Annotated Bibliography on the Ancient Stoic Dialectic (Second Part: F - Z)

BIBLIOGRAPHY


   Abstract: "It has been noted before in the history of logic that some of Frege’s logical and semantic views were anticipated in Stoicism. In particular, there seems to be a parallel between Frege’s *Gedanke* (thought) and Stoic *lekton*; and the distinction between complete and incomplete lekta has an equivalent in Frege’s logic. However, nobody has so far claimed that Frege was actually influenced by Stoic logic; and there has until now been no indication of such a causal connection. In this essay, we attempt, for the first time, to provide detailed evidence for the existence of this connection. In the course of our argumentation, further analogies between the positions of Frege and the Stoics will be revealed."
The classical philologist Rudolf Hirzel will be brought into play as the one who links Frege with Stoicism. The renowned expert on Stoic philosophy was Frege's tenant and lived in the same house as the logician for many years."

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"In their logical theory Stoic philosophers made use of a simple but important distinction alleged to hold among valid arguments, a distinction to which Aristotle had first called attention.(1) They distinguished those arguments whose validity is evident from those whose validity is not evident and so needs to be demonstrated. The Stoics, having supposed that the distinction obtains, raise and answer the question, how does one demonstrate the validity of those arguments whose validity is not plain? The Stoics appear to have set forth both a discursive method of demonstration and a test for validity. In this paper I examine these two facets of Stoic logic.(2)

The paper is in three parts. The first is essentially terminological and taxonomic. There I record Stoic definitions of logical terms and I give three Stoic classifications of arguments, appending samples from the writings of Sextus Empiricus.(3) This provides and puts on exhibit an array of typically Stoic arguments to which I refer in the second part of the paper. There I examine Sextus' contention that the disagreement among the Stoics over the criterion of truth for a conditional proposition renders inefficacious the test that had been set forth as sufficient for judging the validity of an argument, and I argue that Sextus' charge has to be qualified. Even if an unqualified form of Sextus' accusation could be established, its importance, I maintain, would be diminished by the fact that the Stoics didn't make extensive use of this test anyhow. As I show in the third part of the paper, the Stoics ordinarily claim to prove the validity of all valid arguments(4) not by means of a test but by means of a calculus of propositions(5) having its base in a theory of deduction, which includes a language consisting of connectives and variables, axiomatic inference schemata, and rules of derivability. I conclude with a statement about the Stoic theory of deduction in relation to systems of logic developed in the 19th and 20th centuries and to Aristotelian syllogistic." (p. 151)

(1) Prior Analytics I.24b22-26, 27a16-18. The distinction between plainly valid syllogisms and non-evidently valid syllogisms is for Aristotle the distinction between 'perfect' syllogisms, on the one hand, and 'imperfect' syllogisms, on the other. A perfect syllogism is one in which, as Aristotle frequently puts it, the necessity (of the conclusion if the premises be assumed) is evident. That the Stoics presupposed this distinction is made clear in Part III of this paper.

(2) I wish to thank my colleagues, James A. Thomas and Harold Morick, for helpful critical remarks on an earlier draft of this paper. I am also enormously indebted to John Corcoran for many incisive remarks and helpful suggestions on two later versions of the paper.

(3) Sextus is the richest source we have for a knowledge of Stoic logic. Being a Sceptic he is extremely critical of the Stoics. He also tends to be tediously repetitious. He appears to have quoted and paraphrased with care, though there aren't always non-circular ways of checking this. As Mates has observed (Stoic logic (1961), p. 9), "any parts of Stoic logic which he found either too difficult or too good to refute will be absent from his account", but even so there is enough material in Sextus to extract a fairly good account..."
of the elements of Stoic logic.

(4) Mates refers in several places (pp. 4, 58, 82) to and gives evidence for the Stoics' claim that their propositional logic was complete.

(5) The Stoics didn't call their logic a calculus of propositions (Diogenes Laertius groups Chrysippus' books dealing with the subject under the heading 'Logic in Relation to Arguments and Moods', Vitae VII. 193); but Stoic logic shares so many similarities with modern propositional logic, calling their logic 'a calculus of propositions' while anachronistic is at least not baneful, and it is, in fact, in my view illuminating to use this expression to refer to Stoic logic.


"Whether or not the Stoics conceived of any "science" corresponding in scope and methods to formal semantics in the sense described, for example, by J. Moravcsik (1) seems hard to determine. Evidence regarding this issue is scantly, particularly in view of the fact that some of the isolated testimonies relating to the Stoic theory of meaning are extremely difficult to assess and still require good deal of extensive analysis. From the meager reports concerning the bare essentials of this theory as incorporated into later manuals and elsewhere, it would appear, however, that in the course of their school's history the Stoics developed a fairly detailed semantic theory. It is a theory of meaning that has invited comparison with modern theories and obviously stood it well. In fact, it is generally agreed that the Stoic account of semantics is superior to and more sophisticated than the more influential one offered by Aristotle in the De Interpretatione (16a3-18).(2) It is also considered to figure among the very few definitely modern-minded contributions to the systematic study of philosophical problems carried out by ancient Greek thinkers.
Semantics in general, according to Stoic philosophers, seems to be an integral part of what they called "Logic" or "Dialectic" respectively, that is, the study of the utterance and the study of the utterance as meaningful. It is integral inasmuch as the Stoic conception of logic is one that depends again on their theory of meaning. In the analysis of meaning three components seem to been distinguished. The components or aspects under consideration are: first, the sign (sèmainon, i.e., that which signifies) which is a phoneme or grapheme; second, the significate (sémainomenon, i.e., that which is signified) which is expressed by the sound which we apprehend as it arises in our mind; and third, the external object referred to." pp. 77-78

(2) On this most influential text in the history of semantics, see N. Kretzman, "Aristotle on Spoken Sound," in J. Corcoran, ed., Ancient Logic and its Modern Interpretations (Dordrecht and Boston, 1974) 3-21.

11. Hájek, Alan. 2009. "Two Interpretations of Two Stoic Conditionals." Logical Analysis and History of Philosophy no. 12:206-221. "Four different conditionals were known to the Stoics. The so-called ‘first’ (Philonian) conditional has been interpreted fairly uncontroversially as an ancient counterpart to the material conditional of modern logic; the ‘fourth’ conditional is obscure, and
seemingly of little historical interest, as it was probably not held widely by any group in antiquity. The ‘second’ (Diodorean) and ‘third’ (Chrysippean) conditionals, on the other hand, pose challenging interpretive questions, raising in the process issues in philosophical logic that are as relevant today as they were then.

This paper is a critical survey of some modern answers to four of the most tantalizing of these questions; the issues that I will discuss arise out of interpretations of the Diodorean and Chrysippean conditionals as expressions of natural law, and as strict implications.

I will reject these interpretations, concluding with my own proposal for where they should be located on a ‘ladder’ of logical strength." (p. 206)


"To sum up. I began by reporting briefly the present widely held opinion that Stoic logic was a logic of propositions. I reminded us that in twentieth-century logic, the logic of propositions, consists of rules governing inferences according to their sentence-connectives and that it by no means exhausts the rules of logic. Rather propositional functions or predicates are added to that, and in turn many-place predicates are added. Some investigators have supposed that Stoic logic was confined to a logic of propositions. That restriction may be suggested by the concentration of the Stoics on singular propositions as those which express what exists most clearly and by their claim that all inferences depend on their logic. If, however, the Stoics had no more logic than the logic of propositions, they had no way of accounting for believing (much less for knowing) non-simple propositions in conditional or disjunctive forms, so that such non-simple propositions would be useful in inference.

Evidence was introduced that the Stoics had and used a rule of instantiation in conditional propositions. This led us to see a use for their rules about the three kinds of simple propositions, those with indefinite subjects, tis, ti, 'someone,' 'something;' those with definite subjects, demonstrative articles such as outos, touto, 'this one', 'that thing' and those with intermediate subjects, 'Socrates', 'Dion', anthropos, 'a man'.

There is further evidence that the Stoics claimed to be able to rephrase universal propositions of the Peripatetic form as conditional propositions with indefinite subjects. Some philosophers from other schools acknowledged that the conditionals followed from the standard universal. There was disagreement about the converse. The charge was made that the Stoics failed to acknowledge eternal forms and that they replace them by things which existed in the mind only, or rather since they were corporealists in the body of the knower only. Another paper would be required to discuss the place of these grasps in the Stoic account of knowledge and of ethics, for action involves how I take things." (pp. 155-156)


"For the Stoics dialectic was the discipline where they developed their theory of cognition and of language as well as some kind of grammar und formal logic. All those topics were formed into a system and a lot of remarkable statements made about them. Hence, Stoic dialectic had much influence, and founded the western tradition of systematic linguistic theory. But the original writings of the Stoics are, nevertheless, lost. Thus, in order to study the origins of systematic linguistic thought, we have to collect the testimonies and fragments on Stoic dialectic from many scattered sources, i.e. from later authors who mentioned, reported or criticized Stoic ideas. In the last centuries this task was performed by different scholars. I only mention Rudolf T. Schmidt (1) and -- above all -- Hans v. Arnim whose 'Stoicorum veterum fragmenta' is the famous standard collection of fragments on all the three parts of Stoic philosophy up to now (2). With regard to Stoic dialectic Prof. U. Egli came up with the idea that it would be worth the trouble to collect the fragments once again. He applied for a research program, sponsored by the 'Deutsche Forschungsgemeinschaft (DFG)', and asked me to realize what he had in mind, the result of which is a new collection of fragments on Stoic dialectic, the subject of this paper.

The formal data of this new collection are the following ones: The collection which amounts to 1257 fragment-numbers (plus ca. 70 additional a-numbers) embraces about 1800 texts, the greatest part of which is quoted in Greek or Latin as well as translated into German; various commentaries are inserted. All this comes to 978 crowded typewritten pages. Superadded are some indices and an introduction by the editor. The book is entitled Die Fragmente zur Dialektik der Stoiker - zusammengestellt, ins Deutsche übersetzt und teilweise kommentiert - von K. Hülser (the abbreviation of which will be FDS), and is forthcoming: In 1982 it is published in 8 volumes within the publications of the 'Sonderforschungbereich 99' at the University of Konstanz (Fed. Rep. of Germany). This edition, though it has a small number of copies and no ISBN-number, serves its purpose as a citable on for the time being (available in the library of the University of Konstanz), but will be replaced by a more 'genuine' one as soon as possible. [*]

As for the kind and the content of the new collection, three approaches will be offered in the following. The first one starts from the function of collections of fragments in general; it will explain why v. Arnim's collection is insufficient and a new one necessary, and consequently it leads to certain requirements concerning FDS. The second approach, then, starts from the arrangement of fragments in FDS and will show some systematic aspects of Stoic dialectic connected with it. The third one eventually is centered on the problem of intended completeness; in some cases this aim, being understood systematically, leads to interesting results though it widens the concept of fragments." (pp. 235-236)


Abstract: "This thesis focusses on the notion of analysis in Stoic logic, that is to say on the procedure which the Stoic logicians
followed in order to reduce all valid arguments to five basic patterns. By reconsidering the uses of its Aristotelian homonym and by examining the evidence on the classification of Stoic arguments, I distinguish two methods of Stoic analysis and I discuss their rules: (i) the analysis of non-simple indemonstrables, which constitutes a process of breaking up an argument by means of general logical principles; and (ii) the analysis of (yllogistic) arguments, which replaces demonstration and is effected by employing standard well-determined rules. The ancient sources provide us with concrete examples illustrating the first type of analysis; however, there is no single text that reports the exact procedure of analysing (yllogistic) arguments. Modern scholars have reconstructed in different ways this type of Stoic analysis; I deal with all of them separately and show that the proposed reconstructions are insightful but historically implausible. Based on the textual material concerning the notion of analysis not only in its Stoic context but also in some other of its uses, and especially in mathematical practice, I suggest an alternative reconstruction of the Stoic method of reducing valid arguments to the basic indemonstrables.

"Conclusion. As I indicated at the beginning of the chapter, it was only towards the middle of the twentieth century that Stoic logic began to be studied on its own merits and not as an appendix to Aristotle's syllogistic. To a great extent it was the revival of interest in the logical contributions of the Stoics that convinced scholars to investigate more carefully the other parts of Stoic philosophy, namely ethics and physics. The literature on Stoic logic that has since been published has managed to reconstruct a logical calculus, which still surprises us with its sophistication and its similarities to modern systems of logic. At the same time, though, it also has become clear that we should not fail to take seriously into account what differentiates Stoic logic from its modern counterparts. For only in this way can we get a better understanding of how the history of logic has evolved in close connection to the other parts of philosophy, and more importantly, only in this way do we have a chance to appreciate the peculiar features and insights of ancient logic." (p. 527)
then Bx)," instead of the ordinary conditional composed of two self-contained sentences "If A, then B." Hay brings evidence of three sorts to bear in favor of this thesis. (1) First of all, there are the logical and historical considerations already alluded to: how could the Stoics have claimed to reduce all valid arguments, including the Aristotelian syllogism, to their five undemonstrated schemata, if they did not have some device equivalent to quantification? (2) Secondly, there is the question of the epistemic function of logic: where the major premiss is a conditional such as If Plato lives, then Plato breathes interpreted truth-functionally, and I am able to draw the conclusion Plato breathes, how could I be in a position to know or believe the conditional premiss without already knowing or believing the conclusion? (For the truth of the conditional depends upon the truth of the consequent in this case, since the antecedent is taken as true.) But the epistemic problem will not arise in this form if the major premiss may be universally quantified. I do not need to know that Socrates breathes - I do not need to know anything about Socrates at all - in order to agree that if anything is alive, that same thing (or animal) breathes. (3) Furthermore, Hay calls our attention (and apparently for the first time) to several decisive texts in which the Stoics make theoretical use of generalized conditionals of the form 'If anyone is born under the Dog Star, he will not die at sea.' Finally (4) Hay suggests that the Stoic motive for the alleged reformulation of universal propositions as conditionals was their desire to avoid positing essences or classes or universals of any sort. I am inclined to believe that Hay's principal thesis is correct, at least in principle; but it raises new problems almost as serious as those it solves. First of all, did the Stoics realize that they were introducing quantification when they offered a conditional compounded in this way of two indefinite propositions? If so, this seems to defeat their claim that all valid arguments could be reduced to their five undemonstrated forms. But if they did not see this, they were poorer logicians than Aristotle at a crucial point they will have set up a propositional calculi only at the cost of distorting the facts concerning quantification. We seem to be faced with a dilemma. Either Stoic logic is based solely on the propositional connectives, and then it is epistemically sterile. (This appears to be Mueller's view.) Or else it involves generalized conditionals and a rule of instantiation, but then it is defective as logic since we are left without any account of the quantified conditional. (a) I suspect that the latter is likely to be true, and that by formulating indefinite conditionals to achieve generality, and then instantiating for a definite, ostensibly indicated subject, the Stoics believed that they could in fact do without quantification, i.e. without any theory involving 'all' and 'none.' " (pp. 163-164)

(*) [Stoic Use of Logic, 1969]

(a) I have oversimplified in order to put the problem sharply. It is worth noting that the decisive text from De Fato is explicitly metalinguistic: "If G (a generalized conditional) is true, then C (an ordinary conditional) is also true" (see Hay, note 15). Therefore arguments making use of such a rule of instantiation will be valid but not necessarily reducible to one of the five undemonstrated schemata (compare the examples in Mates, p. 64 and p. 65 n. 32). In the Symposium discussion in St. Louis several suggestions were made for reconstructing the Stoic generalized conditional without quantification theory, as the meta-linguistic representation for a "bundle of individual conditionals" (Quine, Methods of Logic, p. 13), much as an axiom schema may represent an infinite set of individual axioms. I leave it to others to decide how far such a suggestion can be worked out systematically.


Labarge, Scott. 2002. "Stoic Conditionals of Necessity and Explanation." History and Philosophy of Logic no. 23:241-252. Abstract: "An examination of a particular passage in Cicero's De fato (Fat. 13-17) is crucial to our understanding of the Stoic theory of the truth-conditions of conditional propositions, for it has been uniquely important in the debate concerning the kind of connection the antecedent and consequent of a Stoic conditional should have to one another. Frede has argued that the passage proves that the connection is one of logical necessity, while Sorabji has argued that positive Stoic attitudes toward empirical inferences elsewhere suggest that that cannot be the right interpretation of the passage. I argue that both parties to the debate have missed a position somewhere between them which both renders a connection between antecedent and consequent that is not merely empirical and makes sense of the actual uses to which the Stoics put the conditional. This will be an account which grounds the connection between antecedent and consequent in aprolépsis, a special kind of concept which plays a special epistemological role for the Stoics, especially in grounding scientific explanations. My contention will be that Stoic conditionals are true when there is a conceptually necessary connection between antecedent and consequent such that the former explains the latter via aprolépsis."


"This study examines the dialectical origin of syntactical description in our traditional grammar. Two famous texts take pride of place in containing the first descriptions of a 'clause' in Greek literature, namely Plato's Sophist and Aristotle's Peri hermeneias. These descriptions arose in the context of a more general inquiry into the nature of truth and language which gave rise to the first speculations on the form of the logical proposition in Greek Antiquity. By establishing as the unit of propositional analysis a combination of two linguistic items, Onoma ('name', 'noun') and rhema ('verb', 'predicate') these philosophers laid the foundation for the doctrine of the parts of speech which later constituted the core of ancient grammar. Their concern was to establish the two functional constituents of the proposition, roughly the subject and the predicate, by means of which true and false statements could be made. The object of their concern -- the minimal statement consisting of a noun and a verb -- came to figure as the point of departure for syntactical analysis when it began to be pursued in independent grammatical treatises. In the grammar of Apollonius Dyscolus (2nd century A.D.), which is our first extant grammatical treatise on syntax, syntactical description proceeds from the minimal self-sufficiency (autoteleia) of the linguistic expression. But the description of the minimal sentence by Apollonius bears witness to the distinctly Stoic origin of the notion of self-sufficiency." (p. 11)


   "The text of Sextus Empiricus contains a number of corrupt places which can easily be corrected by reference to a few technical terms and elementary concepts of Stoic logic. It is the aim of the present paper to prove this assertion with respect to a certain class of cases and, in so doing, to show that any future editor of Sextus ought to have a clear understanding of Stoic logic." (p. 290)


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The fragments of the Stoics which are explicitly concerned with a theory of relations are few, scattered and difficult to interpret. The largest of them is preserved in Simplicius' commentary on the *Categories* (165.32 ff.; SVF ii 403) and it expounds an important distinction which the Stoics made between two kinds of relatives. This doctrine is attributed to the Stoics, but no representative of the school is mentioned. Echoes of it are reflected in some sceptical arguments reported by Sextus Empiricus (*M VII* 455-456) and Diogenes Laertius (IX 87-88) (1). Besides, there are some related passages in the scholia on Dionysius Thrax's *Ars grammatica* which are supposed to go back to Apollonius Dyscolus (II century A.D.), where, although the Stoics are not explicitly named, Stoic material is believed to be used and referred to (2). There is also a text of Sextus (*M VII* 453-454; *SVF* II 404) in which a general definition of relatives is attributed by him to the Dogmatists and reasons can be given for saying that his Dogmatists must be identified with the Stoics. Finally, some passages in which the name of Chrysippus is tied to questions which are supposed to concern our problems are difficult to interpret and on closer inspection they reveal themselves not to pertain to the theory of relatives (3).

In the face of this complicated situation in our sources, I will examine first Simplicius' passage, trying to disentangle it from spurious connections with other parts of the Stoic doctrine which have generated more than one misunderstanding of it. Secondly, I will inquire to what extent a possibly general definition of relatives implied in Simplicius' distinction is consistent with the statements reported by other sources, in order to determine whether Simplicius' report can be inserted in a coherent framework. This sketch of the plan of our inquiry shows that we confer a central role on Simplicius' passage, and this assumption might be disputed, since Simplicius is a late authority and no Stoic master of the first generation is mentioned in it. We will discuss these problems later. Whatever their solution might be, it must be pointed out that Simplicius' text is almost the only one in which a relevant aspect of the Stoic doctrine of relatives is expounded and discussed. The other sources are much vaguer and mostly concerned with a general characterization of the notion of relative. Therefore, it is difficult in this situation not to confer a special position on Simplicius' passage." pp. 129-130

1) These texts are not found in von Arnim's collection. They will be discussed in section VIII.
(2) These passages too are not in von Arnim. We will examine them later (cf. sections XI-XII).
(3) I am thinking especially of three passages we will consider later, namely Varro *De lingua latina* X 59 (SVF a 155); Plutarch, *De Stoicorum repugnantibus* 1054EF (*SVF* II 550); Aulus Gellius *Noctes atticae* VII 1, 1-6 (*SVF* II 1169): cf. sections XIV and XV.


Abstract: "The majority of formal accounts attribute to Stoic logicians the classical truth-functional understanding of the material conditional and exclusive disjunction. These interpretations were disputed, some Stoic logicians favouring modal and/or temporal analyses; moreover, what comes down to us of Stoic logic fails to secure the classical interpretations on purely formal grounds. It is therefore of some interest to see how the non-classical interpretations fare. I argue that the strongest logic we have good grounds to attribute to Stoic logicians is not complete with respect to the non-classical interpretations of disjunction and the conditional."

"We know that one of the issues dividing the Stoics and the Peripatetics concerned the use of logic. Alexander [of Aphrodisias] (1) insists that only Peripatetic logic is an organon for philosophy, an instrument for making unknown things known through known premises. Since the Stoics called logic a part of philosophy, they may well have considered their propositional logic a theoretical discipline for which epistemological considerations were irrelevant. This modern attitude seems quite commensurate with the Stoics' presentation of logic. They seem to have been interested in technical devices and formalization for its own sake. I suggest, then, that an important disagreement between the Peripatetic and Stoic logicians concerned the power of their respective logics to represent arguments. The Peripatetic claims were that all scientific proofs are categorical syllogisms and that the inference schemata of the Stoics represented techniques of argument having no place in science. The Stoic reply was that the first claim is false since there are very elementary relational arguments in mathematics which are not syllogisms. Moreover, they pointed out that all conclusive arguments, including categorical syllogisms, could be represented as propositional arguments by a (trivial) technical device. Formally the Stoics held an unassailable position, but they were vulnerable to attack on methodological grounds, since establishing the truth of the premises of the newly formulated argument seemed to involve making an inference in terms of the old logic. The Peripatetics therefore insisted on the claim, believed for many centuries after them, that their logic was the instrument of science. We do not know the Stoic response to this claim, but it is reasonable to suppose that they retreated to the view that the theory of deductive inference was a technical discipline studied for some ethical end perhaps, but not as the method of scientific discovery." (p. 184)

(1) In *Analyticorum Priorum* 1 ff.

"The charge of uselessness permeates the ancient literature on Stoic logic. Alexander [of Aphrodisias] is very concerned to defend Aristotelian logic as the tool(organon) of philosophy and science, a means for making unknown things known through known premises. For Sextus no logic is capable of serving these functions. The gist of both men's attack on Stoic logic is that with its arguments there is no way to establish the premises without first establishing the conclusion. The attack is usually made in terms of the first undemonstrable argument and depends upon the truth-functional interpretation of the conditional. Suppose one wishes to prove 'the second' by establishing 'the first' and 'if the first the second.' Then if 'the first' is established, the only way to establish 'if the first the second' is to establish 'the second,' i.e., to establish the conclusion one is trying to prove. Similar objections could be raised against the other undemonstrable arguments. In each case, when the second premise is taken as true, then the obvious truth-functional argument for the first premise requires establishing the truth of the conclusion. There is no way out of this situation, a fact that strongly suggests that Sextus's insistence on applying the truth-functional interpretation to the conditional represents an argumentative device rather than an accurate reflection of standard Stoic doctrine. If the first premise of an undemonstrable
argument expresses a stronger than truth-functional connection between its component propositions, there is no reason why the first premise cannot be established independently of the conclusion.

Of course, the position I have just ascribed to the Stoics means that philosophically a great deal of weight must be placed on the knowledge of necessary connections between propositions. Many of Sextus's arguments are directed against the possibility of such knowledge. To consider these arguments would take us outside the domain of logic and into epistemology. The point I wish to make is that the Stoics could have claimed universality for their propositional logic without subjecting themselves to attacks on grounds of uselessness. But to what use did the Stoics put their logic? It is tempting to suppose that the Stoics might have treated logic as a technical discipline developed for its own sake. The picture of Chrysippus analyzing innumerable arguments into the undemonstrable points makes it seem certain that to some extent logic was pursued for its own sake. But at least some Stoics thought of logic as more than a self-sufficient technical discipline.

(...) The most important inferences from signs would be those based on the first undemonstrable syllogism. Questions about the viability of inferences from sign to thing indicated or commemorated would almost certainly end up as questions about the connection asserted to hold in the first premise, i.e., as questions of metaphysics or epistemology. One cannot expect logic to settle such questions, nor is there any reason to think the Stoics expected it to. The thrust of their logic was to provide a framework in which questions of inferential validity could be settled and questions that fell outside of logic, e.g., whether sweat implies the existence of pores, made precise. It seems fair to say that Stoic achievement in this area remained unparalleled until the time of Leibniz. (pp. 22-25)

48. ———. 1979. "The Completeness of Stoic Propositional Logic." Notre Dame Journal of Formal Logic no. 20:201-215. "In this paper I wish to pursue in more detail the question of the completeness of Stoic propositional logic. I shall bring out certain anomalies in Becker's [1957] argument which obscure the precise sense in which his system is complete. The Kneales' system (*) will be shown to be complete in a stronger sense than Becker's but not to be as historically plausible a reconstruction of the Stoic theory. In conclusion I shall suggest a modification of both systems which is historically more plausible than either and also complete in the stronger sense. In the course of the paper I will also discuss other logical and historical points about the systems. I shall take for granted the truth-functionality of the Stoic propositional connectives but disregard interdefinability relationships. I will also formulate the systems of Becker and the Kneales in ways which diverge slightly but unproblematically from their own presentations." (p. 202)


50. Nasieniewski, Marek. 1998. "Is Stoic Logic Classical?" Logic and Logical Philosophy no. 6:55-61. Abstract: "In this paper I would like to argue that Stoic logic is a kind of relevant logic rather than the classical logic. To realize this purpose I will try to keep as close as possible to Stoic calculus as expressed with the help of their arguments."


Chapter 4. The Stoic lekton 45; 5. The Stoic axioma 75-88.

"The Stoic conception of the bearers of truth and falsity centres around the notion of axioma. As an axioma is a species of the genus lekton, I shall first discuss the nature of the lekton. It will be maintained that the word lekton must have had several shades of meaning, although the deplorable state of our sources makes it impossible to reach a high degree of certainty about the exact borderlines between these different nuances and their ascription to definite authors or periods." (p. 45)

"As we saw in the foregoing chapter, an axioma is a complete and independent pragma which is expressed in a speech act of asserting. The complete and independent pragma is the thought of an action or passion and its indispensable complements. In so far as this pragma is put into words it is a lekton; in so far as it is expressed in a speech act of asserting it is an apophantion or axioma, an asserted thought-content. A pragma such as 'Plato liking Dion' can be expressed in different speech acts: for instance, in a yes-or-no question, 'Does Plato like Dion?', in a wish, 'May Plato like Dion', or in an assertion, 'Plato likes Dion'. On the other hand, the same type of speech act, say asserting, may be related to different pragmata; for I may assert many different things. Reflections of this kind must have led the Stoics to a distinction between the generic element of the pragma or lekton and the specific element of the speech act in which a certain thought is expressed.

As a rule, then, an axioma is a thought-content which is in fact asserted. Nevertheless, the Stoics used the name axioma also for the antecedent and consequent of a conditional, although as parts of the composite whole these are not actually asserted. This may be accounted for by the fact that axioma originally meant that which is assumed or taken to be true. Or, as I suggested at the end of 4.2.5, the Stoics may have regarded the antecedent and consequent as potential axiomata, just as they held that a privative assertion of the form 'Un(kind he is)' contains the potential axioma 'Kind he is'. Such an assertable would lie somewhere between the neutral pragma or lekton and the factually asserted axioma." (p. 75)


75. Stakelum, James W. 1940. Galen and the Logic of Propositions. Romae: Angelicum. "These pages, restrictedly entitled Galen and the Logic of Propositions, originally formed part of an academic dissertation, Galen's Introduction to Dialectic. The threefold purpose of the larger study was to present Galen's Dialectic in a clear light, to examine his doctrine and weigh its importance as to originality or historical precedent, and from these considerations to draw conclusions as to its influence on succeeding generations. The doctrine, scattered throughout the Galenic text, was gathered under five headings: I. Galen's Introductory Remarks; II. Logic of Propositions; III. Aristotelian Term Logic; IV. Other Classes of Syllogisms; V. Applied Logic. Owing to the limited size of the volumes of this series, published under the sponsorship of Father I. M. Bochenski, O. P., it is impossible to publish here the whole result of the inquiry. Accordingly, we have selected for presentation our Introduction -- rearranged as Part One in several short chapters -- and the most important portion of our examination of Galen's Dialectic, dealing
with the logic of propositions. The latter section is divided into three parts. A brief conclusion completes the essay. It is traditional to attribute to Galen an eminent position in the field of logic, but rarely do we find specific reasons assigned for this eminence. The composition of this dissertation has, for me, definitely determined Galen's position in the history of logic. It is hoped that it will serve a similar purpose for others."


M. R. Stopper is a pseudonym of Jonathan Barnes.


"Besides what In Ciceronis Topica shows us about Boethius, it is also a valuable source for us as a witness to the thought and culture of his period."

"But perhaps the most interesting unexplored section in In Ciceronis Topica is Boethius’s presentation of Stoic logic, and that is the part I want to concentrate on in this paper. Rather than dwell on the main theme of In Ciceronis Topica, the art of discovery and its instruments, the Topics, I want to focus instead on just that small part of Boethius’s commentary in which he relates the Topics to Stoic dialectic or logic and reveals his understanding of that part of Stoicism. We are beginning to understand the ancient art of discovering arguments, and it has garnered increasing attention among contemporary scholars. But as far as I know, Michael Frede (30) is alone among recent historians of philosophy in considering Boethius’s contribution to our understanding of Stoic logic; and even he gives only a brief discussion of a small part of the relevant Boethian text. So in what follows I will concentrate on just the fifth book of In Ciceronis Topica, in which Boethius discusses the so-called undemonstrated modes or argument forms of the Stoics. I need to make plain here that my area of interest and expertise is Boethius and not the Stoics; but I think that in In Ciceronis Topica Boethius sheds some light on a vexing problem which has troubled students of Stoic logic for some time." (pp. 6-7)


78. Tracy, Kevin. 2006. The Development of Dialectic from Aristotle to Chrysippus, University of Pennsylvania. Available at ProQuest Dissertation Express order number: 3225558.

Abstract: "From Aristotle onward, formal logic was an element of ancient Greek dialectic (dialektiké). Aristotle's Prior Analytics (4th century BCE) is the earliest evidence of a formal logic in antiquity. The evidence for the formal logic of the Stoic philosopher Chrysippus (3rd century BCE) is fragmentary, nonetheless it makes clear that not more than a century or so after Prior Analytics, Chrysippus revolutionized formal logic. The scholarship on Stoic logic has not yet presented the history of dialectic from Aristotle to Chrysippus as a contiguous narrative. Without such a narrative, one cannot explain what, in general, motivated the innovations of Chrysippus, what made Stoic logic coherent as a unified project, or what relationship that project had to earlier work in logic. This dissertation approaches the problem through the presentation and interpretation of the ancient source material. First it describes the logical doctrines of Aristotle, Theophrastus, and the 'Megarics' in such a way as to make clear what questions these predecessors left for Chrysippus. It then describes how Chrysippus addressed these questions. Finally, it uses the resulting narrative to give a detailed account of Stoic formal logic. The dissertation yields five principal conclusions. First, neither the Peripatetics nor the
'Megarics' described logical forms of propositional logic; Chrysippus was the first to do so. Second, the guiding aim of Chrysippus' logic was to avoid adopting a semantic stance in describing logical forms and explaining logical relationships. Third, the Stoics distinguished 'valid' (hugies) from 'true' (aléthes), so that sunartésis is a standard for the validity rather than the truth of the Stoic conditional (sunhémmenon). Fourth, the Stoics produced derivations for categorical arguments in their deduction system. Fifth, the Stoic deduction system is roughly analogous to the first-order fragment of Frege's system, except on two points: it most likely was not designed to accommodate the use of polyadic predicates with multiple quantifiers, although the possibility for doing so inheres in its approach to the analysis of propositions, and it uses the 'natural' approach rather than the 'axiomatic' approach of Frege.
84. White, Michael J. 1986. "The Fourth Account of Conditionals in Sextus Empiricus." *History and Philosophy of Logic* no. 7:1-14. "This paper develops an interpretation of the fourth account of conditionals in Sextus Empiricus's *Outlines of Pyrrhonism* that conceptually links it with contemporary 'relevance' interpretations of entailment. It is argued that the third account of conditionals, which analyzes the truth of a conditional in terms of the joint impossibility of antecedent and denial of consequent, should not be interpreted in terms of a "relative" incompatibility of antecedent and denial of consequent because of stoic acceptance of the truth of some conditionals of the form $p \rightarrow -p$ and its converse. Rather, it is suggested, ancient attempts to avoid the so-called paradoxes of implication involve the fourth account of conditionals. I hypothesize that this account is related to stoic attempts to define truth conditions for conditionals in terms of a theory of the concludency (validity) of arguments in opposition to the more common procedure (represented by the first three accounts of conditionals) of specifying truth conditions for conditionals 'semantically' and using those truth conditions in the development of a theory of argument validity."


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