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AVICENNA ON THE LOGIC OF "CONDITIONAL" PROPOSITIONS

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I. *Introduction.* Like most of the notable medieval Arabic philosophers working in the Aristotelian tradition, Abū ᶜAlī al-Ḥusain ibn ᶜAbdallāh ibn Sīnā, better known under the Latinized name of Avicenna (980-1037), wrote extensively on logic. In their logical works, the Arabian philosophers invariably hewed to their Greek sources with painstaking care. It is consequently of some interest to find in Avicenna a discussion of the logic of hypothetical and disjunctive propositions which, beginning from a point of departure that is clearly Greek, and indeed Stoic in origin, goes beyond the discussion hitherto found in the accessible sources. The object of the present paper is to throw some light upon this chapter of Avicenna's logic.

II. *"Conditional" Propositions.* Avicenna distinguishes between "attributive" (Arabic: *ḥamliyyah*) propositions, which ascribe a predicate to a subject, or deny it to the subject,[1] and "conditional" (*sharṭiyyah*) propositions, i.e., compound propositions each of whose constituent propositions are displaced from their ordinary assertive function to play another role (I, 115). The paradigm examples of "attributive" propositions are "Man is an animal" and "Man is not a stone" (I, 116-117; D, 36). In the full light of his discussion, Avicenna's "attributive" propositions are readily seen to correspond to *categorical* propositions. The paradigm examples of "conditional" propositions are "If the sun shines, it is day" and "Either this number is even, or it is odd" (I, 117-118; cf. D, 36). Thus "conditional" propositions are *compounds* of "attributive" proposition, the compound statement being such as not to assert its components, but to relate them.

Avicenna considers two main types of "conditional" propositions: "conjunctive" (*muttaṣilah*) and "disjunctive" (*munfaṣilah*). The "conjunctive conditional" propositions correspond to *hypothetical* statements. The paradigm examples are "If the sun has risen, it is day", and "If the sun has

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risen, it is not night" (I, 117-118; D, 41-42). The "disjunctive conditional" propositions correspond to *disjunctive* statements (in the sense of exclusive disjunction).[2] The paradigm examples are "Either this number is even, or it is odd" and "Either this number is even, or it is not divisible into two even parts" (I, 118, D, 41-42).[3]

Avicenna's distinctions correspond exactly with those found in Boethius' treatise *De Syllogismo Hypothetico*,[4] which subsequently became established in Western logic.[5] (Since Latin writings were not available to the Arabs, this may be taken as further evidence in support of the general supposition that the pivotal ideas of Boethius' work derive from Greek sources).[6] This correspondence may be indicated as follows:

"Modern" Terminology	Boethius' Terminology	Avicenna's Terminology
I. Categorical Propositions	I. Categorical Propositions	I. Attributive Propositions
II. Non-Categorical Propositions	II. Hypothetical Propositions	II. Conditional Propositions
1) Hypothetical	1) Conjunctive	1) Conjunctive
2) Disjunctive	2) Disjunctive	2) Disjunctive

Thus, for Avicenna, a "conditional" proposition may take either of the forms:

(i) "Conjunctive" case: *If A, then C.*
(ii) "Disjunctive" case: *Either A, or C.*

In both cases, a "conditional" proposition has two constituents, of which the former (i.e., *A*) is characterized as *antecedent* (*muqaddam*), and the latter (i.e., *C*) as *consequent* (*tālī*) [I, 117; D, 41]. Avicenna applies this terminology in the "disjunctive" as well as in the "conjunctive" case. When a "disjunctive conditional" proposition takes the form "Either *A*, or C_1, or C_2", *both* C_1 and C_2 are characterized as consequents (D, 41-42). Avicenna also recognizes such complex "conditional propositions" as "*If A, then either* C_1 *or* C_2", and "*Either if A then* C_1 *or it is not the case that if A then* C_2" (I, 129-130).

III. *The Quality of "Conditional" Propositions.* According to Avicenna, "conditional" propositions can be either affirmative or negative. His paradigm examples of negative "conditionals" are: "Not: if the sun has risen, it is night", and "Not: either this number is even, or it is divisible into two equal parts" II, 118; D, 43-44). He is explicit in emphasizing that the quality of a "conditional" proposition has nothing to do with the affirmativeness or negativity of its constituents, but depends solely upon whether the liaison or relationship between them is affirmed or denied (I, 118; cf. D, 43).

With respect to the quality of "conditional" propositions, Avicenna thus presents the following classification:

Mode of "Conditional"	Affirmative Form	Negative Form
"Conjunctive"	*If A, then C.*	*Not: if A, then C.*
"Disjunctive"	*Either A, or C.*	*Not: either A, or C.*

Avicenna apparently takes no account here of the fact that there is no way in which a proposition of the form "*Not: if A, then C*" can be transformed of the "conjunctive conditional" paradigm "*If X, then Y*".[7] Nor can "*Not: either A or C*" (in Avicenna's exclusive sense of "*either . . . or*") be put into the form "*Either X, or Y*". Avicenna fails to note that in introducing the negative forms of "conditional" propositions in the way he does, he has, in effect, *broadened* the categories of "conjunctive" and "disjunctive" propositions beyond their original characterization.[8]

IV. *The Quantity of "Conjunctive Conditional" Propositions.* As a result of the work of Benson Mates, it is well-known that the Megarian logician Diodorus Cronus introduced a mode of implication characterized by the principle that "*If A, then C*" is to amount to:

At each and every time t: If A-at-t, then C-at-t.

Following Mates, we may symbolize this *Diodorean implication* in modern notation as: $(t)(A_t \supset C_t)$.[9] Diodorus' paradigm example of a true implication statement is "If it is day, then it is light", and of a false one, "If it is day, then I am conversing".[10]

The Diodorean conception of implication remained a living idea among the Stoic logicians.[11] It is well-known that the Arabic philosophers drew extensively on the work of the Stoics.[12] Thus it was that Avicenna found that Diodorean implication afforded a ready-made instrument for the quantification of "conditional" propositions.

Avicenna teaches that an affirmative "conjunctive conditional" proposition "*If A, then C*" may take the universal form,

(i) Always [i.e. "at all times"[13] or "in all cases"]: when A, then (also) C;

or the particular form,

(ii) Sometimes: when A, then (also) C.[14]

Correspondingly, the negative "conjunctive conditional" propositions can take the universal form,

(iii) Never: when A, then (also) C;

and the particular form,

(iv) Sometimes not: when A, then (also) C.[15]

Avicenna's discussion and his illustrative examples make it clear that what he has in mind is most simply and accurately described in terms of the table:

Cases in which	*C* holds	*C* does not hold
A holds	I	II
A does not hold	III	IV

Here the universal affirmative (i) corresponds to the condition that compartment II is empty. (Note that this accounts for the terminology of "conjunctive" for hypotheticals—if II is empty, then *C* is always "conjoined" with *A*.) The particular affirmative (ii) corresponds to the circumstance that compartment I is non-empty (i.e., *A* and *C* are sometimes "conjoined"). Analogously, the universal negative (iii) corresponds to the circumstance that compartment I is empty, and the particular negative (iv) to the circumstance that compartment II is non-empty.

Thus we may summarize:

Avicenna's Classification of Conjunctive Conditional Propositions

Form	Symbolic Rendition	Avicenna's Illustrative Paradigm
A (U.A.)	$\begin{cases} (t)\,(A_t \supset C_t) \\ (t){\sim}(A_t \,\&\, {\sim}C_t) \end{cases}$	"Always: when the sun has risen, it is day." (I, 123; D, 43-44)
E (U.N.)	$(t){\sim}(A_t \,\&\, C_t)$	"Never: when the sun has risen, it is night." (I, 123; D, 44)
I (P.A.)	$(\exists t)(A_t \,\&\, C_t)$	"Sometimes: when the sun has risen, it is cloudy." (I, 123; D, 44)
0 (P.N.)[16]	$(\exists t)(A_t \,\&\, {\sim}C_t)$	"Sometimes not: when the sun has risen, it is cloudy." (I, 123-24; D, 44)

As this exposition of Avicenna's discussion shows, his treatment of "conditional conjunctive" propositions is in effect a generalization upon the Diodorean analysis of implication. The single universal affirmative mode of Diodorean implication is expanded into a full-scale treatment of this implication relationship, fully articulated with respect both to quantity and to quality.

V. *The Quantity of "Disjunctive Conditional" Propositions.* In quantifying "conjunctive conditional" propositions, Avicenna, as we have seen, follows in the footsteps of the Stoics, carrying to their "logical conclusion" suggestions inherent in the Diodorean concept of implication. In the analogous quantification of "disjunctive conditional" propositions, Avicenna's discussion takes yet another step beyond Stoic logic as we presently conceive it.

In the quantification of "disjunctive conditional" propositions of the form "*Either A, or C*", Avicenna proceeds by close analogy with his Diodorean-style quantification of implication-statements of the form "*If A, then C*". Thus Avicenna holds that an affirmative "disjunctive conditional" statement may take either the universal form,

(i) Always [i.e., "at all times" or "in all cases"]: either A, or C;

or the particular form,

(ii) Sometimes [i.e., "at certain times" or "in certain cases"]: either A, or C.[17]

Correspondingly, the negative "conjunctive conditional" propositions can take either the universal form,

(iii) Never [i.e., "at no times" or "in no cases"]: either A, or C;

or the particular form,

(iv̌) Sometimes [i.e., "at certain times" or "in certain cases"] not either A, or C.

Again, the exact construction Avicenna places upon these propositions is best described in terms of the table:

Cases in which	C holds	C does not hold
A holds	I	II
A does not hold	III	IV

The universal affirmative proposition (i) corresponds to the condition that compartments I and IV are both empty; and the particular affirmative (ii) corresponds to the circumstance that at least one of the compartments II and III is non-empty. Analogously, the universal negative (iii) corresponds to the circumstance that compartments II and III are both empty (i.e., A and C always either occur conjointly or are absent conjointly), while the particular negative (iv̌) corresponds to the circumstance in which at least one of the compartments I and IV are non-empty.

Thus we may summarize:

Avicenna's Classification of "Disjunctive Conditional" Propositions

Form	Symbolic Rendition[18]	Avicenna's Illustrative Paradigm
A (U.A.)	$(t)\,(A_t \vee C_t)$	"Always: either a number is even, or it is odd." (I, 123; cf. D, 44)
E (U.N.)	$(t) \sim (A_t \vee C_t)$	"Never: either the sun has risen, or it is day." (I, 123; cf. D, 44)
I (P.A.)	$(\exists t)\,(A_t \vee C_t)$	"Sometimes: either Zaid is in the house, or Amr is there." (I, 123; cf. D, 44)
0 (P.N.)	$(\exists t) \sim (A_t \vee C_t)$	"Sometimes not: either a fever 'bilious', or it is 'sanguine'." (I, 123-124; cf. D, 44)

We thus find that Avicenna's discussion carries over to disjunctive propositions the Diodorean-style quantification which it provided for hypothetical propositions. It is possible that this might be found already in his Arabic predecessors,[19] or in some late Greek commentary on Aristotle's logic written under Stoic influences.[20] But so far as I have been able to determine, Avicenna is the first writer in the history of logic to give an analysis of hypothetical and disjunctive propositions that is fully articulated with respect to quality and to quantity.

VI. *The Theory of Immediate Inference for "Conditional" Propositions.* In the treatise under consideration, Avicenna dispatches the question of the theory of immediate inference for "conditional" propositions in one brief remark. He observes that, in the two cases of *contradiction* and of *conversion* the same rules apply which govern the "attributive", i.e. categorical, propositions, the antecedent playing the role of subject, and the consequent that of predicate (I, 131). The extent to which this remark is correct may be seen in the following tabulation:

Categorical Inference[21]	Status of "Conjunctive Conditional" Analogue	Status of "Disjunctive Conditional" Analogue
Contradiction		
1) Of *A* and *O*.	holds	holds
2) Of *E* and *I*.	holds	holds
Conversion		
1) Of *A* (invalid)	fails	holds*
2) Of *E* (valid)	holds	holds
3) Of *I* (valid)	holds	holds
4) Of *O* (invalid)	fails	holds*

It is clear that Avicenna's statement is correct only with the exception of the two starred cases. But Avicenna is perfectly aware of this unorthodox feature of "disjunctive conditional" propositions, and himself comments upon it with admirable explicitness.[22] It seems necessary therefore to regard Avicenna's above-cited statement as an incautious formulation. What he should have said is that, with regard both to contradiction and conversion, all of the categorically valid inferences are also valid for "conditional" propositions, though the converse of this rule holds only in the case of "conjunctive conditional" propositions.

With regard to other kinds of immediate inference, it is clear thaı subalternation (*A* to *I*, *E* to *O*), contrariety of (of *A* and *E*) and subcontrariety (of *I* and *O*) also hold with respect both to "conjunctive conditional" and to "disjunctive conditional" propositions.

VII. *Another Treatment of the Quality and Quantity of Hypothetical and Disjunctive Properties.* To have a standard of comparison for assessing the treatment of the logic of "conditional" propositions to be found in Avicenna, it is useful briefly to examine the discussion of hypothetical and disjunctive propositions in a modem logic-manual written in the Western "Aristotelian" tradition. For this purpose, I have chosen J. Welton's comprehensive *Manual of Logic* (vol. I, 2d. ed., London 1896; cited henceforth as "ML").

The paradigm of a hypothetical proposition is taken as "If M, then P" (p. 181). Here *M* and *P* are understood to be strictly subject-predicate propositions, of the type "*S* is an *M*" and "*S* is a *P*", respectively. A hypothetical proposition is negative when its *consequent* is negated, so that the paradigm of a negative hypothetical is "*If M, then not P*". (It is thus recognized that the *denial* of a hypothetical is not itself of hypothetical form—a result that Avicenna apparently viewed with distaste.) The quantity of a hypothetical proposition is fixed by prefixing "always" for universals, and "sometimes" for particulars (p. 186). The four resulting modes are characterized as:[23]

Mode	Formulation	Interpretation
A (U.A.)	Always, if *M*, then *P*.	$(s)(M_s \supset P_s)$
E (U.N.)	Always, if *M*, then not *P*. Never, if *M*, then *P*.	$(s)\,(M_s \supset \sim P_s)$ $(s) \sim (M_s \,\&\, P_s)$
I (P.A.)	Sometimes, when *M*, then *P*.	$(\exists s)(M_s \,\&\, P_s)$
O (P.N.)	Sometimes, when *M*, then not *P*.	$(\exists s)(M_s \,\&\sim P_s)$

It is readily seen that, from a *strictly formal* standpoint, this analysis is entirely equivalent with that presented by Avicenna. A great difference, however, lies in the *semantical interpretation* of hypotheticals in the two treatments. For Avicenna, the U.A. proposition "*If A, then C*" is construed as: "In every *case in which A* holds true, so also does *C*". For Welton, on the other hand, "*If M, then P*" is to be construed as "For every *individual for which M* holds true, so also does *P*". Avicenna thus construes hypotheticals after the Stoic "case-in-which-true" manner, while Welton adheres to the "thing-for-which-true" construction of subject-predicate logic.

With respect to the theory of immediate inference for hypotheticals, Welton states that, on the analysis just given, "the whole doctrine of opposition is applicable" (ML, 244), and proceeds to show this in a detailed way.[24] In view of the formal equivalence just remarked upon, the Avicenna can, of course, make the same claim.

With regard to *disjunctive* propositions, one fundamental point of difference lies in the fact that Welton construes disjunction in terms of its *inclusive* applications (ML, 188-189). He proceeds to recognize four modes of disjunctive propositions:[25]

Mode	Formulation	Interpretation
A (U.A.)	All *S*'s are either *P*'s or *Q*'s	$(s)(P_s \vee Q_s)$
E (U.N.)	No *S*'s are either *P*'s or *Q*'s	$(s)\sim(P_s \vee Q_s)$
I (P.A.)	Some *S*'s are either *P*'s or *Q*'s	$(\exists s)(P_s \vee Q_s)$
O (P.N.)	Some *S*'s are neither *P*'s nor *Q*'s	$(\exists s)(\sim P_s \,\& \sim Q_s)$ $(\exists s)\sim(P_x \vee Q_s)$

We may observe that, aside from the different (i.e., inclusive) construction of the disjunction relation "either. . . or", there is a substantial formal analogy between the four modes of Welton's treatment and those of Avicenna's discussion. However, there is again a vast difference in the meaning which these two analyses accord to disjunction-statements. In Welton, the discussion is rigidly restricted to the confines of subject-predicate logic. In Avicenna we have the Stoic-Megaric notion of quantifying over "cases in which X holds". In Welton's analysis, on the other hand, we have only the orthodox "Aristotelian" notion of quantifying over "things to which X applies".

As regards the theory of immediate inference for disjunctive propositions, Welton explicitly recognizes that "the full doctrine of opposition cannot be applicable" (ML, 246). He is quite clear as to the modifications that are required.[26]

VII. *Conclusion.* We have seen that a fully articulated theory of the logic of hypothetical and disjunctive propositions is apparently first to be found in the logical treatises of Avicenna. This theory may possibly be a product of late Greek rather than of originally Arabian logic, being a natural extension of ideas inherent in Stoic logic. At any rate, Avicenna is the earliest logician in whose writings this theory has thus far been identified.

As a comparison with the approach of "Aristotelian" logicians in the Latin West emphasizes, Avicenna's quantification of hypothetical and disjunctive propositions proceeds in truth-condition terms, rather than in the subject-predicate terms of the analysis given by European logicians. This difference of approach is clearly traceable to Stoic influences. Avicenna's treatment of "conditional" propositions thus affords a striking illustration of the fact that in Arabic logic, Stoic ideas were yet alive which did not figure in the more orthodox Aristotelianism which developed among the Latins.

NOTES

1. *Livre des Directives et Remarques* (Kitāb al-Ishārāt wa-'l-Tanbīhāt), translated by A. M. Goichon (Paris and Beyrouth, 1951), p. 114. [This work is henceforth cited as "I".] *Le Livre de Science* (*Dānesh — nāme),* pt. I (Logic and Metaphysics), translated by M. Achena and H. Massé (Paris, 1955), pp. 36-37. [This work is henceforth cited as "D".] Avicenna's fullest treatment of logic is to be found in his massive treatise *Al - Shifā'* whose logical sections are now appearing in print in Cairo under the auspices of the Egyptian Ministry of Education. The section of this work relevant to the present paper (No. IV on syllogistics, *al-Qiyās*) has not yet appeared. Until it is available, the present discussion must be viewed as tentative.

   In a work entitled *L'Organon d'Aristote dans le Monde Arabe* (Paris, 1934), Ibrahim Madkour has made an extensive study of the *Ishārāt.* (The section of this work which will concern us here is treated on pp. 159-172.) Valuable though it is, Madkour's discussion is not always to be trusted on points of logic, and indeed sometimes puts Avicenna into errors which he himself avoided.

2. The exclusive character of disjunction is quite clear throughout Avicenna's discussion. For example: "The assertion of a disjunctive proposition consists in asserting an incompatibility—as when one says: 'It is either thus, or it is so'." (D. 44). Sometimes, however, Avicenna's examples of disjunctions would be compatible with an inclusive construction of "either. . . or".

3. For fuller information regarding Avicenna's classification of propositions, and for his terminology, see A. M. Goichon, *Lexique de la Langue Philosophique d'Ibn Sīnā* (Paris, 1938), pp. 305-318. That the distinctions just explained became part of the standard machinery of Arabic logic is shown by their inclusion in al-Abharī's popular tract "Introduction to Logic" (*Īsāghūjī fī-'l-Manṭiq*). See E. E. Calverly's translation in the *D. B. MacDonald Memorial Volume* (Princeton, 1933), pp. 75-85 (see pp. 80-81).

4. Migne, *Patrologia Series Latina*, vol. 64 (=*Boetii Opera Omnia*, v. II), pp. 831-876, see pp. 832-834. For two other points of agreement between Boethius and Avicenna regarding logical matters see S. M. Afnan, *Avicenna* (London, 1958), p. 84 and p. 97.

5. See H. W. B. Joseph, *An Introduction to Logic* (2d. ed., Oxford, 1916), p. 348, n. 1. Cf. Sir William Hamilton's *Lectures on Logic*, lecture XIII.
   Mlle. Goichon believes that Avicenna's "conditional" propositions constitute "une sorte de proposition qui ne presente pas une correspondence exacte avec celle que l'on étudie en logique occidentale", and conjectures that Avicenna derived this concept from Oriental sources (I, 115, footnote 1). But this view is unwarranted, because every detail of Avicenna's characterization of "conditional" propositions corresponds precisely to Boethius' treatment of the category of "hypothetical" propositions. In general, however, Miss Goichon clearly and rightly stresses Avicenna's indebtedness in the analysis to Stoics sources (I, 57 and 67).

6. Regarding the occurrence of these distinctions in Chrysippus, see von Arnim, *Stoicorum Veterum Fragmenta* (Leipzig, 1903), vol. II, p. 68; as cited by S. M. Afnan, *Avicenna* (London, 1958), p. 196, and cf. also pp. 86-87. A discussion of the sources of Boethius is found in K. Dürr, *The Propositional Logic of Boethius* (Amsterdam, 1951), pp. 4-15. The distinctions in question apparently go back to the earlier peripatetics, Theophrastus and Eudemus in particular, and were taken up by the Stoics.

7. In consequence of this, Western logicians did not divide the class of hypotheticals into the subdivisions of affirmative and negative. (See for example, J. Gredt, *Elementa Philosophiae Aristotelico-Thomisticae* (Barcelona, 1946) I, pp. 37-40.)

8. Rather than taking this omission to represent a mere oversight on Avicenna's part, I believe it to be an (added) indication that Avicenna's logic draws upon sources in which the Stoic distinction between *denial* (*arnētikon*) and *negation* (*apophatikon*) is made. (See B. Mates, *Stoic*

Logic [University of California Publications in Philosophy, vol. 26 (1953)], p. 31). If we start with discussions in which this distinction is presupposed, but assume it to be blurred in translation or exegisis, Avicenna's remarks are a natural consequence.

9. Benson Mates, "Diodorean Implication", *The Philosophical Review*, vol. 58 (1949), pp. 234-242; see especially p. 238. Cf. also Martha Hurst, "Implication in the Fourth Century B.C.", *Mind*, vol. 44 (1935), pp. 485-495; and Mates' *Stoic Logic*, Berkeley and Los Angeles (1953; University of California Publications in Philosophy, no. 26).

10. In the case of atemporal subject-matter, it would seem natural to substitute "case-in-which" for "time-at-which" phraseology, for example in a Diodorean-type rendering of the conditional "If a number is prime, it cannot be divided by four". Our very scanty sources regarding Diodorus however give no indication that he applied his analysis to atemporal cases.

11. See Mates' discussion, *op. cit.* p. 234. Sextus Empiricus quotes the remark of Callimachus that "Even the crows on the roof-tops are cawing about which conditionals are true" (*Adv. Math.* (Loeb), I, 309).

12. See S. Horowitz's classic study, "Ueber den Einfluss des Stoicismus auf die Entwicklung der Philosophie bei den Arabern", *Zeitschrift der Deutschen Morgenländischen Gesellschaft*, vol. 57 (1903), pp. 177 ff.

13. Regarding Avicenna's emphasis upon this temporal construction see Miss Goichon's comment, I, p. 157, n.b.1.

14. See I, 123; D, 43-44.

15. See I, 123-124; D, 43-44.

16. In Avicenna's discussion, following Aristotle (*Anal. Pr.*, 24a18-22), propositions of "indeterminate" quantity are also treated. A proposition is of indeterminate quantity when, like "Man is a writer" its quantity is indefinite, being wholly equivocal as between "All men are writers" and "Some men are writers" (I, 123-124; D, 44).

17. See I, 123-124; D, 43-44.

18. The upper case vee "V" is here used to symbolize exclusive disjunction, following Bocheński's usage in his discussion of Boethius in *Ancient Formal Logic* (Amsterdam, 1951), p. 107.

19. We know that al-Fārābī (c. 870-950) wrote on hypothetical propositions and inferences. (See C. Prantl, *Geschichte der Logik im Abendlande*, vol. II, pp. 317-318). We know too that al-Fārābī's teacher, Abū Bishr Mattā ibn Yūnus (c. 860-940) wrote a treatise on hypothetical syllogisms. (See M. Steinschneider, "Die Arabischen Uebersetzungen aus dem Griechischen", *Zwölftes Beiheft zum Centralblatt für Bibliotheks-wesen* [Leipzig, 1893], p. 43.) Unfortunately, however, neither of these works has survived. However, al-Fārābī's treatise on syllogistics (*al-qiyās*), published by Mlle. M. Türker in 1958 (*Revue de la Faculté de Langues, d'Histoire, et de Géographie de l'Université d'Ankara*, vol.

16, 1958), does contain a short section on conditional syllogisms, giving a discussion which in large measure agrees, as far as it goes, with Avicenna's treatment. Furthermore, al-Kindī (c. 800-873) is known to have been partial to hypothetical and disjunctive syllogisms. (See R. Walzer, "New Light on the Arabic Translations of Aristotle", *Oriens,* vol. 6 (1953), p. 129.)

20. The concepts of Stoic logic penetrated into the other schools of Greek philosophy. See, for example, H. Matte in *Gnomon*, vol. 23 (1951), p. 35.
21. It is assumed throughout that the requirement of existential import is satisfied.
22. See D, 42-43, where Avicenna discusses the greater amenability to conversion of "disjunctive conditional" propositions *vis à vis* the "disjunctive conditional" ones.
23. ML, 244; see also p. 271.
24. See ML, 244-246.
25. ML, 192; see also p. 246.
26. See ML, 274.

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