Questions in Semantics and Logic
—Amsterdam, December 15th—

9.00 Introduction

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Beyond "knowing that": non-standard epistemic logics

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Abstracts

Yanjing Wang — *Beyond "knowing that": non-standard epistemic logics*

Standard epistemic logic focuses on propositional knowledge(in terms of "knowing that"). However, various knowledge expressions are used in everyday life, which suggests non-standard but interesting new epistemic operators. In this talk, I survey our recent line of work on modal logics based on "knowing whether", "knowing what" and "knowing how" operators. These new logics are apparently not normal modal logics due to the lack of standard modal axioms, which require new techniques to handle. Often, these logics are essentially decidable fragments of first-order or second-order modal logic where an existential quantifier is bundled with a normal modality. As we will demonstrate, these non-standard epistemic logics sit in between logic, linguistics, computer science, and philosophy. We will draw connections to inquisitive semantics and dependence logic in the end of the talk.

Hans van Ditmarsch — *Public announcement games and question-answer games*
joint work with Thomas Ågotnes, Johan van Benthem, and Ştefan Minică

We propose strategic games wherein the strategies either consist of players making public announcements (public announcement games) or consist of players asking each other questions and answering those questions (question-answer games). In a simplification of the question-answer game two players simultaneously ask each other a question that the opponent is then obliged to answer. The motivation for our research is to model conversation including the dynamics of questions and answers, and to provide new links between game theory and dynamic logics of information. Our main contributions for question-answer games are: the notion of a two-person question-answer game with information goals, the existence and computation of equilibria for these games, the correspondence with Bayesian games and their equilibria, and the existence of equilibria for positive goal formulae (a connection between logic and game theory). The results for public announcement games are fairly similar, but there are notable differences. For example, there is a maximally informative strategy in public announcement games (namely announce all you know), but there is no such thing as asking a question that will (always) elicit the maximally informative answer (you cannot know this). Further research involves generalizations to several rounds of questions and answers (or rounds of announcements), and to lying games wherein some communicated information may have the intention to deceive.

References:
– Ågotnes, van Benthem, van Ditmarsch, Minică. Question-Answer Games. JANCL 21(34): 265288, 2011
– Ågotnes, van Ditmarsch. What will they say? Public announcement games. Synthese 179(1): 5785, 2011

Hannes Leitgeb — *A Hyperintensional Logic for the Causal 'Because'?*

I am going to investigate the prospects of developing a hyperintensional semantics and logic for the causal 'because' operator, where by 'hyperintensional' I mean: logically equivalent sentences cannot always be substituted for each other salva veritate in a 'because'-context. The starting point will be some philosophical observations that may be taken to suggest a hyperintensional account of causality and/or causal explanation. (This includes taking 'because'-sentences as answers to 'why'-questions and the resulting relationship to inquisitive semantics.) After presenting a version of van Fraassen's and Fine's truth-maker semantics in a somewhat new format, I extend the semantics to one for the causal 'because' operator: this will give us a hyperintensional causal semantics in which each formula is assigned a set of minimal truth-makers composed of states of nodes in a causal network. I introduce a hyperintensional system of causal logic that is sound and complete with respect to that semantics. Finally, I discuss some possible alternatives and extensions, and I evaluate some of the positive and negative features of the resulting systems.

Fan Yang — *Propositional dependence logic*

Dependence logic has a close relationship with inquisitive semantics. In this talk, we review this connection and present a new axiomatization for propositional dependence logic that is inspired by the connection. We will also prove the interpolation theorem for both propositional dependence logic and inquisitive logic.

Vít Punčochař — *Algebras of information states*

I will present a semantic framework based on algebraic structures that are interpreted as structures of information sates (where, e.g., the join of the states a and b represents the body of information that is common to a and b). The proposed semantics combines into one framework various features of standard relational and algebraic semantics. I will discuss some basic properties of this synthesis and then focus on the role of disjunction in the semantics. I will show that this framework enables us to add inquisitive disjunction to any superintuitionistic modal propositional logic.

Maria Aloni — *Hidden questions*

I will present a uniform analysis of the definites 'the way to Larissa' and 'the number of Jupiter's moon' as used in (1) and (2):

(1)   Meno knows the way to Larissa. (Plato, Meno)

(2)   The number of Jupiter's moons is four. (Frege, 1884)

The definite in (1) is an example of a concealed question (e.g. Heim 1979, Romero 2005). The definite in (2) is arguably a specificational subject (Higgins 1973, Moltmann 2013).

Although syntactically nominals, concealed questions and specificational subjects will be argued to be semantically questions (contra Heim 1979 and Romero 2005). Building on Aloni (2008) and Aloni and Roelofsen (2011) I will assume that questions, concealed questions and specificational subjects quantify over contextually determined domains of individual concepts (aka 'conceptual covers'). Because of this feature,the proposed semantics can be easily applied to explain more complex cases like (3) and (4):

(3)   John knows the price that Fred knows. (Heim 1979)

(4)   a.   The price that Fred thought was $1.29 was (actually) $1.79. (Romero 2005)
       b.   The price that Fred thought was $1.29 was the price of milk.

References:
Aloni, Maria (2008) *Concealed questions under cover.* In Franck Lihoreau (ed.), Knowledge and Questions. Grazer Philosophische Studien, 77 // Aloni, Maria and Roelofsen, Floris (2011) *Interpreting concealed questions.* Linguistics and Philosophy 34 // Higgins, Roger (1973) *The Pseudocleft construction in English.* PhD dissertation, MIT.// Heim, Irene (1979) *Concealed Questions*, in Semantics from Different Points of View, eds. B. Rainer, U. Egli, and A. von Stechov, Berlin: Springer. // Moltmann, Friederike (2013) *Reference to Numbers in Natural Language.* Philosophical Studies, 162.3 // Romero, Maribel (2005) *Concealed Questions and Specificational Subjects.* Linguistics and Philosophy 28

Nadine Theiler — *Too much information! How false answers matter for the interpretation of embedded questions.* Joint work with Maria Aloni and Floris Roelofsen

Responsive verbs like 'know' can embed both declarative or interrogative complements. Standard accounts of such verbs (e.g., Karttunen 1977, Groenendijk and Stokhof 1984, Lahiri 2002, Spector and Egré 2015) are reductive: they assume that whether X stands in a knowledge-wh relation to some question is completely determined by whether X stands in a knowledge-that relation to some answer to the question. George (2013) observed that X's knowledge-wh, however, not only depends on her knowledge-that, but also on her possibly false beliefs—a fact that reductive accounts cannot capture.

In this talk, we will develop an account of responsive verbs that is not reductive, but *uniform*, in the sense that it assumes a single entry for the interrogative-embedding and the declarative-embedding uses of a verb. The key insight that will allow us to capture the belief-dependency of knowledge-wh is that, across all levels of exhaustive strength, extensional responsive verbs are sensitive to both the true and the false answers to the embedded question. Our way of modelling this false-answer sensitivity is by deriving a fine-grained specification of what X needs to know in order to know-wh, but crucially also what she must not believe. In other words, we will emerge with an account of when X has enough information and when she has too much information.

Lucas Champollion — *Some questions in typed inquisitive semantics*
joint work with Ivano Ciardelli and Floris Roelofsen

This talk lays out a compositional account of wh-questions in typed inquisitive semantics (Theiler, 2014, Ciardelli & Roelofsen, 2015). Relevant issues include multiple wh-questions, the interaction between wh-items and disjunction, and the presuppositions of which-questions.

Wataru Uegaki — *Predicting the exhaustivity of embedded questions under factive predicates*

Factive question-embedding predicates, e.g., "know" vs. "surprise" (in its 'literal' reading; Theiler 2014), vary in the strength of exhaustivity involved in the interpretation of their interrogative complements (Heim 1994; Beck and Rullmann 1999). This observation has led theories to posit flexibility in the semantics of question-embedding (Beck and Rullmann 1999; George 2011), but no account has successfully predicted the strength of exhaustivity given the lexical semantics of the embedding predicates (cf. Guerzoni 2007; Nicolae 2013).

This talk presents a semantics of question-embedding that achieves this prediction. I will argue that there is only one kind of semantic derivation for questions embedded under factive predicates, i.e., a derivation involving an exhaustification at the matrix clause. All readings fall out from this derivation once the lexical semantics of embedding predicates is taken into account. Specifically, matrix exhaustification derives the so-called "intermediate exhaustivity" (Spector 2006, Klinedinst and Rothschild 2011) only if the embedding predicate is upward monotonic. This reading can then be strengthened into the so-called strong exhaustivity by the mechanism of neg-raising (Bartsch 1973; Gajewski 2007). Not only does this account predict the variation in exhaustivity, but it also captures a previously unreported connection between neg-raising and strong exhaustivity among question-embedding predicates.

Yimei Xiang
Deriving disjunctive mention-all answers

This talk aims at deriving disjunctive mention-all answers of $\diamond$-questions. I argue that mention-all is available when the wh-trace is associated with an O_{DOU}-operator. I define O_{DOU} as an exhaustivity operator that operates on pre-exhaustified sub-alternatives: it affirms the prejacent and negates the exhaustification of each sub-alternative. Here sub-alternatives are alternatives excluding the prejacent and the innocently excludable alternatives. This proposal is supported by the uses of Mandarin particle *dou*: *dou* licenses the universal FCI uses of disjunctions and wh-items in declaratives and forces mention-all readings in wh-questions. Next, I assume that the extension of a plural or number-neutral NP is closed under disjunction. Finally, I argue that a higher-order disjunctive answer can be complete when strengthened by O_{DOU}, yielding an FC inference.