranged in this manner is called a Nat. History, & must be considered as the foundation & materials of natural knowledge.

Did the universe continue unchanged this would constitute the whole of our knowledge of nature. But we are witnesses to an uninterrupted succession of changes. These changes are events which are very interesting to us on account of the service or hurt which they may do us. A knowledge of these changes therefore is of much greater importance than of the resemblances & distinctions which we may observe among eternal bodies. We observe these changes always to happen in a determined manner, so that one event is invariably followed by another event. The rising of the Sun is invariably followed by the light of day, & his setting with the obscurity of night. This circumstance therefore of contiguity of time & place is much more interesting to us than the circumstance of resemblance of resemblance. It is more interesting on another account, because we are always acting & our activity terminates in certain changes. These are usually produced by the intervention of other bodies, on which we act producing a change in their situation, which is followed by the change which we want. If I would drive a nail I employ a hammer, give it a motion with my hand & direct the motion to the head of the

33. The nail, & thus I found. A very slight correction will correct me if I should have formed so hastily a notion as that my will was the immediate cause of the Nail's entering the wood. I transfer this to the hammer's motion. But observing other bodies in circumstances similar to hammers, for the change produced is common to all hammers, I find that their motion will be followed by similar events, & this, altho' the motion has not been communicated by any hand. Thus I form a conclusion, much more general, that motion in one body will be followed by a motion in the body which it strikes. This the relation of events then in the way of contiguity in time & place is of great importance, for by this means the presence of other bodies are accompanied by pleasure or pain to us & by this means we know what means to employ in order to employ desired ends. In making an arrangement of these facts we suppose that bodies are possessed of qualities which fit them for producing these changes, which we always observe. These qualities are the principle of this arrangement, & their names are nothing but expressions of the relations which we observe. Thus Magnetism is only the expression of that relation observed between the Magnet & Iron, in consequence of which the presence of the one is always accompanied by a certain motion in the other. We express this relation in another manner, by saying that the presence of the Magnet is the cause of the motion of the Iron. Here there is a new inference similar to that of the existence of external objects from our sensations. We infer the existence of one thing by the existence of another, like by smoke

34. smoke, Iron by magnetism, Poison by death. —
As our sensations are considered & interpreted as the
signs ~~of the existence~~ of the existence
of external bodies, so appearances are considered
& interpreted as the signs of other causes. Thus causes
are perceived by means of appearances.

They may for distinction's sake be called
secondary or acquired perceptions. They resemble
our original perceptions in this, that the connection
between the appearance & the cause is established
by nature, independent of any action of ours.
But they are distinguished by this circumstance
that the interpretation or perception of the cause
by means of the phenomena is not innate,
but is acquired by experience & observation.

This skill of interpreting the appearance of
nature, or this perception of causes by means of
these appearances is of the utmost consequence
to the knowledge of nature. All that we know
of active nature is nothing more. All that we
can do in art is founded on it, founded upon
our observation of these connections and on our
confidence that these connections will continue
the same during our application of them to
our purpose, with what they were when for-
merly observed.

This ~~confidence~~ ^{confidence} in the constancy of natural
operations is not the deduction of reason, for we know
nothing of the connection which subsists between
the events which we observe to be connected.
We only see them frequently conjoined, but see
no reason why they have been so, and conse-
quently no reason for expecting that they should
be so again.

Yet some Philosophers have endeavoured

to

35. to account for it from principles still more general. They have all attempted to show that it is only a case of the association of Ideas. The frequent concomitancy of two objects is the cause that when one of them comes unexpectedly in the way the other is immediately suggested by the imagination. Thus the appearance of one event makes us expect, say they, the appearance of the other. It may indeed, & frequently does produce, the imagination or simple apprehension of the other. But this is not expectation. Expectation concludes a belief of the future appearance of the concomitant object. Now it is this belief which is the subject of this question. —

Mr. Hume thinks that this expectation is a consequence of the vivacity of the Idea which is the natural consequence of frequent conjunction. But every objection, & they appear to me unanswerable, which may be made to this Theory of belief in general, may be made with still greater force against his Theory of expectation or of this confidence in the consequence of this natural operation.

It must be referred to the same force with that inferencem which we make of external existence from our sensations or perceptions. — This confidence in the constancy of natural operations is a principal of animal nature, is an instinct which operates in Brutes as well as in men, & without which both would be incapable of subsistence, & man totally incapable of all improvement. For altho the operations of nature may be constituted, yet we should never have formed any expectation from the longest continued experience. But this instinctive principle

36. Principally enables us to profit by our own experience,
& that of all other men & Animals, & is the foun-
dation of all our inductive reasoning, all reasoning
from analogy, & every disquisition concerning
matters of fact. The degree of our expectation
always bears a proportion to the frequency of
the observed conjunction, & therefore the reasoning
on these subjects is always reckoned more
conclusive in proportion as our induction of
facts is more copious.

This principle which is of such importance
& extensive influence may be called the
principle of induction, and affords us the prin-
ciple of arrangement for the events which are
observed in the natural world. Arranging
them according to their generality, insures us
of their being arranged according to their mutu-
al connections in the way of cause & effect.

As the perception of external things by means
of our sensations was compared to the Interpre-
tation of the natural language of man, so this
perception of causes, by means of the appear-
ances may be compared to the interpretation of
ordinary artificial language. In this the signs
are certain artificial inflections & modifications
of voice. The connection with each of these
of the sentiment is arbitrary, established by the
will of man, and in learning the language
we discover the connection by experience,
assisted by our knowledge of the natural
language.

Almost all that we know of other mens
opinions is no more than an interpretation
of this artificial language, and all the
intercourse which we hold with them is
founded on our knowledge of the connection
between

37. between the word & the thought, and on our confidence that this connection will subsist when we again listen to the words in the same manner as we did before - In other words, founded on our confidence of the vivacity of man, & that he will always connect the same thoughts with the same words. This is an anticipation in the mind of man not derived from experience, tho' founded on it, nor from reason, nor from any contract with our fellow creatures; but is really a principle of human Sentiment, & a principle of our constitution, without which we should be totally incapable of language & of instruction. It becomes the foundation of a great part of our knowledge, all that is derived from testimony in the same manner as our confidence, in the constancy of natural operations does. And as nature rarely, very rarely, deviates from general laws, so man rarely, very rarely, deviates from truth.

And thus the appearances are the language of nature, informing us of the powers of natural substances. "This language, to use the words of an ingenious writer & an acute Philosopher, is the universal study, & the Students are of various Casts; Brutes, Idiots, & Children employ themselves in this study, & owe to it all their acquired perceptions. Men of common understanding, make a greater progress, & learn by a small degree of reflection, many things of which the others are ignorant. Philosophers occupy the highest forums of the school & may be called Critics in the language of nature. All these Casts have one teacher, Experience guided by the principle of induction."

While the Interpretation of the primary language &

138. Language of nature is properly called History, the in-
terpretation of this secondary language is properly
called Philosophy; a far more noble part of the
knowledge of nature, including the causes of the
external objects, the causes of the external qua-
lities, of their internal properties, of the changes
which they undergo, of the laws & order of these
changes, & in short, of the whole life & movement
of nature. Natural history becomes inter-
esting to a truly Philosophic mind only by
its subserviency to philosophy, and this is
the only part of natural knowledge, which
when methodized & properly arranged deserves
the name of Science.

It is a field of contemplation of an unbounded
extent, reaching from an atom to God, and
therefore it is absolutely necessary for its
successful cultivation that it be in the hands
of different cultivators & treated in different
ways.

Some have attended only to the appear-
ances of fitness, which appear innumerable
in the universe, & by arranging them into
classes according to their generality, & interpre-
ting them as indications of thought & intention,
have acquired many classes of Intellectual &
sentimental beings, actuated by propensities
& directed by reason. In contemplating any
one class they observe that the individuals are
connected together by certain propensities, or at
least, while each seeks his own enjoyment he
advances that of the others. Such observers
find that these classes are not unconnected,
that man & the Brutes are not unconnected
Inhabitants

Inhabitants of this lower world. For they observe that their propensities are of such a kind that while each class thinks only of itself it contributes to the happiness of the rest. Even man, the selfish tyrant of this earth, cannot in every instance reap all the sweets of his situation without contributing to the subsistence & enjoyment of thousands of the brute creation. Thus the whole assemblage seems connected & employed in increasing the sum total of enjoyment. Such a fitness of the various propensities of the intelligent beings, which fall under our observation, such a subserviency to a general purpose strikes these observers as a mark of thought & intention evidently distinct from all the particular intentions, and superior to them all, and thus irresistably leads them to infer the existence of a supreme mind directing the whole of this intellctual system.

The same observers discover that the bodies which compose the inanimate creation, are not only connected, as has been formerly observed, by a similitarity of constitution & properties, but that they are also connected with the Intellectual beings by a subserviency to their purposes & enjoyment, in consequence of that perfect correspondence between the constancy of natural operations and the expectations of sensient beings. This fitness & adjustment appears also to be the effect of an intention, of which the final cause is the enjoyment of the Sensient Inhabitants of the universe.

This constancy therefore in the natural operations both in the material & intellectual system appears to these observers to be the effect of laws imposed upon the parts of the universe by the supreme mind.

To such observers the world appears a system of means employed in order to gain certain ends. It appears a work of art & makes us infer a degree of power, skill & good intentions in the artist.

61. of the means, & the exertion is frequently made without even any attention to the important end. In order to secure the general well being of the system against any danger from the ignorance or inattention or indolence of the individuals, they are led to perform the necessary actions by immediate propensities, by which the action is rendered desirable of itself, independent of the value of its ultimate end. — Thus in our sublunary world the support of life, the continuance of the Race, and the improvement of the means of subsistence by the acquisition of Knowledge are not intrusted to our apprehensions of their importance, but are obtained by means of our natural propensities of hunger, sexual love & curiosity. Thousands of similar instances occur to the judicious & careful observer of the actions of intelligent beings, and they in this manner appear to him the unwitting instrument in the hands of the great Artist, by which he executes his grand & beneficent purposes.

When we compare our own nature with that of other Animals we observe a remarkable difference in this respect. Our instinctive curiosity, supercedes the use of many Instincts which are bestowed on other Animals in order to increase their power. For this single instinct, by giving us a knowledge of nature incomparably more extensive than that of any other Animal gives us an equal superiority in power. A happy direction which in our nature is given to this Instinct contributes greatly to the increase of our power. We are continually disposed to attend to the experience & observation of other men & even of other Animals, and thus we turn it to our own account. But the most favourably instigated to this purpose is our love of social life & of communicating our thoughts to each other.

122. *Other by speech or writing.* The applicable knowledge of other Animals is limited, not by any organ different, nor by want of Interest in the objects of their observation, but because each Individual must derive all his knowledge from his own experience & observation & cannot employ those of another. Thus no stock is accumulated to the species which remains this day in the same state in which it was found soon after the Creation. But with man the experience of one man is the property of all who observe him, or to whom he chooses to impart it, & all have a desire to make communication. Thus the knowledge of one age & country is accumulated to that of another; the species improves in knowledge & power & man, who on account of the delicacy of his frame and the small number of his instincts was in the beginning inferior to most Animals in Sagacity, strength & resource, has come in a few years to surpass them all, & that to a degree which will admit of no comparison.

All this superiority proceeds from our superior knowledge of the laws which the Almighty has impressed on his works, whether intellectual or material. By knowing the passions of men & their mutual influence, the Statesman can lead millions. By knowing the laws of motion a feeble man can direct a great machine of war & employ the exertions of power equal to that of thousands of his fellow men.

Were we apprized of all the laws which God, the Almighty & glorious artist, has impressed on his works our knowledge & our power would be inconceivably great. Did we perceive the circumstances by which he has connected the events which we always observe to accompany each

43. each other, we should never mistake, never be as a
loss, what means to employ in order to obtain any
desired end.

But from what has been already said we find
that all this is hid from our view. All that we
know of nature is those conjunctions of events
which we perceive. Our knowledge of nature must
therefore be limited by our experience, whether
acquired by ourselves or by communication from
other men. Our powers must be limited by our
knowledge. Increase of power is highly desirable,
therefore the knowledge of nature is very im-
portant & a system of this knowledge justly
merits the title of Philosophy & Science.

I have already taken notice that those
observers of nature who have only to the
fitness & adjustment which renders the universe
one whole & a source of enjoyment to sentient
beings; look on the constancy of natural oper-
ations as the consequence of laws imposed
on the various parts of nature by its great
Author. But this is all the language of
Analogy. When a Magistrate issues his orders
& by his enforcing obedience to them produces
a constancy in the actions of his subjects. This
is properly the effect of the laws. But should
a Stranger come into this Country & observe the
constancy of action & yet be ignorant of the
constitution of the Country, the extent au-
thority of the Magistrate, he will ascribe this
constancy of action to the genius & manners of
the people. Nay, many instances of this
constancy call customary law has no other
foundation, & it is termed a law only from
an

116. an analogy in the effect.

Just as in nature. Will it shall please God to reveal to us the laws which he has imposed on his works, or those principles which necessarily connect those events which we always observe to happen in company, we, as strangers to this scene & to his unsearchable operations must ascribe this constancy in the operations of the universe to the nature of the thing.

To us therefore a law of nature must appear in a very different light from that in which it is viewed by the theologian. To us it must appear merely a fact. If any fact is found to extend to a great number of individual subjects it is called a law of nature.

When we mention any law of nature we do nothing but express this generality of fact, this point of conformity & coincidence which is observed in a great many particular cases. It is the result of our power of abstraction, with respect to events by which we neglect the difference among them & attend only to the similarity.

Thus when I say that gravitation is a law of nature I do nothing but express by one general phrase that stones, sticks, metals, fluids, vapours, & in short all bodies fall if unsupported. In this respect a law of nature is an analogical expression much resembling the expression a gram or rule. A rule, in propriety of language, expresses command but a rule in grammar expresses mere similarity of relation or construction. "An active puts its object in the accusative case" - is an expression perfectly similar to this "A stone in motion puts the stone which it strikes in D

A Physical law therefore is an expression of a natural operation observed in a great number of particular cases, a designation or description of the point of conformity observed in a great number of events. Whencever therefore we treat of any object as a matter of generally observed fact, we treat it Physically, and the expressions of these general facts are Physical laws. Thus it is a Physical law of the human mind that kindness produces gratitude, that Injuries destroy it. It is a Physical law in the material world that impulse produces motion, that resistance destroys it. Gratitude is a Physical law of mind as gravitation is of Body. It is of great consequence to attend to this precision in the meaning of the term - Physical law. It is used with great ambiguity by the Materialists, and a want of precision has greatly retarded the progress of Natural philosophy.

Most of this want of precision in Nat. Phil: has arisen from an unwary combination of our instinctive faculty of abstraction with another faculty equally instinctive, that of considering all natural appearances as operations & interpreting them as the signs of causes. The fault committed by us in this combination is the too hastily assigning as the cause of the event, the other event which we always observe to precede it. Thus we assign kindness as the cause of gratitude, a Magnet as the cause of the motion of the Iron, The muck as the cause of Death, the motion of a String as the cause of sound. But inquisitive men, by careful observation have been able to trace out in these conjunctions of events certain trains of intermediate events, & from this have justly inferred that

46. That what the vulgar call the cause is by no means so. They find, for instance, in the case of sound, the motion of the string produces a wave in the air adjoining to it. This wave produces a wave in the air beyond it. This is continued in a long series of successive events till it reaches the ear, this vibration agitates a bone which is in contact with the drum - this agitation is communicated to another bone, & from this bone to a third, which communicates motion to the auditory nerve. Between the agitation of the nerve & the sensation which accompanies it, no observation has as yet discovered any intermediate events. Thus when at the distance of about four yards I hear the lowest sound of a Violin I am able to trace a series of about 10,000 successive events, & therefore so many intermediate causes & effects.

This observation leads to another conclusion. We cannot assert with any appearance of proof that between each of these events there are not interposed many other events. Nay we know that there are. It terminates in another very different conclusion. This chain of concomitant events interposed between the event which the vulgar call the cause & that which they call the effect cannot be infinite. There must be somewhere two events immediately conjoined. Shall we call them cause & effect? No. The cause is the principle which connects the prior event with the posterior in such a way as to make them inseparable & the one always to follow the other. The cause is the energy or power residing (however inscrutably) in the prior event & producing the latter. We give this a name, calling it a power by analogy with what we observe in our own exertions. Thus in the instance of sound we discover the powers of impulse, communication

of motion, inertia of matter, elasticity, nervous irritability
of mutual sensibility.

Since philosophy is the interpretation of the secondary
symptoms of nature, the interpretation of appearances
& inferences of their causes, it may be justly termed the
Science of causes. It is employed in the study of nat-
ural subjects, as connected by this relation of causation.
Since then our whole employment is to consist either in
tracing the causes of observed phenomena, which are
their signs, or in explaining complex phenomena by
our knowledge of the combined causes, it is plain
that the only way of ensuring ourselves against
mistake is to acquire just notions of this relation
of causation, & to keep it constantly in view during
our future enquiries.

Whatever it is, it is the relation which connects
matters of fact. Now it is evident that we do not
infer the truth of a matter of fact in the same
way that we do that of the relation of Ideas.
We cannot infer the truth of a stone falling
when unsupported in the same manner as we do
the incommensurability of a diagonal & side of a
square. The latter is the natural result of the
operations of our thoughts & has no dependence on
any thing else. What we call the demonstration
of such a proposition is only the manner in which
we come to the knowledge of its truth, but by no
means the reason for its being true. But in any
matter of fact the contrary may be true, without
involving any contradiction or absurdity in our
conceptions. Does it not follow from this that
we are insensible of the relation which subsists
between cause & effect? We do not perceive it. Did
we perceive it we would see the same contradiction
& absurdity in supposing that a stone unsupported
would not fall, as in supposing that the diagonal
& side of a square can be measured by the same scale.
But

48. But many philosophers are of opinion that we have a distinct perception of this relation, a distinct conception of cause, energy, power, or whatever name you please to give this relation. (Pray the logic this use of names is an unfair circumstance) It is of importance to us to examine the truth of these opposite opinions.

How is the notion of cause acquired? By intuition? No - no object whatever carries along with it a sensible appearance of the cause of its production, nor of the consequence which will result from putting it in any situation.

All acknowledge this in instances which are perfectly new to us; no one can see any thing in a piece of sugar which should occasion light by gently rubbing it on another in a dark room. But we are apt to think otherwise in cases that are familiar to us, yet a careful observation of any, the most familiar instances will show us that we no more see the efficient principle than in the cases already mentioned.

Nor is it the produce of reflection. Reflection can recall to our imagination an Idea which we were formerly conscious of. But since the Idea of a cause never came into the mind by the perception of this cause, neither can it ever come into our mind by reflection.

Can it then come by reasoning or argument. All arguments are of two kinds. If the reasoning is employed about the relations of Ideas, the arguments are what are called demonstrations, & the opposite proposition cannot be affirmed without involving an absurdity. But here the reasoning is about a matter of fact, & the contrary may always be true &

another

19. true without involving any absurdity. But has the reasoning about a matter of fact. Our notion therefore of the connection between the two events, which we consider as related in the way of cause & effect is not derived from reasoning.

Is it derived logically from experience? No. We have experience only of the past, but not of the future. All that experience teaches us of the connection between any two events is that they were conjoined.

This impossibility of deriving from any source whatever a reason for that belief that events which always happened in conjunction will continue to do so, which belief is the origin of our notion of causation, has rendered two of the most eminent Philosophers in Europe to deny that there was any connection at all. Dem. Malebranche says that the whole chain of events which happen in the universe are quite unconnected, that no event includes in its own nature any circumstance which renders the subsequent event necessary & unavoidable, that the constancy of natural operations is not the consequence of the nature of the things; that all events are the immediate operations of Deity.

Mr Leibnitz says the same thing, at least of all the phenomena which show the actions of mind in an apparent connection with the motions of matter. He says that the Deity ordained a certain series of events in the mind, that is, a certain succession of thoughts, desirous that he ordained another set of successive events in the material world so adapted to the other as always to correspond with them, tho' without any connection. Just as a well regulated Clock will keep exact time with the motion of the fixed Stars, so that its index shall always be in one determined position, while the Star was in another.

50. another corresponding position. Thus we an unvaried coincidence without any connection. This is the famous system of preestablished harmony, which formerly made so much noise in philosophy.

Now while both these Gent^l denied the existence of any such relation as that of causation, it is evident that they took its existence for granted. For each of them on a better will and degree of God a cause of everything.

Mr. Hume having shown the impossibility of finding any origin of this Idea of a necessary connection, endeavours to show how we come to entertain the opinion. He resolves it into that well known fact in human nature, the association of Ideas. When the first of the two events, which always happen in company appears the Idea of the other immediately presents itself to the imagination with a degree of vivacity proportioned to the frequency of the formerly observed conjunctions & this vivacity of conception constitutes the belief & a persuasion that the same event will again be accompanied by its former companion.

But without insisting on this that Mr. Hume's explanation is liable to all the unanswerable objections that may be made to his theory of belief. I must observe that in the present case the explanation is quite inadmissible upon his own principles. According to these the present belief is the only certain existence which I know. The frequent prior conjunctions of events, even if we confine the events to our Ideas of them, is all a hypothesis according to him & therefore can never be a foundation for any just explanation.

Mr. Hume's all are mistaken in supposing that this necessary connection is a thing of which we say we have an Idea. This is inaccurate language & the thing spoken of is by no means an Idea, a simple apprehension, it is a proposition, an opinion, a belief. It is one of the facts of human nature.

51. nature, that whenever we have found a particular event frequently or invariably followed by another particular event, & when the event which always has preceded appears, the other not only comes into our mind by the association of Ideas, but comes into our mind with the belief that it will happen. This fact in our nature is of the utmost consequence to us, for without this opinion that the operations of nature are constant, we can gain no knowledge of nature, no good one from experience. Let us compare this with other facts in human nature. In no important case are we left to the deduction of reason. The preservation of the individual requires the use of food, the continuation of it requires Copulation - the improvement of it requires Society & Knowledge - All these important ends require efforts directed to the external things. In none of them are we left to reason, but we have the propensities of Hunger, Love, benevolence, & Curiosity, & Perception, probably therefore, would make us expect that in acquiring knowledge from experience we should not be left to the slow deductions of argument, but be directed by an original instinct or principle adapted to the constancy of natural operations. Accordingly we are furnished with such a principle, the principle of induction, by which we draw general conclusions from particular facts. This instinct suggests us the relation of Causation, a thing as different from the sign of it, the observed connection of events as a Bell is from the Sensation of Sound, which is its sign employed to suggest its existence to the mind.

By this Instinct we are given a knowledge of Nature in the same manner as the instinct of Credulity gives us the knowledge of what are the sentiments of him who converses with us.

The

52. The beginning of existence every change in nature which we can observe is by an inevitable principle in our nature interpreted as the sign of a cause. A single conjunction is sufficient to show the operation of this principle. If a child has made a noise by any little action it is eager to repeat it & why it expects that the repetition of the action will be attended with a repetition of the noise.

This eagerness to repeat the experiment is a wise precaution of nature not to allow the child to be misled by the operation of this necessary principle. If the same action is thoughtfully repeated without the expected effect, the mind gets into that situation called suspense, whose two contrary expectations exist together in the mind. All are conscious how disagreeable this situation is, & how eagerly we endeavour to get out of it by frequent repetition of the experiment till the expectation on one side obliterates the contrary expectation.

Thus then I think it appears that those terms, cause & effect, are used merely to express that operation of our mind by which we are led to expect & believe the existence of one thing by means of the existence of another thing, & therefore we apply them with equal propriety in such a case as sound to the motion of the sonorous body & the sensation in our mind, altho' there intervene many events totally unknown by most of them, who assign the vibration of the sonorous body as the cause of the sound.

I say they apply with equal propriety in this case as to a case in which there is really no intervening event. I apprehend that in no case do we mean the term cause the occasionality or efficacy by which the immediate cause is enabled to produce the effect. For in this case cause could not have its relative term effect. At the same time this inductive principle, while it interprets every change &

53. change in nature as an effect, & thus suggests the cause, it suggests the notion of a quality which constitutes the connection of the cause & effect. When the motion of a piece of Iron suggests to me the presence of a Magnet which I do not see, it at the same time suggests the notion & belief of a quality in the magnet by means of which it produces the effect. This efficiency we call a quality, virtue, power, or a property, when it serves to characterize.

Philosophy has been defined the study of natural substances, considered as related in the way of cause & effect. Every disquisition therefore of which the reasonings proceed on this relation is a philosophical or physical disquisition.

Thus universal physics becomes a study of prodigious extent, reaching from an atom to God. It can never be expected, that this can all be studied by one man. Fortunately for its advancement, the inclinations of different persons have led them to consider different branches of the Science.

Some have attended only to the phenomena of mind & endeavoured to explore their causes, that is the faculties & propensities of mind. & thus they have formed a system of Scientific knowledge called Pneumatology.

Others have attended to the appearances which are exhibited in the changes among bodies, & which indicate qualities by which they act on each other. Some qualities distinguish individuals. Others extend to many individuals. Others are still more general & a small number are observed in every appearance of matter.

By this subordination all bodies are comprehended in one whole, evidently fitted for a general effect, while numberless subordinate effects are observed in its different parts.

To this assemblage we may give the name of

54. of the material system. It is frequently termed Nature, & the terms natural laws, natural causes, natural appearances are usually restricted to those which are exhibited in the material world. No inconvenience would follow from this restriction were it scrupulously adhered to.

But this is not always the case. Some authors use the term, natural law to express every coincident effect in the way we have already described.

This is undoubtedly the proper use of the word, & the French writers have frequently used the term *Loi physique* in this enlarged & philosophical sense. But some have been misled by this ambiguity of language & in their investigation of natural causes have taken the term in the limited sense; & thus in their explanation of the phenomena have extended their Synthesis much farther than their induction on which they had founded the existence of the natural law. They have extended it to the phenomena of mind, & thus have been guilty of great & dangerous mistakes.

It is with this limitation that we in Britain have always used the term Natural Philosophy, & *mnemotology* makes no part of the study which goes by this name. I must be understood therefore henceforward to use the term natural philosophy, natural causes, natural laws, natural phenomena in this limited sense.

In our contemplation of the phenomena of nature we are frequently able to observe alternate trains of causes & effects. I gave a remarkable instance in the phenomena of sound. But in many phenomena a careful observation points out nothing but the terminus of this chain, which however we denominate cause & effect. A more attentive examination brings into view many causes & effects which by between.

This occasions a distinction of causes into immediate & remote. It is one chief aim of Philosophy to investigate these trains of causes & effects. For as the cause

cause of the want is ascribed by us to a power or quality of body, we shall be in continual danger of ascribing to bodies powers which do not belong to them, if we are ignorant of the intermediate steps. The great improvements in Therapeutics have proceeded on this principle. Specifics are now almost entirely exploded. Medicines are not classed according to the diseases which they sometimes cure, but according to this mode of operation. A medicine is not now called a Febrifuge, but a Sudorific.

Further, some causes are found to be involved in others. A blow will put a stone in motion & therefore is considered as the cause of this motion. Gravity will in certain cases accelerate this motion, & is therefore considered as the cause of the acceleration. But careful observation will show that both the motion & acceleration are the effects of a more general principle, the inertia of matter.

Thus causes may be divided into general and particular. It is another great object of Natural Philosophy to investigate this doctrine or distinction. For as events are ascribed to powers of nature we are by this means enabled to discover those powers which operate in the whole of the material system.

Having classed causes according to their generality, & having discovered the train of intermediate events which are interspersed between what the vulgar call the cause & effect, we are enabled to discern & apprehend the whole procedure of nature in her operations. This is the second object of science to explain the phenomena. It is also what gives the science its chief value; for it is by this means that we are enabled to apply it to the purposes of life.

The

The explaining of a phenomenon is, nothing more than pointing out the power of nature from which it proceeds & determining the energy of this power. More philosophically, It is pointing out the class of events in which it is comprehended. We are thus said to account for the fact. Thus the rise of water in pumps may be shown to be a modification of the general fact that all bodies are heavy, or when unsupported will fall.

The law of nature, or of general fact, of which one phenomenon is a particular case, is called the principle of the explanation, & the explanation itself is called a theory of the phenomena. Thus Euler's explanation of the Lunar motions is called a theory of the moon on the principle of gravitation, a collection of theories including all the phenomena of nature is a system of that philosophy.

When the energy of the property which we consider as the cause & the phenomenon is immediately connected with the phenomenon, we commonly perceive the connection at once. But this is not often the case. The property has its exertion modified by the joint exertion of some other property. The particular exertions of each must be separately considered, & we must then judge what will be the result of the combination. In such cases our explanation must proceed by steps.

Thus in the case now mentioned, the rise of water in pumps by gravity. We must observe that air is heavy, & presses on the surface of standing water with a force equal to 15 1/2 pounds on a square inch. We must observe that water also is heavy, & that it is fluid, that is, a body whose parts yield to any pressure, & cannot rest in life equally pressed in every direction. We must then show from the form of the pump, that by the action of the piston, the pressure of the air is now removed

removed from the surface of the water in the barrel of the pump, then follows the explanation. The water will move to the side on which it is least pressed, that is, it will rise in the pump - nor will it rest till its pressure on the bottom of the pump is equal to 17 pounds on the square inch, that is, till it is more than 30 feet high.

This employment of intermediate steps is called proof, & the steps are arguments. This manner of inferring the particular fact from the principle is called reasoning *a priori*, and consists of these steps - 1. Announcing the principles in all its extent - all bodies are heavy. 2. Comparing the principle with the fact, by means of the proof. 3. Affirming the connection - Gravitation causes the water to rise.

This method of arguing is clear, certain & determined, & is the way employed in communicating knowledge to those who have less than ourselves. The prodigious progress which has been made in Geometry shows what length it may be carried with irresistible evidence. On account of its perspicuity & full conviction was long esteemed the only method of demonstration, & the only inlet to sound knowledge, & nothing was received as true which could not be demonstrated in this way. Accordingly this Logic, or art of reasoning, which was also called the art of discovering truth, was nothing but a scientific application of this method of reasoning, & consisted entirely in rules for conducting the argument.

This instrument of acquiring knowledge has long been applied to the study of Natural Philosophy, & has been reputed the only way of acquiring a certain knowledge of physical operations. It is natural to expect that natural Philosophy, under the conduct of an infallible guide, must have made great progress, & it will be matter of surprise to find that the fact is quite the reverse. It is not above 200 years that

that it has to emerge from worse than darkness. It consisted in a set of doctrines delivered with the most imposing apparatus of Logical demonstration, but which were in almost every case belied by fact, & gave us no assistance in the application of the qualities of natural bodies to the purposes of life.

There must therefore be some defect in this method of reasoning, considered as an inlet to truth. The fact is Philosophers had totally mistaken the road, & when their journey should have ended there they thought that they were setting out. The whole of the Aristotelian Logic that art so much boasted of as the only inlet to truth is in direct opposition to the procedure of nature by which we every day, & in every action of our lives discover truth. Aristotle's logic is not the art of discovering truth - it is the art of communicating knowledge & of detecting error. It is nothing more than an application of this maxim that what can be predicated of a whole class of things can be predicated of each individual of that class. Now it is plain that this is not a great account of the art of discovering truth nor a complete account of the art of reasoning. Reasoning is the art of producing belief by means of argument & what a group produces belief invariably & irresistibly is reasoning. The ancient Logic supposed all the great principles already known, & that nothing remained but the application of them to the particular facts. But were this true, the application of them can hardly be called a discovery. The fact is that the general principles are the chief objects of our search & they have come into view only now & then as by accident, & never by the labours of the Logician.

We indeed can tell us whether we are mistaken in our first principles - For if the general principles it is

is true, it is true in every particular fact, and therefore if false, many particular fact, it is not a true — general principle. —

Here we find the cause of the great fluctuation of this Science. It systems were continually pushing down their predecessors, & soon shared the same fate themselves. The reasonings were founded contradictory to fact, & therefore rejected as false, & new ones adopted, which shared the same fate upon examination. How was this to be remedied — the reasonings were commonly just enough — examine the first principles. This was a new task in Science, & the received Logic had no principles for our instruction. Nothing remains, but to reject them all without exception, & endeavour to form new ones which should stand the test of Logic, that is, should in every case, give consequences agreeable to fact.

In order to do this Philosophers considered that under the unnoticed tuition of kind nature we have acquired a great deal of various knowledge, & it is therefore highly probable that her method is a proper one for acquiring knowledge. An imitation of this would seem to promise an imitation of her success.

We are too apt to overlook & even to slight the occupations of Children, whom we may observe, as soon as they get the use of their limbs, incessantly busied in handling every thing over & over, putting it in every position & at every distance. We say at most that it is an innocent amusement. But we ought to say, with an acute Philosopher, that they are most rationally and seriously employed. They are acquiring habits of perception, of which their original stock is very small, & quite insufficient for the purposes of life. They are forming an acquaintance with the objects around them, struck by similitudes. If a new effect — happens by their handling any substance they are not content with this, but try to make it happen again. When a Child has for the first time tumbled a glass over the table & broken it, if another is within

its mark it is sure to show the same fate. If it is indulged in this it will continue to do it with a guiding, which discovers our attention. The very first eager repetition shows a confidence in the constancy of natural laws, to experiment, & the desire of repeating it shows the Interest which it takes in the exercise of this usefull principle. The Child is beginning the study of nature, & its own Invention is the same with that which Newton calculating the Moon's place by his sublime theory, & comparing it with his observation. The Child & the Philosopher observe each of them a conjunction of events, & expect that it will continue. The Child attends not to this abstract object of speculation, but throws down another glass to enjoy the pleasure of the noise. The Philosopher suspects the conjunction to be the consequence of a natural law, & tries an experiment which again succeeds. The Child is happy & eager to enjoy, a pleasure which to us appears very trifling. It has the same foundation with that of the Philosopher, who is happy in the success of the experiment, & the fact, formerly trifling, to both, has now acquired an importance. Both go on repeating the experiment till the fact ceases to be a novelty to either, till the child is satisfied & the Philosopher has established a natural law. Should they be interrupted, the Child cries, the Philosopher laments his want of opportunity to continue so hopeful a pursuit.

Such says the ingenious Philosopher already quoted is the education of kind nature, who from the beginning to the end of life, makes the play of his Scholars their most instructive lessons, & has implanted in our mind the instinctive principle of induction, by which we are enabled to learn them.

The exercise of this instinctive principle, by which nature prompts us to infer general principles from many particular facts gives us a species of Logic new in the Schools of Philosophy, but old as human

61. human nature. It is certainly a method of discovery, for by this means a method of discovery, formerly unknown, now comes into view. It is a method of reasoning, for it produces belief. It is a just Logic, for it is founded on, & indeed is only an application of that maxim equally just with what is the foundation of the Aristotelian Logic, what is true of each individual of a whole class of things, is true of the whole class. Indeed the general law, or affirmation concerning a class of objects is only a short way of making the affirmation of each particular of that class. It is an expression of a point of coincidence among a number of objects, which differ in many other particulars.

As the ancient Logic had its rules, so has the modern Lord Bacon, who has the honour of first proposing it to the Philosophers, composed a treatise of these rules calling it novum organum scientiarum. It may be considered as a grammar of Nature's language, & as one of the noblest presents which Philosophy has ever made.

The principle rule is the following, that the induction of particulars must be carried as far as the general affirmation. If this is not attended to, the mind of man which from his earliest years shows a great eagerness for searching after first principles, will frequently be disposed to ascribe to the operations of a general last conjunction of events which have been merely accidental.

Hence the popular belief in omens, palmistry, & all kind of fortune-telling. When Dr. N. asserted as a general law that when a beam of white light passed out of air into any number of transparent substances & out of them into air again in such a manner as to be inclined to the direction of its first incidence, it was tinged with colour, he was, for want of an induction of particulars as extensive as his affirmation, for it is now found that an inclination may be found, such as that the emerging beam of light shall be entirely free from colour.

This rule must evidently give quite a new turn to Nat: Phil^y. In order to acquire the knowledge —

62. Knowledge of very general Principles, we must make very copious inductions of particular facts, that we may not be deceived as to the generality of our Principles inferred from them. We must acquire a very extensive acquaintance with the phenomena of nature, & pay a very particular attention to all the changes which we see continually happening around us. From these particular facts we infer the general laws, & then from these laws as Principles we explain the complicated phenomena.

The study of nature then, may be conveniently divided into three branches - Phenomenology - Articology & Theory. Or History - Investigation & Explanation.

The Phenomenology consists in a complete Natural History, in which the objects are not considered so much in the light of men existing related to each other in the way of similarity & distinction, but in the light of events related to each other in the way of cause & effect. It must contain a numerous collection of principle facts accurately observed, & faithfully narrated, properly selected, & cleared of unnecessary & extraneous circumstances.

I cannot give a better instance than what you will meet with in the 13th book of Newton's Principia.

1. The Satellites of Jupiter describe round him areas proportional to the times & the squares of the periodic times are proportional to the Cubes of the mean distances.

2. The same may be affirmed of the Satellites of Saturn.

3. All the planets move round the Sun in Ellipses, having the Sun in the focus, & describe areas proportional to the times, & the squares of the periodic times are proportional to the cubes of the mean distances.

4. The Moon describes round the earth areas proportional to the times.

5. The Moon in a minute of time deviates 16.1 feet from the tangent of her Orbit.

6. Stone on the surface of this earth falls from rest 16.1 feet in a second of time.

Having thus provided ourselves with the materials of Nat. Philosophy we must proceed to give it

itself. This we do by arranging all these facts according to some convenient similarity & distinction. The very first arrangement that we make of them divides them into a number of classes, of facts which to a certain degree resemble each other. The expression of this coincidence of resemblance of facts is a law of nature. Thus it is a law of nature that all the planets describe Ellipses round the sun. Had we never gone farther in our arrangements we should have ascribed this coincidence to a property or quality belonging to each planet considered as a whole.

But after we have made this arrangement we find similarities even in the different classes. As in making up any class in the first arrangement we abstracted our consideration from the circumstances in which the individuals differed from each other & attended only to those in which they agreed. So we can consider each class as an individual & neglecting the circumstances in which they differ, attend only to that in which they agree. viz. the description of Areas proportional to the times, & the deviation from the tangent of their orbits being $\div \frac{1}{D^2}$.

Hence we make the more general expression, that each of the heavenly bodies deviates from a rectilinear course towards each other body, & its deviation is (caeteris paribus) $\div \frac{1}{D^2}$.

We have now brought all the phenomena into two classes - the heavenly bodies & bodies on the surface of the earth. - Upon comparing the motion of the Moon with the motion of a falling stone, we find the same coincidence take place. The deviation of the moon & stone from the tangent of their paths is $\div \frac{1}{D^2}$.

Hence an expression of a coincidence of fact, or law of nature, still more original. All matters tend to all matter, & the approach is $\div \frac{1}{D^2}$.

Lastly we ascribe the fall of a stone to a cause or power which we call Gravity, or, more philosophically, Gravitation, (expressing the fact, not the quality) and we say that the stone gravitates to the Earth.

Hence

Then the general law, all matter gravitates to all matter with a force $\propto \frac{1}{r^2}$.

Now this scientific arrangement of facts terminates in Biology, or the discovery of the causes of things. Since we know nothing of the cause but the facts themselves, it is plain that this arrangement is the Causology.

But as our inference of cause is so habitual, we do not generally think that we are proceeding in this simple way of arrangement. Our investigation has another appearance to our mind, altho it is nothing but this arrangement of facts according to similarity & distinction. We examine how far the laws of nature already known concur in producing the observed effect, & we appreciate the energy of each according to the circumstance of its execution. Then combine them all & compare the result of the combination with the former. If it is the same we have explained the phenomenon. If it is different we have discovered a new law, of which this difference is the sign, & we ascribe this new discovered law to the operation of a new cause or power to be added to our list of first principles & arranged according to its generality. If, for instance, it is universal, the expression of the universal coincidence of facts is an universal law of nature, & an effect of an universal property of matter. Thus in the instance already produced, Dr. N. considered in all these phenomena what were the effects of the only laws of nature which we knew, viz. the law of Inertia & of compounded motion & separating their effects from the observed phenomena, ascribed the remainder of the phenomena, which he found universal, to a new power directed to every particle of matter, & so decreasing with every increment of distance as that at twice the distance it was only $\frac{1}{4}$ of its former intensity. The fact he expressed by saying that all matter gravitates to all matter with a force $\propto \frac{1}{r^2}$, & the power he called universal gravity or gravitation. — All individual phenomena, which cannot be comprehended in any general phenomenon or general law, must remain individual in our arrangement. Since in this case there is no investi-

gation, no tracing of causes, all that can be said of such phenomena is only narration. All such phenomena therefore, are the proper objects of natural history, & ought to be kept there till others of the same kind can be found, which by establishing a coincidence of fact enables us to form a class & infer a natural principle. In making & arranging this collection of phenomena, from whose coincidences we propose to infer the general laws, we meet with great difficulties. Of these the chief is, that in almost all the spontaneous phenomena of nature, many general powers combine their influence, & it requires the utmost sagacity to appreciate the precise part of the complicated effect which is the produce of such cause. In such cases it is extremely convenient to put the body, under examination, in a situation in which the operation of some, if not all those known powers shall either be suspended, or modified in a way that we perfectly know. Whether we can with care & accuracy appreciate the effects of the others which we have not been able to modify or suspend, or we can discover the existence of a new law & the operation of a new power. This is called making an experiment, & is of all others the most effectual way of advancing our knowledge of nature & has got the name of Experimental Philosophy.

But it is not sufficient for this purpose to put the body into any chance situation. Little good can accrue to philosophy from random experiments. They should be made with one of those two views. either to get rid of the uncertain combination of the agency of principles already known, or to see whether the body is not subjected to the influence of some power which we suspect to act upon it. I cannot give you a better instance of the superiority of well contrived experiments over those made at random than in the writings of Mr. Boerhaave & Mr. Boerhaave.

The first do not contain the 100th part of the experiments of the other - but each little essay terminates in a general discovery, while I do not recollect three discoveries in all the writings of Boet. Perhaps the best models in Experimental philosophy now extant are the optics of Newton, & Dr. Hales's essay on lime & lime waters.

I have said that one end of experiment is to confirm or overthrow our suspicion about the influence of supposed principles. Conjectures of this kind frequently arise in the mind of diligent enquirers. There will frequently occur among the particular phenomena certain analogies with phenomena already known to be the result of the operations of powers already discovered. Altho' these phenomena do not proceed from the same cause, they may proceed from an analogous cause.

In such a case we must examine what would be the effect of this analogous cause in some particular situation. We must then put the body in this situation. If the effect perfectly agrees with our deduction our suspicion is strengthened. We must now proceed to ascertain what would be the effect of our supposed cause in every possible case, and then put the body in all these situations. If the result in every situation perfectly agrees with our deduction, our suspicions now become much better founded, the case is in some degree similar to that of deciphering a letter. We judge that we have discovered the true cypher when we can make sense of the letter. And this comparison has led some to conclude that when our analogical cause gives results which in every instance are the same with the phenomena, it is really the true cause. But this proof is itself only an analogy, and the analogy is different in an important circumstance.

Such conjectures therefore, however confirmed by experiments, must never aspire to a higher rank than that of probable hypothesis. We must never use it as a principle of explanation. For since we know nothing of cause & effect but the conjunction of two events, it is evident that when we do not see the two events we see nothing of causation. The hypothesis admitted as a principle of explanation takes it for granted that the event which I call the cause exists. But all that can be made of the hypothesis is that if the supposed cause did exist in all the effects which we see it really would be the cause, & the effects enable us to determine its nature.

Should I, in the course of the following Lectures, assert that all the phenomena of Magnetism proceed from the action of a fluid residing in the Magnet, unable to quit it, but capable of being equally dispersed thro' it, whose particles repel each other but attract the particles of Iron; & should I make use of this assertion in order to demonstrate some proposition which I have no opportunity of comparing with fact, I should proceed unphilosophically & be in danger of error. For I must acknowledge that I never saw this fluid & cannot demonstrate its existence.

But should I assert that all the phenomena which have been observed are perfectly analogous to that which would be the effect of such a fluid, & on this authority make use of the analogy in order to foretell what will be the result in a particular case which may be tried - I argue according to the rules of sound Logic. I also do service to the Science by giving a general expression of a fact, & thereby abridge both language & conception, & also stir up the curiosity of Philosophers to examine into the reality of the cause.

From these observations we see the propriety of Newton's first rule, "that no cause of Natural phenomena must be admitted but what exists." All hypothesis

Hypothesis therefore must be banished or neglected. An hypothesis proves nothing but the possibility of the hypothetical cause. It gives us no knowledge nor any generation of facts; for the conjecture is founded on a great coincidence of facts, & we thrust in our hypothetical law between two which we really observe. The hypothesis therefore is no more extensive than the similarity of facts observed, & the hypothetical law is not more general than the observed law. Let us therefore throw away altogether the hypothetical law & insert the observed one among our list of general laws. It will be in different language from our hypothetical law, but it will express the same facts in nature.

There may be a case in which a hypothesis must be admitted as a true cause. When we find that it perfectly corresponds in its results with the phenomena, & when moreover we can demonstrate that no other cause which can be assigned can operate in producing the phenomena.

Thus then a copious natural history, & a series of well contrived experiments, when properly arranged terminates in the expression of the general laws of nature, or, as we commonly speak, in the discovery of the general powers of nature.

Having once made considerable advances in this we will be in a condition to explain by the rules of the ancient Logic many complicated phenomena which did not suggest the general principle, & which fill upon the scene of our observation, and this communicates knowledge to others with ease & dispatch. This constitutes the third branch of the study of nature.

Theory, which contains an explanation of the phenomena, which are comprehended under the general laws, but which are of so complicated a nature that they did not suggest this general law, altho' had they been employed with this view & divested of every foreign circumstance, they must have suggested it. Centrons vibrations in a Cylind will

will lead to a demonstration of the constant and uniform action of Gravity proportioned to the quantity of matter, but it did not first suggest it.

Theory therefore proceeds synthetically from the general law already established, & considered as exerting its influence on the phenomena under examination. This influence is determined both in degree & in kind, and all its consequences appreciated & affirmed. Thus, to abide by the same instance, since all matter gravitates to all matter, the Moon must gravitate not only to the earth, but to the sun. This must occasion considerable varieties in her motions. They must be accelerated in the 1st & 3rd quarters & retarded in the 2nd & 4th, that diameter of her orbit which passes thro' the Sun, must always be lengthened, & its inclination to the Ecliptic must continually change, & the line of intersection recede. In this manner following the action of gravity thro' all its consequences, we obtain an account a priori of the Lunar motions.

This manner of studying nature has been prosecuted there two centuries past. Philosophers have been occupied in observing facts & making copious collections of them. Points of coincidence among them have struck the minds of great men from time to time, & led them to infer the operations of general powers. When facts had been arranged in consequence of this coincidence new coincidences were observed among the different classes, & thus occasioned an arrangement of laws - still more general.

By these efforts, investigation became familiar & reasoning from induction became more satisfactory. Philosophers studied the rules of this method and became more expert in it. The old Logic lost its credit & the modern, or that by induction & experiment took its

its place. Hypothesis, which had been used as principles, were banished. Nothing was admitted as a principle which was not inferred from an induction as copious as the principle was denoted general. Conclusions from such principles became every day more agreeable to fact, & therefore served better for explaining the phenomena. Mistakes sometimes occurred, but recourse being had to more copious inductions, or more accurate observations, enabled philosophers to correct these mistakes. In the present study of nature our steps are more slow, hesitating & painful, our conclusions are more limited & modest, but our discoveries are more certain & progressive, & our conclusions are more applicable to the purposes of common life. (here a blank in Nactum. of 4 pages)

All the phenomena of nature which we are instinctively led to consider as effects, or as the signs of causes, may be conveniently arranged into two classes, & it is of importance to attend to the distinction between them, because it also divides the study of nature into two different branches, which have arisen from the two great classes of our events.

The first class comprehends all the phenomena which are exhibited to our observation in the sensible motions & actions of the sensible masses of matter, as in the planetary motions, the motions & actions of machines, the sensible motions & actions of fluids, & such like. These phenomena are generally called mechanical, or mechanism.

The 2^d Class comprehends all the phenomena exhibited to our observation in the insensible motions & mutual actions of the insensible particles of matter. Such for instance are exhibited in the Chemical phenomena of heat & mixture, & in the growth of animals & vegetables. - These Classes are eminently distinguished in

in a scientific view of them, whether we would investigate their cause or explain subordinate phenomena. In both we must grant that the principle which connects the pairs of concomitant events, whether we will the vulgar denominated cause & effect, rendering the one an unavoidable consequence of the other, is totally unperceivable, not being the object of our perception.

But in the first class we see the immediate occasion of this principle whatever it is. We can observe it with accuracy we can determine its kind & its degree which are the signs of the kind & degree of the unperceived cause. This operation being always some modification of motion allows us to call in the aid of Geometry & Arithmetick, & thus to ascertain with accuracy & precision the energy of the cause, judging of its tendency & quantity by the tendency & quantity of the observed effect. But in the 2^d class of the phenomena the cause is quite otherwise. The immediate operation of the cause is not perceived by us. All that we can observe is the assemblage of particles which look place before the action & that which takes place after it, & what we consider as the result of it. The production of nature in producing the change is quite unobserved by us - the intermediate steps are hid from our view. We are not only ignorant of the cause which determines a particle of our food to become a part of our body, while other particles are rejected. We are not only ignorant of the cause which determines a particle of Vitriolic acid to quit the particle of fossil alkali, with which it is united in Glauber salt, and attach itself to a particle of magnesia already united to the marantic acid which it now quits, but we do not see the operation. These particles & their motion are not the object of our senses, and all that we see is only the ultimate effect of these motions. The motions which are the immediate effects of their motions, & their proper signs, fitted to show us their nature are unperceived by us.

Our knowledge therefore of these phenomena must be more imperfect than our knowledge of the other. & we must here content ourselves with the discovery of remote causes, & with our ignorance of the true powers which

which produce the visible effects.

But Philosophers, attending to the circumstances that even in these cases the changes are produced by motions, however unperceived they may be, have concluded that the laws, according to which nature operates in producing these changes, are included in the laws which operate in the phenomena of the first class, or that they are the same, & that the motions, tho' unseer, are perfectly similar to those which are observed in the phenomena of that class. Accordingly they have employed similar methods for their investigation calling in the aid of Arith-
metick & Geometry. But their success has been very discouraging. In truth they should not have expected any. For their whole train of reasoning have proceeded on an analogy assumed without sufficient authority. There is not that similarity in the visible effects which is absolutely necessary for the foundation of an analogy, and to make the matter worse, this ill founded analogy has been mixed with hypotheses. Certain forms have been assigned to their particles, & certain laws have been continued for their actions, for whose existence we have not the least argument - and to complete the mistake, most of these fancied forms & laws are such as are either self contradictory & inconsistent, or such as, when allowed to operate in a way analogous to what we observe in the sensible motions of bodies would produce effects different from those which are really observed.

Notwithstanding these discouraging circumstances I must observe that this kind of enquiry has improved of late along with the improvement & extension of mechanical Philosophy, & we ought not to despair of still greater advances. But still the greatest improvements which has been made in Chymistry & Philosophy, have been made by neglecting entirely these hidden operations & by carefully observing the secondary laws, or remote connections exhibited in the phenomena.

Not only Scientific propriety points out this division of the phenomena of the material world, & the study of them, but this division has also arisen from a division in pursuits of mankind, when their wants led them to study nature, medicine manufactures.

This

3. This has occasioned a just construction of the meaning
affixed to term Natural Philosophy. In Bonifant, at least
it is in a great measure restricted to the consideration of the
first class of phenomena. The second which philosophers with
the appearance of truth, suppose to be subordinate & dependent on
it, as we have not yet been so fortunate as to discover their
connection, has produced the Sciences of Chemistry & Physiology
which have been carried to a great degree of perfection by the
labours of ingenious men.

It is to this first branch that I propose to confine myself in
the following course of Lectures. By doing I shall not
undertake more than the short time of a winters season
will allow me to accomplish. In this course, I shall be
able to give you an account of all the ^{properties} properties of body,
to which the phenomena even of the other class are also
subject. Thus you will understand the analogy which
has led Philosophers to suppose that these phenomena
of the other class are produced by the operation of the
same causes. Perhaps I shall even show you the attempt
which maybe made to investigate the province of
Nature in these hidden operations. I will not pretend
to have investigated them, but shall only make you
acquainted with the method & principles which are
proper to be employed in that enquiry. I shall
think it necessary, in order to make you competent
Judges of the subtilty of some systems of explanation
which are in fashion, being supported by the au-
thority of great names.

Allow me therefore to define Natural Philo-
sophy to be the study of ^{the} sensible motions & actions
of bodies, with a view to discover the general powers
of nature & to explain the phenomena consequent
on their exertions.