A BIBLIOGRAPHY:
JOHN CORCORAN'S PUBLICATIONS ON ARISTOTLE 1972–2015
By John Corcoran

Indeed, one of the great strides forward in the modern study of Aristotle's syllogistic was the realization that it is a system of natural deduction.
——Kevin Flannery, SJ [2001, 219]

Corcoran [...] has convincingly shown that the best formalization of Aristotle's reductio ad impossibile is by means of a natural deduction system.
—Mario Mignucci [1991, 12]

The most radical opponent of Lukasiewicz is Corcoran.
—Tadeusz Kwiatkowski [1980, 188]

*I present an interpretation that essentially follows Corcoran. One principal virtue of Corcoran's approach, which is especially important in the context of a translation of the **Prior Analytics**, is that it permits a formal model which stays very close to Aristotle's actual text, since it allows us to read formally precise natural deductions straight out of it.*
—Robin Smith [1989, xvii]

Contents

Abstract

This presentation includes a complete bibliography of John Corcoran's publications relevant on Aristotle's logic. The Sections I, II, III, and IV list respectively 23 articles, 44 abstracts, 3 books, and 11 reviews. Section I starts with two watershed articles published in 1972: the *Philosophy & Phenomenological Research* article—from Corcoran's Philadelphia period that antedates his discovery of Aristotle's natural deduction system—and the *Journal of Symbolic Logic* article— from his Buffalo period first reporting his original results. It ends with works published in 2015.

Some items are annotated as listed or with endnotes connecting them with other work and pointing out passages that, in retrospect, are seen to be misleading and in a few places erroneous.

In addition, Section V, "Discussions", is a nearly complete secondary bibliography of works describing, interpreting, extending, improving, supporting, and criticizing Corcoran's work: 10 items published in the 1970s, 24 in the 1980s, 42 in the 1990s, 60 in the 2000s, and 70

in the current decade. The secondary bibliography is also annotated as listed or with endnotes: some simply quoting from the cited item, but several answering criticisms and identifying errors.

Section VI, "Alternatives", lists recent works on Aristotle's logic oblivious of Corcoran's research and, more generally in some cases, even of the Łukasiewicz-initiated tradition.

As is evident from Section VII, "Acknowledgements", Corcoran's publications benefited from consultation with other scholars, most notably George Boger, Charles Kahn, John Mulhern, Mary Mulhern, Anthony Preus, Timothy Smiley, Michael Scanlan, Roberto Torretti, and Kevin Tracy. All of Corcoran's Greek translations were done in collaboration with two or more classicists. Corcoran never published a sentence without discussing it with his colleagues and students.

I. Articles

Our first task is to state our subject, which is demonstration.
—Aristotle 24a10 (Ross 1949/1965, 287)

1.   1972. Completeness of an Ancient Logic. *Journal of Symbolic Logic*, **37**, 696–702. MR0317886 [47 #6435].[a]

This seven-page paper presents a highly compressed and abbreviated model of Aristotle's second logic. As the title suggests, it includes a mathematical proof that every sentence that follows from a given set of sentences is derivable from the given set—the expressions 'sentence', 'follows from' and 'derivable from' being taken in the senses of the model. This paper, written for mathematical logicians, is not and was not intended to be a contribution to history and philosophy of logic like *Corcoran 2009*. Nevertheless, it is the most-cited of Corcoran's works.

2.   1972. Conceptual Structure of Classical Logic, *Philosophy & Phenomenological Research* **33**, 25–47.[b]

This paper clears and prepares the ground for Corcoran's subsequent research in history and philosophy of logic. It divides off from what had been called arguments two categories: (1) those things determined by their premises and conclusion; (2) those things having beyond their premises and conclusion further content sometimes making evident that the conclusion follows from the premises. This was and is an indispensable step in understanding Aristotle's concept of syllogism. This line of thought is extended and refined in later works, especially *Corcoran 1989*.

3.   1973. A Mathematical Model of Aristotle's Syllogistic. *Archiv für Geschichte der Philosophie*, **55**, 191–219. MR0444423 [56 #2776]**.**

This article presents a mathematical model reflecting certain structural aspects of Aristotle's logic. Accompanying the model is an interpretation of scattered parts of the *Analytics*. Although our interpretation does not agree in all respects with those previously offered, our work would have been impossible without the enormous ground work of previous scholars—especially Jenkinson, Łukasiewicz, and W. D. Ross—to whom we are deeply grateful. Our interpretation restores Aristotle's reputation as a logician of consummate imagination and skill.

Several attributions of shortcomings and logical errors to Aristotle are seen to be without merit. Aristotle's logic is found to be self-sufficient in several senses. First, his theory of deduction is logically sound in every detail. (His indirect deductions had been criticized.) Second, Aristotle's logic presupposes no other logical concepts, not even those of propositional logic. Third, the Aristotelian system is seen to be complete in the sense that every valid argument expressible in his system admits of a deduction within his deductive system. Relative to his context this is an epistemic result: every *valid* argument can be *known to be valid* by means explicitly presented methods. Contrast this with the fact that not every *true* proposition can be *known to be true*.

4.   1974m. Aristotelian Syllogisms: Valid arguments or true generalized conditionals? *Mind*, **83**: 278–81. MR0532928 [58 #27178].

This tightly-written, self-contained four-page paper must be studied to be appreciated. It meticulously analyses quotations from Aristotle and Łukasiewicz to establish that Aristotle was using indirect *deductions*—as required by the natural-deduction interpretation—and not indirect *proofs*—as required by the axiomatic interpretation. Łukasiewicz was explicit and clear about the subtle fact that Aristotle's practice could not be construed as correctly performed indirect *proof* of universalized conditions presupposing axiomatic premises—as the Łukasiewicz interpretation would require. Łukasiewicz's evidence is presented fully; it is irrefutable. But, instead of considering the possibility that Aristotle's discourses were not *intended* to express indirect proofs of universalized conditions presupposing axiomatic premises, Łukasiewicz came to the amazing conclusion that Aristotle did not understand indirect proof. This paper builds on the admirable Łukasiewicz scholarship to establish a conclusion diametrically opposed to the one Lukasiewicz asserted.

5.   1974a. Aristotle's Natural Deduction System, in J. Corcoran, ed., *Ancient Logic and Its Modern Interpretations*, Dordrecht: Reidel. 85–132. MR0497848 [58 #16077]**.**

This paper supersedes and develops *Corcoran 1973*. The early draft presented at a conference in Buffalo in April of 1972 was improved using criticisms by Josiah Gould, Charles Kahn, Norman Kretzmann, Ian Mueller, and others.

6.   1974s. Remarks on Stoic Deduction, *ibid*. in J. Corcoran, ed., *Ancient Logic and Its Modern Interpretations*, Dordrecht: Reidel. 169–181. MR0485115 (58 #4970)**.**

Although, as indicated by the title, this paper does not focus on Aristotle's logic. However, it does contain remarks specifically about Aristotle and syllogistic that complement other works on Aristotle in this book. Moreover, it contains extensive methodological material that will be useful in any investigations in history of logic. In particular, it distinguishes sentential from argumental rules: a distinction essential in understanding the difference between (1) deduction—as in the Corcoran-Smiley interpretation of syllogistic—and (2) reduction—as in the manipulation of arguments that gave rise to the mnemonics Bocardo, Camestres, and so on. The deduction/reduction contrast is developed in *Corcoran 1983*.

7.   1974f. Future Research on Ancient Theories of Communication and Reasoning, in J. Corcoran, ed., *Ancient Logic and Its Modern Interpretations*, Dordrecht: Reidel.185–187. MR0485116 [58 #4971]**.**

After reviewing the modern research into logical systems—such as equational logics—devoid of the apparatus of propositional connectives, this paper notes the emergence of natural-deduction systems devoid of the apparatus of axiomatization. It notes that these developments helped free historians to seek new ways of understanding Aristotle's logic. It predicts that Stoic logic will be reassessed with new open-minded approaches.

8.   1975a. Aristotle on the Underlying Logics of Sciences, *Fifth International Congress of Logic, Methodology, and Philosophy of Science*, XII 11–12.

9.   1975g. An Ancient Generic Theory, *Fifth International Congress of Logic, Methodology, and Philosophy of Science*, XII 37–38. (Co-author: Lee Mohler)

10.   1982. Critical Notice: Contemporary Relevance of Ancient Logical Theory. *Philosophical Quarterly*, **32**, 76–86. (Co-author: Michael Scanlan)

This detailed, and largely negative, critical review of *Lear 1980* contains several new observations about Aristotle's logic.

11.   1989. Argumentations and Logic, *Argumentation* 3, 17–43. MR91b:03006 P R

As noted by others, this can be seen as a succinct version of Corcoran's reworking of Aristotle's *Analytics.* Argumentations are at the heart of the deductive and the hypothetico-deductive methods, which are involved in attempts to reduce currently open problems to problems already solved. These two methods span the entire spectrum of problem-oriented reasoning. This paper treats analysis, synthesis, evaluation, and function of argumentations. Perennial philosophic problems, epistemic and ontic, related to argumentations are put in perspective. So much of what has been regarded as logic is seen to be involved in the study of argumentations that logic may be usefully defined as the systematic study of argumentations.

12.   1992. El Nacimiento de la Logica (The Birth of Logic). *Agora*, **11/2**, 67–78.

Spanish translation by J.M. Saguillo and C. Martinez-Vidal of expanded and revised version of an unpublished English paper distributed by the Society for Ancient Greek Philosophy, 1992.

13.   1994. The Founding of Logic: Modern Interpretations of Aristotle's Logic. *Ancient Philosophy*, **14**, 9–24.

14.   2003. Aristotle's Prior Analytics and Boole's Laws of Thought. *History and Philosophy of Logic*, **24***,* 261–288**.** Reviewed by Risto Vilkko. *The Bulletin of Symbolic Logic*, **11**(2005) 89–91. Also by Marcel Guillaume, MR2033867 (2004m: 03006).

15.	2003. Introduction. George Boole's *The Laws of Thought*. Buffalo: Prometheus Books. Reviewed: J. van Evra in *Philosophy in Review*. *24*, (2004) 167–169. MR1994936 (2004i:03001)

16.	2006. C. I. Lewis: History and Philosophy of Logic. *Transactions of the C. S. Peirce Society*. 42, 1–9.

This paper establishes the continuity of logic throughout history focusing on Aristotle, Boole, and Lewis. Before Boole, logic was focused on two central problems of logic as formal epistemology: how to show that a given conclusion follows from given premises that formally imply it, and how to show that a given conclusion doesn't follow from given premises that don't formally imply it. Aristotle wanted a decisive criterion for determining if the conclusion follows, and a decisive criterion for determining if the conclusion does not follow. Using other equally traditional terminology, the two central problems were how to establish validity and how to establish invalidity of an arbitrary argument, no matter how many premises or how complicated its propositions. Aristotle did not solve the problem of formal epistemology in its full generality, nor did he claim to—contrary to what a few later authors seemed to have thought. Although he believed or even knew that he had completed "the logic of categorical propositions", he never thought that he had completed logic. In the opinion of many logicians today, perhaps not a majority, the full problem has still not been solved (despite occasional enthusiastic statements that it has). Aristotle would never have written Lewis's breathtakingly overconfident statement: "Given premises and conclusion, logic can determine whether this conclusion follows".

17.	2006. Schemata: the Concept of Schema in the History of Logic. *Bulletin of Symbolic Logic*. 12, 219–40. MR2223922 (2007j:03003).

Aristotle's rules and figures can be thought of in terms of schemata in senses articulated in this paper.

18.	2007. Notes on the Founding of Logics and Metalogic: Aristotle, Boole, and Tarski. *Current Issues in Logic / Temas Actuales de Lógica.* Imprenta Universidade Santiago de Compostela (University of Santiago de Compostela Press). Reviewed by Alasdair Urquhart *BSL* 14 (2008) 271–2 and by Michael Scanlan *HPL* 30 (2009) 397–401.

19.	2009. Aristotle's Demonstrative Logic. *History and Philosophy of Logic*,	**30** 1–20.

This paper argues that *Prior Analytics* contains a general theory of demonstration and deduction together with a program for its ultimate specific development. Further, it argues that the syllogistic is a brilliantly oversimplified illustrative special case never intended to be a comprehensive account of deduction. The inadequacies of the syllogistic are so obvious that no-one of Aristotle's intelligence could have overlooked all of them. Nevertheless, this common sense view, which respects Aristotle's intelligence and perceptiveness, contradicts such scholars as Robin Smith and Gisela Striker. *Smith 2011*, reviewing *Striker 2009*, wrote: "Striker is absolutely clear on one important point: Aristotle's claim that the syllogistic is the full story about valid inference is to be taken at full value […]. This means, not only that he did not think

there were other inferential forms that fell outside it, but also that [sc. he held] whatever can be *said at all* can be said in the language of the syllogistic, the language of categorical sentences."

20.   2009. Aristotle's Logic at the University of Buffalo's Department of Philosophy. *Ideas y Valores: Revista Colombiana de Filosofía*, **140** (August 2009) 99–117.

21.   2010. Essay-Review of: Striker, G., trans. 2009. *Aristotle's Prior Analytics: Book I.* Trans. with Intro. and Comm. Oxford: Oxford University Press. *Notre Dame Philosophical Reviews*.

We provide background not easily accessible elsewhere. We discuss Striker's translation in comparison with previous translations: something Striker did not do. Moreover, we discuss Striker's interpretation and commentary in comparison with its predecessors often providing information Striker omitted or mishandled. We put the issues in perspective often making critical observations that apply widely in the field of *Prior Analytics* Studies. Our overall assessment of the book is negative.

This book asserts without explanation that Aristotle's deductions are "more plausibly seen as derivations in a natural deduction calculus" without any indication of which natural deduction calculus is concerned or what explains the increased plausibility. It further asserts, without giving evidence, that the natural-deduction interpretation "is widely accepted."

Despite this book's numerous flaws, many of which would easily correctable in a second edition, it will be found useful if not indispensable for those currently engaged in the field of *Prior Analytics* Studies, a field which is still in its infancy, as readers of this book will readily infer. The alternatives suggested to Robin Smith's translation choices are often worth consideration. It is to be emphasized, however, that this book is unsuitable for those entering or seeking an introduction to *Prior Analytics* Studies.

22.   2014. Existential import today: New metatheorems; historical, philosophical, and pedagogical misconceptions. *History and Philosophy of Logic.* 36–61**.** (Co-author: Hassan Masoud)

23.   2015. Existential-import mathematics. *Bulletin of Symbolic Logic*. 21: 1–14. (Co-author: Hassan Masoud)

II. Abstracts

> *Syllogism should be discussed before demonstration, because it is the genus to which demonstration belongs.*
> —Aristotle 25b30 (Ross 1949/1965, 300).

1.   1972. Aristotle's Natural Deduction System, *Journal of Symbolic Logic*, **37**, 437.

2.   1981. Ockham's Syllogistic Semantics, *Journal of Symbolic Logic*, **46**, 197–198.

3.   1983. Deduction and Reduction: two proof-theoretic processes in *Prior Analytics* I. *Journal of Symbolic Logic*, **48**, 906.

4.   1987. Three Rules of Distribution: One Counterexample, *Journal of Symbolic Logic* **52**, 886–7.

5.   1992. Logical Methodology: Aristotle and Tarski. *Journal of Symbolic Logic*, **57**, 374.

6.   1998. Was Aristotle the first mathematical logician? *Abstracts of Papers Presented to the American Mathematical Society* 1998, 19.

7.   2003. Aristotle's *Prior Analytics* and Boole's *Laws of Thought. International Conference on Ancient and Medieval Philosophy: Conference Abstracts,* New York: Fordham University.

8.   2004. Comparing Aristotle's *Prior Analytics* and Boole's *Laws of Thought. Bulletin of Symbolic Logic* **10**, 289.

9.   2007e. Existential Import. *Bulletin of Symbolic Logic*, **13**, 143–4.

10.   2007a. Aristotle, Boole, and Tarski. *Bulletin of Symbolic Logic*, **13**, 382–3.

11.   2008a. Aristotle's Many-sorted Logic. *Bulletin of Symbolic Logic*, **14**, 155–6.

12.   2008s. Disbelief Logic Complements Belief Logic. *Bulletin of Symbolic Logic.* 14 (2008) 436. (Co-author: Wagner Sanz)

13.   2009b. Aristotle's Independence Proofs. *Bulletin of Symbolic Logic*, **15**, 244–5. (Coauthor: George Boger).

14.   2009c. Aristotle's underlying logic: a three-hour tutorial. *Bulletin of Symbolic Logic*, **15** 335.

15.   2009t. Aristotle's evasive invalidity omissions. *Bulletin of Symbolic Logic*, **15**, 462. (Coauthor: Kevin Tracy)

16.   2010a. Aristotle's direct deductions*: metatheorems. *Bulletin of Symbolic Logic,* **16**,136. (Co-authors: Newton da Costa and Luis Dos Santos).

17.   2010b. Stating and misstating implications and consequences. *Bulletin of Symbolic Logic,* **16**, 435–36. (Co-author: George Boger)

18.   2011b. Protasis in *Prior Analytics*: proposition or premise? *Bulletin of Symbolic Logic*, **17**, 151–2. (Co-author: George Boger)

19.   2011e. Existential Import Argument Schemas: Aristotelian and Boolean. *Bulletin of Symbolic Logic.* 17 (2011) 324–5.

20.   2011g. Kurt Ebbinghaus on Aristotle's syllogistic. *Bulletin of Symbolic Logic.* 17 (2011) 325. (Co-author: Klaus Glashoff)

21.   2012m. Predicates and predications. *Bulletin of Symbolic Logic.* 18 (2012) 148. (Co-author: Corey McGrath)

22.   2012a. Aristotle's syllogistic premises. *Bulletin of Symbolic Logic.* 18 (2012) 300–1.

23.   2012h. Aristotle's syllogistic terms. *Bulletin of Symbolic Logic.* 18 (2012) 301–2. (Co-author: Jean-Louis Hudry)

24.   2012g. Aristotle's conception of syllogism. *Bulletin of Symbolic Logic.* 18 (2012) 301. (Co-author: Thomas Gezella)

25.   2012l. Discussing incommensurability in Aristotle. *Bulletin of Symbolic Logic.* 18 (2012) 472–3. (Co-author: Justin Legault)

26.   2012t. Autonymy and parautonymy in history of logic. *Bulletin of Symbolic Logic.* 18 (2012) 473–4. (Co-author: Kevin Tracy)

27.   2012b. Implicational-future sentences. *Bulletin of Symbolic Logic.* 18 (2012) 472. (Co-author: George Boger)

28.   2013l. Aristotle and Tarski on consequence. *Bulletin of Symbolic Logic.* 19 (2013) 234. (Co-author: Justin Legault)

29.   2013m. Aristotle's "whenever three terms". *Bulletin of Symbolic Logic.* 19 (2013) 234–5. (Co-author: Hassan Masoud).

30.   2013t. Barnes on ancient logic. *Bulletin of Symbolic Logic.* 19 (2013) 133. (Co-author: Kevin Tracy).

31.   2013m. Predications in ancient logic. *Bulletin of Symbolic Logic.* 19 (2013) 132–3. (Co-author: Corey McGrath).

32.   2013l. One-place plural predicates in Aristotle's logic. *Bulletin of Symbolic Logic.* 19 (2013) 254–5. (Co-author: Justin Legault).

33.   2013. Heinrich Scholz on Aristotle's underlying logic. *Bulletin of Symbolic Logic.* 19 (2013) 252–3.[c]

34.   2013jl. Aristotle, Boole, and Tarski on contradiction. *Bulletin of Symbolic Logic.* 19 (2013) 515. (Co-author: Justin Legault).

35.   2013ln. Aristotle: necessary conclusions and necessarily concluding. *Bulletin of Symbolic Logic.* 19 (2013) 515–516. (Coauthors: Justin Legault and Daniel Novotny)

36.   2014b. Aristotelian logic and Euclidean geometry. *Bulletin of Symbolic Logic.* 20 (2014) 247.   (Coauthor: George Boger)

37.   2014. Aristotle's syllogisms: basic and extended. *Bulletin of Symbolic Logic.* 20 (2014) 131.

38.   Formalizing Euclid's first axiom. *Bulletin of Symbolic Logic.* 20 (2014) 404–5. (Coauthor: Daniel Novotný)

39.   Aristotle's semiotic triangles and pyramids. *Bulletin of Symbolic Logic.* 21 (2015) 198.

40.   Aristotle's third logic: deduction. *Bulletin of Symbolic Logic.* 21 (2015) 102–103. (Coauthor: Kevin Tracy)

41.   Ancient motion theories. *Bulletin of Symbolic Logic.* Forthcoming (Coauthor: Stanley Ziewacz)

42.   Aristotle's axiomatic beginnings. *Bulletin of Symbolic Logic.* Forthcoming

43.   The Aristotle Łukasiewicz omitted. *Bulletin of Symbolic Logic.* 21 (2015) 237–238.

44.   Interpreting Aristotle's definition of *sullogismos*. *Bulletin of Symbolic Logic.* Forthcoming (Coauthor: Kevin Tracy)

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III. Books (editor)

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> *A syllogism is a form of speech in which, certain things being laid down, something follows of necessity from them, i.e. because of them, i.e. without any further term being needed to justify the conclusion.*
> —Aristotle 24b18 (Ross 1949/1965, 287)

1974.   *Ancient Logic and Its Modern Interpretations*. Proceedings of the Buffalo Symposium on Modernist Interpretations of Ancient Logic, Dordrecht: Reidel. MR0392486 (52 #13303)**.** Now distributed in hardback and e-book by Springer Verlag. http://link.springer.com/book/10.1007%2F978-94-010-2130-2

This collection contains articles by Corcoran on Aristotle, articles by others about Corcoran's work on Aristotle, and other items.

1993.   Cohen, M. and E. Nagel. 1934/1962/1993. *An Introduction to Logic*, second edition.

Revised, with new exercises, new indices, a new bibliography, and a 30-page introduction by J. Corcoran. Hackett Publishing Company, Indianapolis (1993), first edition published by Harcourt, Brace, & World, Inc., New York (1962), originally published as Book I of *An Introduction to Logic and Scientific Method*, Harcourt, Brace, and Company, New York, 1934.

Corcoran's Editor's Introduction contains remarks on Aristotle's logic. The book's treatment of Aristotle's logic attests the then-current state of understanding: a valuable baseline benchmark against which to measure the progress made by the Lukasiewicz-initiated developments. Section 4 of the 1993 Editors Introduction contains observations about Aristotle's logic and also critical comments about Cohen-Nagel's treatment of Aristotle. In particular, deduction—of conclusions from premises—is clearly distinguished from reduction—of syllogisms to syllogisms. Deduction is described as a method for establishing validity; reduction is described merely as a methodology for "dealing with syllogisms" by transforming one into another—a far cry from deducing one's conclusion from its premises.

2003. George Boole's *The Laws of Thought*. Buffalo: Prometheus Books. Introduction by Corcoran. Reviewed: J. van Evra in *Philosophy in Review*. *24*, (2004) 167–169. MR1994936 (2004i:03001)

After a thorough point-by-point comparison, Corcoran's Introduction concludes that Boole's level of rigor was below Aristotle's, that Boole was oblivious to indirect deduction (which of course was prominent in Aristotle), and that Boole uncritically followed Aristotelian doctrine even where Boole's system could not consistently support it. Moreover, Corcoran notes that although the result of Boole's work was the overthrowing of the paradigm Aristotle established, Boole's aim was not revolutionary. Boole set out to advance the Aristotelian paradigm.

IV. Reviews

> *A perfect syllogism is one that needs nothing other than the premisses to make the conclusion evident; an imperfect syllogism needs one or more other statements which are necessitated by the given terms but have not been assumed by way of premisses.*
> —Aristotle 24b22 (Ross 1949/1965, 287)

1.   1978. Joja, A., "La doctrine de l`universel chez Aristote", in *Mathematical Reviews* 56, #5192 (Coauthor: Wendy Ebersberger).

2.   1980. Lear, J., *Aristotle and Logical Theory* (1980), in *Canadian Philosophical Reviews* **I** 85–92 (Coauthor: Michael Scanlan).

3.   1981. Englebretsen, G. "Noncategorical Syllogisms", in *Notre Dame Journal of Formal Logic* (1980), in *Mathematical Reviews* (Coauthor: Michael Scanlan) 81k: 03014.

4.   1982h. Hintikka, J. "Aristotelian Induction" *Rev. International Philosophy* 34 (1980), in *Mathematical Reviews* 82m: 00016.

5.   1982t. Toth, I., "Aristote et les paradoxes de Zėnon" *Eleutherie* (1970), in *Mathematical Reviews* 82m: 01011.

6.   1982c. Crowley, C., *Universal Mathematics in Aristotelian-Thomistic Philosophy* (1980) in *Mathematical Reviews* 82m: 01003.

7.   1984. Lear, J., *Aristotle and Logical Theory* (1980), in *Mathematical Reviews* 84h: 03015.

8.   1987. Smith, R., "Aristotle as Proof-theorist", *Philos. Nature*. (1984), in *Mathematical Reviews* 87e:01003.

9.   1988. Saccheri, G. *Euclides Vindicatus* (1733), edited and translated by G. B. Halsted, 2nd ed. (1986), in *Mathematical Reviews* MR0862448. 88j:01013.

10.   1990. Cleary, J. *Aristotle on [...] Priority* (1988) in *Mathematical Reviews* 90j:01008.

11.   2011. Review of Skura, T. "A Refutation Theory". *Logica Universalis* 3 (2009), 293–302, in *Mathematical Reviews.* MR2559398**.**

Also see the articles *Corcoran-Scanlan 1982* and *Corcoran 2010.*

V. Discussions

> *When three terms are so related that the third is included in the middle term and the middle term included in or excluded from the first, the extremes can be connected by a perfect syllogism.*
> —Aristotle 25b32 (Ross 1949/1965, 300)

Corcoran's work on Aristotle is discussed in the following.
Endnotes contain quotations.

1970s

1. Smiley, Timothy. 1973. What is a Syllogism? ***Journal of Philosophical Logic*** 2: 136–154.[d]

1974

2. Mulhern, John. 1974. Modern Notations and Ancient Logic. In *Corcoran 1974*, 71–82.

3. Mulhern, Mary. 1974. Corcoran on Aristotle's Logical Theory. In *Corcoran 1974*, 133–148.

1976

4. Ioan, Petru. 1976. Review: *Corcoran 1974*. ***Revue Philosophique de Louvain***. **74**: 333–334.[e]

5. Largeault, Jean. 1976. Review: *Corcoran 1974*. ***Archives de philosophie.*** **39**: 563–83.

1977

6. Berka, Karel. 1977. What is the Nature of Aristotle's Syllogisms? ***Acta Universitatis Carolinae, Philosophica et Historica***. **4**: 11–28.

1979

7. Berka, Karel. 1979. A reinterpretation of Aristotle's syllogistic. ***Organon***, vol. 15, 35–48.

8. Bosley, Richard. 1979. Review: *Corcoran 1974*. ***Mind,*** New Series, Vol. 88, No. 350 (Apr. 1979), pp. 284–286.[fghi]

9. Lear, Jonathan. 1979. Aristotle's Compactness Proof. ***Journal of Philosophy,*** 76, 198–215.

Scanlan 1982 documents serious mathematical and logical mistakes that vitiate Lear's attempt to use compactness in explicating ***Posterior Analytics*** I, Chapters 19-22. The content of Lear 1979 reappears as Chapter 2 of *Lear 1980*.

10. Schmidt, Rudolf. 1979. ***Die Grammatik der Stoiker.*** Braunsweig: Vieweg Teubner.

1980s

1. Clark, Michael. 1980. ***The Place of Syllogistic in Logical Theory***. Nottingham: University of Nottingham Press.
http://eprints.nottingham.ac.uk/1547/1/THE_PLACE_OF_SYLLOGISTIC_IN_LOGICAL_THEORY.pdf

2. Englebretsen, George. 1980. On propositional form. ***Notre Dame Journal of Formal Logic,*** vol. 20 (1980), pp. 101–110.

3. Lear, Jonathan. 1980. ***Aristotle and Logical Theory***. Cambridge: Cambridge UP.

See *Scanlan 1982* and *Corcoran-Scanlan 1980*, *1982*, and *1984*.

4. Kwiatkowski, Tadeusz. 1980. Jan Łukasiewicz – A historian of logic. ***Organon*** 16–17 (1980–1981), 169–188.[j]

5. Novak, Joseph. 1980. Some recent work on the assertoric syllogistic. ***Notre Dame Journal of Formal Logic,*** vol. 21 (1980), pp. 229–42.[k]

This excellent paper is a useful survey of *axiomatic* approaches to syllogistic. But its conclusion goes beyond that topic; it contains the following. "The works noted above include the

classic formalizations of the syllogistic as an axiomatic system. Recently, however, another approach seems to be gaining acceptance, that which considers the syllogistic as a natural deduction system. Smiley and Corcoran independently developed such an approach. The authors argue that … their approach is much more faithful to the text of Aristotle and they offer deductions of various moods to illustrate this. The motivation behind the work of these two authors, i.e., an accurate rendering of the Aristotelian text, is of course commendable, and of all interpretations theirs takes the most concern to follow Aristotle's word and procedure."

1981

6. Englebretsen, George. 1981. *Three Logicians*, Assen, Van Gorcum, 1981.

7. Smith, Robin. 1981. Some studies of logical transformations in *Prior Analytics*. *History and Philosophy of Logic* **2,** 1–9.

8. Thom, Paul. 1981. *The Syllogism*. Munchen: Philosophia Verlag.

1982

9. Jongsma, Calvin. 1982. *Richard Whately and the Revival of Syllogistic Logic in Great Britain in the Early Nineteenth Century lessons.* PhD Thesis, University of Toronto.[1]

10. Thom, Paul. 1982. Conversion of Propositions Containing Singular or Quantified Terms in Pseudo-Scotus. *History and Philosophy of Logic* 3, 129–149.

11. Thom, Paul. 1982. The Place of Syllogistic in Logical Theory. *Philosophical Books* 23.2 (April, 1982: 73–76). DOI: 10.1111/j.1468-0149.1982.tb01886.x

12. Smith, Robin. 1982. What is Aristotle's echthesis? *History and Philosophy of Logic* 3, 113–127.

13. Scanlan, Michael. 1982. On Finding Compactness in Aristotle. *History and Philosophy of Logic* 4, 1–8.[m]

Abstract for *Scanlan 1982*: "Jonathan Lear has suggested that Aristotle attempts to demonstrate a proof-theoretic analogue of a compactness theorem in *Posterior analytics* I, chs. 19-22. Aristotle argues in these chapters that there cannot be infinite series of predications of terms. Lear's analyses of Aristotle's arguments are shown to be based on confusions about the nature of infinite orderings. Three distinct confusions are identified. In final remarks, it is suggested that a compactness claim is irrelevant to the issues which motivate Aristotle's arguments."

1983

14. Smith, Robin. 1983. Completeness of an ecthetic syllogistic, *Notre Dame Journal of Formal Logic*, 24, 224–32.

1984

15. Smith, Robin. 1984. Aristotle as Proof Theorist. *Philosophia Naturalis* 21: 2–4, pp. 590–597.

1985

1986

16. Stekeler-Weithofer, Pirmin. 1986. *Grundprobleme der Logik: Elemente einer Kritik der formalen Vernunft.* Berlin: De Gruyter.

1987

17. Gasser, James. 1987. *La syllogistique d'Aristote à nos jours*. Neuchâtel : CdRS.

1988

18. Lear, Jonathan. 1988. *Aristotle: the Desire to Understand*. Cambridge: Cambridge UP.

19. Mráz, Milan. 1988. *K implikaci v Aristotelově logice.* Rozpravy Československé Akademie, Svazek.

1989

20. Gasser, James. 1989. *Essai sur la nature et les critères de la preuve*. Editions DelVal.

21. Johnson, Fred. 1989. Models for modal syllogisms. *Notre Dame Journal of Formal Logic.* 30: 271–284.

This paper makes several interesting and original points. For example, it says the differences between the Smiley and the Corcoran systems suggest that there could be still further plausible natural-deduction models of Aristotle's syllogistic. Incidentally, to the best of my knowledge, no detailed study of these differences has been. However, in footnote 8, this paper presents two arguments rejected by Smiley's approach but accepted by Corcoran's. Inexplicably, it fails to point out two crucial properties that both arguments share: having contradictory premise sets and having terms in the conclusion not occurring in the premises.

22. Mozes, Eyal. 1989. A Deductive Database Based on Aristotelian Logic. *Journal of Symbolic Computation* 7, 487–507.

23. Smith, Robin. 1989. *Aristotle's Prior Analytics.* Indianapolis: Hackett, 1989.[no]

Smith's translation is far superior to all others I know of. It is indispensable for contemporary study of Aristotle's logic. The commentary is the most thorough, most thoughtful, and most rigorous yet produced: it combines the linguistics of a classicist with the logic of a mathematician and the hermeneutics of a philosopher.

24. van Rijen, Jeroen. 1989. *Aspects of Aristotle's Logic of Modalities*. Dordrecht: Reidel.

1990s

1. Barnes, Jonathan. 1990. Review of Smith's 1989 *Aristotle's Prior Analytics*. *Classical Review* NS 40:234–236.[p]

2. Graham, Daniel. 1990. *Aristotle's Two Systems.* Oxford: Oxford UP.

3. Merrill, Daniel. 1990. *Augustus De Morgan and the Logic of Relations*. Dordrecht, Kluwer.[q]

This imaginative and informative work applies to De Morgan's relational logic the basic ideas of the Corcoran-Smiley approach to Aristotle's syllogistic.[r]

4. Vega, Luis. 1990. *La Trama de la Demostración*. Madrid: Alianza Editorial.

5. Wedin, Michael. 1990. Negation and Quantification in Aristotle. *History and Philosophy of Logic* 11 (2):131-150.

1991

6. Barnes, Jonathan, et al. 1991. *Alexander of Aphrodisias: On Aristotle Prior Analytics 1.1−7.* London: Duckworth.

7. Bell, Albert, and James Allis. 1991. *Resources in Ancient Philosophy: an annotated bibliography of scholarship 1965-1989.* London: Scarecrow Press.

8. Berka, Karel. 1991. La syllogistique aristotelicienne – Reconstruction historico-logique, In Mohammed Allal Sinaceur, Ed. *Penser avec Aristote*, Paris, Eres, pp. 429–431.

9. Flannery, Kevin. 1991. Review of Smith's 1989 *Prior Analytics*. *Ancient Philosophy* 11: 187–193.

10. Gasser, James. 1991. Aristotle's Logic for the Modern Reader. *History and Philosophy of Logic 12*: 235–240.

This review of *Smith 1989* makes several original points and should be considered as an important contribution in its own right toward clarifying the Corcoran-Smiley approach. It also contains some interesting alternatives to Smith's translations—not being bound by the ground rules Smith established for his own translation.

11. Manekin, Charles. 1991. *The Logic of Gersonides.* Reidel, Dordrecht.

12. Mignucci, Mario. 1991. Expository proofs in Aristotle's syllogistic. *Oxford Studies in Ancient Philosophy: Supplementary Volume 1991: Aristotle and the Later Tradition.* Oxford: Oxford UP.[st]

13. Scanlan, Michael. 1991. Review of Smith 1989. In *Mathematical Reviews* (91g: 03001).[u]

Scanlan 1991 contains the following. "The translator has been guided by this recent work, especially that of Corcoran. It has affected such aspects as the choice of English equivalents for Aristotle's Greek and the inevitable interpretative choices made in any translation. This does not mean that the translation is a rewriting of Aristotle in the modern style. The translator has adhered to the recent tendency in Aristotle translations to translate Greek technical terms with one-to-one English equivalents as far as possible. This enables the Greekless reader to independently assess Aristotle's variations in terminology. Debatable points of translation and general interpretation are taken up by the translator in an extensive commentary.

14. Shapiro, Stewart. 1991. *Foundations without Foundationalism: the Case for Second-Order Logic.* Oxford: Oxford UP.

1992

15. Detlefsen, Michael. 1992. *Proof and Knowledge in Mathematics.* London: Routledge.

1993

16. Boger, George. 1993. The Logical Sense of *paradoxon* in Aristotle's *Sophistical Refutations*, *Ancient Philosophy* 13.1, 55–78.

1994

17. Degnan, Michael. 1994. Recent Work in Aristotle's Logic. *Philosophical Books* 35.2 (April, 1994): 81–89.[v]
http://onlinelibrary.wiley.com/doi/10.1111/j.1468-0149.1994.tb02858.x/abstract

18. Furley, David, and Alexander Nehamas. Richard. 1994. *Aristotle's Rhetoric*. Princeton: Princeton UP.

19. Reyes, Marie, John Macnamara, and Gonzalo Reyes. 1994. Functoriality and Grammatical Role in Syllogisms. *Notre Dame Journal of Formal Logic*, 35:41–66.[w]

20. Smith, Robin. 1994. Logic, Dialectic, and Science in Aristotle. *Ancient Philosophy*, **14**, 3–7.

21. Smiley, Timothy. 1994. Aristotle's completeness proof. *Ancient Philosophy*, **14**, 25–38.

22. Smith, Robin. 1994. Dialectic and the syllogism. *Ancient Philosophy*, **14**, 133–151. PDF

1995

23. Edel, Abraham. 1995. *Aristotle and his Philosophy*. 2nd ed., New York: Transaction Publishers.

24. Flannery, Kevin. 1995. *Ways into the Logic of Alexander of Aphrodisias.* Leiden: Brill.

25. Patterson, Richard. 1995. *Aristotle's Modal Logic*. Cambridge: Cambridge UP.

26. Reyes, Marie, John McNamara, and Gonzalo Reyes. 1995. A category-theoretic approach to Aristotle's term logic. Editors: Mathieu Marion and R.S. Cohen. **Quebec Studies in the Philosophy of Science: Part I: Logic.** Springer,

27. Smith, Robin. 1995. Aristotle's logic. *The Cambridge Companion to Aristotle* (Cambridge Companions to Philosophy). Jonathan Barnes, Editor. Cambridge: Cambridge UP.

28. Stekeler-Weithofer, Pirmin. 1995. *Sinn-Kriterien: die logischen Grundlagen kritischer Philosophie von Platon bis Wittgenstein.* Berlin: Schöningh.

1996

29. Bottazzini, Umberto. 1996. The Mathematical Writings from Daniel Bernoulli's Youth. *Die Werke von Daniel Bernoulli.* Band I. Basil: Birkhäuser.

30. Englebretsen, George. 1996. *Something to Reckon with: the Logic of Terms.* Ottawa: University of Ottawa Press.[x]

31. Mulder, Dwayne Hudson. 1996. The Existential Assumptions of Traditional Logic. *History and Philosophy of Logic* 17 (1-2):141–154.

32. Striker, Gisela. 1996. Perfection and Reduction in Aristotle's *Prior Analytics*. In Michael Frede and Gisela Striker (Eds.) *Rationality in Greek Thought*. Oxford: Oxford University Press.[yzaa]

33. Thom, Paul. 1996. *Logic of Essentialism: An Interpretation of Aristotle's Modal Syllogistic* The New Synthese Historical Library. Dordrecht: Kluwer.[bb]

34. Van Eemeren, Frans et al. (Eds.) 1996. Fundamentals of Argumentation Theory. London: Routledge.

1997

35. Martin, John. 1997. Aristotle's Natural Deduction Reconsidered. *History and Philosophy of Logic*, 18:1–15.[cc]

36. Jehamy, Aïda Chehadé. 1997. *Essais de formalisation de la logique d'Aristote*. Beirut: University of Lebanon Press.

37. Lamarque, Peter. 1997. **Concise Encyclopedia of Philosophy of Language.** Oxford: Elsevier Science.[dd]

38. Boger, George. 1998. Completion, Reduction, and Analysis: Three Proof-theoretic Processes in Aristotle's *Prior Analytics*, **History and Philosophy of Logic**, 19:187–226.

39. Striker, Gisela. 1998. Aristotle and the uses of logic. In Jyl Genzler (Ed.) **Method in Ancient Philosophy**. Hardback. Oxford: Oxford University Press.[ee]

40. Boger, George. 1999. The Modernity of Aristotle's Logical Investigations. **Paideia.** http://www.bu.edu/wcp/Papers/Logi/LogiBoge.htm

41. Gasser, James. 1999. Logic and Metaphor. **History and Philosophy of Logic**, *20*: 227–238.

42. Pelletier, F. J. 1999 A brief history of natural deduction. **History and Philosophy of Logic 20**:1–31.

2000

1. Bäck, Allan. 2000. **Aristotle's Theory of Predication.** Leiden: Brill.

2. Boger, George. 2000. The Modernity of Aristotle's logic. In D. Sfendoni-Mentzou (Ed.) **Aristotle and Contemporary Science**, vol. 2. New York: Peter Lang Publishers, 97–112.

3. Degnan, Michael. 2000. Review of Patterson 1995. **Ancient Philosophy 20**:215–22.[ff]

4. Lagerlund, Henrik. 2000. **Modal Syllogistics in the Middle Ages.** Leiden: Brill.

5. Nambiar, Sriram. 2000. The influence of Aristotelian logic on Boole's philosophy of logic. In **A Boole Anthology**, James Gasser, Ed. Dordrecht: Kluwer.

6. Pelletier, F. J. 2000. A history of natural deduction and elementary logic textbooks, in J. Woods, and B. Brown (eds.), **Logical Consequence: Rival Approaches**,Vol. 1, Hermes Science, Oxford, pp. 105–138.

2001

7. Bastit, Michel, and Jacques Follon. 2001. **Logique et métaphysique dans l'organon d'Aristote**. Paris: Peeters Publishers.

8. Caicedo, Xavier and Alejandro Martin. 2001. Completud de dos cálculos lógicos de Leibniz. **Theoria**, **Segunda Epoca**, 16: 539-558.

This imaginative and informative work deftly applies the basic ideas of the Corcoran-Smiley approach to Aristotle's syllogistic to a pair of logics constructed by Leibniz.

9. Flannery, Kevin. 2001. *Acts Amid Precepts: the Aristotelian Logical Structure of Thomas Aquinas's Moral Theory.* Washington, DC: Catholic University of America Press.[gg] [hh]

10. King, Peter. 2001. Consequence as inference. *Medieval Formal Logic.* **Dordrecht**: Kluwer.
http://individual.utoronto.ca/pking/articles/Consequence_as_Inference.pdf

11. Martin, John. 2001. Proclus and the Neoplatonic Syllogistic. *Journal of Philosophical Logic*, **30**, 187–240.

12. Striker, Gisela. 2001. Aristotle and the uses of logic. In Jyl Genzler (Ed.) *Method in Ancient Philosophy.* Revised edition: Paperback. Oxford: Oxford University Press.[ii]

13. Wehrle, Walter. 2001. *The Myth of Aristotle's Development and the Betrayal of Metaphysics.* Lanham MD: Rowman and Littlefield.

14. Woods, John. 2001. *Aristotle's Earlier Logic.* Oxford: Hermes Science.[jj] [kk] [ll]

15. Yrönsuuni, Mikko. 2001. *Medieval Formal Logic*. London: Routledge & Kegan Paul.

16. Zarka, Yves-Charles. 2001. *Comment écrire l'histoire de la philosophie?* Paris: Presses Universitaires de France.

2002

17. Boger, George. 2002 Essay-Review of *Aristote: Les Réfutations Sophistiques. Introduction, traduction et commentaire*. Louis-André Dorion. (Paris: J. Vrin, 1995) *Ancient Philosophy* 22, 195–204.

18. Patterson, Richard. 2002. *Aristotle's Modal Logic.* First paperback edition. Cambridge: Cambridge UP.[mmnnoo]

19. Smith, Robin. 2002. Ancient Greek Philosophical Logic. In Dale Jacquette (Ed.) *A Companion to Philosophical Logic.* New York: Wiley-Blackwell.[pp]

2003

20. Crabbé, Marcel. 2003. The formal theory of syllogisms. *The Review of Modern Logic* 9 (2003), no. 1–2, 29–52. http://projecteuclid.org/euclid.rml/1081173833.

21. Grass, Rainer. 2003. *Schussfolgerungslehre in Erfurten Schulen des 14 Jahrhunerts*. Berlin: Gruner.

22. Martin, John. 2003. All Brutes are Subhuman: Aristotle and Ockham on Privative Negation. *Synthese*, **134**, 429–461.

<div align="center">2004</div>

23. Boger, George. 2004. Aristotle's Underlying Logic. In Dov Gabbay & John Woods (Eds.) *Handbook of the History of Logic*. vol. 1, Ch. 3. Amsterdam, Netherlands: Elsevier, 101–246.[qq]

This excellent and rich chapter of 147 pages deserves to be expanded into an autonomous book. However, it needs work: it contains many mistakes and misunderstandings, some already noted by Klaus Glashoff (see below). Boger's reconstructions of Aristotle's indirect deductions—syllogisms by reductio ad impossible—are conveniently juxtaposed with Boger's faithful translations of Aristotle's own versions. This makes it possible to see in a glance Boger's understanding of Aristotle, and his misunderstandings. One page, page 229, especially its Tables 39 and 40, tells much of the story. After setting down the premises, Boger—following Aristotle's practice—notes the conclusion as the goal: Boger uses the question-mark notation described in Corcoran 2009. And, again, following Aristotle's practice for *direct* deductions, the conclusion reappears at the end, but as a goal achieved.

But Boger's indirect deductions fail to follow Aristotle in two theoretically and philosophically important ways: it is hard to say which is worse. When the second part of the contradiction is reached, Aristotle ends his deduction: Aristotle shows that C follows from the premises by deducing a contradiction, i.e. two propositions one being the contradictory of the other, from the premises augmented by the contradictory of C. But Boger, apparently unable to grasp Aristotle's two-proposition notion of contradiction, compulsively adds another step conjoining the two parts of the contradiction into one conjunctive proposition. Aristotle never does this. This conjunctive step from propositional logic not only betrays Aristotle but it plays into the hands of Aristotle's enemies who charge Aristotle with covert use of propositional logic. Boger's second mistake is to add a second unnecessary step: entering as a new line the final conclusion. This step again betrays Aristotle and it suggests that the final conclusion is being deduced from the contradiction.

Incidentally, there is a remarkable notational similarity of (1) Boger's procedure on page 229 (and elsewhere) to (2) Lemmon's proposition-logic rule RAA [*Reductio Ad Absurdum*]. See page 26 of E. J. Lemmon 1965. *Beginning Logic*. Indianapolis: Hackett. Sad to say, Lemmon's RAA is pathetically clumsy and violates the heuristic that a natural deduction rule for a given connective should mention no other connective. Lemmon should have taken a page out of Aristotle's book and used a rule that did not need a conjunction of a proposition with its own negation.[rr]

24. Boger George. 2004. Review of *Aristotle on False Reasoning: Language and the World in the Sophistical Refutations* by Scott G. Schreiber. Albany, NY: State University of New York Press. *Informal Logic* **23**:1, pp 77–90.

25. Dov Gabbay and John Woods (Eds.) *Handbook of the History of Logic*. vol. 1. Amsterdam, Netherlands: Elsevier.

26. Glashoff, Klaus. 2004. Review of Gabbay et al.2004. *Bulletin of Symbolic Logic.* 10: 579-583.

Glashoff wrote: "The third chapter, by George Boger "Aristotle's Underlying Logic", is the central one on Aristotle's logic within this volume. Boger says […] that his work belongs to the line of research begun by Łukasiewicz and continued by Smiley and Corcoran. […] this Volume 1 of the *Handbook of the History of Logic* is of value due to the excellent chapters by George Boger on Aristotle's syllogistic logic […]."

27. Guillaume, Marcel. 2004. Review: Aristotle's Prior Analytics and Boole's Laws of Thought. *History and Philosophy of Logic*, **24**, 261–288**. Mathematical Reviews**, MR2033867 (2004m: 03006).[ss]

28. Harari, Orna. 2004. *Knowledge and Demonstration: Aristotle's Posterior Analytics*. New York: Springer.

29. Johnson, Fred. 2004. Aristotle's modal syllogisms. In Dov Gabby & John Woods (Eds.) *Greek, Indian, and Arabic Logic*: *Handbook of the History of Logic*. vol. 1, Ch. 4. Amsterdam, Netherlands: Elsevier, 247–308.

This chapter lives in its own world. On page 248 it says that Smith's 1989 translation supports the Łukasiewicz view that syllogisms are "implications". On page 281 it says: "Corcoran gives a Henkin-style completeness proof for the assertoric syllogistic. His system validates inferences such as *Eab*, so *Acc*, inferences eschewed by relevance logicians. This inference is valid for Corcoran since the conclusion is logically true, even though the premise is irrelevant to the conclusion." One of the problems with this passage is that the language of Corcoran's system lacks sentences with repeated terms such as *Acc*.

30. Martin, John. 2004. *Themes in Neoplatonic and Aristotelian Logic*. Aldershot: Ashgate.

31. Woods, John, and Andrew Irvine. 2004. Aristotle's Earlier Logic. In Dov Gabby & John Woods (Eds.) *Handbook of the History of Logic*. vol. 1. Amsterdam: Elsevier.[ttuu]

2005

32. Cutler, Darcy. 2005. Aristotle and Modern Logic. In K.A. Peacock & A.D. Irvine (eds.) *Mistakes of Reason: Essays in Honour of John Woods.* Toronto: University of Toronto Press.

33. Glashoff, Klaus. 2005 Aristotelian syntax from a computational point of view, *Journal of Logic and Computation* 15 (2005), 949–973.

34. Shapiro, Stewart, and William Wainwright. 2005. *Oxford Handbook of Philosophy of Mathematics and Logic*. Oxford: Oxford University Press

35. Vilkko, Risto. 2005. Review: Aristotle's Prior Analytics and Boole's Laws of Thought. *History and Philosophy of Logic*, **24**, 261–288. *The Bulletin of Symbolic Logic*, **11**(2005) 89–91.

2006

36. Bobzien, Susanne. 2006. Ancient Logic, *Encyclopedia of Philosophy*. 2nd edition. (10 Vols.), ed. D. M. Borchert, Detroit: Thomson Gale 2006, Vol. 5, pp. 397-401.

No reader unacquainted with the Łukasiewicz axiomatic approach could discern it in this article. Łukasiewicz interprets Aristotle's completing of incomplete syllogisms as proving theorems using an unacknowledged propositional logic. Likewise, no reader unacquainted with the Corcoran-Smiley natural-deduction approach to syllogistic could discern it in this article. Corcoran and Smiley interpret Aristotle's completing of incomplete syllogisms as deducing their conclusions from their premises. The name 'Łukasiewicz' occurs exactly once in the article's text, viz. in the following sentence: "Thus the Stoics introduced an implicit bracketing device similar to that used in Lukasiewicz' Polish notation." The names 'Corcoran' and 'Smiley' do not occur at all in the article's text.

One prominent syllogistic process attributed to Aristotle is the "reduction" of imperfect syllogisms to perfect syllogisms that gave rise to the medieval mnemonics, Baroco, Camestres, and so on. These mnemonics are not explained, leaving open the possibility that a neophyte could confuse the "reduction"—advocated since the Middle Ages by the pre-Łukasiewicz paradigm—with the "deduction"—advocated since the 1970s by the post-Łukasiewicz paradigm. But, this article does not distinguish them. Indeed, the article encourages the confusion by saying "By contrast, the syllogisms of the second and third figures are incomplete and in need of proof. He proves them by reducing them to syllogisms of the first figure and thereby 'completing' them."

The article's introduction gets off to a bad start by ignoring *Prior Analytics'* first sentence, which reveals that Aristotle took the study of demonstration to be his topic. See my 2009 "Aristotle's Demonstrative Logic". The bibliography is stale and inadequate: no work done by Smiley since 1973 is cited, no work done by Corcoran since 1974 is cited, and no work done by Smith since 1994 is cited. Some items are misdated and some have no author. Moreover, in connection with Stoic logic neither Mates' 1956 *Stoic Logic* nor Corcoran's 1974 "Remarks on Stoic deduction" are deemed worthy of being cited. Finally, the writing is often indecipherable or ungrammatical and the article is replete with unexplained technical terms.

37. Stekeler-Weithofer, Pirmin. 2006. *Philosophiegeschichte.* Berlin: De Gruyter.

38. Tracy, Kevin. 2006**. *The Development of Dialectic from Aristotle to Chrysippus*.
      PhD. Dissertation, University of Pennsylvania.[vv] [ww] [xx]

This PhD dissertation in Classics is the best history of ancient logic known to me. It displays a mastery of logical Greek, the relevant Greek texts, the secondary literature, and modern logic and philosophy of logic. The prose is lucid. It should be transformed into a book.

2007

39. Abeles, Francine. 2007. Lewis Carroll's Visual Logic. *History and Philosophy of Logic*, 28:
      1–17.

40. Andrade, Edgar, and Edward Becerra. 2007. Corcoran's Aristotelian syllogistic as a
      subsystem of first-order logic. *Revista Colombiana de Matematicas*, 41: 67–80.

41. Carnielli, Walter. 2007. Polynomializing: Logical inference in polynomial format and the
      legacy of Boole. *Model-Based Reasoning in Science, Technology, and Medicine
      (Studies in Computational Intelligence).* Lorenzo Magnani and Ping Li (Editors). Berlin:
      Springer.

42. Ebert, Theodor, and Ulrich Nortmann. 2007. *Aristoteles: Analytica Priora Buch I.* Berlin:
      Akademie Verlag.

43. Martinez, Concha. 2007. Corcoran in Spanish. *Current Issues in Logic / Temas Actuales de
      Lógica.* Imprenta Universidade Santiago de Compostela (University of Santiago de
      Compostela Press). Reviewed by Alasdair Urquhart *BSL* 14 (2008) 271–2 and by
      Michael Scanlan *HPL* 30 (2009) 397–401.

44. Sagüillo, José Miguel.   2007. Corcoran the philosopher. *Current Issues in Logic / Temas
      Actuales de Lógica.* Imprenta Universidade Santiago de Compostela (University of
      Santiago de Compostela Press). Reviewed by Alasdair Urquhart *BSL* 14 (2008) 271–2
      and by Michael Scanlan *HPL* 30 (2009) 397–401.

45. Shapiro, Stewart. 2007. Corcoran the mathematician. *Current Issues in Logic / Temas
      Actuales de Lógica.* Imprenta Universidade Santiago de Compostela (University of
      Santiago de Compostela Press). Reviewed by Alasdair Urquhart *BSL* 14 (2008) 271–2
      and by Michael Scanlan *HPL* 30 (2009) 397–401.

46. Tuominen, Miira. 2007. *Apprehension and Argument: Ancient Theories of Starting Points
      for Knowledge.* Berlin: Springer.[yy]

2008

47. Andrade, Edgar, and Edward Becerra. 2008. Establishing Connections between Aristotle's Natural Deduction and First-Order Logic. *History and Philosophy of Logic*, 29: 309–325.

48. Kaye, Sharon. 2008. *Medieval Philosophy.* Oneworld: London.

49. Moss, Lawrence. 2008. Completeness theorems for syllogistic fragments. *Logic for Linguistic Structures.* Fritz Hamm and Stephan Kepser, Eds. Berlin: Walter de Gruyter.

50. Nimrod, Bar-Am. 2008. *Extensionalism: the Revolution in Logic.* Berlin: Springer.[zzaaa]

2009

51. Akbarian, Reza. 2009. *Islamic Philosophy: Mulla Sadra and the Quest of Being.* Xlibris

52. Borell, Carlos. 2009. *By Good and Necessary Consequence*. Eugene OR: Wipf and Stock Publications.

53. Correia, M. 2009. The syllogistic theory of Boethius. *Ancient Philosophy*, **29**: 391–407.

54. Detel, Wolfgang. 2009. *Companion to Ancient Philosophy*. Mary Louise Gill and Pierre Pellegrin, Eds. Wiley-Blackwell: London.

55. Groarke, Louis. 2009. *An Aristotelian Account of Induction.* Montreal: McGill-Queens UP.[bbb]

56. Malink, Marko. 2009. A non-extensional notion of conversion in the Organon. *Oxford Studies in Ancient Philosophy: Supplementary Volume 37*. Oxford UP, Oxford.[ccc]

57. Pratt-Hartmann, Ian and Lawrence Moss. 2009. Logics for the Relational Syllogistic. *Review of Symbolic Logic*, **2**: 647–683

58. Smith, Robin. 2009. Logic. *Oxford Encyclopedia of Ancient Greece and Rome.* Oxford: OUP.

59. Striker, Gisela. 2009. *Aristotle's Prior Analytics: Book I.* Trans. with intro. and comm. Oxford: Oxford University Press.

This book asserts without explanation that Aristotle's deductions are "more plausibly seen as derivations in a natural deduction calculus". There is no indication of which natural deduction calculus is concerned or what explains the increased plausibility. It adds: "A first model of the natural-deduction kind was published in German …; more influential in the Anglophone literature has been the work of John Corcoran". It further asserts, without giving evidence, that the natural-deduction interpretation "is widely accepted." See the review listed above as *Corcoran 2010*.

60. Thom, Paul. 2009. Review of Corcoran 2009. Aristotle's Demonstrative Logic. *History and Philosophy of Logic*, **30** 1–20. *Mathematical Reviews.* MR2488682 (2009m: 03003)

2010

1. Biondi, Paolo. 2010. Review of Striker's 2009 translation of *Prior Analytics*. *Classical Review*. **60**:370–2.

2. Corkum, Phil. 2010. Review of Striker's 2009 translation of *Prior Analytics*. *Journal of History of Philosophy*.**48**:236–7.[dddeee]

The Corkum review begins as follows: "Łukasiewicz in the 1950s interpreted the syllogistic as an axiomatic theory: the perfect syllogisms are axioms; the imperfect syllogisms are theorems, implications derived from the axioms by means of an underlying system of inferential reasoning; perfection establishes the truth of the imperfect syllogisms. By contrast, Corcoran and Smiley in the early 1970s independently represented the syllogistic as a Fitch-style natural deduction system: the perfect syllogisms and conversion rules are intuitively valid inference rules; the imperfect syllogisms are deductions with more than two premises providing step-wise derivation of a conclusion; perfection establishes the validity of an imperfect argument form. … I doubt that any representation of the whole syllogistic as a modern system will be entirely satisfactory. A virtue of Gisela Striker's excellent translation of, and commentary on, the *Prior Analytics Book I* is its neutrality on these interpretative controversies".

No passage is cited to document this neutrality claim. In fact, the Corkum claim that Striker is neutral apparently conflicts with several passages in Striker's book: some that seem to reject the Łukasiewicz interpretation *and* some that seem to accept the Corcoran-Smiley interpretation. For example, on page xv Striker wrote that Aristotle's "proofs of validity are more plausibly seen as derivations in a natural deduction calculus". Moreover, Striker's Introduction begins with a presentation of a natural deduction system—not a propositional-logic based axiom system.

3. Dutilh, Catarina. 2010. *Formalizing Medieval Logical Theories*. Berlin: Springer.

4. Gili, Luca. 2010. *La sillogistica di Aristotele. La riduzione di tutte le deduzioni valide al sillogismo*. Lampi di Stampa, Milan 2010

5. Gomes, Evandro and D'Ottaviano, Itala. 2010. Aristotle's Theory of Deduction and Paraconsistency. *Principia: Revista Internacional de Epistemologia*, **14**: 71–97.

6. Gomes, Evandro and D'Ottaviano, Itala. 2010. Um panorama da teoria aristotélica do silogismo categórico. 1º de Setembro de 2010. (ftp://logica.cle.unicamp.br/pub/e-prints/vol.10,n.4,2010.pdf)

7. Glashoff, Klaus. 2010. An Intensional Leibniz Semantics for Aristotelian Logic. *Review of Symbolic Logic*, Published online by Cambridge University Press 17 Mar 2010. Doi:10.1017/S1755020309990396

Glashoff wrote in his abstract: "Thus, this paper is an addendum to Corcoran's work, furnishing his formal syntax with an adequate semantics which is free from presuppositions which have entered into modern interpretations of Aristotle's theory via predicate logic"

8. Indrzejczak, Andrzej. 2010. *Natural Deduction, Hybrid Systems, and Modal Logics.* Berlin: Springer.

9. Klyukanov, Igor. 2010. *A Communication Universe.* Rowman and Littlefield: Lanham MD.

10. Lagerlund, Henrik. 2010. Medieval Theories of the Syllogism. *The Stanford Encyclopedia of Philosophy*, Edward N. Zalta (ed.), <http: //plato.stanford.edu/entries/medieval-syllogism/>.

11. Sanmartin, Miguel Candel. 2010. To be (something) or not to be: Existence and predication in Aristotle's logic and metaphysics. *Filosofi a Unisinos,* 11(1):62–84. doi:10.4013/fsu.2010.111.05

12. Raymond, Dwayne. 2010. Polarity and inseparability: the foundation of the apodictic portion of Aristotle's modal logic. *History and Philosophy of Logic*. **31**:193–218.[fff]

2011

13. Crubellier, Michel. 2011. Du sullogismos au syllogism. *Revue Philosophique de la France et de L'étranger.* 136: 140–84.

14. Fine, Kit. 2011. Aristotle's Megarian Manoeuvres. *Mind.* 120: 993–1034.

15. Gili, Luca. 2011. *La sillogistica di Alessandro di Afrodisia. Sillogistica categorica e sillogistica modale nel commento agli Analitici Primi di Aristotele.* Hildesheim-Zürich-New York, Georg Olms.

16. Gourinat, Jean-Baptiste. 2011. Aristote et la logique formelle moderne : sur quelques paradoxes de l'interprétation de Łukasiewicz. *Philosophia Scientiæ* 2011/2 (15-2),pp. 69–101.

17. Joray, Pierre. 2011. Principe de contradiction et ecthèse dans la syllogistique d'Aristote. In Hourcade A. & Lefebvre R., Eds. *Aristote: rationalités.* Presses Universitaires de Rouen et du Havre, 41–53, 2011.

18. Lenz, Martin. 2010. *Lockes Sprachkonzeption.* Berlin: De Gruyter.

19. Mineshima, Koji. 2011. A generalized syllogistic inference system based on inclusion and exclusion. *Studia Logica.* Published online 08 August 2012

20. Morison, Benjamin. 2011. What was Aristotle's concept of logical form? In *Episteme, etc.: Essays in Honour of Jonathan Barnes*. Oxford: Oxford UP. DOI:10.1093/acprof:oso/9780199696482.003.0009

21. Pratt-Hartmann, Ian. 2011. The Hamiltonian Syllogistic. *Journal of Logic, Language and Information*. **20**: 445−474.

22. Prawitz, Dag. 2011. Proofs and perfect syllogisms. Chapter 16. *Logic and Knowledge.* Carlo Cellucci et al., Eds. Cambridge: Cambridge Scholars.

23. Schumann, Andrew. 2011. Preface: Modern Review of Judaic Logic. *History and Philosophy of Logic*. **32**: 1–8.

24. Smith, Robin. 2011. Review of Striker's 2009 translation of *Prior Analytics*. *Ancient Philosophy*. **31**:417–24.

This is an amazing review. It begins and ends with ostensively sincere praise; yet the middle contains polite but damning criticism: observations that seem to impugn Striker's very qualifications to write on logic. It suggests that Striker does not understand two crucial concepts of logic: indirect deduction and deductive completeness. Moreover, the review does not discuss Striker's waffling on the axiomatic/natural-deduction controversy. The issue is not mentioned in this review: in fact, the three expressions 'Łukasiewicz', 'axiomatic' and 'natural deduction' don't occur.

Besides its fully-warranted criticism, the review also showers high praise on the translation—mostly unwarranted in my opinion. For example, Smith praises as 'innovative' Striker's translation of *deiktikôs* as 'ostensively' at 29a31. But this translation goes back over 150 years to Owen's 1853 translation of *Organon*. It was also used by others more recently: e.g. by Ross in 1949 and Smiley in 1973. How can a 150 year-old translation that has become somewhat of a tradition be innovative?

I must add for the record that in this context I disapprove of 'ostensively': I prefer 'directly'. But I also think that proper translation of *deiktikô* is a thorny issue that deserves much more discussion.

25. Vega, Luis, and Paula Olmos. Eds. 2011. *Compendio de Lógica, Argumentación y Retórica.* Madrid: Trotta.

26. Van Bentham, Jan, et al. Eds. 2011.*Games, norms, and reasons: Logic at the crossroads*. Berlin: Springer.

27. Varenne, Franck. 2011. Le rapport entre science et logique chez Aristote vu a travers la critique de Dewey. *Aristote: rationalités*. Hourcade, A. and R. Lefebvre. Eds. Presses Universitaires de Rouen et du Havre, pp. 55−68.

<div align="center">2012</div>

28. Andrade, Edgar, and Catarina Dutilh. 2012. Validity, the squeezing argument, and alternative semantic systems: the case of Aristotelian syllogistic. *Journal of Philosophical Logic*. **41**: 387–418.

29. Cellucci, Carlo. 2012. Logica dell'argomentazione e logica della scoperta. ***Logica e diritto: tra argomentazione e scoperta.*** Paolo Gherri and Gianfranco Basti. Eds.Vatican City, Lateran UP.

30. Bonevac, Daniel. 2012. History of quantification. ***Handbook of the History of Logic. Volume 11: Logic: A History of its Central Concepts.*** Volume editors: Dov M. Gabbay, Francis Jeffry Pelletier and John Woods. Amsterdam, Elsevier.

31. Crivelli, Paolo. 2012. Aristotle's logic. ***Oxford Handbook of Aristotle.*** Christopher Shields, Ed. Oxford, Oxford UP.

32. Dutilh, Catarina. 2012. Medieval Theories of Consequence. ***The Stanford Encyclopedia of Philosophy,*** Edward N. Zalta (ed.), < http://plato.stanford.edu/entries/consequence-medieval/>

33. Pelletier, Francis, and Allen Hazen. 2012. History of Natural Deduction. ***Handbook of the History of Logic. Volume 11: Logic: A History of its Central Concepts.*** Volume editors: Dov M. Gabbay, Francis Jeffry Pelletier and John Woods. Amsterdam, Elsevier.

34. Thom, Paul. 2012. Logical form. ***The Oxford Handbook of Medieval Philosophy.*** John Marenbon, Ed. Oxford: Oxford UP.

35. Wesoły, Marian. 2012. *Analysis peri ta schemata*: Restoring Aristotle's Lost Diagrams of the Syllogistic Figures. ***Peitho***. **3**:83–114.

36. Woods, John. 2012. History of Fallacies in Western Logic. ***Handbook of the History of Logic. Volume 11: Logic: A History of its Central Concepts***. Volume editors: Dov M. Gabbay, Francis Jeffry Pelletier and John Woods. Amsterdam: Elsevier.

2013

37. de Almeida, Wellington. 2013. Termos singulares, transcategoriais e *Summa Genera* na lógica de Aristóteles. ***Manuscrito***. **36**: 5–48.

38. Brands, Harmut, and Chistoph Kann, Eds. and trs. 2013. ***William of Sherwood: Einführung in die Logik, Introductiones in Logicam.*** Lateinish-Deutsch. Hamburg: Felix Meiner.

39. Castelnérac, Benoit, and Mathieu Marion. 2013. Antilogic. ***The Baltic International Yearbook of Cognition, Logic, and Communication.*** **8**: 1–31.[ggghhh]
http://dx.doi.org/10.4148/1944-3676.1079

40. Cellucci, Carlo. 2013. Chapter 6: Aristotle's logic: the deductivist view. ***Rethinking Logic.*** Springer: New York.

41. Crager, Adam. 2013. *The infinite in Aristotle's logical epistemology*. Amsterdam: Institute for Logic, Language, and Computation Scientific Publications.

42. Ferreira, Mateus. 2013. O que são silogismos perfeitos? *Dois Pontos*. **10**: 189-224. DOI: http://dx.doi.org/10.5380/dp.v10i2.32042

43. Hudry, Jean-Louis. 2013. Aristotle on meaning. *Archiv für Geschichte der Philosophie*, **93**: 253–280.

44. Hudry, Jean-Louis. 2013. Aristotle on Deduction and Inferential Necessity. *Review of Metaphysics.***67**: 210–19.

45. Kakkuri-Knuuttila, Marja-Liisa, and Miira Tuominen. 2013. Aristotle on the role of predicables in dialectical disputations. *Oxford Studies in Ancient Philosophy: Supplementary Volume 43*. Oxford: Oxford UP.

46. Keyt, David. 2013. Deductive logic. *Blackwell Companion to Aristotle.* Ed. Georgios Anagnostopolous. London: Wiley-Blackwell.[iii]

47. Malink, Marko. 2013. *Aristotle's Modal Syllogistic*. Cambridge MA: Harvard UP.

48. Marion, Mathieu. 2013. Some remarks on syllogistic, dialectic, and the study of their history**.** *Al-mukhatabat Journal*, 8: 9–36.[iii]
http://www.academia.edu/5117695/Mathieu_MARION_Universite_du_Quebec_a_Montreal_SOME_REMARKS_ON_SYLLOGISTIC_DIALECTIC_AND_THE_STUDY_OF_THEIR_HISTORY

49. Martin, John. 2013. Distributive terms, truth, and the *Port-Royal Logic*. *History and Philosophy of Logic*. **34**:133–154.

50. Pagnan, Ruggero. 2013. Diagrammatic calculus of syllogisms. *Visual Reasoning with Diagrams.* Amirouche Moktefi et al., Eds. Basel: Springer.

51. Pagnan, Ruggero. 2013. Syllogisms in Rudimentary Linear Logic, Diagrammatically. *Journal of Logic, Language, and Information.* 22 (1): pp. 71–113. http://link.springer.com/article/10.1007%2Fs10849-012-9170-4

52. Pratt-Hartmann, Ian. 2013. The Syllogistic with Unity. *Journal of Philosophical Logic*. **42**: 391-407.

53. Shenefelt, Michael and Heidi White. 2013. *If A, Then B: How the World Discovered Logic.* Columbia UP: New York.

54. Van Eemeren, Frans et al. (Eds.) 2013. *Fundamentals of Argumentation Theory*. 2nd ed. London: Routledge.

55. Vega, Luis. 2013. *La Fauna de las Falacias*. Madrid: Trotta.

2014

56. Barnes, Jonathan, et al. 2014. *Alexander of Aphrodisias: On Aristotle Prior Analytics 1.1-7.* Paper. London: Bloomsbury.

57. Beziau, Jean-Yves. 2014. Is Modern Logic Non-Aristotelian? to appear in D. Zaitsev (ed.), *Nikolai Vasiliev's Logical Legacy and Modern Logic***. Heidelberg: Springer,.

58. Joray, Pierre. 2014. The Principle of Contradiction and Ecthesis in Aristotle's Syllogistic, *History and Philosophy of Logic***. **35**: 219 –236.

59. Koren, Ladislav. 2014. Quantificational accounts of logical consequence from Aristotle to Bolzano*. Organon*. **21**: pp. 22–44.

60. Mander, W. J. 2014. *Oxford Handbook of British Philosophy in the Nineteenth Century*. Oxford: OUP.

61. Pratt-Hartman, Ian. 2014. The Relational Syllogistic Revisited. forthcoming. *Linguistic Issues in Language Technology.*

62. Simons, Peter. 2014. Jan Łukasiewicz, *The Stanford Encyclopedia of Philosophy*, Edward N. Zalta (ed.), <http://plato.stanford.edu/archives/sum2014/entries/lukasiewicz/>.[kkk]

63. Tennant, Neil. 2014. Aristotle's syllogistic and core logic. *History and Philosophy of Logic*, 35, pp. 120–147.[lll]

64. Vega, Luis. 2014. *Una Guía de Historia de la Lógica*. Madrid: UNED.

2015

65. Gaines, Brian. 2015. Universal logic as a science of patterns. *The Road to Universal Logic.* Vol. I. Arthur Buchsbaum and Arnold Koslow. Editors. Basel: Springer. http://www.springer.com/birkhauser/mathematics/book/978-3-319-10192-7

66. Hudry, Jean-Louis. 2015. Aristotle on language and universal proof. *The Road to Universal Logic.* Vol. I. Arthur Buchsbaum and Arnold Koslow, Editors. Springer, Switzerland. http://www.springer.com/birkhauser/mathematics/book/978-3-319-10192-7

67. Kovac, Srecko. 2015. Causality and attribution in an Aristotelian theory. *The Road to Universal Logic.* Vol. I. Arthur Buchsbaum and Arnold Koslow, Editors. Springer, Switzerland. http://www.springer.com/birkhauser/mathematics/book/978-3-319-10192-7

68. Masoud, Hassan. 2015. *The Epistemology of Natural Deduction***. PhD Dissertation. University of Alberta, Edmondton.

69. Thom, Paul, and John Scott. 2015. **Robert Kilwardby,** *Notule libri Priorum.* Critical edition, translation, introduction notes and indexes Oxford: OUP for The British Academy.

70. Steinkrüger, Philipp. 2015. Aristotle's assertoric syllogistic and modern relevance logic. *Synthese*. **192**:1413–1444.[mmmnnn]

This paper contains several peculiarities, perhaps the least important of which is that the most recent of my works cited was published over forty years ago: its bibliography is stale and needs updating. Another is its questioning the view, long settled in the minds of all scholars I know, that in Aristotle's usage every syllogism is valid in the sense that its conclusion follows logically from its premises. This paper also thinks that adding a premise to a valid argument can make it invalid. It never distinguishes a premise-conclusion argument—devoid of steps of reasoning—from a deduction containing intermediate steps that show the conclusion to be a consequence of the premises. This distinction must be understood if Aristotle's process of perfecting or completing an incomplete syllogism is to be grasped. Moreover, it never recognizes Aristotle's distinction of demonstrations from syllogisms.

The main goal of the paper is nearly a category mistake: it wants to determine whether Aristotle's logic was "relevance logic". But "relevance logics" were developed in the 1920s or so in response to the so-called paradoxes of material implication—something not found in syllogistic. Besides, relevance logicians approach logic from axiomatically formalized propositional logics having propositional variables and incapable of being underlying logics of sciences. In contrast Aristotle from the very beginning approaches logic through scientific demonstration—a point nowhere mentioned in this article.

71. Woods, John. 2014. *Aristotle's Earlier Logic*. 2nd ed. revised. [1st 2001, q.v.] London: College Publications.

VI. Alternatives

> *It is clear too that all the imperfect deductions are made perfect by means of the first figure. ... It is possible also to reduce all deductions to the universal deductions in the first figure.*
> —Aristotle 29a30-b2 (Jenkinson-Barnes 1928/1984, 12)

Parry, William and Edward Hacker. 1991. *Aristotelian Logic.* Albany: SUNY UP.

Mendell, Henry. 1998. Making sense of Aristotelian demonstration. *Oxford Studies in Ancient Philosophy: Supplementary Volume 1998.* Oxford: Oxford UP.

Mosterin, Jesus. 2006. *Aristóteles*. Madrid: Alianza Editorial.

Preus, Anthony. 2007. *Historical Dictionary of Ancient Greek Philosophy*. Lanham, MD: Rowman & Littlefield.

Spade, Paul Vincent. 2007. *Thoughts, Words, and Things: An Introduction to Late Mediaeval Logic,* IU ScholarWork Repository. *http://hdl.handle.net/2022/18939*.

Parsons, Terence. 2014. *Articulating Medieval Logic*, Oxford UP, Oxford,

Spade, Paul Vincent. 2014. History of logic: origins of logic in the west.
http://www.britannica.com/EBchecked/topic/346217/history-of-logic

Groarke, Leo. 2015. Aristotle's Logic. *Internet Encyclopedia of Philosophy*.
http://www.iep.utm.edu/aris-log/

VII. Acknowledgements

> *We call in others to aid us in deliberating on important questions—distrusting ourselves as not being equal to deciding.*
> —Aristotle 1112b10.

It must be said, however, that not all publications citing my work on Aristotle show any understanding of it or even contribute to discussion of it. Among those that do show understanding and contribute to its discussion are the following: George Boger, Abraham Edel, Edgar Andrade, Darcy Cutler, Michael Degnan, George Englebretsen, Kevin Flannery, James Gasser, Pierre Joray, David Keyt, Marcel Guillaume, Mathieu Marion, John Martin, John Mulhern, Mary Mulhern, Sriram Nambiar, Richard Patterson, Paul Thom, Michael Scanlan, Timothy Smiley, Robin Smith, Kevin Tracy, Risto Vilkko, and John Woods. Apparently my writings on syllogistic have reached such a level of recognition that a person writing on the subject feel they must be cited even when the writer has no idea what is in them.

It is gratifying to be able to report that after forty years of scrutiny by demanding scholars, to my knowledge few serious objections to my research have come to light—other than those I found myself, some of which I have published. Perhaps the most embarrassing was my early conflation of reduction [e.g. of an imperfect two-premiss syllogism to a perfect one] and deduction [e.g. of the conclusion of an imperfect three-premiss syllogism from its three premises using the two-premise perfect syllogisms]. With guilt I remember dismissing a twinge of misgivings when first writing this absurd claim. John Woods justly took me to task on this but only after my mea culpa, which he did not know of, had appeared in print (Corcoran 1983). I further distanced myself from the absurd claim that identified reduction with deduction in Corcoran 2013, where I wrote the following:

> The thesis that Aristotle's syllogistic was an underlying logic contradicted all previous views of the syllogistic, e.g. that it was an axiomatic science presupposing a hidden underlying logic or that it was a system of "reductions" as described in the medieval mnemonics BARBARA, CELARENT, etc.

Although Robin Smith does not refer to my unfortunate remark, my mistake, including saying that Aristotle's reductions were deductions, might have contributed to Smith's mistake of taking the reduction mnemonics to be instructions for doing deductions [Smith 1989, 229-230]. But his mistake goes beyond mine in detail: he says that the 'p' indicates conversion per accidens ['p' for 'per accidens']: "conversion into a particular premise (*a* into *i*, *e* into *o*)". However, Aristotle's natural deduction system conspicuously omits a rule for conversion of *e* into *o*.

On the subject of mea-culpas, I hasten to add that over the years I have become much more sensitive to the distinctions among [scientific] demonstration [or proof], [cogent] deduction, and [syntactic or string-theoretic] derivation. As a result, I cringe when I reread certain passages, mainly from my earliest papers. For example, in 1972 I wrote the following in the first paragraph.

It was also pointed out that Aristotle's logic is self-sufficient in two senses: First, that it presupposed no other logical concepts, not even those of propositional logic; second, that it is (strongly) complete in the sense that every valid argument formable in the language of the system is demonstrable by means of a formal deduction in the system. Review of the system makes the first point obvious. The purpose of the present article is to prove the second. Strong completeness is demonstrated for the Aristotelian system.

Today, I would not say that a valid argument is *demonstrable*. Instead, I would say that a valid argument is *deducible*—meaning that its conclusion is deducible from its premises—or that *the validity* of a valid argument is demonstrable—meaning of course that the proposition saying the argument is valid demonstrable. Propositions are demonstrable; arguments are deducible. The second occurrence of a demonstrate-cognate, viz. 'demonstrated', is fully acceptable as long as 'strong completeness' is taken to be elliptical for 'the proposition saying that Aristotle's logic is strongly complete'.

Also, I would not begin an article using the word 'argument' without somehow indicating that is means "premise-conclusion argument" as opposed to "argumentation"

My main outlook—that the syllogistic contains a natural deduction system at its core—has been sustained. I must remind many people of two important points: (1) that Smiley made the same discovery at about the same time; and (2) in several ways what Smiley and I did would have been impossible without the ground-breaking work of Jan Łukasiewicz and two of his students, Stanisław Jaskowski and Alfred Tarski.

The controversy over the Lukasiewicz axiomatic approach versus the Corcoran-Smiley natural-deduction approach has been declared defunct. For example, the distinguished Łukasiewicz scholar, Peter Simons, wrote in 2014:

"Łukasiewicz's trenchant and controversial views sparked a controversy over how to interpret the syllogistic. While … [sc. Łukasiewicz] did win an early adherent in Patzig (1968), subsequent criticisms by Corcoran (1972, 1974) and, independently, Smiley (1974) established clearly that syllogisms are not propositions but inferences [sc. deductions], and that Aristotle had no need of a prior logic of propositions. That view is now universal among scholars of Aristotle's logic."

Even Patzig's student Striker stated (1998, p. 212):

"I take it to be generally agreed by now that formal syllogistic is best represented as a system of natural deduction, rather than an axiomatized theory".

One sign that a controversy has ended is that people stop writing about it. Robin Smith 2011 review of Striker's 2009 translation and commentary in *Ancient Philosophy* does not mention it. The review does not even mention Łukasiewicz: Corcoran and Smiley are mentioned once each but not for their interpretation. In fact, the expressions 'axiomatic' and 'natural deduction' do not occur.

Credit for the victory must be shared among the many scholars who developed, articulated, and defended the Corcoran-Smiley natural-deduction approach including Corcoran's Buffalo students, Smiley's Cambridge students, and scholars such as Robin Smith, Abraham Edel, Kevin Flannery, and others.

Sad to say, this cannot be taken to imply that the natural-deduction approach is universally accepted. Jesus Mosterin's 2006 book does not even mention it. Moreover, there are several well-known scholars whose writings reveal a misunderstanding of Aristotle's logic rooted in obsolete scholarship. To be clear—it is not that all these people side with Łukasiewicz, or even oppose both approaches— these people generally ignore or, very occasionally, denigrate the Łukasiewicz scholarship and everything it inspired. Some of them even think that syllogisms have only two premises. For these people it is as if Łukasiewicz, Corcoran, Smiley, and the rest had done nothing, or nothing worth mentioning.

Among this group are found some well-known names: Jaakko Hintikka, Henry Mendell, Terence Parsons, Anthony Preus, and Paul Vincent Spade, to name five. William Parry might also belong on this list if his 1991 book is taken to represent his views.

Why is it sad that some writings on Aristotle's logic ignore the natural-deduction approach? There are several reasons. They all give a distorted view of the history of logic. Those that limit Aristotle's syllogisms to two-premise categorical arguments denigrate Aristotle in the eyes of logicians and analytic philosophers. In addition, they lend support to early symbolic logicians such as Bertrand Russell who ridiculed Aristotle's logic perhaps in an attempt to encourage people to accept modern logic. Moreover these writings underestimate or miss completely Aristotle's concern with deduction in general as found in geometry and in dialectic and with demonstration productive of scientific knowledge. Thus they wrongly identify his main concern, and they fail to recognize the continuity between Aristotle's logic and our own.

It is also useful to note that they miss the distinction between the Aristotle's general theory of deduction and the special theory of categorical deductions—i. e. the distinction presented in my 2009 "Aristotle's Demonstrative Logic".

Why do able scholars ignore Aristotle's natural-deduction system in their writings? One can only speculate. Some have invested considerable work in mastering the intricacies of the medieval scholastic approach, which focuses on reduction and ignores deduction. Others want to avoid anything that highlights deduction and takes attention away from dialectic. Others have not bothered to learn the Łukasiewicz-initiated scholarship.

That said, I have something to say to the small minority who are offended by my approach to history of logic: an approach that combines features of the Baltimore "history of ideas" movement led by Arthur Lovejoy and the Warsaw "mathematical archeology" movement led by Jan Lukasiewicz. The paradigm Corcoran-Smiley established will suffer the fate of the previous paradigms: it will be corrected, refined, defended by increasingly lame arguments, and

ultimately replaced, but by one that incorporates its main features—not by one that repudiates them.

Several publications merely cite my work without even noting that my work—like Smiley's—emphasizes two facts: that geometry was taught axiomatically in the Academy when Aristotle studied there and that the first sentence of *Prior Analytics* connects the *Analytics* to geometry. Łukasiewicz and others never mention that sentence.

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[a] The main purpose of this paper was mathematical. It was irrelevant, and would have been distracting, to point out that for Aristotle and for me, deduction is a goal-directed activity. The fact that goal-introduction is omitted in these deductions introduces a discrepancy between the model and Aristotle's system. The discrepancy was since corrected in print. See the role of the question mark as goal-introducer in Corcoran 2009: Aristotle's Demonstrative Logic. *History and Philosophy of Logic.* 30 (2009) 1–20. In this 1972 model, there is no separation between direct deductions and indirect deductions: every indirect deduction actually is a direct deduction. Every indirect deduction of a given conclusion from given premises is a direct deduction from the given premises augmented by the contradictory opposite of the conclusion. In the 2009 model, no indirect deduction is a direct deduction: there is a complete separation between direct deductions and indirect deductions.

[b] As its title might suggest, this article supplies some of the basic conceptual structure used in my subsequent work and, in particular, framing my approach to history and philosophy of logic. It was written in the 1960s in Philadelphia before I came to Buffalo. In fact, I presented this paper at Buffalo when being interviewed for a position. My original discoveries about Aristotle's logic were all made in Buffalo over a year later. The basic ideas were completed in the summer of 1971 and they were presented in the Linguistics Institute NSF Seminar jointly taught by Edward Keenan and me.

The paragraph on page 38 of this paper about Aristotle shows that I had fully accepted the then-common interpretation of *Prior Analytics* that was completely oblivious to Aristotle's natural deduction system. Moreover, other aspects of this paper also show roughness since smoothed out. Specifically, I then divided premise-conclusion arguments into valid and invalid but instead of dividing argumentations into cogent and fallacious, I tried to get the word 'sound' to play a role its history rendered it unsuitable for: a role for which 'cogent' is perfectly suited.

[c] Corcoran 2013, 252: "Different scholars working independently in the 1970s are currently credited with discovering that Aristotle's syllogistic was an *underlying logic* embodying deductive reasoning intended to obtain theorems from axioms of axiomatic sciences—as in pre-Euclidean geometry ([3], p. xvi). The expression 'underlying logic' had been introduced by Alonzo Church in the 1950s ([1], pp. 57-58 and 317-329). Aristotle's rules of sentence and deduction formation were so detailed that strong completeness results were obtained—an underlying logic is *strongly complete* if every sentence satisfied by all models of given premises is obtainable from those premises using the logic's rules. The thesis that Aristotle's syllogistic was an underlying logic contradicted all previous views of the syllogistic, e.g. that it was an axiomatic science presupposing a hidden underlying logic or that it was a system of "reductions" as described in the medieval mnemonics BARBARA, CELARENT, etc."

[d] Smiley 1973, p.154: "(Added in proof) Since this article was written I have learnt of concurrent work by Prof. J. Corcoran (to appear in *Journal of Symbolic Logic*, *Archiv für Geschichte der Philosophie*, and *Mind*). Corcoran's approach to the syllogistic is very similar to that advocated here, but his treatment is independent and distinctive and provides further strong support for the new approach."

[e] Ioan 1976, p. 333: "The principal contribution of this volume is provided by Corcoran's study "Aristotle's Natural Deduction System" (pp. 85—131)." [Translation from French, JC]

[f] Bosley 1979, p. 284: "The book under review is a collection of papers either read at a symposium in 1972 or written in connection with the symposium. There is too little unity and evenness to address a general judgment to the reader; I can make a general remark: the collection has the interest of an issue of a journal of second standing."
COMMENT: No authors or editors should ever be surprised or disappointed to learn that their works do not have universal appeal to informed scholars. In fact, there are informed scholars whose disapproval should be welcomed. Nevertheless, I am disappointed with Bosley's elliptical, pompous, subjective, and uninformative remark. Despite Bosley's one disrespectful sentence his review raises some important issues: it is worth careful study. JC

[g] Bosley 1979, p. 285: "In 'Aristotle's Natural Deduction System' John Corcoran argues that Aristotle developed a natural deduction system."

COMMENT: The review never mentions the fact that Corcoran was arguing against the then-well-established view that the syllogistic was an axiomatic theory. Lukasiewicz, the father of modern study of Aristotle's logic, is not mentioned in the review; the word 'axiom' does not occur. Moreover, the review disputes some details of the Corcoran interpretation, but it fails to pronounce on the larger issue of whether the natural-deduction approach is basically correct. And sadly, it does not mention Smiley's meticulous exposition of Aristotle's Greek text. JC

[h] Bosley 1979, p. 285: "In describing his system Mr. Corcoran proposes to 'restate ... perfect syllogisms as rules of inference' (p. 109). If one means to give a correct interpretation of Aristotle's discussion of assertoric syllogisms, it is a mistake to hold that a syllogism is a rule. It is also a mistake to assert that '. . . each application of a rule of inference is (literally) a first figure syllogism' (p. 92). A syllogism is a piece of reasoning: in particular, the act or the achievement of reaching a conclusion. One does not aid the cause of interpretation by suggesting that in executing the act in the first figure one applies a rule. In any case nothing is both a rule and an application of a rule."

COMMENT: Corcoran repeatedly emphasizes, contrary to Lukasiewicz, that every premise and every conclusion of a syllogism is something having a truth-value: not a schema, not a propositional function, not a form, and not a formula with free variable occurrences. The Barbara rule is a kind of universal having each Barbara syllogism as an instance. But Bosley's construal of Corcoran, which might well be fair—Corcoran should not be expected to write in such a way as to block every conceivable misconstrual—raises the issue of whether Aristotle's word *sullogismos* is always used for a mental process or act taking place in a single person's mind during a single time interval, whether it is always used for the particular result or product of that act, whether it is always used for something more abstract that is involved in every such act or result regardless of who performs it, or whether it is always used in some other way, or whether it is used in various ways throughout *Prior Analytics*. One reason for presenting a mathematical model instead of a full interpretation was to avoid the obligation to answer this and other questions that are difficult or unanswerable. See Corcoran's "Aristotle's demonstrative logic" for further discussion along these lines. JC

[i] Bosley 1979, p. 285: "Mr. Corcoran's interpretation rests in part upon a misunderstanding of the notions of perfect and of imperfect syllogisms. He means to account for a perfect syllogism when he writes, 'If the reasoning in a deduction actually shows that the conclusion follows from the premises, the deduction is said to be sound' (p. 92). But a perfect and an imperfect syllogism do not differ in point of having their conclusiveness shown. They differ in the means for reaching the conclusion."

COMMENTS: (1) Corcoran regrets trying to force the word 'sound' to carry a meaning its history renders unsuitable if not impossible: 'cogent' is the word suggested by John Kearns and adopted in later articles. (2) Bosley missed Corcoran's point: the issue is not "having their conclusiveness shown" but "showing their conclusiveness". The imperfect syllogism does not produce knowledge that its conclusion follows from its premises but the perfect and the perfected do. JC

[j] Kwiatkowski 1980: "The most radical opponent of Lukasiewicz is J. Corcoran."

[k] Novak's "Conclusion" makes several points that are now widely accepted.

[l] Jongsma 1983, pp. 3f: "But the person to whom I owe the greatest debt is Professor John Corcoran […]. In addition to generally supporting my studies in history of logic, he has read and criticized the thesis as a whole. I especially appreciate the measure of clarity which my discussions with him have provided regarding the philosophical issues at stake in the thesis. Though my dialogue with him on the appropriate use of present-day notions in philosophy of logic and logic proper for interpreting history of logic, I have come to see how contemporary philosophy can be of genuine service to history of logic."

[m] From Scanlan 1982: "In a recent article in ***The Journal of Philosophy*** Jonathan Lear (1979) advances the view that Aristotle was interested in demonstrating a proof-theoretic analogue of compactness for his system of deduction. A logic (specifically, the consequence relation of the logic) is compact, in the usual sense, if any conclusion which follows from an infinite set of premises also follows from a finite subset. Unfortunately, Lear does not explicitly state what he takes the proof-theoretic analogue of this notion to be, so it is difficult to evaluate whether Aristotle was concerned with it. This note does not address the general thesis of Lear's article. I am instead interested in pointing out some fundamental confusions about the nature of infinite "series" [Lear's word for linear orderings] which vitiate Lear's attempt to explicate Aristotle's difficult remarks in ***Posterior analytics*** I, chs. ***19-22.***"

[n] Smith 1989, xi: "John Corcoran has for many years tried to keep my thoughts about Aristotle's logic coherent; he read through the entire manuscript in draft and suggested several corrections in the Notes. As if that were not generosity enough, he … read the whole book in page proofs, suggesting still further changes and finding any number of errors I had overlooked."

^o Smith 1989, p. xvii: "One principal virtue of Corcoran's approach, which is especially important in the context of a translation of the *Prior Analytics*, is that it permits a formal model which stays very close to Aristotle's actual text, since it allows us to read formally precise natural deductions straight out of it."

^p Jonathan Barnes was in a foul mood when he wrote this informative and revealing review. Barnes's second sentence contradicts the book's title and his third sentence denigrates the back cover of the paperback edition.

Everyone following the Lukasiewicz-Corcoran controversy should read it carefully. Barnes, formerly considered sympathetic to the Łukasiewicz view as fine-tuned by Patzig, says volumes by saying nothing on the subject. Smith's book may have silenced him on this issue. The names Łukasiewicz and Corcoran do not occur, nor do the expressions 'axiomatic system' and 'natural deduction system'. Corcoran is referred to indirectly by Barnes in the first paragraph which gratuitously criticizes *the blurb* that appears on the back of the paperback edition. Readers of the hardback will not know what Barnes is talking about. The blurb was not written by Smith: it is signed 'John Corcoran'. Barnes called it "a fatuous puff".

Everyone interested in translating Aristotle's ***Prior Analytics*** will benefit from reading Barnes's many insightful comments and criticisms of Smith's translation. It is worth noting that this review of *Smith 1989* appeared in 1990: an unusually prompt response. Moreover Barnes's 2007 book maintains his silence on the issue of whether Aristotle's syllogistic is better regarded as an axiomatic system or a natural-deduction system.

^q My role in Merrill 1990 was more extensive than it may seem. For example, under 'Corcoran, John' in the index there is one entry: p. 200. But my work and my contributions to the book are mentioned on the following pages: x, 200, 246, 248(twice), 249, 250, 251, 253, and 254 (twice).

^r Merrill 1990, p. 200: "Łukasiewicz's important account of Aristotle's syllogistic formulated that theory within sentential logic. Smiley and Corcoran showed, though, that Aristotle's syllogistic could be formulated better without sentential logic. This had several advantages. The formulation was closer to the methods that Aristotle actually used. It avoided assuming an implicit substructure of sentential logic. And it was simpler. […] It will be closer to De Morgan's own mode of argument if we avoid the sentential formulation; and it will be certainly be simpler."

^s Mignucci, 1991, 11: "Nowadays two interpretations seem to have a following among scholars. One is the Łukasiewicz interpretation […]. The other […] I believe is the true one […]."

^t Mignucci, 1991, 12: "J. Corcoran, 'Aristotle's natural deduction system' […] 1974, has convincingly shown that the best formalization of Aristotle's *reductio ad impossibile* is by means of a natural deduction system."

^u Scanlan 1991: "In the early 1970s, working independently, J. Corcoran and T. Smiley each gave treatments of Aristotle's logic as a natural deduction system that did not involve propositional logic [Corcoran, Arch. Gesch. Philos. **55** (1973), no. 2, 191–219; MR0444423 (56 #2776); Smiley, J. Philos. Logic **2** (1973), no. 1, 136–154]. Aristotle's syllogisms were viewed as direct and indirect deductions in a language in which all sentences belong to one of the four categorical types. Aristotle's claimed "reduction" of all syllogisms to the two universal syllogistic forms of the first figure, traditionally called Barbara and Celerant, was seen as the proof-theoretic assertion that every deduction can be transformed into one using only these two rules. This approach accounts much more closely for the fine details of terminology and reasoning in specific passages of the *Prior analytics* than previous interpretations of Aristotle's logic."

^v Degnan 1994, p.82: "Timothy Smiley and [sc. John] Corcoran, working independently, showed that Aristotle's theory of deduction contains a self-sufficient natural deduction system that presupposes no other logic."

^w Reyes et al. 1994, p. 61: "The work of Łukasiewicz on syllogistic has been criticized by Corcoran [5]. In particular, Corcoran disputes the view of Łukasiewicz that the Aristotelian syllogistic constitutes an axiomatic theory. The main thrust of Corcoran's work is to show that it is rather '[…] an underlying logic which includes a natural deductive system and that it is not an axiomatic theory as had previously been thought'."

^x Englebretsen 1996, p. 49: "I have offered a slightly different survey of Aristotle's logic […]. Corcoran and Scanlan 1982 is an ideal place to start. Also see the essays in Corcoran 1974."

^y Striker 1996, p. 203: "Ever since Lukasiewicz reinstated Aristotle as the founder of formal logic, there has been a wealth of studies of Aristotle's syllogistic as a formal system. Against Lukasiewicz's claim that syllogistic is a system in which certain theses function as axioms, others as theorems derived from these, it has been argued—convincingly, to my mind—that it would be historically more accurate to represent syllogistic as a system of natural deduction […]."

^z Striker 1996, p. 205n: "The currently favored translation ˉdeductionˉ, though perhaps less misleading than ˉsyllogismˉ, does not bring out the point that Aristotle takes syllogisms to be arguments."

COMMENT: Given the absence of a definition of 'argument', the reader is at a loss to determine what Striker thinks 'deduction' doesn't bring out. JC

[aa] Striker 1996, p. 207: "John Corcoran has argued that the distinction between a perfect and an imperfect syllogism is that between a full deduction and a valid inference which needs filling out.[...] Corcoran concludes that the long deduction will then count as a perfect syllogism. But this no longer agrees with Aristotle's own explanation of the term teleios."

COMMENT: Striker's magisterial pronouncement does not include any clues as to what she takes "Aristotle's own explanation of the term teleios" to be or where it disagrees with what I wrote on this point. What I wrote was discovered and published independently by Scholz, Smiley, and probably others. JC

[bb] Thom 1996, p.4: "In proof theory, I follow the definitive work of Smiley and Corcoran in using a natural deduction analysis of the syllogistic."

[cc] Martin 1997, p.1: "My goal in this paper is to reconsider John Corcoran's now classical work on the syllogistic. Corcoran's purpose was to argue against two key theses of the interpretation of Lukasiewicz (1957) and others: that syllogisms should be construed as conditionals […] and that Aristotle's reduction [sic] […] should be viewed as an axiomatic theory."

[dd] Lamarque 1997, pp. 251f: "A more accurate interpretation of Aristotle's strategy [sc. than the Lukasiewicz interpretation] was offered by Corcoran (1974). In this work Aristotle's method is cast in the form of a natural deduction system. Corcoran convincingly shows that Aristotle's proofs [sc. deductions] can be read as objects generated by an underlying logical calculus which does not presuppose propositional logic."

COMMENT: Aristotle's completed syllogisms were intended not just as deductions—showing that their respective conclusions follow from their premise sets—but also as exemplifications of his theory of deduction. Of course, they are "proofs" in that they prove that their respective conclusions follow from their premise sets. But it is misleading to call them proofs without explaining that they do not prove their conclusions to be true. Normally, when something is called a proof it is implied that the proof's conclusion is true and that the proof proves it. Lamarque is not the only person who bungles this point.

[ee] Striker's opening paragraph states as her own view a summary of the results of Corcoran 1974, as she generously and candidly reports in her footnote (1998, p.209).

[ff] Degnan 2000, p.215: "In the mid-seventies John Corcoran and Timothy Smiley published ground-breaking articles on Aristotle's assertoric syllogism which rescued Aristotle's reputation as a logician from W. V. O. Quine's and Bertrand Russell's criticisms."

[gg] Flannery 2001, p.219: "Indeed, one of the great strides forward in the modern study of Aristotle's syllogistic was the realization that it is a system of natural deduction."

[hh] Flannery 2001, p.202: "The approach I take here is somewhat different from John Corcoran's, although it owes much to it. According to Corcoran, "an imperfect syllogism is potentially perfect and is made perfect by adding more propositions which express a chain of reasoning from premises to the conclusion" [Corcoran 1973, p. 195; see also p. 205; see also Smiley 1973, p.137]. I agree that, according to Aristotle, a syllogism is perfected by performing additional operations; but the perfected syllogism does not seem to be this augmented chain of reasoning. As the above texts [sc. 28a3-7, 29a31-36] show, the perfected syllogism, for Aristotle, becomes a perfect (i. e., first figure) syllogism in the process of being perfected."

COMMENT: Does this make any sense? How could a syllogism not in the first figure become one in the first figure? Are syllogisms things that evolve?

[ii] Striker 1998 states (p. 212): "I take it to be generally agreed by now that formal syllogistic is best represented as a system of natural deduction, rather than an axiomatized theory".

COMMENT: Naturally, I am glad to read this. However, I must point out that Striker did not say anything this clear in her introduction to the 2009 translation.

[jj] Woods 2001, Ch I: "Aristotle's own [sc. completeness proof] attempt, which doesn't quite succeed, is to be found at *Prior Analytics* I 23. However, Corcoran has shown how to repair Aristotle's proof. See John Corcoran, "Completeness of an Ancient Logic", *Journal of Symbolic Logic* 37 (1972), 696-702."

[kk] Woods 2001, Ch II: "Here is Corcoran on the point: "My opinion is this: *if* the Łukasiewicz view [that Aristotle's logic is an axiom system] is correct *then* Aristotle cannot be regarded as the founder of logic. Aristotle would merit the title no more than Euclid, Peano, or Zermelo insofar as these men are regarded as founders, respectively, of axiomatic geometry, axiomatic arithmetic, and axiomatic set theory. (Aristotle would merely have been the founder of 'the axiomatic theory of universals')" ("Aristotle's Natural Deduction System", 98). I note, in this connection,

that Gentzen's structural rules are not by any means exclusive to the Gentzen calculi. They hold in Frege's system and in virtually every other logic published subsequently. Why do I invoke the name of Gentzen? Why isn't the core theory of validity a Frege-logic or Whitehead & Russell logic? My answer is that Gentzen was the first (along with Jaskowski, independently) to break with the axiomatic tradition in modern logic and to show that natural deduction systems have all the power of axiomatic set-ups. Because I hold, with Corcoran, that Aristotle conceived of logic in natural deduction terms, it is seemly to use the honorific "Gentzen" in reconstructing Aristotle's conception of validity."

[ll] Woods 2001, Ch 4: Corcoran makes the interesting proposal, in which I concur, that Aristotle's "distinction between perfect and imperfect syllogisms suggests a clear understanding of the difference between deducibility […] and implication […]—a distinction which modern logicians believe to be their own (cf. Alonzo Church, *Introduction to Mathematical Logic*, Princeton: Princeton University Press, 1956, p. 323, fn. 529)". This is an insightful remark.

[mm] Patterson 2002, pp. 178f: Some of my reservations about this sort of analysis are implicit in what has gone before. First, at a very general level, my own aim has been to analyze Aristotle's modal proofs in a way that allows us to think them through as he did. This is not so unusual. As Robin Smith remarks, John Corcoran's formal model (and Smith's own, which essentially follows Corcoran's) of the assertoric syllogistic "stays very close to Aristotle's actual text, since it allows us to read formally precise natural deductions straight out of it." By contrast, Lukasiewicz's model incorporates the whole of the propositional calculus, and his proofs of the moods recognized by Aristotle are carried out using its resources, typically in ways that can hardly be read directly out of the text step-by-step.
Comment: Notice Patterson comes close to implying that Aristotle's syllogisms are natural deductions.

[nn] Patterson 2002, pp. 241f: The reader should consult especially John Corcoran, "Aristotle's Natural Deduction System," in *Ancient Logic and Its Modern Interpretations,* ed. John Corcoran, pp. 85-131, for a defense of "deduction" as a translation of *syllogismos* and a view of "syllogisms" as deductive structures. [See also Timothy Smiley, "What Is a Syllogism?" *Journal of Philosophical Logic* 2(1973): 136-54; Robin Smith, *Aristotle, Prior Analytics,* translated, with introduction, notes, and commentary (Indianapolis: Hackett, 1989) (hereafter cited as *Notes),* p. 106 (on 24a12) and esp. pp. 109f. (on 24b 18-22); and Jonathan Barnes, "Proof and the Syllogism," in *Aristotle on Science: The Posterior Analytics,* ed. E. Berti (Padova: Antenore, 1981), pp. 17-59.] For defense of a narrower construal, see Michael Frede, "Stoic vs. Aristotelian Syllogistic," *Archiv fiir Geschichte der Philosophie* 56 (1974): 1-32. This issue is related to the view of "incomplete" syllogisms - as opposed to "complete" *(teleios)* ones - as deductive structures requiring certain steps (conversions of premises or conclusion, use of *reductio ad impossibile)* to make them into valid deductions. (For discussion, see the works by Corcoran, Smiley, and Smith just cited.)
COMMENT: Patterson's last sentence needs work. The worst mistake might be the implication that incomplete syllogisms are invalid; all syllogisms are valid in the sense that their conclusions follow from their respective premises. Does Patterson make this point in his book? Does he define valid? Another, but related, mistake is that, although there is no way to make an incomplete syllogism valid since it already is such, there is a way to make it cogent: to make it evident that its conclusion follows from its premises. For Patterson's 'make them into valid deductions' put 'make them into cogent deductions'. Validity is semantic and ontic; cogency is pragmatic and epistemic. A third mistake is in Patterson's enumeration of the steps used to complete an incomplete syllogism: use of the four perfect first-figure syllogisms is incorrectly omitted and conversion of conclusions is incorrectly included.

[oo] Patterson 2002, pp. 280: Again, I use "complete" and "perfect" indifferently as translations of *teleios.* John Corcoran and Timothy Smiley strongly prefer "complete" on grounds that it indicates something important about the "completion" *(epiteleisthai, teleiousthai, perainesthai)* of a syllogism, namely, that this consists in supplying additional steps so as to make a valid premise-conclusion argument (i.e., a set of premises and a conclusion that they imply) into a deduction (i.e., an extended discourse that makes it evident that a certain conclusion is implied by certain premises). See especially Corcoran, "Aristotle's Natural Deduction System," and T. Smiley, "What Is a Syllogism?" Cf. Robin Smith, *Notes,* p. 110.

In fact, one could use the terms "perfect" and "perfecting" in this way, too, because "perfect" (as a translation of *teleios)* often means "not missing any parts." Thus, although I find the view of Corcoran, Smiley, and Smith attractive and plausible, I shall use both terms.
COMMENT: The only "reason" I know of for using 'perfect' is that it is the Anglicization of the Latin word *perfectus* used to translate *teleios.* The word *perfectus* meant *finished, done, completed,* and the like: connoting the end result of a process. But, as

often happens, Anglicization added meanings such as *excellent* or *wonderful*, and the added meanings render 'perfect' an inappropriate translation. We could not praise students by saying their papers were complete. Of course, there are qualifications to be made: we need a discussion rather than a quarrel. When will common sense come to Aristotle scholarship?

pp Smith 2007, §3: " On this basis, I am persuaded that the theory contained in the *Prior Analytics* was developed largely to serve the needs of Aristotle's theory of demonstration, especially this argument: here, as in much of the early history of modern symbolic logic, logical theory arose to meet the needs of the philosophy of mathematics."

qq Boger's acknowledgement on page 243 should not be taken to imply that I saw the final draft or even anything on page 229 before publication.

rr There are other mistakes on page 229, some of which might be relevant to understanding the above. For example, Boger's translated passage that he describes as containing Aristotle's indirect deduction of Baroco does not contain just the deduction: it goes on for two more sentences. The material beginning 'And if' is not part of the deduction being discussed and should be deleted.

ss Guillaume 2004:"In fact, many of Corcoran's remarks throughout this very rich paper […] will be of interest to the reader, including his discussion of recent studies concerning the Aristotelian system and the conclusions that he makes […]. The author states, "The gulf between modern logic and Boole is much greater than that between modern logic and Aristotle". In fact, starting on the very first page he argues, "where Aristotle had a method of deduction that satisfies the highest modern standards of soundness and completeness, Boole has a semi-formal method of derivation that is neither sound nor complete". He adds in his conclusion that "the method of countermodels for independence proofs (that demonstrate the absence of logical consequence) is prominent in *Prior Analytics*, but sadly absent from *Laws of Thought*". He also asserts that Aristotle "proves mathematically that two of his four two-premise rules were eliminable. There is nothing in Boole's writings remotely comparable to this." And these are only three of the many examples cited by Corcoran of Aristotle's superiority over Boole."

tt Woods and Irvine 2004, p.53: "Here is Corcoran on the point: "My opinion is this: if the Lukasiewicz view [that Aristotle's logic is an axiom system] is correct then Aristotle cannot be regarded as the founder of logic. Aristotle would merit the title no more than Euclid, Peano or Zermelo insofar as these men are regarded as founders, respectively, of axiomatic geometry, axiomatic arithmetic and axiomatic set theory. (Aristotle would merely have been the founder of "the axiomatic theory of universals')" [Corcoran, 1974b, p. 98]."

uu Woods and Irvine 2004, p.55: "Corcoran's opinion is that Aristotle did not require of syllogisms as such that they have just two premises. That he did not impose this restriction is suggested "by the form of his definition of syllogism […], by his statement that every demonstration is a syllogism […], by the context of chapter 23 of Prior Analytics, and by several other circumstances .[...] Unmistakable evidence that Aristotle applied the term in cases of more than two premises is found in Prior Analytics I, 23 (especially 41a17) and in Prior Analytics II, 17, 18 and 19 (esp. 65b17; 66a18 and 66b2)." [Corcoran, 1974b, p. 90]. Still, it is clear that Aristotle often does reserve the term "syllogism" for two-premiss arguments. We follow Corcoran in supposing that such a restriction is explicable by the fact that Aristotle thought if all two-premiss syllogisms are deducible in the logic of the Prior Analytics, then all direct syllogisms whatever are also deducible."
COMMENT: The expression of the view shared by Woods, Irvine, and me needs work. For "Aristotle thought if all two-premiss syllogisms are deducible in the logic of the Prior Analytics, then all direct syllogisms whatever are also deducible" put "Aristotle thought if all incomplete two-premiss syllogisms are deducible, then all incomplete syllogisms—whatever the number of premises—are also deducible". The qualification "direct" is at the very least unnecessary. It also misleading in a strange way. What we are talking about is incomplete syllogisms not completions of them. However, 'direct' and 'indirect' do not apply to incomplete syllogisms at all: it would be a category mistake to say of a given incomplete syllogism, devoid of intermediate steps, that it is direct or indirect. The attributes of being direct and of being indirect refer to the manner of completion. Whether this mistake vitiates other passages in this generally accurate work, I did not notice. Whether this mistake is a result of other mistakes in this work, I could not say without further investigation. JC

vv Tracy 2006, p. 2: "Aristotle was not the first to conceive of axiomatic procedures. Euclid's axiomatic geometry is surely descended from axiomatic approaches to geometry contemporary with or earlier than Aristotle (Corcoran, "Aristotle, Boole, and Tarski"). But he is the first, as far as we know, to have conceived of studying deduction itself; he is the first to have developed a formal logic."

ww Tracy 2006: "Both Corcoran ("Aristotle's Natural Deduction System") and Smiley ("What is a syllogism?") reconstruct Aristotle's logic as a natural deduction system in this way."

xx Tracy 2006, p. 174: "As Corcoran observes, "[Aristotle's] theory of propositional form is very seriously inadequate. It is remarkable that he did not come to discover this for himself, especially since he mentions specific proofs from arithmetic and geometry. If he had tried to reduce these to his system, he may have seen the problem"".

yy Tuominen 2007, p. 43: "It has often been pointed out that this definition [of sullogismos] does not restrict inferences to syllogisms [sic] in the three figures, i.e. the two-premise three-term inferences discussed in the Prior Analytics. Because of this some scholars have started to translate 'sullogismos' as 'deduction'. However, others have pointed out that this translation is not quite appropriate because Aristotle's definition of syllogism excludes some deductions, for instance ones whose premise or premises [sic] are identical with the conclusion and those that have redundant premises. I have here left 'sullogismos' untranslated as 'syllogism'; the dialectical syllogism is not syllogism in the more narrow sense of the syllogistic figures of the Analytics. Nonetheless, we should also note that the very same definition is presented in the *Prior Analytics*."

COMMENT: The claim that 'deduction' is not appropriate because Aristotle's definition excludes certain items that would be called deductions by some people—e.g. there is no "sullogismos" whose conclusion is among its premises and there is none with redundant premises—is amazing. It is at once a *non-sequitur* and a *petitio*. It is a non-sequitur because the word 'deduction' in English is not so sharply defined as to necessarily include the items mentioned. It is a *petitio* because the premise that such items were excluded by Aristotle has not been established.

zz Bar-Am 2008, p. 145: J. Lukasiewicz [1951] started the modern fashion of anachronistic formal studies of Aristotle's logic. […] The following texts are the best known, formal studies of Aristotle Logic: G. Patzig 1968, T. J. Smiley 1973, J. Corcoran (ed.) 1974, J. Lear, 1980, P. Thom 1981.

aaa Bar-Am 2008, p. 149: "Aristotle could not make a clear-cut distinction between the search for the purely formal (logic) and the search for informative truth (science). Some modern admirers of Aristotle take it for granted that he had made this distinction clearly and endorsed it. Others invent new terms so as to avoid the issue. Notable among these is J. Corcoran (2003 p. 286). By contrast, the terrific M. Grene writes (1963 p. 69): "We may, therefore, legitimately consider Aristotelian logic not as the first adumbration of a formal system but as a discipline enabling the student to acquire scientific knowledge". Later on (ibid., p. 71) she adds: "Aristotle's logic is not a pure logic, a system valid for 'all possible worlds', like the formal systems envisaged by Leibniz."

bbb Louis Groarke 2009, p. 100: "We discuss these passages in detail below. For the moment, simply note that authorities now translate Aristotle's *sullogismos* as "deduction" (including Robin Smith, John Corcoran, Terence Irwin, Gail Fine, Timothy Smiley, A. J. Jenkinson, and so on, to name a few). This is accurate […]."

ccc Malink 2009: Both Corcoran, 'Completeness', and Smith, 'Ecthetic Completeness', intend to prove that a certain deductive system for Aristotle's syllogistic is complete with respect to (i.e. strong enough to prove everything valid in) a certain semantics. The proposition 'BaB' is valid in their semantics, but not provable in their deductive systems. So the proof of completeness fails when propositions such as 'BaB' are admitted.

COMMENT: This remark needs work. To begin with, no one-term sentence is valid in the semantics in question for the simple reason that the language admits no such sentences. Moreover, it is a category mistake to criticize a proof for not proving what it did not claim to prove. Further, Malink is accusing Corcoran and Smith of a mathematical blunder that he should have known they did not make. Scores of qualified people read Corcoran's proof and found it flawless. What was Malink thinking? Besides, Corcoran and Smith are not discussing "a certain deductive system", i.e.one system: Corcoran discusses one, Smith another. Also, neither Corcoran nor Smith is discussing provability: both are discussing deducibility of conclusions from premises. Malink's 'intend' implies doubts about whether Corcoran and Smith achieve their stated goals: after forty years of acceptance such doubts are unwarranted and unsubstantiated. To disagree with Corcoran, Smith, and many others on the debatable role of one-termed propositions such as "Every good is a good" in Aristotle's syllogistic it is not necessary or even relevant to discuss completeness proofs. In fact, bringing up the subject of completeness proofs is a non-sequitur that suggests a lapse of focus or worse. Moreover, in the absence of arguments adduced by the opponents, the reader deserves to be suspicious. There are further difficulties with Malink's remark.

ddd Corkum 2010 wrote: "Striker translates *syllogismos* not with 'deduction', as in Smith's 1989 Hackett translation, but with the transliteration 'syllogism'. …[S]ince Striker's translation is inconsistent with Barnes's use of 'deduction' in his translation of the *Posterior Analytics* and Smith's use of 'deduction' in his translation of *Topics*

Book I, both also in the Clarendon Series, it is unlikely that the translation will supplant Smith's translation of the *Prior Analytics*."

Comments: (1) The conclusion "it is unlikely that the translation will supplant Smith's translation of the *Prior Analytics*" is a non-sequitur—notwithstanding its truth. Ample evidence for it is found in Corcoran 2010. (2) Striker did not altogether avoid connecting the Greek *sullogismos* with the English *deduction*. For example, *logos syllogistikos* is translated *deductive argument* [42a35-b4, 185].

[eee] Corkum 2010 wrote: "Corcoran and Smiley in the early 1970s independently represented the syllogistic as a Fitch-style natural deduction system: the perfect syllogisms and conversion rules are intuitively valid inference rules; the imperfect syllogisms are deductions with more than two premises providing step-wise derivation of a conclusion; perfection establishes the validity of an imperfect argument form.

Comments: (1) The imperfect syllogisms do not provide step-wise derivation of their conclusions from their premises. On the contrary they are valid arguments for whose validity to be known we need a step-by-step deduction. Corkum has this backward. Imperfect syllogisms "need" what Corkum says they provide. (2) Instead of point-by-point explanation of Corkum's errors in "perfection establishes the validity of an imperfect argument form", I will simply rewrite what he should have said: "perfection establishes the validity of an imperfect syllogism". (3) Calling the Corcoran and Smiley deduction systems "Fitch-style" is useless and of dubious correctness. Fitch introduces assumptions to be discharged whereas Aristotle never discharges an assumption: in indirect deductions the conclusion never occurs after the reasoning that deduces it. See Corcoran 2009, "Aristotle's Demonstrative Logic".

[fff] Raymond 2010, p. 194: "This section outlines the basis for the interpretation, drawing out how Aristotle's historical intuitions concerning polarity (things that never combine) and inseparability (things that never separate). As we will see, these two intuitions are germane to logic, understood as natural deduction (e.g. Smiley 1973, Corcoran 1974, and Smith 1989)."

[ggg] Castelnérac, Benoit, and Mathieu Marion, 2013, p.24: "This is not the place for a critique of this approach, already severely undermined since pioneering work by Timothy Smiley and John Corcoran in the 1970s. We would like simply to say a word about Aristotle's context. Much of the work in the history of logic in this tradition has shown a remarkable lack of sensitivity to it. With Łukasiewicz, history of logic looked more like an attempt at fitting Aristotle's text onto the Procrustean bed of one's own axiomatic conception of logic, and, although work by Smiley and Corcoran certainly fitted the text much better, it was also ahistorical."

COMMENT: Perhaps Smiley and Corcoran would have learned something or mended their ahistorical ways if they had been instructed in exactly what historical context they had overlooked.

[hhh] Castelnérac, Benoit, and Mathieu Marion, 2013, p.28: "The key papers here are Smiley (1973) and Corcoran (1974a). See also Lear (1980) and Smith (1989), which incorporates the Smiley-Corcoran approach in the translation and commentary."

[iii] Keyt 2013: Can it be proven that the conclusion of every valid categorical argument is deducible from its premises by means of Aristotle's inference rules without first proving that every such argument is a chain argument? The answer is that it can be. Using the sophisticated methods of modern metatheory, John Corcoran has done it (Corcoran, 1972).

COMMENT: I am grateful to Keyt for appreciating my achievement and praising its sophistication. However difficult it was to discover the theorem *as a hypothesis* and however difficult it was to discover *the proof* of the theorem as a fact, it is not very difficult to follow. In 1971, I taught it to a group of 20-30 linguistics graduate students most of whom had little or no previous logic. I hope Keyt's generous praise does not have the unintended consequence of deterring students from studying my proof. They will enjoy the experience and learn things that can be applied elsewhere. That said, I cannot accept all the credit for discovering the proof: I gratefully acknowledge the help I got from my students. Peter Malcolmson's contribution was essential.

[jjj] Marion 2013, p. 18: There is certainly no need to see axiomatic systems everywhere when one looks at the history of logic, given that the introduction of that approach [sc. to logic] only dates from Frege. Moreover, that these are less suited for modelling Aristotle's syllogistic has been independently shown by John Corcoran and Timothy Smiley in the early 1970s, when they interpreted Aristotle's syllogistic not as an axiomatic system requiring an underlying logic, but as an underlying logic itself, which is best modelled (in the ordinary sense of the word 'model') as a Gentzen-style system. They also gave completeness proofs for their respective systems and thus restored Aristotle's stature as a logician.

[kkk] Simons 2014: Łukasiewicz's trenchant and controversial views sparked a controversy over how to interpret the syllogistic. While the principles did win an early adherent in Patzig (1968), subsequent criticisms by Corcoran (1972, 1974) and, independently, Smiley (1974) established clearly that syllogisms are not propositions but inferences, and that Aristotle had no need of a prior logic of propositions. That view is now universal among scholars of Aristotle's logic. In retrospect, it appears that Łukasiewicz was keen to wish onto Aristotle his own (Fregean) view of logic as a system of theorems based on a propositional logic.

[lll] Tennant 2014, Abstract: I use the Corcoran–Smiley interpretation of Aristotle's syllogistic as my starting point for an examination of the syllogistic from the vantage point of modern proof theory.

[mmm] Steinkrüger 2015, Sect.3: "To be sure, those interpretations that affirm that the syllogistic requires an underlying propositional logic have been met by forceful arguments to the contrary (Corcoran 1974b; Smiley 1973)."

[nnn] Steinkrüger 2015, Sect.3: "Aristotle's remarks on the form of premises up to this point of the *Prior Analytics* do not expressly forbid statements such as 'All A is A' (cf. 24a16–7 and footnote 19). In my view, Aristotle ultimately rejects such statements, but this question does not affect my point here. See Corcoran (1974b, pp. 96 and 99)."