TIME AND THE VERB

A Guide to Tense & Aspect

Robert I. Binnick

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Cui dono lepidum novum libellum . . . tibi. . . .

Catullus

To Wendy, with much love,
this little book is dedicated.

PREFACE

Whoever has read in one book that English has three tenses, in another that it has two, and in yet a third that it has sixteen; or has been told by one authority that the French *imparfait* represents an incomplete or habitual action in the past, by a second that it is used of an action simultaneous with another action, and by a third that it is used for circumstances and background description; or has read in one text that the perfective tenses of Russian are just like the perfect tenses of English, but in another that they are totally different; or has read here that Biblical Hebrew has tenses and there that it does not, may be pardoned for some confusion and some skepticism as to the claim of linguistic scholars to know a great deal about tense.

The reader may be surprised to learn that tense has been studied for almost twenty-five hundred years, since at least the time of the ancient Greeks, and that hundreds of books and articles have been devoted to it in general, and thousands more to the tenses of particular languages. It is no contradiction to say that we know a very great deal about tense, but understand it little. In the two decades since Robin Lakoff wrote that we "cannot account for many ways in which tenses are used in English and other languages," our knowledge of tense has increased greatly, but our understanding of it has deepened less.

It has been difficult even to know how much we do understand it, for confusing as discussions of the tenses of various languages may be, the scholarly literature concerning tense in general is, if anything, even more confusing. Philosophers, logicians, grammarians, general linguistic scholars, and scholars of particular languages approach tense in very different ways, with differing goals, and with assumptions drawn from sundry scholarly traditions, often employing confusing terminology and arcane symbolism inaccessible to outsiders, and applying special methods grounded in some particular school of linguistics or logic.

For example, an understanding of how distinctions of time are made in Arabic can be extremely important to many who do not know Arabic and have no interest in learning it but wish to understand what tense, in general, is all about. But Semiticists writing about Arabic often do not transliterate examples given in Arabic script, provide no detailed translation (or no translation at all), and use a special terminology unknown outside of Semitic studies.

The present work attempts to provide a complete guide to grammatical tense and the kindred phenomenon of grammatical aspect, both to characterize what we have learned about the expression of time in the verb and to render accessible to the interested reader as much of the relevant literature as possible.

Though it uses the methods and findings of linguistic science, this book is designed to be useful to anyone, scholar or layperson, who wishes to understand tense and aspect. Assuming on the part of the reader minimal background in grammar and linguistics, it presents the facts and theories which have been brought forward in the ongoing investigation of tense and aspect, explains in as nontech-

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nical language as possible the terminology and symbolism used in the scholarly literature, and builds from the simplest concepts and approaches to the most complex.

This book does not pretend to present a coherent general theory, which scholars remain far from achieving, though at the end of the 1980s the outlines of one have perhaps begun to emerge. Nonetheless, it should contain as good an account as any available of the meanings and uses of the various tenses found in the languages most familiar to speakers of European languages, based on what is known about tense in general.

Comrie's *Tense* (1985) and *Aspect* (1976) have been criticized for excessive concentration on certain familiar languages. I would offer criticisms of both books, fine though they may be—obviously the present work was written because I believe they left a serious need unfilled—but I think this particular criticism invalid. The mere recitation of curious facts about a large number of "exotic" languages is in itself neither useful nor revealing. The languages discussed here are cited because facts about them illustrate points of theory or have been used to argue for or against certain hypotheses.

Emphasis has been placed on familiar languages not only because the discussion is more likely to be accessible to the reader but also because, for the most part, only the more familiar languages have been well-explored and entered crucially into theory-formation (with the noteworthy exception of the Bantu language Kikuyu). If the present work discusses mainly Greek, Latin, Romance, Germanic, Russian, and—yes—Kukuyu, it is not accidental.

My purpose has been to provide the sort of book James Pickbourn would have liked to have had, just two hundred years ago, when he was mortified to discover that neither he nor anyone else could adequately explain the uses of the tenses of the English verb. After much reading, he "began to suspect the subject [of tense] had never been minutely discussed by any of our grammarians," adding, "the result of these researches I confess much surprised me; for I had read all these authors without ever remarking the deficiency."

The present volume is designed to serve as three guidebooks in one. First, it encompasses a short history of the study of tense (part I) and of aspect (part II). Second, it provides a commentary on and guide to the scholarly literature, especially aiming to aid the reader in approaching the extraordinarily technical work of the last two decades. In chapters 7 and 8, in particular, recent developments are investigated in great detail. Assuming that few readers will have much background in formal semantics, I have included a lengthy introduction. A list is provided of all symbols and abbreviations used, which includes virtually all symbols found in the literature.

Third and last, the book constitutes a guide to the meanings and uses of the various tenses and aspects of the more familiar languages. The summary section points the reader interested in this or that question (e.g., the difference between the *imparfait* and the simple past tense of the Romance languages) to discussions of the various theories offered and of the best current thinking.

An historical approach allows movement from the presentation of the simplest ideas and phenomena to the most sophisticated. Part I begins with the earliest

theories of tense, formulated by the ancient Greeks, and ends with the most recent theories of modern grammarians, formulated in the 1950s and 1960s. Since that time, theories of tense which do not take aspect into consideration, or which are based on traditional methods of grammar, have largely been supplanted, and the study of tense revolutionized, by new goals and methods.

Throughout this period, spanning some twenty-five hundred years, not only did theories of tense become ever more complex as simpler accounts provided inadequate, but the data utilized grew broader and more interesting as well. In chapter 1 we will see that the ancient Greeks largely confined themselves to the question of how many tenses there are. Not recognizing that tense and time are different, they had some difficulty in reconciling the three times—past, present, and future—with the half-dozen tenses of their own language.

Chapter 2 brings us up to the Renaissance, when the study of modern languages began. Though the goal remained one of accounting for the tenses by labeling them, the European languages had developed a much more complex system of tenses than had existed in Greek or Latin, requiring a considerable revision of ancient theories. What emerged were two streams of thought, aspectual theory and the theory of relative tense, which continue to influence research today.

The vast expansion of European exploration brought Westerners into contact with languages manifestly different from the familiar European ones. Starting in the eighteenth century, attempts to apply European grammatical concepts to these "new" languages revealed the inadequacies of the grammatical tradition and led ultimately to a radical break with the past. Nonetheless, the investigation of tense remained hampered by the false assumptions that to describe the meaning of a verb form is to explicate its use, and that contextually defined meanings of a tense are either insignificant or purely derivative of one basic meaning.

It was only in this century (chapter 3) that grammarians began to look at the full range of problems concerning the expression of time in the verb. Whereas formerly very little attention was paid to how tenses were actually used, as opposed to what they ideally meant, the focus on use now revealed a wide range of phenomena previously unconsidered. In particular, the relationship of tense to grammatical constructions and to syntax was specifically examined for the first time. The range of data considered by Hans Reichenbach (1947), William Bull (1960), and Robert Allen (1966) was far greater than that utilized by earlier scholars.

In part II the historical approach must be partly abandoned, since most important work on aspect is relatively recent. Although Aristotle discussed it some twenty-four hundred years ago, and aspect entered the Western grammatical tradition through Slavic studies not long after 1800, the modern concept of aspect was established only as recently as the 1930s. In our century tense and aspect have increasingly been viewed as two complementary facets of one set of phenomena (work on languages has revealed yet a third, called "status").

Part II first examines the traditional theory of the type of aspect found in Slavic languages (chapter 5), then shows how that theory was applied to Greek aspect, and finally (especially in chapter 6) illustrates how contemporary approaches developed largely in response to the failure of that enterprise.

Contemporary research on tense and aspect consists of two broad streams very much in opposition. The first, heavily influenced by philosophical logic, emphasizes explicitness and formal rigor, placing great emphasis on technical details. These theories (chapter 7) emphasize semantics in the narrow sense of a referential theory of how language is linked to the external world, and assume that the uses of an expression in some way follow its meaning or meanings, or at least that meaning is independent of use.

But scholars who have had to deal with real language as it occurs in literary texts or records of actual conversation are aware that the uses of tenses and aspects often do not accord with their nominal meanings. This second, informalist, stream (chapter 8) contains work by scholars who have emphasized use rather than meaning and have expressed some skepticism in regard to the notion of "the" meaning of a form or expression; some have gone so far as to propose that meaning follows use rather than the reverse. The methods of such scholars owe more to literary than to logical analysis. The two streams appear to be uniting in the work of those formal semanticists who apply to research on tense and aspect in discourse and text both the results of the informalist school and the methods of formal semantics.

The purpose of part II is, to a great extent, to explicate the various contentious issues in current research, to characterize what each of the schools of thought has achieved, and to point out problems remaining to be solved. As it happens, there are many such issues which either fall beyond the scope of tense and aspect proper (though they are related to them) or have not been treated by either of the current methodologies. Such borderline issues are not discussed at length, but some are described at the conclusion of part II.

The most important omission here is that of mood. While mood does not bear directly on temporal distinctions, it is so closely related to tense and aspect that originally this book was conceived of as a guide to tense, aspect, *and* mood. The reader interested in mood can refer to Palmer's *Mood and Modality* (1986); in the present work mood and modality are discussed only as they relate to tense and aspect.

Of necessity, emphasis has been placed on materials written in English and readily available to the average reader. Nonetheless, many obscure works in a number of languages have had to be utilized. Frequent quotation from these and other sources has been necessary because much of this material has never been translated or even, in some cases, edited or reprinted. It seemed worthwhile to let Priscian and Scaliger speak in their own (albeit translated!) words, as well as some contemporary writers (in and out of English) who are unusually articulate (or, occasionally, arcane). My own in-text translations of a source are indicated by "(tr)" following the entry in the References.

For a number of reasons, scholars writing in and about English are overrepresented here. While there is a very large and interesting body of literature—much of it untranslated—on the languages of the Soviet Union, practically none of this material is readily available, nor has it significantly affected Western scholarship. This is regrettable, as aspectological studies in eastern Europe and the Soviet Union have advanced further than most scholars in the West realize.

Despite the length of the present book, a great deal of material has unavoidably been omitted, and many scholars have perhaps been slighted. The tradition of tense logical studies represented by the work of Åqvist, Bäuerle, Guenther, Hoepelman, and Rohrer, while extraordinarily interesting, ultimately seems foreign to the concerns of the traditions discussed here.

I would have liked to say more as well about the ideas of Bartsch, Coseriu, Cresswell, Givón, Guillaume (and his followers), and Joos, and to have explained at greater length the foundations of Situation Semantics. More use could perhaps have been made of the work of Imbs (1960), Schogt (1968), Martin (1981), and Vet (1980, 1981, 1983) on French; of Hackman (1976) and others on Hindi and other Indian languages; of the extensive literatures on Japanese, German, Turkish (e.g., Johanson, 1971), and Slavic aspect aside from Russian; of Bertinetto (1986a) on Italian; of Holisky (1978, 1980, 1981) on aspect in Georgian; and of Fischer (1973), Cogen (1977), Fischer and Gough (1978), and Frishberg and Gough (n.d.) on American Sign Language; as well as S.-G. Andersson (1972) on telicness. I might have delved as deeply into the other "tenseless" languages, especially the creoles and sign languages, as I did into Biblical Hebrew. Since completing the manuscript, a number of interesting works have appeared which I have unfortunately not been able to utilize.

If I have insisted on a historical approach, it is partly because I do not share the prevailing prejudice that linguistic scholars need not concern themselves much with the works of the past. The consequence of this attitude is constant reinvention of the wheel and repeated announcement of the imminent appearance of the squared circle. In research for this book I have come across more than one publication which presents as novelties proposals already put forward—or rejected—by Aristotle, Jespersen (1924), Reichenbach (1947), and others in between.

Already in 1751 James Harris complained of writers' ignorance of older or foreign writings. What he says of his *Hermes* might equally be said of the present work:

> [It aims] to pass, as far as possible, from small matters to the greatest. Nor is it formed upon sentiments that are now in fashion, or supported only by such authorities as are modern. Many Authors are quoted, that now a-days are but little studied; and some perhaps, whose very names are hardly known.
>
> Nothing can more tend to enlarge the Mind, than . . . extensive views of Men, and human Knowledge; nothing can more effectually take us off from the foolish admiration of what is immediately before our eyes, and help us to a juster estimate both of present Men, and present Literature.
>
> A like evil to that of admiring only the authors of our own age [and our own country], is that of admiring only the authors of one particular Science.
>
> Such then is the Apology made by the Author of this Treatise, for the multiplicity of antient quotations, with which he has filled his Book. If he can excite in his readers a proper spirit of curiosity; if he can help in the least degree to enlarge the bounds of Science; to revive the decaying taste of antient Literature; to lessen the bigotted contempt of every thing not modern; and to assert to Authors of every age their just portion of esteem; if he can in the least degree contribute to these ends, he hopes it may be allowed, that he has done a service to mankind.

If the present book proves interesting or useful and contributes to future research, all the great effort of writing it will have proven worthwhile. The five years spent on the project came to seem interminable, and only the encouragement of wife and friends sustained me in this demanding task.

I gratefully acknowledge here the assistance variously provided by Keith Percival, Peter Salus, Harald Ohlendorf, Ian McDonald, Leslie Kobayashi, Barbara Jacennik, William Ladusaw, and others I may have unfortunately forgotten over the years. I am equally thankful to all those who granted permission to reproduce diagrams. I especially wish to thank my publisher's anonymous reader for useful comments, which I have sometimes ignored (to my peril) but more often profited from. Above all, thanks are due to Robin Lakoff, who with extraordinary kindness provided me with detailed commentary concerning almost every page of part I. The editorial team at Oxford University Press has done an extraordinary job in editing a demanding manuscript. In particular, I wish to thank my copy editor, Clifford Browder, and my associate editor, Henry Krawitz.

Work on this book was begun in two singular buildings—the Dwinelle Library of the University of California at Berkeley, and Frank Lloyd Wright's Marin County Civic Building, which houses the Marin County Library—while I was at Berkeley on a sabbatical research leave from the University of Toronto, which was partly funded by a grant from the Social Sciences and Humanities Research Council of Canada. Without the robber barons of the last century and the taxpayers of the present one, this work might never have been started.

The book may be regarded as an appendix either to Comrie's *Tense* and *Aspect* or to the section on tense in McCawley's *Everything That Linguists Have Always Wanted to Know about Logic*. But perhaps it is best considered an homage to two brilliant works, Pickbourn's *Dissertation on the English Verb* (1789) and Harris's *Hermes* (1751). I can only hope that my book belongs in such illustrious company.

Toronto R.I.B.
March 1991

ABBREVIATIONS AND SYMBOLS

The alphabetical order used for the entries is A, B, C, D, . . . , Z for Latin, and A, B, Γ, Δ, . . . , Ω for Greek. Keyboard symbols follow the order !1@2#3$4%5 ↑ 6&7*8(9)0_–+ ={[}]|\:;''⟨≤,⟩≥.?/~'. The other symbols that follow are listed alphabetically by their glosses; thus ''⇒'' follows ~ and is alphabetized under *e* for *entails*. The difference between upper and lower case is ignored, and variants are ''alphabetized'' immediately following their prototype; ∀ follows A, and slashed epsilon (∉) follows epsilon (∈). Subscripted and superscripted letters follow all letters in the text line; T_E follows TE. < is treated as ⟨, > as ⟩, and — as –.

	Explanation or Gloss	*Page*
A	model	238, 269
ABL	ablative case	59
ACC	accomplishment	402
ACC	accusative (object) case	59
ACH	achievement	402
ACT	active voice	19
ACT	activity	402
All x	universal quantifier	229
AOR	aorist tense	35
AP	Anticipated Point axis	116
ARP	Anticipated Retrospective Point axis	118
ASL	American Sign Language	444
$A_{s,e,r} \models p$	p is true in model A relative to times s, e, r	277
AT	occurrence operator	312
Aux	auxiliary verb, auxiliary component	357
∀	universal quantifier	235
B_A	set of all basic expressions belonging to category A	235
BECOME	operator for becoming	291
BSL	British Sign Language	444
c	connection	334
c	context	227
C	set of syntactic categories	232
CN	category of common nouns	232
ComesAbout	operator for becoming	330
COMP	completive aspect operator	296
COND	conditional	416
CR	current relevance	100
CRS	Current Relevant State	338
C_S	characteristic function for the set S	221
c_s	concept of situation s	337
C_α	set of all constants of type α	234
D	discourse	394
d	discourse situation	334
DAT	dative case	94
dom	domain	336
DRS	discourse representation structure	394

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DS	deep structure	369
DUR(x,y)	occurrence operator: x occurs during y	322
D_α	set of possible denotations of type α	238
e	event	326
E	event time	111, 265, 394
E	eventuality	335
E	set of events	326
e	the type of events (Saurer)	326
e	the type of individual expressions	232
EB	embedded past	100
Ed	underlying past tense (Huddleston)	364
E_i	set of events	402
-en	past participial affix of English	356
EP	embedded past	100
e_r, e_s	reference time, speech act time	402
ET	event time (Smith)	347
ex_a	extension of a	236
E(PPxV)	event (relative to vector x)	116
ê	set of events	326
∃	existential quantifier	235
f	correspondence functor	236
f	fact	335
F	false (truth-value)	218
f	function assigning types to syntactic categories	236
F	operator for definite future time (Tichý)	246
F	Priorian future tense operator	243
FEM	feminine gender	35
Ff	operator for indefinite future time (Tichý)	246
FUT	future tense	33
FUT	future tense operator	247
FUT_{def}, FUT_{indef}	operators for definite and indefinite future tenses	246
g	function assigning denotations to variables	229
G	Priorian "always in future" operator	243
GEN	genitive (possessive) case	35
GG	Generative Grammar	356
GPT	Given Primary Time	420
GPTC	time interval based on a chronology	420
GPTD	time interval of decoding	420
GPTE	time interval of enunciation	420
GPTN	neutral time interval serving as GPT	420
GS	Generative Semantics	354
GST	Given Secondary Time	420
H	operator for the present perfect tense (Montague)	245
h	possible history	291, 327
H	Priorian "always in the past" operator	243
H	set of functions from intervals to truth values	269
H	set of histories	291
HasBeen	perfect operator	265
HAVE	operator for perfect tenses	267
h_c	history with respect to connection c	334
I	interval of time	253
i	reference time (Johnson)	269, 314

I	set of possible worlds (Montague)	238
IAV	category of adverbs modifying intransitive verbs	232
ID	indefinite past	100
iff	if and only if	218
IL	intensional logic	231
IMM	operator for imminent status	263
imparf, IMPARF	imperfect tense	405
IMPERF	operator for imperfect tense	296
IMPF	imperfect	21
IMPF	operator for "imperfect" aspect (Johnson)	296
IMPVE	operator for imperfective aspect	296
in_a	intension of a	236
INDIC	indicative mood	19
INF, INFIN	infinitive	21
-ing	present participial affix of English	356
Inr (I)	set of inertial histories of I	292
IV	category of intransitive verbs	232
j	instant of time (Johnson)	269
J	reference time (Johnson)	297
J	set of times (Montague)	238, 269
j	speech-act time (Dowty)	314
k	event time (Dowty)	319
l	location of a situation	331
L	necessity operator	335
LTL	logical translation language	230
l_u	universal location	336
M	model	229
M	possibility operator	235
MASC	masculine gender	33
ME_α	set of all meaningful expressions of type α	234
MID	middle voice	19
MS, mS	main set, minor set	421
Mu, mu	main unit, minor unit	425
N	operator shifting reference to present time (Kamp)	314
N	the type of names	232
NEUT	neuter gender	84
NL	natural langauge	231
NOM	nominative (subject) case	35
Now, NOW	operator shifting reference to present time	329
NP	noun phrase	351
occ	occurrence operator (Cresswell)	322
OPT	optative (mood)	70
OT	orientation time	348
$^{o}\alpha$	operator o applied to α	240
O_i^+, O_i^-	overlap functions	404
P	predicate	221
P	Priorian past tense operator	243
P_A	set of all phrases (derived expressions) belonging to category A	232
PART	particle	164
PARTIC	participle	35
PASS	passive	21
passé, PASSÉ	simple past tense	405

PASSÉ COMPOSÉ	complex past tense	406
PASSÉ SIMPLE	simple past tense	406
PAST	past tense	471 (ch. 2, n. 60)
Past, PAST	past tense operator	244
$PAST_{def}$, $PAST_{indef}$	operators for definite and indefinite past tenses	246
Perf, PERF	operator for perfect aspect	244
PERF	(present) perfect tense	21
Pf	operator for indefinite past tense (Tichý)	246
PFVE	operator for perfective aspect	296
PL	plural	33
PLUPF	pluperfect	89
POSS	possibility operator	318
PP	past (or perfect) participle	33
PP	Present Point axis	116
Pres, PRES	operator for present tense	251
PRES	present tense	19
PROG	operator for progressive aspect	259
PROG	progressive (Hinrichs)	402
P(x)	x is a pause	322
QUEST	question marker	21
R	reference point (reference time)	111, 252
r	reference time	277
RAP	Retrospective Anticipated Point axis	116
R_n	n-place relation	336
RP	"Reichenbach's Pragmatics" (Nerbonne)	414
RP	Retrospective Point axis	116
RRP	Retrospective Retrospective Point axis	118
r_s	region of a situation s	337
R_S	syntactic rule	238
R_{SI}	rule of semantic interpretation	231
RT	reference time (Smith)	345
R_T	translation rule	231
S	the category of sentences	232, 351
s	forms intensional types	234
s	situation type	331
S, s	speech-act time	252
s	subject	221
SG	singular	35
Some x	existential quantifier	229
SOT	sequence of tense(s)	86
S^o_α	set of situations open with respect to concept α	338
$S_p(x)$	x is a subevent of an event of type p	322
SS	Situation Semantics	330
ST	speech-act time (Smith)	345
ST	stative (Hinrichs)	402
ST_s	structure of a situation s	337
SUBJ	subjunctive mood	19; 471 (ch. 2, n. 60)
T	the category of terms	232
t	evaluation (speech-act) time	229
t	instant of time	253
T	model (Saurer)	227
T	set of times	238, 253

T	text (Lo Cascio)	425
T	"tomorrow" operator	254
T	true (truth value)	218
t	the type of sentences	232
T_a	anaphoric tense	425
t_{Adv}	time of the adverbial	327
T_d	deictic tense	425
t_{decod}	time of decoding	420
TDIP	temporal discourse interpretation principle (Dowty)	413
TE	temporal expression	345
t_E	event time (Saurer)	327
t_{enun}	time of enunciation	420
t_{eval}	evaluation time	420
t_F	frame time (Saurer)	327
TmAv	category of time adverbs	312
t_s	speech-act time	327
TV	category of transitive verbs	232
$\overline{T}$	set of texts (Lo Cascio)	425
U	the universal set	221
V	existential quantifier	326
V_α	set of all variables of type α	234
V_i^+, V_i^-	interpretation functions	402
$\vee$	disjunction, "or"	235
$\check{}\alpha$	extension of α	235
$\wedge$	conjunction, "and"	235
w	evaluation world (Johnson)	238
W	future tense operator (Montague)	245
w	possible world	229
W	set of worlds	238
XN	extended now	100, 265
Y	"yesterday" operator	254
YEST	"yesterday" operator	328
ϵ	is a member (of a set)	220
ε_i	event structure	401
$\notin$	is not a member (of a set)	220
λ	lambda operator ('λx P' roughly = '{x:P}')	235
Λ	the null set	220
$\underline{\Lambda}$	is a subepisode of	298
$\overline{\overline{\sigma}}$	course of events	331
σ*	actual course of events	336
!	not acceptable (not grammatical) with the meaning intended	469 (ch. 1, n. 87)
1	the truth-value true	217
1	the universal set	221
1PL	first person plural	35
1SG	first person singular	19
2PL	second person plural	80
2SG	second person singular	80
3PL	third person plural	19
3SG	third person singular	21
$\hat{}\alpha$	intension of α	235
&	conjunction, "and"	312
*	unacceptable, ungrammatical	469 (ch. 1, n. 87)
$(t_i, \ldots$	interval starting at instant t_{i+1}	253

(x)	universal quantifier	312
. . . ,t_i)	interval ending at instant t_{i-1}	253
0	the null set	220
0	the truth-value false	217
0	unmarked value for features	159
0V	"zero" vector (prime point)	116
−	absolute complement of A: −A = everything which is not in set A	253
−	complement; A−B = complement of B relative to A: everything in A but not in B	253
−	negative value for features	159
−	separates morphemes; indicates affixes	13
−V	"minus" or retrospective vector	116
—	precedes: A—B = A precedes B	112
+	positive value for features	159
+V	"plus" or prospective vector	116
=	coincides with	111, 253
=	identity: A=B = A is identical with B	219
$=_{def}$	by definition: "$A =_{def} B$" means A is defined as B	243
≠	A≠B = A is not identical with B	253
{. . .}	unordered set, e.g., {1, 2} is the set consisting of 1 and 2; {x:x is a cook} is the set of all cooks	219
[t_i, . . .	interval starting at instant t_i	253
[t]	moment of time	253
[T]	set of all intervals in T except the empty interval	253
[<]	wholly precedes	253
. . . ,t_i]	interval ending with the instant t_i	253
:	"such that": {x:x is a cook} is the set of all cooks	219
<	precedence relation	291
<	precedes: t<t′ = t precedes t′	253
⟨s,α⟩	intensional type corresponding to extensional type α	234
⟨α,β⟩	type of expression forming expressions of type β when applied to expressions of type α	234
$<_i^+$, $<_i^-$	precedence relations	402
$<\!\!<$	wholly precedes	327, 402
$\langle . \overset{t}{.} . \rangle$	ordered set, e.g., ⟨1, 2, . . . , 9⟩ is the 9-membered set (9-tuple) consisting of the numbers 1 through 9 in order	220
≤	relation on T (ordering of time)	238, 253
≤	$t_i \leq t_j$ = t_i is earlier than, or coincides with, t_j	253
,	coincides: A,B = A coincides with B	112
>	t>t′ = t′ follows t (t precedes t′)	111, 253
.	separates morphemes	14
?	of questionable acceptability (grammaticality)	469 (ch. 1, n. 87)
?*	possibly unacceptable (ungrammatical)	469 (ch. 1, n. 87)
/	forms categories; A/B is the category of expressions forming expressions of category A when conjoined with an expression of category B	232
//	forms categories; A//B is the (second) cate-	232

	gory of expressions forming expressions of category A when conjoined with an expression of category B	
$\sim$	negation	235
$\leftrightarrow$	biconditional (equivalence); A↔B = A is equivalent to B (A if and only if B, A→B and B←A)	235
$\rightarrow$	category of expressions: $\frac{A}{\rightarrow B}$ the category of expressions resulting in an expression of category A when adjoined to right of an expression of category B	233
$\leftarrow$	category of expressions: $\frac{A}{\leftarrow B}$ the category of expressions resulting in an expression of category A when adjoined to left of an expression of category B	233
$\models$	entailment: A⊨B = A entails B	277
$\rightarrow$	implication: A→B = A implies B, if A then B (material implication)	235
$\supset$	implication: A⊃B = A implies B	322
$\subset$	implication: A⊂B = B implies A	322
$\subseteq_i^+, \subseteq_i^-$	inclusion relations	403
$\vdash$	inference: A⊢B = B is inferrable from A	329
∞	infinity	253
$\cap$	intersection: A ∩ B = the intersection of A and B (set of all things which are in both A and B)	219
$\Box$	necessity operator	330
$\div$	negative value for features (Holt)	159; 481 (ch. 5, n. 64)
$\not\subseteq$	not a subset: A⊈B = A is not a subset of B	219
$\not\supseteq$	not a subset: A⊉B = B is not a subset of A	219
$\Diamond$	possibility operator	265
$\subset$	proper subset: A⊂B = A is a subset of B, but some members of B are not in A	253
$[\![\ldots]\!]^{\alpha}$	semantic value of an expression relative to α (superscript optional)	229
$\subseteq$	subset: A⊆B = A is a subset of B	219
$\supseteq$	subset: A⊇B = B is a subset of A	219
$\models_{e}^{M^{s,r}} A$	truth in a model: A is true at e in model $M^{s,r}$	315
$\cup$	union: A∪B = the union of A and B (set of all things which are in either A or B)	220

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