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AN ANSWER TO ARMSTRONG'S QUESTION ABOUT INCOMPLETENESS IN COPI

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In a recent article[1] Robert L. Armstrong raised a question about the proof presented by Irving M. Copi of the incompleteness of the first 19 rules of inference of Copi's method of deduction.[2] Copi's proof is a variation on a well-known technique introduced for axiomatic propositional logic by Bernays in 1918; in 1935 Huntington showed that the method could be extended to rules of inference.[3] This author has checked Copi's proof, and it is correct. Armstrong, on the other hand, presents formal proofs and accompanying arguments which cast doubt on Copi's proof. Armstrong's remarks are quite valuable, insofar as they reveal Copi's system to be less than transparent. But what are we to make of this situation? It can be resolved on the grounds of formal logic as follows.

Copi's collection of 19 rules is designed for systematizing the deduction of conclusions from premises. As it stands, however, the system cannot arrive at the *truth* of any statement whatsoever. This is because each of the first nine rules clearly requires initial premises, and each of the ten forms of the Rule of Replacement presupposes a premise or derived statement into which the replacement is made. But no premises, or axioms, are given *a priori* as a part of this formal system. Copi's 19 rules may be compared to the massive machinery of a new steel mill lying idle, waiting for the opening-day arrival of raw material. The spirit of formalization precludes after-the-fact "changing the rules of the game," such as the introduction of additional premises not initially provided for in a

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1. Robert L. Armstrong, "A question about completeness," *Notre Dame Journal of Formal Logic*, vol. 17 (1976), pp. 295-296.

2. Irving M. Copi, *Symbolic Logic*, 4th edition, The Macmillan Co., New York (1973), pp. 47-50.

3. Alonzo Church, *Introduction to Mathematical Logic I*, Princeton University Press, Princeton (1956), p. 163.

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