

circumstantial. Of the distinction between the two no better statement can be found than that made by Chief Justice Shaw in his charge to the jury at the trial of John W. Webster:—

“The distinction, then, between direct and circumstantial evidence, is this. Direct or positive evidence is when a witness can be called to testify to the precise fact which is the subject of the issue in trial; that is, in a case of homicide, that the party accused did cause the death of the deceased. Whatever may be the kind or force of the evidence, this is the fact to be proved. But suppose no person was present on the occasion of the death, and of course no one can be called to testify to it,—is it wholly unsusceptible of legal proof? Experience has shown that circumstantial evidence may be offered in such a case; that is, that a body of facts may be proved of so conclusive a character as to warrant a firm belief of the fact, quite as strong and certain as that on which discreet men are accustomed to act in relation to their most important concerns. . . .

“Each of these modes of proof has its advantages and disadvantages; it is not easy to compare their relative value. The advantage of positive evidence is, that you have the direct testimony of a witness to the fact to be proved, who, if he speaks the truth, saw it done; and the only question is, whether he is entitled to belief? The disadvantage is, that the witness may be false and corrupt, and the case may not afford the means of detecting his falsehood.

“But, in a case of circumstantial evidence where no witness can testify directly to the fact to be proved, you arrive at it by a series of other facts, which by experience we have found so associated with the fact in question, as in the relation of cause and effect, that they lead to a satisfactory and certain conclusion; as when foot-prints are discovered after a recent snow, it is certain that some animated being has passed over the snow since it fell; and, from the form and number of the foot-prints, it can be determined with equal certainty, whether it was a man, a bird, or a quadruped. Circumstantial evidence, therefore, is founded on experience and observed facts and coincidences, establishing a connection between the known and proved facts and the fact sought

to be proved. The advantages are, that, as the evidence commonly comes from several witnesses and different sources, a chain of circumstances is less likely to be falsely prepared and arranged, and falsehood and perjury are more likely to be detected and fail of their purpose. The disadvantages are, that a jury has not only to weigh the evidence of facts, but to draw just conclusions from them; in doing which, they may be led by prejudice or partiality, or by want of due deliberation and sobriety of judgment, to make hasty and false deductions; a source of error not existing in the consideration of positive evidence.”<sup>1</sup>

## SECTION III.

## DEDUCTION AND INDUCTION.

From the point of view of logic, arguments may be classified according as they move from the general to the specific,—DEDUCTION,<sup>2</sup>—or from the specific to the general,—INDUCTION.<sup>3</sup>

A simple example of DEDUCTION has come down to us from Aristotle: “All men are mortal, Socrates is a man, therefore Socrates is mortal.” In saying that “all men are mortal,” we assert that every <sup>Deduction.</sup> member of a class designated as “men” is mortal; in saying that “Socrates is a man,” we assert that Socrates belongs to the class designated as “men;” in saying that “Socrates is mortal,” we assert that what we have said concerning the class to which Socrates belongs is true of Socrates. The two assertions “all men are mortal” and “Socrates is a man” are called the *premisses*; <sup>4</sup> the asser-

<sup>1</sup> Chief Justice Shaw, in the case of John W. Webster, indicted for the murder of George Parkman. Reported by George Bemis.

<sup>2</sup> From *de*, from, and *ducere*, to lead.

<sup>3</sup> From *in*, into, and *ducere*, to lead.

<sup>4</sup> *Praemissa*, from *prae*, before, and *mittere*, to send or put.



tion deduced from the premisses, the assertion "Socrates is mortal," is called the *conclusion*; <sup>1</sup> the three assertions taken together constitute what is called a *syllogism*.<sup>2</sup>

In every valid syllogism, as in the typical example just given, the conclusion inevitably follows from the premisses; for it contains nothing that is not in the premisses. In saying that "all men are mortal" and that "Socrates is a man," we say by implication that "Socrates is mortal." The statement of the syllogism in full enables one to see clearly the premisses from which the conclusion is deduced.

A deductive argument may be presented in various forms. For example:—

(1) Laws that cannot be enforced should be repealed; the law prohibiting the sale of intoxicating liquors cannot be enforced; this law should, therefore, be repealed.

(2) If laws cannot be enforced, they should be repealed; the law prohibiting the sale of intoxicating liquors cannot be enforced; this law should, therefore, be repealed.

(3*a*) Laws that cannot be enforced should be repealed; the law prohibiting the sale of intoxicating liquors should, therefore, be repealed.

(3*b*) The law prohibiting the sale of intoxicating liquors cannot be enforced, and should, therefore, be repealed.

(3*c*) The law prohibiting the sale of intoxicating liquors should be repealed, for it cannot be enforced.

The only difference between syllogisms (1) and (2) is in the manner of stating the first premiss; in (1) the assertion concerning laws that cannot be enforced rests on the assumption that such laws exist; in (2) the same assertion rests on the hypothesis that such laws exist,—that is, it is conditional. The abridged syllogisms (3*a*), (3*b*), and (3*c*) differ from (1) and

<sup>1</sup> *Conclusus*, from *con-*, together, and *claudere*, to close.

<sup>2</sup> *Συλλογισμός*, a reckoning all together, from *σύν*, together, and *λογίζεσθαι*, to reason.

(2) in the omission of the second premiss from (3*a*), of the first premiss from (3*b*) and (3*c*),—omissions that are readily supplied.

A syllogism with one or more of its parts suppressed, as (3*a*), (3*b*), or (3*c*) in the example just given, is called an *enthymeme*.<sup>1</sup> In practical life reasoning is usually conducted in this abridged form. For example:—

The income tax is unequal in its operation; therefore, it cannot last.

The income tax is justifiable, for it tends to diminish inequality in the distribution of wealth.

"Robinson Crusoe" must be an allegory, for Defoe says it is.

"Robinson Crusoe" must be a true story, everything is so minutely described.

Greek, being a dead language, is of no use to living men.

As Greek literature is the source of what is best in modern literature, knowledge of it is an essential part of a liberal education.

A college student should be free to choose his studies, for he can profit by no study which he is forced to pursue.

Certain studies every college student should pursue, for they are the foundations of culture.

The wearing of high hats at the theatre should be forbidden by law, for high hats are a nuisance to short men.

A law prohibiting the wearing of high hats at the theatre is restrictive of liberty, and laws restrictive of liberty are impolitic.

"In a rude state of society, men are children with a greater variety of ideas. It is therefore in such a state of society that we may expect to find the poetical temperament in its highest perfection."<sup>2</sup>

<sup>1</sup> *Ἐνθύμημα*, from *ἐνθυμεῖσθαι*, to keep in mind, consider, infer; from *ἐν*, in, and *θυμός*, mind. For the history of the change in meaning which this word has undergone, see Murray's "New English Dictionary," and De Quincey's essay on "Rhetoric."

<sup>2</sup> Macaulay: *Essays*; Milton.



"If he has never been on a quest for buried treasure, it can be demonstrated that he has never been a child."<sup>1</sup>

"It is well known that most students are at a disadvantage in attacking any subject, because their minds are untrained."<sup>2</sup>

"The law was unconstitutional also, counsel averred, for the reason that it was class legislation."<sup>3</sup>

"When it [the new German constitution] was first published, the London *Times* remarked, in all seriousness, that it was sufficiently illogical to justify the hope that it would work well."<sup>4</sup>

"Why is our food so very sweet?  
Because we earn before we eat."<sup>5</sup>

The principal fallacies of deductive argument are *begging the question*, technically known as *petitio principii*, and *arguing beside the point*, technically known as *ignoratio elenchi*.<sup>6</sup>

To beg the question is to deduce a conclusion from an assumed premiss and then to use the conclusion so reached as proof of the proposition originally assumed. The nature of this fallacy (often called "arguing in a circle") may be learned from the following anecdote:—

A woman, on seeing a very small porringer, said to a child, "That must have been the little wee bear's porringer, it is so small," and then added, "He must have been smaller than we thought, must n't he?" To assume that the bear was very small in order to prove that the porringer was his, and then from the fact that the porringer is small to infer that the bear must have been very small, is, manifestly, to beg the question.

<sup>1</sup> R. L. Stevenson: *Memories and Portraits*; *A Humble Remonstrance*.

<sup>2</sup> Charles Dudley Warner. *Harper's Magazine*, March, 1895, p. 645.

<sup>3</sup> Report of W. D. Guthrie's argument before the United States Supreme Court in the income-tax cases: *The Boston Herald*, March 8, 1895.

<sup>4</sup> *The [New York] Nation*, March 14, 1895, p. 205.

<sup>5</sup> Nathaniel Cotton: *Fables*; *The Bee, the Ant, and the Sparrow*.

<sup>6</sup> Literally, "ignoring the refutation."

Another example is given by Stephen:—

"A ship is cast away under such circumstances that her loss may be accounted for either by fraud or by accident. The captain is tried for making away with her. A variety of circumstances exist which would indicate preparation and expectation on his part if the ship really was made away with, but which would justify no suspicion at all if she was not. It is manifestly illogical, first, to regard the antecedent circumstances as suspicious, because the loss of the ship is assumed to be fraudulent, and, next, to infer that the ship was fraudulently destroyed from the suspicious character of the antecedent circumstances."<sup>1</sup>

A single word may involve a begging of the question. Disbelievers in Mr. Bellamy's view of the future beg the question when they speak of his "Utopia;" for Utopia is understood to mean an unattainable ideal. An English journal declares that Mr. Leslie Stephen uses a "question-begging epithet" when he calls Tito Melema a "feminine" character. In the title of Mill's essay on "The Subjection of Women," the word "subjection" begs the question by assuming that the present condition of woman is one of subjection to man,—a point to be proved. The title of Dr. Bushnell's work on woman suffrage—"The Reform against Nature"—begs the question by assuming that the proposed reform is "against nature." Those who deem the game of foot-ball an important means of physical education maintain that those who call the game "brutal" beg the question by applying to the game itself an epithet deserved by some players. The following instance of question-begging is given by Bentham:—

"Take, for example, *improvement* and *innovation*: under its own name, to pass censure on any improvement might be too bold:

<sup>1</sup> Sir James Fitzjames Stephen: *Introduction to the Indian Evidence Act*, chap. ii.



applied to such an object, any expressions of censure you could employ might lose their force; employing them, you would seem to be running on in the track of self-contradiction and nonsense.

“But improvement means something new, and so does *innovation*. Happily for your purpose, *innovation* has contracted a bad sense; it means something which is new and bad at the same time. Improvement, it is true, in indicating something new, indicates something good at the same time; and therefore, if the thing in question be good as well as new, *innovation* is not a proper term for it. However, as the idea of *novelty* was the only idea originally attached to the term *innovation*, and the only one which is directly expressed in the etymology of it, you may still venture to employ the word *innovation*, since no man can readily and immediately convict your appellation of being an improper one upon the face of it.

“With the appellation thus chosen for the purpose of passing condemnation on the measure, he by whom it has been brought to view in the character of an improvement, is not (it is true) very likely to be well satisfied: but of this you could not have had any expectation. What you want is a pretence which your own partisans can lay hold of, for the purpose of deducing from it a colourable warrant for passing upon the improvement that censure which you are determined, and they, if not determined, are disposed and intend to pass on it.

“Of this instrument of deception, the potency is most deplorable.”<sup>1</sup>

Not only should we avoid the question-begging fallacy in our own arguments, but we should be on the watch for it in the arguments of those whose conclusions we oppose. If we can show that a so-called argument is mere assumption, — and this we can often do by stating it in syllogistic form, — we have done all that is necessary for its refutation.

To argue beside the point<sup>2</sup> is to try to prove something which is not the proposition in dispute, but which

<sup>1</sup> Jeremy Bentham: The Book of Fallacies, part iv. chap. i.

<sup>2</sup> See page 344.

the reasoner either mistakes for it or wishes others to mistake for it. To prove a man's cleverness as a writer when the question is whether <sup>Arguing beside the point.</sup> he has business ability, to prove a man's success as a soldier when the question is whether he has ability in civil affairs, to prove a man's gift for extemporaneous speaking when the question is whether he is a statesman, is to argue beside the point.

The variety of this fallacy known as *argumentum ad hominem* and that known as *argumentum ad populum* are thus explained by Professor Jevons: —

“An attorney for the defendant in a lawsuit is said to have handed to the barrister his brief marked ‘No case; abuse the plaintiff's attorney.’ Whoever thus uses what is known as *argumentum ad hominem*, that is, an argument which rests, not upon the merit of the case, but the character or position of those engaged in it, commits this fallacy [that of arguing beside the point]. If a man is accused of a crime it is no answer to say that the prosecutor is as bad. If a great change in the law is proposed in Parliament, it is an Irrelevant Conclusion to argue that the proposer is not the right man to bring it forward. Every one who gives advice lays himself open to the retort that he who preaches ought to practise, or that those who live in glass houses ought not to throw stones. Nevertheless there is no necessary connection between the character of the person giving advice and the goodness of the advice.

“The *argumentum ad populum* is another form of Irrelevant Conclusion, and consists in addressing arguments<sup>1</sup> to a body of people calculated to excite their feelings and prevent them from forming a dispassionate judgment upon the matter in hand. It is the great weapon of rhetoricians and demagogues.”<sup>2</sup>

A subtle form of arguing beside the point is the so-called “fallacy of confusion,” which consists in using a term in one sense in one part of the argu-

<sup>1</sup> Query as to the position of this word.

<sup>2</sup> W. S. Jevons: Elementary Lessons in Logic, lesson xxi.



ment and in another sense in another part. Some fallacies of this sort are nothing but verbal puzzles, which, however useful in sharpening the wits of students of logic, have no place in a treatise on rhetoric. Others are too dangerous to be passed by without notice. Such are those mentioned by Mill in the following passage:—

“The mercantile public are frequently led into this fallacy by the phrase ‘scarcity of money.’ In the language of commerce, ‘money’ has two meanings: *currency*, or the circulating medium; and *capital seeking investment*, especially investment on loan. In this last sense, the word is used when the ‘money market’ is spoken of, and when the ‘value of money’ is said to be high or low, the rate of interest being meant. The consequence of this ambiguity is, that as soon as scarcity of money in the latter of these senses begins to be felt,—as soon as there is difficulty of obtaining loans, and the rate of interest is high,—it is concluded that this must arise from causes acting upon the quantity of money in the other and more popular sense; that the circulating medium must have diminished in quantity, or ought to be increased. I am aware that, independently of the double meaning of the term, there are in the facts themselves some peculiarities, giving an apparent support to this error; but the ambiguity of the language stands on the very threshold of the subject, and intercepts all attempts to throw light upon it.

“Another word which is often turned into an instrument of the fallacy of ambiguity is *theory*. In its most<sup>1</sup> proper acceptation, theory means the completed result of philosophical induction from experience. In that sense, there are erroneous as well as true theories, for induction may be incorrectly performed; but theory of some sort is the necessary result of knowing any thing of a subject, and having put one’s knowledge into the form of general propositions for the guidance of practice. In this, the proper sense of the word, theory is the explanation of practice. In another and a more vulgar sense, theory means any mere fiction of the imagination, endeavouring to conceive how a thing

<sup>1</sup> See pages 158, 159.

may possibly have been produced, instead of examining how it was produced. In this sense only are theory and theorists unsafe guides.<sup>1</sup>

Another example may be taken from a recent work on education:—

“‘Who rules o’er freemen should himself be free’ is a good line and a sound maxim, surviving the attack made on it by the parodist;<sup>2</sup> yet it will not pass muster as an argument. ‘Freemen’ is used in a political sense, and political freedom is different from natural freedom or moral freedom. In plain prose, the ruler of freemen should be restrained by law, or else their freedom is at the mercy of his caprice; but if restrained by law, he does not seem at first sight to be free. Yet the line is a good one in spirit; for the second ‘free’ may be taken to mean free-hearted or free from passion—morally free, in fact. Such a play upon words is ornamental, and need not be illusory; but it ought not to pass unchallenged.”<sup>3</sup>

The generalizations from which we reason in deduction are themselves the products of INDUCTION. Thus, the general assertion that all men are mortal, which forms the first premiss in our typical example of deductive reasoning,<sup>4</sup> is itself derived from known instances of death. The general assertion, however, goes much further than the particulars on which it is based, for it includes not only all men who have died but all who live. So, too, the conclusion that, because the law of gravitation holds true in relation to all the bodies we know, it also holds true throughout the physical universe, is more than the sum of the particulars known. Induction, then, adds to our knowledge; but

<sup>1</sup> J. S. Mill: *A System of Logic*, book v. chap. vii. sect. i.

<sup>2</sup> “Who drives fat oxen should himself be fat.”

<sup>3</sup> W. Johnson: *On the Education of the Reasoning Faculties*; in “*Essays on a Liberal Education*,” edited by F. W. Farrar, essay viii.

<sup>4</sup> See page 341.



the knowledge so added is to a certain extent guess-work, for it rests on the supposition that what is true of all known members of a class is true of all unknown members of the same class.

An induction based on observation of all individuals of a class is beyond question; for in such an induction the general conclusion can be nothing but the sum of the particulars enumerated. It is, however, rarely possible to observe all individuals of a class. The next best thing is to base an inference from the known to the unknown on an argument derived from the relation of cause and effect. A familiar example is the induction that where there is smoke there is fire. The strength of the argument lies in the causal connection between fire and smoke. In the absence of knowledge of a causal connection an inductive argument has little force. Thus, it has been asserted that animals which ruminate have cloven hoofs; but science has not discovered a connection between rumination and cloven hoofs. If a new ruminant should be found, one might infer that it would have cloven hoofs; but in the absence of knowledge of a causal connection, and in face of the fact that some animals with cloven hoofs (pigs and tapirs, for example) are not ruminants, such an inference would have little force.

The fallacy which the inductive reasoner needs to guard against is that of inferring a general conclusion from instances so few or so unimportant as not to warrant that conclusion, and of ignoring instances that make against it. From this fallacy few books of travel are altogether exempt, so strong is the temptation to found a general statement on a few superficial and detached observations. Every partisan, every bigot, every person

Induction  
based on causal  
connection.

Fallacies of  
induction.

dominated by a fixed idea of any kind, is in danger of jumping from an insufficient number of special instances that favor his view to a general assertion which might be met by special instances that favor the opposite view.

A singular instance of induction unwarranted by the facts on which it is based is furnished by the comment of a recent writer on a passage which he quotes from Defoe's "Serious Reflections." The passage begins, "I have heard of a man, that, upon some extraordinary disgust which he took at the unsuitable conversation of some of his nearest relations, whose society he could not avoid, suddenly resolved never to speak any more." This resolve, as Defoe goes on to show, the man kept, with disastrous results, nearly twenty-nine years. The comment referred to is as follows:—

"That the paragraph had reference to Defoe is evident from the opening sentence; . . . 'I have heard of a man,' 'I know a man,' and the like, being favorite prologues of Defoe's when he was about to introduce bits of personal history."<sup>1</sup>

The conclusion that Defoe always meant himself when he said "I have heard of a man," "I know a man," etc., is unwarranted.

A variety of this fallacy is that which consists in assuming a causal connection where none exists, in arguing that because one thing follows another it is caused by that other,—the fallacy technically known as *post hoc, propter hoc*. In the Middle Ages most people supposed that eclipses and comets caused disasters of various sorts; and even in our own day some half-educated persons believe that changes of the moon cause changes in the weather, that the equinoxes cause "equinoctial storms," that the presence of thirteen at table causes the subsequent death of one of the number. The fallacy in question is not,

<sup>1</sup> Thomas Wright: The Life of Daniel Defoe, chap. ii.



however, confined to the half-educated, as those who follow the course of medical and political discussions are aware. Some examples are given in a recent article by President Eliot: —

“Many popular delusions are founded on the commonest of fallacies — this preceded that, therefore this caused that; or in shorter phrase, what preceded, caused. For example: I was sick; I took such and such a medicine and became well; therefore the medicine cured me. During the Civil War the Government issued many millions of paper money, and some men became very rich; therefore the way to make all men richer must be to issue from the Government presses an indefinite amount of paper money. . . . Bessemer steel is much cheaper now than it was twenty years ago; there has been a tariff tax on Bessemer steel in the United States for the past twenty years; therefore the tax cheapened the steel. England, France, and Germany are civilized and prosperous nations; they have enormous public debts; therefore a public debt is a public blessing. He must carry Ithuriel's spear and wear stout armor who can always expose and resist this fallacy.”<sup>1</sup>

Since deduction uses as premisses the generalizations made by induction, it furnishes a valuable means of testing the validity of these generalizations by applying them to particular cases. If a generalization so used turns out to be false, a new premiss may be provided by induction.

In all reasoning it is usual to combine the inductive with the deductive method; but whereas the trained reasoner can, if he chooses, analyze his processes of thought, the untrained reasoner goes from one method to the other without knowing what he is doing. That there is, however, no essential difference

<sup>1</sup> Charles W. Eliot: *Wherein Popular Education has Failed*. The Forum, December, 1892, p. 424. See also Mill's "System of Logic," book v. chap. v. sect. v.

between scientific and unscientific processes, Professor Huxley makes clear in the following passages: —

“Scientific reasoning differs from ordinary reasoning in just the same way as scientific observation and experiment differ from ordinary observation and experiment — that is to say, it strives to be accurate; and it is just as hard to reason accurately as it is to observe accurately.

“In scientific reasoning general rules are collected from the observation of many particular cases; and, when these general rules are established, conclusions are deduced from them, just as in every-day life. If a boy says that ‘marbles are hard,’ he has drawn a conclusion as to marbles in general from the marbles he happens to have seen and felt, and has reasoned in that mode which is technically termed induction. If he declines to try to break a marble with his teeth, it is because he consciously, or unconsciously, performs the converse operation of deduction from the general rule ‘marbles are too hard to break with one's teeth.’”<sup>1</sup>

“The vast results obtained by Science are won by no mystical faculties, by no mental processes, other than those which are practised by every one of us, in the humblest and meanest affairs of life. A detective policeman discovers a burglar from the marks made by his shoe, by a mental process identical with that by which Cuvier restored the extinct animals of Montmartre from fragments of their bones. Nor does that process of induction and deduction by which a lady, finding a stain of a peculiar kind upon her dress, concludes that somebody has upset the inkstand thereon, differ in any way, in kind, from that by which Adams and Leverrier discovered a new planet.

“The man of science, in fact, simply uses with scrupulous exactness the methods which we all, habitually and at every moment, use carelessly.”<sup>2</sup>

<sup>1</sup> Huxley: *Introductory Science Primer*.

<sup>2</sup> *Ibid.*: *Lay Sermons*; *On the Educational Value of the Natural History Sciences*.