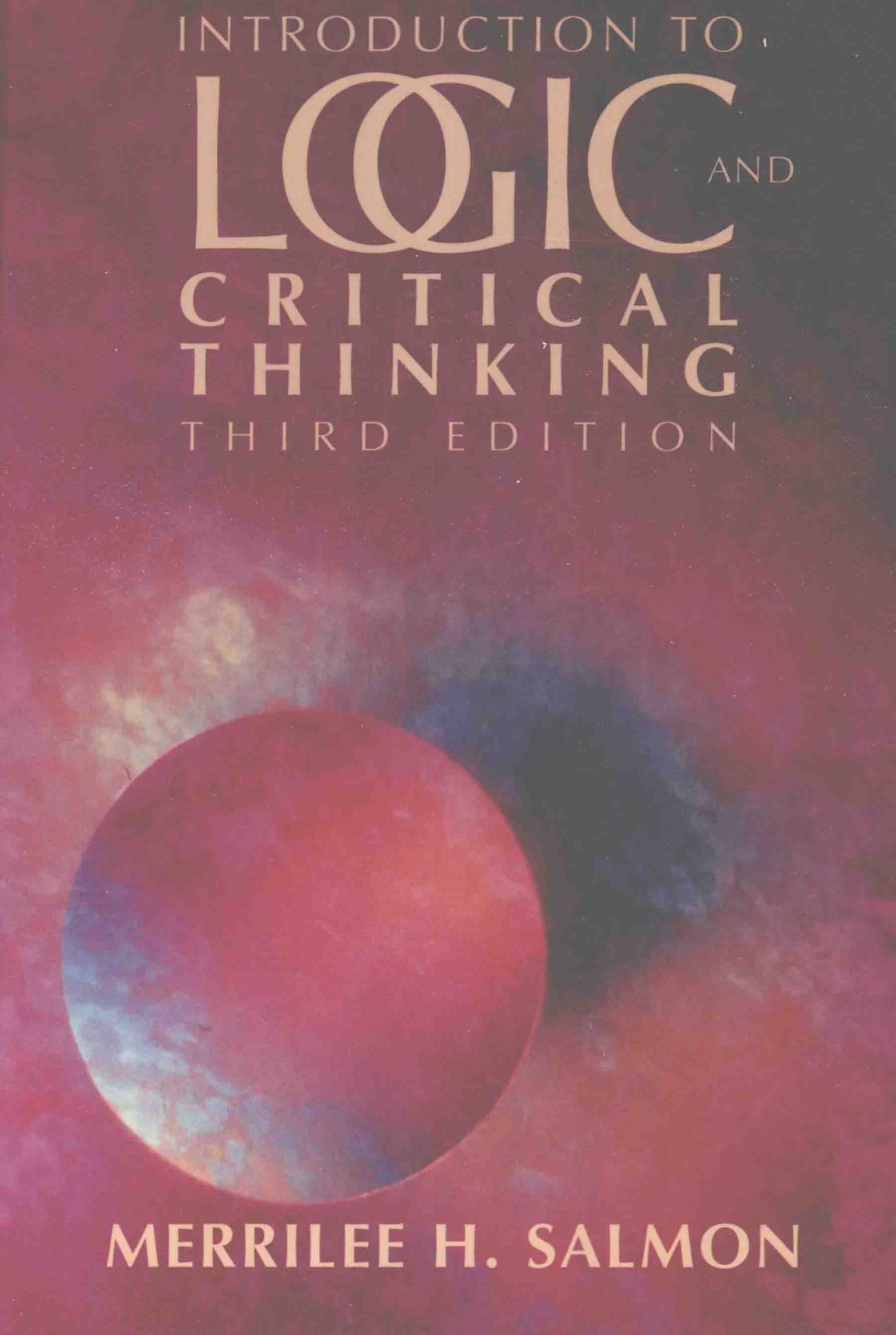
INTRODUCTION TO LOGIC AND CRITICAL THINKING

THIRD EDITION



MERRILEE H. SALMON

INTRODUCTION TO LOGIC AND CRITICAL THINKING

THIRD EDITION

MERRILEE H. SALMON

UNIVERSITY OF PITTSBURGH

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Preface to the First Edition

This book is designed to help students who are beginning college to acquire a deeper understanding of the relationships between logic and language and to increase their skills in critical thinking. Students must be equipped with these skills if they are to be able to recognize situations in which unsupported assertions require justification, to analyze and assess the arguments of their own.

Motivation for achieving these goals is provided by means of a variety of examples and exercises that show the usefulness of critical-thinking skills in everyday life. Students are asked to analyze exactly what claims are being made in various contexts and to determine whether reasons are given or should be given to support the claims they are asked to accept. Once assertions that require support have been distinguished from arguments (in which reasons are given for claims), three categories of argument types are distinguished: deductive arguments, inductive arguments, and fallacies. Standards for evaluating various types of arguments are presented. Many examples and exercises focus on the reconstruction of arguments in ordinary language.

A special feature of this text is the careful analysis of inductive reasoning prior to the treatment of deductive arguments. Several reasons can be given for this reversal of what has become the standard order in introductory texts.

- Inductive reasoning based on samples, arguments from analogy, statistical syllogisms, and arguments that attempt to establish casual connections have already been encountered frequently by students in their roles as consumers, citizens, and problem-solvers. Interesting real-life examples can be used to illustrate and explain the standards for evaluating these pervasive forms of argument.
- In their examination of familiar types of inductive reasoning, students gradually gain sensitivity to the structural features of arguments and to such important logical distinctions as the difference between universal and statistical generalizations. They are thus better able to appreciate the value of the more formal treatment of deductive reasoning that follows the analysis of inductive arguments.
- When inductive arguments are presented in this way, students are less likely to be left with the impression that only deductive arguments are really effective and that inductive rerasoning is an inferior alternative to be relied on when nothing better is available.

After 16 years of teaching introductory logic courses to small groups of students and to large lecture groups with the assistance of teaching fellows, I am convinced of the value of treating induction before deduction. However, the text is designed so that it can be used by instructors who prefer the more usual order. Chapters 1, 2, 6, 8 (followed by Appendix 1), 9, and 10 may be followed by Chapters 3, 4, 5, 7, and 11.

Another unusual feature of this text is its treatment of fallacies. After a brief general account of fallacies is presented in Chapter 2, particular types of fallacies are addressed throughout the text within the context of analyzing the

correct forms of inductive and deductive arguments that various fallacies resemble. In addition, some theoretical backround is supplied to show that fallacious reasoning frequently involves systematic types of error. One example is the belief that causes must somehow *resemble* their effects; another is the common tendency to overlook solid statistical data when presented with some particular vivid information that conflicts with the data. Such errors are not the result of carelessness, individual psychological quirks, or an intent to deceive. This approach to fallacies fosters a deeper understanding of correct as well as incorrect forms of reasoning.

The language used in the text is as simple and direct as possible. Technical vocabulary is introduced only when it is required and is redefined in Review sections at the end of each chapter. Formal methods are employed when they are useful for clarification, and even those students who begin the course with an aversion to formalization ("math anxiety") can usually master these methods with little difficulty. Instructors who wish to minimize attention to formal methods can omit the material on probabilities (Chapter 5 and Section VI of Chapter 7), the formal proof method in Appendix I, and Section VII on logic and computers in Chapter 8 without loss of continuity.

All the material in the text can be covered comfortably in a semester course that meets four times a week. If the course is fast-paced, most of the material can be covered in a semester course that meets three times a week. Fewer hours of class time may require more selective coverage, but the chapters and sections are designed so that this can be done easily. For example, Chapter 5, Section VI of Chapter 7, Section VII of Chapter 8, and the Appendix may be omitted. If time is short, Section IV on Venn diagrams in Chapter 9 may also be omitted, inasmuch as an alternative set of rules is presented for evaluating syllogistic arguments.

Over the years of teaching logic and thinking about how it should be taught, I have received much help from those who were my teachers, teaching assistants, and students. Although they cannot all be named, it is a pleasure to acknowledge their contributions. Special thanks go to Robert Fogelin at Dartmouth College, and to the reviewers, who offered valuable criticisms of a draft of this text: Donald Anderson, Los Angeles Pierce College; Paul Bassen, California State University, Hayward; Leslie Burkholder, Carnegie-Mellon University; Charles Chastain, University of Illinois at Chicago Circle; Allan S. Gnagy, University of Kansas; Russell Kahl, San Francisco State University; Walter H. O'Briant, University of Georgia; Ric Otte, University of California at Santa Cruz; Elliott R. Sober, University of Wisconsin; Eric Stiffler, Western Illinois University; and Robert Wengert, University of Illinois at Champaign-Urbana. Bill McLane of Harcourt Brace provided expert advice and editorial assistance for which I am most grateful.

Finally my deepest thanks go to my husband, Wesley C. Salmon, for his logical expertise, generous advice, and staunch support.

Merrilee H. Salmon

Preface to the Third Edition

While responses to earlier editions of *Introduction to Logic and Critical Thinking* have been gratifying, many who use it have suggested improvements. This third edition tries to respond to those suggestions. Because no textbook can have too many exercises, this edition contains about twenty percent more than the previous edition, at various levels of difficulty. Solutions to all of the odd-numbered exercises can be found at the end of the book. This edition discusses additional fallacies as well, in connection with the correct forms of argument that they resemble. As in the previous edition, the Index of Fallacies (Appendix 2) contains a list of all fallacies treated in the book, along with brief definitions and references to the discussions in the text.

A revised version of "Paying Special Attention to the Language of Arguments: Definitions" (Chapter 11 in earlier editions) is Chapter 2 in the third edition. This structural change responds to the belief of many teachers that the material covered in this chapter prepares students for later discussions of ordinary-language arguments by raising their sensitivity to linguistic issues.

One distinguishing feature of earlier editions—the treatment of inductive reasoning before deductive reasoning—remains the same. Many examples of inductive arguments (arguments from analogy, statistical syllogisms, inductive generalizations, reasoning to the truth of hypotheses, and so on) occur in everyday life. For this reason, students are likely to be familiar with these forms of argument and to have grappled already with some of the problems that inductive reasoning poses. As a result, they are prepared to pay serious attention to methods for analyzing such arguments.

Learning about matters of form in real-life contexts prepares them, in turn, to take seriously the more abstract features of deductive arguments. With a better understanding of the structure of inductive reasoning, many students who have experienced "math anxiety" in their earlier dealings with formalizations gain a new appreciation of the simplicity that formal treatments of deductive logic provide.

After the first three chapters present critical thinking and logic in a general way, a more detailed account of inductive reasoning follows in Chapters 4, 5, and 6. Chapter 7 provides a brief treatment of conditional (deductive) arguments in preparation for the discussion of inductive arguments of confirmation in Chapter 8.

Instructors who have their own reasons for preferring the more traditional approach, however, can proceed without loss of continuity from Chapter 3 to Chapters 7, 9, 10, and 11 before addressing Chapters 4, 5, 6, and 8.

As in the earlier editions, Appendix 1 presents a version of the popular "tree-method" for testing the validity of deductive arguments. This natural-deduction system for propositional logic is a variant of the proof method developed by Gerhard Gentzen. Although not to everyone's taste, this method interests students with a flair for formal reasoning, and some have set up machine programs to emulate the system.

A primary aim of this textbook is to present the study of logic and critical thinking in a way that makes it relevant to students' lives while at the same time providing a clear and rigorous treatment of technical matters that are a part of the enterprise. Reviewers of this and previous editions have helped immensely in this project by sharing their insights and expertise. It is a great pleasure to acknowledge the help of R. Boyd (Texas Christian University), J. Cargile (University of Virginia), D. Gilboa (University of Wisconsin, Oshkosh), D. Hillman (University of Pittsburgh), F. McGuinness (California State University, Northridge), H. Phillips (Whitman College), W. Salmon (University of Pittsburgh), E. Sherline (University of Wyoming), D. Stalker (University of Delaware), J. Tilley (Indiana University), R. Wahl (Idaho State University), and S. Wertz (Texas Christian University). Special thanks to Charlotte Broome for preparing the index.

During the years between the appearance of the second and third editions, the Andrew W. Mellon Foundation has generously supported my empirical research on reasoning in conversation. This work, done under the auspices of the Learning and Research Development Center at the University of Pittsburgh, and in collaboration with colleagues there, has informed the book in ways too numerous to mention. I am very grateful to R. Glaser and L. Resnick, Directors of the Center, to all of the members of Dr. Resnick's Pragmatics group, and most especially to C. Zeitz, for stimulating new ways of thinking about how to use what students already know to help them learn to reason well.

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