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INTRODUCTION

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1 CONTEXTS IN FORMAL SEMANTICS

It is, of course, not obligatory, to take 'folk semantics', according to which to be a ('meaningful') expression is to have a ghostly pendant called *meaning*, at face value. There are many linguists and philosophers who argue that it is futile to see the meaningfulness of an expression as a matter of a thing it possesses. However, there is also a strong tradition which *does* take meanings at face value, and tries to find out what they are, or at least in which way they should be reconstructed or explicated.

The modern history of this tradition starts especially with Gottlob Frege, who proposed to exempt meanings from the legislation of philosophy and to subordinate them rather to logic. The logico-philosophical approach to meaning, elaborated by Wittgenstein, Russell and Carnap and resulting in the Montagovian and post-Montagovian formal semantics, wanted to abstract from the way language is actually put to use and account for the semantics of language as an abstract system[1]. The pioneers of this approach to semantics also concentrated on language as a means of encoding knowledge; and hence first and foremost as a means of expressing context-independent propositions, which thus appeared as the primary subject matter of semantics. Context-dependence was seen mostly as a marginal and unimportant phenomenon: everything, so the story went, worth being said can be articulated by means of a context-independent sentence or sentences – and using context-dependent means is only an oblique (though sometimes perhaps handy) way of doing the same. Such view of language was imputed also into the foundations of formal semantics and governed it for some time.

[*] I am grateful to Klaus von Heusinger for helpful comments on a previous version of this text.

[1] Elsewhere (Peregrin, 2001) I pointed out that that ambition may be seen as establishing an interesting kinship between this program and Ferdinand de Saussure's program of concentrating solely on language as *langue* (as contrasted to *parole*) and that, consequently, formal semantics can be seen as a way of carrying out his structuralistic program.

However, even within this framework there were, from the beginning, serious attempts to incorporate context-dependence into the agenda[2]. In his path-breaking paper on formal semantics, David Lewis (1970) made some proposals in this direction; but the first systematic accounts of context dependence within this tradition were provided by David Kaplan and Robert Stalnaker. Kaplan (1970) pointed out that 'circumstances' intervene into the process of determining an utterance's truth value twice, rather than only once, as possible-worlds semantics appeared to suggest. He urged that the utterance must be first confronted with its *context* to yield an intension which can be only then confronted with a possible world to yield the truth value of the utterance w.r.t. the world. Thus, deciphering an utterance such as *I am hungry* we must first exploit the context to unfold the indexical *I*, whereby we reach a proposition which then can be true w.r.t. some possible worlds (namely those in which the current utterer is hungry) and false w.r.t. others.

Whereas Kaplan concentrated on contexts as inputs to utterances, Stalnaker (1970; 1978) was the first to study contexts also as outputs from utterances, thus introducing a truly dynamic perspective. According to him, an utterance 'consumes' the actual context to yield a proposition (which may than be evaluated w.r.t. various possible worlds), and parallelly produces a new context which can be consumed by subsequent utterances. In the simplest case, where both contexts and propositions are seen as sets of possible worlds, the new context may be seen as simply the intersection of the context with the proposition. Thus when I say *I am hungry*, two things happen: the content of the sentence uttered gets amended by the context to yield a proposition which becomes the utterance meaning; and the context gets in turn amended by this proposition to yield a new context.

2 SYSTEMS OF DYNAMIC SEMANTICS

Despite such pioneering work, up to almost the beginning of the 1980s, the mainstream of formal semantics still approached language as a static system. Then, especially after path-breaking papers of Lewis (1979), Kamp (1981) and others, the situation started to change: it started to be ever more clear that the anaphoric structure of natural language, which is being put to work in almost any kind of discourse, cannot be accounted for without some kind of 'going dynamic'. Moreover, Kamp has indicated how to carry out a dynamic turn without abandoning the framework of formal semantics in the wide sense (although perhaps abandoning one in the narrow, i.e. strictly model-theoretic sense). And later Groenendijk & Stokhof (1991), van Benthem (1997) and others showed that the turn can be accomplished even within the narrow bounds of logic and model theory: they presented logical systems which were dynamic just in the way needed for the semantic analysis of the anaphoric structure of language[3].

[2] Prior to the establishment of formal semantics, context-dependence was explicitely addressed for example by Bar-Hillel (1954).

[3] Earlier versions of dynamic logic originated especially within the context of computer science.

The most general idea behind the dynamic turn in semantics appears to be the acceptance of the Stalnakerian insight that our pronouncements must be seen both as 'context-consumers' and 'context-producers'. A sentence such as *He wears a hat* is not truly intelligible (and is neither true, nor false) without there being a context for it to 'consume' and to furnish its *he* with a referent. Such a context might be constituted by the circumstances of utterance of the sentence (which may include pointing at a person), but often it is produced by some previous utterances: e.g. by the previous utterance of a sentence like *Look, there is a man passing by!*

Turning the idea of sentences being context-producers and context-consumers into the formally-semantic cash leads to thinking of a sentence as something which has a *context-change potential*: i.e. is able to bring about a change of the actual context. This, in turn, often leads to viewing the denotation of the sentence as something which involves (or simply *is*) a function mapping contexts on contexts (which is taken to be the formal reconstruction of the potential). Contexts are often seen also as *information states*: they are constituted by all the information amassed by the discourse so far. (And, importantly, they contain what can be called an *individuary*[4] – a collection of individuals having been made salient by the discourse – which acts as the casting agency for the needs of the pronouns and other anaphoric expressions of language.) Hence the resulting semantic model consists of (i) a set *S* of information states and (ii) a family of functions from *S* to *S*.

Thus, while on the Kaplanian picture a proposition came to interact with the context to produce the content of the actual utterance ('what is said'), now it is recognized to fulfill also one more important task: to create a new context. And if the Kaplanian picture led to the explication of the proposition as a function from contexts to contents (which were explicated as intensions), now they, *prima facie*, come to be explicable as a pair of functions: one mapping contexts on contents (the *character*, in Kaplan's term) and the other one mapping contexts on contexts (the context-change potential). But in fact these two functions need not be independent: one of the possible ways in which an utterance may produce the new context is to take its content and somehow add it to the old context. In this way, the production of the content may appear as a by-product (or an intermediate product) of the production of the new context; and the context-change potential might be looked at as fulfilling both the tasks. This appears to be what has led some of the semanticists to the identification of propositions with context-change potentials[5].

A variety of dynamic semantic models of language emerge from various kinds of explications of the notion of context or information state. Take, as an example of one kind of such approach, Hans Kamp's *discourse representation theory* (DRT)[6]: there the role of the information states is played by *discourse representation structures* (DRSs), each of which consists of a set of individuals and a set of conditions supplied for them by the discourse. Thus a sentence like

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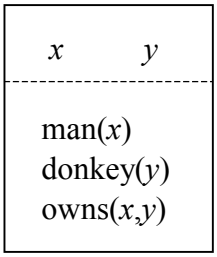
[4] See Peregrin (2000a).

[5] Note, however, that as a sentence must interact with the context to yield not only a new context, but also the content of the actual utterance ('what is said'), identifying its meaning with the context change potential is subsuming the latter task under the former, which may not be unproblematic (cf. Stalnaker, 1999).

[6] Kamp (1981); Kamp and Reyle (1993); van Eijck and Kamp (1997).

A man owns a donkey

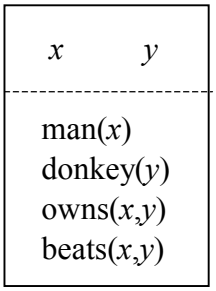
introduces two individuals together with the conditions that the first of them is a man, the second one is a donkey and the first owns the second. This gives rise to the following DRS:



Hence sentences produce DRSs; but they can, and some of them need to, consume DRSs. Thus a sentence such as

He beats it

needs a context delivering the reference for its pronouns. If it is uttered in the context represented by the above DRS, it enriches it with the condition that the first of the individuals of the DRS beats the second; hence produces, in effect, the following DRS:



All in all, a sentence is to be seen as something which in general upgrades a given DRS to another, more elaborated one.

Quite a different explication of the notion of context is provided by such systems as Groenendijk & Stokhof's (1991) DPL[7]. Here the role of information states is played by sets of assignments of objects to the so called *discourse markers*. The intuitive idea behind this could be explained as follows: uttering *a man* introduces an individual which becomes the potential referent for *he*; hence the context produced by the utterance can be reconstructed as assigning this object to *he*. In general, the context is an assignment of all potential referents to all possible anaphoric phrases of language, which are established by the previous utterances. And discourse markers are what assume the role of the phrases within the language of DPL.

[7] See also van Benthem (1997) and Muskens et al. (1997).

Thus, (1) is analyzed as

$\exists d_1 d_2(\text{man}(d_1) \wedge \text{donkey}(d_2) \wedge \text{owns}(d_1,d_2))$

and produces the context consisting of all functions which map d_1 and d_2 on some elements of the universe such that the first of them is a man, the second one is a donkey and the first owns the second. The subsequent utterance of (2) which is analyzed as

$\text{beats}(d_1,d_2)$

then reduces this set to the set of only those functions which map d_1 onto an individual which beats d_2. (Thus, within DPL, $\exists d_1 d_2(\text{man}(d_1) \wedge \text{donkey}(d_2) \wedge \text{owns}(d_1,d_2)) \wedge \text{beats}(d_1,d_2)$ is – surprisingly – equivalent to $\exists d_1 d_2(\text{man}(d_1) \wedge \text{donkey}(d_2) \wedge \text{owns}(d_1,d_2) \wedge \text{beats}(d_1,d_2))$. The reason is that the operators $\exists$ and $\wedge$ are not the well-known operators of predicate logic: the former in fact establishes an assignment of an 'arbitrary' value to a discourse marker, whereas the latter represents a concatenation.)

A dynamic approach also based on logic but in a rather different way (and in fact older than the previous ones) is represented by Hintikka's proposals to account for the semantics of sentences in terms of games[8]. It is well known that the usual semantics of standard logic (first-order predicate calculus) can be alternatively formulated as based on games: each formula is taken to represent a game of two players (*Me*, attempting to show that the formula is true, and *Nature*, attempting the opposite), such that one of them (*Me*) has a winning strategy just in case the sentence is true. Thus the formula

$\exists x_1 x_2(\text{man}(x_1) \wedge \text{donkey}(x_2) \wedge \text{owns}(x_1,x_2))$

of the standard predicate logic is thought of as representing a game in which *I* am first to pick up two individuals of the universe, a_1 and a_2, so that the game is to continue with the formula

$\text{man}(a_1) \wedge \text{donkey}(a_2) \wedge \text{owns}(a_1,a_2)$.

(What I aim at is picking up some such individuals that the latter formula will be true.) In the next turn, *Nature* chooses one of the three conjuncts with respect to which the game is to continue then. (What it aims at is choosing that which is most unlikely to be true.) And then the game comes to an end: if the selected atomic formula is true, *I* win, if not, the victory belongs to *Nature*.

Hintikka proposed various kinds of broadening of the range of games representable by sentences, going behind the boundaries of those naturally associated with the formulas of first-order logic. And we can also think of modifying the rules in such a way that they produce

[8] Hintikka (1973); Hintikka and Sandu (1997); and also the contributions in the last part of this volume.

'contexts' with 'individuaries'. (Keeping track of the moves of the game produces, besides other things, a list of individuals picked up by *Me* in the course of the game[9].)

3 EXPRESSION MEANING VS. UTTERANCE MEANING

Whereas formal semantics in its original form saw context-dependence as a form of imperfection, and the relationship between 'true' semantics and discourse analysis or pragmatics as akin to that between pure and applied mathematics, the above sketched dynamic turn has necessarily implied a blurring of this boundary. Formal semanticists have recognized that we can hardly account for meanings of a nontrivial part of natural language without taking into account how discourse functions, how what is said can depend on context, and how it can in turn change the context.

In this way formal semantics has come into contact with a different semantic tradition, the tradition which has, from the beginning, concentrated on the actual processes of communication rather than on language as an abstract system and thus has given pride of place to *utterance meaning* over *expression meaning* – for it is, after all, the utterance meaning which does the job of communication. Within philosophy, this tradition has its roots especially in the Oxford ordinary language philosophy of J. L. Austin, P. Strawson and G. Ryle; but it has been later reinforced by many linguists and cognitive scientists who aimed at an account of how people actually communicate.

The most influential conceptual framework for studying utterance meaning (and its relationship to expression meaning) is due to the Oxford philosopher H. Paul Grice (1957; 1989). His idea was that to understand an utterance is to grasp what the utterer intended to convey, i.e. to grasp the 'speaker meaning', which is only indirectly related to the meaning of the sentence he uttered. (Thus, by uttering *It is late* one may want to say that he should go home, or that his neighbor should not make such a noise etc.) Grice argued that the meaning of the sentence uttered is used only as an indirect indicator of the speaker's meaning, which it yields only in interaction with many general assumptions about the speaker's goals and intentions (such that the speaker intends to convey something, that she intends to convey something which is relevant to her audience etc.).

The idea that to understand somebody's utterance is to find out what he intends to say (using the meaning of the expression he uttered as a mere clue) resulted, within the context of cognitive science, into conceptions of linguistic communication as based on something like a 'mind-reading' (see, e.g., Sperber and Wilson, 2002; and also Breheny, this volume). In a slightly different way, Noam Chomsky and his followers have also contributed to this tradition in that they have turned the attention of linguists to the processes of *generating* utterances, i.e. to the processes which result in the utterer's making the particular utterance she makes (see Hinzen, this volume).

[9] See Hintikka and Kulas (1985); and also Janasik and Sandu (this volume).

4 BUT ... WHAT IS IT ALL ABOUT?

After the dynamic turn, the conceptual foundations of formal semantics became a little bit ambiguous. The static semantic theories of possible worlds or situations were replaced by theories centering around the concepts of context or information state. However, while possible worlds were readily explainable as our means of accounting for "what (empirical) truth is relative to" (Stalnaker, 1986) and hence possible-worlds semantics could be seen as a relatively straightforward account for truth conditions, the foundations of dynamic semantics are still much less clear.

To be sure, there seems to exist an almost universal agreement that what dynamic theories are about is something like an 'information flow' or 'kinematics of discourse'. Thus, Chierchia (1994, 141), claims that what we are now after is the question "how [meaning] affects the information available to illocutionary agents"; and van Benthem (1997, p. ix) urges that even logic is now to concentrate on "the logical structure of cognitive actions, underlying human reasoning or natural language understanding". However, what exactly does this mean?

Prima facie there might seem to be no great fuzziness here. There are information states, so the story goes, and there is communication which changes them; and dynamic semantics is to account for this. However, in what sense do information states exist and how do they actually get changed by means of communication? There seems to be at least two quite different answers available, answers which can be called *individualistic* and *collectivistic*, respectively. According to the first, the contexts we describe are a matter of (i.e. 'are in the head of') an individual speaker, according to the other they have a status of some socially-constructed reality.

Both many cognitive scientists and some linguists with the Chomskyan background appear to be more sympathetic to the individualistic interpretation. Many of them saw a great deal of previous formal semantics as simply chimerical in that it addressed something which did not really exist, and now hail dynamic semantics as a means of turning attention to what is really there: to the manipulation of some mental representations or to workings of some language faculty. After the dynamic turn, these theoreticians have been joined by a host of those which were inspired by DRT interpreted in a mentalist way.

Many logicians and some philosophers, on the other hand, are more or less reluctant to make meaning into a matter of mind or cognition. After all, they feel, it was the most crucial lesson Frege taught us that to subordinate logic, and consequently also semantics, to psychology is a way to hell; and some of them also accept Wittgenstein's or Quine's arguments to the effect that language cannot but be social through and through. Hence they often prefer the collectivistic understanding of information states. According to this, information states are not within the heads of individual speakers, they are rather our means of hypostasing certain states of groups of speakers: states of sharing the acceptance of some beliefs or pieces of knowledge.

Now notice that whereas on the individualistic reading the dynamic turn involves a substantial change of the subject matter of semantics (from studying meanings to studying processes

behind the production or comprehension of utterances), on the collectivistic reading this is not necessarily so. True, we can still see semantics as turning its attention to a description of certain processes (though now not cognitive, but rather 'socio-logical' ones); but we can also go still further on the way of rendering information states 'virtual' and claim that they are not something which we *describe*, but rather something which we only *use as a tool* for describing the semantic aspect of language and of communication. This 'instrumental' approach to dynamic semantics should be better recognized as a reading of its own: as it usually assumes that the ultimate data semantic theory is to account for with the help of meanings are our linguistic inferences and inferential rules, let us call it *inferentialistic*.

The situation is similar to the one which obtained during the heyday of possible worlds. Though there almost did not exist the possibility of a mentalist interpretation (more precisely those who wanted such an interpretation found possible world semantics straightforwardly inadequate[10]), there still remained two possible ways of making sense of possible worlds, a 'metaphysical' one and an 'instrumental' one. According to the first, possible worlds existed in some metaphysical sense (and prior to language) and to do possible world semantics was to reveal their relationship to natural language expressions. According to the other, possible worlds were only in the eye of the beholder (semanticist), who used them as a tool for explicating facts about meaning (which were usually seen as a matter of the rules of language, especially the inferential ones).

Thus, a possible world semanticist of the latter kind might say that what he is after is simply and straightforwardly meaning, but as he wants to explicate also meanings of modal and counterfactual locutions, he needs a richer semantics than offered by standard first-order logic, and arguably the most handy one, due to Kripke, employs entities which are suitably called possible worlds. And similarly, an information-state semanticist might say that as what he is after is explication also of anaphoric locutions, he arguably needs a semantics of 'updates' and entities suitably called contexts or information states[11].

It might seem that these three interpretations of dynamic turn differ only in some not so important ideology. But this is not so; their differentiation has profound consequences for the way we are to assess the success of the individual theories. Suppose that two theoreticians disagree about the meaning of an expression and want to find a criterion for resolving their disagreement. If they are both subjectivists, then they are bound to search for the criterion within the minds of the speakers, for then their theories are meant to depict something which is to be found there. If, on the other hand, they are both collectivists, they will have to look at the praxis of communication. And if they are both inferentialists, then they will have to check the inferences governing the usage of the expression. Of course the worst situation obtains if each of them interprets the dynamic turn in a different way – then they can hardly not talk past each other. And, as a matter of fact, this is quite a frequent situation.

[10] As, e.g., Partee (1980).

[11] See Peregrin (2000b).

5 IS MEANING DYNAMIC?

Different interpretations of the dynamic turn also lead to quite different answers to the question what the turn tells us about the nature of meaning. Some exponents of the turn would see it as abandoning the ('futile') search for expression meanings and concentrating on utterance meanings or on the very process of communication. Others would see it as disclosing the real nature of meanings – telling us that what meaning really is is not a class of possible worlds or a situation type or something of this kind, but rather an update, a function from information states to information states (where the information state may be explicated as a class of possible worlds, as a DRS, as a set of mappings of discourse markers on individuals etc.). And still others would see it as opening a new way of explicating meaning, which can coexist alongside the older ones, but which is particularly suitable for the explication of the anaphoric features of language.

It was with these questions in mind that we organized the workshop "Is Meaning Dynamic?", which was held in Prague in September 2001 and at which most of the papers included in this volume were presented. Its topic was suggested by the fact that the problems concerning the interplay between the dynamics of language and the nature of meaning have been affecting different areas of logic, linguistics and philosophy of language in such a way that they appear to foster a true paradigm shift: indeed, this question itself appears to be not only a 'context-consumer' (i.e. is the product of the recent status of the discussions of the nature of meaning), but also a 'context-producer' since it actually changes the character of the discussions. And though the papers do not provide ready-made answers to this question or to questions related to it, the book can hopefully facilitate a kind of brainstorming which might lead us either to some answers, or to reconsidering the questions.

The book consists of three parts. The papers in the first deal with foundational questions: why should we think that meaning is dynamic, what exactly does it mean that it is dynamic and what does this imply for the methodologies of semantics. The fact that the dynamic view has also already achieved a certain tradition in forming theories is reflected by the papers of the second part. These papers show different applications of dynamic theories / views / approaches in different areas of the theory of language, such as the compositional process of interpretation, the lexical meaning of the articles, the interaction with a discourse structure or the semantics of imperatives. Papers of the last part then address the game-theoretical variety of dynamic semantics.

Johan van Benthem realizes that if we take the shift from the static perspective on language to the dynamic one, we will have to reconsider our very concept of inference: for the traditional view of inference as reflexive, transitive, obeying cut etc. turns out to be obsolete. Therefore he considers quite different kinds of inference and indicates that it is this very kind which is of a piece with the usual kinds of dynamic semantics.

The paper by *Noor van Leusen and Reinhard Muskens* considers the problem of 'procedurality' versus 'declarativity' of dynamic theories. Whereas the common wisdom appears to be that whereas DRT is decidedly procedural, DPL and related theories are declarative, the authors

argue that a synthesis between the two perspectives can be reached if logic is used as a metalanguage for the description of natural languages. Procedural aspects, they claim, are then associated with the proof theory of this logic, declarative aspects with its model theory.

A thorough criticism of the foundations of dynamic semantics is presented by *Richard Breheny*. He concentrates on the question of what exactly it is that is accounted for by dynamic theories of formal semantics; and he argues that some of these theories are based on an unwarranted 'semantization' of what are essentially pragmatic effects of utterances.

Wolfram Hinzen confronts the kind of dynamics which appears to fuel current dynamic theories of the kind of DPL with the different kind of dynamics implicit in the Chomskyan view of language. His point is that "given that the philosophical theory of meaning has long since moved on to the philosophy of mind, it remains surprising that the Chomskyan enterprise continues to be as marginal to it" and that "it seems desirable to have more discussions on how these partings of ways could be fruitfully overcome."

Ruth Kempson, *Wilfried Meyer-Viol and Masayuki Otsuka* argue that there is a sense in which we should see the dynamics of language as grounded already within syntax; and moreover, that syntax may be the *only* place of the system of language where we need to 'go dynamic'. What they propose is to concentrate on the process of interpretation of strings, which they account for as a process of building syntactico-semantic trees; and argue that "the old question of whether we need structures in representing interpretation in semantics is transformed into a new question: *Do we need any mode of representation other than growth of logical forms in order to express generalisations about natural-language syntax?*"

The nature of the dynamic turn can be clearly seen in the analyses of the English articles. While the static versions of formal semantics often accepted the obviously inadequate Russellian approach (according to which *a* amounted to existence and *the* to unique existence), the dynamic turn has opened the door for much more adequate analyses replacing existence with referential availability and uniqueness with top salience. *Klaus von Heusinger*'s paper discusses this very development and attempts to elaborate on it.

While the focus on the dynamic aspect of language is a relative *novum* for formal semantics, it has been long discussed within some linguistico-semanticist circles, notably within the so-called Prague School. And this is the background of the paper of *Petr Sgall*: he discusses the interplay of semantics and the workings of discourse, trying to accommodate the insights of the Praguian theory (with its concepts of *communicative dynamism*, *topic-focus articulation* etc.) within the formally semantic framework.

Dynamic semantics can be, in fact, seen as switching from seeing our assertoric statements as representing or expressing something (classes of possible worlds, DRSs etc.) to seeing them as *effecting* something – namely the change of the actual information state or context. This not only maneuvers semantics of natural language into the vicinity of that of programming languages (Groenendijk and Stokhof, for example, explicitly admitted theories of semantics of programming languages as a source of inspiration for their DPL), but it also reduces the semantic gap between the assertoric mode of speech and the imperative one. And the semantics

of imperatives is the subject matter of two papers closing the second part: while *Berislav Žarnić* discusses more the technical side of the semantic theories of imperative discourse, *Timothy Childers and Vladimír Svoboda* deal more with the foundational problems.

The last part of the book is devoted to the game-theoretical approaches to semantics. *Tapio Janasik and Gabriel Sandu* discuss the way in which such approaches can deal with anaphoric reference. *Manuel Rebuschi* argues that game-theoretical semantics should be based on substitutional, rather than on the objectual, quantification. And *Louise Vigeant* scrutinizes the step from the original version of game-theoretical semantics to the independence-friendly logic and concludes that the step contains an undesirable 'intensionalization', which takes it away from laudable verificationism.

What all the discussions appear to indicate is that the 'dynamics' which is in play is more than a mere hypothesis – that it rather aspires to become an integral part of our general view of meaning. The dynamic turn is thus responsible not only for some new theories, but also for a change in our overall notion of semantics. Hence, however we want to answer the question whether meaning is dynamic, it is simply no longer possible for us to ignore it.

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