

Against the Aristotelian Method Concerning Scientific Knowledge

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1. Introduction

Many have called Aristotle “the first scientist” because of his inductive method and reliance on empirical evidence. As Glanville Downey declares, “his principles of scientific thought and method have remained fundamental.”¹ Such inductive method is the focus of this paper, but before critiquing it, other aspects of Aristotle’s philosophy must first be presented in order to show the process that led him to such conclusion.

2. The Aristotelian Method Concerning Scientific Knowledge

2.1. Aristotle’s Realism

The first important factor is Aristotle’s conception of reality (reality does not only refer to empirical reality, e.g., the natural universe). Aristotle accepts metaphysical realism, i.e., the view that there is a reality that is independent from my mind (I tend to stay away from saying “mind-independent reality” because a realist may still say that reality is dependent on the mind of God, and thus, someone may not properly interpret “mind-independent reality” as “reality independent on a dependent mind, i.e., a mind that is not God’s”). Because of his realism, Aristotle also accepts the appearance vs. reality distinction since he believes in both the realm of belief (appearance, or the way things appear) and the realm of fact (reality, or the way things are in themselves).

2.2. Aristotle’s Theory of Truth

Along with realism, Aristotle accepts the *Correspondence Theory of Truth*, which says that a statement (a sentence that is either true or false), which is indicative of a belief, is said to be true if it corresponds to reality, while it is said to be false if it does not correspond to reality. For instance, Aristotle states that the truth-value of the statement ‘he is sitting’ depends on an independent reality, “for if the statement ‘he is sitting’ is true, yet, when the person in question has risen, the same statement will be false.”² Furthermore, he says that “the statement ‘he is sitting’ remains unaltered, but it is at one time true, at another false, according to circumstances.”³ Such correspondence, however, entails an asymmetric relation between facts and statements; after all, facts concerning reality determine the truth of statements, but not the other way around. As Aristotle mentions, “the truth or falsity of a statement depends on facts, and not on any power on the part of the statement itself.”⁴

2.3. Aristotle’s Externalism

In addition, Aristotle is inclined to look at external factors rather than internal ones. As Terence Irwin states, “objective principles are prior to, and logically independent of, our beliefs; a belief is true because it fits how things are, not the other way round. Hence the truth of our beliefs must be logically independent of any of their internal properties – consistency, coherence, simplicity.”⁵ Indeed, for Aristotle, it is not enough for a system to be coherent (i.e., circular) since one can defend any view. He argues that circular demonstration “reduces to the mere statement that if a thing exists, then it does exist – an easy way of proving anything.”⁶

2.4. On Universals: Plato vs. Aristotle

Aristotle, like Plato, aims at Universals, i.e., general categories. For instance, particular trees are part of the universal concept of ‘tree’. However, Aristotle finds the universals in particular things, i.e., the universals and the particulars cannot exist without one another; for Plato, on the contrary, the universals exist apart from and are independent of particular things. Therefore, for Aristotle, we begin with sense perception (empirical evidence, observation) and then develop general principles from it; for Plato, however, we must begin with knowledge of the Universals (or the Forms as he called them) and then descend to knowledge of particulars,

which are mere images of the Forms (e.g., particular trees are mere images of the *Form of Tree*). With these things in mind, Plato's method is an *a priori* method since it is independent from experience, while that of Aristotle is *a posteriori* since it depends on empirical evidence.

2.5. Aristotle's Naïve Realism

Terence Irwin says, "in empirical inquiry, Aristotle relies on naïve realism, in assuming that perception accurately grasps features of an objective world, and on naïve empiricism, in assuming that empirical inquiry preserves objectivity in so far as it simply extends, generalizes, and appeals to the data of perception."⁷ His account of inquiry expresses these convictions; for he has no doubt of the accuracy of our authoritative perceptual appearances, and if we use these to form and to test theories, we will reach theories that correspond to the objective reality revealed by our perceptual appearances."⁸

Such an assumption is crucial to Aristotle's method since if naïve realism is rejected, the method whereby we reach first principles via the observations that present themselves to us falls apart. For instance, if constructivism is true (i.e., if all observation is rationally constructed, and thus interpreted, by the subject), then great doubt will be cast on this inductive method of proceeding from the particulars to the universals. As Terence Irwin says, "in saying that the end or goal of natural science is the appearance, Aristotle presumably means that it is a theory fitting the appearance."⁹ But if appearance fits the theory, i.e., theory precedes observation, then this account is wrong.

2.6. Aristotle's Inductive Method

Aristotle makes use of both deduction and induction. As John North declares, "Aristotle gave to experience an indispensable role in the process of acquiring knowledge, but De Rijk insists that there is also in the philosopher's work a rational, speculative, element."¹⁰ His syllogism, a deductive form of reasoning, was fundamental not only to formal thought, but also for the development of science since nature was seen as being as orderly as such reasoning. As Rufus Suter says, "it is important that we grasp the immense value for science of this bare, non-committal, inescapable character of the orderliness of nature which was reflected from the syllogism."¹¹ However, in the first place, we must derive and find true premises that will serve as the foundational principles of a given science. The problem, however, is finding such principles. This is not a matter of pure form, rather content.

For Aristotle, infinite regresses and circles of demonstration are not legitimate foundations for scientific knowledge (*epistêmê*). Instead, we must acquire our foundational premises through experiences derived from the empirical world. He declares "it is clear that we must get to know the primary premises by induction; for the method by which even sense-perception implants the universal is inductive."¹² Thus, Aristotle's method, concerning the empirical sciences at least, is as follows: first, look at observation, and then derive general principles whereby the phenomena observed are subsumed under them. In this respect, observation precedes theory since the theory must correspond with the observation. As Terence Irwin says, Aristotle's view requires "a theory not to conflict with appearances."¹³

3. Critique of the Aristotelian Method Concerning Scientific Knowledge

3.1. Observation is Rationally Constructed

Naïve realism (which Aristotle accepts) implies that nothing is interpreted, i.e., that we don't add anything to pure observation or pure sensory data. In other words, a crucial assumption is that observation precedes theory rather than theory preceding observation. But in order for an observation and observational statement to provide an accurate description of the world as it is (without interpretation), then at least the following criterion has to be met: the statement must express only what is directly observed. However, we cannot observe the fundamental concepts imperative to our thought and speech, including those concerned with the natural world (e.g., causality, existence, substance, space, time, motion, sameness and difference, etc.).

Where is empirical evidence for causality as such? For instance, David Hume, the ultimate empiricist, fully admits that from observation alone (which only consists of correlation, i.e., "A then B"), causality cannot be legitimately inferred. What about empirical evidence for existence? Substance? Space? Time? Motion? Sameness and difference? Where are these things? They cannot be shown empirically because they are rational (i.e., products of the mind). Since the empirical is a product of the rational (the empirical is dependent on the rational, but the rational is not dependent on the empirical), then the empirical is rationally constructed, thus defeating naïve realism, and thus, defeating Aristotle's inductive method. A famous example of this constructivist notion is in Immanuel Kant, who, for example, says that time, space, causality, and other categories are what structure our empirical experience. Since such categories are fundamental to our experience, and they are rational constructions, then all other phenomena are ultimately rational constructs.

The Aristotelian method is philosophically unjustified since there is no such thing as pure observation, which makes the method itself futile. Observation (which is interpreted) works in the following way: first, the individual believes whatever he chooses to for whatever reasons; second, those beliefs will consist of his theoretical framework, whereby all other things (including observation) will be judged and interpreted accordingly. First comes the theory, then the observation, which will conform to the theory employed.

Is it possible for theory to change? Yes. However, any change does not arise out of observational considerations, rather out of purely rational ones. For instance, a theory may be accepted because of its pragmatic value, or a theory may be rejected because it seems to go against more fundamental theories, or a theory may be accepted because it seems to explain more with less... the point is, however, that pure observation itself does not cause theory change, and this is not only the case in everyday life, but also in science. If a person says, "I have changed my view because observation has proven that my previous view is false," then such an individual deceives himself. Theory change occurs whenever the individual chooses to change it and only for rational (or theoretical) reasons!

3.2. Universal Essences are Transcendent

Terence Irwin says, "induction (*epagôgê*) is the method that Aristotle describes for the approach to first principles. It is the right method because induction proceeds from particulars to universals? Since the things known to us are particulars, induction can lead us from these to the things known by nature. If the things initially known to us were as universal as the things known by nature, then induction would not be the method that leads us from one to the other; we would have to argue 'syllogistically' (i.e. deductively)."¹⁴ The key part, however, is the notion that "the things known to us are particulars." This is the crux of Aristotle's idea on method.

Aristotle argues, "the premises of demonstrated knowledge must be true, primary, immediate, better known than and prior to the conclusion."¹⁵ But how can I know a particular without knowing the universal? Isn't the particular mere manifestation of the universal? For instance, since being, as Ibn Sina says, is the first and primary concept conceived by the intellect, then all of my thoughts depend on it (that is why metaphysics is properly called 'first philosophy'). How can I then properly think (and speak) of particular cases of being (e.g., being-affected, being in a place, being in time, etc.) without knowing being itself? Being in its pure form, then, is what I know (or am aware of) first. It is logically impossible to think of instances and applications of being without knowing being in the first place, even if I am not aware of this process.

Both Plato and Aristotle, when trying to find the essence of something, point to the *eidos*, i.e., literally the "what it is" of a thing. The difference between the two is that Plato speaks of a transcendent *eidos* that is independent from the particular thing. For Aristotle, there is no such independence. Plato knows that "if one is to ascend to thought, one must start with the visible."¹⁶ For instance, with regards to Beauty, an individual may have repeated exposure to it in particular cases (e.g., amorous relationships, beautiful paintings, etc.); then, such an idea can be aroused in the mind. However, in order to find its true essence or being, Plato urges us to perceive Beauty in itself as opposed to beauty of a particular object, even if this process is hard. Aristotle, of course, points to the empirical world, but if we analyze, we can see serious methodological problems with Aristotle's view (on the other hand, in this respect, Plato's view or method is at least better). Simply stated, the problem with Aristotle's method (i.e., his Inductive Syllogism, which is "an attempt to show how to establish a universal proposition with absolute certainty"¹⁷) is that it does not properly and rigorously distinguish between essential properties and contingent ones.

Take the Method of Agreement, which begins with particulars and draws general conclusions about essence and causal relations between things. In looking at manifestations of magnanimity (e.g., Alkibiades, Achilles, Ajax, Socrates, and Lysander), Aristotle asks, "what is the essence of magnanimity?"¹⁸ He tries to find it in particulars, but how can he legitimately determine it? For example, they are all male, so is that the essence of magnanimity or is it merely accidental? What is the correct interpretation? Based on the particular cases alone, we can't truly tell, and remember that "an exhaustion of instances is impossible, for at any one time they must, in regard to actual observation, be considered to be infinite."¹⁹ The rigorous method that ought to be employed is as follows: first, one must know what magnanimity is, then one can determine who is magnanimous and who is not. We must first, a priori, identify the essence of magnanimity (in Platonic language, this would be the *Form of Magnanimity*), then look at the particulars and identify manifestations of magnanimity.

3.3. Answering Two Objections to my Position

First, it might be said that whenever everyone agrees, such a view is to be considered a given as opposed to a matter of (rational) interpretation. For instance, insofar as everyone "sees" causality, then causality is not a matter of interpretation, rather, a given. However, I answer that there is no logical necessity between "the percentage of agreement" and "whether or not a thing is a matter of interpretation". Logically speaking, it is possible that: first, A is a given, yet not everyone agrees with it (they are then deliberately lying and arrogant in denying the obvious evidence); second, it may be the case that A is a matter of interpretation, yet everyone accepts it because all people have used the same interpretative devices. Since these two cases are logically possible, we cannot say that, by logical necessity, if everyone believes A, then A is not a matter of interpretation.

A second objection is that if it is admitted that every observation is merely a matter of rational interpretation, and that we cannot truly find the essence of a thing in the realm of the senses, then empirical evidence becomes worthless with regards to knowledge (*epistêmê*). That is my point! Empirical evidence (and using empirical evidence as "proof" or justification for a philosophical position) is philosophically unjustified, and thus, worthless. We can only rely on reason for the attainment of knowledge, and if reason is not competent, then no knowledge can ever be attained.

4. Implications

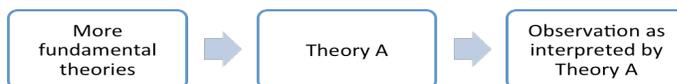
4.1. Popular Science is a Myth

The popular view of science (which views science as a “discovery” of the unknown) is that observation precedes theory. For instance, scientists look at empirical evidence and then derive general principles whereby the phenomena observed are subsumed under them. This view, by the way, seems to be common not only for non-scientists, but also for scientists themselves. This, however, is tremendously naïve and foolish, for theory precedes observation.

Andy Pickering presents an example, which concerns the discovery of the weak neutral current in the 1970s. Ultimately, under a particular theoretical model (V-A model), when certain experiments (bubble chamber experiments) were conducted, A (weak neutral current) was “seen” as non-existent. However, when a new theoretical model (Weinberg-Salam model) was accepted for non-observational reasons (e.g., this new model was more fruitful and unified two fundamental forces into one), then when scientists looked back to the same experiments (bubble chamber experiments), they “saw” proof that A (weak neutral current) is real.²⁰ As Andy Pickering states, “the interpretative practice of the 1960s, which supported the non-existence of the neutral current, was displaced by that of the 1970s, which made the neutral current manifest.”²¹ Indeed, theory precedes observation, not the other way around.

4.2. Metaphysics is the Solution to Rigorous Thought

What if a theory (Theory A, for instance) is questioned? How will the matter be resolved? Well, such a theory, insofar as it is not absolutely fundamental, will be based on other more fundamental theories. The process is as follows (the arrows signify the process of justification):



There are three possibilities to discovering whether Theory A is true or not: looking backwards, looking within, and looking forwards. Looking backwards refer to justifying Theory A with more fundamental theories. Looking within refers to justifying Theory A with Theory A itself. Looking forwards refers to justifying Theory A with observation, which is interpreted by Theory A itself.

First, it is clearly unjustified to look within, for if that’s permissible, then a person, for instance, can say that the Bible is true because the Bible says so. Second, against the popular view, it is also philosophically unjustified to look forward, for the observation itself must be interpreted via a theoretical framework. If pure, non-interpreted observation was possible, then the Aristotelian Method could work, but that is not the case. Meaningful observation must be interpreted: either it is interpreted using Theory A, which will “prove” that Theory A is true (this, clearly, is also circular), or a different theory is used, which may “prove” that Theory A is false. Again, looking forwards does not work either because observation itself is theory-laden (i.e., observation must be interpreted with a theoretical framework). The only legitimate choice is looking backwards, which will bring me to metaphysics.

Surely then, properly and technically speaking, there is no empirical evidence for any particular scientific theory, for theory precedes observation. With that in mind, it is foolish and hypocritical for any scientist to justify a scientific theory with “non-interpreted observation”, for that is simply a myth. Thus, whenever scientists say things such as “observation shows that gravity is true”, or “empirical evidence proves that evolution is true”, such statements can be automatically considered philosophically unjustified, and thus, false, for even if the theory is true (e.g., even if gravity is true), the justification is not legitimate, i.e., empirical evidence does not prove anything. Remember that philosophy involves not only truth, but also proper justification. Hence, Plato defines (philosophical) knowledge as ‘justified true belief’, not mere ‘true belief’.

Once a theoretical framework is accepted, then everything that comes after it will be interpreted based on such theoretical framework. However, when such theory is questioned, both the opponents and supporters of the theory must look backwards towards more fundamental beliefs and assumptions (again, it is a waste of time and philosophically unjustified to look at what comes after, including observation). All changes in theory and all conflicts are only rational, i.e., internal, as opposed to involving both internal and external elements (there is no external, for there is no way of going beyond one’s own mind and ideas). Some reasons why theory change occurs include coherence, fruitfulness, and simplicity, but notice that these come from more fundamental and purely rational beliefs and theories, i.e., empirical evidence doesn’t “show” any of these things to be true: if a person believes that reality is contradictory as opposed to coherent, then any “incoherence problem” will not arise, for such theoretical framework accepts logically inconsistent explanations; if a person believes that good theories need not be fruitful, then fruitfulness will be irrelevant; if a person believes that good theories need not be simple, then simplicity will also be irrelevant. The point is that all of these criteria (and the like) are purely rational and internal ones, not empirical and external.

Metaphysics, then, is the only legitimate solution to discovering if a theory is true or not (or whether it is philosophically justified or not).²² Whenever there is a debate about a particular theory that deals with the empirical world, it is a complete waste of time to “look” at the observation because it will be interpreted in accordance with theory. As with any debate, the foundations are what

must first be analyzed, for Thomas Aquinas tells us that the most fundamental way in which error can arise is by a false (or weak, or philosophically unjustified) foundation. That is what must be resolved first, and that is where metaphysics becomes relevant, for 'being' is the primary concept conceived by the intellect, as Ibn Sina says. That is why metaphysics precedes any discipline, including science (which merely involves applied instances of being).²³ If we want to be methodologically rigorous, rationalistic (i.e., *a priori*) metaphysics must be our method and first study. By the way, if such metaphysics is impossible (i.e., it cannot be done with certainty), then everything is merely a matter of faith, for there cannot be certainty about anything if there is no certainty regarding its foundation.

5. Conclusion

The ultimate purpose of this work is to simplistically show that observation (phenomena) should not be put first, for that is simply naïve and foolish. I will repeat one of Andy Pickering's concluding remarks by saying that "I certainly would not claim to have given exhaustive answers to all of the questions which arise."²⁴ However, my point is clear: the Aristotelian method is not philosophically justified, and science (popular science), insofar as it is based on the foolish idea that "pure observation" exists and that it precedes theory, is a myth. Also, only rationalistic metaphysics, without the aid of empirical evidence, is philosophically justified. It is easy to find confirmation if you're looking for it, for a theory is never falsifiable by observation insofar as a person chooses that theoretical framework (a theory is falsifiable by another theory, but not by observation). Anything below Plato's divided line (i.e., the realm of the senses, or observation) cannot yield knowledge. Indeed, a change in idea (or theory) must come from within, i.e., from the person: no observation will change that!

Notes

¹ Glanville Downey, "Aristotle and Modern Science", 42.

² Aristotle, *Categories*, Section 1, Part 5

³ *Ibid.*

⁴ *Ibid.*

⁵ Terence Irwin, *Aristotle's First Principles*, 117.

⁶ Aristotle, *Posterior Analytics*, Book I, Part 3

⁷ Terence Irwin, 26. According to John North's "Aristotle's Empiricism", p. 95, De Rijk offers an interpretation of Aristotle that saves him from being a naïve realist. I do not take such an interpretation in this paper.

⁸ *Ibid.*, 35.

⁹ *Ibid.*, 34.

¹⁰ John North, "Aristotle's Empiricism", 93.

¹¹ Rufus Suter, "Aristotle and the Scientific Method", 471.

¹² Aristotle, *Posterior Analytics*, Book II, Part 19

¹³ Terence Irwin, 33.

¹⁴ *Ibid.*

¹⁵ Aristotle, *Posterior Analytics*, Book 1, Section 2

¹⁶ Jean Grondin, *Introduction to Metaphysics from Parmenides to Levinas*, 28.

¹⁷ William Dickie, "A Comparison of the Scientific Method and Achievement of Aristotle and Bacon", 472.

¹⁸ William Dickie, "Anticipations in Aristotle's Four Experimental Methods", 403-404.

¹⁹ William Dickie, "A Comparison of the Scientific Method and Achievement of Aristotle and Bacon", 471.

²⁰ I used parenthesis throughout this paragraph to denote the distinction between form and content. Notice that the formal structure of the method is not in parenthesis, while the content is. Also, remember that I am ultimately attacking the formal structure; the content merely serves as a particular example of my critique of the form.

²¹ Andy Pickering, "Against Putting the Phenomena First: The Discovery of the Weak Neutral Current", 113.

²² I am not implying that Aristotle's metaphysics is absolutely correct, but that the intention behind such 'first philosophy' is.

²³ In his *Metaphysics*, Book 7, Chapter 11, Aristotle calls physics "second philosophy."

²⁴ Andy Pickering, 115.

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