Peirce's reading on Aristotle's account of induction

La lectura de Peirce en torno a la explicación aristotélica de la inducción

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Resumen

En varias oportunidades durante su vida, Peirce sostuvo que Aristóteles es el primero en presentar una forma perfecta de inducción y también afirmó que seguía a Aristóteles en esta formulación. A pesar de esto, Peirce critica la justificación de la inducción que da Aristóteles como una enumeración de todos los individuos y como una inferencia autoevidente e inmediata que depende de la intuición (*nous*). En este artículo, el autor explora la lectura y los comentarios que Peirce realiza de los dos pasajes más importantes de Aristóteles sobre la inducción (epagōgē), a saber, los *Analíticos Primeros* II, 23 y los *Analíticos Posteriores* II, 19. El primero es comentado y parcialmente traducido por Peirce; en cambio, el segundo no es mencionado directamente pero parece que se refiere a él cuando discute el mismo problema de los primeros principios. Además de presentar los comentarios de Peirce acerca de estos dos pasajes, el autor evalúa críticamente la exactitud de estos y encuentra que Peirce los interpreta erróneamente en algunas ocasiones.

Palabras Clave

Charles S. Peirce, Aristóteles, Inducción, epagōgē.

Abstract

On several occasions during his life, Peirce argued that Aristotle was the first to present a perfect form of induction, and also claimed that he followed Aristotle in this formulation. Despite this, Peirce criticizes Aristotle´s justification of induction as an enumeration of all individuals and as a self-evident and immediate inference that depends upon intuition (*nous*). In this article, the author explores the readings and comments that Peirce makes of the two most important passages of Aristotle on induction (epagōgē), namely, *Prior Analytics* II, 23 and *Posterior Analytics* II, 19. The first is commented and partially translated by Peirce whereas the second is not mentioned directly, although it seems that Peirce refers to it when he discusses the problem of first principles. In addition to presenting Peirce's comments about these two passages, the author evaluates critically their accuracy and finds that Peirce sometimes interprets them wrongly.

Key words

Charles S. Peirce, Aristotle, Induction, epagōgē.

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Several times along his life Peirce claimed Aristotle was the first one who presented a perfect form of induction and also claimed to follow Aristotle in this formulation. Although, Peirce's ideas of induction will go beyond the mere syllogistic account and the justification given by the Greek philosopher, and although Peirce's late account of induction is more diverse and useful than that of Aristotle, the influence of Aristotle`s concept of induction on Peirce is undeniable, and an exposition of Peirce's reading and commentaries on Aristotle`s ideas of induction is interesting for Peirce's scholars.

Peirce's commentaries on Aristotle's accounts of *epagōgē* (induction) are focused mainly on *Prior Analytics II 23.* Peirce complimented this formal account of induction as a perfect one, but at the same time, criticized this account on the basis that Aristotle tried to justify the validity of induction by way of complete enumeration. On the other hand, Peirce did not make an explicit commentary on the other Aristotle's important account of *epagōgē* in *Posterior Analytics* II 19. However, there is a passage in his *Minute Logic* of 1902 in which he dealt with Aristotle's theory of the origin of the first principles of demonstration, which is precisely the topic of the account in *Posterior Analytics II 19*. Peirce rejected completely Aristotle's explanation of the origin of principles. He did not accept, for instance, Aristotle's rejection of a regression to infinity; Peirce called it the paradox of cognition and considered to be fallacious.

This paper aims to expose Peirce's insight on Aristotle's theory of induction. In that extend it is an expositive paper. However, it also takes the chance to correct a customary and erroneous reading of Aristotle, which Peirce also held, namely that the Greek philosopher was an intuitionist with regard to the origin of the first principles of sciences.

Peirce's remarks of Aristotle's Prior Analytics II, 23

From as early as his lectures on the logic of science at Harvard in 1865 Peirce argued that Aristotle perfectly stated the form of an inductive syllogism in his account of *epagōgē* in *Prior Analytics II, 23 (See W1: 177, 179, 262-264; and MS 741, p11 ff.)*[1]. There, Aristotle stated the following: man, horse, and mule

[1] The works by Charles S. Peirce are cited and abbreviated as follows:
EP The Essential Peirce: Selected Philosophical Writings, edited by N. Houser and C. Kloesel, 2 vols. (Bloomington: Indiana University Press, 1992), followed by volume and page number.
CP Collected Papers of Charles Sanders Peirce, edited by C. Hartshorne, P. Weiss (volumes 1-6), and A. Burks (volume 7-8) (Cambridge, Mass.: Harvard University Press, 1931-58), followed by volume and paragraph number.
HP Historical Perspectives on Peirce's Logic of Science: A History of Science, edited by Carolyn Eisele, 2 vols. (Berlin: Mouton-de Gruyter, 1985), followed by volume and page number.
MS Peirce manuscripts in Houghton Library, followed by a Robin number and page number.
W Writings of Charles S. Peirce: A Chronological Edition, edited by Max Fisch et al. (Bloomington: Indiana University Press, 1982-), followed by volume and page number.

are long-lived; man, horse, and mule are without gall, therefore, what is without gall is long-lived. "This is truly an induction", said Peirce, "because it gathers particulars under a general principle" (W1:262-263).

This is a perfect form of induction, furthermore, because for Peirce the best way to expound an induction is through a syllogistic form. In the same way as the deductive syllogism can be formalized and its figure and mood can be identified, induction (and abduction too) can be formalized in a syllogistic structure. Peirce's translation of Aristotle's account of syllogistic induction is as follows: "Induction is opposed to [deductive] syllogism. For the latter, through the middle term, proves the extreme of the third; whereas the former (less exactly), through the third, the extreme of the middle" (MS 741, p. 11). Thus, the formal structure of a deductive syllogism is:

All M is P
All S is M
Therefore, All S is P

And the formal structure of an inductive argument is:

Some P is S
Some P is M
Therefore, All M is S

Peirce also explained it in the following way. All inference has a rule, a case, and a result. A deductive syllogism consists in a case subsumed in a rule in order to infer a result. Induction is the inference of the rule by means of the result and case as premises (Cf. W3:324-327 (Deduction, Induction and Hypothesis, 1878)). Hypothesis (abduction) is the inference of the case by means of the result and rule as premises. In short, induction and hypothesis consist in the inversion of the order among rule, case and result. As a consequence, an induction can be reduced to an explanatory deductive syllogism, when the inferred rule works as major premises in deductive syllogism (W1:180). This is shown by Peirce with an example identical to that of Aristotle:

All Cloven footed animals are herbivora	Rule
Neat deer are cloven-footed	Case
Therefore, neat deer are herbivora	Result

And the corresponding inductive syllogism:

Neat deer are herbivora	Result
Neat deer are cloven-footed	Case
Therefore, all cloven-footed animals are herbivora	Rule

This example is identical to Aristotle's because Peirce used the same qualities of the terms, especially the middle term. The middle term is the most important term in every inference, not only deduction but induction and abduction too. In the above mentioned examples of induction, Aristotle used "man, horse, and mule", whereas Peirce used "neat deer". This kind of term is denominated by Peirce as "enumerative", for obvious reasons.

The example of induction in *Prior Analytics II 23* is, therefore, a perfect form of induction, from Peirce's point of view. However, although it presents a perfect form of induction, such an account presents two problems. Peirce said: "This doctrine as far as it goes, is quite correct. But to it Aristotle adds two assertions that are mistaken and which I will state presently, as soon as I have made some improvements upon this correct but not sufficiently definite statement" (MS 764, 14; see also W1: 179 and W1:264). The two mistakes, according to Peirce, are the limitation of the form of induction to only one mood and figure, and the justification of induction based on the enumeration of all particulars. The first of these mistakes, Peirce argued, is that inductive inference cannot be limited to the first figure (of the explaining deductive syllogism); rather, it can function in the second and third figures as well.

> [T]his being the proper form of induction in the syllogistic system, it is clear that Aristotle has left a great gap in his account of the matter… It is clear therefore that Aristotle conceives of no other induction than that which is derived from the major premise of the first figure. Now there is only one kind of induction which can be thrown into this form, and this is not other than induction by simple enumeration. Bacon, therefore, was right when he said that Aristotle gave the rules for this form only (W1:265).

Peirce, therefore, extended the forms of induction to the second and third figures[2]. The inductive syllogism that Aristotle presented in *Prior*

[2] Peirce, along with Aristotle, thought that the deductive syllogism has only three figures.

Analytics II 23 is, according to Peirce, a derivation from the first figure of the deductive argument, as the following chart shows:

Table 1. Derivation of the Inductive syllogism from the first figure deductive syllogism

DEDUCTIVE SYLLOGISM		INDUCTIVE SYLLOGISM	
Figure 1 DARII Mood: AII	All cloven-footed animals are herbivora. Neat and deer are cloven-footed. Therefore, neat and deer are herbivora.	Figure: 3 Mood: IIA	Neat and deer are herbivora. Neat and deer are cloven-footed. All cloven-footed animals are herbivora.

Inductive syllogisms in the other two figures are as follows:

Table 2. Derivation of the inductive syllogism from the second figure deductive syllogism (See W1: 266)

DEDUCTIVE SYLLOGISM		INDUCTIVE SYLLOGISM	
AEE-2 CAMENES	All cloven –footed are herbivora. No rats, dogs, apes are herbivora. Therefore, no rats, dogs, and apes are cloven-footed.	EEA-3	No rats, dogs, apes are herbivora. No rats, dogs, and apes are cloven-footed. All cloven –footed are herbivora.
AII-3 DATISI	All cloven-footed animals are herbivora Some cloven-footed animals are ruminants. Therefore, some ruminants are herbivora.	IIA-1	Some ruminants are herbivora. Some cloven-footed animals are ruminants. All cloven-footed animals are herbivora.

Peirce was not trying to reduce inductive syllogisms to the deductive ones. The fact that Peirce derived the figures of an inductive syllogism from the modes of a valid deductive syllogism does not mean that he was attempting a deductivist account of induction. He was just trying to show that there is a symmetrical system of syllogisms and that if induction provides explicative rules that can be applied later to a deductive syllogism, then induction is more probably to be valid. In fact, the first rule that Peirce postulated in order for an induction be valid is

that its explaining syllogism must be valid as well (See CP 2. 511; CP 2. 712 On The Natural Classification of Arguments (1867, 1893)). Therefore, there will be as many different kinds of induction as there are different kinds of valid deductive syllogism (CP 2. 512).

Thus, since the main feature of induction is its ability to explain particular facts through an inference of the general rule, one of the few requirements for an induction to work is that the inferred rule or major premise be universal. All moods in the first figure have universal rules (**A**AA, **E**AE, **A**II, **E**IO), therefore any inductive syllogism that can be reduced and explained through one of those forms (W1: 429) is a valid induction. Likewise, since any of the other two figures can be reduced to the first figure (for instance, Camestres and Cesare can be reduced to Celarent), and since, as he noted an inductive syllogism can be explained for any mood in the first figures, then "it is obvious that the explaining syllogism of an induction or hypothesis may be of any mood or figure" (CP 2. 512; see also W 1:428-434).

From this, Peirce concluded that there is an inductive form for each valid deductive syllogism. However, a detailed look at each of the possible forms of induction shows that there are two deductive syllogisms that do not fulfill the requirements for an induction. Peirce took the major premise of a deductive syllogism as a rule, which should be inferred in an induction. In order that the induction be valid as induction (that is, not necessarily true from the truth of the premises) the rule that is inferred should be universal or at least general. However, it seems to me that Peirce did not notice that in the third figure there are two syllogisms with particular rules. They are Bocardo and Disamis. Thus, although Peirce claimed that all valid syllogisms can work as referents to induction, I think these two valid syllogisms contradict his claim.

In short, from Peirce's first considerations about induction, it is possible to conclude that although he regarded it valid, although in a different way than deduction, he appraised induction for its capacity for enlarging knowledge and for explicating the general characteristics of a class. Its validity is assured as long as it infers a universal rule of a valid deductive syllogism; hence, all valid deductive syllogisms can be reduced into induction except, from my point of view, Bocardo and Disamis.

Peirce's second critique of Aristotle's account of induction in *Prior Analytics II 23* regards Aristotle's argument on behalf of the validity of the

inductive syllogism. In the final lines of that account, Aristotle claimed that the validity of induction lies in the enumeration of all particulars. Peirce's translation of those final lines is as follows: "but we must regard C (the middle term from which the others are united) as made up of all the individuals, for the induction has its inference from all" (MS 341, 4; W1:177). From this, it seems that the example 'man, horse, mule' means all men, horses, and mules.

Peirce rejected this justification of induction due to the reasons he expresses in the following paragraph, which, for importance and clarity, I will present in its entirety. The passage has two versions in Peirce's manuscripts, although both belong to the same year (1865) and were written with the same purpose of being read during his Harvard Lectures. Therefore, I am going to transcribe what seems to be the last version and, I will indicate in parentheses the features of the earlier version:

> That induction is only through complete (simple) enumeration; or at least, that there is such an induction is the doctrine of all logicians. I object to this, however, *in toto*. Aristotle evidently supposes that a general term is equal to a sum of singulars (all individuals) and that we can say this man, that man, and that man are all men. (But this is easily refuted. Singulars are not symbols but only signs. If they have extension they have certainly no intension. By that I mean that their truth does not depend on any quality of the object. For instance, if I name a girl Richard, Richard is her name previous usage notwithstanding. Owing to this meaninglessness, singulars come under general terms only by accident, not by implication of the words themselves). But the extension (comprehension) of a universal (general) term consists in the total of all *possible* things to which it is applicable and not merely of those which are found to (actually) occur. (So that singulars never can fill up this extension. 'All men,' in logic, means man in general). Thus all men means strictly man in general. And even supposing all men now in existence were enumerated, how could I enumerate all the men who have been, far less the men who are to be? (I might perhaps enumerate all the men who have been, but I never can know that I have enumerated all who are to be… In short, the logic comprehension is a total of possible and possible have no total enumeration…. It follows that this complete datum of induction which has

> always been taken for granted by pure logicians, is not within the range of logical possibility. And inasmuch as all logical explanations of induction have been based upon this postulate, the real explanation can never been reached) (W1:263-264 with a former version in W1:177-178).

Peirce's rejection of a complete enumeration as the justification of induction is based on the nature of the terms. He stated that every term can have extension and intension. The extension indicates the objects that the term refers to, whereas intention refers to the meaning. A universal or general term, said Peirce, has a large extension but a short intension, whereas a particular symbol has a short extension and a large intension or none[3]. The large extension of a universal term indicates all possible objects, not just all actual objects referred to for the term. Aristotle's mistake, according to Peirce, is that he thought that the large extension of a universal term inferred in the conclusion of an induction indicates all actual objects. Thus, the universal term "man", for Peirce, indicates all possible men, whereas that, for Aristotle, indicates all actual men.

Peirce rejected the enumeration of all particulars as the justification of induction because the total enumeration is utopian and unable to be enacted. To enumerate all men that have been is already utopian, and to enumerate all men who are to be is senseless. It is as if say that it is necessary to be present at the death of every single human being, present, and future, in order to validate the assumption that 'all men are mortal'. Likewise, Peirce asked, how can the moment in which the totality is reached be noted? Peirce said "we never can know how great a part of the whole of nature we have discovered" (EP 1:76).

The problem of enumeration, says Peirce, is that it leads us to misunderstand the meaning of generality in symbols (terms) and statement (propositions). Generality does not depend upon the total enumeration of the element that actually contains, rather, it depends upon "all possible things to which it is applicable". Therefore, the validity of induction lies in possibility rather than in necessity; this means that the universality of an inductive inference is not supported in the revision of every single singular to which it refers, but to the total of all possibilities. If induction were based on the total enumeration of all individuals, then it would be a perfect induction closer to deduction (Cf.

[3] The particular terms of the premises are not symbols for Peirce. They are enumerative terms whose sum of intentions makes no sense. The enumerative terms are only indices that stand for existent things without a particular quality.

CP 2. 734; 757) due to its necessary inferences. Peirce said: "For what is called 'complete enumeration' is not inductive reasoning, but is logistic deduction" (MS 842, 51). If it were possible to say that all individuals of a limited group are of certain nature, then it would be as valid and necessary to say that some member is of that nature, as deduction infers the truth of the conclusion from the truth of the premises.

Nevertheless, induction infers probably and not apodictically, and this happens because most of the time it is impossible to determine the nature of each member of the class. In groups with infinite members or groups whose members are not all actual, the generalization of one of their characteristics is probable and possible. "Logical comprehension is a total of possibles and possibles have no total enumeration" (W1:178 (Harvard lectures 1865). MS 341, 4). For this reason, Peirce emphasized two characteristics of inductive reasoning, namely that it obtains successful results in the long run and that it will be self-correcting over the course of a long period of time.

In a further writing, perhaps from the 1900s or later, Peirce reevaluated this critique of Aristotle's justification of induction. Here, Peirce said that Aristotle could not have meant to say "all particulars" but "all we know". We already have shown the difficulties of reading a complete enumeration into Aristotle's account and we have just considered Peirce's disbelief in the complete enumeration as the warranty of induction. Peirce seemed to realize that Aristotle could not have said that induction is justified in a complete enumeration and accused other logicians of such an interpretation:

> He [Aristotle] doubtless means from all which one has sufficient knowledge although lots of logicians, I suppose the majority, understand him to mean all there are and call an argument which concludes something to be true of all of a class by making the premises enumerate every instance of the class, this I say they call a "perfect induction". This is not an adduction (induction) at all. It is so a necessary inference and therefore deductive, i.e. supposing a premiss to state, as Sir Hamilton, per example, requires that the instances are a complete list of members of the class.
>
> But understanding Aristotle to mean as I say all the instances of which the reasoner has sufficient knowledge to use them at all, or all he remembers, then the reasoning is what I should call "crude adduction" (MS764, 75-76).

In conclusion, Peirce's account of Prior An. II 23 can simply be summarized as follows: Aristotle stated the perfect form of an inductive syllogism, even though he limited it to one mood and figure, and even though he justified its validity in the enumeration of particulars. To these two Aristotelian mistakes, Peirce answered that induction can have as many moods and figures as there are valid deductive syllogisms, and that enumeration of all particulars is a useless justification. Perhaps what Aristotle meant, said Peirce, was a complete enumeration of all known objects.

Peirce's remarks on Aristotle's Posterior Analytics II 19

Except for *Prior Analytics* II 23, Peirce did not comment explicitly on any other of Aristotle's accounts of *epagōgē*. He did, nonetheless, mention the problem of the origin of first principles in Aristotle's philosophy, which can be seen as an implicit reference to Aristotle's account of *epagōgē* in *Posterior Analytics* II, 19. In his *Minute Logic* of 1902, Peirce discussed various philosophers' answers to the problem of the origins of the principles of logic. Among other historical answers, Peirce included the light of reason, or intuition from a rationalistic point of view, and pointed out that Aristotle belongs somewhat to this group[4].

However, although Peirce classified Aristotle among the philosophers who maintained an intuitive origin of the first principles, he claimed that there is an inconsistency in Aristotle, for to some extent the Greek philosopher maintained an empiricist theory of the origin of first principles. "[H]e (Aristotle) considered the first principles to owe their origin to induction from sensible experiences. No doubt, Aristotle did hold that to be the case, and held moreover, that the general in the particular was directly perceived, an extraordinarily crude opinion" (CP 2.26 (Minute Logic)). Nonetheless, Peirce criticized those who interpreted Aristotle merely as a proposer of an empiricist theory of the origin of the first principles; for he found that Aristotle also maintained that the origin of first principles came from the light of reason, i.e., the self-evident character of those principles or "intuition"[5]. As evidence of that, Peirce mentioned a passage in *Metaphysics* where Aristotle seemed

[4] The most prominent members of this group are Galileo, with his idea of a Light of reason, and Descartes with his idea of 'clear and distinct' ideas which are self-evident to reason.

[5] I am going to place quotation marks to the word "intuition" wherever I mean to translate Aristotle's word *Nous*, which I will argue stands for an intellectual capacity based on the data of sense experience. Therefore, it does not mean the rationalistic conception of intuition or immediate grasping devoid of sense experience.

to accept the truth of the law of non-contradiction as a self-evident proposition. "Consequently", said Peirce, "if Aristotle had been asked how he knew that the same proposition could not be at once true and false, he could have given no other proof of it than its self-evidence… Indeed this is precisely the position he takes in the Metaphysics G iii, 1005b, 19" (CP2. 26).

Concretely, Peirce was accusing Aristotle of inconsistency, that is, of maintaining explicitly that the origin of principles is based on an empirical induction, and at the same time of referring implicitly to the self-evidence of those principles. Peirce seemed to neglect or misunderstand *Posterior Analytics* II 19, for it is precisely there that Aristotle claimed both that *epagōgē* originates the first principles from an empirical point of view, and that *nous*, "intuition", is responsible for this inductive act. This dichotomy between rationalism and empiricism has been exhibited by many scholars at the moment of interpreting Aristotle's philosophy, and Peirce is here also judging Aristotle from the same point of view. However, Aristotle stated that the origin of the first principles is rational and empirical at the same time. It is undeniable that Aristotle argued for the empirical origin of the first principles, but it is also undeniable that he defended the agency of *nous* in the inductive act of acquiring the universal. Sense-perception provides the data from which *nous* grasps the universal.

In such a dichotomy that Peirce and other scholars used to read ancient philosophers, intuition is understood as a faculty devoid of sense perception, and sense perception is a capacity isolated from any contact with intellectual faculties. But, it seems to me that Aristotle is proposing a theory in which intellectual faculties work along with sensible ones. As a result of such a dualistic view, Peirce rejected intuition as an epistemological capacity and was unable to see Aristotle's actual position. Although Peirce is not a dualist in his own philosophy, he was interpreting Aristotle from that point of view. For Peirce, and I think for Aristotle too, the difference between thought and sensation is not a radical one for there is a *continuum* between them. That is why he said, according to his second cotary proposition, that there is "nothing is in the intellect which was not previously in the senses" (EP 2:227). From my point of view, Peirce's idea of a continuum between sensation and thought is roughly the same as Aristotle's account of the interaction between sensation and *nous*. In conclusion, it seems to me that Peirce mistook Aristotle's concept of *nous* for the Cartesian concept of intuition, and neglect or misunderstood *Post. An. II 19*.

Along with "intuition", *nous*, as a basic element of Aristotle's theory of the origin of first principles, Peirce criticized another aspect of Aristotle's theory, namely, his rejection of regression *ad infinitum* in the attempt to demonstrate the principles. In the case of the impossibility of a regression, Peirce accused Aristotle of mistaking the process of thinking for a discrete magnitude. Aristotle's argument claims that the principles of any demonstrative reasoning are indemonstrable, for if they were demonstrable they should be based on further principles that will also need to be demonstrable. Since there cannot be an ultimate demonstration of the first principles, the origin of those principles must lie in an indemonstrable process that avoids the endless process of reasoning. Peirce answered Aristotle as follows:

> Aristotle[6] argues that there must be certain first principles of science, because every scientific demonstration reposes upon a general principle as a premiss. If this premiss be scientifically demonstrated in its turn, that demonstration must again have been based upon a general principle as its premiss. Now there must have been a beginning of the process, and therefore a first demonstration reposing upon an indemonstrable premiss. This is an argument like the Achilles and Tortoise argument of Zeno, except that, instead of going forward in time, it goes backward. If we were to admit that the process of thought in the mind is really composed of distinct parts, corresponding to the arguments of the logical representation of it, each requiring a distinct effort of thought, then, indeed, we should have to admit Aristotle's reasoning […]
>
> In like manner, the assumption that the reasoning process, as it is in the mind, consists of a succession of distinct arguments, each having a previously thought premiss, involves the assumption that reasoning cannot begin with the very perceptions of sense, since in these perceptions the process of thought has not yet begun; so that they do not contain any judgments capable of being exactly represented by propositions, or assertions. If that be so, there must clearly be a first premiss. But there is no necessity for supposing that the process of thought, as it takes place in the mind, is always cut up into distinct arguments (CP 2. 27 (Minute Logic)).

[6] Notice that Peirce quoted here *Posterior Analytics I, ii*, and not *Posterior Analytics* II, 19, which may be evidence that he neglected this passage.

Peirce, then, dismissed Aristotle's argument against the regression to infinity, for Aristotle was assuming that every belief is supported by a reasoning, namely, a thoughtful argument, and that every reasoning is also supported by a previous reasoning. Thought is not composed of "distinct parts", and even more it is not composed of an endless series of thoughts. If every thought were preceded by another thought, then thought in general would be isolated without any reference to sense-perception. On the contrary, Peirce conceived along with Aristotle that the origin of the first principles is sense-perception, but for the same reason, Peirce rejected Aristotle's argument about the impossibility of regressions. This is nothing but the application of his synechism to the mind.

Aristotle and Peirce agreed somewhat with this explanation of the origin of first principles from an empirical basis. However, Peirce did not call this process induction. Peirce reserved the name "induction" for a controlled reasoning. Instead, the origin of first principles from sense-perception, said Peirce, is through an uncontrolled, unconscious, and uncriticizable process that he identified as "perceived facts" (CP2. 26) or "perceptual judgments" (EP 2: 229). Exploring this distinction between controlled and uncontrolled thinking, Peirce criticized Aristotle's argument for the impossibility of regression. Not all thinking is a controlled reasoning whose premises are obtained through a likewise controlled reasoning, and so on. The ultimate foundation of reasoning or origin of the first principles is an uncontrolled thinking (See EP 2:228-229, EP2:191)[7].

Peirce, then, rejected Aristotle's argument on regression *ad infinitum*. Moreover, he assumed there was another inconsistency in Aristotle's philosophy, claiming that Aristotle himself drew this distinction between controlled and uncontrolled reasoning. Thus, according to Peirce, even though Aristotle made the distinction between controlled and uncontrolled reasoning, he did not use it at the moment of identifying the origin of the principles and made the mistake of thinking of reasoning as an endless process that should be initiated for a first intuition. Peirce believed that the distinction was in Aristotle's works, and accused some Aristotelians (Grote and others) (CP2.26) of neglecting it. If the distinction is neglected, the origin of first principles could be only through intuition. There could be no other explanation than the fact

[7] Cf. Anderson and Hausman, *Conversations on Peirce: Reals and Ideals* (New York: Fordham University Press, 2012), 102.

that the ultimate controlled reasoning that provides the first principles is an intuitive act.

This distinction between controlled and uncontrolled mental processes is a vital distinction from Peirce's point of view. He insisted that the perceptual process is interpretative and that its uncontrolled character can make some beliefs appear as self-evident because it is neither possible to give any complete account of it nor to take it to be an object of any immediate critique. Nonetheless, its uncontrolled character does not mean that it is intuitive, *a priori*, or an immediate grasp that is merely rational and devoid of sense-perception. As a result, if the empirical process of apprehension of the first principles is uncontrolled and not open to immediate critiques, then the result of the process is indubitable, according to Peirce. Only a scientific inquiry based on other empirical data and verified on experiments can be opposed to the initial experience. In short, even though these principles are supported by sense experiences, they merely seem self-evident because the process is unconscious and involuntary. Peirce stated his view as follows:

> But that process of induction by which he (Aristotle) held that first principles became known, was according to Aristotle not to be recovered and criticized. It was not even voluntary. Consequently, if Aristotle had been asked how he knew that the same proposition could not be at once true and false, he could have given no other proof of it than its self-evidence. Grote and those who agree with him (Aristotelians), as well as some other schools of thinkers, quite overlook the important distinction between thought that can be controlled and thought which cannot be controlled (CP2.26)

I doubt that Aristotle had made such a distinction between controlled and uncontrolled reasoning. The only proof or evidence Peirce had to sustain such a claim is that there is a difference in Aristotle's thought between induction as logically indefensible and induction as the infallible process of originating the first principles of sciences. From my point of view, this is the same distinction I stated between necessary and dialectical induction (Cf. Flórez 81- 91). However, I do not think that it can carry a deeper meaning so as to mean controlled, conscious and voluntary against uncontrolled, unconscious and involuntary reasoning.

Peirce stated that Aristotle distrusted induction as a controlled argument and rejected it for scientific aims (*epistēmē*). For Aristotle, the only

epistemic reasoning is deduction. Instead of that, induction, as an uncontrolled empirical process is, for Aristotle, the support of scientific principles. Concerning this Peirce said: "The truth is that Aristotle, like all subsequent Greeks, […] looked upon induction as logically indefensible. Consequently, where it was subconscious, it was treated as infallible, while it was not admitted into a scientific argument at all" (CP2.26). Peirce is not very specific about the references to Aristotle, since he does not cite any particular place in *Posterior Analytics*. He was perhaps referring to II, 19 where Aristotle claims that *epagōgē* is more accurate than *epistēmē*. Aristotle based this accuracy on the faculty of intellect or *nous* which has the capacity to see the primary principles of science. Peirce did not mention the Aristotelian terms, instead, he mentioned infallibility supported by a subconscious process.

Conclusion of Peirce's Commentaries on Aristotle's Accounts of Induction

From the above considerations, it is clear that Peirce suggested that the two accounts of *epagōgē* by Aristotle are completely different. *Prior Analytics* II 23 is an account that truly expresses the form of an induction, although restricted to a unique figure and wrongly justified. *Posterior Analytics* II 19 or, at least, Aristotle's solution to the problem of the origin of first principles does not, for Peirce, represent induction. It can be seen as an empirical account of the unconscious and involuntary origin of the first principles, but it is not an induction. In other words, each account corresponds to a different level in the mental process, namely, an uncontrolled mental process, which creates the first principles, and a controlled argument that uses those principles in order to make inferences that lead to the major premises of deductive syllogisms.

From Peirce's point of view, the account of *epagōgē* in *Pr. An.* II, 23 is a perfect one insofar as it describes induction as a syllogism in the first figure that attempts to prove, with less exactitude, the major premise. This account agrees with Peirce's own definition and formalization of induction in which a rule is inferred, and therefore, he rendered it as a perfect one. Nonetheless, Peirce did not accept blindly this account of induction and reproached Aristotle for neglecting the other two figures of induction, and for justifying induction as a complete enumeration and as infallible.

On the other hand, Peirce did not mention the account of *epagōgē* in *Posterior Analytics* II, 19, but it is clear that his comments on the

uncontrolled mental process that reveals the first principles are related to this account. It is clear because the account discusses the problem of a regression of reasoning and the role of sense–perception in the acquisition of the first principles and premises. Regarding this problem of the origin of first principles, Peirce accused Aristotle of two inconsistencies. First, Peirce thought that Aristotle was explicitly advocating for an empirical theory of the origin of the first principles, but implicitly justifying the origin of principles in the light of reason or intuition. This, from my point of view, is a misunderstanding because of *Post An*. II 19 and *De Anima* show both empirical and rationalist elements compounding the theory of the origin of first principles. The fact that Peirce did not quote *Post An*. II 19 and that he failed to notice Aristotle's actual position suggests that Peirce either neglected *Post An*. II 19 or he misunderstood it.

Second, Peirce seemed to accuse Aristotle of an inconsistency between his expressed rejection of the possibility of a regression *ad infinitum* in a demonstration, and his acceptance of two different kinds of reasoning, a controlled and an uncontrolled one. I think Peirce is right in rejecting Aristotle's argument against a regression. This is consistent with Peirce's rejection of an intuitive faculty and with his synechism. However, I do not think Peirce is right in assigning to Aristotle the idea of a distinction between those two kinds of reasoning. The only distinction that can be assigned to Aristotle is that between an induction that infallibly reaches the principles of sciences and an induction that dialectically infers the most commonly accepted propositions. Perhaps Peirce was trying to explain this distinction and proposed that it is based on a difference between conscious and voluntary reasoning and unconscious and involuntary reasoning, but I do not think that Aristotle can be pushed so far as to say that there is such a thing as unconscious and involuntary reasoning.

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