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Complexity and Coherence: Approaches to Linguistic Research and Language Teaching



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Complexity and Coherence – Outlining a Mosaic¹

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Complexity and Coherence seem two important terms in linguistics and beyond that do not go together very often, neither in linguistic research nor teaching. This volume intends to show that they are interesting aspects of description not only in themselves but as a paired configuration because they can be seen as interdependent when regarded as constituting parameters for a “good” text. Although their relationship is marked by a certain contrast and even tension, they have to be balanced. A “good” text can be complex if complexity is structured as to satisfy coherence expectations and demands of a reader/listener. We distinguish several types of complexity, on structural and processing level, and several types of coherence including the cohesive devices in linguistic forms. To balance out the complexity by appropriate coherence is the art of producing appropriate texts. Although this volume cannot provide comprehensive answers to the complex relationship between complexity and coherence, it can highlight the various aspects that create two mosaics and some areas of overlap and even interdependency and thus outline directions for further thought and research.

INTRODUCING AN UNEQUAL PAIR

Complexity and coherence in language can be considered on different levels. Linguistically, we can distinguish the levels of description beginning with morphology and working upward to semantics and pragmatics. Methodologically, theoretical and applied view points can be taken. Thus, considering complexity and coherence brings together researchers with different backgrounds and different theoretical persuasions. In this volume, specific definitions of complexity and coherence that were shared by all contributors remained elusive. This led us to negotiate a broad mosaic that would enable us to cooperate and still remain within our respective research contexts. This also ensured communication across disciplinary boundaries and proved to be among the most valuable results of the entire project.

Although the research focus in the teams was initially on either complexity or coherence, some synergetic insights were found. The two key concepts proved an unequal but interesting pair, because there is some intricate overlap. Although their relationship is marked by a certain contrast and even tension, they have to be balanced out in texts. They can, for instance, be seen as interdependent when they are regarded as constituting parameters for what makes a “good” text. A “good” text can be complex if complexity is structured as to satisfy coherence expectations and demands of a reader/listener.

TOWARDS LINGUISTIC COMPLEXITY

What therefore is linguistic complexity? Attempting a definition depends largely on the extent to which we consider linguistic phenomena as phenomena of the natural world, subject to analysis as a system of elements and relationships. Hence, the attempts at defining complexity do not always provide a plausible basis for linguistic analysis. Problematic are especially ad hoc definitions that lead to folk views (as valid as they are in isolated cases) of complexity without powerful constraints, since complexity is not necessarily difficulty and complex means not necessarily complicated. Since the world is complex, it may be realistic or appropriate, interesting and even convincing. Problematic are further abstract definitions considerably removed from the practice of linguistic descriptive and explanatory mechanisms.

A preliminary working definition that owes much to Aristotelian metaphysics (cf. the four “worlds” of object, form, reason and effect, Barrow 1988: 70) would therefore describe the complexity of a linguistic object as the sum of its elements (at various levels of consideration – phoneme, morpheme, lexeme and text level etc.) and the possible (i.e. permitted) relationships between them. This arrangement resembles complex configurations in social psychology or ethology, in which interactants or agents (e.g. animal species) in a closed set (say, an island) function together (see Wilson, 1998 for example) in a stable system far from equilibrium. The emerging complexity in these multiple instances of homeostasis is a function of the number of possible interaction combinations at a definite point in time and at a subsequent point in time. It is trivial to note that this figure is combinatorily high and therefore an unusable way to quantify (linguistic) complexity, even taking into account that the constraints on this system are rigidified by the demand for grammaticality. After all, the linguistic enterprise, especially research in morphosyntax, is a programme to reduce complexity by achieving descriptive and explanatory adequacy (in that order) via formalization. Semantics is traditionally considered harder although there is no lack of attempts at formal description (e.g. Partee, ter Meulen & Wall, 1990), conceptual reduction, (e.g. Jackendoff, 1990, 2004) or cultural description via complete enumeration (e.g. Wierzbicka, 2004).

Adding to that, there are branches of linguistics that extend the notion of a linguistic phenomenon by including utterance situation, state of mind of the speaker, presuppositions of shared cultural and world knowledge etc. A linguistic view on complexity is therefore as much a question of vantage points as of working level agreement.

Within a joint project of the universities Chemnitz and Brno that yielded among other publications this volume, we thus tried to define a smallest common denominator of complexity by drafting a mosaic of different layers that is still broad enough for all collaborators to agree. We started out by adopting and

adapting a definition from natural sciences and information science: Complexity is measured as the amount of algorithms that are necessary to describe a phenomenon (e.g. Küppers, 1990). This means, complexity is a **measure of randomness within structure**.

Structure itself is defined as the presence or absence of information (cf. Aristoteles' **form**). As an axiom, any structural phenomenon can be described and enumerated using formal algorithms. Therefore, the fewer algorithms are needed to fully enumerate a phenomenon the less complex it is. More complex phenomena are described by a larger number of algorithms. A phenomenon counts as structurally random when the number of algorithms to enumerate e.g. a sequence of informationally diverse items is equal to the number of items themselves. Structures of this complexity are found in nature (number theory) but not in artefacts. Artefacts like natural language are filtered through speakers' brains and therefore determined by the (considerable) complexity of human language competence which offers complexity in the states it can theoretically attain.

Trying to match this definition with linguistic description turns out difficult only at first glance. Any model in linguistics accounts for a certain spectrum of phenomena; simple clauses e.g. receive less grammatical effort than sentences with subordination etc. It therefore makes sense to subdivide the very general notion of complexity into the broad notions of structural complexity and processing complexity (or cognitive complexity).

FROM STRUCTURAL TO PROCESSING COMPLEXITY

Few algorithms (universals) regulate the basis of speech and language faculty, the conceptual and propositional level. Surface level speech introduces a momentum of fuzziness that needs to be captured with more algorithms. As long as the number of algorithms is smaller than that of the phenomena, there are patterns in language to be uncovered. If the number is equal, chaos abounds.

Structural complexity emerges from the different levels of processing, the phonological, lexico-semantic, syntactic and integration level. All these levels are well-attested in neural imaging studies (esp. Friederici, Hahne & Saddy, 2002) that detect semantic analysis as a spike of left anterior cortical activity at 200 ms (P200), syntactic analysis at 400 ms (N400) and integration, reanalysis (and repair) at 600 ms (P600). Thus, what appears like an outward modularisation of linguistic levels as a result of the structuralist approach is in fact derivable from neurophysiological reality.

Does structural complexity therefore equal processing complexity? A simple example of structural complexity is the perceived ease of recognizing polysyllabic/rare words in comparison to monosyllabic, frequent words. Frequency and monosyllabicity both facilitate word recognition, polysyllabicity

inhibits word recognition (Marslen-Wilson, 1993 among many others); thus lexical complexity is a function of the phonological representation.

Beyond the level of neuronal implementation, how do we measure complexity? If we adopt a cognitive-linguistic stance and agree that syntax is conventionalised semantics and semantics is conventionalized conceptualisation (cf. Langacker, 2002), the conceptual level has to be a natural starting point. Two processes guide conceptualisation beyond the level of meaning and the mental lexicon. These two processes are categorization and recursion. The former has convenient roots in gestalt perception (from where it continues to influence cognitive linguistics and especially Cognitive Grammar), whereas the latter lies at the heart of the most current approaches in formal grammar (cf. Hauser, Chomsky & Fitch, 2002). This observation holds well for the processing problem in the following example. The relational element within a clause that represents complexity most is the inflected verb. Recursive application of a rule to a structural representation however can lead to processing breakdown as in onion-sentences of the type

- (1) The cat that the dog that the horse that the grass ate chased scared was gray.

In garden path sentences, self repair inhibits processing speed, cf.

- (2) a. The firefighter told the woman that he had risked his life for many people in similar fires
 b. The firefighter told the woman that he had risked his life for to install a smoke detector

The first sentence is less complex than the second in which readers are led “down the garden path” and show inhibited processing at the to-infinitive.

However, there is conflicting evidence, e.g. syntactic complexity does not always lead to processing inhibition (as it would be predicted in Generative syntax). In a classic study, Fodor, Bever & Garrett found no difference between classes of sentences requiring more or less syntactic derivations. Inhibition as well as complexity is therefore signaled by multiple morphosyntactic cues (cf. Haase, this volume).

This problem is exacerbated when we consider differences in lexical aspect of the verbs or in transitivity. Transitive verbs of the *meet*- and of the *know*-type differ in that *know* accepts infinitival complements whereas *meet* requires just nominal direct objects. *Know*-verbs are therefore more complex, are acquired later and are less frequent in language. Holmes and Forster (1972) found better recall for *meet*-verbs thus initiating research on inhibited access for the more complex constructions.

TOWARDS A MOSAIC OF COMPLEXITY

A short overview of the existing literature in the field (cf. the appended concise bibliography) shows that current linguistic research discusses complexity on all levels mentioned and beyond. Structural complexity and processing complexity do overlap. A structural component is part of a single act of processing, which equals the certain definite structural part. A discussion between reductionist and constructivist approaches proves circular here.

The articles on linguistic complexity in this volume reflect the diversity of approaches and present a mosaic of case studies in very different areas of (English) linguistic research and language (and linguistic) teaching. The article by Schmied deals with the issue of complexity and coherence in materials development in teaching and the sensitization of students via network-like presentations in online knowledge bases like TWiki. Here the interrelationship of structural complexity and processing complexity is put into the wide context of coherence generated by textual devices but also semiotic and technical frameworks. Haase takes on complexity issues in the causative-inchoative alternation field. This contribution offers a generative approach to a lexical-semantic problem with far-reaching ramifications for the built-up of complex structures from simple principles. In a more technical component, Weisser describes the Text Feature Analyser, a tool to compare complexity on the basis of statistical measurements, including the occurrence of word-classes with a high coherence value, like conjuncts. He illustrates the usefulness by comparing a specialized and a popular text on the same topic and stresses the practical applications in teaching. These expansions into practical university life are expanded by Frenzel and May. They explore the core concepts complexity and coherence in the wide frame of teaching academic skills, especially speaking and writing, to new university students. Ondráček expands the teaching perspective to pronunciation. Hanušová and Najvar investigate the issue of foreign language learning at an early age in the context of current educational reform in the Czech Republic. They claim that the complexity of the process of second language acquisition must be respected and particular constituting elements must be considered in context.

FROM COHERENCE TO COHESION AND PRAGMATICS

When conceptualizing coherence, a concept which in its complexity is still not understood in the same way in all its aspects by different linguists, it is necessary to consider it first of all with regard to cohesion. Both coherence and cohesion are important linguistic notions. While cohesion was becoming accepted as a well-defined and useful category for text analysis, particularly after the publication of Halliday and Hasan's *Cohesion in English* (1976), coherence was still only a vague and fuzzy notion. However, this rather complex concept, still a matter of ongoing debate, has been given considerable attention by many

linguists in the past three decades. A great number of books and papers on coherence have appeared and coherence has become one of the key concepts in text and discourse analysis. (For a bibliography of coherence and cohesion, see Lenk, Gietl & Bublitz, 1997.) At the same time it became possible to witness a considerable shift in the ways coherence is understood, namely a shift from a static text-based descriptive approach according to which coherence is the product of textual cohesion and connectivity, towards a more dynamic understanding, according to which coherence is conceptualized as a potentially variable co-operative achievement of the speaker/writer and the hearer/reader and seen as a context-dependent, hearer/reader-oriented and comprehension-based, interpretative notion (Bublitz 1997: 2).

While Halliday and Hasan (1989) regard cohesion and coherence as closely related and state that “variation in coherence is the function of variation in the cohesive harmony of a text” (Halliday/Hasan 1989: 94), many linguists draw a stricter distinction between the two concepts. For example, Stubbs (1983) and Widdowson (1979) define cohesion as the overt structural link between sentences as formal items and coherence as the link between the communicative acts that sentences are used to perform. Similarly, Mey (2001: 154) maintains that “cohesion establishes local relations between syntactic items (reference, concord and the like), whereas coherence has to do with the global meaning involved in what we want to express through our speech activity”.

Human beings do not require formal textual markers before they are prepared to interpret a text since, as Seidlhofer and Widdowson (1997) maintain, one “might derive a coherent discourse from a text with no cohesion in it at all” (Seidlhofer & Widdowson 1997: 207) and, intuitively, one is able to distinguish “coherent talk from incoherent babbling” (Mey 2001: 15). People naturally assume coherence, and interpret the text in the light of that assumption (Brown & Yule 1983: 66). Moreover, many coherent links of the text are recoverable on the basis of previous experience of particular text types and their semantic organization; in other words, people use their common sense and impose coherence on the text (Tárnyiková 1995: 24-25) while trying to achieve coherent interpretation. Hence, in agreement with Bublitz (1988: 32), who holds that “cohesion is neither a necessary nor a sufficient condition for coherence”, and Seidlhofer and Widdowson (1997: 207), who state that “textual cohesion provides no guarantee of discourse coherence”, several of the authors of the present volume (e.g. Dontcheva-Navratilova, Hůlková, Miššíková, Povolná, and Vogel) view coherence as independent of cohesion assuming that a text, either spoken or written, can be perceived as coherent without cohesive means and, conversely, that a text can comprise cohesive means without being understood as coherent.

Unlike cohesion, which is a textual property, coherence is not a text-inherent and invariant property (as are cohesion and connectivity) (Bublitz 1988: 32). It is

context-dependent, hearer-/reader-oriented and a matter of interpretation, a matter of permanent negotiation of meaning between participants, since negotiation of meaning is a basic feature of all human communication. Consequently, “one cannot say: a text *has* coherence, but only: a text *achieves* coherence” (ibid.). Although coherence is based on the language means used in the text, it is also dependent on additional information provided by the entire situational context, i.e. linguistic co-text, social and cultural environment, communicative principles and conversational maxims and the interpreter’s encyclopaedic knowledge. Since it is not texts but rather people that cohere when interpreting and understanding texts, it can even be stated that for one and the same text there exist a speaker’s/writer’s, a hearer’s/reader’s and an analyst’s coherence, which may or may not match (Bublitz 1997: 2). Moreover, since each listening *to* or reading *of* a text is performed with a particular intention and in a particular context, the interpretation of the same text by the same hearer/reader or analyst on different occasions need not be identical.

Coherence is not static, but dynamic, since it comes into being in the process of human interaction, in the ongoing process of negotiation of meaning. Therefore, coherence cannot be taken for granted but, depending on the situation, genre or text type can be viewed as being more or less temporary, since it is permanently in need of being checked against new information. It is only approximate and a matter of degree and may be best described as a scalar notion (Bublitz 1997: 3). In order to help their hearers/readers create coherence, speakers/writers normally use signals to guide them to a line of understanding which comes as close as possible to their own understanding. Conversely, hearers/readers use these guiding signals as instructions to achieve coherence and arrive at an interpretation which is in conformity with the speakers’/writers’ communicative intentions. Thus coherence combines the general linguistic basis of cohesive devices in lexicon and syntax with the specific pragmatic interpretation of utterances in context.

TOWARDS A MOSAIC OF COHERENCE

However, the signals that the speaker uses are different from those that the writer has at his/her disposal, since while spoken discourse can be characterised by “permanent negotiation of meaning between conversational partners” (Povolná 2007: 197), in written discourse there is a lack of overt negotiation of meaning between the writer and the addressee(s) (Seidlhofer & Widdowson 1997: 211). Moreover, since genres impose various constraints on the interpretative potential of texts (Dontcheva-Navratilova, this volume), some texts allow for numerous interpretations (e.g. informal private face-to-face conversation and literary texts), while others, especially those characterised by conservatism and formulaicity, enforce a very restricted range of interpretations

which are specific to a given culture or discourse community (e.g. legal documents and company annual reports).

In agreement with what has been stated above about the distinctions between coherence and cohesion and those between coherence as achieved in spoken and written discourse, the authors of the contributions dealing with coherence in the present volume attempt to show how these distinctions are reflected in the data they have analysed in their own research, with the aim of contributing to the study of coherence as an important linguistic notion. While Povolná concentrates on three different genres of spoken English and presents evidence that interactive discourse items (which are at the core of her broader research) contribute to the achievement of coherence, other contributors analyse some aspects of coherence and cohesion in written discourse. Dontcheva-Navratilova investigates resolutions as an instance of the genre of formal written discourse in institutional settings and shows that the writer and the reader rely both on the context and on explicit signals in the text to achieve coherence. Vogel argues that in his material (consisting of company annual reports) coherence is created lexically rather than grammatically, owing to the prevalingly summative function of the genre analysed. Hůlková's contribution draws special attention to connective adjuncts and their cohesive role in academic texts in English and even beyond the usual pair of cohesion and coherence by pointing out that eventually all factors contribute towards pragmatics and the individual pragmatic interpretation of utterances by the reader. Miššíková discusses two important concepts in stylistic analysis, namely foregrounding and openness, and relates them to her analysis of a literary text, while paying attention to coherence and cohesion.

TOWARDS A SYNERGETIC VIEW OF COMPLEXITY AND COHERENCE

This contribution has laid out a wide mosaic of two core concepts of linguistics (and beyond) in various aspects, from conceptualisation to application, from linguistics to methodology. It has also expanded the narrow concepts, complexity was diversified into structural and processing complexity, coherence separated into an underlying language basis in the form of various cohesive elements and an overarching contextualisation effort by text recipients including semiotic and other (partly technical) frames.

Once we have established the two mosaics of complexity of coherence, the obvious question arises where we can find the added value of combining both concepts. The different articles allow this combination only to different degrees. The greatest synergetic effect can be achieved where the reading, learning and teaching of texts is the focus of attention. In this subfield, the different views on complexity can be reconciled by assuming that a delicate balance between structural complexity and processing complexity can be supported by cohesive devices that enable the recipient to construct coherence in the respective contexts,