Deduction

1866 | Lowell Lectures on The Logic of Science; or Induction and Hypothesis: Lecture I | W 1:362

We must begin, however, with the simplest kind of argumentation - that which is called Deductive reasoning - or as we may call it reasoning from preconceived ideas - that which traces out what is implicitly involved in what we already admitted. Few errors are made by any but the most careless reasoners in this kind of argument; and it may seem, therefore, not worth studying but the more difficult kinds of inference cannot possibly be understood without a thorough knowledge of Deduction.

1867 | On a New List of Categories | W 2:58; CP 1.559

In an argument, the premises form a representation of the conclusion, because they indicate the interpretant of the argument, or representation representing it to represent its object. The premises may afford a likeness, index, or symbol of the conclusion. In deductive argument, the conclusion is represented by the premises as by a general sign under which it is contained. In hypotheses, something *like* the conclusion is proved, that is, the premises form a likeness of the conclusion. [—] That it is different with induction another example will show [—] the premisses are an index of the conclusion.

1878 | Deduction, Induction, and Hypothesis | CP 2.620

But, because all inference may be reduced in some way to *Barbara*, it does not follow that this is the most appropriate form in which to represent every kind of inference. On the contrary, to show the distinctive characters of different sorts of inference, they must clearly be exhibited in different forms peculiar to each. *Barbara* particularly typifies deductive reasoning; and so long as the is is taken literally, no inductive reasoning can be put into this form. *Barbara*, is, in fact, nothing but the application of a rule. The so-called major premiss lays down this rule; as, for example, *All men are mortal*. The other or minor premiss states a case under the rule; as, *Enoch was a man*. The conclusion applies the rule to the case and states the result: Enoch is mortal. All deduction is of this character; it is merely the application of general rules to particular cases.

1878 | Deduction, Induction, and Hypothesis | CP 2.643

We may say, therefore, that hypothesis produces the *sensuous* element of thought, and induction the *habitual* element. As for deduction, which adds nothing to the premisses, but only out of the various facts represented in the premisses selects one and brings the attention down to it, this may be considered as the logical formula for paying attention, which is the *volitional* element of thought, and corresponds to nervous discharge in the sphere of physiology.

1892 | The Law of Mind | CP 6.144-147

The three main classes of logical inference are Deduction, Induction, and Hypothesis. These correspond to three chief modes of action of the human soul. In deduction the mind is under the dominion of a habit or association by virtue of which a general idea suggests in each case a corresponding reaction. But a certain sensation is seen to involve that idea. Consequently, that sensation is followed by that reaction. That is the way the hind legs of a frog, separated from the rest of the body, reason, when you pinch them. It is the lowest form of psychical manifestation. [—]

Thus, by induction, a number of sensations followed by one reaction become united under one general idea followed by the same reaction; while, by the hypothetic process, a number of reactions called for by one occasion get united in a general idea which is called out by the same occasion. By deduction, the habit fulfills its function of calling out certain reactions on certain occasions.

The inductive and hypothetic forms of inference are essentially probable inferences, not necessary; while deduction may be either necessary or probable.

1896 [c.] | Lessons of the History of Science | CP 1.66

Deduction is that mode of reasoning which examines the state of things asserted in the premisses, forms a diagram of that state of things, perceives in the parts of that diagram relations not explicitly mentioned in the premisses, satisfies itself by mental experiments upon the diagram that these relations would always subsist, or at least would do so in a certain proportion of cases, and concludes their necessary, or probable, truth.

1900-05-20 | Smithsonian Institution letters | HP 2:877

Deduction is necessary inference, where we hold to the conclusion because we think we see clearly that the premisses could not, in any constitution of the universe be true without that conclusion being true along with them. Deduction relates to an ideal state of things in which

its premisses are absolutely true. Although all deduction is necessary inference, it may relate to probabilities. Thus, if I know the probability that any given man will die in December, and know the like for January and February, the sum of those three probabilites is *necessarily* the probability that he will die in a winter month. Probability is the ratio of the number of individuals in a species to the number of individuals in a genus over that species, within *a certain course of experience*. Deduction, not making any real observations, only observing our own premised ideas, can never ascertain what a probability really is, but only calculate what it would be supposing certain other probabilities are so and so.

1901 | On the Logic of Drawing History from Ancient Documents Especially from Testimonies (Logic of History) | CP 7.204

This appears to be in harmony with Kant's view of deduction, namely, that it merely explicates what is implicitly asserted in the premisses. This is what is called a half-truth. Deductions are of two kinds, which I call *corollarial* and *theorematic*. The corollarial are those reasonings by which all corollaries and the majority of what are called theorems are deduced; the theorematic are those by which the major theorems are deduced. If you take the thesis of a corollary, – i.e. the proposition to be proved, and carefully analyze its meaning, by substituting for each term its definition, you will find that its truth follows, in a straightforward manner, from previous propositions similarly analyzed. But when it comes to proving a major theorem, you will very often find you have need of a *lemma*, which is a demonstrable proposition about something outside the subject of inquiry; and even if a lemma does not have to be demonstrated, it is necessary to introduce the definition of something which the *thesis* of the theorem does not contemplate.

1901 | On the Logic of Drawing History from Ancient Documents Especially from Testimonies (Logic of History) | CP 7.207

… deduction professes to show that certain admitted facts could not exist, even in an ideal world constructed for the purpose, either without the existence of the very fact concluded, or without the occurrence of this fact in the long run in that proportion of cases of the fulfilment of certain objective conditions in which it is concluded that it will occur, or in other words, without its having the concluded objective probability. In either case, deductive reasoning is necessary reasoning, although, in the latter case, its subject matter is probability.

1902 | Minute Logic: Chapter I. Intended Characters of this Treatise | MS [R] 425:120-121

Arguments are of three kinds, *Deduction*, *Induction*, and what I call *Abduction* [—] If the

facts directly asserted in the argument compell or tend to compell the fact asserted in the conclusion, so that the inference takes place by force, the argument is Deductive.

From early/discarded draft

1902 [c.] | Minute Logic: Chapter I. Intended Characters of this Treatise | CP 2.96

Argument is of three kinds: *Deduction*, *Induction*, and *Abduction* (usually called adopting a hypothesis). An Obsistent Argument, or *Deduction*, is an argument representing facts in the Premiss, such that when we come to represent them in a Diagram we find ourselves compelled to represent the fact stated in the Conclusion; so that the Conclusion is drawn to recognize that, quite independently of whether it be recognized or not, the facts stated in the premisses are such as could not be if the fact stated in the conclusion were not there; that is to say, the Conclusion is drawn in acknowledgment that the facts stated in the Premiss constitute an Index of the fact which it is thus compelled to acknowledge. All the demonstrations of Euclid are of this kind. Deduction is Obsistent in respect to being the only kind of argument which is compulsive.

1903 | Harvard Lectures on Pragmatism: Lecture V | CP 5.145

These three kinds of reasoning are Abduction, Induction, and Deduction. Deduction is the only necessary reasoning. It is the reasoning of mathematics. It starts from a hypothesis, the truth or falsity of which has nothing to do with the reasoning; and of course its conclusions are equally ideal. The ordinary use of the doctrine of chances is necessary reasoning, although it is reasoning concerning probabilities.

1903 | Harvard Lectures on Pragmatism: Lecture V, a deleted passage | PPM 276-277

Now, I said, Abduction, or the suggestion of an explanatory theory, is inference through an Icon, and is thus connected with Firstness; Induction, or trying how things will act, is inference through an Index, and is thus connected with Secondness; Deduction, or recognition of the relations of general ideas, is inference through a Symbol, and is thus connected with Thirdness. [—] But my connection of Abduction with Firstness, Induction with Secondness, and Deduction with Thirdness was confirmed by my finding no essential subdivision of Abductions, that Induction split at once, into the Sampling of Collections, and the Sampling of Qualities, while in the logic of relatives the three figures of syllogism gain a reality which is not so easily perceived in non-relative syllogism but really exists there also.

1903 | Harvard Lectures on Pragmatism: Lecture VI | CP 5.161-162

… In deduction, or necessary reasoning, we set out from a hypothetical state of things which we define in certain abstracted respects. Among the characters to which we pay no attention in this mode of argument is whether or not the hypothesis of our premisses conforms more or less to the state of things in the outward world. We consider this hypothetical state of things and are led to conclude that, however it may be with the universe in other respects, wherever and whenever the hypothesis may be realized, something else not explicitly supposed in that hypothesis will be true invariably. Our inference is valid if and only if there really is such a relation between the state of things supposed in the premisses and the state of things stated in the conclusion. Whether this really be so or not is a question of reality, and has nothing at all to do with how we may be inclined to think. If a given person is unable to see the connection, the argument is none the less valid, provided that relation of real facts really subsists. If the entire human race were unable to see the connection, the argument would be none the less sound, although it would not be humanly clear. Let us see precisely how we assure ourselves of the reality of the connection. Here, as everywhere throughout logic, the study of relatives has been of the greatest service. The simple syllogisms, which are alone considered by the old inexact logicians, are such very rudimentary forms that it is practically impossible to discern in them the essential features of deductive inference until our attention has been called to these features in higher forms of deduction.

All necessary reasoning without exception is diagrammatic. …

1903 | Harvard Lectures on Pragmatism: Lecture VI | CP 5.171

Abduction is the process of forming an explanatory hypothesis. It is the only logical operation which introduces any new idea; for induction does nothing but determine a value, and deduction merely evolves the necessary consequences of a pure hypothesis.

Deduction proves that something *must* be; Induction shows that something *actually is* operative; Abduction merely suggests that something *may be*.

1903 | Lowell Lectures on Some Topics of Logic Bearing on Questions Now Vexed. Eighth Lecture, Abduction | CP 5.590

If we are to give the names of Deduction, Induction, and Abduction to the three grand classes of inference, then Deduction must include every attempt at mathematical demonstration, whether it relate to single occurrences or to “probabilities,” that is, to statistical ratios; Induction must mean the operation that induces an assent, with or without quantitative modification, to a proposition already put forward, this assent or modified assent being regarded as the provisional result of a method that must ultimately bring the truth to light; while Abduction must cover all the operations by which theories and

conceptions are engendered.

1903 | Syllabus: Nomenclature and Division of Triadic Relations, as far as they are determined | EP 2:297-298; CP 2.267-268

A *Deduction* is an argument whose Interpretant represents that it belongs to a general class of possible arguments precisely analogous which are such that in the long run of experience the greater part of those whose premisses are true will have true conclusions. Deductions are either *Necessary* or *Probable*. Necessary Deductions are those which have nothing to do with any ratio of frequency, but profess (or their interpretants profess for them) that from true premisses they must invariably produce true conclusions. A Necessary Deduction is a method of producing Dicent Symbols by the study of a diagram. It is either *Corollarial* or *Theorematic*. A Corollarial Deduction is one which represents the conditions of the conclusion in a diagram and finds from the observation of this diagram, as it is, the truth of the conclusion. A Theorematic Deduction is one which, having represented the conditions of the conclusion in a diagram, performs an ingenious experiment upon the diagram, and by the observation of the diagram, so modified, ascertains the truth of the conclusion. Probable Deductions, or more accurately, Deductions of Probability, are Deductions whose Interpretants represent them to be concerned with ratios of frequency. They are either *Statistical Deductions* or *Probable Deductions Proper*. A Statistical Deduction is a Deduction whose Interpretant represents it to reason concerning ratios of frequency, but to reason concerning them with absolute certainty. A Probable Deduction proper is a Deduction whose Interpretant does not represent that its conclusion is certain, but that precisely analogous reasonings would from true premisses produce true conclusions in the majority of cases, in the long run of experience.

1903 | Graphs, Little Account [R] | MS [R] S27:1

Deduction is that kind of inference in which the fact expressed in the conclusion is inferred from the facts expressed in the premisses, regardless of the manner in which these facts have come to the reasoner’s notice. Deduction is either necessary or probable.

1905 | Letters to Mario Calderoni | CP 8.209

… there are but three elementary kinds of reasoning. … The second kind of reasoning is *deduction*, or necessary reasoning. It is applicable only to an ideal state of things, or to a state of things in so far as it may conform to an ideal. It merely gives a new aspect to the premisses. It consists in constructing an image or diagram in accordance with a general precept, in observing in that image certain relations of parts not explicitly laid down in the

precept, and in convincing oneself that the same relations will always occur when that precept is followed out. For example, having convinced ourselves of the truth of the *pons asinorum* with the aid of a diagram drawn with a common lead pencil, we are quite sure it would be the same with a diagram drawn in red; and a form of syllogism which is certain in black is equally so in red. A phenomenon having been observed in a laboratory, though we may not know on what conditions it depends, yet we are quite sure that it would make no difference whether the number of degrees of the longitude of the planet Eros just one week previous were a prime or composite number. [—] Deduction is certain but relates only to ideal objects.

1906 [c.] | Suggestions for a Course of Entretiens leading up through Philosophy to the Questions of Spiritualism, Ghosts, and finally to that of Religion | MS [R] 876:3-4

The second kind of reasoning is Deduction. This is necessary reasoning. That is it makes the truth of the conclusion whensoever the premisses may be true, to be *evident*. The premisses, in so far as they determine the character of the conclusion, are merely hypothetical. The evidence consists in the fact that the state of things which they *suppose* is fully diagrammatized so that one can *see* that a modification which adds nothing to the supposed condition connects the premisses into the conclusion.

1907 | Second Talk to the Phil. Club [and] Second Talk. On Deduction | MS [R] 754

Several years reconsideration leads to this new definition. Not *necessary* but *compulsive* reasoning. [—] Deduction points to the premisses & to their relation & then shakes its fist in your face and tells you "By the eternal powers, you have *got to* admit the conclusion.["] [—] Compulsive means that you are logically forced to admit the conclusion.

1908 | A Neglected Argument for the Reality of God | CP 6.470-472

… constitutes the Second Stage of Inquiry. For its characteristic form of reasoning our language has, for two centuries, been happily provided with the name Deduction.

Deduction has two parts. For its first step must be by logical analysis to Explicate the hypothesis, i.e. to render it as perfectly distinct as possible. This process, like Retroduction, is Argument that is not Argumentation. But unlike Retroduction, it cannot go wrong from lack of experience, but so long as it proceeds rightly must reach a true conclusion. Explication is followed by Demonstration, or Deductive Argumentation. Its procedure is best learned from Book I of Euclid's *Elements*, a masterpiece which in real insight is far superior to Aristotle's *Analytics*; and its numerous fallacies render it all the more instructive to a

close student. …

The purpose of Deduction, that of collecting consequents of the hypothesis, having been sufficiently carried out, the inquiry enters upon its Third Stage …

1908 | A Neglected Argument for the Reality of God | CP 6.472-473

Concerning the question of the nature of the logical validity possessed by Deduction, Induction, and Retroduction, which is still an arena of controversy, I shall confine myself to stating the opinions which I am prepared to defend by positive proofs. The validity of Deduction was correctly, if not very clearly, analyzed by Kant. This kind of reasoning deals exclusively with Pure Ideas attaching primarily to Symbols and derivatively to other Signs of our own creation; and the fact that man has a power of Explicating his own meaning renders Deduction valid.

1910 [c.] | On the Three Kinds of Reasoning [R] | MS [R] 755:5

By *deduction* I mean that kind of reasoning which if it be sound, and if its premisses are true, renders its conclusion *certain*.

1911 | A Logical Criticism of the Articles of Religious Belief | MS [R] 856:2

By Deduction, or mathematical reasoning, I mean any reasoning which will render its conclusion as certain as its Premisses, however certain these may be.

1913 | Letters to F. A. Woods | CP 8.385-387

I have always, since early in the sixties, recognized three different types of reasoning, viz: 1st, *Deduction* which depends on our confidence in our ability to analyze the meanings of the signs in or by which we think; 2nd, *Induction*, which depends upon our confidence that a run of one kind of experience will not be changed or cease without some indication before it ceases; and 3rd, *Retroduction*, or Hypothetic Inference, which depends on our hope, sooner or later, to guess at the conditions under which a given kind of phenomenon will present itself.

Each of these three types occurs in different forms requiring special studies.

From the 1st type to the 3rd the security decreases greatly, while the uberty as greatly

increases …

nd | Logic: Fragments [R] | MS [R] S64

There are three stages of inquiry, demanding as many different kinds of reasoning governed by different principles. They are,

1, *Retroduction*, forming an explanatory hypothesis[;]
2, *Deduction*, tracing out the consequences that would ensue upon the truth or falsity of that hypothesis; and
3, *Induction*, the experimental testing of the hypothesis by inquiring whether its consequences are born out by fact, or not.