Introduction

Wolfgang Klein and Ping Li

> There is no present or future, only the past,
> happening over and over again, now.
>
> Eugene O'Neill

The ability to express time belongs to the most fundamental traits of human communication. All human languages that we know of provide their speakers with a range of lexical and grammatical devices to say when something happened and how long it lasted, to say whether it happened, or will happen, for the first time, regularly or very often, and to say whether some event or state precedes, overlaps with or follows another event or state. These devices include grammatical categories such as tense and aspect, certain features in the lexical meaning of verbs, various types of temporal adverbials and particles, but also discourse principles such as the maxim to tell events in the order in which they happened.

In many languages, one of these devices, tense, is so deeply rooted in the grammatical system that it is hardly possible to utter a sentence without referring to time. This may be the reason why the study of how time is expressed in human languages has a strong bias towards tense and, to a somewhat lesser extent, aspect - two categories which are often combined to what traditional grammars usually call a "tense system". This bias is unfortunate for two reasons. First, many languages have no inflectional morphology at all, hence, no categories as tense and aspect in their grammatical system (e.g., Chinese has no grammatical tense). This does not mean, of course, that the speakers of those languages cannot indicate that something is in the past, the present, or the future, or that something is on-going or completed; they just use other means, for example particles or adverbials. Second, in languages like Greek, English or French, in which tense and aspect are parts of the grammatical system, the expression of time is not confined to these two devices. Typically, the temporal information which the speaker wants to convey is encoded by a combination of various means, including adverbials, inherent temporal features of the verb and discourse principles. Hence, any real understanding of how the expression of time works requires a somewhat broader perspective. This book tries to provide such a perspective.

Our book is not meant to be a comprehensive survey of what linguistics and its neighbouring disciplines have found out about the various facets of how time is reflected in human languages. Given the wealth of literature on this issue, this would be a hopeless task. The book should rather be considered as an invitation to study how time is expressed in human language, and to provide a good starting point for such an enterprise. Its chapters take the reader through a number of foundational issues, such as the various notions of time and the various devices found in different languages; other chapters are devoted to more specific questions, such as the acquisition of time, its modelling in formal semantics and in computational linguistics, or how its expression can be empirically investigated. In this way, it reflects the state of the art, on the one hand, and it also aims to pave the way for future research, on the other.

Time is not a uniform notion. There is the time of physics, the time of biology, the time of psychology, the time of economy; there is the time of philosophers, of anthropologists, of linguists, of orchestra conductors. All of these notions share certain characteristics, and they differ in others. In the first chapter "Concepts of time", *Wolfgang Klein* briefly characterizes a selection of these concepts; he then discusses three perennial issues in the study of time since the Antiquity; these are the relation between "time and change", the "units of time", and the role which the "now" of the observer plays in concepts of time. In the last section, he sketches the core components of a "basic time structure" which underlies the expression of time in human languages.

The next chapter "How time is encoded" by *Wolfgang Klein* examines six main devices which human languages use to express time; tense, (grammatical) aspect, "Aktionsarten" (lexical aspect), temporal adverbials, particles, and discourse principles. By far most research on temporality is devoted to the first three of these devices. It is shown that the established definitions (for example "tense is a grammatical category which serves to localise the time of event in relation to the moment of speech" or "aspect is a grammatical category which serves to present the event as on-going or completed") raise a number of non-trivial problems. The chapter concludes with a brief discussion of how these problems might be overcome.

The third chapter, *Jürgen Bohnemeyer 's* "Temporal anaphora in a tenseless language: the case of Yucatec", is an in-depth investigation of a Mayan language which lacks deictic tense (in the usual understanding) as well as words which correspond to English *before, after, while, until.* Still, its speakers are no less able to make appointments and to tell stories with a complex temporal structure than speakers of English or French. Bohnemeyer demon-

strates that their system is based on a very systematic and clever use of various types of temporal anaphora. His analysis not only shows that temporality can function very differently from what we are used to think; it also challenges us to have a fresh look at those languages which are supposed to be relatively well-described.

Whereas all natural languages have temporal expressions, formal languages - for example languages of logic or programming languages - typically lack such devices. But about forty years ago, philosophers and linguists began to develop more complex formal systems which permit a precise analysis of how, in natural languages, the meaning of compound expressions results from the meaning of its components. *Arnim von Stechow's* chapter "Tenses in compositional semantics" illustrates this for English; beyond tenses proper, he also examines lexical and grammatical aspect.

We do not know in which way "human time" - that is, the way in which we experience time and think about time - is shaped by our genetic endowment, on the one hand, and by social and cultural experience, on the other. But clearly, the way in which temporality is expressed must be learned, since languages differ considerably in this regard, no matter how similar the underlying temporal notions may be. In his chapter "Temporal expressions in first and second language acquisition", *Yasuhiro Shirai* gives a survey of what we know about these developmental processes, in particular how the acquisition of the mother tongue differs from the acquisition of a second or third language.

One reason why the study of temporality has made much less progress than it could have done is a certain methodological narrowness, coupled with an unbalanced diet of examples: by far most claims in the literature are based on speaker's intuitions of what certain forms - say *he was sleeping* vs. *he slept* - mean, or on the study of occurrences of such forms in a text corpus; in either case, the data have a strong bias towards utterances which describe singular events in (real or fictituous) past. Both procedures, even if extended to other text types and usages, have serious shortcomings. The chapter "New perspectives in analysing aspectual distinctions across languages" by *Christiane von Stutterheim, Mary Carroll* and *Wolfgang Klein* shows that other - and actually very simple - experimental methods can give a much more reliable and differentiated picture of how speakers of different languages use certain temporal forms. This is illustrated here for aspect; but the methods can easily be extended to other temporal devices.

There is a clear difference between the temporal properties of a situation (state, process, event) itself and the mental representation which the speaker

has of this situation, when he or she sets out to speak about it. It is the speaker's mental representation, rather than the situation itself, which is crucial for the linguistic expression of time. The more or less subjective "view" on the situation is closely connected to grammatical and lexical aspect. In the chapter "Verb aspect and the mental respresentation of situations", *Carol Madden* and *Todd Ferretti* first examine the traditional classification of these two notions, and then, they present evidence from recent psycholinguistic experiments on how speakers construct the discourse model that underlies their language production.

The concluding chapter "Computational modeling of the expression of time" by *Ping Li and Xiaowei Zhao* is devoted to a very different way to investigate temporality - computational approaches. The strong association and interaction between lexical aspect and grammatical aspect, particularly in the domain of first language acquisition, has previously led some researchers to argue for innate semantic categories or prelinguistic predispositions. Ping Li and Xiaowei Zhao provide counter-evidence to this argument with simulations of aspect acquisition in a connectionist network, DevLex-II. The simulation results indicate that the strong association between lexical aspect and grammatical aspect can emerge from dynamic self-organization and Hebbian learning in dynamic computational systems, therefore invalidating a priori assumptions about specific structures of innate linguistic or conceptual knowledge. Thus, computational modeling is not an aim in itself - it is a tool to verify or falsify existing claims on how time is expressed, and to provide novel simulation data that can further inspire new empirical studies.

The expression of time marks an important human linguistic capacity, and the study of it requires the joint efforts of linguists, psychologists, and other cognitive scientists. It is our hope that this book serves as a catalyst for future research that will elucidate the cognitive and linguistic processes underlying the expression of time.