Retroduction

1896 [c.] | Lessons of the History of Science | CP 1.81

It is certain that the only hope of retroductive reasoning ever reaching the truth is that there may be some natural tendency toward an agreement between the ideas which suggest themselves to the human mind and those which are concerned in the laws of nature.

1896 [c.] | Lessons of the History of Science | CP 1.65

There are in science three fundamentally different kinds of reasoning, Deduction (called by Aristotle {synagögé} or {anagögé}), Induction (Aristotle's and Plato's {epagögé}) and Retroduction (Aristotle's {apagögé}, but misunderstood because of corrupt text, and as misunderstood usually translated *abduction*). Besides these three, Analogy (Aristotle's {paradeigma}) combines the characters of Induction and Retroduction.

1896 [c.] | Lessons of the History of Science | CP 1.68

Retroduction is the provisional adoption of a hypothesis, because every possible consequence of it is capable of experimental verification, so that the persevering application of the same method may be expected to reveal its disagreement with facts, if it does so disagree.

1898 | Cambridge Lectures on Reasoning and the Logic of Things: Philosophy and the Conduct of Life | RLT 110-111

Reasoning is of three kinds. The first is necessary, but it only professes to give us information concerning the matter of our own hypotheses and distinctly declares that, if we want to know anything else, we must go elsewhere. The second depends upon probabilities. The only cases in which it pretends to be of value is where we have, like an insurance company, an endless multitude of insignificant risks. Wherever a vital interest is at stake, it clearly says, "Don't ask me." The third kind of reasoning tries what il lume naturale, which lit the footsteps of Galileo, can do. It is really an appeal to instinct. Thus reason, for all the frills [it] customarily wears, in vital crises, comes down upon its marrow-bones to beg the succour of instinct.

1898 | Cambridge Lectures on Reasoning and the Logic of Things: Types of Reasoning | RLT 141-142

We see three types of reasoning. The first figure empraces all Deduction whether necessary of

probable. [—] The third figure is Induction by means of which we ascertain how often in the ordinary course of experience one phenomenon will be accompanied by another. No definite probability attaches to the Inductive conclusion, such as belongs to the Deductive conclusion; but we can calculate how often inductions of given structure will attain a given degree of precision. The second figure of reasoning is Retroduction. Here, not only is there no definite probability to the conclusion, but no definite probability attaches even to the mode of inference. We can only say that the Economy of Research prescribes that we should at a given stage of our inquiry try a given hypothesis, and we are to hold to it provisionally as long as the facts will permit. There is no probability about it. It is a mere suggestion which we tentatively adopt.

... the second figure reads:

Anything of the nature of M would have the character {p}, taken haphazard,
S has the character {p};
∴ Provisionally, we may suppose S to be of the nature of M.

Still more convenient is the following conditional form of statement:

If {m} were true, {p}, {p}', {p}" would follow as miscellaneous consequences -
But {p}, {p}', {p}" are in fact true;
∴ Provisionally, we may suppose that {m} is true.

This kind of reasoning is very often called *adopting a hypothesis for the sake of its explanation of known facts*.

This probable reasoning in the second figure is, I apprehend, what Aristotle meant by {apagögé}. There are strong reasons for believing that in the chapter on the subject in the Prior Analytics, there occurred one of those many obliterations in Aristotle's MS. due to its century long exposure to damp in a cellar, which the blundering Apellicon, the first editor, filled up with the wrong word. Let me change but one word of the text, and the meaning of the whole chapter is metamorphosed in such a way that it no longer breaks the continuity of the train of Aristotle's thought [—] Supposing this view to be correct, {apagögé} should be translated not by the word *abduction*, as the custom of the translators is, but rather by reduction or *retroduction*. In these lectures I shall generally call this type of reasoning *retroduction*.

I first gave this theory in 1867, improving it slightly in 1868. In 1878 I gave a popular account of it in which I rightly insisted upon the radical distinction between Induction and Retroduction. In 1883, I made a careful restatement with considerable improvement. But I was led away by trusting to the perfect balance of logical breadth and depth into the mistake of treating Retroduction as a kind of Induction. [—] In 1892 I gave a good statement of the rationale of Retroduction but still failed to perceive the radical difference between this and Induction, although earlier it had been clear enough to my mind.

1898 | Cambridge Lectures on Reasoning and the Logic of Things: The First Rule of Logic | RLT 170; CP 5.581

As for retroduction, it is itself an experiment. A retroductive research is an experimental research; and when we look upon Induction and Deduction from the point of view of Experiment and Observation, we are merely tracing in those types of reasoning their affinity to Retroduction. [—] To return to Retroduction, then, it begins with Colligation. Something corresponding to Iteration may or may not take place. And then comes an Observation. Not, however, an External observation of the objects as in Induction, nor yet an observation made upon the parts of a Diagram, as in Deduction; but for all that just as truly an observation. [—] The act of observation is the deliberate yielding of ourselves to that *force majeure*, - an early surrender at discretion, due to our foreseeing that we must, whatever we do be borne down by that power, at last. Now the surrender which we make in Retroduction, is a surrender to the Insistence of an Idea. The hypothesis, as the Frenchman says, *c'est plus fort que moi*. It is irresistible; it is imperative. We must throw open our gates and admit it at any rate for the time being.

1906 [c.] | Reasoning [R] | MS [R] 753:3

Retroductive reasoning is the only one of the three which produces any new idea. It originates a theory.

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] 876:2-3

Retroduction is the passage of the mind from something observed or attentively considered to the representation of a state of things that may explain it. Its conclusion is usually regarded as a more or less likely conjecture; but it may be a mere suggestion of a question or, on the other hand, it may be the most confident of convictions. The essential point is that the consideration of what is observed or known produces some representation of something not so known. This kind of reasoning is justified by two propositions taken together. One is that man's mind which is a natural product formed under the influences which have developed Nature (here understood as including all that is artificial,) has a natural tendency to think as Nature tends to be. This must be so if man is ever to attain any truth not directly given in perception; and that he is to attain some such truth he cannot consistently, nor at all, deny. The other proposition is that no other process of deriving one judgment from another can ever give any substantial addition to his knowledge; so that, if he is to reason at all, we must assume that this kind of reasoning succeeds often enough to make it worth while; since it certainly is not worth while to leave off reasoning altogether.

1907 | Pragmatism | MS 318:21-3

...*Retroduction*, or that process whereby from a surprising array of facts we are led to a conjectural theory to account for them. Many logicians refuse to call this last 'inference', because its conclusion is so extremely problematical as to amount to little more than an interrogation. I am sure they are wrong,

however: they have not possessed themselves of the true scientific definition of 'inference'. The logical justification of a retroduction, of which the proper conclusion is that the conjectured state of things is "likely," in the vague sense of tending to resemble the real state of things, consists in the two-fold truth that in case the conjectured state of things should closely resemble the real state of things, then the acceptance of the vague proper conclusion will prove of some considerable advantage in the conduct of further inquiry, even if not also (as usually will be the case,) in some future practical conduct; while, on the other hand, should the conjectured state of things be markedly in contrast to the real state of things, the acceptance of the same proper conclusion would bring comparatively little disadvantage.

In a footnote, Peirce states that he has chosen to employ the term 'retroduction' instead of 'abduction' in order to avoid certain scholarly disputes regarding the *Second Prior Analytics*.

1908 | A Neglected Argument for the Reality of God | CP 6.469-470

The inquiry begins with pondering these phenomena in all their aspects, in the search of some point of view whence the wonder shall be resolved. At length a conjecture arises that furnishes a possible Explanation, by which I mean a syllogism exhibiting the surprising fact as necessarily consequent upon the circumstances of its occurrence together with the truth of the credible conjecture, as premises. On account of this Explanation, the inquirer is led to regard his conjecture, or hypothesis, with favor. As I phrase it, he provisionally holds it to be "Plausible"; this acceptance ranges in different cases – and reasonably so – from a mere expression of it in the interrogative mood, as a question meriting attention and reply, up through all appraisals of Plausibility, to uncontrollable inclination to believe. The whole series of mental performances between the notice of the wonderful phenomenon and the acceptance of the hypothesis, during which the usually docile understanding seems to hold the bit between its teeth and to have us at its mercy, the search for pertinent circumstances and the laying hold of them, sometimes without our cognizance, the scrutiny of them, the dark laboring, the bursting out of the startling conjecture, the remarking of its smooth fitting to the anomaly, as it is turned back and forth like a key in a lock, and the final estimation of its Plausibility, I reckon as composing the First Stage of Inquiry. Its characteristic formula of reasoning I term Retroduction, *i.e.* reasoning from consequent to antecedent. In one respect the designation seems inappropriate; for in most instances where conjecture mounts the high peaks of Plausibility – and is *really* most worthy of confidence – the inquirer is unable definitely to formulate just what the explained wonder is; or can only do so in the light of the hypothesis. In short, it is a form of Argument rather than of Argumentation.

Retroduction does not afford security. The hypothesis must be tested.

1908 | A Neglected Argument for the Reality of God | CP 6.475

Finally comes the bottom question of logical Critic, What sort of validity can be attributed to the First Stage of inquiry? Observe that neither Deduction nor Induction contributes the smallest positive item to the final conclusion of the inquiry. They render the indefinite definite; Deduction Explicates; Induction evaluates: that is all. Over the chasm that yawns between the ultimate goal of science and such ideas of Man's environment as, coming over him during his primeval wanderings in the forest, while yet his very notion of error was of the vaguest, he managed to communicate to some fellow, we

are building a cantilever bridge of induction, held together by scientific struts and ties. Yet every plank of its advance is first laid by Retroduction alone, that is to say, by the spontaneous conjectures of instinctive reason; and neither Deduction nor Induction contributes a single new concept to the structure. Nor is this less true or less important for those inquiries that self-interest prompts.

1908 [c.] | A Neglected Argument for the Reality of God (G) | MS [R] 842: 29-30

... Another question to be noted for later consideration is whether this first step in inquiry can conclude, if it can be called "concluding," otherwise than in the interrogative mood, if grammarians will acknowledge such a mood. Certain it is that if a series of experience does no more than suggest an idea interrogatively, the mere occurrence of the suggestion, warrants us in regarding the movement of thought as having the essential character of this first stage of inquiry. I call this mode of inference, or, if you please, this step toward inference, in which an explanatory hypothesis is first suggested, by the name of *retroduction*, since it regresses from a consequent to a hypothetical antecedent. But while this explains why I have selected the vocable 'retroduction' to express my meaning, I claim the right, as inventor of the term, to make its definition to be, the passage of thought from experiencing something, E, to predicating a concept of the mind's creating; the subject of the predication being a specified class to which E belongs, or an indefinite part of such class.

The second stage of inquiry consists in deducing the consequences of the retroductive hypothesis. The word "retroductive," however, is surplusage; for every hypothesis, however arbitrary, is suggested by something observed, whether externally or internally and such suggestion is, from a purely logical point of view, retroduction.

1908 [c.] | A Neglected Argument for the Reality of God (G) | CP 2.755

Retroduction and Induction face opposite ways. The function of retroduction is not unlike those fortuitous variations in reproduction which played so important a *rôle* in Darwin's original theory. In point of fact, according to him every step in the long history of the development of the moner into the man was first taken in that arbitrary and lawless mode. Whatever truth or error there may be in that, it is quite indubitable, as it appears to me, that every step in the development of primitive notions into modern science was in the first instance mere guess-work, or at least mere conjecture. But the stimulus to guessing, the hint of the conjecture, was derived from experience. The order of the march of suggestion in retroduction is from experience to hypothesis.

1910 [c.] | Letters to Paul Carus | CP 8.238

As for the validity of the hypothesis, the retroduction, there seems at first to be no room at all for the question of what supports it, since from an actual fact it only infers a *may-be* (*may-be* and *may-be not*). But there is a decided leaning to the affirmative side and the frequency with which that turns out to be an actual fact is to me quite the most surprising of all the wonders of the universe.

1910 [c.] | Letters to Paul Carus | CP 8.227-231

... the division of the elementary kinds of reasoning into three heads was made by me in my first lectures and was published in 1869 in Harris's *Journal of Speculative Philosophy*. I still consider that it had a sound basis. Only in almost everything I printed before the beginning of this century I more or less mixed up Hypothesis and Induction ... .

The general body of logicians had also at all times come very near recognizing the trichotomy. They only failed to do so by having so narrow and formalistic a conception of inference (as necessarily having formulated judgments for its premises) that they did not recognize Hypothesis (or, as I now term it, *retroduction*) as an *inference* ... .

When one contemplates a surprising or otherwise perplexing state of things (often so perplexing that he cannot definitely state what the perplexing character is) he may formulate it into a judgment or many apparently connected judgments; he will often finally strike out a hypothesis, or problematical judgment, as a mere possibility, from which he either fully perceives or more or less suspects that the perplexing phenomenon would be a necessary or quite probable consequence.

That is a retroduction. Now three lines of reasoning are open to him. [—]

Or, second, he may proceed still further to study the phenomenon in order to find other features that the hypothesis will *explain* (i.e. in the English sense of explain, to deduce the facts from the hypothesis as its necessary or *probable* consequences). That will be to continue reasoning retroductively, i.e., by hypothesis.

1910 [c.] | On the Three Kinds of Reasoning [R] | MS [R] 755:14

That kind of reasoning by which we are more or less inclined to believe in a theory because it explains facts that without the theory would be very surprising is what I call Retroduction, or reasoning from consequent to antecedent. To understand the legitimacy of this kind of reasoning (often and often as it deceives us,) is to understand the legitimacy, the truth-leading power of all reasoning.

1911 | Letter to J. H. Kehler | NEM 3:177-178

I am unable yet quite to *prove* that the three kinds of reasoning I mean are the *only* kinds of sound reasoning; though I can show reason to think that it can be proved, and *very strong* probable reasons for thinking that there is no fourth kind. I call the three, Deduction, Induction, and Retroduction; though the last only is a word invented by me.

A scientific inquiry must usually, if not always, begin with retroduction. An Induction can hardly be sound or at least is to be suspected usually, unless it has been preceded by a Retroductive reasoning to the same general effect.

1911 | Letter to J. H. Kehler | NEM 3:203-204

Skipping a great deal, I now take up the third great class of Reasonings, which I call Retroductions. [—] By the third class of reasonings one only infers that a certain state of things *may be* true and that the indications of its being so are sufficient to warrant further examination. [—] The reason for accepting the Retroductive conclusion, is that man must trust to his power of getting at the truth simply because it is all he has to guide him; and moreover when we look at the instincts of various animals, we are struck with wonder at how they lead those creatures toward rational behaviour. [—]

I do not, at present, feel quite convinced that any logical form can be assigned that will cover all "Retroductions". For what I mean by a Retroduction is simply a *conjecture* which arises in the mind.

1911 | Letter to J. H. Kehler | NEM 3:206

I consider Retroduction (a poor name) to be the most important kind of reasoning, notwithstanding its very unreliable nature, because it is the only kind of reasoning that opens up new ground. [—] Retroduction gives hints that come straight from our dear and adorable Creator. We ought to labour to cultivate this Divine privilege. It is the side of human intellect that is exposed to influence from on high. With this investigation starts. Having once formed a conjecture, the first thing to be done is to draw Deductions from it and compare them with observations. [—]

So Retroduction comes first and is the least certain and least complex kind of Reasoning.

1911 | A Logical Criticism of the Articles of Religious Belief | MS [R] 856:3-4

By Retroduction I mean that kind of reasoning by which, upon finding ourselves confronted by a state of things that, taken by itself, seems almost or quite incomprehensible, or extremely complicated if not very irregular, or at least surprising; we are led to suppose that perhaps there is, in fact, another definite state of things, because, though we do not perceive any unequivocal evidence of it, nor even of a part of it, (or independently of such evidence if it does exist,) we yet perceive that this supposed state of things would shed a light of reason upon that state of facts with which we are confronted, rendering it comprehensible, likely (if not certain,) or comparatively simple and natural.

1913 | Letters to F. A. Woods | CP 8.385-388

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 … .

I don't think the adoption of a hypothesis on probation can properly be called induction; and yet it is *reasoning* and though its *security* is low, its *uberty* is high.

nd | Lecture I | MS [R] 857: 4-5

The three kinds of reasoning may be designated by the letters A, B, C.

A is that process in which the mind goes over all the facts the case, absorbs them, digests them, sleeps over them, assimilates them, dreams of them, and finally is prompted to deliver them in a form, which, if it adds something to them, does so only because the addition serves to render intelligible what without it, is unintelligible. I have hitherto called this kind of reasonings which issues in explanatory hypotheses and the like, *abduction*, because I see reason to think that this is what Aristotle intended to denote by the corresponding Greek term '[apagoge]' in the 25th chapter of the 2nd Book of his Analytics [...] But since this, after all, is only conjectural, I have on reflexion decided to give this kind of reasoning the name of *retroduction* to imply that it turns back and leads from the consequent of an admitted consequence, to its antecedent. Observe, if you please, the difference of meaning between a *consequent* the thing led to, and a *consequence*, the general fact by virtue of which a given antecedent lead to a certain *consequent*.

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.

Retroduction

The recommendations of an explanatory hypothesis are
1st, verifiability; 2nd, simplicity; 3rd, economy.