Semantics and Pragmatics: the 60's onwards

Denotations, Representations, and Utterance Understanding

Ronnie Cann, Ruth Kempson and Eleni Gregoromichelaki

The Dynamics of Conversational Dialogue (DynDial)
ESRC-RES-062-23-0962

www.kcl.ac.uk/research/groups/ds

1969-2009: Overview

How we got here

- The Sixties: setting up semantics for a grammar
- The Seventies: The Challenge of Semantics
- The 80's: Context in Pragmatics and Semantics
- From 1990's till now: The Ellipsis Challenge
  - 90's: Ellipsis and context

Turn of the century: Dialogue Modelling

- Reflecting the flow of language processing

Where to go from here

- Where are we now?
- New questions

Outline

Sentence-Based Grammars $\rightsquigarrow$ Grammars as Mechanisms for Performance

- FROM 1969
  - Competence grammar architecture independent of performance
  - Syntax as induction of sentence-structure
  - Semantics as problematic but driving syntax development
  - Pragmatics as out of the picture
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- How could this shift have become possible?

- The challenge of modelling context update

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- Lexical content as clusters of semantic markers Lehrer 1969

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- Chomsky's dismissal of semantics (1995): ..insofar as we understand language use, the argument for a reference-based semantics (apart from an internalist syntactic version) seems to me weak. It is possible that natural language has only syntax and pragmatics...

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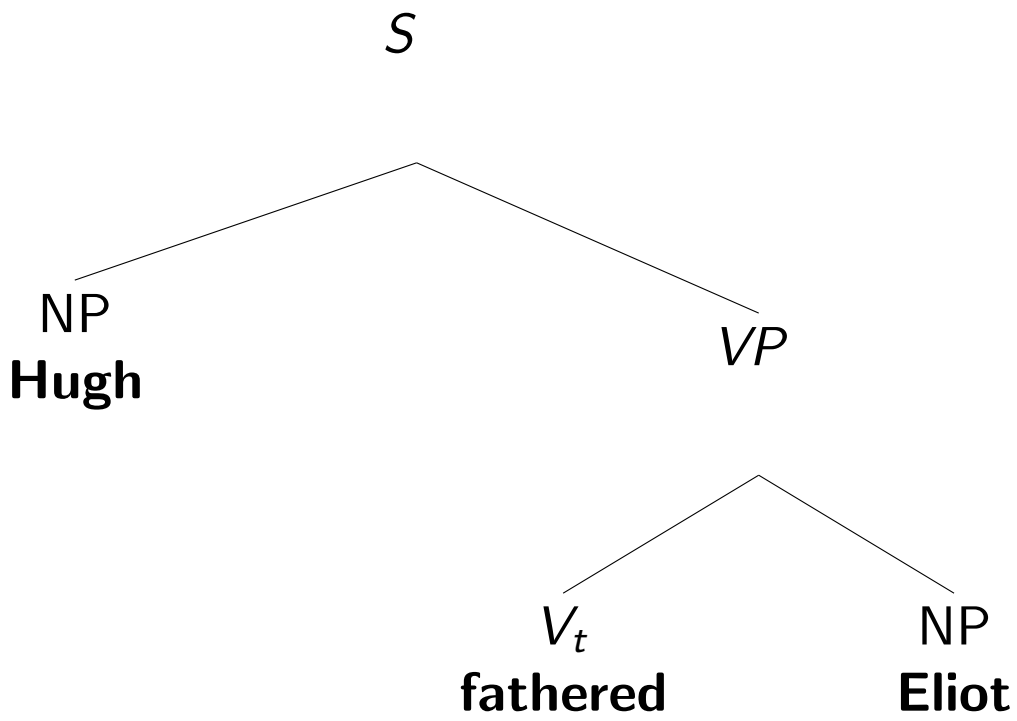
  Interpretation for $Fathered(b, c)$ relative to M is then bottom-up as dictated by syntax:

  $[[F(b, c)]]^M =$ True because $[[\langle b, c\rangle]]^M$ is in $[[Fathered]]^M$

Natural Language as a Formal Language Montague 1970

- The Lambda Calculus used to extend predicate-logic semantics achieving compositionality of sentence-meaning



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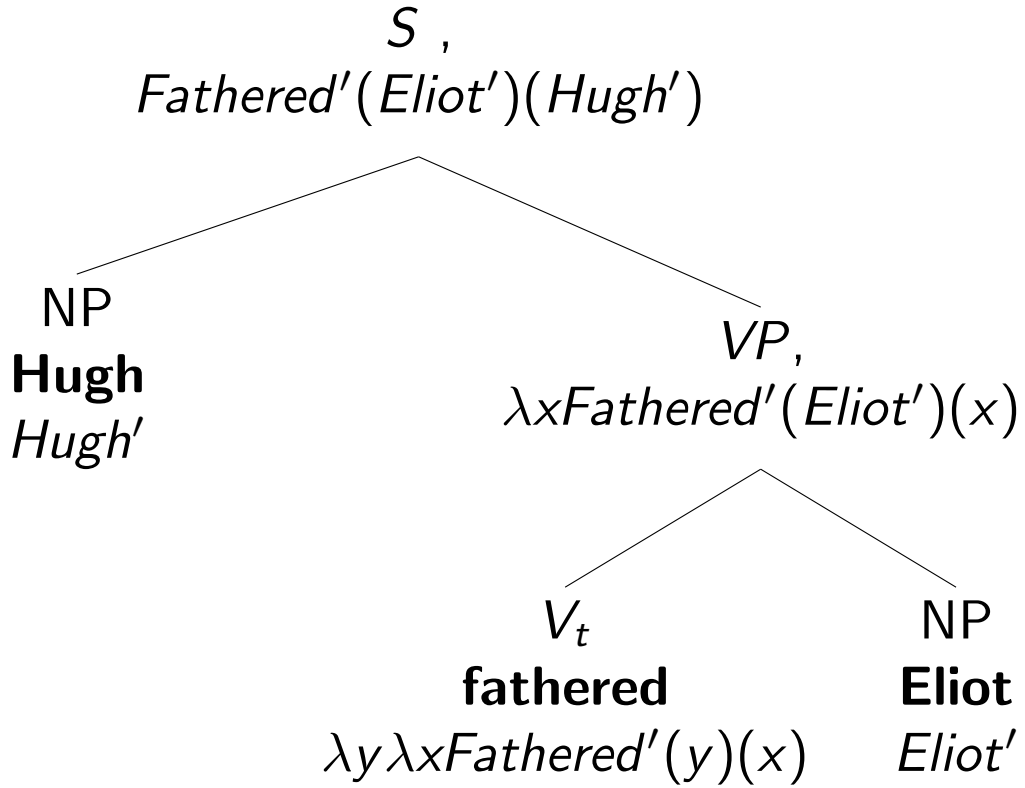

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- Lewis' demolition of Representationalist Semantics

  Semantic Markers are symbols: items in the vocabulary of an artificial language we may call Semantic Markerese. Semantic interpretation by means of them amounts merely to a translation algorithm from the object language to the auxiliary language Markerese. But we can know the Markerese translation without knowing the first thing about the meaning of the English sentence: namely the conditions under which it would be true. Semantics with no treatment of truth conditions is not semantics. Translation into Markerese is at best a substitute for real semantics..... Translation into Latin might serve as well..... Lewis 1970

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- An externalist perspective: no psychological claims made

  (though cf. Steedman 2000, Morrill forthcoming)

Where does Pragmatics fit in?

Pragmatics: Meaning Minus Truth-Conditions Gazdar 1979

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- Sentence-meanings (systematically composed from fixed word meanings) presumed to need only fixing of reference relations to provide core utterance-understandings
- Presumption of the Cooperative Principle used to explain data of language use that conflict with assumption of rule-based sentence-meanings underpinning language understanding
- Metaphor, irony, etc etc explained as violations of the maxims.

Pragmatics as part of overall theory of cognition

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- Selection of interpretation, as with Gricean program, is inferential, interlocuters communicating in virtue of reasoning about the content of each other's mental states

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  Natural language surface strings cannot be interpreted directly relative to a model in any straightforward way.

Context-Dependence in Model-Theoretic Semantics

- Despite prevalent sociology, semantic representations re-emerged:
  Discourse Representation Theory (DRT) Kamp 1981
  Building partial models (DRS) as representations

  (4) (i) John loves a woman. (ii) She is French.
  Interpretation for sentence (i), and then (ii):

x,y (discourse referents)
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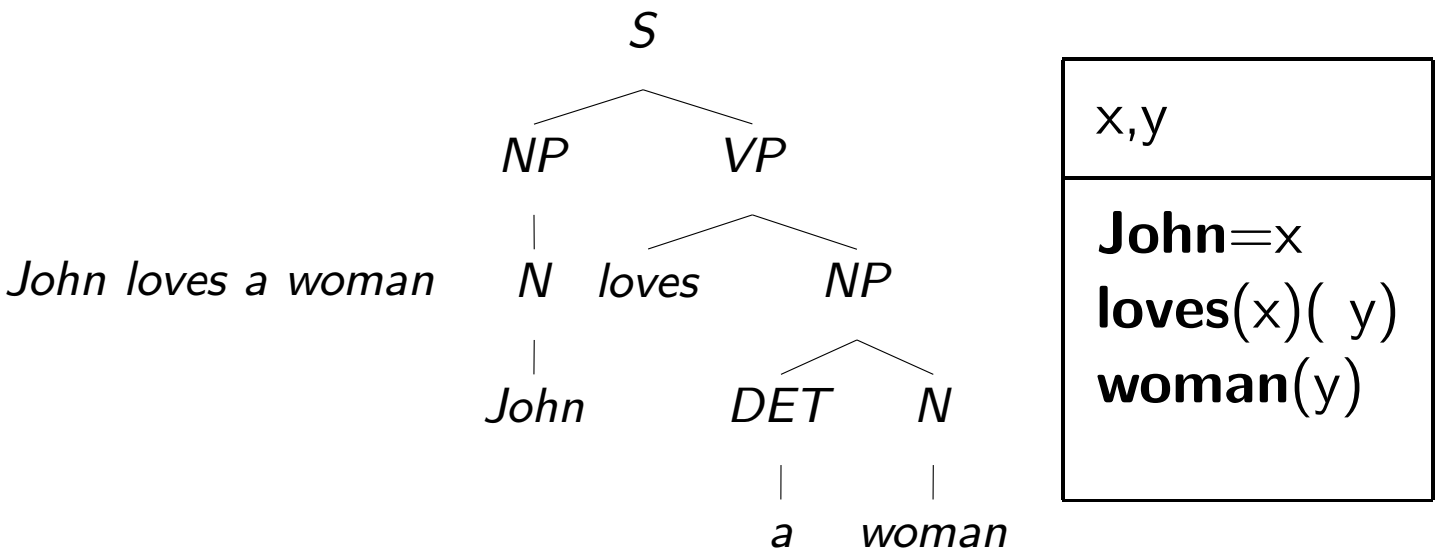
Pronoun construal is part of the construction algorithm

The Process of Building a DRS (sentence-by-sentence)

NL string → sentence structure → DRS → Model-theoretic content



A DRS D is true with respect to model M iff D is embeddable into M, verifying all conditions in D in M.

Ellipsis as a window on context?

- *ellipsis* (from the Greek: elleipsis, "omission"): a construction that lacks an element that is recoverable or inferable from the context.

(5) John is coming to the house on the 17th with Harry; and Tom on the 20th with Sue. You too? I also heard Mary was, with Bill, but on the 22nd.

- Ellipsis parallels anaphora in being essentially context-dependent, and so might be expected to formally be an extension of an anaphora account.
- Current syntactic/semantic accounts do not predict this.

Ellipsis split between syntax/semantics/pragmatics

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(6b) I defended everyone. Bill too. (*stripping*)

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- Syntactic accounts postulate ambiguity, structure-specific stipulation, no attempt at overall characterisation of ellipsis

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- Parallelism has to be stipulated Fox 2002

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- Parallelism effects stipulated specifically for ellipsis, yet not fully successful Steedman 2000:

(9) Every consultant is meeting up with a potential benefactor; and so is every senior administrator.

Problems for semantic accounts

- No basis for morphosyntactic constraints e.g. case constraints on fragments (German)Morgan 1973, 1989

(10)

Hat	Kim	nicht	den Brief	geschrieben?	Nein	Ich/*Mich
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- Neither syntactic nor semantic accounts cover all data (Webber 1979):

(11) The problem should have been looked into, but nobody did.

Ellipsis - pragmatics

- **Pragmatic accounts** are partial, used only for individual types of phenomena:
- e.g. subsentential utterances/assertion (Stainton 2006)

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- Pragmatic accounts do not aim to provide a uniform basis of explanation
- Consequence that ellipses are taken to be irremediably heterogeneous.

Outline

Ellipsis – the new challenge of conversational dialogue Clark 1996, Pickering & Garrod 2004, Ginzburg 2009

- Dialogue contains a high proportion of elliptical fragments
- Conversational dialogue sole basis for data from which children learn language
- Extending the remit of ellipsis analysis or merely degenerate language use?

Context-dependence of linguistic interaction: Fragments

- Where do utterance boundaries occur?

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- Children can do it from earliest stages of language acquisition

(16) Carer: Old McDonald had a farm... On that farm he had a
Child: cow.

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Intentions may emerge/develop during dialogue construction

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- interruptions BEFORE proposition-intention fixable:

(19) A. They X-rayed me, and took a urine sample, took a blood sample. Er, the doctor
B: Chorlton?
A: Chorlton, mhm, he examined me..... [BNC]

Dialogue: challenges for all

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What can utterance understanding mean if we can switch tasks before propositional intentions are available?

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- Speaker/Listener switching deeply problematic for all sentence-based grammars. The grammar provides the wrong kind of output, leaving the phenomenon a mystery.
- Concept of context needed for ellipsis neither denotational nor static: context involves structural update reflecting word by word incrementality. Arbitrary sentence parts can be context for subsequent elliptical fragment

What's going wrong? Pragmatics

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- Are language users really so altruistic? Tomasello 2008

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  - Semantic representations are necessary
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  - Anaphora resolution is part of that construction process, hence content update involves changes in structure **as the analysis unfolds**
- Point of departure:
  - Semantic Representation is the **only** grammatical structure that is necessary
  - Structure is developed in unfolding context:
    Syntax is process NOT representation Steedman 2000, Kempson et al. 2001, Cann et al 2005

Dynamic Syntax

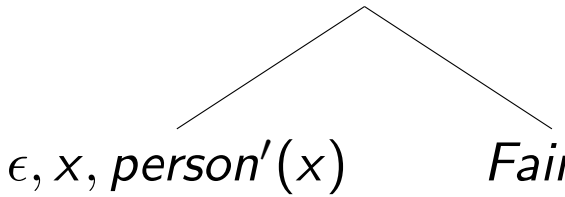
- Syntax as process by which representations of content are built up.
- No encapsulation so pragmatics interacts with syntactic process and growth of semantic representations.
- Parsing is primary and strictly word-by-word (context is developed in temporally linear fashion).
- Generation is parasitic on parsing, but uses the same syntactic processes but with the constraint of the output being known.
- Underspecification and update are the driving forces of the grammatical process.

Syntax as goal-satisfaction

- Building representations of content as monotonic tree growth from word-sequence driven by 'requirements', e.g. to establish content of a certain type.

  Parsing "Someone fainted"

$$?Ty(t), \Diamond \quad \longmapsto \quad Faint'(\epsilon, x, person'(x) \wedge Faint'(x)), Ty(t), \Diamond$$



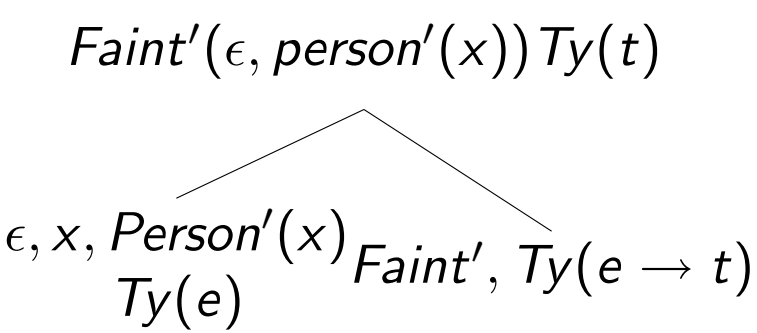
All terms are concepts, induced by procedures from words

Generation

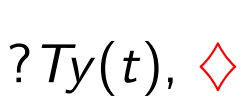
- Speakers go through the same tree-growth actions, except they also have a somewhat richer goal tree.
- Each word licensed must update partial tree towards the goal tree

(20) Generating *Someone fainted*

GOAL TREE



TEST TREE



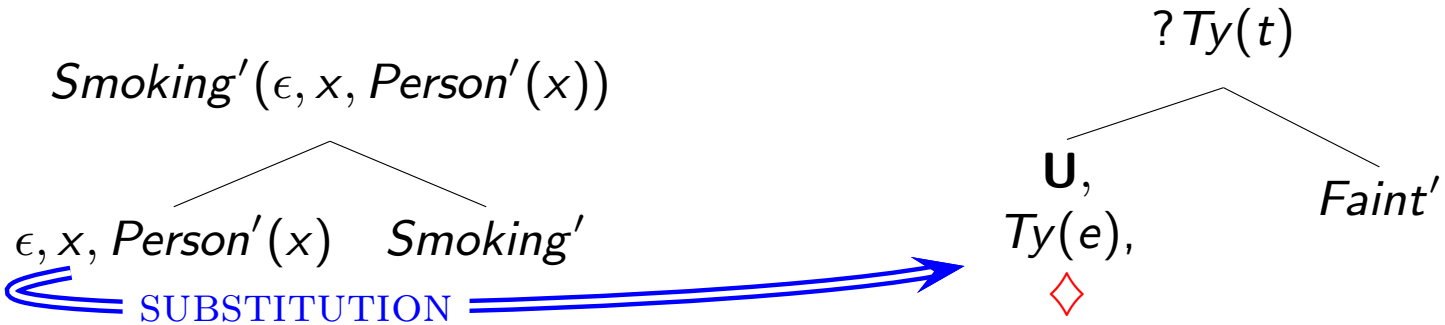
Underspecification of content

- Pronouns project META-VARIABLES (**U**)

  Substituted by item from context during construction

(21) Somone was smoking He fainted.

TREE AS CONTEXT: TREE UNDER CONSTRUCTION:



Both content and context contain structure+actions

Ellipsis - Filling out interpretation from Context

- With semantics as structural representations of content, syntax as the process of constructing such representations, production and parsing as both using the same processes
- Context can be defined as a store of evolving structures + actions used to build them Purver et al 2007, Cann et al 2009
- Users can retrieve actions stored in context and re-use those to build up interpretation

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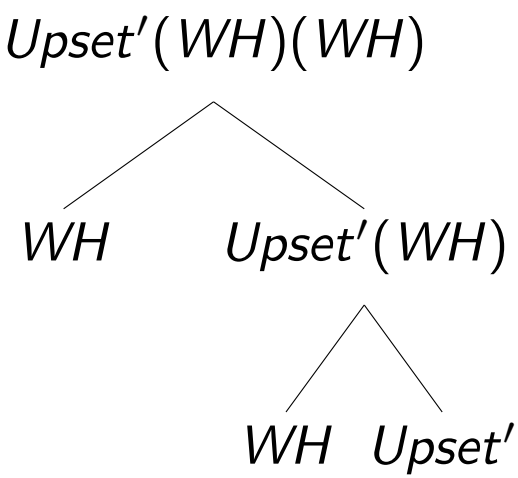
- Users can retrieve actions stored in context and re-use those to build up interpretation
- The parallelism effects in ellipsis (structural and semantic) follow immediately

Ellipsis: re-using actions from context

Interpreting:

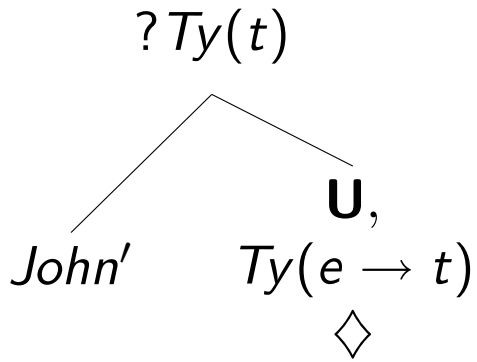
(22) Who hit himself? John did.

CONTEXT



CONTEXT ACTIONS TO RE-RUN

TREE UNDER CONSTRUCTION



actions of *upset*
actions of reflexive
completing/evaluating tree

Ellipsis: re-use of actions induces parallellism

- Using **actions** from context – *sloppy readings*:

(23) John upset his mother. Harry too.

(24) The man [who arrested *John*] failed to read *him his* rights.
The man who arrested Tom did too.

- Also more general parallellism effects: scope, construction type....

(25) A man, I certainly wouldn't appoint. A friend of mine, I just might.

Making syntax dynamic: dialogue and acquisition

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  Sharing a grammar means we can build structures together (without guessing mental states)
- Split utterances as IMMEDIATE consequence.
  Interlocutors take up the partial tree so far constructed as input to the new task.

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  Sharing a grammar means we can build structures together (without guessing mental states)
- Split utterances as IMMEDIATE consequence.
  Interlocutors take up the partial tree so far constructed as input to the new task.
- We expect dialogue to be the optimal learning environment.
  The child relies on what you offer them. If they understand sufficient to have built up a partial structure, they can achieve a big effect by just adding one bit.

Outline

Grammars as reflections of processing?

- Established representationalism in semantics

  Language is a tool-box for constructing formal languages, a system with semantic flexibility in perpetual flux: Cooper and Ranta 2008, Larsson 2008
- Syntax as growth of semantic representations: Cann et al 2005, Purver et al 2006
- A grammar is a set of mechanisms for utterance processing reflecting incrementality of parsing and production: Phillips 1996, 2002, Hawkins 2004, Kempson et al 2001
- Grammar as mechanisms for (conversational) interaction:Gregoromichelaki et al 2009

Open issues

- How critical is the role of mind-reading to all language use?
  Keysar, Barr et al, Clark, Brennan, Sperber & Wilson, Carston
- What would an account of communication which is less intention-heavy look like?
- What is the precise feeding relation between syntax and pragmatics?
- What is the nature of word content? Pritchard 2009
- What are the core properties of a dynamical system and how are these instantiated in language?
- Can we make formal sense of the claim that language is a complex adaptive system? Goldberg et al (forthcoming)

Semantics: An Introduction to Meaning in Language

Cann, Kempson and Gregoromichelaki 2009

Cambridge Textbook Series: Cambridge University Press