

Chapter V.

Fallacies Of Generalization.

§ 1. The class of Fallacies of which we are now to speak, is the most extensive of all; embracing a greater number and variety of unfounded inferences than any of the other classes, and which it is even more difficult to reduce to sub-classes or species. If the attempt made in the preceding books to define the principles of well-grounded generalization has been successful, all generalizations not conformable to those principles might, in a certain sense, be brought under the present class; when, however, the rules are known and kept in view, but a casual lapse committed in the application of them, this is a blunder, not a fallacy. To entitle an error of generalization to the latter epithet, it must be committed on principle; there must lie in it some erroneous general conception of the inductive process; the legitimate mode of drawing conclusions from observation and experiment must be fundamentally misconceived.

Without attempting any thing so chimerical as an exhaustive classification of all the misconceptions which can exist on the subject, let us content ourselves with noting, among the cautions which might be suggested, a few of the most useful and needful.

§ 2. In the first place, there are certain kinds of generalization which, if the principles already laid down be correct, *must* be groundless; experience can not afford the necessary conditions for establishing them by a correct induction. Such, for instance, are all inferences from the order of nature existing on the earth, or in the solar system, to that which may exist in remote parts of the universe; where the phenomena, for aught we know, may be entirely different, or may succeed one another according to different laws, or even according to no fixed law at all. Such, again, in matters dependent on causation, are all universal negatives, all propositions that assert impossibility. The non-existence of any given phenomenon, however uniformly experience may as yet have testified to the fact, proves at most that no cause, adequate to its production, has yet manifested itself; but that no such causes exist in nature can only be inferred if we are so foolish as to suppose that we know all the forces in nature. The supposition would at least be premature while our acquaintance with some even of those which we do know is so extremely recent. And however much our knowledge of nature may hereafter be extended, it is not easy to see how that knowledge could ever be complete, or how, if it were, we could ever be assured of its being so.

The only laws of nature which afford sufficient warrant for attributing impossibility (even with reference to the existing order of nature, and to our own region of the universe) are, first, those of number and extension, which are paramount to the laws of the succession of phenomena, and not exposed to the agency of counteracting causes; and, secondly, the universal law of causality itself. That no valuation in any effect or consequent will take place while the whole of the antecedents remain the same, may be affirmed with full assurance. But, that the addition of some new antecedent might not entirely alter and subvert the accustomed consequent, or that antecedents competent to do this do not exist in nature, we are in no case empowered positively to conclude.

§ 3. It is next to be remarked that all generalizations which profess, like the theories of Thales, Democritus, and others of the early Greek speculators, to resolve all things into some one element, or like many modern theories, to resolve phenomena radically different into the same, are necessarily false. By radically different phenomena I mean impressions on our senses which differ in quality, and not merely in degree. On this subject what appeared necessary was said in the chapter on the Limits to the Explanation of Laws of Nature; but as the fallacy is even in our own times a common one, I shall touch on it somewhat further in this place.

When we say that the force which retains the planets in their orbits is resolved into gravity, or that the force which makes substances combine chemically is resolved into electricity, we assert in the one case what is, and in the other case what might, and probably will ultimately, be a legitimate result of induction. In both these cases motion is resolved into motion. The assertion is, that a case of motion, which was supposed to be

special, and to follow a distinct law of its own, conforms to and is included in the general law which regulates another class of motions. But, from these and similar generalizations, countenance and currency have been given to attempts to resolve, not motion into motion, but heat into motion, light into motion, sensation itself into motion; states of consciousness into states of the nervous system, as in the ruder forms of the materialist philosophy; vital phenomena into mechanical or chemical processes, as in some schools of physiology.

Now I am far from pretending that it may not be capable of proof, or that it is not an important addition to our knowledge if proved, that certain motions in the particles of bodies are the *conditions* of the production of heat or light; that certain assignable physical modifications of the nerves may be the conditions not only of our sensations or emotions, but even of our thoughts; that certain mechanical and chemical conditions may, in the order of nature, be sufficient to determine to action the physiological laws of life. All I insist upon, in common with every thinker who entertains any clear idea of the logic of science, is, that it shall not be supposed that by proving these things one step would be made toward a real explanation of heat, light, or sensation; or that the generic peculiarity of those phenomena can be in the least degree evaded by any such discoveries, however well established. Let it be shown, for instance, that the most complex series of physical causes and effects succeed one another in the eye and in the brain to produce a sensation of color; rays falling on the eye, refracted, converging, crossing one another, making an inverted image on the retina, and after this a motion--let it be a vibration, or a rush of nervous fluid, or whatever else you are pleased to suppose, along the optic nerve--a propagation of this motion to the brain itself, and as many more different motions as you choose; still, at the end of these motions, there is something which is not motion, there is a feeling or sensation of color. Whatever number of motions we may be able to interpolate, and whether they be real or imaginary, we shall still find, at the end of the series, a motion antecedent and a color consequent. The mode in which any one of the motions produces the next, may possibly be susceptible of explanation by some general law of motion: but the mode in which the last motion produces the sensation of color, can not be explained by any law of motion; it is the law of color: which is, and must always remain, a peculiar thing. Where our consciousness recognizes between two phenomena an inherent distinction; where we are sensible of a difference which is not merely of degree, and feel that no adding one of the phenomena to itself would produce the other; any theory which attempts to bring either under the laws of the other must be false; though a theory which merely treats the one as a cause or condition of the other, may possibly be true.

§ 4. Among the remaining forms of erroneous generalization, several of those most worthy of and most requiring notice have fallen under our examination in former places, where, in investigating the rules of correct induction, we have had occasion to advert to the distinction between it and some common mode of the incorrect. In this number is what I have formerly called the natural Induction of uninquiring minds, the induction of the ancients, which proceeds *per enumerationem simplicem*: "This, that, and the other A are B, I can not think of any A which is not B, therefore every A is B." As a final condemnation of this rude and slovenly mode of generalization, I will quote Bacon's emphatic denunciation of it; the most important part, as I have more than once ventured to assert, of the permanent service rendered by him to philosophy. "Inductio quæ procedit per enumerationem simplicem, res puerilis est, et precario concludit" (concludes only *by your leave*, or provisionally), "et periculo exponitur ab instantiâ contradictoriâ, et plerumque secundum pauciora quam par est, et *ex his tantummodo quæ præsto sunt pronunciat*. At Inductio quæ ad inventionem et demonstrationem Scientiarum et Artium erit utilis, Naturam separare debet, per rejectiones et exclusiones debitas; ac deinde post negativas tot quot sufficiunt, super affirmativas concludere."

I have already said that the mode of Simple Enumeration is still the common and received method of Induction in whatever relates to man and society. Of this a very few instances, more by way of memento than of instruction, may suffice. What, for example, is to be thought of all the "common-sense" maxims for which the following may serve as the universal formula, "Whatsoever has never been, will never be." As for example: negroes have never been as civilized as whites sometimes are, therefore it is impossible they should be so. Women, as a class, are supposed not to have hitherto been equal in intellect to men, therefore they are necessarily inferior. Society can not prosper without this or the other institution; *e.g.*, in Aristotle's time, without slavery; in later times, without an established priesthood, without artificial distinctions of rank, etc.

One poor person in a thousand, educated, while the nine hundred and ninety-nine remain uneducated, has usually aimed at raising himself out of his class, therefore education makes people dissatisfied with the condition of a laborer. Bookish men, taken from speculative pursuits and set to work on something they know nothing about, have generally been found or thought to do it ill; therefore philosophers are unfit for business, etc., etc. All these are inductions by simple enumeration. Reasons having some reference to the canons of scientific investigation have been attempted to be given, however unsuccessfully, for some of these propositions; but to the multitude of those who parrot them, the *enumeratio simplex, ex his tantummodo quæ præsto sunt pronuncians*, is the sole evidence. Their fallacy consists in this, that they are inductions without elimination: there has been no real comparison of instances, nor even ascertainment of the material facts in any given instance. There is also the further error, of forgetting that such generalizations, even if well established, could not be ultimate truths, but must be results of laws much more elementary; and therefore, until deduced from such, could at most be admitted as empirical laws, holding good within the limits of space and time by which the particular observations that suggested the generalization were bounded.

This error, of placing mere empirical laws, and laws in which there is no direct evidence of causation, on the same footing of certainty as laws of cause and effect, an error which is at the root of perhaps the greater number of bad inductions, is exemplified only in its grossest form in the kind of generalizations to which we have now referred. These, indeed, do not possess even the degree of evidence which pertains to a well-ascertained empirical law; but admit of refutation on the empirical ground itself, without ascending to casual laws. A little reflection, indeed, will show that mere negations can only form the ground of the lowest and least valuable kind of empirical law. A phenomenon has never been noticed; this only proves that the conditions of that phenomenon have not yet occurred in experience, but does not prove that they may not occur hereafter. There is a better kind of empirical law than this, namely, when a phenomenon which is observed presents within the limits of observation a series of gradations, in which a regularity, or something like a mathematical law, is perceptible; from which, therefore, something may be rationally presumed as to those terms of the series which are beyond the limits of observation. But in negation there are no gradations, and no series; the generalizations, therefore, which deny the possibility of any given condition of man and society merely because it has never yet been witnessed, can not possess this higher degree of validity even as empirical laws. What is more, the minuter examination which that higher order of empirical laws presupposes, being applied to the subject-matter of these, not only does not confirm but actually refutes them. For in reality the past history of Man and Society, instead of exhibiting them as immovable, unchangeable, incapable of ever presenting new phenomena, shows them, on the contrary, to be, in many most important particulars, not only changeable, but actually undergoing a progressive change. The empirical law, therefore, best expressive, in most cases, of the genuine result of observation, would be, not that such and such a phenomenon will continue unchanged, but that it will continue to change in some particular manner.

Accordingly, while almost all generalizations relating to Man and Society, antecedent to the last fifty or sixty years, have erred in the gross way which we have attempted to characterize, namely, by implicitly assuming that nature and society will forever revolve in the same orbit, and exhibit essentially the same phenomena; which is also the vulgar error of the ostentatiously practical, the votaries of so-called common sense, in our day, especially in Great Britain; the more thinking minds of the present age, having applied a more minute analysis to the past records of our race, have for the most part adopted a contrary opinion, that the human species is in a state of necessary progression, and that from the terms of the series which are past we may infer positively those which are yet to come. Of this doctrine, considered as a philosophical tenet, we shall have occasion to speak more fully in the concluding Book. If not, in all its forms, free from error, it is at least free from the gross and error which we previously exemplified. But, in all except the most eminently philosophical minds, it is infected with precisely the same *kind* of fallacy as that is. For we must remember that even this other and better generalization, the progressive change in the condition of the human species, is, after all, but an empirical law; to which, too, it is not difficult to point out exceedingly large exceptions; and even if these could be got rid of, either by disputing the facts or by explaining and limiting the theory, the general objection remains valid against the supposed law, as applicable to any other than what, in our third book, were termed Adjacent Cases. For not only is it no ultimate, but not even a causal law. Changes do indeed take place in

human affairs, but every one of those changes depends on determinate causes; the "progressiveness of the species" is not a cause, but a summary expression for the general result of all the causes. So soon as, by a quite different sort of induction, it shall be ascertained what causes have produced these successive changes, from the beginning of history, in so far as they have really taken place, and by what causes of a contrary tendency they have been occasionally checked or entirely counteracted, we may then be prepared to predict the future with reasonable foresight; we may be in possession of the real *law* of the future; and may be able to declare on what circumstances the continuance of the same onward movement will eventually depend. But this it is the error of many of the more advanced thinkers, in the present age, to overlook; and to imagine that the empirical law collected from a mere comparison of the condition of our species at different past times, is a real law, is *the* law of its changes, not only past but also to come. The truth is, that the causes on which the phenomena of the moral world depend, are in every age, and almost in every country, combined in some different proportion; so that it is scarcely to be expected that the general result of them all should conform very closely, in its details at least, to any uniformly progressive series. And all generalizations which affirm that mankind have a tendency to grow better or worse, richer or poorer, more cultivated or more barbarous, that population increases faster than subsistence, or subsistence than population, that inequality of fortune has a tendency to increase or to break down, and the like, propositions of considerable value as empirical laws within certain (but generally rather narrow) limits, are in reality true or false according to times and circumstances.

What we have said of empirical generalizations from times past to times still to come, holds equally true of similar generalizations from present times to times past; when persons whose acquaintance with moral and social facts is confined to their own age, take the men and the things of that age for the type of men and things in general, and apply without scruple to the interpretation of the events of history, the empirical laws which represent sufficiently for daily guidance the common phenomena of human nature at that time and in that particular state of society. If examples are wanted, almost every historical work, until a very recent period, abounded in them. The same may be said of those who generalize empirically from the people of their own country to the people of other countries, as if human beings felt, judged, and acted everywhere in the same manner.

§ 5. In the foregoing instances, the distinction is confounded between empirical laws, which express merely the customary order of the succession of effects, and the laws of causation on which the effects depend. There may, however, be incorrect generalization when this mistake is not committed; when the investigation takes its proper direction, that of causes, and the result erroneously obtained purports to be a really causal law.

The most vulgar form of this fallacy is that which is commonly called *post hoc, ergo propter hoc*, or, *cum hoc, ergo propter hoc*. As when it was inferred that England owed her industrial pre-eminence to her restrictions on commerce; as when the old school of financiers, and some speculative writers, maintained that the national debt was one of the causes of national prosperity; as when the excellence of the Church, of the Houses of Lords and Commons, of the procedure of the law courts, etc., were inferred from the mere fact that the country had prospered under them. In such cases as these, if it can be rendered probable by other evidence that the supposed causes have some tendency to produce the effect ascribed to them, the fact of its having been produced, though only in one instance, is of some value as a verification by specific experience; but in itself it goes scarcely any way at all toward establishing such a tendency, since, admitting the effect, a hundred other antecedents could show an equally strong title of *that* kind to be considered as the cause.

In these examples we see bad generalization *a posteriori*, or empiricism properly so called; causation inferred from casual conjunction, without either due elimination, or any presumption arising from known properties of the supposed agent. But bad generalization *a priori* is fully as common; which is properly called false theory; conclusions drawn, by way of deduction, from properties of some one agent which is known or supposed to be present, all other co-existing agents being overlooked. As the former is the error of sheer ignorance, so the latter is especially that of semi-instructed minds; and is mainly committed in attempting to explain complicated phenomena by a simpler theory than their nature admits of. As when one school of physicians

sought for the universal principle of all disease in "lentor and morbid viscosity of the blood," and imputing most bodily derangements to mechanical obstructions, thought to cure them by mechanical remedies;(257) while another, the chemical school, "acknowledged no source of disease but the presence of some hostile acid or alkali, or some deranged condition in the chemical composition of the fluid or solid parts," and conceived, therefore, that "all remedies must act by producing chemical changes in the body." We find Tournefort busily engaged in testing every vegetable juice, in order to discover in it some traces of an acid or alkaline ingredient, which might confer upon it medicinal activity. The fatal errors into which such an hypothesis was liable to betray the practitioner, received an awful illustration in the history of the memorable fever that raged at Leyden in the year 1699, and which consigned two-thirds of the population of that city to an untimely grave; an event which in a great measure depended upon the Professor Sylvius de la Boe, who having just embraced the chemical doctrines of Van Helmont, assigned the origin of the distemper to a prevailing acid, and declared that its cure could alone [only] be effected by the copious administration of absorbent and testaceous medicines.(258)

These aberrations in medical theory have their exact parallels in politics. All the doctrines which ascribe absolute goodness to particular forms of government, particular social arrangements, and even to particular modes of education, without reference to the state of civilization and the various distinguishing characters of the society for which they are intended, are open to the same objection--that of assuming one class of influencing circumstances to be the paramount rulers of phenomena which depend in an equal or greater degree on many others. But on these considerations it is the less necessary that we should now dwell, as they will occupy our attention more largely in the concluding Book.

§ 6. The last of the modes of erroneous generalization to which I shall advert, is that to which we may give the name of False Analogies. This Fallacy stands distinguished from those already treated of by the peculiarity that it does not even simulate a complete and conclusive induction, but consists in the misapplication of an argument which is at best only admissible as an inconclusive presumption, where real proof is unattainable.

An argument from analogy, is an inference that what is true in a certain case is true in a case known to be somewhat similar, but not known to be exactly parallel, that is, to be similar in all the material circumstances. An object has the property B: another object is not known to have that property, but resembles the first in a property A, not known to be connected with B; and the conclusion to which the analogy points, is that this object has the property B also. As, for example, that the planets are inhabited, because the earth is so. The planets resemble the earth in describing elliptical orbits round the sun, in being attracted by it and by one another, in being nearly spherical, revolving on their axes, etc.; and, as we have now reason to believe from the revelations of the spectroscope, are composed, in great part at least, of similar materials; but it is not known that any of these properties, or all of them together, are the conditions on which the possession of inhabitants is dependent, or are marks of those conditions. Nevertheless, so long as we do not know what the conditions are, they *may* be connected by some law of nature with those common properties; and to the extent of that possibility the planets are more likely to be inhabited than if they did not resemble the earth at all. This non-assignable and generally small increase of probability, beyond what would otherwise exist, is all the evidence which a conclusion can derive from analogy. For if we have the slightest reason to suppose any real connection between the two properties A and B, the argument is no longer one of analogy. If it had been ascertained (I purposely put an absurd supposition) that there was a connection by causation between the fact of revolving on an axis and the existence of animated beings, or if there were any reasonable ground for even suspecting such a connection, a probability would arise of the existence of inhabitants in the planets, which might be of any degree of strength, up to a complete induction; but we should then infer the fact from the ascertained or presumed law of causation, and not from the analogy of the earth.

The name analogy, however, is sometimes employed by extension to denote those arguments of an inductive character but not amounting to a real induction, which are employed to strengthen the argument drawn from a simple resemblance. Though A, the property common to the two cases, can not be shown to be the cause or effect of B, the analogical reasoner will endeavor to show that there is some less close degree of connection

between them; that A is one of a set of conditions from which, when all united, B would result; or is an occasional effect of some cause which has been known also to produce B; and the like. Any of which things, if shown, would render the existence of B by so much more probable, than if there had not been even that amount of known connection between B and A.

Now an error or fallacy of analogy may occur in two ways. Sometimes it consists in employing an argument of either of the above kinds with correctness indeed, but overrating its probative force. This very common aberration is sometimes supposed to be particularly incident to persons distinguished for their imagination; but in reality it is the characteristic intellectual vice of those whose imaginations are barren, either from want of exercise, natural defect, or the narrowness of their range of ideas. To such minds objects present themselves clothed in but few properties; and as, therefore, few analogies between one object and another occur to them, they almost invariably overrate the degree of importance of those few: while one whose fancy takes a wider range, perceives and remembers so many analogies tending to conflicting conclusions, that he is much less likely to lay undue stress on any of them. We always find that those are the greatest slaves to metaphorical language who have but one set of metaphors.

But this is only one of the modes of error in the employment of arguments of analogy. There is another, more properly deserving the name of fallacy; namely, when resemblance in one point is inferred from resemblance in another point, though there is not only no evidence to connect the two circumstances by way of causation, but the evidence tends positively to disconnect them. This is properly the Fallacy of False Analogies.

As a first instance, we may cite that favorite argument in defense of absolute power, drawn from the analogy of paternal government in a family, which government, however much in need of control, is not and can not be controlled by the children themselves, while they remain children. Paternal government, says the argument, works well; therefore, despotic government in a state will work well. I waive, as not pertinent in this place, all that could be said in qualification of the alleged excellence of paternal government. However this might be, the argument from the family to the state would not the less proceed on a false analogy; implying that the beneficial working of parental government depends, in the family, on the only point which it has in common with political despotism, namely, irresponsibility. Whereas it depends, when real, not on that but on two other circumstances of the case, the affection of the parent for the children, and the superiority of the parent in wisdom and experience; neither of which properties can be reckoned on, or are at all likely to exist, between a political despot and his subjects; and when either of these circumstances fails even in the family, and the influence of the irresponsibility is allowed to work uncorrected, the result is any thing but good government. This, therefore, is a false analogy.

Another example is the not uncommon *dictum* that bodies politic have youth, maturity, old age, and death, like bodies natural; that after a certain duration of prosperity, they tend spontaneously to decay. This also is a false analogy, because the decay of the vital powers in an animated body can be distinctly traced to the natural progress of those very changes of structure which, in their earlier stages, constitutes its growth to maturity; while in the body politic the progress of those changes can not, generally speaking, have any effect but the still further continuance of growth: it is the stoppage of that progress, and the commencement of retrogression, that alone would constitute decay. Bodies politic die, but it is of disease, or violent death; they have no old age.

The following sentence from Hooker's *Ecclesiastical Polity* is an instance of a false analogy from physical bodies to what are called bodies politic. "As there could be in natural bodies no motion of any thing unless there were some which moveth all things, and continueth immovable; even so in politic societies there must be some unpunishable, or else no man shall suffer punishment." There is a double fallacy here, for not only the analogy, but the premise from which it is drawn, is untenable. The notion that there must be something immovable which moves all other things, is the old scholastic error of a *primum mobile*.

The following instance I quote from Archbishop Whately's *Rhetoric*: "It would be admitted that a great and

permanent diminution in the quantity of some useful commodity, such as corn, or coal, or iron, throughout the world, would be a serious and lasting loss; and again, that if the fields and coal-mines yielded regularly double quantities, with the same labor, we should be so much the richer; hence it might be inferred, that if the quantity of gold and silver in the world were diminished one-half, or were doubled, like results would follow; the utility of these metals, for the purposes of coin, being very great. Now there are many points of resemblance and many of difference, between the precious metals on the one hand, and corn, coal, etc., on the other; but the important circumstance to the supposed argument is, that the *utility* of gold and silver (as coin, which is far the chief) *depends on their value*, which is regulated by their scarcity; or rather, to speak strictly, by the difficulty of obtaining them; whereas, if corn and coal were ten times as abundant (*i.e.*, more easily obtained), a bushel of either would still be as useful as now. But if it were twice as easy to procure gold as it is, a sovereign would be twice as large; if only half as easy, it would be of the size of a half-sovereign, and this (besides the trifling circumstance of the cheapness or dearness of gold ornaments) would be all the difference. The analogy, therefore, fails in the point essential to the argument."

The same author notices, after Bishop Copleston, the case of False Analogy which consists in inferring from the similarity in many respects between the metropolis of a country and the heart of the animal body, that the increased size of the metropolis is a disease.

Some of the false analogies on which systems of physics were confidently grounded in the time of the Greek philosophers, are such as we now call fanciful, not that the resemblances are not often real, but that it is long since any one has been inclined to draw from them the inferences which were then drawn. Such, for instance, are the curious speculations of the Pythagoreans on the subject of numbers. Finding that the distances of the planets bore, or seemed to bear, to one another a proportion not varying much from that of the divisions of the monochord, they inferred from it the existence of an inaudible music, that of the spheres; as if the music of a harp had depended solely on the numerical proportions, and not on the material, nor even on the existence of any material, any strings at all. It has been similarly imagined that certain combinations of numbers, which were found to prevail in some natural phenomena, must run through the whole of nature: as that there must be four elements, because there are four possible combinations of hot and cold, wet and dry; that there must be seven planets, because there were seven metals, and even because there were seven days of the week. Kepler himself thought that there could be only six planets, because there were only five regular solids. With these we may class the reasonings, so common in the speculations of the ancients, founded on a supposed *perfection* in nature; meaning by nature the customary order of events as they take place of themselves without human interference. This also is a rude guess at an analogy supposed to pervade all phenomena, however dissimilar. Since what was thought to be perfection appeared to obtain in some phenomena, it was inferred (in opposition to the plainest evidence) to obtain in all. "We always suppose that which is better to take place in nature, if it be possible," says Aristotle; and the vaguest and most heterogeneous qualities being confounded together under the notion of being *better*, there was no limit to the wildness of the inferences. Thus, because the heavenly bodies were "perfect," they must move in circles and uniformly. For "they" (the Pythagoreans) "would not allow," says Geminus,(259) "of any such disorder among divine and eternal things, as that they should sometimes move quicker and sometimes slower, and sometimes stand still; for no one would tolerate such anomaly in the movements even of a man, who was decent and orderly. The occasions of life, however, are often reasons for men going quicker or slower; but in the incorruptible nature of the stars, it is not possible that any cause can be alleged of quickness or slowness." It is seeking an argument of analogy very far, to suppose that the stars must observe the rules of decorum in gait and carriage prescribed for themselves by the long-bearded philosophers satirized by Lucian.

As late as the Copernican controversy it was urged as an argument in favor of the true theory of the solar system, that it placed the fire, the noblest element, in the centre of the universe. This was a remnant of the notion that the order of nature must be perfect, and that perfection consisted in conformity to rules of precedency in dignity, either real or conventional. Again, reverting to numbers: certain numbers were *perfect*, therefore those numbers must obtain in the great phenomena of nature. Six was a perfect number, that is, equal to the sum of all its factors; an additional reason why there must be exactly six planets. The

Pythagoreans, on the other hand, attributed perfection to the number ten; but agreed in thinking that the perfect number must be somehow realized in the heavens; and knowing only of nine heavenly bodies, to make up the enumeration, they asserted "that there was an *antichthon*, or counter-earth, on the other side of the sun, invisible to us." (260) Even Huygens was persuaded that when the number of the heavenly bodies had reached twelve, it could not admit of any further increase. Creative power could not go beyond that sacred number.

Some curious instances of false analogy are to be found in the arguments of the Stoics to prove the equality of all crimes, and the equal wretchedness of all who had not realized their idea of perfect virtue. Cicero, toward the end of his Fourth Book, *De Finibus*, states some of these as follows: "Ut, inquit, in fidibus plurimis, si nulla earum ita contenta numeris sit, ut concentum servare possit, omnes æque incontentæ sunt; sic peccata, quia discrepant, æque discrepant; paria sunt igitur." To which Cicero himself aptly answers, "æque contingit omnibus fidibus, ut incontentæ sint; illud non continuo, ut æque incontentæ." The Stoic resumes: "Ut enim, inquit, gubernator æque peccat, si palearum navem evertit, et si auri; item æque peccat qui parentem, et qui servum, injuriâ verberat;" assuming, that because the magnitude of the interest at stake makes no difference in the mere defect of skill, it can make none in the moral defect: a false analogy. Again, "Quis ignorat, si plures ex alto emergere velint, propius fore eos quidem ad respirandum, qui ad summam jam aquam appropinquant, sed nihilo magis respirare posse, quam eos, qui sunt in profundo? Nihil ergo adjuvat procedere, et progredi in virtute, quominus miserrimus sit, antequam ad eam pervenerit, quoniam in aquâ nihil adjuvat: et quoniam catuli, qui jam despecturi sunt, cæci æque, et ii qui modo nati; Platonem quoque necesse est, quoniam nondum videbat sapientiam, æque cæcum animo, ac Phalarim fuisse." Cicero, in his own person, combats these false analogies by other analogies tending to an opposite conclusion. "Ista similia non sunt, Cato.... Illa sunt similia; hebes acies est cuiquam oculorum: corpore alius languescit: hi curatione adhibitâ levantur in dies: alter valet plus quotidie: alter videt. Hi similes sunt omnibus, qui virtuti student; levantur vitiis, levantur erroribus."

§ 7. In these and all other arguments drawn from remote analogies, and from metaphors, which are cases of analogy, it is apparent (especially when we consider the extreme facility of raising up contrary analogies and conflicting metaphors) that, so far from the metaphor or analogy proving any thing, the applicability of the metaphor is the very thing to be made out. It has to be shown that in the two cases asserted to be analogous, the same law is really operating; that between the known resemblance and the inferred one there is some connection by means of causation. Cicero and Cato might have bandied opposite analogies forever; it rested with each of them to prove by just induction, or at least to render probable, that the case resembled the one set of analogous cases and not the other, in the circumstances on which the disputed question really hinged. Metaphors, for the most part, therefore, assume the proposition which they are brought to prove: their use is, to aid the apprehension of it; to make clearly and vividly comprehended what it is that the person who employs the metaphor is proposing to make out; and sometimes also, by what media he proposes to do so. For an apt metaphor, though it can not prove, often suggests the proof.

For instance, when D'Alembert (I believe) remarked that in certain governments only two creatures find their way to the highest places, the eagle and the serpent, the metaphor not only conveys with great vividness the assertion intended, but contributes toward substantiating it, by suggesting, in a lively manner, the means by which the two opposite characters thus typified effect their rise. When it is said that a certain person misunderstands another because the lesser of two objects can not comprehend the greater, the application of what is true in the literal sense of the word *comprehend*, to its metaphorical sense, points to the fact which is the ground and justification of the assertion, viz., that one mind can not thoroughly understand another unless it can contain it in itself, that is, unless it possesses all that is contained in the other. When it is urged as an argument for education, that if the soil is left uncultivated, weeds will spring up, the metaphor, though no proof, but a statement of the thing to be proved, states it in terms which, by suggesting a parallel case, put the mind upon the track of the real proof. For, the reason why weeds grow in an uncultivated soil, is that the seeds of worthless products exist everywhere, and can germinate and grow in almost all circumstances, while the reverse is the case with those which are valuable; and this being equally true of mental products, this mode of conveying an argument, independently of its rhetorical advantages, has a logical value; since it not only suggests the grounds of the conclusion, but points to another case in which those grounds have been found, or

at least deemed to be, sufficient.

On the other hand, when Bacon, who is equally conspicuous in the use and abuse of figurative illustration, says that the stream of time has brought down to us only the least valuable part of the writings of the ancients, as a river carries froth and straws floating on its surface, while more weighty objects sink to the bottom; this, even if the assertion illustrated by it were true, would be no good illustration, there being no parity of cause. The levity by which substances float on a stream, and the levity which is synonymous with worthlessness, have nothing in common except the name; and (to show how little value there is in the metaphor) we need only change the word into *buoyancy*, to turn the semblance of argument involved in Bacon's illustration against himself.

A metaphor, then, is not to be considered as an argument, but as an assertion that an argument exists; that a parity subsists between the case from which the metaphor is drawn and that to which it is applied. This parity may exist though the two cases be apparently very remote from one another; the only resemblance existing between them may be a resemblance of relations, an analogy in Ferguson's and Archbishop Whately's sense: as in the preceding instance, in which an illustration from agriculture was applied to mental cultivation.

§ 8. To terminate the subject of Fallacies of Generalization, it remains to be said, that the most fertile source of them is bad classification: bringing together in one group, and under one name, things which have no common properties, or none but such as are too unimportant to allow general propositions of any considerable value to be made respecting the class. The misleading effect is greatest, when a word which in common use expresses some definite fact, is extended by slight links of connection to cases in which that fact does not exist, but some other or others, only slightly resembling it. Thus Bacon,(261) in speaking of the *Idola* or Fallacies arising from notions *temere et inæqualiter à rebus abstractæ*, exemplifies them by the notion of Humidum or Wet, so familiar in the physics of antiquity and of the Middle Ages. "Invenietur verbum istud, Humidum, nihil aliud quam nota confusa diversarum actionum, quæ nullam constantiam aut reductionem patiuntur. Significat enim, et quod circa aliud corpus facile se circumfundit; et quod in se est indeterminabile, nec consistere potest; et quod facile cedit undique; et quod facile se dividit et dispergit; et quod facile se unit et colligit; et quod facile fluit, et in motu ponitur; et quod alteri corpori facile adhæret, idque madefacit; et quod facile reducitur in liquidum, sive colliquatur, cum antea consisteret. Itaque quum ad hujus nominis prædicationem et impositionem ventum sit; si alia accipias, flamma humida est; si alia accipias, aer humidus non est; si alia, pulvis minutus humidus est; si alia, vitrum humidum est: ut facile appareat, istam notionem ex aquâ tantum, et communibus et vulgaribus liquoribus, absque ullâ debitâ verificatione, temere abstractam esse."

Bacon himself is not exempt from a similar accusation when inquiring into the nature of heat: where he occasionally proceeds like one who, seeking for the cause of hardness, after examining that quality in iron, flint, and diamond, should expect to find that it is something which can be traced also in hard water, a hard knot, and a hard heart.

The word {~GREEK SMALL LETTER KAPPA~}{~GREEK SMALL LETTER IOTA WITH OXIA~}{~GREEK SMALL LETTER NU~}{~GREEK SMALL LETTER ETA~}{~GREEK SMALL LETTER SIGMA~}{~GREEK SMALL LETTER IOTA~}{~GREEK SMALL LETTER FINAL SIGMA~} in the Greek philosophy, and the words Generation and Corruption, both then and long afterward, denoted such a multitude of heterogeneous phenomena, that any attempt at philosophizing in which those words were used was almost as necessarily abortive as if the word *hard* had been taken to denote a class including all the things mentioned above. {~GREEK CAPITAL LETTER KAPPA~}{~GREEK SMALL LETTER IOTA WITH OXIA~}{~GREEK SMALL LETTER NU~}{~GREEK SMALL LETTER ETA~}{~GREEK SMALL LETTER SIGMA~}{~GREEK SMALL LETTER IOTA~}{~GREEK SMALL LETTER FINAL SIGMA~}, for instance, which properly signified motion, was taken to denote not only all motion but even all change: {~GREEK SMALL LETTER ALPHA WITH PSILI~}{~GREEK SMALL LETTER LAMDA~}{~GREEK SMALL LETTER LAMDA~}{~GREEK SMALL LETTER OMICRON~}{~GREEK SMALL LETTER

IOTA WITH OXIA~}{~GREEK SMALL LETTER OMEGA~}{~GREEK SMALL LETTER SIGMA~}{~GREEK SMALL LETTER IOTA~}{~GREEK SMALL LETTER FINAL SIGMA~} being recognized as one of the modes of {~GREEK SMALL LETTER KAPPA~}{~GREEK SMALL LETTER IOTA WITH OXIA~}{~GREEK SMALL LETTER NU~}{~GREEK SMALL LETTER ETA~}{~GREEK SMALL LETTER SIGMA~}{~GREEK SMALL LETTER IOTA~}{~GREEK SMALL LETTER FINAL SIGMA~}. The effect was, to connect with every form of {~GREEK SMALL LETTER ALPHA WITH PSILI~}{~GREEK SMALL LETTER LAMDA~}{~GREEK SMALL LETTER LAMDA~}{~GREEK SMALL LETTER OMICRON~}{~GREEK SMALL LETTER IOTA WITH OXIA~}{~GREEK SMALL LETTER OMEGA~}{~GREEK SMALL LETTER SIGMA~}{~GREEK SMALL LETTER IOTA~}{~GREEK SMALL LETTER FINAL SIGMA~} or change, ideas drawn from motion in the proper and literal sense, and which had no real connection with any other kind of {~GREEK SMALL LETTER KAPPA~}{~GREEK SMALL LETTER IOTA WITH OXIA~}{~GREEK SMALL LETTER NU~}{~GREEK SMALL LETTER ETA~}{~GREEK SMALL LETTER SIGMA~}{~GREEK SMALL LETTER IOTA~}{~GREEK SMALL LETTER FINAL SIGMA~} than that. Aristotle and Plato labored under a continual embarrassment from this misuse of terms. But if we proceed further in this direction we shall encroach upon the Fallacy of Ambiguity, which belongs to a different class, the last in order of our classification, Fallacies of Confusion.