

**Ernest
Lepore**

with
Sam Cumming

**Revised
Second Edition**



Meaning and Argument

An Introduction to Logic
Through Language



WILEY-BLACKWELL

Praise for *Meaning and Argument*

“With care, imagination, and infectious enthusiasm, Lepore develops a novel and effective general technique of formalization which complete beginners should be able to grasp and use to deal with virtually any example in a first logic course.”

Bob Hale, *University of Glasgow*

“*Meaning and Argument* is especially strong on the subtleties of translating natural language into formal language, as a necessary step in the clarification of expression and the evaluation of arguments. The range of natural language constructions surveyed is broader and richer than in any competing introductory logic text that I am aware of. As such, the book provides a solid and attractive introduction to logic not only for philosophy students, but for linguists as well.”

Richard Larson, *University Stony Brook*

“I can thoroughly recommend Ernest Lepore’s *Meaning and Argument*, particularly for those seeking to teach or learn how to paraphrase into formal symbolism, a much neglected aspect of logic. It contains a wealth of examples and is informed throughout by a deep theoretical knowledge of contemporary linguistics and philosophy of language.”

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“Lepore’s book is unusual for a beginning logic text in that it contains no natural deduction proof system but rather concentrates on finding models and counter-models by means of a semantic tableaux method. It is also unusual in containing many translation examples that exemplify constructions that linguists have found interesting in the last decades. In both of these ways the book is well suited for use in educating philosophy students in the importance of logic even when these students do not intend to go further in the study of formal logic as a discipline.”

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“*Meaning and Argument* is a beautiful display of both the power of first-order logic and the complexity of natural language. The book focuses on the use of logic to expose and remedy many difficulties with understanding a sentence’s exact meaning. Lepore’s user-friendly style makes the book enjoyable for beginning logic students, and his coverage of the details makes it useful for advanced students and professionals. There is no logic textbook that comes even remotely close to accomplishing what *Meaning and Argument* does.”

Kent Johnson, *University of California at Irvine*

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REVISED SECOND EDITION

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with Sam Cumming

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Contents

Preface to Revised Second Edition	xiii
Preface to Second Edition	xiv
Preface to Revised Edition	xv
Acknowledgments	xvi
Introduction to Teacher	1
1 A Brief Introduction to Key Terms	5
1.1 Arguments	5
1.1.1 <i>What is a Statement?</i>	6
1.1.2 <i>Premises and Conclusion</i>	6
1.2 Putting Arguments into a Standard Format	7
1.3 Multiple Conclusions	9
1.4 Deductive Validity	10
1.5 Soundness	13
1.6 Missing Premises and Conclusions	13
2 Argument Forms and Propositional Logic	17
2.1 Formal Validity	17
2.2 Quotation Marks	19
2.3 Metalinguistic Variables	21
2.4 Non-formal Validity	23
2.5 The Need for Propositional Logic	24
2.5.1 <i>Symbolic Notation</i>	25
2.6 The Type/Token Distinction	26
3 Conjunction	31
3.1 Logical Conjunction	31

3.2	Distinguishing Deductive from Non-deductive Aspects of Conjunction	33
3.3	Phrasal Logical Conjunctions	34
3.4	Series Decompounding	34
3.5	Using ‘Respectively’	35
3.6	Symbolizing Logical Conjunctions	35
4	Negation	42
4.1	Logical Negation	42
4.2	Some Other Negative Expressions	43
4.3	A Point about Methodology	45
4.4	A Point on Ambiguity	45
4.5	Symbolizing Logical Negations	45
4.6	Ambiguity and the Need for Groupers	46
4.7	Review of Symbols	47
4.8	Using ‘Without’	48
4.9	Argument Forms Continued	48
4.10	Symbolizing Logical Negations Continued	51
5	Truth Tables	56
5.1	Well-formed Formulas	56
5.2	Scope	57
5.3	Main Connective	58
5.4	Truth Tables	59
5.4.1	<i>Truth Table Analyses of Statements</i>	61
5.4.2	<i>Truth Table Analyses of Arguments</i>	64
6	Disjunction	68
6.1	Logical Disjunction	68
6.2	Disjunction and Negation	69
6.3	Iterations and Groupers	71
6.4	Inclusive versus Exclusive ‘Or’	73
6.5	Symbolizing Logical Disjunctions Continued	76
7	Conditionals	79
7.1	Conditionals with Constituent Statements	79
7.2	Conditionals without Constituent Statements	80

7.3	Logical Conditionals	80
7.4	Symbolizing Conditionals in PL	82
7.5	Necessary and Sufficient Conditions	82
7.6	Only If	84
7.7	Unless	86
7.8	Since, Because	88
7.9	Conditionals and Groupers	89
7.10	If and Only If	90
7.11	A Revised Grammar for Well-formedness in PL	91
7.12	Summarizing Truth Tables	99
7.12.1	<i>Validity</i>	99
7.12.2	<i>Contradiction, Tautology, Contingency</i>	102
7.12.3	<i>Consistency</i>	104
7.12.4	<i>Logical Equivalence</i>	105
8	Truth Trees	109
8.1	Reviewing Validity	109
8.2	Tree Trunks and Compound and Atomic Statements	110
8.3	Truth Tree Rules	111
8.3.1	<i>Non-branching Rules</i>	111
8.3.2	<i>Branching Rules</i>	112
8.4	Strategies	114
8.5	Truth Trees and Invalidity	117
8.6	Propositional Logic and Counter-examples (Counter-models)	121
8.7	Logical Properties and Relations Revisited	123
8.7.1	<i>Consistency</i>	123
8.7.2	<i>Contradiction, Tautology, Contingency</i>	124
8.7.3	<i>Logical Equivalence</i>	126
9	Property Predicate Logic	129
9.1	Limits of Propositional Logic	129
9.2	Singular Terms	130
9.3	Property Predicates	132
9.4	Quantifiers	134
9.4.1	<i>Simple Existential Quantifier Statements</i>	135
9.4.2	<i>Symbolizing Simple Existential Statements</i>	135
9.4.3	<i>Simple Universal Quantifier Statements</i>	137
9.4.4	<i>Negations of Existentials</i>	138

9.5	Complex Predicates	139
9.6	Well-formedness in PPL	142
9.7	Quantifiers Modifying General Terms	145
9.7.1	<i>Existential Quantifiers and General Terms</i>	145
9.7.2	<i>Universal Quantifiers and General Terms</i>	147
10	Evaluating Arguments in Property Predicate Logic	155
10.1	Quantifiers and Scope	156
10.2	The Truth Tree Method Extended	157
10.2.1	<i>Quantifier Exchange Rule (QE)</i>	157
10.2.2	<i>Universal Quantifier Rule (UQ)</i>	158
10.2.3	<i>Existential Quantifier Rule (EQ)</i>	161
10.3	Super Strategy	164
10.4	Property Predicate Logic and Counter-examples (Counter-models)	166
10.5	PPL Logical Equivalences and Non-equivalences	168
10.6	Other Logical Properties and Relations	170
10.6.1	<i>Consistency</i>	170
10.6.2	<i>Logical Equivalence</i>	170
10.6.3	<i>Contradiction, Logical Truth, Contingency</i>	171
11	Property Predicate Logic Refinements	172
11.1	Literal Meaning	172
11.2	'Any' as an Existential	173
11.3	Restrictive Relative Clauses	175
11.4	Pronouns Revisited	176
11.4.1	<i>Deixis and Anaphora</i>	176
11.4.2	<i>Quantification and Anaphora</i>	177
11.5	Only	180
11.6	Restrictive Words in English	182
11.7	Evaluating Symbolizations of English in Logical Notation	185
12	Relational Predicate Logic	191
12.1	Limits of Property Predicate Logic	191
12.2	Convention 1: Number	193

12.3	Convention 2: Order	194
12.4	Convention 3: Active/Passive Voice	195
12.5	Convention 4: Single Quantifiers	197
12.6	Variables	199
12.6.1	<i>Convention 5: Variables and Quantifiers</i>	200
12.6.2	<i>Convention 6: Variables and Property Predicates</i>	200
12.6.3	<i>General Comments about Variables</i>	201
13	Relational Predicate Logic with Nested Quantifiers	207
13.1	Multiply General Statements	209
13.2	Universal Quantifier Procedure	212
13.3	Existential Quantifier Procedure	213
13.4	Double Binding Variables	213
13.4.1	<i>Kicking Out</i>	216
13.5	Systematic and Analytic Procedures	217
13.6	A Grammar for Well-formedness in RPL	218
13.7	Nested Quantifiers, Variables, and Scope	220
13.8	Order and Scope Refinements	221
13.8.1	<i>The Order and Scope Procedure</i>	224
13.9	Summary of the Overall Procedure for Symbolizing English Statements with Nested Quantifiers into RPL	226
14	Extending the Truth Tree Method to RPL	229
14.1	RPL Arguments without Quantifiers	229
14.2	RPL Arguments without Nested Quantifiers	230
14.3	RPL Arguments with Nested Quantifiers	232
14.4	Choosing Singular Terms to Instantiate	233
14.5	Infinite Truth Trees for RPL Arguments	234
14.6	Summary of Truth Tree Strategies	236
14.7	Relational Predicate Logic and Counter-examples (Counter-models)	239
15	Negation, Only, and Restrictive Relative Clauses	244
15.1	Negation	244
15.2	'Only' as a Quantifier	246
15.3	Restrictive Relative Clauses	249

15.3.1	<i>The Quantificational Restrictive Relative Clause Procedure</i>	250
15.4	Quantifiers and Anaphora	252
15.4.1	<i>Repair Algorithm</i>	254
15.5	Anaphora and Restrictive Relative Clauses	257
15.6	Anaphora Across Sentences	262
15.7	Quantification in English	265
16	Relational Predicate Logic with Identity	268
16.1	Limits of Relational Predicate Logic	268
16.2	Extending the Truth Tree Method to RPL ⁼	270
16.2.1	<i>Identity-out Rule</i>	270
16.2.2	<i>Identity-in Rule</i>	271
16.3	Sameness and Distinctness in English	273
16.3.1	<i>'Only' Again</i>	273
16.3.2	<i>Words of Distinction: Except, But, Other (than), Besides, Else</i>	274
16.4	Numerical Adjectives	276
16.4.1	<i>At Least n</i>	276
16.4.2	<i>At Most n (No More than n)</i>	279
16.4.3	<i>Exactly n</i>	281
16.4.4	<i>Counting Pairs</i>	283
16.4.5	<i>Combinatorics (optional)</i>	283
16.5	Definite Descriptions	284
16.5.1	<i>The Definite Description Quantifier Procedure</i>	288
16.5.2	<i>Definite Descriptions as Anaphors</i>	289
16.5.3	<i>Plural Definite Descriptions</i>	289
17	Verbs and their Modifiers	294
17.1	Prepositional Phrases	294
17.2	The Event Approach	296
17.3	Indirect Support of the Event Approach	298
17.3.1	<i>Fixing Referents and Binding Anaphoric Pronouns</i>	298
17.3.2	<i>Quantification over Events</i>	299
17.3.3	<i>Conversational Inferences and Events</i>	300
17.3.4	<i>Methodological Reflections</i>	300
17.4	Adverbial Modification	301
17.5	Problems with the Event Approach	304

Appendix	308
A1 Conjunction	308
A1.1 <i>Prepositional Phrases</i>	308
A1.2 <i>Conversational Inferences and Deductive Validity</i>	309
A1.3 <i>Relative Clauses</i>	311
A2 Negation and Disjunction	314
A2.1 <i>Modalities and Negation</i>	314
A2.2 <i>Disjunction and Conversational Inferences</i>	315
A3 Conditionals	315
A3.1 <i>Explication of the Material Conditional Truth Table</i>	315
A3.1.1 Paradoxes of implication	318
A3.1.2 Conditionals and conversational inferences	318
A3.1.3 Paradoxes of implication revisited	320
A3.2 <i>'If's and 'Then's without Conditionality</i>	321
A4 Property Predicate Logic	321
A4.1 <i>Only</i>	321
A4.2 <i>Conversational Inferences</i>	322
A4.2.1 Existential import	322
A4.2.2 Scalar inferences	323
A4.3 <i>More on Literal Meaning</i>	324
A4.4 <i>Adjectival Modification and Predication</i>	325
A4.5 <i>A Non-standard Quantifier – Most</i>	329
A5 Relational Predicate Logic	330
A5.1 <i>Passive Voice: Another Argument for Variables</i>	330
A5.1.1 Passive voice for nested quantifier procedure	332
A5.2 <i>Properties of Relations</i>	333
A5.2.1 Symmetry, asymmetry, non-symmetry	333
A5.2.2 Transitivity, intransitivity, non-transitivity	334
A5.2.3 Total reflexivity, reflexivity, irreflexivity, and non-reflexivity	335
A6 Relational Predicate Logic with Identity	337
A6.1 <i>'Only' and Existential Import</i>	337
A6.2 <i>Descriptions and Anaphora</i>	338
A6.3 <i>Plural Anaphora</i>	339
A6.3.1 Plural definite descriptions as anaphors	344
A6.3.2 Singular indefinite antecedents of plural pronouns	344
A6.3.3 Partitives	346
A6.4 <i>Existence</i>	347

A6.5	<i>Intensionality</i>	348
A6.6	<i>Properties of the Identity Relationship</i>	348
A6.7	<i>The Superlative</i>	349
A6.8	<i>Identity and Predicative Adjectives</i>	350
A7	Verbs and their Modifiers	350
A7.1	<i>Infinitives and Gerunds</i>	351
A7.2	<i>Reference to Events</i>	353
A7.3	<i>The Logic of Perceptual Verbs</i>	354
Answers for Selected Exercises		356
Chapter 1		356
Chapter 2		357
Chapter 3		358
Chapter 4		361
Chapter 5		363
Chapter 6		364
Chapter 7		366
Chapter 8		373
Chapter 9		378
Chapter 10		381
Chapter 11		392
Chapter 12		397
Chapter 13		398
Chapter 14		400
Chapter 15		413
Chapter 16		419
Chapter 17		426
Appendix		427
Logical Symbols		429
Index		430

Preface to Revised Second Edition

This is the revised second edition of *Meaning and Argument*. There was also a revised first edition. In this version, the revisions concern mostly added exercises and their solutions. We also corrected errors throughout – we hope the book is as close to error-free now as possible. We added some discussion of conversational inferences (e.g., “or” cases) and subjunctive conditionals.

We would like to thank the supportive criticism of Paul Gomberg as well as the invaluable assistance of Alex Anthony and Una Stojnic. We dedicate this new edition to all three of them.

Preface to Second Edition

This is the second edition of *Meaning and Argument*. There was also a revised first edition. In this latest version the revisions concern mostly issues surrounding anaphora. The account of “donkey” anaphora (anaphora between quantifiers and pronouns that are not in their syntactic scope) from the previous editions has been systematically reworked and extended to all of the connectives (via a “repair” algorithm). Furthermore, we have been able to treat anaphora between the premises, or from a premise to the conclusion, of an argument. We have also extended the account to plural pronouns. This is very much an active area of research, and as a result we introduce several competing accounts (for instance Geach’s “pronoun of laziness” account and Evans’ “E-type” account) with different areas of coverage. We have also added techniques for building countermodels, and revised each chapter and appendix in light of new research in order to improve reader comprehension.

Preface to Revised Edition

Some typographical errors and other infelicities were found in the first edition of this book. I want to thank Blackwell Publishing and in particular Jeff Dean for encouraging me to put together a new revised edition. Most of the corrections I have already put up on the home page for the book, <http://www.wiley.com/go/meaningandargument>. It also seemed to me (and my students) that some of the exercises were less helpful than they should be. So I have revised many of the exercises – cutting here, adding there, re-ordering – throughout. In addition, I've elaborated on issues I thought should be elaborated upon – e.g., anaphora, predicative adjectives, 'exactly', negation of existentials, and numerical quantifiers.

I had wanted to add new chapters on natural deduction – in addition to the tableaux ('truth tree') method already in the book – but discovered that this addition would require too many chapters for merely a revised edition. So I have put up a natural deduction system with strategies and exercises on the book's home page.

A number of people have sent me useful comments on this book since its publication. I'd like to thank them here. Herman Cappelen, Walter Dean, Toby DeMarco, Georg Dorn, Ray Elugardo, Edmund Gettier, Kent Johnson, Matt Philips, T. W. C. Stoneham, and Alan Weir.

A very special thanks goes to Sarah-Jane Leslie. Sarah-Jane has been a participant in every single aspect of this book and its uses since its publication. She was in the first class I taught using the book after it was published. She found several errors and has made numerous recommendations for how to improve this new edition, including writing up some of the new sections. She put together the home page for the book and continues to maintain it. I cannot thank her enough. I dedicate this new revised edition to her.

Acknowledgments

I (and others) have taught various drafts of this book; so first I thank the literally dozens of classes that have had to put up with my working out these materials in front of them. I enjoyed it immensely (I still do), but I also realize how frustrating it must have been for many students. Many other logic books have influenced me in one way or another, so many that I cannot even recall them all. In addition, so many discussions with colleagues and students have caused me to rethink much of what I had said that it's impossible for me to thank each and every person who has contributed to the final product. I don't even like the sound of that – the final product. The only way I was able to convince myself to let this book go into print was by thinking of it as but one more draft, to be revised as soon as I distribute the first published copy and begin a new semester.

Logic is not the sort of subject that jumps to mind in pondering friendship, but in reminiscing about who among my colleagues contributed to the development of this book I was struck with a rather strong (but not perfect) link between colleagues and long-term, recent, past, or current friends.

I began thinking about reasoning in high school. My then and still close friend, my first friend, is Brian McLaughlin. We spent years trying to solve various logical *conundra* like how on earth the Virgin Mary could have been a virgin and still have given birth to Jesus. In college I had the good fortune to find myself in the classroom of several terrific teachers, but three that stand out vis-à-vis logic are Ed – the Jet – Gettier, Terry Parsons, and Steve Herman. From Steve I learned about the joy of philosophy, and I'll say more about him below. Ed Gettier continues to make me wonder what went wrong with my generation. I was under 20, barely articulate, a terrible Jersey public high school education holding me back, yet Ed never failed to figure out and answer what I was trying to ask. Like many others who went through UMass, I still treasure my collection of napkins chock full of Ed's ideas and notes and

passion for logic and philosophy. Terry Parsons was the first philosopher I got to know who knew a lot of logic, and, boy, could he teach it. I don't have napkins from Terry, but I have precious notes. I continue to learn from him. It's rare to hook up with someone as smart as Terry who also takes joy in teaching esoteric subjects and does it so well.

When I got to graduate school I thought I knew a fair amount of logic. I suppose I did, but not as much as I thought. John Wallace spotted that right away. He was the first philosopher who taught me how powerful a tool logic can be without having to ram it down everyone's throat. Michael Root, the other chief influence on me in graduate school, taught me how to teach logic. I assisted him in several introductory logic courses. Lots of the examples in this book are cribbed from his excellent notes.

Sometime toward the end of my graduate education I came into personal contact with Donald Davidson. Under his influence I came to see that logic was an important device for thinking about natural language. I'm not sure why it took so long for me to figure that out. This book has ultimately been shaped by Davidson's wisdom about the importance of semantics for thinking about natural language. Just one more debt I owe Donald.

In 1979, I spent a summer living with Barry Loewer while we were both attending a National Endowment of Humanities seminar run by Dick Grandy. I got a lot out of that seminar, but most memorable from that summer is the beginning of a long and continuing intellectual and loving friendship. Anyone who knows Barry knows that he knows his way around hard philosophy as well as anyone in the profession. After having been set straight by him, we merrily proceeded over the next decade to collaborate on well over a dozen articles, some of which we both still believe.

When I took a job at Rutgers University, I hooked up with Bas van Fraassen – the Bas. We were both single and new to New Jersey. I still smile thinking about our hopping back and forth between my place on St Mark's Place in the East Village and his home in Princeton. Bas did a lot for my self-confidence. If anyone as smart as he is didn't think what I was saying was stupid, I figured I had to be on to something. More importantly, Bas, even when critical, knew how to dish it out gently and affectionately – we can all learn a lot from his example.

Around that same time I joined a trio, Dr E. Saarinen and Colin – the Ace – McGinn being the other two members. Esa, Colin, and I bounced around Helsinki, London, and New York City. Although we were all intensely interested in philosophical logic, I'm not sure how much influence we exerted over each other on that front. What I do recall quite fondly about the two of

them, though, is how they pressed me to work things out for myself, and to rely less on others. I hope some of that comes through in this book. To the extent that it does, it's intentional.

As the years passed, I came to know Willard Van Orman Quine. It took me about five years not to be intimidated just by being in his presence. Once I got over that initial star shock, I began to talk with him about logical form. It's no accident that he has come to be known as the father of American philosophy. No introductory logic book can replace his *Methods of Logic*, and it would be folly to try to do so. My route was to try to amplify on his superior lead.

More recently I came under the spell of Jerry Fodor. We wrote a book together and a number of critical essays. No matter how strange one finds what Jerry sometimes says in and out of print, there is no denying how damn good he is at philosophy. No one else I know sees the dialectic as quickly and as well as he. I'm more than appreciative for the good number of times he's challenged me on a piece of faulty reasoning before I put it into print.

Three years ago I decided I should try to publish my logic notes. That decision brought me back full circle to Steve Herman, my first philosophy teacher. I had a draft of the book ready to hand to Steve Smith, my friend and editor at Blackwell Publishing. I visited Steve Herman in Maryland one weekend and showed him that 'final' draft. After a few hours he told me he thought it could be turned into a good book with another year's hard work. He also agreed to help. It never occurred to me to move any faster. Steve was off by at least two years; but it's been great fun helping him finish my book.

There are many others. I've been blessed to have so many clear-headed, smart friends, young and old. During the past year or so a number of graduate students have become involved in helping me rewrite: in particular, Jeff Buechner, Kent Johnson, Jonathan Cohen, and Phillip Robbins. In the final stages of putting together this book, Herman Cappelen graciously taught it at Vassar College. He and his students offered keen criticism. Stephen Neale has taught us all much about descriptions, from which chapter 16 has benefited. On the penultimate draft, Bernie Linsky, Barry Schein, and especially Bob Hale showered me with criticism, all of which was very helpful. There are others I'm sure I've neglected to thank. Next time. The book is dedicated to two old friends, for whom it would be nothing close to exaggeration to say that this book is as much theirs as mine in ways only they know.

For Steve Herman and Dick Foley.
I'm a lucky person to be their friend.

Introduction to Teacher

Often misunderstanding or conflict results from people not getting clear with each other. We take for granted that our language is an adequate vehicle of expression, but it isn't. Although formal logic texts typically take on the task of helping students clarify ambiguous language, they tend to focus more on proof making, determining when a conclusion follows from its premises. Students should be taught to test the validity of formalized arguments, but a reasonable expectation is that they express themselves clearly before drawing conclusions. A primary task of logical skill development should be to give students tools for capturing adequately in a notation arguments they express in a natural language. To this end, language should play about one half of the project in a logic course, though it rarely does, at least not explicitly. Whether logic teachers are aware of it or not, it's impossible to teach how to evaluate arguments from natural language without dabbling a bit in philosophy of language. (Of course, introductory logic can be taught exclusively on formal proofs in formal languages. Many try to do so. Why such courses should be taught in philosophy programs and not in mathematics or computer science programs is a mystery to me; indeed, why they should be taught at all eludes me as well.) *Meaning and Argument* shifts away from traditional emphasis on proofs (manipulation of a formal system) to symbolization of arguments of English in a formal system. It does so while still introducing students to what they ordinarily learn in an introductory logic course: truth tables, validity, propositional logic, predicate logic without and with identity, formal proofs, consistency, and so on. *Meaning and Argument* is not so bold as to claim that symbolization techniques are mechanical, but nor is it so cavalier as to suggest that manipulating natural language arguments into formal languages is an unteachable skill that one either has or doesn't have.

Another distinctive feature of *Meaning and Argument* is that it shows how the need for expressive power and for drawing distinctions forces formal

language development. In this sense the book is Quinean in spirit: symbolization (or, to use Quine's term, regimentation) should be ruled by the maxim of 'shallow analysis'. As Quine counsels us, 'expose no more logical structure than seems useful for deduction or other inquiry at hand' (*Word and Object*, p. 160). Symbolization is a tool useful for sorting out those linguistic constructions which can be rendered within the framework of a given logic from those that cannot be so regimented.

Some logic teachers might be tempted to dismiss rudimentary systems like the Propositional Calculus because they lack the complexity of logical apparatus needed to prove the validity of arguments we know intuitively to be valid. *Meaning and Argument* starts with these more elemental systems, however, using them to guide students through an idealized journey of thought. The purpose is to retrace what one might imagine were the paths which great logicians traveled as they elaborated simpler formal systems. In this way the book tries to get at why things might have happened as they did. The process is not necessary. Given modern tools and diagnostic devices, a mechanic can be trained to identify a malfunction and correctly replace the malfunctioning part without ever having torn apart an engine and rebuilt it. Intuitively there is something to be said on behalf of the latter approach, at least insofar as getting back on the road is one's primary objective. But in the case of formal logic, we should want more than mechanical translation and testing of validity. Understanding formal systems and how they work and develop can be a valuable part of a curriculum that has as one of its goals to train systematic and scientific thinkers.

At the introductory level much that has passed as logic teaching is how-to, feel-good education, which has as its main purpose to help students get the right answers. Often this endeavor leads to well-intentioned efforts to give students recipes, step-by-step techniques, that render the processes of symbolization and proof making mechanical. Teaching students to treat conjunctions, conditionals, universal statements, or any other sort of logically complex expression as a purely grammatical matter is too facile, giving a temporary illusion of success at the early stages. This book stresses understanding; it sensitizes students to the contextual nature of language, and thus to the importance of not being lulled into automatic symbolizations based on grammatical structures alone. At each stage of system elaboration and development, the book seeks to answer the meta-logical questions:

Why is a particular formalism needed?
What form should it take?

These questions engage students in an inquiry, which allows them to see logical studies as a human enterprise aimed at achieving well-understood goals – clarity and good reasoning. When students realize that systems are elaborated and developed so that increasingly complex and ambiguous statements can be clearly stated and so that valid arguments can and invalid arguments cannot be proved, the entire subject matter begins to make sense. Instead of symbolizing statements and devising proofs without knowing why, students come to see the forest for the trees.

This book answers its main questions by proceeding from a simple formal language to increasingly more complex formal languages and by explaining the reason for each complication. The moves from propositional to property predicate logic, to relational predicate logic, and finally to relational predicate logic with identity are made clear to the student at each step. In this sense the book is progressive; yet, from the first chapter to the last, the book should be accessible to a novice.

In addition, this book introduces the student to the differences between logical and conversational implications. Throughout, the case is made that many logical fallacies may best be understood as failures to distinguish reasonable conversational inferences from strict logical deductions.

Instructional method: Meaning and Argument proceeds inductively in a pedagogical sense. An example either of a statement or an argument is given. The student's intuitions are tested: What does the statement mean? Is the argument intuitively valid? Does the logical system presented, at its current level of development, enable us to capture this sense, clear up ambiguities, and prove validity? If not, how might the system be elaborated?

In the case of symbolization, *Meaning and Argument* contributes to the literature of logic pedagogy. It provides the student with procedures for symbolizing complicated locutions from English into the appropriate formal notation, a systematic and manageable process that leads almost invariably to correct symbolizations.

Relation of book to current linguistic theory: In the last 50 years linguists, logicians, philosophers, and computer scientists have assembled a substantial and highly sophisticated body of work on the structure of natural language. Inasmuch as *Meaning and Argument* aspires to be an introduction to the tools and techniques for studying natural language, one might expect the book to incorporate some of this burgeoning literature. However, anything less than a comprehensive, even if not a critical, review of that literature

would be superficial and, I expect, confusing for most introductory students. Furthermore, an introductory book of this nature is better kept independent of current technical trends. For example, some very important recent contributions by formal semanticists are not acknowledged here. The bibliographies at the end of most chapters, however, list this burgeoning literature.

A Brief Introduction to Key Terms

1.1 Arguments

Arguments crop up in conversations, political debates, lectures, editorials, comic strips, novels, television programs, scriptures, films, graffiti, posters, on the net, and so on. Ordinarily when we argue with others, we try to persuade them of some point. The forms of persuasion are many. We can persuade others by hitting them, by screaming at them, by drugging them, and so on. These kinds of persuasion are, unfortunately, prevalent. However, in this book we will use the term ‘argument’ exclusively to pick out sets of statements of the following sort:

Provided the fetus is a person, a fetus has a right to life. Should a fetus have a right to life, it is false that someone has the right to take its life. However, if abortions are moral, someone does have the right to take the life of a fetus. Consequently, if a fetus is a person, abortions are not moral.

Lung cancer is not caused by smoking, and this is so for the following reasons. Lung cancer is more common among male smokers than among female smokers. If smoking were the cause of lung cancer, this would not be true. The fact that lung cancer is more common among male smokers implies that it is caused by something in the male makeup. But if caused by this, it is not caused by smoking.

Anyone who deliberates about alternative courses of action believes he is free. Since everybody deliberates about alternative courses of action, it follows that we all believe ourselves to be free.

What do these passages have in common in virtue of which each is an argument in our sense? In this book an argument is any set of *statements* – explicit

or implicit – one of which is the *conclusion* (the statement allegedly being defended) and the others are the *premises* (statements allegedly providing the defense).¹ The relationship between the conclusion and the premises is such that the conclusion purportedly *follows from* the premises. This description of an argument leads us to ask what statements are, and what it means to say that one statement follows from others.

1.1.1 What is a Statement?

A statement is any declarative sentence that is either true or false.² The following are statements:

Galileo was an astronomer.
 Provided the fetus is a person, a fetus has a right to life.
 No one but Nixon knew the truth.
 Lung cancer is not caused by smoking.
 Everybody deliberates about alternative courses of action.
 Martin Van Buren was not the ninth president of the United States.

Interrogatives, imperatives, and exclamations are sentences that are not statements; for example:

Is George Washington president?
 Shave yourself!
 Wow!

1.1.2 Premises and Conclusion

A main aim in learning logic is to enhance skills in assessing arguments as we find them. But arguments cannot be assessed unless they are first identified as arguments. Although there are no sure signs of whether an argument is present, fairly reliable indicators exist.

Premise indicators: Premise indicators are terms that indicate that a premise will immediately follow. In the second argument in §1.1 above, the first sentence ends with ‘this is so for the following reasons’. This clause indicates that the statements which follow are the premises of this argument. The third argument has a second sentence that begins with the word ‘Since’, indicating that a premise is about to be introduced. Other such expressions include ‘because’,

‘for’, ‘after all’, ‘given’, ‘whereas’, ‘although’, ‘suppose’, ‘assume’, ‘let us presume’, ‘granted’, ‘here are the facts’. When a premise indicator starts a clause, then what follows the premise indicator is usually a premise.

Conclusion indicators: Likewise, when a conclusion indicator starts a clause, then what follows is usually a conclusion. In the first argument in §1.1 above, the last sentence begins with the word ‘Consequently’, indicating that it is the conclusion. Other conclusion indicators include ‘therefore’, ‘so’, ‘hence’, ‘it follows’, ‘... proves’, ‘... shows’, ‘we can now infer’, ‘it cannot fail to be’, ‘let us conclude’, ‘this implies’, ‘these facts indicate’, ‘this supports the view or claim’, ‘let us infer’, ‘as a consequence we can deduce’.

Many passages contain arguments but none of these indicators, and some passages contain one or more of them without stating a premise or a conclusion. Indeed, the indicators seen most frequently are often used as neither conclusion nor premise indicators, as in the following sentences.

How long has it been **since** you last saw him?

He is **so** good at what he does.

For two years he has been away.

After all these days, you come home.

Let us go **hence**.

None of these sentences is being offered as a premise for some conclusion or as a conclusion from some premises. Even though each contains familiar indicator terms, obviously the terms are not being used as indicators in these sentences.

Alternatively, one may simply announce that an argument is forthcoming, and then go on to affirm several statements. In this case, the context makes clear that the last statement is the conclusion and the others are premises. Still, some terms are almost always used as conclusion or premise indicators. It’s hard to imagine a context in which ‘on the assumption that’ is not a premise indicator or ‘as a consequence it follows’ is not a conclusion indicator.

1.2 Putting Arguments into a Standard Format

Having determined that some piece of discourse contains an argument, the next task is to put it into a standard format. This task may involve all of the following:

- i. Identifying the premises and the conclusion.
- ii. Placing the premises first. (Order does not matter.)
- iii. Placing the conclusion last.
- iv. Making explicit any premise or even the conclusion, which may be only implicit in the original but essential to the argument.

So standard forms for the above three arguments are:

Provided the fetus is a person, a fetus has a right to life.

Should a fetus have a right to life, it is false that someone has the right to take its life.

If abortions are moral, someone does have the right to take the life of a fetus.

If a fetus is a person, abortions are not moral.

The first three statements are premises, and the fourth is the conclusion.

Lung cancer is more common among male smokers than among female smokers.

If smoking were the cause of lung cancer, this would not be true.

The fact that lung cancer is more common among male smokers implies that it is caused by something in the male makeup.

If it is caused by this, it is not caused by smoking.

Lung cancer is not caused by smoking.

The first four statements are premises, and the fifth is the conclusion.

Anyone who deliberates about alternative courses of action believes he is free.

Everybody deliberates about alternative courses of action.

We all believe ourselves to be free.

The first two statements are the premises, and the third is the conclusion.

In none of the arguments is a premise or a conclusion missing. Nothing said so far explains exactly how we were able to devise these standard forms based on what we were presented with. So far our process has been rather loose, and it cannot be tightened until we say something substantive about when one statement follows from some others.

1.3 Multiple Conclusions

As we have characterized arguments, no argument can have more than one conclusion. Of course, sometimes we do find passages with more than one conclusion. There are two types of cases. The first occurs when more than one conclusion is drawn from the same set of premises. For such a case we adopt the convention that distinct arguments can have the same premises, but different conclusions. So, for example, (1)–(4) below include two distinct arguments. (1)–(2) are premises, and (3)–(4) are conclusions. So (1)–(3) constitute one argument; and (1)–(2) and (4) constitute another distinct argument.

1. All women are mortal and rational.
2. Andrea is a woman.
3. So, Andrea is rational.
4. So, Andrea is mortal.

The second case occurs when we chain arguments together so that a single statement serves as both a premise and a conclusion. In this case the conclusion of one argument functions as a premise of another. (5)–(9) include two arguments.

5. Killing children is evil.
6. Children were being killed in Bosnia.
7. Therefore, someone was doing something evil in Bosnia.
8. When someone does something evil, he should be punished.
9. So, whoever killed children in Bosnia should be punished.

(5)–(6) are premises of an argument with (7) as its conclusion. However, (7) is also the premise of an argument, which along with (5), (6), and (8), has (9) as its conclusion.

Exercise 1.1 Standard form

- Put arguments (1)–(4) into a standard form.
1. If we are going to avoid a nuclear war in the next few years, we will have to adopt strong punitive measures now. But if we adopt such measures,

- many nations will be very unhappy. Thus, we are going to avoid a nuclear war in the next few years only if many nations are going to be unhappy.
2. The state will increase its financial support of our university only if the priorities of the legislature shift in favor of higher education. But if such a shift were to occur, the people who benefit from other state projects would complain bitterly. If the state does not increase financial support for the university, tuition will have to be raised. So, tuition will be raised.
 3. If a man is to play some role in society, that role must be determined by nature or by society. However, if his role is determined by nature, that role will be the role of the selfish hunter on the make. Hence, either society determines a role for man, or man will play the role of the selfish hunter always on the make.
 4. If it is true that 30 out of every 50 college coeds have sexual intercourse outside marriage, then it is very important to have birth control information available from the Student Health Service. It is very important to have birth control information available from the Student Health Service. Thus, we know that 30 out of every 50 college coeds have sexual intercourse outside marriage.
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1.4 Deductive Validity

What is it for one statement to follow from others? The principal sense of ‘follows from’ in this book derives from the notion of a deductively valid argument.

A deductively valid argument is an argument such that it is not possible both for its premises to be true and its conclusion to be false.

So, consider argument (10)–(12).

10. The current Vice-President will win the next election.
11. If the current Vice-President wins the next election, then the country will prosper.
12. So, the country will prosper.

This is an argument in which the conclusion follows intuitively from its premises. But what is it about (10)–(12) that makes us think that (12) can