

CONTENTS

Preface	viii
1 Meaning and Logic	1
1.1 Linguistic Meaning	4
1.2 Logic and Language: A Bit of Background	7
Part I: The Classical Picture	
2 Truth Table Logic	15
2.1 Connectives	15
2.2 Syntactic Definitions	20
2.3 Semantic Definitions	22
2.4 Modes of Inference	23
2.5 The Deduction Equivalence	25
2.6 Testing for Validity: The Tree Method	26
2.7 Truth Functions	28
2.8 Notations	30
3 Predicates	33
3.1 Predicates	33
3.2 Syntax of Predicate Logic	37
3.3 Models for Predicate Logic	38
3.4 Sets and Lexical Semantics	40
3.5 Sets and Connectives	42
3.6 Properties of Relations and Functions	43
3.7 Algebraic Background I	47
4 Quantifiers	53
4.1 Syllogisms	53
4.2 Syntax of First Order Quantification Theory	56
4.3 Semantics of First Order Quantification Theory	58
4.4 Relations between Quantifiers	60
4.5 More Quantifiers	62
4.6 Translating into First Order Logic	63
4.7 First and Higher Order	63

5	Functions: The Lambda Calculus	67
5.1	Predicates as Functions	68
5.2	Syntax of the Lambda Calculus	74
5.3	Semantics of the Lambda Calculus	78
5.4	Connectives and Higher Order Logic	79
5.5	More Types	81
5.6	Combinators	85
Part II: Modality		
6	Possibility and Necessity	91
6.1	Modal Logics	91
6.2	Syntax of Modal Logics	100
6.3	Semantics of Modal Logics	102
6.4	Modal Systems	104
6.5	Modal Realism and First Order Logic	116
7	Worlds and Individuals	123
7.1	Introduction	123
7.2	Syntax of Quantified Modal Logic	132
7.3	Semantics of Quantified Modal Logic	133
7.4	Scope Interaction in Quantified Modal Logic	135
7.5	Higher Order Modal Logic	139
7.6	Epilogue to Part II	141
Part III: Negation and Partiality		
8	Many Valued Logics	145
8.1	Introduction	145
8.2	Syntax of Many Valued Logic	151
8.3	Semantics of Many Valued Logic	151
8.4	Presuppositions	157
8.5	Going Higher Order	163
8.6	Probability and Fuzziness	164
8.7	Algebraic Background II	171
9	Situations and Information	176
9.1	An Outline of Situation Semantics	176
9.2	The Notation of Situation Theory	180
9.3	Situation Semantics	182
9.4	Some Linguistic Issues	185
9.5	Back to Logic?	187
9.6	Channel Theory	188
9.7	Visual Logic	189
9.8	Epilogue	192

10	Intuitionism and Constructive Proof	194
10.1	Intuitionism and Natural Deduction	195
10.2	Syntax of Intuitionistic Logic	202
10.3	Semantics of Intuitionistic Logic	202
10.4	Relation to Situation Semantics	205
10.5	Constructive Proof and Labelled Deduction	206
10.6	Intermediate Logics and the S4–S5 Spectrum	208
10.7	The Curry Howard Isomorphism	211
10.8	Algebraic Background III	216
10.9	Epilogue to Part III	217
Part IV: Substructural Logics and Categorical Grammar		
11	Relevance, Resources and Order	223
11.1	Structural Rules	223
11.2	Syntax of Substructural Logics	234
11.3	Semantics of Substructural Logics	236
11.4	Frame Conditions	238
11.5	Characterisation of Proof Terms	241
11.6	Connectives in Substructural Logics	244
11.7	A Few Words about Quantifiers	253
11.8	Applications outside Categorical Grammar	254
12	Grammar as Logic	260
12.1	Basic Issues	261
12.2	Logical Syntax of Categorical Grammar	267
12.3	Semantics of Categorical Grammar	268
12.4	The Gentzen Calculus	269
12.5	Multi-Modal Categorical Grammar	274
12.6	Discontinuity	275
12.7	Symmetric Logic	276
12.8	Adding Semantics	279
13	Combinators	283
13.1	Introduction to Combinators	283
13.2	Combinator Syntax	290
13.3	Combinator Semantics	292
13.4	Combinatory Categorical Grammar	292
13.5	More Combinators	296
13.6	Pairing and Truth Functions	298
Bibliography		302
Index		310