IBN SĪNĀ'S JUSTIFICATION OF THE USE OF INDUCTION IN DEMONSTRATION

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Abstract

In his works on demonstration (*burhān*) Ibn Sīnā lists five varieties of propositions which can be known for certain to be true and which may consequently be used as premises in demonstrative arguments. These are: (1) first principles or axioms (*awwalīyāt*), (2) propositions containing their own syllogisms (*qadāyā qiyāsātuhā ma'ahā*), (3) sense perceptions (*maḥsūsāt*), (4) historical and geographical propositions based on the reports of eyewitnesses (*mutawātirāt*), and (5) propositions derived from experience (*mujarrabāt*). The first two varieties comprise propositions based purely on reason, whereas the last three include propositions based on information gained through the senses. The fifth variety, moreover, involves propositions based not only on the senses but on induction (*istiqrā'*) as well. Since Ibn Sīnā elsewhere argues that induction must be rejected as a basis for propositions known for certain to be true, he must here justify his acceptance of induction in the case of propositions derived from experience. He does this by distinguishing between induction in general and the type of induction involved in experience. This paper attempts to clarify and explain Ibn Sīnā's distinction between these two types of induction.

The purpose of demonstration, according to Ibn Sīnā, is the attainment of truth. Demonstration, therefore, must be restricted to syllogistic or deductive arguments (*qiyās*) whose premises consist solely of indubitable propositions (*yaqīnīyāt*), that is, propositions which are known for certain to be true. Only such arguments, he claims, can result in conclusions that can be known for certain to be true. Arguments based on induction (*istiqrā'*), unless the induction is complete, or on analogy (*tamthīl*) cannot be used in demonstration, because such arguments do not lead to conclusions which can be known for certain to be true. Demonstration is thus defined by Ibn Sīnā as a syllogism composed of indubitable premises for the purpose of producing an indubitable conclusion (*qiyās mu'allaf min yaqīnīyāt li-intāj yaqīnī*).[1]

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[1] On the definition of demonstration see his *Kitāb al-Najāh*, p. 66, as well as *al-Ishārāt wa-al-Tanbīhāt, al-Manṭiq*, pp. 287-288 (Tehran edition); *al-Shifā', al-Manṭiq, al-Burhān*, pp. 51-53; *Dānishnāmah-i 'Alā'ī, Manṭiq*, p. 128; *Le Livre de Science*, I, 74.

The purpose of dialectic (*jadal*) and rhetoric (*khaṭābah*), on the other hand, is not the attainment of truth, but rather to achieve victory over an opponent in a debate or to persuade someone to accept a certain belief regardless of whether the belief is true or not. Since the attainment of truth is not their purpose, dialectic and rhetoric are not restricted to syllogistic or deductive arguments, nor must their premisses be indubitable. Both dialectic and rhetoric may include arguments based on induction (*istiqrā'*) or analogy (*tamthīl*) and may contain premisses which are well-known or widely accepted but which may not necessarily be true. Rhetoric may even contain premisses which are only probably true.[2]

In the sections on demonstration in his logical works, Ibn Sīnā lists five, and sometimes six, varieties of propositions which can be known for certain to be true and which may consequently be used as premisses in demonstrative arguments. These are: (1) first principles or axioms (*awwalīyāt*), such as the statement that the whole is greater than any of its parts; (2) propositions containing their own syllogisms (*qaḍāyā qiyāsātuhā ma'ahā*), such as the statement that four is an even number; (3) particular propositions based on sense perception (*maḥsūsāt, mushāhadāt*), such as the statement that this fire is hot; (4) propositions based on the reports of a sufficient number of eye-witnesses to preclude the possibility of their having agreed on a lie (*mutawātirāt, qaḍāyā tawāturīyah*), such as the statement that Mecca exists, for one believes this statement to be true regardless of whether one has actually been to Mecca or not; and, finally, (5) propositions based on experience (*mujarrabāt, tajribīyāt*), such as the statement that scammony is a laxative, or that wine is intoxicating, or that fire burns. In one of his works, *al-Ishārāt*, Ibn Sīna mentions a sixth variety of proposition which may also be used in demonstration. This variety comprises propositions based on intuition (*ḥadsīyāt*), that is, what one might call bright ideas or brilliant hypotheses supported by experience, such as the statement that the light of the moon is derived from that of the sun. In his other works Ibn Sīna apparently considered this sixth variety to be a subcategory of the fifth variety comprising propositions based on experience.[3]

These five varieties of demonstrative premiss may, of course, also be used in dialectic and rhetoric. However, since the purpose of dialectical and rhetorical arguments is not primarily the attainment of truth, such arguments may also contain premisses which are not indubitable.

Ibn Sīnā lists two varieties of premiss which can be used in dialectic but not in demonstration. These are: (1) well-known propositions (*mashhūrāt, dhā'i'āt*), that is, propositions which the great majority of people hold to be true, such as the statement that lying is evil, or justice is obligatory; and (2) admitted propositions (*musallamāt*), that is, propositions admitted as true by one's opponent in a debate,

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[2] For the purpose of dialectic and rhetoric see *al-Shifā', al-Manṭiq, al-Jadal*, pp. 24-25; *Dānish-nāmah-i 'Alā'ī, Manṭiq*, pp. 128-134; *Le Livre de Science*, I, 74-76.

[3] See, for example, *al-Ishārāt wa-al-Tanbīhāt, Manṭiq* pp. 213-219 (Tehran edition); *al-Shifā', al-Manṭiq, al-Burhān*, pp. 63-64; *al-Najāh*, pp. 61-66; and *Dānish-nāmah-i 'Alā'ī, Manṭiq*, p. 128 ; *Le Livre de Science*, I, 74-76.

such as the statement that God is one. He also lists two varieties of premiss that can be used in rhetoric but not in dialectic or demonstration. They are: (1) accepted propositions (*maqbūlāt*), that is, propositions accepted on the authority of someone else, such as the statements of scholars and other eminent or esteemed persons; and (2) opinions or probable propositions (*maẓnūnāt*), that is, propositions which are only probably true and might very well be false.[4]

If we return now to the five varieties of premiss that can be used in demonstrative arguments, it is evident that the first two varieties, namely, first principles and propositions containing their own syllogisms, comprise propositions based purely on reason, whereas the last three varieties include propositions based on information gained through the senses. The fifth variety, moreover, which consists of propositions based on experience, involves not only the senses but incomplete induction (*istiqrā' nāqiṣ*) as well.

As mentioned previously, however, incomplete induction, according to Ibn Sīnā, does not result in certain knowledge, and, therefore, no proposition based on incomplete induction can be known for certain to be true, and consequently no such proposition ought to be used as a premiss in demonstration. Ibn Sīnā cites two examples of incomplete induction which result in false conclusions. The first example is the case of a man who lives his entire life among black people in Africa and comes to the conclusion that all men are black. The second is the case of a man who examines all species of animals except the crocodile and comes to the conclusion that all animals move their lower jaws when chewing. Had he examined the crocodile he would have discovered that crocodiles move their upper jaws.[5]

Since Ibn Sīnā himself holds that incomplete induction can sometimes result in a false conclusion, how can he then justify the use of propositions based on induction as premisses in demonstration? He clearly does not want to exclude such propositions from demonstration, because to do so would exclude from demonstration all of the natural and physical sciences, including his own field of medicine, since they are all sciences derived from induction based on experience. Demonstration would then remain a valid method only for such subjects as mathematics and logic. Ibn Sīnā's problem is clear. On the one hand he wishes to retain demonstration as a method of attaining certain knowledge, but on the other hand he wishes to avoid having to come to the conclusion that demonstration is a method which cannot be applied to the physical sciences because they are based on induction and experience.

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[4] See *al-Shifā', al-Manṭiq, al-Jadal*, pp. 34, 39, 43, 72; *al-Ishārāt wa-al-Tanbīhāt, al-Manṭiq*, pp. 219-228; *Dānishnāmah-i 'Alā'ī, Manṭiq*, pp. 128-129; *Le Livre de Science*, I, 74-76; *Kitāb al-Najāh*, pp. 61-66. For a table of the various types of arguments and premisses that Ibn Sīnā asserts may be used in demonstration as compared to dialectic and rhetoric see the appendix at the end of the paper.

[5] See Ibn Sīnā, *al-Shifā', al-Manṭiq, al-Qiyās*, pp. 557-567; *al-Shifā', al-Manṭiq, al-Burhān*, pp. 95-96; *al-Ishārāt wa-al-Tanbīhāt, al-Manṭiq*, p. 231 (Tehran edition), I, 203-206 (Sulaymān Dunyā edition); *Dānishnāmah-i 'Alā'ī, Manṭiq*, pp. 92-93; *Le Livre de Science*, I, 61;

Ibn Sīnā is, of course, well aware of this problem and discusses it at length in several chapters of his *Kitāb al-Shifā'*.[6] His solution is to make a distinction between induction on the one hand, and experience on the other. He asserts that experience is a special kind of induction which, unlike induction in general, results in certain knowledge. The reason experience results in certain knowledge, he claims, is because the events or phenomena experienced involve causal relations. Thus a universal proposition based on experience involves a causal connection between subject and predicate, but a proposition based only on induction does not. For example, in the proposition "all fires burn," there is a causal connection between the fire and its act of burning. Similarly, in the propositions "wine is intoxicating" and "scammony is a laxative" there is a causal connection between the wine and its intoxicating effect and between the scammony and its action as a laxative.

How can one know, however, whether or not there exists a causal connection between a subject and predicate? One can know that such a causal connection exists, Ibn Sīnā says, through repeated observation of a certain phenomenon. For example, if two things, such as fire and burning, are repeatedly observed together, one can conclude that the burning does not occur accidentally or randomly, but as a result of the action of the fire, and that the fire is the cause of the burning. If there were no causal connection between the fire and the burning, then one would have observed instances of fire coming in contact with paper, for example, in which burning did not occur. One can therefore conclude that it is in the nature of fire to burn, and, since the natures of things do not change, that fire will continue to burn in the future. We can thus know for certain that all fires burn and always will.

Having presented his solution to the problem of how induction can be used in demonstration, Ibn Sīnā then takes up the objection of someone who brings up the proposition mentioned earlier that all men are black. How can one know that there is not something in the nature of men that causes them to be black? Ibn Sīnā's answer is that any universal statement about something must be restricted to the varieties and types of that thing that have actually been observed. Since in the proposition mentioned here only men in a limited area have been observed, one may safely say that all men in that area are black and that it is in the nature of such men to be black. Ibn Sīnā admits, moreover, the possibility that there may exist a variety of scammony somewhere that does not act as a laxative. He is not saying here that induction must be complete, that is, that every single man in the area has to be observed before one can say that they are all black or that one must have observed every instance of scammony acting as a laxative before one can make a universal statement about scammony. What he is saying is simply that one must restrict such statements to the type of scammony or the race of men one is familiar with. In other words, one can be completely truthful in saying that the scammony that one is familiar with always acts as a laxative or that all the men of the race one is familiar with are black.

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[6] See *al-Shifā', al-Manṭiq, al-Burhān*, pp. 93-98, 223-224, and *al-Shifā', al-Manṭiq, al-Qiyās*, pp. 557-567.

In conclusion, and in order to situate Ibn Sīnā's thought on this question historically, I should like to compare briefly his position with that of al-Fārābī, who died in 339/950, or some 87 years before Ibn Sīnā's death in 428/1037, and with the position of al-Ghazālī, who died in 505/1111, or 74 years after Ibn Sīnā.

Al-Fārābī, in discussing the premisses upon which demonstrative arguments can be based, mentions only two varieties of premiss rather than the five or six varieties mentioned by Ibn Sīnā. These are: (1) premisses based on innate reason, or intuition (*al-ṭibā'*), and (2) premisses based on experience (*al-tajribah*). Al-Fārābī calls the first variety first premisses (*muqaddimāt uwal*) or first principles (*mabādi' uwal*); the second variety he calls principles of certainty (*awā'il al-yaqīn*). Like Ibn Sīnā he makes a distinction between experience and induction. Although the two concepts are similar and are often used interchangeably, he says, they are nevertheless distinct in that induction does not lead to certain knowledge, whereas experience does lead to certain knowledge. Unlike Ibn Sīnā, however, he does not find it necessary to explain why experience leads to certain knowledge and induction does not. What is important, al-Fārābī says, is that, as a result of experience, one has an awareness of knowing with certainty, whereas with induction one does not gain any sense of certainty. It is not important to understand why experience results in certainty and induction does not.[7]

It is clear that Ibn Sīnā's treatment of these questions represents a substantial advance over al-Fārābī's treatment. It is perhaps for this reason that al-Ghazālī adopts in its entirety Ibn Sīnā's enumeration of the varieties of premiss that can be used in demonstration and also adopts, but not without a major modification, Ibn Sīnā's explanation of the distinction between induction and experience. Al-Ghazālī admits that through experience one can know which events are random or accidental, and which events follow a regular pattern or law and can therefore be the basis for indubitable universal propositions. He disagrees with Ibn Sīnā, however, in ascribing such regular patterns to causal connections. He does not, for example, doubt the truth of the proposition that all fires burn. What he rejects is Ibn Sīnā's belief that fire is the cause of the burning because of something in the nature of fire which has this effect on combustible materials. The reason he rejects Ibn Sīnā's position is because he wishes to uphold the doctrine of the Ash'arite theologians that God is the direct and immediate cause of everything that exists or occurs in the universe. In al-Ghazālī's view it is God who is the cause of the fire and God who is also the cause of the burning. There is no need, in his opinion, to assume the existence of a causal connection between the fire and the burning, nor, indeed, is there any empirical evidence to support the belief in such a connection. The fact that God acts according to certain patterns and customs is all one needs to know in order to accept the truth of universal propositions based on experience. There is no need at all for Ibn Sīnā's causal explanation.[8]

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[7] See al-Fārābī, *Kitāb al-Burhān*, pp. 24-25.

[8] See al-Ghazālī, *Tahāfut al-Falāsifah*, pp. 185-196 (Kamali translation), pp. 277-296 (Bouyges edition), pp. 225-237 (Sulaymān Dunyā edition). Al-Ghazālī 's pre-

APPENDIX

COMPARISON OF DEMONSTRATION WITH DIALECTIC AND RHETORIC

DEMONSTRATION (*burhān*)	DIALECTIC (*jadal*)	RHETORIC (*khaṭābah*)
Arguments restricted to:	Arguments may include:	Arguments may include:
Syllogism (*qiyās*)	Incomplete induction (*istiqrā' nāqiṣ*)	Incomplete induction (*istiqrā' nāqiṣ*)
Complete induction (*istiqrā' tāmm*)	Analogy (*tamthīl*)	Analogy (*tamthīl*)
Premisses restricted to:	Premisses may include:	Premisses may include:
First principles (*awwalīyāt*)	Well-known propositions (*mashhūrāt*)	Opinions (*maẓnūnāt*)
Propositions containing their own syllogisms (*qaḍāyā qiyāsātuhā ma'ahā*)	Admitted propositions (*musallamāt*)	Accepted propositions (*maqbūlāt*)
Propositions based on sense perception (*maḥsūsāt*)		
Propositions based on the reports of eye-witnesses (*mutawātirāt*)		
Propositions based on experience (*tajribīyāt*)		
Propositions based on intuition (*ḥadsīyāt*)		

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misses of demonstration may be found in his *Miḥakk al-Naẓar fī al-Manṭiq*, pp. 48-55, and his *Mi'yār al-'Ilm fī Fann al-Manṭiq*, pp. 108-111.

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