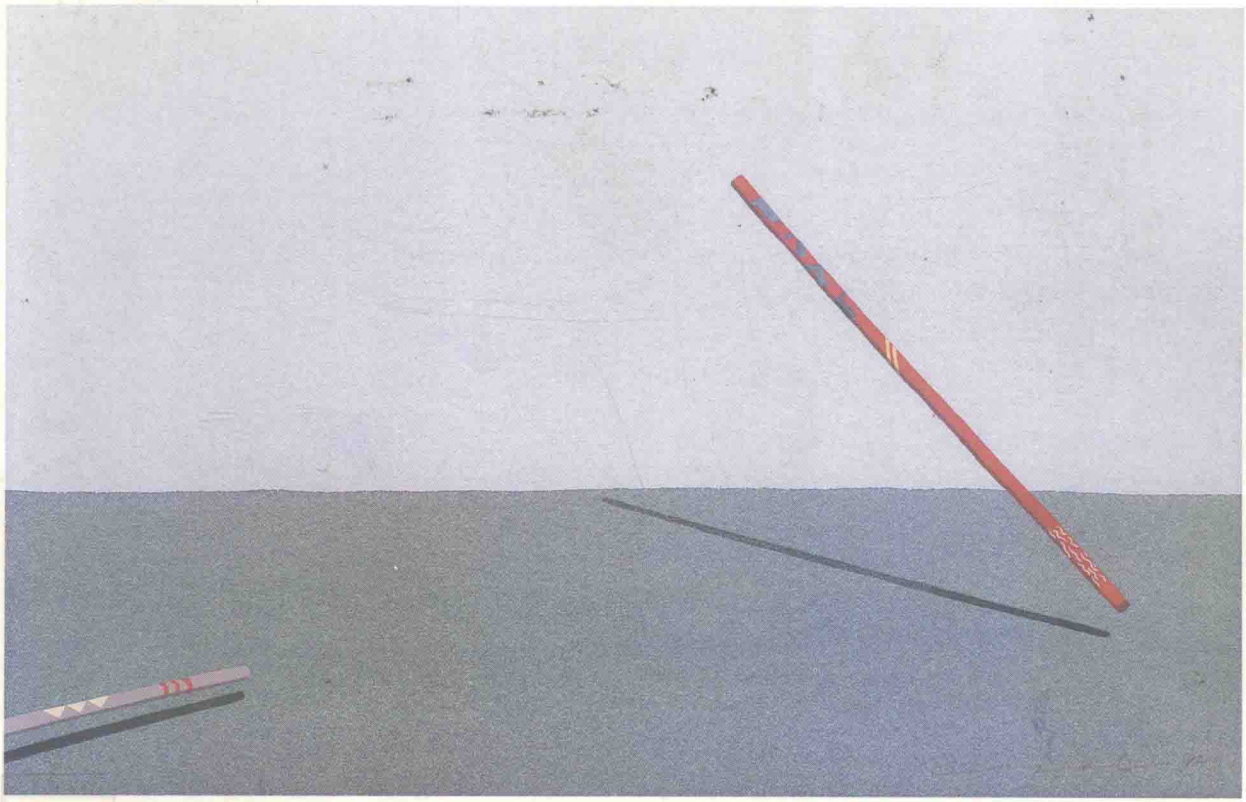
△ WHAT IF...?

Toward Excellence in Reasoning



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▽Toward Excellence in Reasoning

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▲ PREFACE ▼

"They can send me to college but they can't make me think!" So reads a bumper sticker on a student's car. The slogan refutes itself since it took some thought both to create and to appreciate the quip. The problem is not so much to make people think, but to enable and encourage them to think well. That is the goal of this book.

Many college and university courses aim at improving students' reasoning. The recorded history of recommendations for achieving this goal stretches back to Aristotle. We venture adding to this history because for several years Jaakko Hintikka and various associates have been developing a comprehensive theory for understanding the nature of reasoning that sheds new light on how students may be encouraged and enabled to achieve creatively disciplined reasoning skills. This theory, the interrogative approach to inquiry, makes it possible to integrate deductive logic and informal reasoning into a unified whole. Its core is what is known as the interrogative model of reasoning.

The Interrogative Model of Reasoning

The interrogative model, which is used consistently throughout the book, offers a uniform framework for studying and teaching both formal logic and argumentation theory, including the analysis, evaluation, and construction of arguments in ordinary English. As in the old Socratic method, reasoning is cast in the form of a sequence of questions and answers, interspersed with logical (i.e., deductive) inferences.

The interrogative model distinguishes *definitory rules,* which are concerned with reasoning correctly, from *strategic rules,* which tell how to reason effectively. The former define what is admissible in reasoning, while the latter show students how to make creative use of what is allowed by the definitory rules. Strategic rules thus serve as signposts on the way to excellence in reasoning. By stressing strategic rules this text stays focused on the pursuit of excellence in reasoning.

In the interrogative model all inferences are required to be deductive. This eliminates the problem that an *inference* might introduce an element of uncertainty. Thus all inferences are strictly truth preserving.

The effect is to locate problems with uncertainty in the process of discovering and gathering information rather than in the inference process. The interrogative model can then deploy many different insights to develop strategies for coping with uncertainty about the information available to the reasoner. The Instructor's Manual directs interested readers to a bibliography of the original research on the interrogative model.

The text introduces fundamental notions of deductive logic in the early pages of Chapter 1, but the usual terminology of deductive logic is not introduced until the beginning of Part Two (Chapter 5). Our experience has been that students more easily grasp the fundamental nature of valid deductive inference if we postpone the traditional terminology. We find that too many students think they already know what the terms "valid" and "deductive" mean. By employing the less familiar phrase "logical inference," we are able to focus on learning the nature of inference rather than unlearning ideas carried over from everyday use of the traditional terminology.

In Parts Two and Four we face the perennial problem of moving back and forth between everyday English and the formal notation of logicians. We consider it important to face the realities of the problem and acknowledge that no cut-and-dried rules can be formulated (on the beginning student's level, at least) which would be adequate to this task of translation.

Sooner or later, therefore, we must appeal to the students' semantical intuitions, and it is best to appeal to the intuitions that are likely to be strongest and most sure. Our strategy is this: In order to apply the formal rules of interrogative games, it typically suffices to focus on the main logical operator of the statement in question. Accordingly, the formal rules can be applied directly to an English sentence as soon as one identifies its main connective or quantifier—that is, knows whether the statement is a negation, or a conjunction, or a disjunction, or a conditional, or a universal statement, or an existential statement. The ability to make this identification is part and parcel of the ability to understand the statement in the first place. The strategy of focusing on the main logical operator in the sentence frees the students from having to engage in wholesale translation from English into formal notation.

Organization and Special Features

A step-by-step approach ensures that students master each phase of the interrogative model before moving to the next phase. All important definitions are highlighted in boxes, and key concepts are reviewed at frequent intervals. Dozens of exercise sets are provided throughout the text. Half of these are solved and/or discussed in the back of the book. These exercises are marked by a caret (▸).

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Literary and scientific examples are provided throughout the text. Selections ranging from Plato's *Meno* to Isaac Newton to several Sherlock Holmes stories illustrate the interrogative model at work. Many examples from legal contexts are also included.

Part One (Chapters 1–4) gives an overview of the interrogative model of reasoning and its use in the analysis and construction of arguments. In Part One we attempt to keep technical terminology and apparatus to a minimum. In Part Two (Chapters 5–9) deductive logical inference is studied in detail through a flexible system of statement (propositional) logic that is designed to help students integrate deductive inference with the other aspects of reasoning. There is opportunity for considerable work with a formal system, but the connections with everyday English are always near at hand. We do not recommend lingering over statement logic and have therefore kept exercises to a minimum. Appendixes A and C, however, contain additional exercises and insights for those who wish to devote more time to the study of formal logic.

Part Three (Chapters 10–13) presents rules and strategies for introducing information into an argument or inquiry and for assessing the reliability of the information that is introduced. Because the book focuses on how one can reason correctly and effectively, the traditional fallacies are not stressed. Nevertheless, interesting insights into some of the most significant informal fallacies are provided in this part. Those who seek more discussion of the traditional fallacies in the light of the interrogative model are invited to turn to Appendix C.

The interrogative model encourages repeated examination of argument sketches, especially toward the end of Part One and in Part Three, as students become more and more skilled in various aspects of argument analysis, construction, and evaluation. Appendix A contains a large number of argument sketches suitable for illustrating many different features of arguments. We call these "sketches" because the interrogative model emphasizes how important it is to learn how to spot and "fill in" the gaps typically found in everyday reasoning.

Argument construction and the writing of argumentative essays are covered in detail in Parts One and Three. The goal is to help students learn not only how to analyze and evaluate arguments but also how to construct their own and to present them in essay form.

Parts One, Two, and Three complete the examination of the basic elements of reasoning as understood through the interrogative model. Part Four moves on to consider more advanced topics. Chapters 14 and 15 introduce the basics of first-order predicate logic. The tools acquired in these chapters are then employed in subsequent chapters to help students understand more deeply the structure of information seeking through questions. By now students can be expected to have sufficient understanding to appreciate one of the most significant insights of the interrogative model: that parallels between the questioning process and deductive reasoning make it possible to learn new strategies for questioning from proven strategies for deductive reasoning. Chapter 18 examines these strategic parallels. Chapters 19 and 20 offer further discussions of the nature of scientific reasoning and of definability and identifiability.

A complete glossary of terms is provided to help students learn and remember new vocabulary. The entries are all cross-referenced to the more extensive discussions in the text itself. An index provides another convenient tool for finding and exploring topics covered in the text.

Appendix B discusses several recreational questioning games. These games give students insight into the interrogative model and provide the possibility of applying the model in a recreational context.

Appendix C puts the main traditional fallacies into historical and theoretical perspective. Students are not encouraged simply to learn fallacies by rote, but rather to understand what it is about reasoning that makes certain fallacies tempting. Students also come to understand why what is a fallacy in one context may be an important consideration for reasoning in another.

The Instructor's Manual includes theoretical background, teaching tips for each chapter, sample examinations, additional exercise sets, and answers to exercises not solved in the back of the text.

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PART ONE

Introduction to the Interrogative Model of Reasoning

1

Inquiry as Inquiry

To be able to reason well, to be able to construct good arguments and to analyze and evaluate arguments effectively, one has to know what reasoning is. But the nature of reasoning and thinking is a profound philosophical problem to which one cannot expect an easy answer. Fortunately, for the purpose of learning how to reason well, rather than try to formulate an answer that would satisfy a professional philosopher, it suffices to grasp some useful guidelines. In fact, finding some examples of good reasoning will take us a long way in our efforts to understand it.

Useful examples occur in many different contexts. For instance, imagine that you are a TV producer or advertising executive who has been given the task of depicting on TV examples of good thinking (reasoning). You have been asked to present your client as a "thinking man's and thinking woman's company." How would you do that? What is your conception of effective thinking? Pondering this problem may help you to clarify your own ideas.

1.1 Think About It: What If . . . ?

Describe a TV commercial which depicts employees of a company involved in creative or effective thinking. Then explain why you think your commercial succeeds in getting the idea of effective thinking across to the viewers—why you think it serves as an illustration of good thinking.

Not long ago a major computer company asked its advertising agency to create a commercial showing employees engaged in effective thinking. The ad agency's problem was to convey such a concept to TV viewers. Their solution shows a young professional in various nonprofessional activities. Suddenly he or she stops, stands or sits still for a while, goes to a computer, works on it for a while, and then calls his or her boss, saying, "I just thought of it. *What if . . . ?*"

The relevant features of these commercials are fairly obvious. First, the employee of the company appears to have been given a serious professional problem. This problem occupies, perhaps only subconsciously, his or her mind even outside regular office hours. Second, the hero or heroine of the commercial is shown coming upon a way of approaching—perhaps even solving—the problem. How? By asking, "What if . . . ?" that is to say, *by raising a new question.*

The idea of effective thinking, or reasoning, on which the commercial is based is clear. Reasoning is a goal-directed activity. The goal may be to solve a problem, and the means of solving the problem is *by posing suitable questions.* The answers to these questions are ultimately expected to yield the solution or otherwise help to reach the desired goal.

1.2 Inquiry as Inquiry

This text can be thought of as taking a clue from the commercials just described. It is calculated to teach you to reason better by assuming that *reasoning is a process of questioning or interrogation.* Thus, we will often speak of the reasoning process as **rational inquiry.** That great authority on the English language, the *Oxford English Dictionary* (colloquially known as the *OED*), defines one sense of *inquiry* as "the action of seeking . . . for truth, knowledge, or information about something; search, research, investigation, examination." Another sense is defined in the *OED* as "the action of asking or questioning; interrogation." In this book we show how rational inquiry in the first sense is inquiry also in the second sense, that is, an activity of questioning.

▲

Inquiry: (1) The action of seeking for truth, knowledge, or information about something; search, research, investigation, examination. (2) The action of asking or questioning; interrogation.

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