Sketches Of The History Of Man

In Two Volumes

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Edinburgh, 1774

Chap. VI. Reflections on the Utility of Logic, and the Means of its Improvement.

urn:nbn:de:gbv:45:1-697

CHAP. VI.

Reflections on the Utility of Logic, and the Means of its Improvement.

SECT. I. *Of the Utility of Logic.*

MEN rarely leave one extreme without running into the contrary. It is no wonder, therefore, that the exceſſive admiration of Ariſtotle, which continued for ſo many ages, ſhould end in an undue contempt; and that the high eſteem of logic as the grand engine of ſcience, ſhould at laſt make way for too unfavourable an opinion, which ſeems now prevalent, of its being unworthy of a place in a liberal education. Thoſe who think according to the faſhion, as the greateſt part of men do, will be as prone to go into this extreme, as their grandfathers were to go into the contrary.

Laying aſide prejudice, whether faſhionable or unfaſhionable, let us conſider whether logic is, or may be made, ſubſervient to any good purpoſe. Its profeſſed end is, to teach men to think, to judge, and to reaſon, with preciſion and accuracy. No man will ſay that this is a matter of no importance; the only thing, therefore, that admits of doubt, is, whether it can be taught.

To reſolve this doubt, it may be obſerved, that our rational faculty is the gift of God, given to men in very different meaſure. Some have a larger portion, ſome a leſs; and where there is a remarkable defect of the natural power, it cannot be ſupplied by any

any culture whatſoever. But this natural power, even where it is ſtrongeſt, may lie dead for want of the means of improvement; and a ſavage may have been born with as good faculties as a Bacon or a Newton. The amazing difference that appears in advanced life, is owing to this, that the talent of one was buried, being never put to uſe, while that of the other was cultivated to the beſt advantage.

It may likewiſe be obſerved, that the chief mean of improving our rational power, is the vigorous exerciſe of it, in various ways, and in different ſubjects, by which the habit is acquired of exerciſing it properly. Without ſuch exerciſe, and good ſenſe over and above, a man who has ſtudied logic all his life may, after all, be only a petulant wrangler, without true judgement, or ſkill of reaſoning, in any ſcience.

I take this to be Locke's meaning, when, in his Thoughts on Education, he ſays, "If you would have your ſon to reaſon well, "let him read Chillingworth." The ſtate of things is much altered ſince Locke wrote. Logic has been much improved, chiefly by his writings; and yet much leſs ſtreſs is laid upon it, and leſs time conſumed in it. His counſel, therefore, was judicious and ſeaſonable; to wit, That the improvement of our reaſoning power is to be expected much more from an intimate acquaintance with the authors who reaſon beſt, than from ſtudying voluminous ſyſtems of logic. But if he had meant, that the ſtudy of logic was of no uſe, nor deſerved any attention, he ſurely would not have taken the pains to have made ſo conſiderable an addition to it, by his *Eſſay on the Human Underſtanding*, and by his *Thoughts on the Conduct of the Underſtanding*. Nor would he have remitted his pupil to Chillingworth, the acuteſt logician, as well as the beſt reaſoner, of his age; and one who, in innumerable places of his excellent book, without pedantry even in that pedantic age, makes

makes the happieſt application of the rules of logic, for unraveling the ſophiſtical reaſoning of his antagoniſt.

Our reaſoning power makes no appearance in infancy; but as we grow up, it unfolds itſelf by degrees, like the bud of a tree. When a child firſt draws an inference, or perceives the force of an inference drawn by another perſon, we may call this *the birth of his reaſon:* but it is yet like a new-born babe, weak and tender; it muſt be cheriſhed, and carried in arms, and have food of eaſy digeſtion, till it gathers ſtrength.

I believe no man remembers this birth of his reaſon; but it is probable that his deciſions will at firſt be weak and wavering; and, compared with that ſteady conviction which he acquires in ripe years, will be like the dawn of the morning compared with noon-day. We ſee that the reaſon of children yields to authority, as a reed to the wind; nay, that it clings to it, and leans upon it, as if conſcious of its own weakneſs.

When reaſon acquires ſuch ſtrength as to ſtand on its own bottom, without the aid of authority, or even in oppoſition to authority, this may be called its *manly age*. But in moſt men, it hardly ever arrives at this period. Many, by their ſituation in life, have not the opportunity of cultivating their rational powers. Many, from the habit they have acquired, of ſubmitting their opinions to the authority of others, or from ſome other principle which operates more powerfully than the love of truth, ſuffer their judgement to be carried along, to the end of their days, either by the authority of a leader, or of a party, or of the multitude, or by their own paſſions. Such perſons, however learned, however acute, may be ſaid to be all their days children in underſtanding. They reaſon, they diſpute, and perhaps write; but it is not that they may find the truth; but that they may defend opinions which have deſcended to them by inheritance, or into which they have fallen by accident, or been led by affection.

I agree with Mr Locke, that there is no ſtudy better fitted to exerciſe and ſtrengthen the reaſoning powers, than that of the mathematical ſciences; for two reaſons; firſt, Becauſe there is no other branch of ſcience which gives ſuch ſcope to long and accurate trains of reaſoning; and, ſecondly, Becauſe in mathematics there is no room for authority, or for prejudice of any kind, which may give a falſe bias to the judgement.

When a youth of moderate parts begins to ſtudy Euclid, every thing at firſt is new to him. His apprehenſion is unſteady; his judgement is feeble; and reſts partly upon the evidence of the thing, and partly upon the authority of his teacher. But every time he goes over the definitions, the axioms, the elementary propoſitions, more light breaks in upon him; the language becomes familiar, and conveys clear and ſteady conceptions; the judgement is confirmed; he begins to ſee what demonſtration is; and it is impoſſible to ſee it without being charmed with it. He perceives it to be a kind of evidence which has no need of authority to ſtrengthen it. He finds himſelf emancipated from that bondage, and exults ſo much in this new ſtate of independence, that he ſpurns at authority, and would have demonſtration for every thing; until experience teaches him, that this is a kind of evidence which cannot be had in moſt things; and that in his moſt important concerns, he muſt reſt contented with probability.

As he goes on in mathematics, the road of demonſtration becomes ſmooth and eaſy; he can walk in it firmly, and take wider ſteps: and, at laſt, he acquires the habit, not only of underſtanding a demonſtration, but of diſcovering and demonſtrating mathematical truths.

Thus, a man without rules of logic, may acquire the habit of reaſoning juſtly in mathematics; and, I believe, he may, by like means, acquire the habit of reaſoning juſtly in mechanics, in juriſprudence,

riſprudence, in politics, or in any other ſcience. Good ſenſe, good examples, and aſſiduous exerciſe, may bring a man to reaſon juſtly and acutely in his own profeſſion, without rules.

But if any man think, that from this conceſſion he may infer the inutility of logic, he betrays a great want of that art by this inference: for it is no better reaſoning than this, That becauſe a man may go from Edinburgh to London by the way of Paris, therefore any other road is uſeleſs.

There is perhaps no practical art which may not be acquired, in a very conſiderable degree, by example and practice, without reducing it to rules. But practice, joined with rules, may carry a man on in his art farther and more quickly, than practice without rules. Every ingenious artiſt knows the utility of having his art reduced to rules, and by that means made a ſcience. He is thereby enlightened in his practice, and works with more aſſurance. By rules, he ſometimes corrects his own errors, and often detects the errors of others: he finds them of great uſe to confirm his judgement, to juſtify what is right, and to condemn what is wrong.

Is it of no uſe in reaſoning, to be well acquainted with the various powers of the human underſtanding, by which we reaſon? Is it of no uſe, to reſolve the various kinds of reaſoning into their ſimple elements; and to diſcover, as far as we are able, the rules by which thoſe elements are combined in judging and in reaſonning? Is it of no uſe, to mark the various fallacies in reaſoning, by which even the moſt ingenious men have been led into error? It muſt ſurely betray great want of underſtanding, to think theſe things uſeleſs or unimportant. Theſe are the things which logicians have attempted; and which they have executed; not indeed ſo completely as to leave no room for improvement, but in ſuch a manner as to give very conſiderable aid to our reaſoning powers. That the principles laid down with regard to definition

and diviſion, with regard to the converſion and oppoſition of propoſitions and the general rules of reaſoning, are not without uſe, is ſufficiently apparent from the blunders committed by thoſe who diſdain any acquaintance with them.

Although the art of categorical ſyllogiſm is better fitted for ſcholaſtic litigation, than for real improvement in knowledge, it is a venerable piece of antiquity, and a great effort of human genius. We admire the pyramids of Egypt, and the wall of China, tho' uſeleſs burdens upon the earth. We can bear the moſt minute deſcription of them, and travel hundreds of leagues to ſee them. If any perſon ſhould, with ſacrilegious hands, deſtroy or deface them, his memory would be had in abhorrence. The predicaments and predicables, the rules of ſyllogiſm, and the topics, have a like title to our veneration as antiquities: they are uncommon efforts, not of human power, but of human genius; and they make a remarkable period in the progreſs of human reaſon.

The prejudice againſt logic has probably been ſtrengthened by its being taught too early in life. Boys are often taught logic as they are taught their creed, when it is an exerciſe of memory only, without underſtanding. One may as well expect to underſtand grammar before he can ſpeak, as to underſtand logic before he can reaſon. It muſt even be acknowledged, that commonly we are capable of reaſoning in mathematics more early than in logic. The objects preſented to the mind in this ſcience, are of a very abſtract nature, and can be diſtinctly conceived only when we are capable of attentive reflection upon the operations of our own underſtanding, and after we have been accuſtomed to reaſon. There may be an elementary logic, level to the capacity of thoſe who have been but little exerciſed in reaſoning; but the moſt important parts of this ſcience require a ripe underſtanding, capable of reflecting

reflecting upon its own operations. Therefore to make logic the firſt branch of ſcience that is to be taught, is an old error that ought to be corrected.

SECT. 2. *Of the Improvement of Logic.*

In compoſitions of human thought expreſſed by ſpeech or by writing, whatever is excellent and whatever is faulty, fall within the province, either of grammar, or of rhetoric, or of logic. Propriety of expreſſion is the province of grammar; grace, elegance, and force, in thought and in expreſſion, are the province of rhetoric; juſtneſs and accuracy of thought are the province of logic.

The faults in compoſition, therefore, which fall under the cenſure of logic, are obſcure and indiſtinct conceptions, falſe judgement, inconcluſive reaſoning, and all improprieties in diſtinctions, definitions, diviſion, or method. To aid our rational powers, in avoiding theſe faults and in attaining the oppoſite excellencies, is the end of logic; and whatever there is in it that has no tendency to promote this end, ought to be thrown out.

The rules of logic being of a very abſtract nature, ought to be illuſtrated by a variety of real and ſtriking examples taken from the writings of good authors. It is both inſtructive and entertaining, to obſerve the virtues of accurate compoſition in writers of fame. We cannot ſee them, without being drawn to the imitation of them, in a more powerful manner than we can be by dry rules. Nor are the faults of ſuch writers leſs inſtructive or leſs powerful monitors. A wreck, left upon a ſhoal, or upon a rock, is not more uſeful to the ſailor, than the faults of good writers, when ſet up to view, are to thoſe who come after them. It was a

happy thought in a late ingenious writer of Engliſh grammar, to collect under the ſeveral rules, examples of bad Engliſh found in the moſt approved authors. It were to be wiſhed that the rules of logic were illuſtrated in the ſame manner. By this means, a ſyſtem of logic would become a repoſitory; wherein whatever is moſt acute in judging and in reaſoning, whatever is moſt accurate in dividing, diſtinguiſhing, and defining, ſhould be laid up and diſpoſed in order for our imitation; and wherein the falſe ſteps of eminent authors ſhould be recorded for our admonition.

After men had laboured in the ſearch of truth near two thouſand years, by the help of ſyllogiſms, Lord Bacon propoſed the method of induction, as a more effectual engine for that purpoſe. His *Novum Organum* gave a new turn to the thoughts and labours of the inquiſitive, more remarkable, and more uſeful, than that which the *Organum* of Ariſtotle had given before; and may be conſidered as a ſecond grand æra in the progreſs of human reaſon.

The art of ſyllogiſm produced numberleſs diſputes, and numberleſs ſects, who fought againſt each other with much animoſity, without gaining or loſing ground; but did nothing conſiderable for the benefit of human life. The art of induction, firſt delineated by Lord Bacon, produced numberleſs laboratories and obſervatories, in which Nature has been put to the queſtion by thouſands of experiments, and forced to confeſs many of her ſecrets, which before were hid from mortals. And by theſe, arts have been improved, and human knowledge wonderfully increaſed.

In reaſoning by ſyllogiſm, from general principles we deſcend to a concluſion virtually contained in them. The proceſs of induction is more arduous; being an aſcent from particular premiſes to a general concluſion. The evidence of ſuch general concluſions is not demonſtrative, but probable: but when the induc-

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tion is ſufficiently copious, and carried on according to the rules of art, it forces conviction no leſs than demonſtration itſelf does.

The greateſt part of human knowledge reſts upon evidence of this kind. Indeed we can have no other for general truths which are contingent in their nature, and depend upon the will and ordination of the maker of the world. He governs the world he has made, by general laws. The effects of theſe laws in particular phenomena are open to our obſervation; and by obſerving a train of uniform effects with due caution, we may at laſt decypher the law of nature by which they are regulated.

Lord Bacon has diſplayed no leſs force of genius in reducing to rules this method of reaſoning, than Ariſtotle did in the method of ſyllogiſm. His *Novum Organum* ought therefore to be held as a moſt important addition to the ancient logic. Thoſe who underſtand it, and enter into the ſpirit of it, will be able to diſtinguiſh the chaff from the wheat in philoſophical diſquiſitions into the works of God. They will learn to hold in due contempt all hypotheſes and theories, the creatures of human imagination, and to reſpect nothing but facts ſufficiently vouched, or concluſions drawn from them by a fair and chaſte interpretation of nature.

Moſt arts have been reduced to rules, after they had been brought to a conſiderable degree of perfection by the natural ſagacity of artiſts; and the rules have been drawn from the beſt examples of the art that had been before exhibited: but the art of philoſophical induction was delineated by Lord Bacon in a very ample manner, before the world had ſeen any tolerable example of it. This, altho' it adds greatly to the merit of the author, muſt have produced ſome obſcurity in the work, and a defect of proper examples for illuſtration. This defect may now be eaſily ſupplied, from thoſe authors who, in their philoſophical diſquiſitions, have moſt ſtrictly purſued the path pointed out in the *Novum Organum*. Among theſe Sir Iſaac Newton ſeems to hold the firſt rank, having,

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in the third book of his *Principia*, and in his Optics, had the rules of the *Novum Organum* conſtantly in his eye.

I think Lord Bacon was alſo the firſt who endeavoured to reduce to a ſyſtem the prejudices or biaſſes of the mind, which are the cauſes of falſe judgement, and which he calls *the idols of the human underſtanding*. Some late writers of logic have very properly introduced this into their ſyſtem; but it deſerves to be more copiouſly handled, and to be illuſtrated by real examples.

It is of great conſequence to accurate reaſoning, to diſtinguiſh firſt principles which are to be taken for granted, from propoſitions which require proof. All the real knowledge of mankind may be divided into two parts: the firſt conſiſting of ſelf-evident propoſitions; the ſecond, of thoſe which are deduced by juſt reaſoning from ſelf-evident propoſitions. The line which divides theſe two parts ought to be marked as diſtinctly as poſſible, and the principles that are ſelf-evident reduced, as far as can be done, to general axioms. This has been done in mathematics from the beginning, and has tended greatly to the emolument of that ſcience. It has lately been done in natural philoſophy: and by this means that ſcience has advanced more in an hundred and fifty years, than it had done before in two thouſand. Every ſcience is in an unformed ſtate until its firſt principles are aſcertained: after that is done, it advances regularly, and ſecures the ground it has gained.

Altho' firſt principles do not admit of direct proof, yet there muſt be certain marks and characters, by which thoſe that are truly ſuch may be diſtinguiſhed from counterfeits. Theſe marks ought to be deſcribed, and applied, to diſtinguiſh the genuine from the ſpurious.

In the ancient philoſophy there is a redundance, rather than a defect, of firſt principles. Many things were aſſumed under that character without a juſt title: That nature abhors a *vacuum*; That

That bodies do not gravitate in their proper place; That the heavenly bodies undergo no change; That they move in perfect circles, and with an equable motion. Such principles as these were assumed in the Peripatetic philosophy, without proof, as if they were self-evident.

Des Cartes, sensible of this weakness in the ancient philosophy, and desirous to guard against it in his own system, resolved to admit nothing until his assent was forced by irresistible evidence. The first thing which he found to be certain and evident was, that he thought, and reasoned, and doubted. He found himself under a necessity of believing the existence of those operations of mind of which he was conscious: and having thus found sure footing in this one principle of consciousness, he rested satisfied with it, hoping to be able to build the whole fabric of his knowledge upon it; like Archimedes, who wanted but one fixed point to move the whole earth. But the foundation was too narrow; and in his progress he unawares assumes many things less evident than those which he attempts to prove. Altho' he was not able to suspect the testimony of consciousness, yet he thought the testimony of sense, of memory, and of every other faculty, might be suspected, and ought not to be received until proof was brought that they are not fallacious. Therefore he applies these faculties, whose character is yet in question, to prove, That there is an infinitely perfect Being, who made him, and who made his senses, his memory, his reason, and all his faculties; That this Being is no deceiver, and therefore could not give him faculties that are fallacious; and that on this account they deserve credit.

It is strange, that this philosopher, who found himself under a necessity of yielding to the testimony of consciousness, did not find the same necessity of yielding to the testimony of his senses, his memory, and his understanding: and that while he was certain that he doubted, and reasoned, he was uncertain whether two

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and three made five, and whether he was dreaming or awake. It is more ſtrange, that ſo acute a reaſoner ſhould not perceive, that his whole train of reaſoning to prove that his faculties were not fallacious, was mere ſophiſtry: for if his faculties were fallacious, they might deceive him in this train of reaſoning; and ſo the concluſion, That they were not fallacious, was only the teſtimony of his faculties in their own favour, and might be a fallacy.

It is difficult to give any reaſon for diſtruſting our other faculties, that will not reach conſciouſneſs itſelf. And he who diſtruſts thoſe faculties of judging and reaſoning which God hath given him, muſt even reſt in his ſcepticiſm till he come to a ſound mind, or until God give him new faculties to ſit in judgement upon the old. If it be not a firſt principle, That our faculties are not fallacious, we muſt be abſolute ſceptics: for this principle is incapable of proof; and if it is not certain, nothing elſe can be certain.

Since the time of Des Cartes, it has been faſhionable with thoſe who dealt in abſtract philoſophy, to employ their invention in finding philoſophical arguments, either to prove thoſe truths which ought to be received as firſt principles, or to overturn them: and it is not eaſy to ſay, whether the authority of firſt principles is more hurt by the firſt of theſe attempts, or by the laſt; for ſuch principles can ſtand ſecure only upon their own bottom; and to place them upon any other foundation than that of their intrinſic evidence, is in effect to overturn them.

I have lately met with a very ſenſible and judicious treatiſe, wrote by Father Buffier about fifty years ago, concerning firſt principles, and the ſource of human judgements, which, with great propriety, he prefixed to his treatiſe of logic. And indeed I apprehend it is a ſubject of ſuch conſequence, that if inquiſitive men

men can be brought to the ſame unanimity in the firſt principles of the other ſciences, as in thoſe of mathematics and natural philoſophy, (and why ſhould we deſpair of a general agreement in things that are ſelf-evident ?), this might be conſidered as a third grand æra in the progreſs of human reaſon.