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If A, Then B: How the World Discovered Logic (Book Review)

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If A, Then B: How the World Discovered Logic (Book Review)

Abstract

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Comments

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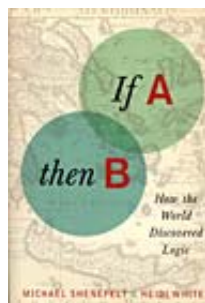


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CELEBRATING A CENTURY OF
ADVANCING MATHEMATICS

If A Then B: How the World Discovered Logic



Michael Shenefelt and Heidi White

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MAA REVIEW

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[Reviewed by Calvin Jongsma, on 01/14/2015]

If A, Then B: How the World Discovered Logic is an engaging but somewhat controversial social history of logic. Written by two current master teachers in New York University's Liberal Studies [Great Books] Program, this work places the rise and development of key logical systems and ideas in their varied social, cultural, and intellectual contexts. It assumes very little prior acquaintance with logic or deductive argument, but those (becoming) familiar with the fundamentals of both are its most likely audience. The focus of the book, as the subtitle indicates, is primarily historical, though philosophical issues (proper foundations of valid argumentation, Wittgenstein's linguistic turn, Kuhn's paradigmatic view of scientific progress, the relation of logic and religious faith) occasionally take their turn on center stage. It is not intended as a textbook in logic, nor does it aim to supplant standard histories of logic such as those by Kneale and Kneale or Bochenski. Its approach is rather to present logic as a human creation motivated by socio-economic and political trends and whose larger purposes go beyond technical innovations and refinements. Without denying the importance of individual ingenuity, the authors offer further levels of explanation connected to the central concerns and tendencies of the cultures in which the systems of logic are embedded. This gives the book a rather unique position among works exploring the origins and historical development of logic.

Deductive logic can be traced back to Aristotle, who first analyzed the validity of arguments in terms of logical form. It is generally recognized that his system of syllogistic logic was prompted by both negative and positive developments in Greek thought. Like his teacher Plato before him, Aristotle was highly critical of the questionable practices of the Sophists; testing arguments for validity provides one with an incontestable analytic tool for rejecting counterfeit reasoning. But Aristotle was also positively impressed by the progress and axiomatic organization of mathematics, which made use of deductive argumentation from its first principles of axioms and definitions. His epistemology and its supporting system of logic were designed to promote that sort of pursuit in all fields of scientific thought. Euclid's *Elements*, written a generation or so later, became the showcase for this sort of approach, though its reasoning was not strictly syllogistic.

Shenefelt and White expand the typical historical matrix of motivating causes for logic by giving primary attention to a variety of natural (the unique geography of Greece) and socio-political (the democratic follies of the Athenian Assembly, armed by Sophist teaching) factors behind the development and acceptance of Aristotle's logic. Philosophical and intellectual factors are also taken into account, but the authors make no real attempt to integrate Aristotle's logic into his epistemology or his overall philosophy. As a consequence, they fail to note some significant ideological differences between syllogistic logic and later systems of logic.

Stoic logic, which focused on disjunctive and conditional arguments, is presented in *If A, then B* as moving away from static philosophical classification (Aristotle) toward personal and ethical decision-making (Chrysippus), where choices must be made between various alternatives and their consequences drawn out. While later scholars became familiar with the logical forms the Stoics identified, such as Disjunctive Syllogism, Modus Ponens, and Hypothetical Syllogism, they tended to view these as minor additions to Aristotle's system, which already had a certain completeness to it. Consequently, philosophers as late as Kant still thought that Aristotle had said nearly the last word on logic.

Although 17th- and 18th-century thinkers reacted negatively to Aristotelian logic with its emphasis on syllogistic reasoning about terms, proposing experimentation and inductive procedures instead as the right way to advance natural science, no new system of logic was developed during this time period. The first genuine alternatives to Aristotle's logic appeared during the last half of the 19th century with the work of Boole, De Morgan, Peirce, Frege, Peano, and others. *If A, then B* discusses these new developments mainly under the general rubric of formalized symbolic logic, though it notes that the distinctly different systems of Sentential Logic (using combinatorial truth-functional connectives) and Predicate Logic (introducing relations and quantifiers) both arose during this time period.

In keeping with their emphasis on social history, the authors assert that symbolic logic is "a consequence of an age of machinery" (205), brought on by the Industrial Revolution in Great Britain, Germany, and Italy. Witnessing the "immense power of mechanical operations" (214), logicians were themselves encouraged to adopt a mechanical approach, advocating reasoning by manipulating symbols in a formal way according to fixed rules. This big-picture approach glosses over some significant perspectival differences among logicians and it fails to adequately credit intellectual influences, but it provides a way to link what is happening in logic to what is going on in society. The authors realize that the existence of parallel features in society and logic is no proof of causality and that connecting developments in logic to trends in society is necessarily conjectural (223–224), but they do want to maintain that large-scale mechanization of industry is at least one of the causes that spurred on the new developments in logic (215, 224). They acknowledge personal and intellectual factors behind the innovations as well (the formal analytic trend in British mathematics, Frege's desire to ground the certainty of arithmetic upon rigorous logical foundations), but they insist on giving significant weight to social movements.

Given the synoptic scope of this book, one can easily challenge aspects of the various theses put forward by Shenefelt and White, and there is certainly room for adding more nuance and complexity to their explanations, but the authors have at least provoked their readers into considering elementary logic within a fuller real-life context than is usually the case in historical treatments of the topic. Students may need to be cautioned to think critically about their claims, but *If A, then B* provides a fascinating springboard for discussing how and why logic developed in various cultures.

The book as a whole is probably most suitable as supplementary reading for an introductory logic course offered in a philosophy department, but it could also provide the basis for some interesting contextual discussions or essay writing by students studying elementary mathematical logic or learning how to do proofs in a transition course. And, of course, the book provides a new resource for those interested in studying aspects of the history of mathematics and logic. The book only takes the story of logic up to about 1900, however, so readers wanting to learn how logic became even more completely intertwined with foundations of mathematics in the 20th century will have to look elsewhere.

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