Dignāga's Three-Membered Inference vs. Aristotle's Syllogism: A Comparative Study of Their Differences

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Abstract

This paper examines fundamental differences between Dignāga's three-membered inference and Aristotle's syllogistic logic through analysis of their logical structures, reasoning processes, and validity criteria. Rather than viewing these systems as formally equivalent or treating one as a variant of the other, this study reveals how they represent distinct approaches to logical reasoning. Through a detailed comparison, it becomes clear that Dignāga's system emphasizes empirical validation and causal relationships, whereas Aristotle's system operates through formal categorical relationships. These differences reflect deeper philosophical orientations: Dignāga's logic functions as an open system requiring continuous empirical verification, while Aristotle constructs a self-contained formal system. The study concludes that each system developed sophisticated methods of establishing valid inference, shaped by its unique intellectual tradition.

Keywords: *Aristotle; Dignāga; logical reasoning; syllogism; three-membered inference*

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Introduction

Logical thinking has evolved significantly within various philosophical traditions. Two systems particularly stand out for their systematic treatment of reasoning: Aristotle's syllogistic logic and the three-membered inference developed by the Buddhist logician Dignāga (circa 480-540 CE). Their profound analysis of inference and lasting influence make them key to understanding how different cultures approached logical reasoning (Matilal, 1998).

Chinese scholarly discussions (Wu, 1993) center on two interpretations. The 'Identity View' suggests that modern logical analysis reveals their formal equivalence, while the 'Partial Overlap View' regards the three-membered inference as a variant or subset of Aristotelian logic. These views, however, miss fundamental differences in reasoning mechanisms and epistemological foundations by focusing too much on surface similarities.

In Prior Analytics (I.1-4), Aristotle established a system of deductive reasoning that derives necessary conclusions through strict syllogistic form. Dignāga, by contrast, constructed his system through thesis, reason, and example, emphasizing the close connection between inference and empirical verification (Hayes, 1988). This difference appears not only in surface structure but also in how reasoning operates and how validity is established.

This study examines the differences between these systems at three levels: their logical structures, reasoning processes, and validity criteria. Through a systematic comparison, it reveals how these two systems of inference reflect distinct understandings of logical thinking shaped by different intellectual traditions.

Structure of Dignāga's Three-Membered Inference

According to Dignāga's Nyāyamukha (English: The Entrance to Logic, Chinese pinyin: 'Yinming zhenglimen lun; Taishō 1628', 1629), his inference consists of three explicit components: thesis (*pakṣa*), reason (*hetu*), and example (*dṛṣṭānta*). This streamlined structure represents a significant refinement of the traditional five-membered inference of the Nyāya school, which included proposition, reason, example, application, and conclusion (Mukherjea, 1976). Dignāga eliminated the application and conclusion as redundant, arguing that they could be derived from the first three members.

This structure is best illustrated by the two canonical examples below:

Component	Sound Example	Fire Example
Thesis	The sound is impermanent.	There is fire on the mountain.
Reason	Because it is produced.	Because there is smoke on the mountain.
Example	Whatever is produced is impermanent, like a pot.	Wherever there is smoke, there is fire; for example, in a kitchen.

Each component serves distinct logical and epistemological functions. First, the **thesis** (*pakṣa*) presents the proposition requiring proof, identifying both the subject (*pakṣa*) and the property to be proven (*sādhya*). The thesis must be clearly stated and mutually intelligible to all parties in a debate (Matilal, 1998). In the sound example, 'sound is impermanent' represents a proposition requiring justification. Next, **reason** (*hetu*) provides

the logical ground for the thesis. In the sound example, 'because it is produced' serves as the *hetu*, establishing the logical connection to impermanence. The final component e**xample** (*dṛṣṭānta*) shows the universal connection between the reason and the property being inferred. The example substantiates the general rule (*vyāpti*) underlying the inference. In the sound example, 'like a pot' illustrates a case where both the reason (being produced) and the property (impermanence) are present.

This three-membered structure emphasizes the essential components of inference, particularly focusing on the universal relation (*vyāpti*) between reason and thesis. The validity of this relation determines the soundness of the inference—a fundamental concept in Dignāga's logical theory that will be examined in the following section.

Validity in Dignāga's Inference: The Role of Vyāpti

Understanding *Vyāpti:* In Dignāga's logical theory, the mere presence of a complete three-membered structure does not guarantee the validity of an inference. The crucial determinant of validity lies in *vyāpti* (遍充), which can be translated as pervasion or invariable concomitance (Katsura, 1983). This concept establishes a universal, exceptionless connection between the reason (*hetu*) and the property to be proven (*sādhya*) (Hayes, 1988).

The necessity of *vyāpti* can be demonstrated through two classical examples:

Sound Example:

> The inference "Sound is impermanent because it is produced" is valid due to the universal rule that

everything produced is invariably impermanent. The *vyāpti* relationship here establishes that the property of 'being produced' (*hetu*) invariably accompanies the property of 'being impermanent' (*sādhya*) without exception (Matilal, 1998).

Fire Example:

The inference 'There is fire on the mountain because there is smoke' demonstrates *vyāpti* through both positive and negative correlations:

Positive correlation (*anvaya*): Smoke is invariably accompanied by fire (as observed in kitchens, hearths, etc.)

Negative correlation (*vyatireka*): Where there is no fire, there is never smoke (as in a clear lake)

This dual observation establishes the pervasion (*vyāpti*) of smoke by fire, demonstrating their invariable concomitance (Stcherbatsky, 1930).

The Three Characteristics of a Valid Reason

The establishment of *vyāpti* (the invariable connection between *hetu* and *sādhya*) requires meeting specific logical conditions. Dignāga systematized these conditions in his Nyāyamukha through the doctrine of *trairūpya* (Mukherjea, 1976) which means three characteristics of a valid reason.

The three characteristics *(trairūpya)* are:

i. Presence in the Subject *(pakṣadharmatā*; Chinese: 宗法性): The reason must be present in the subject of

inference. For Example, In 'Sound is impermanent because it is produced,' being 'produced' must be a genuine property of sound. This establishes the initial logical connection.

ii. Presence in Similar Cases *(sapakṣasattva,* Chinese: 同品定有性): The reason must occur in cases where the property to be proven is known to exist. In the sound example, a pot (similar case) is both produced and impermanent. This confirms a positive correlation through analogous instances.

iii. Absence in Dissimilar Cases *(vipakṣāsattva,* Chinese: 异品遍无性): The reason must be absent in cases where the property to be proven is known to be absent. For example, space, rather than sound, serves as a dissimilar case and is neither produced nor impermanent. This establishes a negative correlation and exclusivity.

These three characteristics work together to establish a comprehensive framework for valid inference. Firstly, they provide the logical foundation for establishing valid *vyāpti* by ensuring that the connection between reason and thesis is neither arbitrary nor coincidental but based on systematic observation and verification. As Dignāga argues in the Nyāyamukha (T1628, 1a15-17): "When the three characteristics of the reason are well-established, this is called inference", demonstrating that only when all three conditions are satisfied can we establish a valid inference.

Secondly, these conditions serve as safeguards against fallacious reasoning. By requiring both positive correlation (through similar cases) and negative correlation (through

dissimilar cases), they help identify and eliminate invalid reasons that might appear convincing at first glance. As Katsura (1983, p. 19) notes, this dual verification process significantly reduces the risk of drawing false conclusions from seemingly plausible premises.

Finally, *trairūpya* represents a sophisticated integration of logical necessity with empirical observation. Unlike purely formal logical systems, Dignāga's approach requires that logical relationships be grounded in observable examples and verifiable experiences. Hayes (1988) argues that this integration of logic and empirical knowledge marked a significant advancement in Indian logical thought. This innovation, as Matilal (1998) points out, had a profound influence on subsequent developments in Buddhist epistemology, particularly in Dharmakīrti's works.

Aristotelian Syllogism: Structure and Logical Foundations

Aristotle's logic, particularly his theory of syllogism, has had an unparalleled influence on Western intellectual history. However, modern interpretations often mistake popular everyday expressions for Aristotle's standard model (Patzig, 1968). Here is the commonly cited '*Barbara'* syllogism:

All humans are mortal.
Socrates is human.
Therefore, Socrates is mortal.

While this example is commonly used to illustrate Aristotelian syllogism, we must carefully distinguish between what Aristotle himself proposed in Prior Analytics and what later logicians added to interpret his work. Tools and terms like

'Barbara,' though useful for understanding syllogism, were not Aristotle's creations but later additions by medieval scholars like Boethius for teaching purposes (Patzig, 1968).

Definition and Form of Aristotelian Syllogism

In Prior Analytics, Aristotle systematically examined syllogism, defining it as a form of logical reasoning that derives a necessary conclusion from two premises. His definition states: "A syllogism is a discourse in which, certain things being stated, something other than what is stated follows of necessity from their being so"(Aristotle, 1989, 24b pp. 18-20).

The key elements here are "necessity" and "propositions." Syllogistic reasoning doesn't rely on external experience but derives conclusions through inherent logical relationships. This formalization makes syllogism one of the earliest systematic deductive models in logic.

Aristotle then defined the form of syllogism as an 'if-then' logical structure rather than everyday categorical judgments. His typical form is:

If A belongs to all B, and B belongs to all C, then A belongs to all C (Corcoran, 1972)

Instead of concrete nouns like 'Socrates' or 'human,' this expression uses abstract variables A, B, and C to represent logical relationships between concepts. This abstraction and use of variables is a defining feature of Aristotelian syllogism, establishing it as a systematic logical structure.

The Structure of Aristotelian Syllogism

A standard Aristotelian syllogism has three parts: two premises and a conclusion. The major premise is about the information that will be the predicate of the conclusion (Aristotle, trans. 1989, 24b18-20). The minor premise has what will be the subject of the conclusion. When these premises are in the right order, the conclusion naturally follows. The logical structure works through three terms (Aristotle,1989, 25b32-26a2):

(1) A major term that shows up in the major premise and becomes the predicate in the conclusion

(2) A minor term that appears in the minor premise and becomes the subject of the conclusion

(3) A middle term that connects everything r by appearing in both premises but not in the conclusion.

Its formal structure can be illustrated in this way:

Components	Formal Expression
Major premise	All B is A
Minor premise	All Cs is B
Conclusion	Therefore, all C is A

To understand this structure better, let's look at a common example, though we should note these examples were added by later teachers (Kneale & Kneale, 1962):

Components	Formal Structure	Example
Major premise	All B is A	All humans are mortal.
Minor premise	All C is B	Socrates is human.
Conclusion	Therefore, all C is A	Therefore, Socrates is mortal.

This way of organizing terms shows how Aristotle built a system where conclusions follow necessarily from their premises. The middle term 'human' connects the major term 'mortal' with the minor term 'Socrates', leading us naturally from what we know (humans are mortal; Socrates is human) to what must be true (Socrates is mortal).

Syllogistic Figures: Patterns of Valid Reasoning

Aristotle classifies syllogisms into three figures, based on the position of the middle term in the premises (Aristotle, 1989, 40b30-41a13). Each figure represents a distinct logical structure, with varying degrees of inferential clarity.

Figure	Position of Middle Term (B)	Pattern
Figure 1	Subject (major premise), Predicate (minor premise)	All B is A. All C is B. So, C is A
Figure 2	Predicate in both premises	All A is B. All C is B. So, C is A
Figure 3	Subject in both premises	All B is A. All B is C. So, C is A

Foundations of Syllogistic Validity

The validity of a syllogism, according to Aristotle, is rooted not in empirical observation or rhetorical plausibility, but in the formal necessity *(ἀνάγκη, anankē)* of the inference (Aristotle, 1989, 25b26-31). A syllogism is valid when the conclusion follows unavoidably from the premises under their internal structure. This emphasis on necessity sets Aristotelian logic

apart from inductive or dialectical reasoning, both of which rely on probability or persuasion rather than formal entailment (Aristotle, 1989, 24a22-b12).

Perfect and Imperfect Syllogisms:

Aristotle distinguishes between perfect and imperfect syllogisms (Aristotle, 1989, 24b22-26). A perfect syllogism is one in which the conclusion follows directly from the premises without additional assumptions. For example:

Perfect Syllogism:

Premise 1: All B are A.
Premise 2: All C are B.
Conclusion: All C are A.

This structure, typical of the first figure, is self-sufficient. The premises, by their arrangement, guarantee the conclusion (Aristotle, 1989, 26b28-33).

In contrast, an imperfect syllogism requires supplementary steps—often involving the conversion of propositions or the addition of implicit assumptions—to reach a valid conclusion. Look at the following:

Imperfect Syllogism:

Premise 1: All B are A.
Premise 2: Some Cs are B.
Conclusion: Some C are A.

Here, the conclusion is not formally guaranteed unless one assumes that the particular statement "some C are B" implies a distributive relationship sufficient to support the inference. Aristotle developed techniques for reducing

such imperfect syllogisms to perfect ones, thereby preserving logical rigor (Aristotle, 1989, 29a30-40).

The Role of the Middle Term:

A central condition for syllogistic validity is the correct use of the middle term (Aristotle, 1989, 29a30-40). The middle term must connect the major and minor terms in such a way that it establishes a necessary relation between them. This typically requires the middle term to be distributed—i.e., to refer to all members of its class—in at least one of the premises (Smith, 1989).

If the middle term is undistributed in both premises, the syllogism may commit the fallacy of the undistributed middle, resulting in an invalid inference. For instance:

Some Bs are A.
Some Cs are B.
Therefore, some Cs are A.

This argument is invalid because the middle term "B" does not conclusively link "C" and "A." The mere overlap among some members of each class does not support a necessary conclusion (Kneale & Kneale, 1962).

Through these foundational elements—structural necessity, the distinction between perfect and imperfect forms, and proper distribution of the middle term—Aristotle establishes a formal system of deductive reasoning that combines logical precision with philosophical depth (Aristotle, trans. Smith, 1989). His insistence on formal necessity and structural validity laid the groundwork for subsequent developments in logical theory, while his analysis of term relationships continues to inform our understanding of deductive inference.

The Differences between Three-Member Inference and Syllogism

Although both Dignāga and Aristotle developed reasoning systems that appear to exhibit a "three-part" structure, their approaches differ fundamentally in the construction of reasoning components, the organization of logical steps, and the functions of each part (Matilal, 1998). To equate Dignāga's three-part inference with Aristotle's syllogism merely based on superficial structural similarity is to fall into a formalist misinterpretation. A true understanding of their divergence requires a deeper analysis of the internal mechanisms of their respective inferential structures.

Differences in the Structural Form

In terms of structural form, Dignāga's model consists of three complete statements: thesis, reason, and example. Rather than focusing on formal logical terms, it emphasizes how language and experience build cognitive connections:

> In Dignāga's model, take the sound example:
> Thesis: Sound is impermanent.
> Reason: Because it is produced.
> Example: Whatever is produced is impermanent, like a pot.

In this structure, the example isn't merely rhetorical but serves as a logical necessity, validating the relationship between reason and thesis. The model builds reasonable inference chains through linguistic expression grounded in experience.

Aristotle's syllogism, by contrast, uses a 'major premise-minor premise-conclusion' structure based on categorical relationships between three terms (Aristotle, 1989, 25b26-31):

Major premise: All humans are mortal.
Minor premise: Socrates is human.
Conclusion: Therefore, Socrates is mortal.

This structure emphasizes formal category relationships, showing a highly abstract and systematic character.

These structural contrasts between Dignāga's three-part inference and Aristotle's syllogism reveal distinct orientations in their understanding of reasoning. Dignāga's inferential strategy, rooted in linguistic articulation and experiential validation, constructs meaning through the interplay of thesis, reason, and example—where the example is not supplemental but logically indispensable.

Differences in Reasoning Processes and Their Philosophical Implications

Building on the structural differences outlined above, we can now examine how reasoning operates within each system.

In Dignāga's logic, reasoning unfolds as a dynamic process of empirical validation (Dignāga, T1628). When applying the three-membered structure:

i. The thesis proposes a relationship to be established.

ii. The reason identifies an observable indicator.

iii. The example validates through concrete experience.

The reasoning process is inherently interactive - each step requires engagement with observable reality. When we reason that 'sound is impermanent because it is produced,' we must actively verify:

i. The production of sound through direct observation.

ii. The connection between production and impermanence through repeated verification.

iii. The analogous cases (like pots) confirm this pattern through empirical examination.

Aristotle's reasoning process, by contrast, operates through pure deduction (Aristotle, 1989, 24a10-15). Once terms are properly categorized and premises established, reasoning proceeds automatically through formal relationships. In the case "Socrates is mortal," the process proceeds as follows:

1. Establishes categorical relationships (human-mortal) through definition.

2. Identifies specific instances (Socrates-human) through classification.

3. Derives necessary conclusions through term relationships by logical necessity.

These distinct approaches reveal fundamentally different epistemological commitments. While Dignāga's system emphasizes the continuous interplay between conceptual understanding and empirical validation, Aristotle's system privileges the formal manipulation of categorical relationships. This difference reflects not merely technical variation but deeper philosophical divergences in how each tradition understands the relationship between logic, knowledge, and truth. Where Dignāga sees reasoning as an active process of discovery grounded in experience, Aristotle constructs a self-contained system of necessary truths derived from formal relationships.

Different Criteria for Valid Inference

While both systems aim to establish valid reasoning, they employ fundamentally different standards for determining what makes an inference legitimate (Hayes, 1988). These differences reflect distinct approaches to validation and truth.

As we mentioned previously, in Dignāga's system, validity fundamentally depends on the legitimacy of the reason through three characteristics:

(i) The reason must be present in similar cases (*anvaya*),

(ii) The reason must be absent in dissimilar cases (*vyatireka*), and

(iii) The reason must be present in the subject of inference (*pakṣadharmat*ā).

To illustrate these criteria, consider the inference 'Sound is impermanent because it is produced':

i. 'Being produced' must be present in known impermanent things (like pots), establishing a positive correlation.

ii. 'Being produced' must be absent in permanent things (like space), confirming a negative correlation.

iii. 'Being produced' must be verified in sound itself through direct perception.

These requirements create a dynamic validation process where:

i. Each criterion must be independently verified.

ii. The verification process depends on empirical observation.

iii. The validity remains open to revision based on new evidence.

iv. Counter-examples can invalidate established inferences.

Aristotle's system, by contrast, determines validity through formal criteria that rely on the necessity inherent in syllogistic reasoning (Aristotle, 1989, 26a23-30):

1) Correct structural arrangement of terms, which establishes proper categorical relationships between major, minor, and middle terms in the premises and conclusion.

2) Truth of premises, which provides the foundational claims from which valid inference proceeds.

3) Necessity of the conclusion following from premises through logical form alone, without requiring additional verification.

When these criteria are met, as in the classic syllogism:
'All humans are mortal' (Major premise)
'Socrates is human' (Minor premise).

'Therefore, Socrates is mortal' (Conclusion)
The validity emerges purely from the logical structure itself. Once the premises are accepted as true and properly arranged, the conclusion follows with absolute necessity, independent of any additional empirical verification. This represents a closed system of formal reasoning where validity is guaranteed by the internal relationships between categorical terms.

Conclusion

A careful examination of Dignāga's three-membered inference and Aristotle's syllogism reveals their profound differences in reasoning mechanisms and validation methods. Dignāga developed a system rooted in empirical observation and causal connections, where knowledge claims must be practically verified. In contrast, Aristotle built his logic on categorical relationships, where truth emerges necessarily from the formal structure of deductive reasoning.

Such divergence points to fundamentally different views of logical inquiry. Where Dignāga saw logic as necessarily engaging with experience and remaining open to revision, Aristotle envisioned it as a complete formal system operating independently of empirical concerns. Both approaches, however, deserve recognition as sophisticated achievements within their respective traditions of thought.

The comparison of these systems enriches our understanding of how human reasoning can take different yet equally valid forms. Instead of forcing one tradition into the framework of another, we might better appreciate how distinct philosophical cultures have crafted their paths to logical rigor. This insight not only facilitates meaningful dialogue between traditions but also illuminates the diverse ways societies have grappled with questions of knowledge and truth.

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