In Zygmunt Frajzyngier *et al.* (eds.). *Diversity and Language Theory* Studies in Language Companion Series, John Benjamins, 2005; pp. 51-80.

What is an empirical theory of linguistic meaning a theory of?

Pierre-Yves Raccah
CNRS - CeReS
Limoges, France
pyr@ccr.jussieu.fr

ABSTRACT

This chapter examines in depth under what conditions linguistic meaning can be the object of an empirical science.

Possible answers, from the point of view of semantics, are given to questions about the proper object of theories of language structure, about what a theory of language structure explains, and about the elements a theory of language structure contains.

It is shown that the only empirical observations related to semantics are utterances and human behaviours; the semantic description of a human language is thus the description of the set of constraints that words and structures of that language impose on the construction of the senses of the utterances. Some of these constraints are imposed by articulators (connectives and operators); others by 'ordinary' words; both kinds of constraints concern the *points of view* which are necessary in order to build the senses of the utterances.

Key-words

Scientific law; explanation; scientific description; empiricity; scientific knowledge; cognition; semantics; semantic constraints; points of view; argumentation; topoi; topical field

INTRODUCTION

In this chapter, I examine under what conditions linguistic meaning can be the object of an empirical science. In particular, I give possible answers, from the point of view of semantics, to the following questions:

- What should be the proper object for theories of language structure?
- What should a theory of language structure explain?
- What elements should a theory of language structure contain?

Within this inquiry, various possible reductionisms will briefly be taken into consideration, as possible directions to investigate in order to answer those questions; among those, I will study in more details the *cognitive reductionism*, and thus give a partial answer to the following question:

- What should be the relationship between theories of language structure and the theories of cognition?

It is a commonsensical belief that science is supposed to uncover the 'laws of nature'. According to that belief, scientific theories state the laws which nature allegedly obey. After briefly picturing the situation of the notion of *scientific law* with respect to the other kinds of rules, I will show that the above mentioned 'commonsensical' belief is misleading: we will discuss the conception of science that stems from it. In that discussion, we will show that scientific theories do not provide *explanations* of the phenomena, in the usual sense of the word, but rather constrained *descriptions*, of the kind I will specify. From that point of view, science could look like a formal language, a sort of representation system, with which one can also generate complex representations out of simpler ones. But scientific theories do much more, they play a crucial psychological and social role: because of the kind of constraints that science impose to possible descriptions, once a scientific theory is accepted by a community, it constitutes an inter-subjective tool to perceive phenomena: accepted hypotheses become the facts of newer theories.

Applying these views to the science of natural languages, we will examine in what sense speakers and hearers can be said to apply semantic rules. We will see that these semantic rules have to be seen as re-constructions, by the observers, of processes of sense construction, in which the meanings of sentences are the tools which operate on the hearer's knowledge for her/him to build an interpretation of the utterance of the sentence, in the situation in which it was uttered. In that sense, though semantics is obviously related to cognitive science, its objects of study are not cognitive objects.

1. Different notions of *rule*

This section provides a short review of the different notions of rules. This review is not exhaustive and does not aim to be so: it only pretends to put into perspective what will be said about scientific laws, preventing, thus, excessive generalisations and providing guidelines for possible extensions.

For each type of rule which we examined in the following contrastive outline, we provided some characteristics of

- the usual names given for rules of that kind,
- its domains of application,
- the kind of entities which is supposed to follow –or not– the rule,
- possible transgressions and transgressors,
- possible clearly inappropriate names for a rule of that kind; kinds of rules which are in opposition or incompatible with rules of that kind.

So, for instance, a particular law, belonging to the first line of the table, has, as its domain, human behaviour, concerns citizens or juridical entities, leaves place to cheaters (civil laws) or criminals (penal law), and cannot be taken to be a strategy, a dogma or a regularity, as soon as it is understood as a law.

The table in the following page sums up the main results of this short analysis[1].

[1] As a recreational exercise, the reader can try to place, in this table, the famous *Murphy Law*, according to which "anything that happens happens in order to worsen the situation, unless it had been predicted by the present law"…

Types (names)	***Domains***	***Entities***	***Transgressors***	***Incompatibility***
Norms, laws, contracts, procedures, orders	Legislation; more generally, human behaviour with respect to other humans and/or institutions. [General, imposed]	Citizens, judges, governments, legislators; member of an organisation.	Criminals, cheaters	Strategy Dogma Regularity
Rules of a game, dance, strategies	Ludic activities; more generally, human behaviour with respect to other humans. [Particular, chosen]	Players, dancers, actors.	Bad (poor) players, cheaters, marginals (?),	Law Dogma Regularity Principle
Rules of a religion, dogmas, commandments	Human beliefs or behaviour with respect to non-human entities (such as divinities). [Imposed]	Members of a religious or mystical community.	Heretics	Strategy Regularity
Moral rules and principles	Human behaviour (in general)	Any human being	Immoral, dirty, revolting	Strategy Regularity Dogma
Formal relations	Mathematics, Logic.	Concepts	Incoherent, inconsistent	Strategy Dogma Regularity
Rules of nature, scientific laws, principles	Material: physics, chemistry, etc. Immaterial: sociology, psychology, linguistics, etc.	Anything…	[No exclusion]…	Strategy Dogma

Table 1*: Different notions of rules.*

2. Laws of nature vs principles of rationality

We often say that nature obeys laws; that natural phenomena can be explained by rules; or that some particular theory explains some particular set of phenomena. As long as these statements remain general and metaphorical, they are acceptable and harmless. However, if someone believed that nature really *obeys* some set of laws (in the sense that it would be *obedient*), (s)he would certainly be considered as mystical or, at least irrational[2].

As a matter of fact, one must consider irrational not only the belief that nature is *obedient*, but also the belief that theories give *explanations* to natural phenomena, in the usual meaning of the word explanation. For both attitudes presuppose a very special metaphysical standpoint according to which nature is subject to *behaviours* which, in the first case, would be dictated by laws[3] and, in the second case, would be such that one could find *reasons* (or even *causes*) for those behaviours. Can we seriously pretend that the law of universal attraction is a cause (or a reason) of the movement of the Earth around the Sun, *in the same way* as Othello's jealousy was one of the causes, of the reasons, of Desdemona's death?

The only way, thus, to avoid personifying nature (with all the irrationality it would imply), is to consider that « natural laws » cease to be natural as soon as they are laws and cease to be laws as soon as they are natural[4]...

2.1. On natural laws and explanations

One might want to hold that, since we can observe regularities in nature, there must be something 'out there' which is responsible for the regularities we observe. This belief – which is also mine, I must confess... – is not really rational[5]: the only conclusions we can draw from observable regularities is that there may be something, *either* 'out there' *or* within the observers' systems of observation, which is responsible for the regularities observed. In other words, the so called 'natural laws' should be interpreted as possible constants of the human cognitive systems, or as relating the human cognitive system to the world we observe, but not as properties of that world alone. However, once we know that whatever we think we are saying about the world is, in fact, a statement about the cognitive relationship we have with the world, we might want to simplify our statements, using the metaphor of natural laws. But we should not be blinded by that metaphor: what linguistic expressions such as « natural law » refer to only belongs to the representations suggested by the use of language; the fact that we can *speak* of natural laws does not guarantee their existence.

It follows from these reflections that, even if we want to describe the regularities of our observations in terms of natural laws, we are not entitled to hold that these regularities exist *because of* some law: this would suppose the personification of nature which we have to reject. For, what law would force nature to obey some natural law ? And, if we wanted to formulate such a law, what would force nature to obey that other law ? Yet another law ?

We thus have to abandon the idea that science *explains* nature. What does remain is the fact that science *describes* nature, in such a way that the descriptions it provides are often felt like explanations (hence, the use of the term *natural law*). If we consider a particular scientific theory as a set of rules which generate a description of some aspects of a class of phenomena, we get hold of a more reasonable conception of *natural laws*. That position can be called a *de*

[2] This attitude is relatively recent: think of the not so old belief according to which *nature abhors a vacuum*...
[3] Like the laws imposed on humans by some god ?
[4] In van Fraasen (1985), Bas van Fraasen holds a similar position, using evidences from a historical analysis of philosophical ideas.
[5] See below, section 3.1.

dicto conception: what we call « natural law » is a rule which explains the description we make of some phenomenon within the framework of some theory, in the sense that the rule allows to formally generate the description. The study of physical theories very well illustrates the necessity of such an epistemological precaution.

When a fact *A* is presented as a cause of a fact *B*, it constitutes a *de re* explanation of the fact *B*. When a fact *A* is presented as a cause of the fact that one may think or say "*B happens (has happened or will happen)*", it constitutes a *de dicto* explanation for *B*. Suppose John arrives at 15:30 at a meeting where he was expected at 15:00; when asked "Why are you late", he might answer "I am late because I had a car incident on my way". He is then presenting the fact *[car incident]* as a *de re* cause of the fact *[delay]*, giving thus a *de re* explanation for the fact *[delay]*. Had he answered "I am late because I arrived 30 minutes after the agreed time", independently of the social effects of such an answer, he would have presented the fact *[arriving 30 minutes after the agreed time]* as a cause for thinking or saying that he is late, that is, as a *de dicto* explanation for the fact *[delay]*. Obviously, in that example, what was expected was a *de re* answer: the *de dicto* one is deceiving in this situation. However, in other situations, the contrary happens. Suppose you hear Paul say "John is nasty" and you ask him "Why?". If John gives you a *de re* explanation, such as "His parents treated him badly when he was a child", you would feel deceived by that answer and would insist "Come on, I am asking why you *say* (or what makes you think) that Paul is nasty". In that case, the expected explanation is a de dicto explanation[6]. This is precisely the kind of expectations we have about scientific descriptions.

If, for instance, we considered the law for the uniformly accelerated movement, as it is expressed in

$$e = 1/2gt^2 + v_0t + e_0$$

as a *de re* explanation of the trajectory of an object with initial velocity v_0 at time t=0, starting at point e_0 of the space, we would then consider the trajectory as caused by the fact expressed by the equation, which, as we have seen above, would be a mystical conception of Nature. In addition, we would also have to explain why this relation holds for this type of movements, and, after a short series of « why? »'s, we would end up considering the law of universal attraction:

$$F=k.\frac{M.M'}{d2}$$

as an *de re* explanation of the trajectory, which would make it necessary to find an explanation for it... and so on.

2.2. De re *vs.* de dicto *descriptions*

Fortunately, this is not the way physicists proceed: the aim of these equations is not to provide an explanation to the « mysteries » of nature, but to explain how the theory describes and predicts the phenomena it is supposed to account for. Scientific theories also provide more abstract laws, which account for less abstract ones, like the universal attraction law accounts for the different movement laws. These more abstract laws, as we have seen, have no intrinsical explanatory value for the phenomena: they only explain how we can describe some phenomenon $\mathcal{E}$ in some particular way $\mathcal{T}(\mathcal{E})$, given that we describe some other phenomena,

[6] The distinction between *de dicto* and *de re* causality is treated in different ways in different languages. There are not many linguistic studies about these different treatments. One of these studies, which deals with the grammatical differences between *de re* and *de dicto* clauses can be found in Frajzyngier (1991).

$\mathcal{E}_1$, $\mathcal{E}_2$, ... $\mathcal{E}_n$, using descriptions $\mathcal{T}(\mathcal{E}_1)$, $\mathcal{T}(\mathcal{E}_2)$, ... $\mathcal{T}(\mathcal{E}_n)$.

The 'explanatory effect' produced by a scientific theory is thus external to the theory itself. In an attempt to reconstruct how this effect can occur, it can be said that it is due to the following two factors:

– our tendency to believe that nature follows rules;
– our tendency to assimilate a phenomenon with its description.

The combination of these factors seems to be operated by the following abductive reasoning:

> « Since nature obeys rules and since rule $\mathcal{S}$ generates a satisfactory « description of the natural phenomenon $\mathcal{E}$, it must be this rule $\mathcal{S}$ that nature « obeys in order to produce phenomenon $\mathcal{E}$.

[note the de *dicto* → *de re* shift from the first to the second occurrence of $\mathcal{S}$.]

2.3. Compositionality and explicativity revisited

In order to provide systematic *de dicto* explanations, a scientific theory q must provide means to

a) structure a set of phenomena of the field in simple and more complex phenomena [7] (we will say that the phenomenal structure of q rests on *external hypotheses*);
b) assign descriptions to the phenomena of that set (let us call that a '*theory of measure*' for q);
c) generate descriptions out of other descriptions, with the means of theory-specific operators (called *internal hypotheses*);
d) compare descriptions one to another (in particular, compare a description assigned to a phenomenon to a description generated).

We can thus say that a theory q *correctly predicts* a complex phenomenon $\mathcal{E}$ whenever the description it *generates* is identical to the description its theory of measure *assigns* to $\mathcal{E}$.

Thus, given a set of external hypotheses for an empirical theory q, which entitle us to consider a phenomenon $\mathcal{E}$ as a structural complex involving the phenomena $\mathcal{E}_1$, $\mathcal{E}_2$, ... $\mathcal{E}_n$ (that is, $\mathcal{E} = \mathcal{R}(\mathcal{E}_1, \mathcal{E}_2, ... \mathcal{E}_n)$ for some structural relation $\mathcal{R}$) given a theory of measure for q, which allows us to describe the relevant aspects of $\mathcal{E}_1$, $\mathcal{E}_2$, ... $\mathcal{E}_n$ and $\mathcal{E}$, as $\mathcal{T}(\mathcal{E}_1)$, $\mathcal{T}(\mathcal{E}_2)$, ... $\mathcal{T}(\mathcal{E}_n)$ and $\mathcal{T}(\mathcal{E})$, and given a theoretical operation $\mathcal{S}$, the experimental contrôle of q, consists in comparing $\mathcal{T}(\mathcal{E})$, that is $\mathcal{T}(\mathcal{R}(\mathcal{E}_1, \mathcal{E}_2, ... \mathcal{E}_n))$, with the description q generates, that is, $\mathcal{S}(\mathcal{T}(\mathcal{E}_1), \mathcal{T}(\mathcal{E}_2), ... \mathcal{T}(\mathcal{E}_n))$.

The following diagram illustrates how this functions[8]:

[7] We will shortly see that presupposing the pre-theoretical phenomenal structure of the world is not theoretically neutral. But, for the time being, since that remark pushes in the direction of my argument, we can safely put that question aside...

[8] Note, however, that it is still misleading, since it does not account for the fact that E_1, E_2, ... E_n and E are not given (see the note above; see also next paragraph).

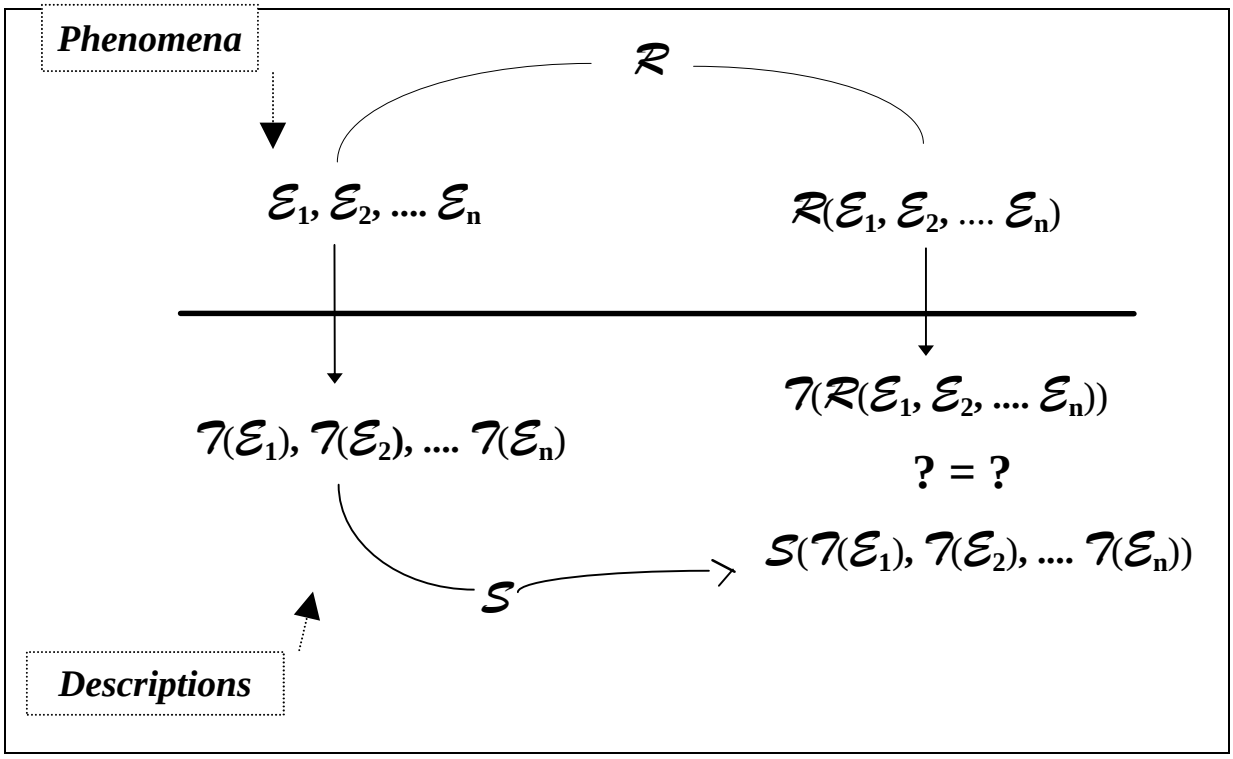


Figure 1 : Structure of scientific theories: first approximation

If Newton's law were not a *de dicto* law, we would expect any two bodies to *really* attract each other at a distance *because of* their mass; that is, we would expect the mass of the bodies to *cause* an action at a distance. This would contradict Lavoisier's second *principle* of scientific rationality ("There is no action at a distance"). This would not *in itself*, constitute an evidence against the *de re* interpretation of Newton's law (there could have been a change of paradigm from Newton's views to Lavoisier's): however, the fact that scientists do not feel Lavoisier's second principle as conflicting with Newton's law *does* constitute an evidence that Newton's law is not interpreted by scientists as a *de re* statement.

Applying that to the study of language meaning allows to understand that the question of compositionality, that was part of the constant discussion among linguists in the seventies, is ill formed: the question is not whether the meaning of a compounded expression is a function of the meaning of its parts (ontological question…) but whether one can describe the meaning of a compounded expression using the descriptions of the meanings of its parts.

3. On what there is…

In the description proposed above, phenomena $\mathcal{E}_1$, $\mathcal{E}_2$, ... $\mathcal{E}_n$ and $\mathcal{E}$ are referred to without questions on how they are perceived, as if they were, so to speak, directly accessible to observation. This reconstruction is based on a metaphor according to which the world, with its structures, *appears* to our cognitive system independently of the way it functions. That is, in spite of the precautions taken for rules or laws, the position defended seems to endorse the simple objectivist point of view for entities or events. This is only an appearance, due to the necessity of the presentation. Let us now focus on the constitution of the facts in an empirical theory.

3.1. Having done with the 'scientific progress' vulgate

First, I would like to insist on the fact that the simple objectivist position cannot be grounds for a scientific activity because it relies on a non-rational belief, which I express in B:[9].

> B our means of observation, that is, our cognitive and perceptive apparatus, occasionally augmented with some technical devices, give us a 'picture' of the world, which can be partial but still reproduces its essential features

The two main reasons why B is not a rational belief are:

a) We cannot know what the « essential features » of the world are, principally because we could not be in the position to exhibit « essential features » of the world which our cognitive system does not handle: the picture our cognitive apparatus can give us of the world is only a picture of what we can *grasp* about it... The statement of the belief B is thus circular for it really says that

> > our means of observation, ..., give us a 'picture' of the world, which can be partial but still reproduces what our means of observation make us think that they are the essential features of the world.

b) The 'picture' our cognitive apparatus gives us of the world cannot be directly compared to the world itself in order to exhibit their resemblance: in order to be in the position to do so, we would have to be in the position to access the world without using our cognitive apparatus so that we could have a point of comparison… There are ways to *indirectly* make that comparison (for instance, an analysis of human or non-human action on the world): but, as we will see, they need human interpretation and, thus, are not theory independent.

Thus, the role of the observer in the construction of the observable facts cannot be considered as a mere 'deformation' of a reality which would be external to her/him, but rather, as a construction of an accessible reality. The externalisation of that accessible reality constructed by the observer can only be posterior to its construction. This externalisation is the result of a social and linguistic process, which will be addressed in section 4.

3.2. Compositionality re-revisited

In the same way as we found necessary to account for the explanatory effect of scientific descriptions, we feel compelled to account for the way our observation of the world structures it into phenomena. The idea is a recursive loop of the scheme suggested above: an accepted theory forces us to perceive the world in terms of the entities and relations it predicts. In other words, consider a theory Θ^1, which describes what it considers as phenomena $\mathcal{E}^1_1$, $\mathcal{E}^1_2$, ... $\mathcal{E}^1_n$, and $\mathcal{E}'$ as $\mathcal{T}(\mathcal{E}^1_1)$, $\mathcal{T}(\mathcal{E}^1_2)$, ... $\mathcal{T}(\mathcal{E}^1_n)$ and $\mathcal{S}^1(\mathcal{T}(\mathcal{E}^1_1), \mathcal{T}(\mathcal{E}^1_2), \ldots \mathcal{T}(\mathcal{E}^1_n))$. Suppose, now, that q^1 has been accepted by the scientific community; a member of this scientific community, while working on a theory q^2, will identify some of q^2's phenomena, $\mathcal{E}^2_1$, $\mathcal{E}^2_2$, ... $\mathcal{E}^2_{n'}$, with some of q^1's descriptions $\mathcal{T}(\mathcal{E}^2_1)$, $\mathcal{T}(\mathcal{E}^1_2)$, … $\mathcal{T}(\mathcal{E}^1_n)$; q^2's structural relation $\mathcal{R}^2$ with q^1's theoretical operation $\mathcal{S}$, and so on. So that *Figure 1* has to be modified accordingly, giving *Figure 2*, in page 9:

[9] And this, of course, does not mean that it is false: it only means that no scientific method or conception can be based on it. I happen to share that belief, but this does not entail, of course, that it is a rational belief...

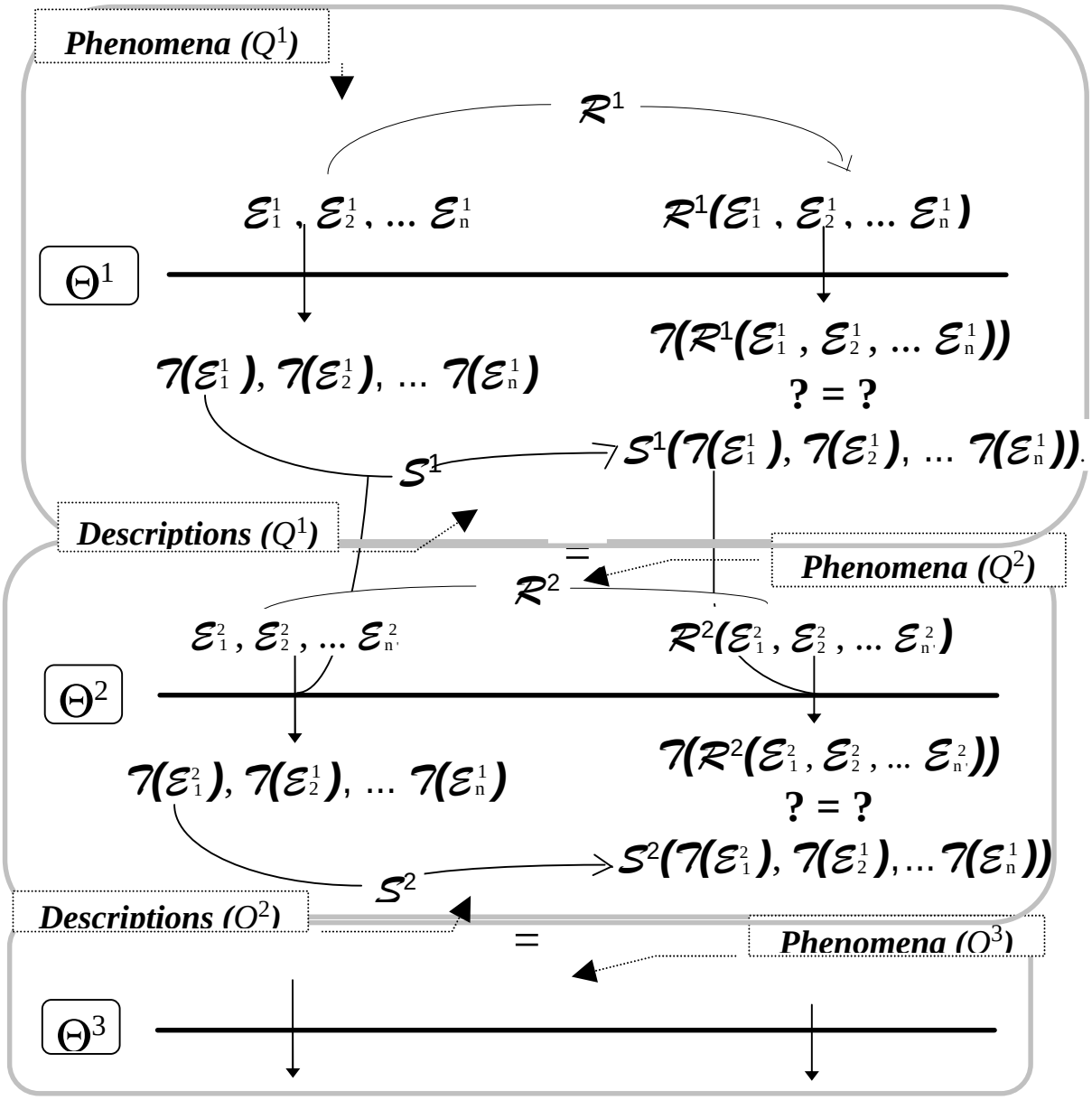


Figure 2: Structure of scientific theories: second approximation

We can thus say that the phenomena of a new theory are the theoretical constructs of accepted theories. This is easily understood when we consider that, behind any measuring device, lies a theory, like, for instance, the ammeter can be seen as a reification of the theory of electro-magnetic induction.

From a metaphysical point of view, one would, of course, need to know where all that starts from, what the first step of this loop is. But, fortunately, science does not include metaphysics: we are not concerned with this question...

We will now see the interest, from a cognitive point of view, of taking into account both the *de dicto* aspect of scientific theories and the rôle of the observer in the construction of scientific facts.

3.3. Towards a cognitive approach to scientific knowledge

According to the conceptual reconstruction developed above, scientific theories are *essentially compositional*, in the sense that what a theory describes as a complex phenomenon is necessarily described, within this theory, in terms of the parts of that phenomenon and a theo-

retical operation assigned to the structural rule which combines the parts of the phenomenon. Given that the correspondence between phenomena and descriptions is a matter of inter-subjective convention, it makes sense to wonder whether it is *true* or *false* that phenomenon $\mathcal{E}$ is assigned description $\mathcal{T}(\mathcal{E})$. These characteristics partially determine the form scientific statements normally take, in order to be evaluated by the scientific community: each noun phrase must refer to one and only one scientific concept (hence, the importance of *terminology* in science); each statement to a truth value, each intransitive verb phrase to a function from scientific concepts (referred to by the subject of the verb phrase) to truth values, and so on. In the context of a communication between scientists, the responsibility for each utterance is supposed to lie with all the scientific community, not only with the speaker. If I utter

$$e = 1/2gt^2 + v_0t + e_0$$

I am not expressing my opinion (or, at least, I am not presenting myself as doing so): I am claiming that what that utterance expresses is held true by the scientific community.

This situation certainly explains why cognition has very often been reduced to a conceptual system and natural language to a logical calculus: cognition was assimilated to scientific knowledge and natural languages to scientific or technical languages, whose lexical items are not *words* but *terms*. I will now briefly show why human knowledge cannot be assimilated to a truth-conditional information system; then, I will show why the meaning of natural language expressions cannot be reduced to truth-conditional information.

The enormous amount of work that has been done in artificial intelligence often rests (though, fortunately, not always...) on the assumption that, given the conceptual and computational tools which are now available to reproduce deductive reasoning, it would be sufficient to *collect* the best experts' knowledge in some field and have it elaborated by some sophisticated *inference engine*, in order to get a perfect expert system, that is, a system which would function like (or even better than) a human expert in that field. But this assumption is unacceptable for at least two reasons:

a) it presupposes that deductive reasoning is appropriate for any kind of expertise (and even, for that matter, at least for one...), and that the same type of reasoning is universally adequate;
b) it considers collecting knowledge as something easy and, even, straightforward whenever you have a good expert at hand.

The first reason does not concern us very much here. Moreover, it has been recognised as a serious problem by artificial intelligence people, and has been treated, technically speaking, with many interesting exotic logical systems, such as *fuzzy logic*, *non monotonic logic*, etc.. Though the results are often interesting from a computational point of view, they are incredibly poor from a cognitive point of view.

The second reason is, actually, the heart of the question we want to address. It *seems* obvious that, since experts possess knowledge of some domain, not only can they use that knowledge properly but, that the more they know, the more they can say about what they know. But this turned out to be another non-rational belief and, in that case, it is simply false... When requested to explain why (s)he went from A to C, an expert may build a complex reasoning, with many steps, which rationally explains his/her inference. But it is usually not the process *(s)he* went into: the rational reasoning may take a few minutes while the expert inferred C from A in less than a second... Actually, this is precisely what experts are paid for: doing at a glance what others take time to do. But there is no reason why an expert should be, *as an expert*, expert of his/her own expertise. For that reason, experts are not the most indicated persons to consult in order to understand their own cognitive processes.

To take an example, suppose you go to your doctor with a headache and (s)he prescribes you aspirin; if you ask her/him why, (s)he, generally, can tell you that:

(i) headaches are generally due to a poor blood circulation in the cerebral membranes;

(ii) the active principle of aspirin is the ion acetylsalicilate;

(iii) the ion acetylsalicilate activates blood circulation because

a) it fluidifies blood,

b) it dilates blood vessels;

thus,

(iv) the ion acetylsalicilate may fight one cause of headaches.

and thus,

(v) aspirin may be indicated to fight headaches

But though this might be the explanation the doctor learnt when (s)he was a student, it is certainly not the reasoning (s)he *actually* made when prescribing aspirin. (S)he, most probably, associated a certain degree of dysfunctioning with a certain class of medicines, and activated this association forgetful of the reasons why that association was memorised. (S)he then remembers these reasons only when explicitly *thinking* about her/his knowledge, but not while *using* it.

This way of managing knowledge may be frightening: the practitioner's expertise (*as a practitioner*) is no longer guaranteed by science. However, this is precisely what makes the difference between a real expert and a beginner… The beginner applies rules (s)he has learnt and of which (s)he is conscious during their application while the expert does not apply rules consciously : there might be a way to describe her/his behaviour using rules, but they are not of the same kind as the ones the beginner applies.

4. Under what conditions the semantics of human languages could be an empirical science?

Let us admit that *semantics* is the study of what, in human languages (and, more specifically in their structures), contributes to the construction of the meaning of utterances. Taking into account the facts mentioned above, about scientificity and empiricity, it makes sense to wonder under what conditions the semantics of natural language can be an empirical science. Indeed, one can easily see that it becomes a very difficult question since, in order to be an empirical discipline, semantics has to be grounded on objective observation, while its object of study, sentence meaning, is, obviously, not directly observable. However, the following considerations could help us not despair… The situation is not very different from that of admittedly empirical sciences such as physics. It can easily be seen that gravity, for instance, is not directly observable; even forces, which appear to be closer to sensorial experience, can be observed only by means of their alleged effects. So that if we could find a way to trap, so to speak, meaning within experimental devices in such a way that it could be indirectly observed through some of its directly observable effects, semantics would not be in a situation worse than that of physics… This is what will be shown, in this section, to be possible. We will also examine some of the consequences of this approach regarding the conception one should have on language and its relationship to human communication, human cognition and ethics. In particular, it will be shown that, though semantics and cognition are tightly related, semantics is not a cognitive science and thus, the term “cognitive semantics” is void and misleading. Finally, it will be shown why, as an apparently paradoxical consequence of the empiricity and scientificity requirements, the minimal semantic units should be connected to subjective points of view, rather than to objective conditions of truth.

4.1. What are the observable phenomena of natural language semantics?

When discussing the notion of natural law, we pointed out that an essential scientificity requirement, valid for any kind of science, is that it should provide descriptions of a class of phenomena, in such a way that the descriptions of some of those phenomena provided *de dicto* explanations for the descriptions of other ones. We also pointed out that the empiricity requirements could not lead to believe that science describes the phenomena 'the way they are', since one cannot seriously believe that there is a possibility, for any human being, to *know* the way things are. Though scientific observers cannot prevail themselves of *knowing* how the world *is*, they have access to the world through their interpretation of the states of their sensorial apparatus. We also saw that that interpretation often relies on previously admitted scientific – or non scientific – theories.

If we want to apply these requirements to semantic theories, we have to find observable semantic facts, which can be accessed to through our senses. It seems that we are faced with a big difficulty, which might force us to admit that there cannot be such a thing as an empirical semantic theory: semantic facts are not accessible to our sensorial apparatus. Even if we want to distinguish, as Marcelo Dascal suggests (Dascal 1983) between *utterance meaning* and *sentence meaning*, none of them is directly accessible to our senses. We are thus in a situation in which the very object about which we want to construct an empirical science prevents its study from being an empirical study…

However, if we admit that physics is a good example of empirical sciences, we should realise that we are not in such a dramatic situation. For what the physicist can observe through her/his senses, say, the actual movements of the pendulum she/he just built, is not what her/his theory is about (in that case, the virtual movements of *any* – existing or non existing – pendulum) the object of physical theories is not more directly accessible to the observers' sensorial apparatus than the object of semantic theories. Physicists use different tricks in order to overcome that difficulty, one of which is the use of *indirect observation*: some directly observable[10] objects or events are considered to be traces of non directly observable ones, which, in some cases, are seen as one of their causes, and, in other cases, as one of their effects.

If we are willing to keep considering physics as an empirical science, we are bound to consider that that *indirect observation* strategy is not misleading; we only have to see how it could be applied to the study of meaning. In order to illustrate how this could be done, we will examine an example and will abstract from it.

Suppose an extra-terrestrial intelligence, ETI, wanted to study the semantics of English and, for that purpose, decided to observe speech situations. Suppose ETI hides in a room where several – supposedly English speaking – human beings are gathered, a classroom, for instance. Suppose now that ETI perceives that John pronounces "It is cold in here". If ETI's observations are all of that kind, there is no chance that it can formulate grounded hypotheses about the meaning of the sequence it heard. For what can be perceived of John's utterance is only a series of vibrations, which, in themselves, do not give cues of any kind as to what it can mean (except for those who understand English and interpret the utterance using their private know-how). If ETI wants to do its job correctly, it will have to use, in addition, observations of another kind. Intentional states are ruled out since they are not directly accessible to the observers' sensorial apparatus. It follows that we will have to reject any statement of the

[10] Though we have shown that nothing can be *directly observable* by a human being (since anything requires the interpretation of the state of our sensorial apparatus), we will use that expression to refer to objects or events whose access is granted by the interpretation of the effect they directly produce on our sensorial apparatus. This terminological sloppiness is introduced for the sake of legibility…

kind: “the speaker meant so and so”, or “normally when someone says XYZ, he or she wants to convey this or that idea” or even “I, observer, interpret XYZ in such and such a way and therefore, that is the meaning of XYZ”. ETI will have to observe the audience’s behaviour and see whether, in that behaviour, it can find a plausible *effect* of John’s utterance: it will have to use indirect observation. The fact that it may be the case that no observable reaction followed John’s utterance does not constitute an objection to the indirect observation method: it would simply mean that ETI would have to plan other experiments. After all, even in physics, many experiments do not inform the theorists until they find the experimental constraints that work.

Before we go further, it is useful to emphasise that we have just seen that the different ‘popular learned conceptions’[11] of semantics are wrong. Indeed, the observable phenomena of semantics (i) cannot be directly meanings, since these are not accessible to our sensorial apparatus; (ii) they are not just utterances, since that would not be enough to describe meaning phenomena; (iii) they are not pairs consisting of utterances and ‘intended meanings’, since such intentional things are not accessible to empirical observation. In our extra-terrestrial example, we suggested that they are pairs consisting of utterances and behaviours.

In the rest of this paper, we will take that suggestion as seriously as possible: in this section, we will see how to constrain the relationship between utterances and behaviours, and examine some of the consequences of this choice[12]. In the following sections, we will present a theoretical framework based on the conception of meaning that follows from that discussion.

4.2. Three pre-theoretical hypotheses which characterise contemporary occidental rationality.

1.1.1. The causal attribution *hypothesis*

Suppose that, in our example, ETI notices that, after John’s utterance, the following three actions take place: (i) Peter scratches his head, (ii) Paul closes the window and (iii) Mary writes something on a piece of paper. We all know (actually, we think we know, but we only believe…) that the correct answer to the question “what action was caused by John’s utterance?” is “Paul’s”. However, ETI has no grounds to *know* it and, in addition, it may be the case that Paul closed the window not because of John’s utterance (which he may even not have heard), but because *he* was cold, or because there was too much noise outside to hear what John was saying… Obviously, the most plausible hypothesis, in normal situations, is the one according to which Paul’s action was caused by John’s utterance; but the fact that it is plausible does not make it cease to be a hypothesis…

Thus, before ETI can continue its study, it must admit the following general hypothesis

H_0 Utterances may cause behaviours

Moreover, in each experimental situation *s*, ETI must make specific hypotheses h_S which particularise H_0 in the situation *s*, and relate particular actions with the utterance under study.

It is important to remind that H_0 and the different h_S are not facts about the world but hypotheses: they do not characterise the way things are but rather the way things are conceived of in our rationality.

1.1.2. The non materiality *hypothesis*

[11] That is, the conception an educated person could have about semantics without having learnt and reflected about it previously… This is, it must be admitted, the conception held by many people who speak or write about language!

[12] For more details, see Raccah (2002).

Let us suppose that ETI shares with us the aspects of our contemporary occidental rationality expressed by H_0. This would not prevent it from believing that the way John's utterance caused Paul's action is that the vibrations emitted by John during his utterance physically caused Paul to get up and close the window. Though it hurts our contemporary occidental rationality, this idea is not absurd: the fact that we simply cannot take it seriously does not *make* it false[13]. Moreover, utterances do have observable physical effects: a loud voice can hurt the hearers' ears, specific frequencies can break crystal, etc. What our rationality cannot accept is the idea that the linguistic effects of the utterances could be reduced to material causality. In order to rule out this idea, we need another hypothesis, which is also characteristic of our rationality rather than of the state of the world:

H_1 The linguistic effects of an utterance are not due to material causes

As a consequence of H_1, if we cannot believe that the observable actions caused by an utterance are due to its materiality, we are bound to admit that they are due to its form. In our rationality, the causal attribution requested by H_0 is constrained to be a formal causality.

1.1.3. The non immediateness *hypothesis*

If we use the term *sentence* to refer to a category of form of utterances, we start to be in the position to fill the gap between what we can observe (utterances and behaviours) and what we want semantics to talk about (sentences and meanings). However, there is yet another option that our rationality compels us to rule out: ETI could accept H_1 and believe that though the causality that links John's utterance to Paul's action is not material, it directly determined Paul's action. That is, one could believe that John's utterance directly caused Paul to close the window, without leaving him room for a choice. This sort of belief corresponds to what we can call a 'magic thinking'; indeed, in the tale about Ali Baba, for instance, there would be no magic if the "sesame" formula were recognised by a captor which would send an "open" instruction to a mechanism conceived in such a way that it could open the cave. The magical effect is due to the directedness of the effect of the formula. It is interesting to note that this feature of our rationality, which compels us to reject direct causality of forms, is rather recent and not completely 'installed' in our cognitive systems: there are many traces in human behaviour and in human languages of the 'magic thinking'. From some uses of expressions like "Please" or "Excuse me" to greetings such as "Happy new year!", an impressing series of linguistic expressions and social behaviours suggests that, though a part of our mind has abandoned the 'magic thinking', another part still lives with it. Think, for instance, about the effects of insults on normal contemporary human beings…

However, for scientific purposes, we definitely abandoned the 'magic thinking' and, again, since it is a characteristic of our rationality and not a matter of knowledge about the world, no observation can prove that it has to be abandoned: we need another hypothesis, which could be stated as follows:

H_2 The directly observable effects of utterances are not directly caused by them

The acceptance of that "anti-magic" hypothesis has at least two types of consequences on the conception one can have of human being.

The first type of consequences pertains to ethics: if utterances do not directly cause observable effects on human actions, no human being can justify a reprehensible action arguing that they have been told or even ordered to accomplish them. If a war criminal tries to do so, he or she will give the justified impression that he or she is not behaving like a human being,

[13] Some Buddhist sects seek the "language of nature" in which the words emit the exact vibrations which correspond to the objects they refer to…

but rather like a kind of animal or robot. As human beings, we are supposed to be responsible for our actions; which does not mean that we are free, since a reprehensible decision could be the only way of serving vital interests. Though this type of consequences of H2 are serious and important, they do not directly belong to the subject matter of this paper and we will have to end the discussion here. However, we think they were worth mentioning…

The second type of consequences of H2 concern the relationship between semantics and cognitive science. Indeed, H2, combined with H0 and H1, can be seen as a way of setting the foundations of a science of human cognition and of picturing its relationship with related disciplines. If we admit, in agreement with H_0, H_1 and H_2, that an utterance indirectly and non materially causes an action, we are bound to accept the existence of a non physical causal chain linking the utterance to the action, part of that chain being inaccessible to our sensorial apparatus. The object of semantics is the first link of the chain; the first internal state can be seen as the *utterance meaning*. The action is determined by a causal lattice in which the utterance meaning is a part, and which includes many other elements and links; none of these elements or links are directly observable, though indirect observation can suggest more or less plausible hypotheses about them. Different theoretical frameworks in cognitive science construe that causal lattice in different ways; they also use the variations of different observable parameters in order to form these hypotheses. In our example, the only two directly observable parameters were utterances and actions, for the part of the lattice that we are interested in is the chain that links utterances to actions. However, other kinds of cognitive science experiments could be interested in studying the variations of other directly observable parameters, such as electrical excitation, visual input, outside temperature, etc. for the beginning of the chain and movement characteristics, body temperature, attention, etc. for the end of the chain[14].

The fact that cognitive science and semantics may share experimental devices is not sufficient to suggest that there can be a "cognitive semantics": the object of semantics (the link between utterances and utterance meanings) does not belong to the causal lattice which constitutes the object of cognitive science.

The following diagram (adapted from Raccah (2002)) sums up the discussion and shows the consequences that can be drawn from it concerning the relationship between the object of semantics and that of cognitive science.

[14] We obviously didn't choose realistic nor very interesting parameters… but our purpose is only illustrative.

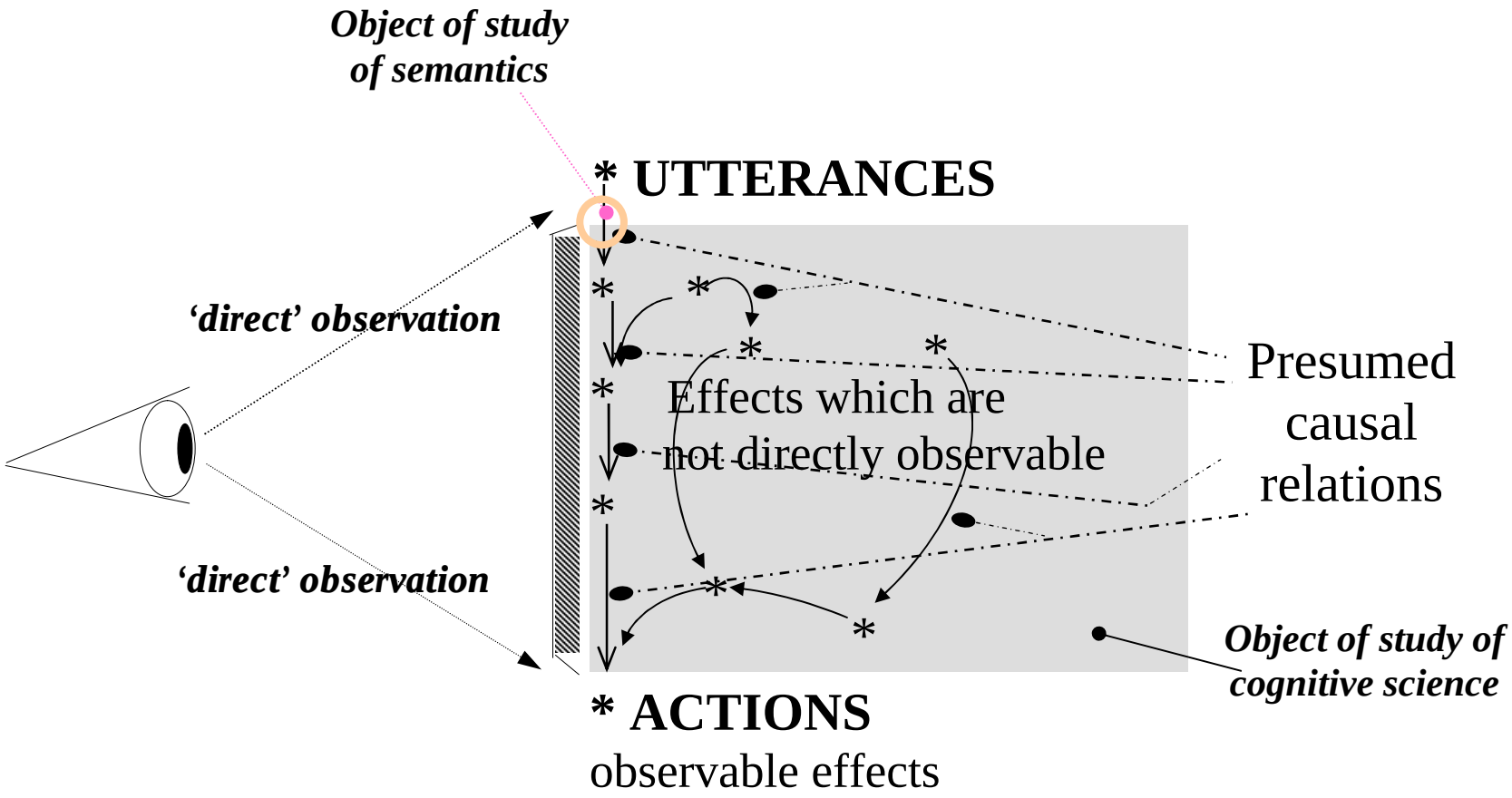


Figure 3: Non-observable causal chain between utterances and actions

4.3. Why constraints on argumentation ought to be accounted for in a scientific empirical theory of sentence meaning

We can now turn back to the question addressed by this section: Under what conditions the semantics of human languages could be an empirical science? We have seen that, in order to describe its object of study, sentence meaning, it is necessary to observe accessible traces of utterance meanings, and abstract from these observations: the sentence-meaning descriptions have to account for what is invariant in the utterance-meanings across the different situations. More precisely, if all the utterances of a sentence S share some property P whose accessible traces can be observed in the reactions of the audience in the different utterance situations, the semantic description of S must include a property P', which is responsible for the property P in all the situations. Without that constraint, there is no guarantee that the semantic description of S is (i) based on empirical observation and (ii) valid for S itself and not only for some utterances of S.

Keeping that in mind, semantics cannot limit itself do describing the informational aspects of meaning: several non-informational properties of utterances do not depend on situations and if they were not described within a semantic theory, they would be simply forgotten… One of these properties concerns argumentation. It is not difficult to observe that, though not all utterances are argumentations, any sentence, whatsoever, can be uttered in a situation in which that utterance *is* an argumentation. Thus, for instance, though it is true that if someone utters "It is 8 o'clock" as an answer to the question "What time is it", he/she is normally not making an argumentation; however, the very same sentence "It is 8 o'clock" can be uttered in a situation in which the speaker is trying to have the addressee hurry up… Obviously, sentences cannot determine the argumentative orientations of their possible utterances (be it only because some of those utterances do not have argumentative orientation while other ones do…). Nevertheless, they must impose constraints on *argumentativity* since, otherwise, any sentence could be use for any argumentative purpose: and this is not the case. For instance, "It is only 8 o'clock" cannot serve the argumentative orientation *it is late*.

The fact that absolutely all sentences can be used in an argumentative utterance requires that an empirical semantic framework for human languages be able to account for the constraints sentences impose on argumentation. In the following sections, we will show that these constraints cannot be derived from truth-conditions or other 'informational' frameworks; we will then introduce the Theory of Argumentation within Language (AWL) and present its aims and functioning. We will finally go back to the relationship between semantics and cognition and discuss the interest of that approach for cognitive research.

5. Why constraints on argumentation cannot be derived from truth-conditions

Since the first studies on language, argumentation has been considered, with very few exceptions, as a phenomenon which had to be accounted for only after the meaning of the sentences under consideration had been "extracted". Indeed, until 1972, it was taken for granted that if someone used sentence A as an argument or an evidence for a conclusion C, it was in virtue of the informational content conveyed by A. According to that "commonsensical" belief, the description of the argumentative power of A had, conceptually, to be grounded solely on a description of its informational content and a characterization of the situation of utterance. After the observations of O. Ducrot and his first systematization, that naive belief turned out to be no longer acceptable (except for one who were ready to accept a particularly broad concept of informational content): see, for instance, (Ducrot 1973), (Anscombre and Ducrot 1983), (Raccah 1984, 1987, 1990)).

The theoretical framework grounded in that reconsideration of the relationship between argumentation and information (let's call it "Argumentation Within Language"; in short AWL) allows to describe, within semantics, the constraints on the argumentative orientation of utterances. AWL central hypothesis is that the warrants that allow a speaker to present an utterance as an argument for some conclusion are all instances of gradual rules presented -by the speaker- as general, in that they also apply to other cases than the one under discussion, and shared, in that the audience is assumed to accept them as such. These gradual rules, through which warrants are classified are called *topoi* (singular: *topos*).

A first class of applications of this framework is an improved description of argumentative articulators (operators and connectives), description given in terms of constraints on argumentative features.

A second class of applications of this framework stems from the following reflection: the argumentative features which are attached to the sentences whose articulators are described have to be the result of a calculus -or, at least, to be described in a more or less compositional way-. The program of this class of applications is thus to build the description of the semantic argumentative features of a sentence out of the semantic description of the words of that sentence (see (Bruxelles, Carcagno & Fournier 1989), (Fournier & Raccah 1990), (Raccah 1990) and (Bruxelles & Raccah 1990)). In connection with this second class of applications, I will illustrate and defend the following three claims: (i) lexical items impose biases on their denotation, (ii) these biases capture an important part of the beliefs and knowledge of the linguistic community who share these lexical items, and (iii) human expertise strongly relies on this kind of knowledge.

In the rest of the chapter, I show why the program above had to be developed (methodological as well as empirical reasons), how it is carried on, and what it brings to semantics. I will particularly insist on a) what there is in argumentation that cannot be satisfactorily dealt with using the classical informational concepts; b) specific properties of argumentative inference rules in the AWL framework; c) how and what of argumentation can be encoded in the description of lexical items.

5.1. The relationship between information and argumentation

I will now show that it is not by virtue of the information it conveys, that an utterance is an argument for some conclusion, rejecting thus the 'classical' position on meaning, according to which meaning would be essentially accounted for in terms of information, i.e. in terms of conditions of reference.

Suppose argumentation were derived from information, that is, suppose that the argumentative content of utterances could be described in terms of the information they convey, with the possible help of argumentative rules which applied to that information. In this case, it could not happen that two sentences which conveyed the same information be uttered in the same situation with opposite argumentative orientation, since the argumentative rules, which depend on the situation, are the same (for the situations are the same) and the informational content on which they would apply would be the same, by hypothesis. This prediction, which is a direct consequence of the 'classical' position does not resist empirical tests, and this gives strong reasons to reject the 'classical' position. Consider sentences

(S4) He worked a little today.
(S5) He worked little today.

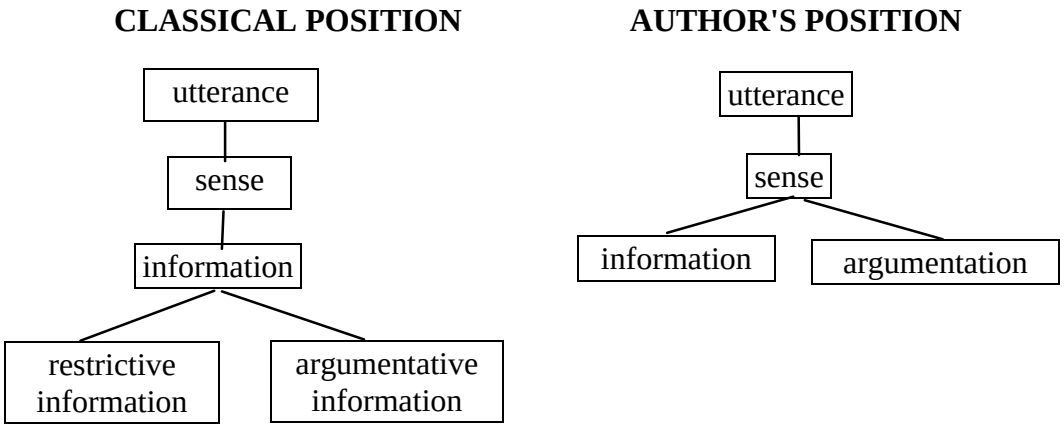
and possible continuations

(C4) He is a good boy.
(C5) He is a naughty boy.

which we will consider as possible candidates for argumentative orientations of utterances of (S4) and (S5). In a situation where it is believed that the more a boy works, the better he is, the expected continuation of utterances of (S4) is (C4) and the expected continuation of utterances of (S5) is (C5); in an abnormal (?) situation in which it were believed that the less a boy works, the better he is, the expected continuation of utterances of (S4) is (C5), and the expected continuation of utterances of (S5) is (C4). Utterances of (S4) and (S5) are thus oriented towards opposite conclusions, no matter the topos which is believed to hold between work and 'perfection'. However, the strictly informational aspects of the sense of utterances of (S4) and (S5) do not differ: the amount of work, for instance, described by utterances of (S4) and by utterances of (S5) is the same, as is attested by the fact that both (S6) and (S7) can be uttered without inconsistancy:

(S6) He worked a little, but he worked little.
(S7) He worked little, but he worked a little.

for if the amounts of work described by (S4) and (S5) were different, they could not be both uttered about the same state of affairs. It could be argued that the conception of informational content which is invoked here is too restrictive and that (S4) and (S5) do not really convey the same information. And, since they do not convey the same information, the objection proceeds, the fact that they convey opposite argumentative orientations is no longer an objection to the 'classical' position. However, there is a sense of information (call it restrictive) in which (S4) and (S5) convey the same information: the one in which we can say that utterances of (S4) or (S5) describe a small amount of work. If we want to 'extend' this (restricted) sense, in such a way that we can say that utterances of (S4) and (S5) do not carry the same information, we have to characterize the difference we want to introduce (keeping in mind that they cannot be too different, since (S6) and (S7) are not inconsistant). Obviously, the only possibility is to characterize these differences in terms of the argumentative behaviors of these utterances. That is, we have to introduce argumentation in the 'extended' concept of information. With such a conception of information, it is clear that the reasons I invoke to reject the classical conception of argumentation are not acceptable: if argumentation is already in information there is no place for another argumentative component. The structure of the two positions, so far, looks like this:

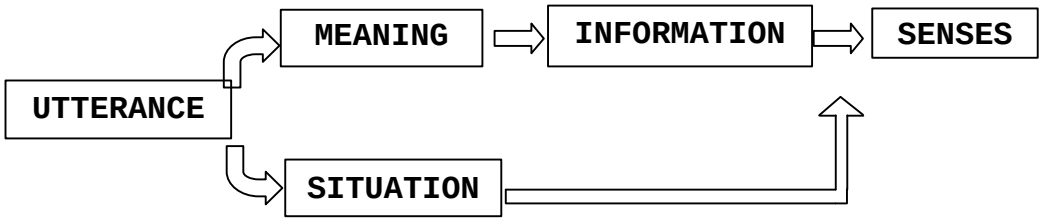


In order to account for the phenomenon presented in the discussion of (S4)-(S7), the classical position has to distinguish two components of information, to maintain that argumentation depends on information: 'strict (or restrictive) information' and 'argumentative information'. Now, does 'argumentative information' depend on 'strict information'? If not, the difference between the two positions is purely terminological: what I said about argu-

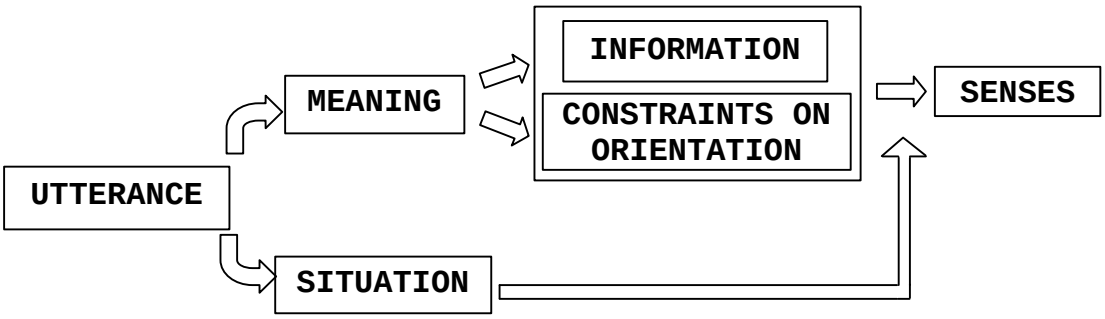
mentation and information has to be accepted about 'argumentative information' and 'strict information', the supplementary layer proposed by the revised classical position being innocuous (though useless...). If yes, then, to account for precisely the same examples, the stubborn classical position will have to make a distinction within 'strict information': 'restrictive strict information' will have to be distinguished from 'argumentative strict information'! And so on...

The discussion above suggests a shift in the conception of sentence meaning, which can be illustrated by a shift between the following two pictures:

classical position



author's position



5.2. Argumentative constraints in connectives and operators

In the sequel, following the terminology developed in Raccah (2002), and adapting it for English, we will use the term *connective* to refer to binary syntactic operations on sentence phrases (as opposed to sub-structures of utterances), and the term *operator* to refer to unary syntactic operations on sentence phrases.

Consider an utterance of:

(S1) It is cold, it may even be raining.

in a situation type in which the speaker was asked if she/he felt like going for a walk. Independently of the theoretical framework in which one wishes to work, the description one will have to come up with will have to account for the fact that utterances of (S1) in such situations are, indeed, answers to the question (usually negative answers). The difference between utterances of (S1) and a yes/no answer is that the former give reasons for the preferred answer. As we will see in the sequel, these reasons are based on implicit inferences, which link bad weather to refusal to go for a walk. These reasons, clearly, do not consist in essential links between weathers and walks, for a speaker who likes cold weather and rain could not use (S1) as a negative answer to such a proposal. Indeed, with such preferences, utterances of (S1) would be positive answers... We thus have to admit that utterances of (S1) -in classical weather preferences situations- present themselves as giving reasons to refuse to go for a walk (in addition, they perform the act of refusal: but this is another as-

pect of its sense). Another aspect of the sense of the utterances of (S1) is of interest here: the fact that the two parts of the sentence (*it is cold*, and *it may be raining*), linked by *even* are presented as having a different argumentative strengths. Utterances of (S1) clearly present rain as being worse than cold for going for a walk; utterances of:

(S'1) It is raining, it may even be cold.

do exactly the contrary. Rain and cold are thus presented, by utterances of (S1), as attached to some argumentative scale, relative to the particular conclusion aimed at, and depending on the particular preferences which are supposed to be admitted by both the speaker and the hearer. Note that that scale is, by no means, inherent to what rain or cold really are: that scale is *essentially* non-objective.

Examples such as (S1) can easily be generalized and, once one has started, it becomes hard to find examples of utterances which do not seem to be presented as arguments for some conclusions...

5.3. Topoi and argumentative inferences

When analyzing utterances of sentence (S1), I said that they present themselves as giving reasons for yes-or-no answers, reasons based on implicit inferences. Since, as we have seen, utterances present these reasons as attached to argumentative scales, the rules which we need to manage these inferences have to be scalar rules. If I think that cold weather is bad to go for a walk and that rainy weather is worse, the rule which lets me infer 'no-walk' from *cold* cannot be an implication-like rule because, if it were so, it could not apply to *rain* to give 'no-walk' with more strength. What we need are rules which allow us to link degrees of bad weather to strength of refusal of the walk. Following Ducrot ((Anscombre and Ducrot 1983), (Raccah 1984 and 1987) and (Ducrot 1988)) I call such rules *topoi*. A topos is an inference rule which links two gradual properties, which I call *topical fields*. Given two topical fields P and Q, a topos has one of the following four forms:

// The more X is P, the more Y is Q //
// The more X is P, the less Y is Q //
// The less X is P, the more Y is Q //
// The less X is P, the less Y is Q //

(where X and Y are members of the fields P and Q, respectively). Though, as we have just seen, there are reasons to use gradual rules such as those for the pragmatic description of argumentation, there were no a priori reasons to decide that the only rules that we will use for such descriptions are topoi. This choice corresponds to a strong hypothesis according to which these tools are sufficient for our aim. In the case of utterances of sentence (S1), in the situation described, the topos could be:

// The worse the weather, the less we want to go out //

Cold and *rainy* are degrees of BAD WEATHER and the topos applies to each of them, leading to negative degrees of 'WANTING TO GO OUT'. Moreover, the use of *even* constrains to place *rainy* higher than *cold* in the scale of BAD WEATHER, leading to a lower degree of 'WANTING TO GO OUT' for *rainy* than for *cold*. In the case of (S'1), we have the same topos, but *cold* and *rainy* are switched in the topical field. Finally, in the case of (S1), with a reverse preference (the case of people who like to walk in the rain...), the topos is obviously different:

// The worse the weather, the more we want to go out //.

Note that a statement such as "X is P to a degree d" is a meta-linguistic statement used to describe an aspect of the sense of possible utterances, and not an utterance of some sen-

tence of the language under study. So that though topoi are inference rules, they are not rules of any natural language. Consequently, they do not link any utterances or sentences of any natural language. The fact that natural language phrases may express non-gradual properties cannot be seen as a counter-example to the hypothesis that topoi are enough for the description of argumentation: topoi do not apply to natural language phrases, but to properties attached to them, and these meta-linguistic properties may be gradual, even though the properties to which they are attached are not. For instance, a sentence like:

(S2) She is a lawyer.

can be uttered as an argument for *her* being bright, dull, wealthy, etc. in spite of its non-gradual aspect. Moreover, (S2) can be embedded in sentences which are uttered in gradual contexts and even play a gradual rôle in them, as in

(S2.1) She is a lawyer, and she is even famous,

where the property of being a lawyer and that of being famous are considered as different degrees in some topical field such as 'HAVING AN INTERESTING SOCIAL POSITION'. In the situations where

(S2.2) She is a lawyer and she is even famous: you should marry her

could be uttered (here, the sentence explicitly contains the argumentative orientation of its utterances), the second topical field (the conclusion field) concerns the interest in marrying her. The topos normally used in utterances of (S2.2) can be formulated as:

// the more interesting the social position, the more interesting the marriage //

but of course, nothing can prevent an English speaker from believing (i) that being a lawyer and being famous are degrees of dullness and (ii) that the duller the person, the more interesting the marriage. In such a twisted case, utterances of (S2.2) still present her being a lawyer and being famous as being arguments to marry *her*, but for different reasons... Thus, gradual rules of inference applied to topical fields associated with the different parts of the sentence uttered account insightfully not only for the argumentation of utterances of sentences whose parts express gradual properties, but also for the argumentation of sentences which have parts which express non-gradual properties.

5.4. A template for the description of connectives and operators

In (Raccah 1987), I have shown that, in order to be able to express the facts presented above, in connection with examples (S1)-(S7), the representation system for the semantic description must include the following conceptual tools:

- distinction between asserted and presupposed indications for argumentation (not discussed here);
- possibility of expressing constraints on the form of the possible topoi (*cf*. the discussion above);
- possibility of expressing constraints on the selection of topoi (*cf*. the discussion on *but*, below);
- possibility of expressing the constraint that some properties are placed at higher, lower or similar degrees on a topical field (like in the case of *even* or *almost* -not discussed here).

For reasons exposed in (Raccah 1987), we also have to distinguish between the argumentation which is *used* in an utterance and the argumentations which are only *validated*

through it[15]. As a result, to adequately describe a sentence S containing a connective such as *but*, we need, in addition to the classical informational decription, to express constraints about the following argumentational aspects of the possible utterances of S:

- argumentational presupposition (let's name RR(S) the set of those constraints);
- argumentational validation (let's name it val(S));
- argumentation used (let's name it U(S)).

I will now illustrate how such a description template allows an accurate description of sentences containig *but*.

Let S be a sentence of the form A *but* B, where A and B are any sentence (possibly containing other occurrences of *but*). We want to express (i) that any utterance of S presents A and B as being opposed argumentatively (no matter the orientation of A or B); (ii) that S acknowledge that both A and B can be held and that A is indeed an argument in favor of some conclusion against which B is an argument; and (iii) that the argumentation proposed by S follows B, rather than A. Using the topoi, we get a description like the following:

RR(S) = RR(A) & RR(B) &
cons(top(B)) = - cons(top(A)) &
val(A) = {top(A)} &
val(B) = {top(B)}
val(S)= val(A) **U** val(B)
U(S) = U(B).

where top(X) is the topos attached to X in the situation of utterance; cons(T) is the consequent of topos T; {a,b,c,...} is the set containing the elements a, b, c,...; and X **U** Y is the union of sets X and Y[16].

6. 2. WORDS AND TOPICAL FIELDS

Simple sentences (that is, sentences which do not contain such operators or connectives) do not seem, at first, to give any semantic indication on argumentation except for the fact that any sentence whatsoever can always presented as an argument for some conclusion. However, it is now clear that the topical fields which are associated with phrases of the language are determined by the language itself, and not only by some beliefs or ideology. For instance, the idea that to steal one's wallet is a degree of, say, dishonesty is an element of the meaning of *steal*, and not only a belief or an ideology: what belongs to the realm of beliefs is the topos according to which the more dishonest, the worse (think, for instance of the corresponding topoi which hold in the mafia, among politicians, etc.). But to the same phrase of the language, one can associate several topical fields (for instance, in the case of *steal one's wallet*, one can associate, besides dishonesty, other fields such as nastiness, mental trouble, irresponsibility, etc.). The lexicon should thus describe each word in such a way that a list of topical fields can be associated to each of those phrases. This conception gives the grounds for a theoretical distinction between *words* and *terms*, distinction that appeared to be useful in traductology.[17]

I will now show how this can be done within the AWL theory.

---

[15] As it is shown in the paper cited, this allows for a compositional description of connectives and operators, and also allows to account for important non-informational differences between connectives (such as the French *mais* and *justement*).

[16] Some of the features represented in that description have not been discussed in this paper: this is only an illustration. For more details, see [Raccah 1987].

[17] See (Raccah 2000) for details on that subject.

6.1. Topoi associated with topical fields

As suggested above, the AWL main idea is that sentences do not merely convey information, but also give conventional indications on how this information is seen by the speaker. The role of topical fields is to represent these conventional indications. Thus, a topical field can be seen as a point of view on some information, that is, as a valuation of a conceptual field. We can thus represent topical fields as ordered pairs <CONCEPTUAL FIELD, *valuation principle*>, where the *valuation principle* can be either a judgment (in that case, we have an *elementary* topical field), or another topical field (in that case, we have a *compounded* topical field; see (Raccah 1990) for more about topical fields). Given a compounded topical field <CF,TF>, there exists a unique topos // <CF,TF>,TF //, which represents the implicit gradual inference rule attached to that topical field. Let us say that that topos is *canonically associated* to that topical field.

6.2. Lexical topoi

In order to account for the argumentation suggested by the words, we add a list of topical fields to the lexical description of certain words. These *lexical topical fields* are uniquely characterized by the topoi canonically associated to them; we call them *lexical topoi*. I will now illustrate this point with an example. Consider the adjective *rich*, and suppose we have an informational description for it, such as the one given by the conceptual field of POSSESSION. Such a description cannot account, by itself, for the particular semantic effect of utterances of a sentence like

(S10) This baby is rich

which is acceptable, although it is strange to say that a baby is rich. When analyzing this impression, one realizes that the use of the adjective *rich* to express that someone possesses suggests that the possessor is in such a situation that he/she can do something with his/her possessions. Thus, in normal cases, a speaker would not use the word *rich* to express possession unless he/she sees that possession as source of power. Utterances of (S10) are odd because they force to see the baby referred to as granted power because of its wealth[18]. AWL accounts for these facts by adding to the lexical description of *rich* a lexical topical field <POSSESSION, *power*>,
which is characterized by the topos

//<POSSESSION, *power*>, *power*//,

which can be re-formulated as

// the more one possesses, the more powerful //.

6.3. Doxal and non-doxal utterances

A lexical topos may be directly used in an utterance, or it can be the first element of a chain leading to another topos, which will be used in that utterance. In the first case, we say that the utterance is *doxal*; in the second case, it is non-doxal. Doxal utterances do not add anything to the meaning of the words: they are but banalities (without being too pessimistic, that applies to most of our everyday exchanges...). Here are examples of sentences suggesting doxal utterances:

(S12) He has been working a lot; he must be tired

[18] There is an independent diachronic evidence for that explanation: the word *rich* comes from the Francique word °*riki*, which meant "powerful" (cf. *Reich*: power). Though etymology does not explain contemporary meaning, one cannot help feeling that a synchronic description, motivated by the present state of a language system, is strengthened when it meets what is known about the evolution of that system.

(S13) He is rich, he can invite you

Non-doxal utterances add knowledge or beliefs to the plain meaning of the words, as illustrated by the following examples:

(S14) He has been working a lot; his colleagues will hate him
(S15) He has been working a lot; he will have a promotion
(S16) He is rich, he will invite you
(S17) He is rich, he must have friends

where the added beliefs are straightforward[19].

7. CONCLUSIONS

Our study of the conditions under which natural language meaning could be the object of an empirical science lead us to understand that, in spite of the close relationship between semantics of human languages and cognitive science, their objects and their empirical fields are different

In the attempt to answer the question "What should a theory of language structure explain", we ended up with the idea that such a theory has to explain the way language structure compels the hearers to build the meaning they build, for the utterance of each sentence, in the particular situation in which it has been uttered. More precisely, we saw that the semantic description of a human language is the description of the set of constraints that words and structures of that language impose on the construction of the meaning of the utterances. This description is utterance independent since it concerns the constraints that language imposes on the interpretation of the utterances, and not the result of the interpretation. It is also empirically grounded, since it is based on the observation of the utterances and of the traces of their interpretations.

We saw that some of those constraints are imposed by articulators (i. e. connectives and operators): they can be very different in different languages; we also saw that some words impose positive (resp. negative) judgments wherever they are used, and whoever uses them: this is the case of euphorical adjectives such as « honest », « interesting »,…, or the corresponding dysphorical ones.

Combining the constraints of the articulators with the euphorical / dysphorical properties allows to 'compute' the ideological force of other words in utterances such as "John is a republican but he is honest". Other words, thus, impose more sophisticated judgments which are to be described as in micro-programs provided by the language which they belong to. Here the diversity across languages is even stronger than what it is with respect to articulators.

Turning back to the initial question, our answer is: yes, meaning in natural languages can be the object of an empirical science, if it is considered as the constraints, invariant across utterances, under which the interpretation is built by the hearers, keeping in mind that interpretations are only indirectly observable and that, of course, constraints on them require even more theoretical work in order to be indirectly observed. In sketching and justifying the theoretical apparatus required in order to make these entities indirectly observable, we gave detailed answers to the fundamental issues, listed in the introduction, regarding the proper object and the kind of explanation attached to such theories.

[19] Notice, however, the difference between (S13) and (S16).

REFERENCES

Anscombre Jean-Claude and Oswald Ducrot (1983). *L'argumentation dans la Langue*, Bruxelles: Mardaga.

Bruxelles Sylvie, Denis Carcagno, Corinne Fournier (1989): "Vers une construction automatique des topoi à partir du lexique". *Communication, Cognition and Artificial Intelligence* **6**:4: 309-328.

Bruxelles Sylvie and Pierre-Yves Raccah (1990). "Argumentation et sémantique: le parti-pris du lexique", *in* Walter De Mulder, Franc Schuerewegen and Liliane Tasmowski *Énonciation et Parti-pris*, 59-73. Antwerpen: Rodopi.

Dascal, Marcelo (1983). *Pragmatics and the philosophy of mind 1: Thought in Language*. Amsterdam and Philadelphia: John Benjamins.

Ducrot Oswald (1973).*La preuve et le dire*. Paris: Mame.

Ducrot, Oswald (1988). "Topoi et formes topiques". *Bulletin d'études de linguistique française*. Vol 22, 1-14. Tokyo.

Fournier, Corinne and Pierre-Yves Raccah (1990). "Argumentation and artificial intelligence: from linguistic models to knowledge management". *In* Yaacov Choueka (ed.) *Computers in Literary and Linguistic Research*, 176-196. Genève: Champion-Slatkine.

van Fraasen, Bas (1985). "Que son las leyes de la naturaleza?", Dianoia 31, 211-262 (appeared in 1986).

Frajzyngier, Zygmunt (1991) 'The de dicto domain in language'. In Approaches to Grammaticalization, Vol. 1: Focus on theoretical and methodological issues, Elizabeth Closs Traugott & Bernd Heine (eds.), pp. 219-251 (Typological Studies in Language 19:1). Amsterdam: John Benjamins.

Raccah Pierre-Yves (1984). "Argumentation in Representation Semantics". *COLING 84*, 525-529. Stanford.

Raccah Pierre-Yves (1987): “Modeling Argumentation and Modeling *with* Argumentation”, Technical report URA 962-CNRS, Paris; published in *Argumentation*, **4**: 447-483, Brussels 1990.

Raccah Pierre-Yves (1990). "Signification, sens et connaissance: une approche topique", *Cahiers de Linguistique Française*, **11**, 179-198.

Raccah Pierre-Yves (2000). “Lexical and dynamic topoi in semantic description: A theoretical and practical differentiation between words and terms”. *In* Lita Lundquist *et al*. *Language, Text and Knowledge*, 11-29. Berlin and New York: Mouton.

Raccah Pierre-Yves (2002). “Lexique et idéologie : les points de vue qui s’expriment avant qu’on ait parlé”. *In* Marion Carel (ed.), *Les facettes du dire : Hommage à Oswald Ducrot*, 241-268. Paris: Kimé.