

minds of reflecting men, in all ages of the world. Nor is this wonderful; for, were things differently constituted, it would be impossible for man to derive benefit from experience; and the powers of observation and memory would be subservient only to the gratification of an idle curiosity. In consequence of those uniform laws by which the succession of events is actually regulated, every fact collected with respect to the past is a foundation of sagacity and of skill with respect to the future; and, in truth, it is chiefly this application of experience to anticipate what is yet to happen, which forms the intellectual superiority of one individual above another. The remark holds

"Jupiter in parvo cum cerneret æthera vitro

"Risit, et ad superos talia dicta dedit.

"Hucine mortalis progressa potentia cura;

"Jam meus in fragili luditur orbe labor.

"Jura Poli, rerumque fidem, legesque Deorum

"Ecce Syracusius transtulit arte senex.

"Inclusus variis famulatur spiritus astris,

"Et vivum certis motibus urget opus.

"Percurrit proprium mentitus signifer annum,

"Et simulata novo Cythlia mense redit.

"Jamque suum volvens audax industria mundum

"Gaudet, et humana Sydera mente regit.

"Quid falso insontem tonitru Salmoëa miror?

"Æmula naturæ parva reperta manus."

In the progress of philosophical refinement at Rome, this metaphorical application of the word *law* seems to have been attended with the same consequences which (as I already observed) have resulted from an incautious use of it among some philosophers of modern Europe. Pliny tells us, that, in his time, these consequences extended both to the lettered, and to the unlettered multitude. "*Pars alia astro suo eventus assignat, et nascendi legibus; semelque in omnes futuros unquam Deo decretum, in reliquum vero otium datum. Sedere cæpit sententia hæc, pariterque et eruditum vulgus et rude in eam cursu vadit.*" (*Plin. Nat. Hist. Lib. ii.*)

equally in all the various pursuits of mankind, whether speculative or active. As an astronomer is able, by reasonings founded on past observations, to predict those phenomena of the heavens which astonish or terrify the savage ;—as the chemist, from his previous familiarity with the changes operated upon bodies by heat or by mixture, can predict the result of innumerable experiments, which to others furnish only matter of amusement and wonder ;—so a studious observer of human affairs acquires a prophetic foresight (still more incomprehensible to the multitude) with respect to the future fortunes of mankind ;—a foresight which, if it does not reach, like our anticipations in physical science, to particular and definite events, amply compensates for what it wants in precision, by the extent and variety of the prospects which it opens. It is from this apprehended analogy between the future and the past, that historical knowledge derives the whole of its value ; and were the analogy completely to fail, the records of former ages would, in point of utility, rank with the fictions of poetry. Nor is the case different in the business of common life. Upon what does the success of men in their private concerns so essentially depend as on their own *prudence* ; and what else does this word mean, than a wise regard, in every step of their conduct, to the lessons which experience has taught them *?

The departments of the universe in which we have an opportunity of seeing this *regular order* displayed, are the three

* “ Prudentiam quodammodo esse divinationem.” *Corn. Nep. in vita Attici.*

following: 1. The phenomena of inanimate matter; 2. The phenomena of the lower animals; and, 3. The phenomena exhibited by the human race.

1. On the first of these heads, I have only to repeat what was before remarked, That, in all the phenomena of the material world, the uniformity in the order of events is conceived by us to be complete and infallible; insomuch that, to be assured of the same result upon a repetition of the same experiment, we require only to be satisfied, that both have been made in circumstances precisely similar. A single experiment, accordingly, if conducted with due attention, is considered, by the most cautious inquirers, as sufficient to establish a general physical fact; and if, on any occasion, it should be repeated a second time, for the sake of greater certainty in the conclusion, it is merely with a view of guarding against the effects of the accidental concomitants which may have escaped notice, when the first result was obtained.

2. The case is nearly similar in the phenomena exhibited by the brutes; the various tribes of which furnish a subject of examination so steady, that the remarks made on a few individuals may be extended, with little risk of error, to the whole species. To this uniformity in their instincts it is owing, that man can so easily maintain his empire over them, and employ them as agents or instruments for accomplishing his purposes; advantages which would be wholly lost to him, if the operations of instinct were as much diversified as those of human reason. Here therefore we may plainly trace a purpose or design, perfectly analo-

gous to that already remarked, with respect to the laws which regulate the material world ; and the difference, in point of exact uniformity, which distinguishes the two classes of events, obviously arises from a certain latitude of action, which enables the brutes to accommodate themselves, in some measure, to their accidental situations ;—rendering them, in consequence of this power of accommodation, incomparably more serviceable to our race than they would have been, if altogether subjected, like mere matter, to the influence of regular and assignable causes. It is, moreover, extremely worthy of observation, concerning these two departments of the universe, that the uniformity in the phenomena of the latter presupposes a corresponding regularity in the phenomena of the former ; insomuch that, if the established order of the material world were to be essentially disturbed (the instincts of the brutes remaining the same) all their various tribes would inevitably perish. The uniformity of animal instinct, therefore, bears a reference to the constancy and immutability of physical laws, not less manifest, than that of the fin of the fish to the properties of the water, or of the wing of the bird to those of the atmosphere.

3. When from the phenomena of inanimate matter and those of the lower animals, we turn our attention to the history of our own species, innumerable lessons present themselves for the instruction of all who reflect seriously on the great concerns of human life. These lessons require, indeed, an uncommon degree of acuteness and good sense to collect them, and a still more uncommon degree of caution to apply them to practice ; not only because it is difficult to find cases in which the com-

binations of circumstances are exactly the same ; but because the peculiarities of individual character are infinite, and the real springs of action in our fellow-creatures are objects only of vague and doubtful conjecture. It is, however, a curious fact, and one which opens a wide field of interesting speculation, that, in proportion as we extend our views from particulars to generals, and from individuals to communities, human affairs exhibit, more and more, a steady subject of philosophical examination, and furnish a greater number of general conclusions to guide our conjectures concerning future contingencies. To speculate concerning the character or talents of the individual who shall possess the throne of a particular kingdom, a hundred years hence, would be absurd in the extreme : But to indulge imagination in anticipating, at the same distance of time, the condition and character of any great nation, with whose manners and political situation we are well acquainted, (although even here our conclusions may be widely erroneous) could not be justly censured as a misapplication of our faculties equally vain and irrational with the former. On this subject, Mr Hume has made some very ingenious and important remarks in the beginning of his *Essay on the Rise and Progress of the Arts and Sciences*.

The same observation is applicable to all other cases, in which events depend on a multiplicity of circumstances. How accidental soever these circumstances may appear ; and how much soever they may be placed, when individually considered, beyond the reach of our calculations, experience shows, that they are somehow or other mutually adjusted, so as to produce

a certain degree of uniformity in the result ; and this uniformity is the more complete, the greater is the number of circumstances combined. What can appear more uncertain than the proportion between the sexes among the children of any one family ! and yet how wonderfully is the balance preserved in the case of a numerous society ! What more precarious than the duration of life in an individual ! and yet, in a long list of persons of the same age, and placed in the same circumstances, the mean duration of life is found to vary within very narrow limits. In an extensive district, too, a considerable degree of regularity may sometimes be traced for a course of years, in the proportion of births and of deaths to the number of the whole inhabitants. Thus, in France, Necker informs us, that “ the number of births is in proportion to that of the inhabitants “ as one to twenty-three and twenty-four, in the districts that are “ not favoured by nature, nor by moral circumstances: this proportion is as one to twenty-five, twenty-five and a half, and “ twenty-six, in the greatest part of France : in cities, as one to “ twenty-seven, twenty-eight, twenty-nine, and even thirty, according to their extent and their trade.” “ Such proportions” “ (he observes) can only be remarked in districts where there “ are no settlers nor emigrants ; but even the differences arising “ from these (the same author adds), and many other causes, “ acquire a kind of uniformity, when collectively considered, “ and in the immense extent of so great a kingdom*.”

It may be worth while to remark, that it is on these prin-

* *Traité de l'Administration des Finances de France.*

ciples that all the different institutions for Assurances are founded. The object at which they all aim, in common, is, to diminish the number of *accidents* to which human life is exposed ; or rather, to counteract the inconveniences resulting from the irregularity of individual events, by the uniformity of general laws.

The advantages which we derive from such general conclusions as we possess concerning the order of nature, are so great, and our propensity to believe in its existence is so strong, that, even in cases where the succession of events appears the most anomalous, we are apt to suspect the operation of fixed and constant laws, though we may be unable to trace them. The vulgar, in all countries, perhaps, have a propensity to imagine, that, after a certain number of years, the succession of plentiful and of scanty harvests begins again to be repeated in the same *series* as before ;—a notion to which Lord Bacon himself has given some countenance in the following passage. “There is a toy which I have heard, and I would not have it given over, but waited upon a little. They say it is observed in the low countries, (I know not in what part) that every five and thirty years, the same kind and suite of years and weathers comes about again ; as great frosts, great wet, great droughts, warm winters, summers with little heat, and the like ; and they call it *the prime*. It is a thing I do the rather mention, because, computing backwards, I have found some concurrence*.”

* Essays, Art. 59.

Among the philosophers of antiquity, the influence of the same prejudice is observable on a scale still greater; many of them having supposed, that at the end of the *annus magnus*, or Platonic year, a repetition would commence of all the transactions that have occurred on the theatre of the world. According to this doctrine, the predictions in Virgil's *Pollio* will, sooner or later, be literally accomplished :

"Alter erit tum Tiphys, et altera quæ vehat Argo

"Delectos Heroas; erunt etiam altera bella;

"Atque iterum ad Trojam magnus mittetur Achilles *."

The astronomical cycles which the Greeks borrowed from the Egyptians and Chaldeans, when combined with that natural bias of the mind which I have just remarked, account sufficiently for this extension to the moral world, of ideas suggested by the order of physical phenomena.

Nor is this hypothesis of a *moral cycle*, extravagant as it unquestionably is, without its partisans among modern theorists. The train of thought, indeed, by which they have been led to adopt it is essentially different; but it probably received no small degree of countenance, in their opinion, from the same

* "Tum efficitur (says Cicero, speaking of this period) cum solis et lunæ, et quinque errantium ad eandem inter se comparisonem confectis omnium spatiis, est facta conversio. Quæ quàm longa sit, magna quæstio est: esse vero certam et definitam necesse est." (*De Nat. Deorum*. Lib. ii. 74.) "Hoc intervallo (Clavius observes) quidam volunt, omnia quæcunque in mundo sunt, eodem ordine esse reditura, quo nunc cernuntur." (*Clav. Commentar. in Sphæram Joannis de Sacro Bosco*, p. 57. Romæ, 1607.)

bias which influenced the speculations of the ancients. It has been demonstrated by one of the most profound mathematicians of the present age*, that all the irregularities arising from the mutual action of the planets, are, by a combination of various arrangements, necessarily subjected to certain periodical laws, so as for ever to secure the stability and order of the system. Of this sublime conclusion, it has been justly and beautifully observed, that “after Newton’s theory of the elliptic orbits of the planets, La Grange’s discovery of their periodical inequalities, is, without doubt, the noblest truth in physical astronomy; while, in respect of the doctrine of final causes, it may truly be regarded as the greatest of all †.” The theorists, however, to whom I at present allude, seem disposed to consider it in a very different light, and to employ it for purposes of a very different tendency. “Similar periods (it has been said) but of an extent that affright the imagination, probably regulate the modifications of the atmosphere; inasmuch as the same series of appearances must inevitably recur, whenever a coincidence of circumstances takes place. The aggregate labours of men, indeed, may be supposed, at first sight, to alter the operation of natural causes, by continually transforming the face of our globe; but it must be recollected that, as the agency of animals is itself stimulated and determined solely by the influence of external objects, the re-actions of living beings are comprehended in the same necessary system; and, consequently, that all the events within the immeasurable circuit of the universe, are the successive evolution of an ex-

* M. De la Grange.

† Edinburgh Review, Vol. II. p. 264.

“tended series, which, at the returns of some vast period, repeats its eternal round during the endless flux of time*.”

On this very bold argument, considered in its connection with the scheme of necessity, I have nothing to observe here. I have mentioned it merely as an additional proof of that irresistible propensity to believe in the permanent order of physical events, which seems to form an original principle of the human constitution;—a belief essential to our existence in the world which we inhabit, as well as the foundation of all physical science; but which we obviously extend far beyond the bounds authorized by sound philosophy, when we apply it, without any limitation, to that moral system, which is distinguished by peculiar characteristics, so numerous and important, and for the accommodation of which, so many reasons entitle us to presume, that the material universe, with all its constant and harmonious laws, was purposely arranged.

To a hasty and injudicious application of the same belief, in anticipating the future course of human affairs, might be traced a variety of popular superstitions, which have prevailed, in a greater or less degree, in all nations and ages; those superstitions, for example, which have given rise to the study of charms, of omens, of astrology, and of the different arts of divination. But the argument has been already prosecuted as far as its con-

* The foregoing passage is transcribed from an article in the *Monthly Review*. I have neglected to mark the volume; but I think it is one of those published since 1800.

See Note (L)

nection with this part of the subject requires. For a fuller illustration of it, I refer to some remarks in my former volume, on the superstitious observances which, among rude nations, are constantly found blended with the practice of physic; and which, contemptible and ludicrous as they seem, have an obvious foundation, during the infancy of human reason, in those important principles of our nature, which, when duly disciplined by a more enlarged experience, lead to the sublime discoveries of inductive science*.

Nor is it to the earlier stages of society, or to the lower classes of the people, that these superstitions are confined. Even in the most enlightened and refined periods they occasionally appear; exercising, not unfrequently, over men of the highest genius and talents, an ascendant, which is at once consolatory and humiliating to the species.

“*Ecce fulgurum monitus, oraculorum præscita, aruspicum prædicta, atque etiam parva dictu in auguriis sternutamenta et offensiones pedum. Divus Augustus lævum prodidit sibi calceum præpostere inductum, quo die seditione militari prope afflictus est.*”†

“Dr Johnson (says his affectionate and very communicative biographer) had another particularity, of which none of his friends ever ventured to ask an explanation. It appeared to me some superstitious habit, which he had contracted ear-

* Vol. I. pp. 355, 356, 357, 3d edit.

† Plin. Nat. Hist. Lib. ii.

“ly, and from which he had never called upon his reason to
“disentangle him. This was, his anxious care to go out or in
“at a door or passage, by a certain number of steps from a
“certain point, or at least so as that either his right or his left
“foot (I am not certain which) should constantly make the first
“actual movement when he came close to the door or passage.
“Thus I conjecture: for I have, upon innumerable occasions,
“observed him suddenly stop, and then seem to count his steps
“with a deep earnestness; and when he had neglected or gone
“wrong in this sort of magical movement, I have seen him go
“back again, put himself in a proper posture to begin the ce-
“remony, and, having gone through it, break from his abstrac-
“tion, walk briskly on, and join his companion*.”

The remark may appear somewhat out of place, but, after the last quotation, I may be permitted to say, that the person to whom it relates, great as his powers, and splendid as his accomplishments undoubtedly were, was scarcely entitled to assert, that “Education is as well known, and has long
“been as well known, as ever it can be*.” What a limited estimate of the objects of education must this great man have formed! They who know the value of a well regulated and unclouded mind, would not incur the weakness and wretchedness exhibited in the foregoing description, for all his literary acquirements and literary fame.

* Boswell's Johnson, Vol. I. p. 264, 4to edit.

† Ibid. p. 514.

III.

Continuation of the Subject.—General Remarks on the Difference between the Evidence of Experience, and that of Analogy.

ACCORDING to the account of experience which has been hitherto given, its evidence reaches no farther than to an anticipation of the future from the past, in cases where the same physical cause continues to operate in exactly the same circumstances. That this statement is agreeable to the strict philosophical notion of experience, will not be disputed. Wherever a change takes place, either in the cause itself, or in the circumstances combined with it in our former trials, the anticipations which we form of the future cannot with propriety be referred to experience alone, but to experience co-operating with some other principles of our nature. In common discourse, however, precision in the use of language is not to be expected, where logical or metaphysical ideas are at all concerned; and, therefore, it is not to be wondered at, that the word experience should often be employed with a latitude greatly beyond what the former definition authorizes. When I transfer, for example, my conclusions concerning the descent of heavy bodies from one stone to another stone, or even from a stone to a leaden bullet, my inference might be said, with sufficient accuracy for the ordinary purposes of speech, to have the evidence of experience in its favour; if indeed it would not savour of scholastic affectation to aim at a more rigorous enunciation of the proposition. Nothing, at the same time, can

be more evident than this, that the slightest shade of difference which tends to weaken the resemblance, or rather to destroy the identity of two cases, invalidates the inference from the one to the other, as far as it rests on experience solely, no less than the most prominent dissimilarities which characterize the different kingdoms and departments of nature.

Upon what ground do I conclude that the thrust of a sword through my body, in a particular direction, would be followed by instant death? According to the popular use of language, the obvious answer would be,—upon experience, and experience alone. But surely this account of the matter is extremely loose and incorrect; for where is the evidence that the internal structure of *my* body bears any resemblance to that of any of the other bodies which have been hitherto examined by anatomists? It is no answer to this question to tell me, that the experience of these anatomists has ascertained a uniformity of structure in every human subject which has as yet been dissected; and that therefore I am justified in concluding, that *my* body forms no exception to the general rule. My question does not relate to the soundness of this inference, but to the principle of my nature, which leads me thus not only to reason from the past to the future, but to reason from one thing to another which, in its external marks, bears a certain degree of resemblance to it. Something more than experience, in the strictest sense of that word, is surely necessary to explain the transition from what is identically the same, to what is only similar; and yet my inference in this instance is made with the most assured and unqualified

confidence in the infallibility of the result. No inference, founded on the most direct and long-continued experience, nor indeed any proposition established by mathematical demonstration, could more imperiously command my assent.

In whatever manner the province of experience, strictly so called, comes to be thus enlarged, it is perfectly manifest, that without some provision for this purpose, the principles of our constitution would not have been duly adjusted to the scene in which we have to act. Were we not so formed as eagerly to seize the resembling features of different things and different events, and to extend our conclusions from the individual to the species, life would elapse before we had acquired the first rudiments of that knowledge which is essential to the preservation of our animal existence.

This step in the history of the human mind has been little, if at all, attended to by philosophers; and it is certainly not easy to explain, in a manner completely satisfactory, how it is made. The following hints seem to me to go a considerable way towards a solution of the difficulty.

It is remarked by Mr Smith, in his *Considerations on the Formation of Languages*, that the origin of genera and species, which is commonly represented in the schools as the effect of an intellectual process peculiarly mysterious and unintelligible, is a natural consequence of our disposition to transfer to a new object the name of any other familiar object which possesses such a degree of resemblance to it, as to serve the memory for

an associating tie between them. It is in this manner, he has shown, and not by any formal or scientific exercise of abstraction, that, in the infancy of language, proper names are gradually transformed into appellatives; or, in other words, that individual things come to be referred to classes or assortments*.

This remark becomes, in my opinion, much more luminous and important, by being combined with another very original one, which is ascribed to Turgot by Condorcet, and which I do not recollect to have seen taken notice of by any later writer on the human mind. According to the common doctrine of logicians, we are led to suppose that our knowledge begins in an accurate and minute acquaintance with the characteristical properties of individual objects; and that it is only by the slow exercise of comparison and abstraction, that we attain to the notion of classes or *genera*. In opposition to this idea, it was a maxim of Turgot's, that some of our most abstract and general notions are among the earliest which we form†. What meaning he annexed to this maxim, we

* A writer of great learning and ability (Dr Magee of Dublin) who has done me the honour to animadvert on a few passages of my works, and who has softened his criticisms by some expressions of regard, by which I feel myself highly flattered, has started a very acute objection to this theory of Mr Smith, which I think it incumbent on me to submit to my readers, in his own words. As the quotation, however, with the remarks which I have to offer upon it, would extend to too great a length to be introduced here, I must delay entering on the subject till the end of this volume. See Note (K).

† “ M. Turgot croyoit qu'on s'étoit trompé en imaginant qu'en général l'esprit n'acquiert des idées générales ou abstraites que par la comparaison d'idées plus particulières. Au contraire, nos premières idées sont très-générales, puisque ne voyant d'abord

are not informed ; but if he understood it in the same sense in which I am disposed to interpret it, he appears to me entitled to the credit of a very valuable suggestion with respect to the natural progress of human knowledge. The truth is, that our first perceptions lead us invariably to confound together things which have very little in common ; and that the specific differences of individuals do not begin to be marked with precision till the powers of observation and reasoning have attained to a certain degree of maturity. To a similar indistinctness of perception are to be ascribed the mistakes about the most familiar appearances which we daily see committed by those domesticated animals with whose instincts and habits we have an opportunity of becoming intimately acquainted. As an instance of this, it is sufficient to mention the terror which a horse sometimes discovers in passing, on the road, a large stone, or the waterfall of a mill.

Notwithstanding, however, the justness of this maxim, it is nevertheless true, that every scientific classification must be founded on an examination and comparison of individuals. These individuals must, in the first instance, have been observed with

“qu'un petit nombre de qualités, notre idée renferme tous les êtres auxquels ces qualités sont communes. En nous éclairant, en examinant davantage, nos idées deviennent plus particulières sans jamais atteindre le dernier terme ; et ce qui a pu tromper les métaphysiciens, c'est qu'alors précisément nous apprenons que ces idées sont plus générales que nous ne l'avions d'abord supposé.”—*Vie de Turgot*, p. 189. Berne, 1787.

I have searched in vain for some additional light on this interesting hint, in the complete edition of Turgot's works, published at Paris in 1808.

accuracy, before their specific characteristics could be rejected from the generic description, so as to limit the attention to the common qualities which it comprehends. What are usually called *general ideas* or *general notions*, are therefore of two kinds essentially different from each other; those which are *general*, merely from the vagueness and imperfection of our information; and those which have been methodically *generalized*, in the way explained by logicians, in consequence of an abstraction founded on a careful study of particulars. Philosophical precision requires, that two sets of notions, so totally dissimilar, should not be confounded together; and an attention to the distinction between them will be found to throw much light on various important steps in the natural history of the mind*.

One obvious effect of the grossness and vagueness in the per-

* The distinction above stated, furnishes what seems to me the true answer to an argument which Charron, and many other writers since his time, have drawn, in proof of the reasoning powers of brutes, from the universal conclusions which they appear to found on the observation of particulars. "Les bestes des singuliers concluent les universels, "du regard d'un homme seul cognoissent tous hommes," &c. &c. *De la Sagesse*, Lib. I. Chap. 8.

Instead of saying, that brutes generalize things which are similar, would it not be nearer the truth to say, that they confound things which are different?

Many years after these observations were written, I had the satisfaction to meet with the following experimental confirmation of them, in the Abbé Sicard's Course of Instruction for the Deaf and Dumb: "J'avois remarqué que Massieu donnoit plus volontiers "le même nom, un nom commun, à plusieurs individus dans lesquels il trouvoit des traits "de ressemblance; les noms individuels supposoient des différences qu'il n'étoit pas en- "core temps de lui faire observer." (*Sicard*, pp. 30, 31.) The whole of the passage is well worth consulting.

ceptions of the inexperienced observer, must necessarily be to identify, under the same common appellations, immense multitudes of individuals, which the philosopher will afterwards find reason to distinguish carefully from each other; and as language, by its unavoidable reaction on thought, never fails to restore to it whatever imperfections it has once received, all the indistinctness which, in the case of individual observers, originated in an ill-informed judgment, or in a capricious fancy, comes afterwards, in succeeding ages, to be entailed on the infant understanding, in consequence of its incorporation with vernacular speech. These confused apprehensions produced by language, must, it is easy to see, operate exactly in the same way as the undistinguishing perceptions of children or savages; the familiar use of a generic word, insensibly and irresistibly leading the mind to extend its conclusions from the individual to the genus, and thus laying the foundation of conclusions and anticipations which we suppose to rest on experience, when, in truth, experience has never been consulted.

In all such instances, it is worthy of observation, we proceed ultimately on the common principle,—that in similar circumstances, the same cause will produce the same effects; and, when we err, the source of our error lies merely in identifying different cases which ought to be distinguished from each other. Great as may be the occasional inconveniences, arising from this general principle thus misapplied, they bear no proportion to the essential advantages resulting from the disposition in which they originate, to arrange and to clas-

sify ; a disposition on which (as I have elsewhere shown,) the intellectual improvement of the species in a great manner hinges. That the constitution of our nature in this respect is, on the whole, wisely ordered, as well as perfectly conformable to the general economy of our frame, will appear from a slight survey of some other principles, nearly allied to those which are at present under our consideration.

It has been remarked by some eminent writers in this part of the island *, that our expectation of the continuance of the laws of nature has a very close affinity to our faith in human testimony. The parallel might perhaps be carried, without any over-refinement, a little farther than these writers have attempted ; inasmuch as, in both cases, the instinctive principle is in the first instance unlimited, and requires, for its correction and regulation, the lessons of subsequent experience. As the credulity of children is originally without bounds, and is afterwards gradually checked by the examples which they occasionally meet with of human falsehood, so, in the infancy of our knowledge, whatever objects or events present to our senses a strong resemblance to each other, dispose us, without any very accurate examination of the minute details by which they may be really discriminated, to conclude with eagerness, that the experiments and observations which we make with respect to one individual, may be safely extended to the whole class. It is experience alone that teaches us caution in such inferences, and subjects

* See Reid's *Inquiry into the Human Mind*, Chap. VI. Sect. 24. Campbell's *Dissertation on Miracles*, Part I. Sect. 1. Smith's *Theory of Moral Sentiments*, Vol. II. p. 382, sixth edition.

the natural principle to the discipline prescribed by the rules of induction.

It must not, however, be imagined, that, in instances of this sort, the instinctive principle always leads us astray; for the analogical anticipations which it disposes us to form, although they may not stand the test of a rigorous examination, may yet be sufficiently just for all the common purposes of life. It is natural, for example, that a man who has been educated in Europe should expect, when he changes his residence to any of the other quarters of the globe, to see heavy bodies fall downwards, and smoke to ascend, agreeably to the general laws to which he has been accustomed; and that he should take for granted, in providing the means of his subsistence, that the animals and vegetables which he has found to be salutary and nutritious in his native regions, possess the same qualities wherever they exhibit the same appearances. Nor are such expectations less useful than natural; for they are completely realized, as far as they minister to the gratification of our more urgent wants. It is only when we begin to indulge our curiosity with respect to those nicer details which derive their interest from great refinement in the arts, or from a very advanced state of physical knowledge, that we discover our first conclusions, however just in the main, not to be mathematically exact; and are led by those habits which scientific pursuits communicate, to investigate the difference of circumstances to which the variety in the result is owing. After having found that heavy bodies fall downwards at the equator as they do in this island, the most obvious, and perhaps, on a superficial view of the question, the most reasonable inference would be, that

the same pendulum which swings seconds at London, will vibrate at the same rate under the line. In this instance, however, the theoretical inference is contradicted by the fact ;—but the contradiction is attended with no practical inconvenience to the multitude, while, in the mind of the philosopher, it only serves to awaken his attention to the different circumstances of the two cases, and, in the last result, throws a new lustre on the simplicity and uniformity of that law, from which it seemed, at first sight, an anomalous deviation.

To this uniformity in the laws which regulate the order of physical events, there is something extremely similar in the systematical regularity (subject indeed to many exceptions) which, in every language, however imperfect, runs through the different classes of its words, in respect of their inflexions, forms of derivation, and other verbal filiations or affinities. How much this regularity or *analogy* (as it is called by grammarians,) contributes to facilitate the acquisition of dead and foreign languages, every person, who has received a liberal education, knows from his own experience. Nor is it less manifest, that the same circumstance must contribute powerfully to aid the memories of children in learning to speak their mother-tongue. It is not my present business to trace the principles in the human mind by which it is produced. All that I would remark is, the very early period at which it is seized by children ; as is strongly evinced by their disposition to push it a great deal too far, in their first attempts towards speech. This disposition seems to be closely connected with that which leads them to repose faith in testimony ; and it also bears a striking resem-

blance to that which prompts them to extend their past experience to those objects and events of which they have not hitherto had any means of acquiring a direct knowledge. It is probable, indeed, that our expectation, in all these cases, has its origin in the same common principles of our nature; and it is certain that, in all of them, it is subservient to the important purpose of facilitating the progress of the mind. Of this nobody can doubt, who considers for a moment, that the great end to be first accomplished, was manifestly the communication of the *general rule*; the acquisition of the exceptions (a knowledge of which is but of secondary importance,) being safely entrusted to the growing diligence and capacity of the learner.

The considerations now stated, may help us to conceive in what manner conclusions derived from experience come to be insensibly extended from the individual to the species; partly in consequence of the gross and undistinguishing nature of our first perceptions, and partly in consequence of the magical influence of a common name. They seem also to show, that this natural process of thought, though not always justified by a sound logic, is not without its use in the infancy of human knowledge.

In the various cases which have been hitherto under our review, our conclusions are said in popular, and even in philosophical language, to be founded on experience. And yet the truth unquestionably is, (as was formerly observed,) that the evidence of experience reaches no farther than to an anticipation of the fu-

ture from the past, in instances where the same cause continues to operate in circumstances exactly similar. How much this vagueness of expression must contribute to mislead us in many of our judgments will afterwards appear.

The observations which I have to offer upon analogy, considered as a ground of scientific conjecture and reasoning, will be introduced with more propriety in a future chapter.

IV.

Continuation of the Subject.—Evidence of Testimony tacitly recognized as a Ground of Belief, in our most certain conclusions concerning contingent Truths.—Difference between the Logical and the Popular Meaning of the word Probability.

IN some of the conclusions which have been already under our consideration with respect to contingent truths, a species of evidence is admitted, of which no mention has hitherto been made; I mean the evidence of *testimony*. In astronomical calculations, for example, how few are the instances in which the *data* rest on the evidence of our own senses; and yet our confidence in the result, is not, on that account, in the smallest degree weakened. On the contrary, what certainty can be more complete, than that with which we look forward to an eclipse of the sun or the moon, on the faith of elements and of computations which we have never verified, and for the accuracy of which we have no ground of assurance whatever, but the scientific reputation of the writers from whom we have bor-

rowed them. An astronomer who should affect any scepticism with respect to an event so predicted, would render himself no less an object of ridicule, than if he were disposed to cavil about the certainty of the sun's rising to-morrow.

Even in pure mathematics, a similar regard to testimony, accompanied with a similar faith in the faculties of others, is by no means uncommon. Who would scruple, in a geometrical investigation, to adopt, as a link in the chain, a theorem of Apollonius or of Archimedes, although he might not have leisure at the moment, to satisfy himself, by an actual examination of their demonstrations, that they had been guilty of no paralogism, either from accident or design, in the course of their reasonings?

In our anticipations of astronomical phenomena, as well as in those which we form concerning the result of any familiar experiment in physics, philosophers are accustomed to speak of the event as only *probable*; although our confidence in its happening is not less complete, than if it rested on the basis of mathematical demonstration. The word *probable*, therefore, when thus used, does not imply any *deficiency* in the proof, but only marks the particular nature of that proof, as contradistinguished from another species of evidence. It is opposed, not to what is *certain*, but to what admits of being *demonstrated after the manner of mathematicians*. This differs widely from the meaning annexed to the same word in popular discourse; according to which, whatever event is said to be *probable*, is understood to be expected with some degree of doubt. *As*

certain as death—as certain as the rising of the sun—are proverbial modes of expression in all countries ; and they are, both of them, borrowed from events which, in philosophical language, are only probable or contingent. In like manner, the existence of the city of Pekin, and the reality of Cæsar's assassination, which the philosopher classes with *probabilities*, because they rest solely upon the evidence of testimony, are universally classed with *certainities* by the rest of mankind ; and in any case but the statement of a logical theory, the application to such truths of the word *probable*, would be justly regarded as an impropriety of speech. This difference between the technical meaning of the word *probability*, as employed by logicians, and the notion usually attached to it in the business of life ; together with the erroneous theories concerning the nature of demonstration, which I have already endeavoured to refute,—have led many authors of the highest name, in some of the most important arguments which can employ human reason, to overlook that irresistible evidence which was placed before their eyes, in search of another mode of proof altogether unattainable in moral inquiries, and which, if it could be attained, would not be less liable to the cavils of sceptics.

But although, in philosophical language, the epithet *probable* be applied to events which are acknowledged to be *certain*, it is also applied to those events which are called *probable* by the vulgar. The philosophical meaning of the word, therefore, is more *comprehensive* than the popular ; the former denoting that particular *species* of evidence of which contingent truths admit ; the latter being confined to such *degrees* of this evidence as

fall short of the highest. These different degrees of *probability* the philosopher considers as a *series*, beginning with bare possibility, and terminating in that apprehended *infallibility*, with which the phrase *moral certainty* is synonymous. To this last term of the *series*, the word *probable* is, in its ordinary acceptation, plainly inapplicable.

The satisfaction which the astronomer derives from the exact coincidence, in point of time, between his theoretical predictions concerning the phenomena of the heavens, and the corresponding events when they actually occur, does not imply the smallest doubt, on *his* part, of the constancy of the laws of nature. It resolves partly into the pleasure of arriving at the knowledge of the same truth or of the same fact by different *media*; but, chiefly, into the gratifying assurance which he thus receives, of the correctness of his principles, and of the competency of the human faculties to these sublime investigations. What exquisite delight must La Place have felt, when, by deducing from the theory of gravitation, the cause of the acceleration of the moon's mean motion—an acceleration which proceeds at the rate of little more than $11''$ in a century,—he accounted, with such mathematical precision, for all the recorded observations of her place from the infancy of astronomical science! It is from the length and abstruseness, however, of the reasoning process, and from the powerful effect produced on the imagination, by a *calculus* which brings into immediate contrast with the immensity of time, such evanescent elements as the fractional parts of a second, that the coincidence between the computation and the event ap-

pears in this instance so peculiarly striking. In other respects, our confidence in the future result rests on the same principle with our expectation that the sun will rise to-morrow at a particular instant; and, accordingly, now that the correctness of the theory has been so wonderfully verified by a comparison with facts, the one event is expected with no less assurance than the other.

With respect to those inferior degrees of *probability* to which, in common discourse, the meaning of that word is exclusively confined, it is not my intention to enter into any discussions. The subject is of so great extent, that I could not hope to throw upon it any lights satisfactory either to my reader or to myself, without encroaching upon the space destined for inquiries more intimately connected with the theory of our reasoning powers. One set of questions, too, arising out of it, (I mean those to which mathematical calculations have been applied by the ingenuity of the moderns) involve some very puzzling metaphysical difficulties *, the consideration of which would completely interrupt the train of our present speculations. I proceed, therefore, in continuation of those in which we have been lately engaged, to treat of other topics of a more general nature, tending to illustrate the logical procedure of the mind in the discovery of scientific truth. As an introduction to these, I propose to devote one whole chapter to some miscellaneous strictures and reflections on the logic of the schools.

* I allude more particularly to the doubts started on this subject by D'Alembert, in his *Opuscules Mathématiques*; and in his *Mélanges de Littérature*.

CHAPTER THIRD.

OF THE ARISTOTELIAN LOGIC.

SECTION I.

Of the Demonstrations of the Syllogistic Rules given by Aristotle and his Commentators.

THE great variety of speculations which, in the present state of science, the Aristotelian logic naturally suggests to a philosophical inquirer, lays me, in this chapter, under the necessity of selecting a few leading questions, bearing immediately upon the particular objects which I have in view. In treating of these, I must, of course, suppose my readers to possess some previous acquaintance with the subject to which they relate; but it is only such a *general* knowledge of its outlines and phraseology, as, in all universities, is justly considered as an essential accomplishment to those who receive a liberal education.

I begin with examining the pretensions of the Aristotelian logic to that pre-eminent rank which it claims among the sciences; professing, not only to rest all its conclusions on the immoveable basis of demonstration, but to have reared this mighty fabric on the narrow ground-work of a single axiom. "On the basis (says the latest of his commentators) of one simple truth, Aristotle has reared a lofty and various structure of abstract science, clearly expressed and fully demonstrated*." Nor have these claims been disputed by mathematicians themselves. "In logica (says Dr Wallis) structura syllogismi demonstratione nititur pure mathematicâ†." And, in another passage: "Sequitur institutio logica, communi usui accommodata.—Quo videant Tirones, syllogismorum leges strictissimis demonstrationibus plane mathematicis ita fundatas, ut consequentias habeant irrefragabiles, quæque officiis fallaciisque detegendis sint accommodatæ‡." Dr Reid, too, although he cannot be justly charged, on the whole, with any undue reverence for the authority of Aristotle, has yet, upon one occasion, spoken of his *demonstrations* with much more respect than they appear to me entitled to. "I believe (says he) it will be difficult, in any science, to find so large a system of truths of so very abstract and so general a nature, all fortified by demonstration, and all invented and perfected by one

* Analysis of Aristotle's Works by Dr Gillies, Vol. I. p. 83, 2d edit.

† See the *Monitum* prefixed to the Miscellaneous Treatises annexed to the third Volume of Dr Wallis's Mathematical Works.

‡ Preface to the same volume.

"man. It shows a force of genius, and labour of investigation, equal to the most arduous attempts*."

As the fact which is so confidently assumed in these passages would, if admitted, completely overturn all I have hitherto said concerning the nature both of axioms and of demonstrative evidence, the observations which follow seem to form a necessary sequel to some of the preceding discussions. I acknowledge, at the same time, that my chief motive for introducing them, was a wish to counteract the effect of those triumphant panegyrics upon Aristotle's *Organon*, which of late have been pronounced by some writers, whose talents and learning justly add much weight to their literary opinions; and an anxiety to guard the rising generation against a waste of time and attention, upon a study so little fitted, in my judgment, to reward their labour.

The first remark which I have to offer upon Aristotle's demonstrations, is, That they proceed on the obviously false supposition of its being possible to add to the conclusiveness and authority of demonstrative evidence. One of the most remarkable circumstances which distinguishes this from that species of evidence which is commonly called moral or proba-

* Analysis of Aristotle's Logic.

That Dr Reid, however, was perfectly aware that these demonstrations are more specious than solid, may be safely inferred from a sentence which afterwards occurs in the same tract. "When we go without the circle of the mathematical sciences, I know no thing in which there *seems* to be so much demonstration as in that part of logic which treats of the figures and modes of syllogisms."

ble, is, that it is not susceptible of degrees ; the process of reasoning of which it is the result, being either good for nothing, or so perfect and complete in itself, as not to admit of support from any adventitious aid. Every such process of reasoning, it is well known, may be resolved into a series of legitimate syllogisms, exhibiting separately and distinctly, in a light as clear and strong as language can afford, each successive link of the demonstration. How far this conduces to render the demonstration more convincing than it was before, is not now the question. Some doubts may reasonably be entertained upon this head, when it is considered, that, among the various expedients employed by mathematical teachers to assist the apprehension of their pupils, none of them have ever thought of resolving a demonstration (as may always be easily done) into the syllogisms of which it is composed *. But, abstracting altogether from this consideration, and granting that a demonstration may be rendered more manifest and satisfactory by

* From a passage indeed in a memoir by Leibnitz, (printed in the sixth volume of the *Acta Eruditorum*) it would seem, that a commentary of this kind, on the first six books of Euclid, had been actually carried into execution by two writers, whose names he mentions. "Firma autem demonstratio est, quæ præscriptam a logica formam servat, non quasi semper ordinatis scholarum more syllogismis opus sit (quales Christianus Herlinus et Conradus Dasypodius in sex priores Euclidis libros exhibuerunt) sed ita saltem ut argumentatio concludat vi formæ," &c. &c. *Acta Eruditor. Lips. Vol. I. p. 285. Venet. 1740.*

I have not seen either of the works alluded to in the above sentence ; and, upon less respectable authority, should scarcely have conceived it to be credible, that any person, capable of understanding Euclid, had ever seriously engaged in such an undertaking. It would have been difficult to devise a more effectual expedient for exposing, to the meanest understanding, the futility of the syllogistic theory.

being syllogistically stated ; upon what principle can it be supposed possible, after the demonstration has been thus analyzed and expanded, to enforce and corroborate, by any subsidiary reasoning, that irresistible conviction which demonstration necessarily commands ?

It furnishes no valid reply to this objection, to allege, that mathematicians often employ themselves in inventing different demonstrations of the same theorem ; for, in such instances, their attempts do not proceed from any anxiety to swell the mass of evidence, by finding (as in some other sciences) a variety of collateral arguments, all bearing, with their combined force, on the same truth ;—their only wish is, to discover the easiest and shortest road by which the truth may be reached. In point of simplicity, and of what geometers call *elegance*, these various demonstrations may differ widely from each other ; but, in point of sound logic, they are all precisely on the same footing. Each of them shines with its own intrinsic light alone ; and the first which occurs (provided they be all equally understood) commands the assent not less irresistibly than the last.

The idea, however, on which Aristotle proceeded, in attempting to fortify one demonstration by another, bears no analogy whatever to the practice of mathematicians in multiplying proofs of the same theorem ; nor can it derive the slightest countenance from their example. His object was not to teach us how to demonstrate the same thing in a variety of different ways ; but to demonstrate, by abstract reasoning, the conclusiveness of demonstration. By what means he set about the

accomplishment of his purpose, will afterwards appear. At present, I speak only of his *design*; which, if the foregoing remarks be just, it will not be easy to reconcile with correct views, either concerning the nature of evidence, or the theory of the human understanding.

For the sake of those who have not previously turned their attention to Aristotle's Logic, it is necessary, before proceeding farther, to take notice of a peculiarity (and, as appears to me, an impropriety,) in the use which he makes of the epithets *demonstrative* and *dialectical*, to mark the distinction between the two great classes into which he divides syllogisms; a mode of speaking which, according to the common use of language, would seem to imply, that one species of syllogisms may be more conclusive and cogent than another. That this is not the case, is almost self-evident; for, if a syllogism be perfect *in form*, it must, of necessity, be not only conclusive, but demonstratively conclusive. Nor is this, in fact, the idea which Aristotle himself annexed to the distinction; for he tells us, that it does not refer to the *form* of syllogisms, but to their *matter*;—or, in plainer language, to the degree of evidence accompanying the *premises* on which they proceed*. In the two books of

* To the same purpose also Dr Wallis: "Syllogismus *Topicus* (qui et *Dialecticus* dici solet) talis haberi solet syllogismus (seu syllogismorum series) qui firmam potius presumptionem, seu opinionem valde probabilem creat, quam absolutam certitudinem. Non quidem ratione *Formæ*, (nam syllogismi omnes, si in justa formâ, sunt demonstrativi; hoc est, si præmissæ veræ sint, verâ erit et conclusio,) sed ratione *Materiæ*, seu *Præmissarum*; quæ ipsæ, ut plurimum, non sunt absolute certæ, et universaliter veræ; sed saltem probabiles, at quæ ut plurimum veræ." Wallis, *Logica*, Lib. iii. cap. 23.

his last Analytics, accordingly, he treats of syllogisms which are said to be demonstrative, because their premises are certain; and in his Topics, of what he calls dialectical syllogisms, because their premises are only probable. Would it not have been a clearer and juster mode of stating this distinction, to have applied the epithets *demonstrative* and *dialectical* to the truth of the *conclusions* resulting from these two classes of syllogisms, instead of applying them to the syllogisms themselves? The phrase *demonstrative syllogism* certainly seems, at first sight, to express rather the complete and necessary connection between the conclusion and the premises, than the certainty or the necessity of the truths which the premises assume.

To this observation it may be added, (in order to prevent any misapprehensions from the ambiguity of language,) that Aristotle's idea of the nature of demonstration, is essentially different from that which I have already endeavoured to explain. "In all demonstration," (says Dr Gillies, who, in this instance, has very accurately and clearly stated his author's doctrine,) "the first principles must be necessary, immutable, and therefore eternal truths, because those qualities could not belong to the conclusion, unless they belonged to the premises, which are its causes *." According to the account of de-

* Aristotle's Ethics and Politics, &c. By Dr Gillies. Vol. I. p. 96.

I am much at a loss how to reconcile this account of demonstrative evidence with the view which is given by Dr Gillies of the nature of syllogism, and of the principles on which the syllogistic theory is founded. In one passage (p. 81.) he tells us, that "Aristotle invented the syllogism, to prevent imposition arising from the abuse of

monstrative or mathematical evidence formerly given, the first principles on which it rests are not eternal and immutable truths, but definitions or hypotheses ; and therefore, if the epithet demonstrative be understood, in our present argument, as descriptive of that peculiar kind of evidence which belongs to mathematics, the distinction between demonstrative and dialectical syllogisms is reduced to this ; that in the former, where all that is asserted is the necessary connection between the conclusion and the premises, neither the one nor the other of these can with propriety be said to be either *true* or *false*, because both of them are entirely hypothetical : in the latter, where the premises are meant to express truths or facts, (supported, on the most favourable supposition, by a very high degree of probability,) the conclusion must necessarily partake of that uncertainty in which the premises are involved.

But what I am chiefly anxious at present to impress on the

" words : " in a second (p. 83.) that " the simple truth on which Aristotle has reared a " lofty and various structure of abstract science, clearly expressed and *fully demonstrative*—is itself founded in the natural and universal texture of language : " in a third (p. 86.) that " the doctrines of Aristotle's Organon have been strangely perplexed by " confounding the *grammatical principles on which that work is built* with mathematical " axioms." Is it possible to suppose, that Aristotle could have ever thought of applying to mere *grammatical principles*,—to *truths founded in the natural and universal texture of language*—the epithets of *necessary*, *immutable*, and *eternal*?

I am unwilling to lengthen this note, otherwise it might be easily shewn, how utterly irreconcilable, in the present instance, are the glosses of this ingenious commentator with the text of his author. Into some of these glosses it is probable that he has been unconsciously betrayed, by his anxiety to establish the claim of his favourite philosopher to the important speculations of Locke on the abuse of words, and to those of some later writers on language, considered as an instrument of thought.

minds of my readers is the substance of the two following propositions: *First*, That dialectical syllogisms (provided they be not sophistical) are not less demonstratively conclusive, *so far as the process of reasoning is concerned*, than those to which this latter epithet is restricted by Aristotle; and, *secondly*, That it is *to the process of reasoning alone*, and not to the premises on which it proceeds, that Aristotle's demonstrations exclusively refer. The sole object, therefore, of these demonstrations, is (as I already remarked) not to strengthen, by new proofs, principles which were doubtful, or to supply new links to a chain of reasoning which was imperfect, but to confirm one set of demonstrations by means of another. The mistakes into which some of my readers might have been led by the contrast which Aristotle's language implies between dialectical syllogisms, and those which he honours with the title of demonstrative, will, I trust, furnish a sufficient apology for the length of this explanation.

Having enlarged so fully on the professed aim of Aristotle's demonstrations, I shall dispatch, in a very few pages, what I have to offer on the manner in which he has carried his design into effect. If the design be as unphilosophical as I have endeavoured to shew that it is, the apparatus contrived for its execution can be considered in no other light than as an object of literary curiosity. A process of reasoning which pretends to demonstrate the legitimacy of a conclusion which, of itself, by its own intrinsic evidence, irresistibly commands the assent, must, we may be perfectly assured, be at bottom unsubstantial and illusory, how specious soever it may at first sight ap-

pear. Supposing all its inferences to be strictly just, it can only bring us round again to the point from whence we set out.

The very acute strictures of Dr Reid, in his Analysis of Aristotle's Logic, on this part of the Syllogistic Theory, render it superfluous for me, on the present occasion, to enter into any details upon the subject. To this small, but valuable tract, therefore, I beg leave to refer my readers; contenting myself with a short extract, which contains a general and compendious view of the conclusion drawn, and of the argument used to prove it, in each of the three figures of syllogisms.

"In the first figure, the conclusion affirms or denies something of a certain species or individual; and the argument to prove this conclusion is, That the same thing may be affirmed or denied of the whole genus to which that species or individual belongs.

"In the second figure, the conclusion is, That some species or individual does not belong to such a genus; and the argument is, That some attribute common to the whole genus does not belong to that species or individual.

"In the third figure, the conclusion is, that such an attribute belongs to part of a genus; and the argument is, That the attribute in question belongs to a species or individual which is part of that genus.

"I apprehend that, in this short view, every conclusion that

“ falls within the compass of the three figures, as well as the
 “ mean of proof, is comprehended. The rules of all the figures
 “ might be easily deduced from it ; and it appears that there
 “ is only one principle of reasoning in all the three ; so that it
 “ is not strange, that a syllogism of one figure should be re-
 “ duced to one of another figure.

“ The general principle in which the whole terminates, and
 “ of which every categorical syllogism is only a particular ap-
 “ plication, is this, That what is affirmed or denied of the whole
 “ genus may be affirmed or denied of every species and indivi-
 “ dual belonging to it. This is a principle of undoubted cer-
 “ tainty indeed, but of no great depth. Aristotle and all the lo-
 “ gicians assume it as an axiom, or first principle, from which
 “ the syllogistic system, as it were, takes its departure ; and
 “ after a tedious voyage, and great expence of demonstration,
 “ it lands at last in this principle, as its ultimate conclusion.
 “ *O curas hominum ! O quantum est in rebus inane ! **”

When we compare this mockery of science with the unrivalled powers of the inventor, it is scarcely possible to avoid suspecting, that he was anxious to conceal its real poverty and nakedness, under the veil of the abstract language in which it was exhibited. It is observed by the author last quoted, that Aristotle hardly ever gives examples of real syllogisms to illustrate his rules ; and that his commentators, by endeavouring to supply this defect, have only brought into contempt the theory

* This axiom is called, in scholastic language, the *dictum de omni et de nullo*.

of their master. "We acknowledge (says he) that this was "charitably done, in order to assist the conception in matters "so very abstract; but whether it was prudently done for the "honour of the art, may be doubted." One thing is certain, that when we translate any of Aristotle's demonstrations from the general and enigmatical language in which he states it, into more familiar and intelligible terms, by applying it to a particular example, the mystery at once disappears, and resolves into some self-evident or identical puerility. It is surely a strange mode of proof, which would establish the truth of what is obvious, and what was never doubted of, by means of an argument which appears quite unintelligible, till explained and illustrated by an instance perfectly similar to the very thing to be proved.

"If A (says Aristotle) is attributed to every B, and B to "every C, it follows necessarily, that A may be attributed to "every C*." Such is the demonstration given of the first mode of the first figure; and it is obviously nothing more than the axiom, called the *dictum de omni*, concealed under the dis-

* Analyt. Prior. cap. iv.

It is obvious, that Aristotle's symbolical demonstrations might be easily thrown into the form of symbolical syllogisms. The circumstance which induced him to prefer the former mode of statement, was probably that he might avoid the appearance of reasoning in a circle, by employing the syllogistic theory to demonstrate itself. It is curious how it should have escaped him, that, in attempting to shun this fallacy, he had fallen into another exactly of the same description;—that of employing an argument in the common form to demonstrate the legitimacy of syllogisms, after having represented a syllogistic analysis as the only infallible test of the legitimacy of a demonstration.

guise of an uncouth and cabalistical phraseology. The demonstrations given of the other legitimate modes are all of the same description.

In disproving the illegitimate modes, he proceeds after a similar manner; condescending, however, in general, to supply us, by way of example, with three terms, such as *bonum*, *habitus*, *prudencia*; *album*, *equus*, *cygnus*;—which three terms, we are left, for our own satisfaction, to form into illegitimate syllogisms of the particular figure and mode which may be under consideration. The manifest inconclusiveness of every such syllogism, he seems to have thought, might assist readers of slower apprehension in perceiving more easily the import of the general proposition. The inconclusiveness, for instance, of those modes of the first figure, in which the major is particular, is thus stated and explained. “If A is or is not in some B, and “B in every C, no conclusion follows. Take for the terms in the “affirmative case, *good*, *habit*, *prudence*; in the negative, *good*, “*habit*, *ignorance**.” With respect to such passages as this, Dr Reid has perfectly expressed my feeling, when he says; That “the laconic style of the author, the use of symbols not familiar, and, in place of giving an example, his leaving us to “form one from three assigned terms, give such embarrassment to a reader, that he is like one reading a book of riddles†.” Can it be reasonably supposed, that so great an ob-

* Analyt. Prior. cap. iv.

† Dr Gillies has attempted a vindication of the use which Aristotle, in his demonstrations, has made of the letters of the alphabet. For some remarks on this attempt, See Note (L.)

scurity in such a writer was not the effect of some systematical design?

From the various considerations already stated, I might perhaps, without proceeding farther, be entitled to conclude, that Aristotle's demonstrations amount to nothing more than to a specious and imposing parade of words; but the innumerable testimonies to their validity, from the highest names, and the admiration in which they continue to be held by men of distinguished learning, render it necessary for me, before dismissing the subject, to unfold a little more completely some parts of the foregoing argument.

It may probably appear to some of my readers superfluous to remark, after the above-cited specimens of the reasonings in question, that not one of these demonstrations ever carry the mind forward, a single step, from one truth to another; but merely from a *general axiom* to some of its particular exemplifications. Nor is this all; they carry the mind in a direction *opposite* to that in which its judgments are necessarily formed. The meaning of a general axiom, it is well known, is seldom, if ever intelligible, till it has been illustrated by some example; whereas Aristotle, in all his demonstrations, proceeds on the idea, that the truth of an axiom, in particular instances, is a *logical consequence* of its truth, as enunciated in general terms. In to this mistake, it must be owned, he was not unnaturally led by the place which is assigned to axioms at the beginning of the elements of geometry, and by the manner in which they are afterwards referred to in demonstrating the propositions.

"Since A (it is said) is equal to B, and B to C, A is equal to C; *for, things which are equal to one and the same thing, are equal to one another.*" This place, I have little doubt, has been occupied by mathematical axioms, as far back, at least, as the foundation of the Pythagorean school; and Aristotle's fundamental axiom will be found to be precisely of the same description. Instead, therefore, of saying, with Dr Gillies, that "on the basis of one single truth Aristotle has reared a lofty and various structure of abstract science,"—it would be more correct to say, that the whole of this science is comprised or implied in the terms of one single axiom. Nor must it be forgotten (if we are to retain Dr Gillies's metaphor) that the structure may, with much more propriety, be considered as the basis of the axiom, than the axiom of the structure.

When it is recollected, that the greater part of our best philosophers (and among the rest Dr Reid) still persevere, after all that Locke has urged on the opposite side of the question, in considering axioms as the ground-work of mathematical science, it will not appear surprising, that Aristotle's demonstrations should have so long continued to maintain their ground in books of logic. That this idea is altogether erroneous, in so far as mathematics is concerned, has been already sufficiently shewn; the whole of that science resting ultimately, not on axioms, but on definitions or hypotheses. By those who have examined my reasonings on this last point, and who take the pains to combine them with the foregoing remarks, I trust it will be readily allowed, that the syllogistic theory furnishes no exception to the general doctrine concerning demonstrative evidence, which I

formerly endeavoured to establish ; its pretended demonstrations being altogether nugatory, and terminating at last (as must be the case with every process of thought involving no *data* but what are purely axiomatical) in the very proposition from which they originally set out.

The idea that all demonstrative science must rest ultimately on axioms, has been borrowed, with many other erroneous maxims, from the logic of Aristotle ; but is now, in general, stated in a manner much more consistent (although perhaps not nearer to the truth) than in the works of that philosopher. According to Dr Reid, the degree of evidence which accompanies our conclusions, is necessarily determined by the degree of evidence which accompanies our first principles ; so that, if the latter be only probable, it is perfectly impossible that the former should be certain. Agreeing, therefore, with Aristotle, in considering axioms as the basis of all demonstrative science, he was led, at the same time, in conformity with the doctrine just mentioned, to consider them as eternal and immutable truths, which are perceived to be such by an intuitive judgment of the understanding. This, however, is not the language of Aristotle ; for, while he tells us, that there is no demonstration but of eternal truths*, he asserts, that the first principles which are the foundation of all demonstration, are got by in-

* Φαίμεν δὲ καὶ, εἰν ὧσιν αἱ προτάσεις καθολαὶ ἐξ ὧν ὁ συλλογισμός, ὅτι ἀναγκὴ καὶ το συμπεράσμα αἰδίοι εἶναι τῆς τοιαυτῆς ἀποδείξεως, καὶ τῆς (ἑπὶ τῶν εἰπεῖν) ἀποδείξεως. καὶ ἐστὶν πρὸς ἀποδείξεις τῶν φθαρτῶν, καὶ ἐπιστήμη ἀπλῶς, ἀλλ' ὕτως, ὥστερ κατὰ συμβεβηκός. *Analyt. Post. Lib. 1. cap. viii.*

duction from the informations of sense*. In what manner this apparent contradiction is to be reconciled, I leave to the consideration of his future commentators.

For my own part, I cannot help being of opinion with Lord Monboddo (who certainly was not wanting in a due respect for the authority of Aristotle) that the syllogistic theory would have accorded much better with the doctrine of Plato concerning *general ideas*, than with that held on the same subject by the founder of the Peripatetic school†. To maintain that, in all demonstration, we argue from generals to particulars, and, at the same time, to assert, that the necessary progress of our knowledge is from particulars to generals, by a gradual induction from the informations of sense, do not appear, to an ordinary understanding, to be very congruous parts of the same system‡; and yet the last of these tenets has been eagerly

* Εκ μὲν οὖν αἰσθητικῶς γιγνέται μνημὴν· ἐκ δὲ μνημῆος πολλὰκις τὸ αὐτὸ γινομένης, ἐμπειρία· αἱ γὰρ πολλαὶ μνημαὶ τῷ ἀριθμῷ, ἐμπειρία μία ἐστίν· ἐκ δ' ἐμπειρίας ἡ ἰκταίτος ἡρημισαντος τὴν καθόλου ἐν τῇ ψυχῇ, τὸ εἶος παρὰ τὰ πολλὰ, ὃ ἀν ἐν ἅπασιν ἐν εὐῇ ἐκείνῳ τὸ αὐτὸ, τέχνης ἀρχὴ καὶ ἐπιστήμη· εἰ μὲν περὶ γενέσειν, τέχνης· εἰ δὲ περὶ τοῦ οὐ, ἐπιστήμη. (Analyt. Post. Lib. ii. cap. xix.) The whole chapter may be read with advantage by those who wish for a fuller explanation of Aristotle's opinion on this question. His illustration of the intellectual process by which general principles are obtained from the perceptions of sense, and from reiterated acts of memory resolving into *one experience*, is more particularly deserving of attention.

† Ancient Metaphysics, Vol. V. pp. 184, 185.

‡ It may perhaps be asked, Is not this the very mode of philosophizing recommended by Bacon, first, to proceed analytically from particulars to generals, and then to reason synthetically from generals to particulars? My reply to this question (a question which will not puzzle any person at all acquainted with the subject) I must delay,

claimed as a discovery of Aristotle, by some of the most zealous admirers of his logical demonstrations *.

till I shall have an opportunity, in the progress of my work, of pointing out the essential difference between the meanings annexed to the word *induction*, in the Aristotelian, and in the Baconian logic.—Upon the present occasion, it is sufficient to observe, that Bacon's plan of investigation was never supposed to be applicable to the discovery of principles which are necessary and eternal.

* See Dr Gillies's Analysis of Aristotle's works, *passim*.

In this learned, and on the whole very instructive performance, I find several doctrines ascribed to Aristotle, which appear not a little at variance with each other. The following passages (which I am led to select from their connection with the present argument) strike me as not only widely different, but completely contradictory, in their import.

"According to Aristotle, *definitions* are the foundations of all science; but those foundations are pure only when they originate in an accurate examination, and patient comparison of the perceptible qualities of individual objects." Vol. I. p. 77.

"Demonstrative truth can apply only to those things which necessarily exist after a certain manner, and whose state is unalterable: and we know those things when we know their causes: Thus we know a mathematical proposition, when we know the causes that make it true; that is, when we know all the intermediate propositions, up to the first principles or axioms, on which it is ultimately built." Ibid. pp. 95. 96.

It is almost superfluous to observe, that while the former of these quotations founds all demonstrative evidence on *definitions*, the latter founds it upon *axioms*. Nor is this all. The former (as is manifest from the second clause of the sentence) can refer only to *contingent* truths; inasmuch as the most accurate examination of the perceptible qualities of individual objects can never lead to the knowledge of things which necessarily exist after a certain manner. The latter as obviously refers (and exclusively refers) to truths which resemble mathematical theorems.

As to Aristotle's assertion, that *definitions* are the first principles of all demonstrations (*αἱ ἀρχαὶ τῶν ἀποδείξεων οἱ ὅρισμοί*), it undoubtedly seems, at first view, to coincide exactly with the doctrine which I was at so much pains to inculcate, in treating of that peculiar evidence which belongs to mathematics. I hope, however, I shall not, on this account, be accused of plagiarism, when it is considered, that the commentary upon these words, quoted above from Dr Gillies, absolutely excludes mathematics from the

In *this* point of view, Lord Monboddo has certainly conducted, with greater skill, his defence of the syllogistic theory; inasmuch as he has entirely abandoned the important conclusions of Aristotle concerning the natural progress of human knowledge; and has attempted to entrench himself in (what was long considered as one of the most inaccessible fastnesses of the Platonic philosophy) the very ancient theory, which ascribes to *general ideas* an existence necessary and eternal. Had he, upon this occasion, after the example of Aristotle, confined himself solely to abstract principles, it might not have been an easy task to refute, to the satisfaction of common readers, his metaphysical arguments. Fortunately, however, he has favoured us with some examples and illustrations, which render this undertaking quite unnecessary; and which, in my opinion, have given to the cause which he was anxious to support, one of the most deadly blows which it has ever received. The following panegyric, in particular, on the utility of logic, while it serves to shew that, in admiration of the Aristotelian demonstrations, he did not yield to Dr Gillies, forms precisely such a comment as I myself could have wished for, on the leading propositions which I have now been attempting to establish.

“ In proof of the utility of logic* (says Lord Monboddo) I

number of those sciences to which they are to be applied.—On this point, too, Aristotle's own language is decisive. Εξ αναγκαίων ἀρα συλλογισμός ἐστίν ἡ ἀποδείξις. Analyt. Poster. Lib. i. Cap. iv.

* Ancient Metaphysics, Vol. V. p. 152.

“ will give an example of an argument to prove that man is a
“ substance ; which argument, put into the syllogistic form, is
“ this :

“ *Every Animal is a Substance ;*

“ *Every Man is an Animal ;*

“ *Therefore every Man is a Substance.*”

“ There is no man, I believe, who is not convinced of the
“ truth of the conclusion of this syllogism : But, how he is con-
“ vinced of this, and for what reason he believes it to be true,
“ no man can tell, who has not learned, from the logic of Aris-
“ totle, to know what a proposition, and what a syllogism is.
“ There he will learn, that every proposition affirms or denies
“ something of some other thing. What is affirmed or denied
“ is called the Predicate ; and that of which it is affirmed or
“ denied, is called the Subject. The predicate being a more
“ general idea than the subject of which it is predicated, must
“ contain or include it, if it be an affirmative proposition ; or
“ if it be a negative proposition, it must exclude it. This is
“ the nature of propositions : And as to syllogism, the use of
“ it is to prove any proposition that is not self-evident. And
“ this is done by finding out what is called a *middle term* ;
“ that is, a term connected with both the predicate and the
“ subject of the proposition to be proved. Now, the proposi-
“ tion to be proved here is, that *man is a substance* ; or, in other
“ words, that *substance* can be predicated of *man* : And the
“ middle term, by which this connection is discovered, is *ani-*
“ *mal*, of which substance is predicated ; and this is the major

“ proposition of the syllogism, by which the major term of the
“ proposition to be proved, is predicated of the middle term.
“ Then *animal* is predicated of *man*; and this is the minor pro-
“ position of the syllogism, by which the middle term is predi-
“ cated of the lesser term, or subject of the proposition to be
“ proved. The conclusion, therefore, is, that as substance con-
“ tains animal, and man is contained in animal, or is part of
“ animal, therefore *substance* contains *man*. And the conclu-
“ sion is necessarily deduced from the axiom I have mention-
“ ed, as the foundation of the truth of the syllogism, ‘ That
“ the whole is greater than any of its parts, and contains them
“ all.’ So that the truth of the syllogism is as evident as when
“ we say, that if A contain B, and B contain C, then A con-
“ tains C.

“ In this manner Aristotle has demonstrated the truth of the
“ syllogism. But a man, who has not studied his logic, can
“ no more tell why he believes the truth of the syllogism above
“ mentioned, concerning *man being a substance*, than a joiner,
“ or any common mechanic, who applies a foot or a yard to
“ the length of two bodies, and finds that both agree exactly
“ to that measure, and are neither longer nor shorter, can give
“ a reason why he believes the bodies to be equal, not know-
“ ing the axiom of Euclid, ‘ That two things, which are equal
“ to a third thing, are equal to one another.’”

“ By this discovery Aristotle has answered the question,
“ which Pontius Pilate, the Roman Governor, asked of our
“ Saviour, *What Truth is?* The answer to which appears now

“ to be so obvious, that I am persuaded Pilate would not have
“ asked it as a question, which he no doubt thought very diffi-
“ cult to be answered, if he had not studied the logic of Aris-
“ totle *.”

After perusing the above exposition of Aristotle's demonstration, the reader, if the subject be altogether new to him, will be apt to imagine, that the study of logic is an undertaking of much less difficulty than he had been accustomed formerly to apprehend; the whole resolving ultimately into this axiom, “ That if A contains B, and B contains C, then A contains C.” In interpreting this axiom, he will probably figure to himself A, B, and C, as bearing some resemblance to three

-
- Ancient Metaphysics, Vol. V. pp. 152, 153, 154.

I have quoted this passage at length, because I consider it as an instructive example of the effects likely to be produced on the understanding by scholastic studies, where they become a favourite and habitual object of pursuit. The author (whom I knew well, and for whose memory I entertain a sincere respect) was a man of no common mental powers. Besides possessing a rich fund of what is commonly called learning, he was distinguished by natural acuteness; by a more than ordinary share of wit; and, in the discharge of his judicial functions, by the singular correctness, gravity, and dignity of his unpremeditated elocution;—and yet, so completely had his faculties been subdued by the vain abstractions and verbal distinctions of the schools, that he had brought himself seriously to regard such discussions as that which I have here transcribed from his works, not only as containing much excellent sense, but as the quintessence of sound philosophy. As for the mathematical and physical discoveries of the Newtonians, he held them in comparative contempt, and was probably prevented, by this circumstance, from ever proceeding farther than the first elements of these sciences. Indeed, his ignorance of both was wonderful, considering the very liberal education which he had received, not only in his own country, but at a foreign university.

boxes, the sizes of which are so adapted to each other, that B may be literally put into the inside of A, and C into the inside of B. Perhaps it may be reasonably doubted, if there is one logician in a hundred, who ever dreamed of understanding it in any other sense. When considered in this light, it is not surprising that it should instantly command the assent of the merest novice: Nor would he hesitate one moment longer about its truth, if, instead of being limited (in conformity to the three terms of a syllogism) to the three letters, A, B, C, it were to be extended from A to Z; *the series of boxes* corresponding to the *series of letters*, being all conceived to be *nestled*, one within another, like those which we sometimes see exhibited in the hands of a juggler.

If the curiosity of the student, however, should lead him to inquire a little more accurately into Aristotle's meaning, he will soon have the mortification to learn, that when one thing is said by the logician, *to be in another*, or *to be contained in another*, these words are not to be understood in their ordinary and most obvious sense, but in a particular and technical sense, known only to adepts; and about which (we may remark by the way) adepts are not, to this day, unanimously agreed. "To those (says Lord Monboddo) who know no more of logic nor of ancient philosophy than Mr Locke did, it will be necessary to explain in what sense one idea can be said to contain another, or the idea less general can be said to be a part of the more general. And, in the first place, it is not in the sense that one body is said to be a part of another, or the greater body to contain the lesser; nor is it as

“one number is said to contain another; but it is *virtually* or
“*potentially* that the more general idea contains the less general.
“In this way the genus contains the species; for the genus
“may be predicated of every species under it, whether exist-
“ing or not existing; so that *virtually* it contains all the spe-
“cieses under it, which exist or may exist. And not only does
“the more general contain the less general, but (what at first
“sight may appear surprising) the less general contains the
“more general, not *virtually* or *potentially*, but *actually*. Thus,
“the genus animal contains *virtually* man, and every other spe-
“cies of animal either existing, or that may exist: But the ge-
“nus animal is contained in man, and in other animals *actual-*
“*ly*; for man cannot exist without being in *actuality*, and not
“*potentially* only, an animal*.”

If we have recourse to Dr Gillies for a little more light upon this question, we shall meet with a similar disappointment. According to him, the meaning of the phrases in question is to be sought for in the following definition of Aristotle: “To say
“that one thing is contained in another, is the same as saying,

* Ancient Metaphysics, Vol. IV. p. 73.

For the distinction betwixt containing *potentially* and *actually*, Lord Monboddo acknowledges himself indebted to a Greek author then living, Eugenius Diaconus. (*Anc. Met.* Vol. IV. p. 73.) Of this author we are elsewhere told, that he was a Professor in the Patriarch's University at Constantinople; and that he published, in pure Attic Greek, a system of logic, at Leipsic, in the year 1766. (*Origin and Progress of Language*, Vol. I. p. 45, 2d edit.) It is an extraordinary circumstance, that a discovery, on which, in Lord Monboddo's opinion, *the whole truth of the syllogism depends*, should have been of so very recent a date.

“that the second can be predicated of the first in the full extent of its signification; and one term is predicated of another in the full extent of its signification,” when there is no particular denoted by the subject, to which the predicate does not apply*.” In order, therefore, to make sure of Aristotle’s idea, we must substitute the definition instead of the thing defined; that is, instead of saying that one thing is contained in another, we must say, that “the second can be predicated of the first in the full extent of its signification.” In this last clause, I give Aristotle all the advantage of Dr Gillies’s very paraphrastical version; and yet, such is the effect of the comment, that it at once converts our axiom into a riddle. I do not say that, when thus interpreted, it is altogether unintelligible; but only that it no longer possesses the same sort of evidence which we ascribed to it, while we supposed that one

* Gillies’s Aristotle, Vol. I. p. 73. “This remark (says Dr Gillies) *which is the foundation of all Aristotle’s logic*, has been sadly mistaken by many. Among others, Dr Reid accuses Aristotle of using as synonymous phrases, the being in a subject, and the being truly predicated of a subject; whereas the truth is, that, according to Aristotle, the meaning of the one phrase is directly the reverse of the meaning of the other.” Ibid.

While I readily admit the justness of this criticism on Dr Reid, I must take the liberty of adding, that I consider Reid’s error as a mere oversight, or slip of the pen. That he might have accused Aristotle of confounding two things which, although different in fact, had yet a certain degree of resemblance or affinity, is by no means impossible: but it is scarcely conceivable, that he could be so careless as to accuse him of confounding two things which he invariably states in direct opposition to each other. I have not a doubt, therefore, that Reid’s idea was, that Aristotle used, as synonymous phrases, the being in a thing, and the being a subject of which that thing can be truly predicated; more especially, as either statement would equally well have answered his purpose.

thing was said by the logician to be *contained* in another, in the same sense in which a smaller box is *contained* in a greater*.

To both comments the same observation may be applied ; that, the moment a person reads them, he must feel himself disposed to retract his assent to the axiom which they are brought to elucidate ; inasmuch as they must convince him, that what appeared to be, according to the common signification of words, little better than a *truism*, becomes, when translated into the jargon of the schools, an incomprehensible, if not, at bottom, an unmeaning *enigma*.

I have been induced to enlarge, with more minuteness than I could have wished, on this fundamental article of logic, that I might not be accused of repeating those common-place *generalities* which have, of late, been so much complained of by Aristotle's champions. I must not, however, enter any farther into the details of the system ; and shall therefore proceed, in the next section, to offer a few remarks of a more practical nature, on the object and on the value of the syllogistic art.

* It is worthy of observation, that Condillac has availed himself of the same metaphorical and equivocal word which the foregoing comments profess to explain, in support of the theory which represents every process of sound reasoning as a series of identical propositions. "L'Analyse est la même dans toutes les sciences, parce que dans toutes elle conduit du connu à l'inconnu par le raisonnement, c'est-à-dire, par une suite de jugemens qui sont renfermés les uns dans les autres." *La Logique*.

SECTION II.

General Reflections on the Aim of the Aristotelian Logic, and on the intellectual Habits which the study of it has a tendency to form.—That the improvement of the power of reasoning ought to be regarded as only a secondary Object in the culture of the Understanding.

THE remarks which were long ago made by Lord Bacon on the inutility of the *sylogism* as an organ of scientific discovery, together with the acute strictures in Mr Locke's Essay on this form of reasoning, are so decisive in point of argument, and, at the same time, so familiarly known to all who turn their attention to philosophical inquiries, as to render it perfectly unnecessary for me, on the present occasion, to add any thing in support of them. I shall, therefore, in the sequel, confine myself to a few very general and miscellaneous reflections on one or two points overlooked by these eminent writers; but to which it is of essential importance to attend, in order to estimate justly the value of the Aristotelian logic, considered as a branch of education*.

* To some of my readers it may not be superfluous to recommend, as a valuable supplement to the discussions of Locke and Bacon concerning the syllogistic art, what has been since written on the same subject, in farther prosecution of their views, by Dr Reid in his Analysis of Aristotle's Logic; and by Dr Campbell in his Philosophy of Rhetoric.