BOOK REVIEW

Maria Aloni and Paul Dekker (eds.), *The Cambridge Handbook of Fomal Semantics,* Cambridge, Cambridge University Press, 2016, 925 p.

This review is about the latest publication in the *Cambridge Handbooks in Language and Linguistics* series, where each volume provides a general description of one major sub-discipline within the field of language and linguistics: phonology, sociolinguistics, pragmatics, second language acquisition, bio-linguistics, generative syntax, and others. Providing a broad picture of the state-of-the-art of formal semantics, and documenting the background and development of the main currents in this field, this handbook is a comprehensive survey of the major theoretical and empirical advances in this domain. In a nutshell, it provides a historical context for what is happening in the field of formal semantics today and its threefold aim can be reduced to (i) the investigation of the various approaches to linguistic meaning, (ii) the overview of the major areas of research within current semantic theory, and (iii) the study of the interfaces of semantics with bordering academic disciplines.

The present volume, edited by Maria Aloni and Paul Dekker, is structured into five large parts. The twenty-five chapters are thematically grouped into one of these sections. The contributions encompass the most important issues and topics within the subject, and offer a coherent picture of the latest theories of and findings in the field of formal semantics.

The book opens with *Contents* (v–vi), *Figures* (vii), *Tables* (viii), *Contributors* (ix–x) and *Preface* (xi–xii).

Part I, entitled *The landscape of formal semantics*, contains five introductory chapters on formal semantics and gives a general sketch of the perspectives from which semantic research is conducted.

The first chapter (Barbara H. Partee, *Formal semantics*, pp. 3–32) sets the stage by first defining 'formal' and 'formal semantics', and then providing a brief history of this sub-discipline of linguistics. This section is studded not only with the names of the most representative contributors to formal semantics but also with references intended for those who would like to pursue things further or dig deeper into the history of formal semantics. The key question refers to what meaning is and how meanings are put together. The author discusses noun phrases, quantifiers, and relative clauses before she turns to issues concerning the syntax–semantics interface, the increasing attention given to the role of context, and the consequent blending of formal semantics and formal pragmatics. The chapter closes with a discussion on the connection between formal semantics and cognitive science, and studies of language processing and language acquisition.

Chapter 2 (James Pustejovsky, *Lexical semantics*, pp. 33–64) first introduces readers to the most representative features of lexical semantics together with the most important milestones in its history. The core of the chapter is dedicated to the interaction of the lexicon with other components of grammar: the semantic distinction between lexical ambiguity and systematic polysemy, the selectional requirements and constraints on verbs, verbs of variable behavior, and event semantics. Some of the topics touched upon here foreshadow the topic of some other chapters dealing with semantic issues

in the verbal domain. Since semantic roles are so crucial to lexical semantics, the author devotes one section to them before closing his contribution with some open issues.

In *Sentential semantics* (pp. 65–105), Peter Pagin is concerned with (declarative) sentences in the syntactic sense and discusses at great length how different semantic theories model sentence meaning. "The Principle of Semantic Compositionality" tackles the question of how the meaning of a complex expression is derived from the meaning of its parts, how these meaning are syntactically combined, and makes a connection to the previous chapter(s). The chapter is distinguished by its highly heterogeneous nature, several of its sections presenting different views on sentence meaning (Frege, Davidson, Montague and Kaplan). The remainder of the chapter is devoted to some more generous topics, such as possible-worlds semantics, centred-worlds propositions, relativism, two-dimensionalism, situation semantics, structured meanings, verificationism and procedural semantics.

In *Discourse semantics* (pp. 106–129), Nicholas Asher focuses on the interaction between discourse contexts and semantic interpretation. He is interested in the way Discourse Representation Theory, Dynamic Predicate Logic and Continuation style semantics lead to a much better understanding of discourse contexts. Asher is also interested in their relation to certain linguistic phenomena such as quantifiers, operators, anaphoric expressions, and anaphoric dependencies. In addition to these theories of discourse semantics, the author presents some other elaborate theories of discourse structure, which all cast light on several examples of context-dependent interpretations in discourse and imply that all units of information serving as constituents of discourse structure have context-dependent interpretations.

The final chapter of Part I (Jonathan Ginzburg, *Semantics of dialogue*, pp. 130–169) is linked to the previous chapter as "studying dialogue forces one to a particularly careful study of the nature of context" (130). Starting with some antecedents of formal dialogue theory, that is, works in the philosophy of language, pragmatics, and cognitive psychology, the author lists a number of core phenomena that linguistic theories of dialogue need to account for: direct relevance, utterances without an overt predicate (sentential fragments and interjections), metacommunicative interaction, and genre sensitivity. Then, he indicates how three contemporary dialogue frameworks account for some of the above phenomena as well as for conversational relevance and conversational meaning, two problems a theory of dialogue should try to solve. The chapter also provides a bird's-eye view of a number of additional dialogue phenomena and challenges which have not been the subject of intense research but which require significant modifications in our view of semantics.

Part II, *Theory of reference and quantification*, is concerned with semantic issues related to the nominal domain.

Paul Dekker and Thomas Ede Zimmermann's joint work (*Reference*, pp. 173–205) specifies the role played by reference in formal semantics. Reference has been investigated thoroughly over the last few decades; it has occupied a prominent place in linguistic theory and raised important questions for logicians and philosophers of language. Reference and meaning of proper names and definite descriptions have attracted the attention of many scholars, hence the divergent perspectives on this topic: the views of Frege, Russell and Quine, to name only the most prominent scholars in these areas. As for theories of direct reference, the names of Kripke, Putnam, and Kaplan are mentioned. Other scholars, such as Strawson, Donnellan, and Karttunen are mentioned in connection with their views on referential acts, referential usage and discourse reference respec-

tively. The glossary of some of the core terms discussed here closes this chapter paving the way for the following contribution.

The next chapter (Dag Westerståhl, *Generalized Quantifiers*, pp. 206–237) goes one step further and discusses generalized quantifiers. After the preliminary section, which is meant to make things easier for the reader with its definitions and examples, the subsequent sections highlight some of the most important achievements of generalized quantifier theory applied to natural language. The following phenomena are dealt with: noun phrases (*Mary*, *everything*), domain restriction (*most students*), quantity (*at least three*), negation (*not all*), polarity (especially negative polarity items such as *yet* and *any*), existential *there* sentences (*there is a cat here*), definites (*the ten boys*) and possessives (*John's books*). The chapter also shows what generalized quantifier theory has to offer to the analysis of each of the above phenomena.

The purpose of the chapter entitled *Indefinites* (Adrian Brasoveanu and Donka F. Farkas, pp. 238–266) is to provide an overview of some of the solutions brought to the semantic and pragmatic problems indefinites raise. And it seems that indefinites do raise serious problems as they are, first and foremost, difficult – if not impossible – to define. Furthermore, there is much disagreement as to where the (precise) borderline between definite and indefinite expressions is and it is sometimes difficult to decide upon the membership of certain controversial nominals especially if one takes into account the various subtypes of existentials. The discussion on the different approaches to the definite/indefinite divide is followed by another problematic aspect of indefinites, namely their unlimited upwards scope, which is considered illusory by some, but real by others. The authors round off their chapter with a description of the typology of indefinites.

Although the issue of plurality may seem straightforward and unproblematic, in the chapter entitled *Plurality* (pp. 267–284) Rick Nouwen sheds light on several puzzling (semantic) aspects of the interaction between plural arguments and predicates. In order to achieve this, some key terms such as *sums* must be explained and illustrated first. This is closely linked, on the one hand, to the distinction between the collective and the distributive understanding of sentences with nominal subjects expressed by plural individuals, and, on the other hand, to cumulative reading and its relation to distributivity. The final section looks at dependency phenomena involving plurals.

In the last chapter of this section, entitled *Genericity* (pp. 285–310), Ariel Cohen considers some of the puzzles and paradoxes raised by generics, and tackles the reason(s) why they are so hard to capture and understand. These few pages prove that there has been a tremendous amount of discussion in the literature regarding the semantic aspects of generalizations. The chapter offers a synopsis of the most important aspects of generics: (i) the distinction between direct kind predication and characterizing generics, (ii) the relationship between generics and quantification, (iii) the possibility of combining the rules-and-regulations and the inductivist theories to explain generics, (iv) the fact that generics are lawlike but they are also similar to sentences involving an overt adverb of quantification, (v) the different ways generics are realized in English and other languages, and (vi) the use of generics.

The five chapters of **Part III**, *Temporal and aspectual ontology and other semantic structures*, turn to semantic issues in the verbal and predicative domain.

The first chapter of this section, more precisely Chapter 11, entitled *Tense* (pp. 313–341), is written by Atle Grønn and Arnim von Stechow. Its aim is to shed light on the most important aspects of the semantics of tense, one of the main devices for encoding time in language. Although much has been written

about this topic, there are still matters of considerable debate in the literature. This review chapter addresses several questions related to the morphological and syntactic expressions of tense and its interpretation at the sentence and text level. It also targets numerous central notions and bread-and-butter issues, such as tense in compositional semantics, referential tense, quantification and temporal adverbials, the analytic perfect construction, (in)definiteness, the (in)definite tense, and (in)definite operators. The last section shows how the presented formal analysis can be extended to integrate the (in)definite aspect and it ensures a smooth transition between this chapter and the following one.

Susan Rothstein's contribution (*Aspect*, pp. 342–368) is a natural continuation of the ideas introduced in the previous chapter. As tense and aspect are two intimately related phenomena, the grammatical category of tense is often defined in interaction with aspect, and the two categories may frequently overlap. These few pages aim at providing a concise overview of the most important findings and insights gained in the study of three aspectual properties: lexical aspect, grammatical aspect, and the telic/atelic distinction. Not only is the relation between the lexical classes and the telicity value complex and unclear because of their interesting and subtle interaction but this relation has also raised a number of general and specific questions, each of which has been answered from a different perspective. The problematic aspect of this part of the chapter (the critical presentation of the four cases of aspectual composition: mereologies, lexical semantic decomposition, scales and event individuation, together with the existence of some variable behaviour verbs) may seem to be in sharp contrast to the relatively simple and unproblematic subject of grammatical aspect, especially if one disregards cross-linguistic variation.

Mereology, by Lucas Champollion and Manfred Krifka (pp. 369–388), focuses on one topic that readers have already been introduced to: mereology and unstructured part relations. With its roots in ontology and mathematics, mereology has also played an important role in natural-language semantics and it is the primary purpose of this review chapter to highlight some of its applications in this field. After a section on the axiomatizations of (unstructured) parthood relations, the author takes a close look at the principal linguistic applications of mereology in the nominal domain (the count–mass and singular–plural distinction), in measurement constructions (*three liters of milk*, *two cats*), and in the verbal domain (cases of conjunction such as *the girls sang and danced*). Finally, the reader is introduced to the idea that the domain of events is a mereology analogous to the domain of individuals, which is often referred to as Krifka's event–argument homomorphism.

Chapter 14, *Vagueness* (pp. 389–441), authored by Hans Kamp and Galit W. Sassoon, first presents the main challenging aspects of vagueness from the point of view of adjectives. The discussion is centered on the idea that relative and absolute adjectives do not group into discrete classes but rather into fuzzy sets with respect to their potential for the expression of vagueness. Then, the authors give some brief illustrations of the pervasive manifestations of vagueness in other categories such as common nouns, proper names, quantifying expressions, frequency adverbs, and adjectival modifiers. The Sorites paradox together with the efforts to understand it, although dealt with mostly from a philosophical point of view, can nevertheless cast light on important connections between vagueness and other aspects of language and thought. The final section examines some additional challenges posed by vagueness in grammar: the connections between vagueness and morphological gradability, on the one hand, and imprecision, on the other

hand, as well as the consequences of vagueness for the architecture of grammar.

Louise McNally's contribution (*Modification*, pp. 442–464) closes this part of the handbook. First, the chapter takes up questions regarding the typology of modifiers, where the modifier is defined as "an expression which combines with another expression to produce a result with the same semantic type" (458). The four most important families of modifier typologies proposed in the literature (the morphosyntactically-based, notionally-based, entailment-based and pragmatic/discourse-related typologies) provide a broad survey of various adjectives. The second part of the chapter is devoted to some key issues raised by modification for semantic theory and degree modification.

Part IV, *Intensionality and force*, covers core areas of formal semantics, and gives an overview of the various moods and modalities in language.

In her chapter on the expression and interpretation of negation in natural language (*Negation*, pp. 467–489), Henriëtte de Swart begins with the treatment of negation in classical logic and the pragmatic problems negation may raise. As far as negation in natural languages is concerned, there is a wide range of negative markers as languages may realize sentence negation by means of negative verbs, auxiliaries and negative particles (in the domain of verbal constituents) or even negative quantifiers (in the domain of nominal constituents). The author not only describes the range of variation attested in the expression and interpretation of sentential negation but also deals with the syntactic status and position of these negative markers relative to the position of the verb in different languages. Interested readers may also find in this chapter details on negative quantifiers and scope, negative polarity items and negative concord.

Conditionals, by Paul Egré and Mikaël Cozic (pp. 490–524), reassesses a number of key issues that have been discussed in the literature with respect to the semantic analysis of conditional sentences constructed with *if*. In the opening sections, the authors set the stage for further semantic considerations on conditionals. First, they review the inadequacies and problematic laws of the two-valued material analysis of conditionals. Then, they offer its main alternative, the Stalnaker–Lewis analysis of conditionals (see Stalnaker 1968 and Lewis 1973), called the variably strict conditionals. This presentation is illustrated with some of the problematic predictions the authors make regarding three laws (the law of Import–Export, the law of Or-to-If, and the law of Simplification of Disjunctive Antecedents) and two refinements of their framework: the referential treatment and the quantificational treatment of *if*-clauses. Both of them make specific predictions about the syntax–semantics interface. The two closing sections move away from the examination of the most influential semantic frameworks and the ways in which they can be used to cast light on indicative conditionals in order to draw attention to the specificity of the other two types of conditionals: counterfactual and relevance conditionals.

Modality has long been of interest within formal semantics, so the following chapter (Lisa Matthewson, *Modality*, pp. 525–559) presents the extremely interesting human ability to talk about possible worlds, which is known as modal displacement. The chapter aims at providing an introduction to three topics which are central to understanding the semantics of modal elements: modal flavour (epistemic, deontic, circumstantial), modal force (strong and weak necessity modals, possibility modals, graded modal force), and modal–temporal interactions (the world and time of evaluation of modal statements). The Kratzerian (Kratzer 1981, 1991, 2012) outline of each of these phenomena is underpinned by some cross-linguistic data from some highly understudied languages, as well as some ongoing de-

bates and interesting unanswered questions. Evidently, there remain many open questions, the answers to which will certainly pose descriptive and theoretical challenges for future work.

In the following chapter (*Questions*, pp. 560–592), Paul Dekker, Maria Aloni and Jeroen Groenendijk explore some basic questions on the meaning of questions in formal semantics. After running through some of the perspectives on interrogatives, the authors turn to the classical semantic theories of questions: proposition set theory, categorial or structured meanings approach, and partition theory. Despite their superficial similarity, which consists in the fact that they all attempt to characterize question meaning in terms of answerhood conditions (the correspondent of truth condition in indicatives), the three approaches differ in several ways. The special topics in the study of questions deal with old and current debates which have to do with identity and scope. The final section deals with some pragmatic features of questions and answers and the general role that questions play in discourse and dialogue, leading up to a brief introduction to inquisitive semantics.

The closing chapter of this part is entitled *Imperatives* (pp. 593–626) and authored by Paul Portner. Its purpose is to take a close look at another sentence type which neither asserts nor asks for information but has a directive meaning. The two main parts of the chapter are organized with reference to the issues which have animated recent theoretical work on the semantics and the pragmatics of imperatives. The first part provides an overview of some of the – seemingly independent – key issues in the semantics of imperatives: (i) semantic restrictions on the imperative subject, (ii) the logical properties that distinguish imperatives from declaratives, (iii) the nature of the directive force in imperatives, and (iv) the interpretation of complex sentences containing imperatives. The second part sketches two theoretical viewpoints on imperative meaning: the modal approach and the dynamic approach.

Part V, *The Interfaces,* is an investigation of the relationship between semantics and other components of the human language system.

The huge number of phenomena that prove to be important to our understanding of the structures and meanings of natural language lie at the juncture between syntax and semantics, and it is this that makes the syntax–semantics interface very important. Among the most relevant interface phenomena that Chapter 21 (Manfred Sailer, *The syntax–semantics interface*, pp. 629–663) discusses, we find argument identification, quantifiers, scope ambiguity, discontinuity, negative concord and cross-linguistic variation. They have all been approached from diverse perspectives such as, first and foremost, Montague Grammar, Logical Form and Categorial Grammar, to name only the three major research trends of the last decades, with other additional perspectives and theories mentioned in the closing section. The question in the main part of the chapter revolves not only around the approaches that these three prominent theoretical frameworks take but also around the type of analysis (syntactic, semantic or interface-based) that they put forth in their approach to each of the above phenomena.

Philippe Schlenker's chapter, *The semantics–pragmatics interface* (pp. 664–727), surveys three domains where the informational content conveyed by the utterance has semantic and pragmatic sources. The first domain of scalar implicatures attributes an implicit meaning beyond the explicit or literal meaning of an utterance by the use of a weaker term on a scale (*some*). The reason why the speaker does not use a more informative term or a term higher on the same scale is that, to the best of his knowledge, none

of the stronger characterizations in the scale holds (*most*, *all*). The second domain of presupposition is an implicit assumption about the world or background belief relating to an utterance whose truth is taken for granted in discourse. Whereas in the former case the initial pragmatic perspective has recently been replaced by a semantic (or even syntactic) viewpoint, in the latter case the movement occurred in the opposite direction: presupposition, a basically semantic phenomenon, has recently been reassigned to pragmatics. Finally, conventional implicature is a type of implicature that is part of the agreed meaning of a lexical item and not part of the conditions for the truth of that item. Behind these definitions, one finds a rich array of methods, concerns, questions, and answers which all show that these phenomena are still a matter of lively debate.

Enric Vallduví's contribution (*Information structure*, pp. 728–755) continues the series of chapters on the areas where semantics has developed ties with other parts of the human language system. The topic of this chapter is information structure, which is an umbrella term for the expression of a bundle of phenomena that exhibit not only pragmatic and semantic but also morphosyntactic and phonological features. In these few pages, the author brings together several information-structural notions, such as theme and rheme, givenness and topic, and contrast. Considering that context – the information state of an interlocutor at the time of utterance – is essential for the information structure, the necessary background for a better understanding of the above notions is provided by the brief description of contextual resources. Most of these notions are defined in connection with other related notions such as discourse referents, alternative, and focus.

Another component of the human language system which meets and affects semantics is cognition and cognitive neuroscience. It is the intended purpose of Giosuè

Baggio, Keith Stenning, and Michiel van Lambalgen to shed light on the properties of this 'meeting point' in their chapter entitled *Semantics and cognition* (pp. 756–774). After looking at the domain of discourse, which proves to be very suitable for the technique known as event-related potentials, the authors present examples of this technique, such as planning and causality, the logic of processing discourse and the way discourse is processed. Then they highlight the importance of logical and formal semantic theories (logical analysis, Bayesian analysis) – as well as some alternative explanations – in producing hypotheses testable by event-related potentials. The discussion is far from exhaustive but it surely provides a coherent introduction to the major strands of research on the bridged gap between semantics and cognition.

The chapter that closes Part V and the entire handbook is entitled *Semantics and computation* (Matthew Stone, pp. 775–800). As suggested by the title, it explores the scientific overlap of formal semantics with another (seemingly distant) field, namely computer science. Computational semantics inspects the natural connection between linguistics and computer science through the parallels between the representations used in the two domains. The author comments on the interaction between computation, on the one hand, and compositional semantics and lexical semantics, on the other hand. Finally, some ideas are mentioned about the explanations given to meaning in the broader context of language use. Due to lack of wide knowledge of computational semantics, I am not in a position to make further comments on this chapter so I would only like to say that these few introductory pages will surely make the overlap between semantics and computation easier to understand.

The book ends with *Bibliography* (pp. 801–915) and *Index* (pp. 916–925).

Each chapter is preceded by an individual table of contents but the references are not arranged after the last section of each and every chapter but they are collected at the end of the handbook in the general bibliography. This, together with the numerous cross-references found in one chapter to related phenomena discussed in another chapter make the book a coherent whole.

The authors of the individual chapters, key academics from around the world, not only present the uncontroversial aspects of the topic but they also call attention to problems, admit limitations, and clearly state the imperfections of the proposed account which lead up to ongoing research. As for the content of the handbook, it contains thoughtful essays covering the many aspects of formal semantics that have been explored and developed extensively in recent years.

Summing up, *The Cambridge Handbook of Formal Semantics* is an excellent book. I would recommend it to anyone interested in formal semantics with the advance warning that it sometimes presupposes basic knowledge of logic and mathematics, and basic familiarity with semantic formalism is sometimes highly required. As far as specialists in semantics are concerned, this handbook should be included in their own personal library because of its richness of the empirical detail covering a broad range of different phenomena. As for general linguists, it should be on the list of absolute must-read books because of its guiding nature showing its readers where formal semantics and its interfaces with other components of the human language system stand.

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