Lecture 3. Integrating formal semantics and the lexicon I. Meaning postulates and the lexicon. Adjective meanings.

1. The Lexicon in Model-theoretic Semantics.

1.1. Languages, world, models. Axioms.

Let us consider the relation between an artificial language like the predicate calculus (PC) and a natural language like English and the meaning of Montague's phrase "English as a formal language". Expressions of a natural language of course relate in some way to the real world in all its richness, in a broad sense of real world including conceivable and possible worlds. Expressions of artificial formal languages are interpreted in models and have no meanings other than those assigned to them by the interpretation function (on the model). Models function as abstractions and representations of some aspects of some kind of reality; their structure reflects on the one hand the structure of the language for

which they provide the basis for interpretation, and on the other hand the nature of the reality they are intended to represent to some degree.

Model structures are like structural presuppositions about the world, or some aspect of some world, implicit in a formal language. Such presuppositions in PC are very primitive: the world consists of objects, devoid of any internal structure, and connections among these objects are represented as (extensional) relations. These presuppositions are similar to relational database representations of the world. Different predicate symbols of the same arity: **love, like, kiss, see** etc. are just different "labels".

When we view a natural language as a formal language, we simultaneously view the world (or the set of possible worlds) as a model of it. This involves some abstraction and regimentation both of the language and of the world(s), as reflected in the type structure imposed on the language and the ontology of the model structures in which it is interpreted.

Ideally, this abstraction should mirror a "real" abstraction which our "language faculty" imposes on the real world, "natural language metaphysics" or "naïve picture of the world" (*naivnaja kartina mira* in the terminology of Moscow semantic school). We will discuss this later when considering the integration of formal and lexical semantics.

In Montague's formal semantics the simple predicates of the language of intensional logic (IL), like **love, like, kiss, see**, etc., are regarded as symbols (similar to the "labels" of PC) which could have many possible interpretations in many different models, their "real meanings" being regarded as their interpretations in the "intended model". Formal semantics does not pretend to give a complete characterization of this "intended model", neither in terms of the model structure representing the "worlds" nor in terms of the assignments of interpretations to the lexical constants. The present formalizations of model-theoretic semantics are undoubtedly still rather primitive compared to what is needed to capture many important semantic properties of natural languages, including for example spatial and other perceptual representations which play an important role in many aspects of linguistic structure. The logical structure of language is a real and important part of natural language and we have fairly well-developed tools for describing it. There are other approaches to semantics that are concerned with other aspects of natural language, perhaps even cognitively "deeper" in some sense, but which we presently lack the tools to adequately formalize. It is to be hoped that these different approaches can be seen as complementary and not necessarily antagonistic.

1.2. Axioms and theories.

Returning to the PC: the means which logic offers for making semantic distinctions among different relations (different predicate symbols) are axioms and theories (and corresponding axiomatizable classes of models).

Let us assume that the set of predicate symbols is fixed.

To each set Σ of closed formulas there corresponds the class Σ^* of all models in which all the formulas of Σ are true.

The class Σ^* is called an *axiomatizable class of models*, and the set Σ is called the set of its *axioms.* But in Σ^*, not only the axioms of Σ may be true. The set Σ^{**} of all closed formulas which are true in Σ^* is called a *theory*, and the formulas of Σ^{**} are called the

theorems of the theory Σ**. (The axioms are a subset of the theorems; they are the *generators* of the set of theorems. The same theory may often be generated by different choices of axioms.)

Example. Consider the example of a tiny PC language containing just two binary predicate symbols **parent** and **grandparent**.

It is easy to see that the formula (i) is true in every model.

(i) $\forall x \forall y$**(parent(**x,y**)** $\vee \neg$ **parent(**x,y**))**

Such formulas are called *tautologies*. And formula (ii), for example, is false in every model.

(ii) $\forall x \forall y$**(parent(**x,y**)** $\&$ $\neg$ **parent(**x,y**))**

Such formulas are called *contradictions*.

Of course, not all formulas are tautologies or contradictions. There are formulas which are true in some models and false in others (called *contingent*). For example, the formula (iii)

(iii) $\forall x \forall z$**(grandparent(**x,z**)** $\leftrightarrow \exists y$**(parent(**$x,y$**)** $\&$ **parent(**y,z**)))**

is true only in those models where a given pair of individuals **a** and **c** stand in the **grandparent**-relation, i.e.

<a,c> $\in$ **grandparent**

iff there exists an individual **b** such that **a** is a parent of **b** and **b** is a parent of **c**, i.e.

<a,b> $\in$ **parent and <b,c>** $\in$ **parent .**

Thus formula (iii) selects the class of models (the axiomatizable class of models characterized by axiom (iii)) in which the relation **grandparent** has some properties which the relation expressed by English *grandparent* has in the real world.

But our axiom (iii), which captures some "correct" properties of the given kinship relations, is evidently insufficient for a complete characterization. It admits, for example, the model (i.e. is true in the model) $\mathbf{M_{BAD}}$ which consists just of objects **a** and **b** such that:

<a,b> $\in$ **parent**
<b,b> $\in$ **parent**
<a,b> $\in$ **grandparent .**

Consider the formula (iv).

(iv) $\forall x \forall y$**(parent(**x,y**)** $\rightarrow \neg$**(**$x = y$**))**

It is true in some models admitted by axiom (iii), and false in others, for example in the "bad" model $\mathbf{M_{BAD}}$ considered above. If we add this formula (iv) as an axiom, and take axioms (iii) and (iv) together, we slightly improve the situation, excluding from the class of models corresponding to these two axioms the model $\mathbf{M_{BAD}}$ along with various other "bad" models.

But it is easy to see that even these two axioms together admit not only "correct" ("intended") models. To describe correct models of kinship, we need some additional axioms. We will not continue that task here, but will turn to further illustrations of the notion of an axiomatic theory and its models.

Consider the formula (v).

(v) $\forall x \forall y \forall z$**((parent(**$x,y$**)** $\&$ **parent(**y,z**))** $\rightarrow$ **grandparent(**x,z**))**

It's not difficult to show that this formula is true in all models in which the formula (iii) is true. So formula (v) is included in the theory generated by axiom (iii) and is a theorem of this theory.

And formula (vi) below is false in all models in which the formula (iii) is true, i.e. it is inconsistent with formula (iii) (and with the theory generated by that axiom).

(vi) $\exists x \exists z$**(grandparent(*x*,*z*) &** $\neg \exists y$**(parent(*x*,*y*))**

If we were to add formula (vi) as an axiom to form the set of axioms (iii) and (vi), the resulting theory would be inconsistent, i.e. would have no models at all. And the negation of formula (vi) is in fact a theorem of the theory whose only axiom is (iii).

The concepts of axioms and theories will be useful at several points in these lectures.

In formal semantics, axioms play a role in at least two places. We will discuss their role in the axiomatization of "natural language metaphysics" (Bach) or the "naive picture of the world"(Apresjan). And axioms which describe the properties of the intended interpretations of lexical (non-logical) constants, called *meaning postulates*, will play a large role in our program of connecting formal and lexical semantics.

1.3. Meaning postulates.

The sample meaning postulates included here are extremely primitive. They are also oversimplified in omitting some essential modal and intensional operators; these are extensional approximations to rules which really must be stated in intensional terms.

(i) Illustrating the use of meaning postulates to spell out the content of "semantic features".

$\forall x$**[king(*x*)** $\rightarrow$ **human(*x*)]**

$\forall x$**[senator(*x*)** $\rightarrow$ **human(*x*)]**

etc. I.e., one can think of "semantic features" like "[+human]" as abbreviations for such meaning postulates.

(ii) Illustrating the use of meaning postulates to specify semantic properties that distinguish various semantic subclasses within a given semantic type. (More below.)

(a) $\forall x \forall P$**[skillful(*P*)(*x*)** $\rightarrow$ ***P*(*x*)]** (a skillful surgeon is a surgeon; this meaning postulate does not apply to adjectives like *former* and *alleged*.)

(b) $\forall x \forall P$**[former(*P*)(*x*)** $\rightarrow \neg$***P*(*x*)]** (*former* is a "privative" adjective, like "counterfeit")

(iii) A meaning postulate with enough information packed into it may constitute a definition; if the meaning postulate specifies necessary and sufficient conditions, it can be written with an "iff" ($\leftrightarrow$) rather than just as a one-way implication.

$\forall x \forall P$**[former(*P*)(*x*)** $\leftrightarrow$ **[PAST(*P*(*x*))** & $\neg$***P*(*x*)]]**

Whether such meaning postulates are possible for more than a small fraction of the lexicon of a natural language is a matter of debate which we do not aim to settle.

(iv) Meaning postulates can put constraints on the interrelations that must hold among the meanings of certain words without necessarily treating one word as "more basic" than another or decomposing both of them into some common "atoms". Decompositional

analyses are not forbidden but are not required; that issue can be open to exploration and debate.

$\forall x \forall y \forall z$**[buy(from-**$z$**)(**$y$**)(**$x$**) →sell(to-**$x$**)(**$y$**)(**$z$**)]**

The representation of argument structure illustrated here is exceedingly primitive and not to be taken seriously. The point of such an example is just to show that one can write axioms concerning the relation of pairs like *buy* and *sell* without trying to represent them as the "same relation" on any level.

(v) Montague included a number of meaning postulates in PTQ; many of them concerned issues of intensionality in various subclasses of verbs, nouns, and prepositions. Below is one which concerns his analysis of *seek* as an intensional transitive verb. The type of *seek* makes its direct object position referentially opaque; this meaning postulate puts mutual constraints on the meanings of *seek*, *try*, and *find*. If one believes that the meaning of *seek* includes but is not fully identical to the meaning of *try to find*, one can replace the ↔ in this meaning postulate by →.

$\forall x \forall S$ **□[seek(**x**,**S**) ↔ try-to(**x**,** $\hat{}$**(find(**S**)))]**

2. Approaches to lexical semantics.

2.1. Moscow semantic school.

2.1.1. Names.

Semantic investigations (insofar as they relate to the Moscow semantic school) began in Moscow in the early 1960's.

The main names: Igor Mel'chuk, Alexander Zholkovsky, Jurij Apresjan. The basic works were published in the 1970's: Mel'chuk (1974), Mel'chuk and Zholkovsky (1984) (completed in the 1970's), Apresjan (1974).

Mel'chuk moved to Montreal and continued his work there. Zholkovksy moved to the USA, and is now at UCLA but working in a different field. Some other colleagues moved to the West too. Apresjan and his group (Glovinskaja, Igor Boguslavskij, Uryson, and others) continue to work in Moscow. There are also other linguists working in semantics in Moscow. The work of Elena Paducheva and Ekaterina Rakhilina and their colleagues is in a number of respects close to that of Apresjan and his school.

2.1.2. The main direction of the Moscow semantic school.

The main direction (from our point of view) of the work of the Moscow semantic school is the systematic description of the lexicon. Although in the course of this work they have published a number of practical dictionaries for various uses, their main work has been the description of the lexicon for linguistic theory.

The principal results of this work have consisted of *tolkovanija* (dictionary definitions, or explications) of words, or lexical entries. Often such a lexical entry or

"lexical portrait" is several pages long. (The definitions in the published complete practical dictionaries are of necessity much shorter.)

2.1.2.1. The metalanguage of dictionary definitions.

Citations from Apresjan 1994 (material in square brackets [] added in our translation):

> ... it has been proposed to use as a metalanguage of the surface-semantic level not an artificial language, but a sublanguage of the object-language restricted and regimented in a specified manner, i.e. really existing words and syntactic constructions in their usual meanings, as is done in traditional lexicography. [p.28]

> 1. The vocabulary of the metalanguage is shorter by several orders of magnitude in comparison with the vocabulary of the Russian language; in particular, all complex lexemes are eliminated which are not used in the definitions of other linguistic units (for example, *blackmail, insinuation, swearing-in*, etc.). There remain two types of words: semantic primitives, i.e. undefined words, not permitting of further semantic reduction, and semantically more complex words (cf. above "intermediate concepts") which are reducible in one or more steps to primitives.
> 2. The vocabulary of the metalanguage is regimented in correspondence with the requirement of a one-to-one correspondence of words and meanings. This means that all synonyms and homonyms are avoided. Usually it is the stylistically and semantically most neutral member of a range of synonyms that is selected for the metalanguage. [p.29]

2.1.2.2. Principal requirements for **tolkovanija.**

Tolkovanija have four functions: (Apresjan 1994)

(i) to explain the meaning of the given linguistic unit;

(ii) to provide the basis for establishing the place of the given unit in the semantic system of the language;

(iii) to provide the basis for the rules mapping syntactic representations to and from semantic representations;

(iv) to provide the basis for the rules specifying the semantic interactions of the given unit with other units when they are combined in semantic composition.

Many kinds of paraphrases or definitions can serve function (i); only *tolkovanie* can play all of the roles (i-iv). In order to fulfill roles (ii-iv), there are four important theoretical requirements:

1) *Tolkovanija* must be non-tautological (no vicious circles).

2) *Tolkovanija* must provide necessary and sufficient conditions. It must be possible to substitute the *tolkovanie* for the word in a text preserving meaning and well-formedness.

3) The full system of *tolkovanija* must have the property of "gradedness". This means gradual decomposition of more complex expressions by means of semantically simpler expressions, eventually reaching the level of semantically primitive elements. In each *tolkovanie*, the meaning should be represented using the "largest blocks possible"; this procedure allows the greatest possible demonstration of interrelatedness among meanings of different units. It also makes definitions much more readable than if each term is decomposed into semantic primitives, with no use of intermediate (non-primitive) terms.

4) *Tolkovanija* must meet a requirement of explicitness. "This means that a *tolkovanie* [of a given word or other unit] should explicitly contain all semantic components with which the meanings of other lexical or grammatical units may interact in a given expression." [p.34]
Example: The *tolkovanie* of *review* should explain why *good review* is ambiguous, while *favorable review* and *interesting review* are not.

2.1.2.3. The structure of tolkovanija.

A *tolkovanie* is constructed as a text on the model of a mathematical definition. It is significant that it is a structured text. Within this text, presuppositions, assertions, implications, and "modal frame" are distinguished.

2.1.3. The "naive picture of the world".

Within the framework of the Moscow semantic school, the concept of the "naive picture of the world" (*naivnaja kartina mira*) was introduced. (Cf. "natural language metaphysics (ontology)" of Bach 1986, Link 1983)

Citation from Apresjan (1995b):

> 1. Every natural language reflects a specific way of perceiving and organizing (=conceptualizing) the world. The meanings expressed in it form some unified system of views, a *sui generis* collective philosophy, which is imposed as obligatory for all speakers of the language. At one time grammatical meanings were contrasted with lexical meanings by virtue of the former being obligatorily expressed, independently of whether they were significant for a concrete communication or not. In the last decade it has been discovered that many elements of lexical meaning are also obligatorily expressed.
> 2. The manner of conceptualization of reality particular to a given language (its view of the world) is in part universal, in part nationally specific, and speakers of different languages may see the world slightly differently, through the prism of their languages.
> 3. On the other hand, it is "naive" in the sense that in many substantial details it differs from the scientific picture of the world. At the same time, naive conceptions are by no means primitive. In many cases they are no less complex and interesting than the scientific. Such, for instance, are the naive conceptions of the internal world of the human. They reflect the experience of introspection of dozens of generations over many thousands of years and they are able to serve as a reliable guide to this world.
> 4. Within the naive picture of the world it is possibe to single out naive geometry, a naive physics of space and time (cf., for instance, the fully relativistic, even though prescientific, concepts of space and time of the speaker and the concept of observer — Apresjan 1986), naive ethics, naive psychology, etc.
> ...
> The ultimate task of systematic lexicography is the expression of the naive picture of the world embedded in a given language — naive geometry, physics, ethics, psychology, etc. [pp. 350-351]

2.2. Other approaches.

2.2.1. Structuralism.

- similarities and contrasts, patterns, individual lexical items as points in a structure of lexical items ("linguistic meaning" only).

Structuralist tradition: de Saussure, American anthropological linguists, Trubetskoy, Jakobson, Sapir, Bloomfield, Harris, Chomsky; in lexical semantics, Nida, Bendix, Katz, Bierwisch, Leech, Lyons, Cruse.

What matters for linguistics are structures, not actual content; not truth-conditions.

"If the categories of phonology can be represented by features which are binary, primitive, universal, abstract, and innate, then it is only to be expected that the categories of syntax ... and semantics (i.e. in the main, word meanings) can also be represented by features which are likewise binary, primitive, universal, abstract, and innate." (Taylor 1989/1995, p.30, on the "classical approach" in semantics.)

Semantic fields: "Semantic field theory makes a meaning claim that the meanings of words must be understood, in part, in relation to other words that articulate a given content domain and that stand in the relation of affinity and contrast to the word(s) in question." (Kittay and Lehrer 1992, pp.3-4.)

Examples: (1) English *window* normally translated as Spanish *ventana*, and in most contexts effectively equivalent. But Spanish has a contrasting term *vidrio* ("windowpane") used, e.g. when speaking of washing the window; and English has a contrasting term "window frame".

(2) Example in Apresjan (1994) : Russian *xotjet'* does not have the same meaning as English *want*; the differences are described in terms of the differing contrasts with near-synomyms in the two languages. *Xotjet'* contrasts principally with *zhelat'*, also with *xotjet'sja, zhazhdat', ...,* while *want* contrasts principally with *wish*, also with *desire, (would) like, yearn for, ...* . (But Apresjan's description of the differences goes well beyond typical structuralist "componential analysis".)

(3) *dinner*, etc., in different languages and even in different cultures and subcultures within a language; but cf. Fillmore's criticisms of structuralism with respect to words like *breakfast*.

2.2.2. Cognitivism, conceptualism

- lexical meanings seen as reflections of conceptual organization and described in terms of conceptual structures, sometimes in terms of conceptual primitives.
Cognitivist perspectives: Jackendoff (mixed cognitive/structural), Lakoff, Talmy, Wierzbicka (partially), Fillmore.

Looking for clues to conceptual primitives and "the underlying conceptual organization of language" (Talmy 1991a, p.1).

Cognitivists, like structuralists, tend (though not always) to see truth-conditions as irrelevant but for a different reason: equal importance given to literal and figurative uses of language, and there tends to be a belief that a person's cognitive model of the world

(physical and non-physical) has little or nothing to do with truth-conditions (I disagree, as do Stalnaker and Cresswell and Johnson-Laird and Keil, for example.)

But cognitive perspective is not necessarily incompatible with truth-conditional requirements; the two perspectives can in principle be combined, jointly imposing strong constraints on a semantic theory. This issue requires further discussion.

Fillmore: frame semantics, not necessarily incompatible with formal semantics. Specifically not structuralist. "Words represent categorizations of experience, and each of these categories is underlain by a motivating situation occurring against a background of knowledge and experience. With respect to word meanings, frame semantic research can be thought of as the effort to understand what reason a speech community might have found for creating the category represented by the word, and to explain the word's meaning by presenting and clarifying that reason." (Fillmore 1982, p.112) Examples: "breakfast", "orphan", "vegetarian", "shore" vs. "coast", two frames for "angle". Intrinsic and extrinsic frames: "good pencil", "good mother", vs. "good stick".

Jackendoff: Conceptual Semantics, a component of Chomskyan generative grammar. Cognitive Semanticists (Lakoff, Langacker) intend to replace Chomskyan generative grammar, Jackendoff intends to work within it. Conceptual structures are generated by conceptual formation rules, and there are mapping principles relating conceptual structures to syntactic structures. The level of conceptual structure is a linguistic level (but not completely language-dependent), with interfaces to nonlinguistic domains such as vision, action, etc. The primitives of conceptual structure cannot appear in isolation: they are like phonological features or quarks, observable only in combination. But they do not consist just of traditional “features”: they may include visual schemata, “cognitive spaces” with ranges of values (e.g. for color terms), “preference rule systems” for domains with family resemblances (Wittgenstein’s *game* example.) “My purpose — the characterization of the mental resources that make possible human knowledge and experience of the world” (Jackendoff 1990, p.8)

2.2.3. Pustejovsky’s “generative lexicon”.

We will not try to discuss Pustejovsky’s approach here, but note that its sources and its goals are in many respects similar to ours, with more influence from computational linguistics. A discussion of some of the most immediately relevant aspects of Pustejovsky’s approach can be found in the papers by Jensen and Vikner on the reading list.

2.2.4. Other approaches.

There are many other approaches to the lexicon, and an increasing number of researchers working on the integration of lexical and compositional approaches to semantics, some of whom have been pursuing this goal much longer than we have. Some of the key names that should be mentioned include David Dowty (a pioneer and a continuing leader of work on the lexicon in the Montague tradition and in formal semantics more generally), Manfred Bierwisch, Manfred Pinkal, Johannes Dölling; also Jane Grimshaw, Beth Levin, Malka Rappaport Hovav. We will not have time to discuss them, but they are all important.

2.3. Some theoretical problems and debates in lexical semantics.

Points of controversy and theoretical dispute include: (i) the extent of the relevance of truth conditions to lexical meaning; (ii) (complementary to (i)) the relation between meanings and concepts, and the possibility (or not) of meaning as something describable independently of what is in the head of the language user; (iii) the line between lexical (linguistic, semantic) and encyclopedic (factual, common-sense, non-linguistic) knowledge (there is more than one possible dichotomy here -- that is part of the problem); (iv) universals and semantic primitives; the choice and grounding of a semantic metalanguage; (v) the treatment of polysemy: how much is "listed", how much is "derived"?.

3. First steps toward integration of formal and lexical semantics.

3.1. Natural language as naïve mathematics describing the "naive picture of the world".

Let us look at natural language "from outside of linguistics" and discuss the analogy between natural language and mathematics.

From some point of view, mathematics is a language which science uses to describe the world (reality). And in using mathematics to describe the world, a physicist or other scientist begins with contentful (as opposed to formal) notions and concrete representations and sometimes even with perceptual images. For example, in our initial impression, a straight line is something like a tight wire and a plane is like the surface of a desk without any edges. We are familiar with visual images of triangle, sphere and cylinder. Geometry, considered as formalized description of space, arises when we introduce formal notions in correspondence to these visual images and find axioms linking these notions. So in building the theory of some fragment of the world with the help of mathematics, we fix and structure some basic notions and specify axioms relating these notions (for example Newton's laws relate such notions as *force*, *mass*, *aceleration* etc.). Doing this, we in a sense replaces the original meaningful notions by formal, i.e. "meaningless" ones. More precisely, all the meanings are transformed into formal constructions and axioms ("Equations understand it better than we" - the well-known saying of a physicist about a good theory).

But natural language, which existed for a long time before mathematics, uses similar means for describing the world. First of all, using language and dividing the world into realia, we use some mechanism of image recognition and assign the words to these continuous perceptual images of these realia. This is a very sophisticated mechanism, and we do not know much about it. What is important is that on this level, we produce the initial structuring of the world, its "discretization", carving it into realia and establishing notions corresponding to kinds of these realia. And possibly some of the most important of our innate linguistic abilities are linked to these mechanisms dealing with perceptual images and their discretization.

Furthermore, language not only carves the world into concrete realia: objects, their properties, actions, events, etc., but classifies and structures these realia, imposing on them a network of abstract notions and relationships, and builds the "theory" of what is called "the naive picture of the world" in the works of Moscow semantic school (Bach 1986 called this "Natural language metaphysics").

Developing the fruitful idea of "the naive picture of the world" pictured by the language, describing "naive physics", "naive psychology" etc., it is possible to say that language plays the role of a "naive mathematics" that describes the "theory" of this "naive picture of the world". In a sense, lexical semantics investigates this theory that lives in our minds and fixes it in dictionary definitions. This theory constitutes "structured knowledge" about the world, embedded implicitly in the language.

This general ("dictionary") knowledge corresponds to (describes) all possible situations, i.e. it is a theory describing all "correct" models (corresponding to all possible situations consistent with this knowledge.)

But concrete texts also contain knowledge about the world (real or possible), which can include knowledge of the most diverse kinds — ranging from the same sort of "general knowledge" found in lexical information, to the description of particular concrete situations (in which is encoded "current knowledge" of concrete situations — again either real or possible).

In the framework of formal semantics, this "textual knowledge" (for example, the description of a concrete situation) is fixed in the form of a formula, corresponding to this text. This formula can be thought of as selecting those models which correspond to the text. (If we take intensional models more carefully into account, we have to say that within any given model, the formula selects those possible worlds or situations that correspond to the text, i.e. which satisfy the given description.) Note that if lexical semantics is not taken into account, then among the models will be both many "correct" ones and many that are "incorrect" from the point of view of lexical semantics.

Illustration: Recall the discussion of axioms, theories, and models from Section 1 above. Without lexical meaning postulates to constrain the possible models that count as interpretations of English, there will be models in which "Every man is his own grandfather" comes out true.

3.2. Lexical meaning as a set of meaning postulates. Text as a theory*.*

We propose to modify the Moscow school approach and represent lexical information not as definitions with necessary and sufficient conditions but in the form of sets of meaning postulates, which link the meaning of the word with meanings of other words and categories. These postulates may or may not exhaust the meaning of the given lexical item, and may or may not be stated in terms of "semantic primitives". We believe this use of meaning postulates is consistent with actual Moscow school practice, and it makes it possible to integrate lexical semantics with the compositional "semantics of syntax" given by formal semantics. If the formal semantic interpretation of a sentence is given as a formula of intensional logic in which lexical items are primitives, and lexical semantics provides a set of meaning postulates for these lexical items, then their integration can be seen as the drawing of entailments from these sources, an approach which is extendable to the integration of semantic interpretation with contextual and other information as well.

So we semantically represent a sentence or a text as a *theory* consisting of different sorts of formulas, i.e. different sorts of axioms and their entailments. By "theory" here,

we do not mean the metalevel linguistic theory, but the set of axioms from various sources: lexicon, compositional semantics, context and background knowledge plus the consequences that can be drawn from these axioms, which together constitute the interpretation of such a sentence in a given context. (Broader and narrower notions of semantic or semantico-pragmatic interpretation correspond to the inclusion or exclusion of various potential sources of axioms.) Such a theory characterizes the class of all models that are consistent with the content of the given text, or of the text together with certain aspects of its context, if the theory includes axioms representing contextual information. The most general structure (features and constraints) of such models have to represent "naivnaja kartina mira" 'the naive picture of the world' (Natural Language Metaphysics or Ontology).

This general scheme, particularly the principles governing interactions among axioms from different sources, has to be investigated with concrete linguistic material. On our model-theoretic perspective, all of the "axioms" from all of the different sources jointly constrain the possible models, and their joint effects may account for phenomena ranging from ambiguity reduction to meaning-shift phenomena such as "coercion". On this view, cooccurrence restrictions reflect the sometimes incompatible demands that different elements may make on the interpretation of the whole. Ambiguities are decreased when not all of the possible variants provide a consistent (or sufficiently plausible) interpretation. Inconsistency, which should in principle always result in "anomaly" judgments, may lead instead to type shifting or other meaning shifts, the complexities of which are one of the main concerns of this paper. It will probably turn out that the mechanism of axiom interaction is rather complicated, and may include modifications (shifts) in some axioms in the context of the others.

3.3. Some initial examples and discussion.

In the remainder of this lecture, we will illustrate some of the issues we have been discussing with some concrete examples.

One set of issues concerns the many kinds of information that are in one way or another associated with words, and the complex question of what information should go into the lexicon and how. It is useful to recall David Lewis's advice: "In order to say what a meaning is, we may first ask what a meaning does, and then find something that does that." [Lewis 1970, p.22]. Clearly, different researchers often work on lexical semantics with different tasks and questions in mind, which place different demands on the form and content of a lexical entry. We will illustrate a few such differences with some brief discussion of the meaning of *mother*, an example that has been treated in numerous frameworks and that conveniently leads into the discussion of genitives and relational nouns and adjectives that will be our main example today. In the discussion of *mother* we will also begin to touch on the issue of what information is to be explicitly listed in the lexicon and what information can be derived, either from what is listed in the lexicon or "from elsewhere"; the part of this question that concerns the separation of "dictionary" from "encyclopedia" will mostly be deferred to the next lectures.

Our main example today will be the beginning of a discussion of genitives, relational nouns, and relational adjectives like *favorite*, with examples like *John's team*, *Mary's former favorite teacher*. We will work through some simple examples that involve the integration of information that comes from the compositional semantics (the

semantics of syntax), from lexical semantics, and from the context, and which also illustrate the issue of "complete definitions" vs. meaning postulates which do not purport to exhaust the meanings of the words they characterize.

We consider also some issues concerning the semantics of adjectives.

4. Genitives, relational nouns, relational adjectives (Part 1); issues of integration of information from multiple sources, complete vs. incomplete definitions.

Here we begin discussion of a sample domain within which we can illustrate the integration of compositional semantic interpretation with lexical information. We start with the basics of one analysis of the genitive and its interactions with various kinds nouns and adjective-noun combinations. Some of the issues that arise in this domain, and some possible alternative analyses, will be explored in Lecture 5.

4.1. Genitives and noun meanings.

(Partee (1983ms/1996)). Consider the data in (15-17).

(15) (a) John's team
(b) A team of John's
(c) That team is John's

(16) (a) John's brother
(b) A brother of John's
(c) (#) That brother is John's

(17) (a) John's favorite movie
(b) A favorite movie of John's
(c) (#) That favorite movie is John's

Informally, unified interpretation of genitive phrase *John's* that applies to all of these cases: genitive phrase always expresses one argument of a relation. But the relation can come from any of three sources:

(i) the context, as in (15) ("plays for", "owns", "is a fan of", etc.); this happens when the noun is a plain 1-place predicate. (We will return to the issue of whether the semantics of a non-relational noun may sometimes itself contribute a salient relation.)

(ii) an inherently relational noun like *brother*.

(iii) an inherently relational adjective like *favorite*.

Call case (i) the "free ***R***" reading, cases (ii) and (iii) "inherent ***R***" readings.

How to unify? Assimilate all cases to the "free ***R***" reading? Hellan 1980. Problem: the contrast among the (c) examples, and the pattern of interpretations in (18), noted by Stockwell, Schachter and Partee (1973).

(18) (a) John's portrait (ambiguous)
(b) A portrait of John's (free ***R*** only)
(c) A portrait of John (inherent ***R*** only)
(d) That portrait is John's (free ***R*** only)

Solution of Partee (1983): distinguish "transitive" and "intransitive" common noun phrases, TCN and CN, distinct rules for genitives. TCNs further distinguished by a feature [+/-gen] to mark whether they take postnominal genitives on their relational reading or not -- *brother* vs. *portrait*.

Summary of syntax/semantics of genitive analysis of Partee 1983:

Predicative genitive: a one-place predicate, free ***R*** only.
Postnominal genitive: combines with CN or TCN to make a CN; free or inherent ***R***.
Prenominal genitive: combines with CN or TCN to make an NP; free or inherent ***R***; incorporates implicit *the*.

Predicative genitive: $\mathbf{TR}(\textit{John's}_{t/e}) = \lambda x[R_i(\mathbf{John})(x)]$ $(= R_i(\mathbf{John}))$

Postnominal genitive: (i) free ***R***: $\lambda P \lambda x[P(x) \,\&\, R_i(\mathbf{John})(x)]$
(ii) inherent ***R***: $\lambda R[\lambda x[R(\mathbf{John})(x)]]$

Prenominal genitive: basically function composition of **TR**(*the*) and postnominal genitive, free or inherent.

$$\mathbf{TR}([\textit{John's}]_{\mathrm{DET}}) = \lambda R[\iota z[R(\mathbf{John})(z)]]$$

Alternative proposal (Jensen and Vikner 1995): Genitive phrase always demands a relational TCN as argument, coerces plain CN to TCN; to be discussed in Lecture 5.]

4.2. favorite

Consider the inherently relational adjective *favorite* ((17) above), and its combinations with plain or relational nouns.

On the analysis of Partee (1983), *favorite* can combine with either a TCN (*favorite teacher)* or a CN (*favorite movie)*, always resulting in a TCN.

(19)(a) $\mathbf{TR}([\textit{favorite}_1]_{\mathrm{TCN/CN}}) = \lambda P[\lambda y[\lambda x[P(x) \,\&\, y \textbf{ likes } x \textbf{ best out of } P]]]$

(b) $\mathbf{TR}([\textit{favorite}_2]_{\mathrm{TCN/TCN}}) = \lambda R[\lambda y[\lambda x[R(y)(x) \,\&\, \mathbf{TR}([\textit{favorite}_1])(R(y))(x)]]]$

In **Appendix 1** we consider semantics of the sentence *"Mary's former favorite teacher jogs"* as example of the integration of the formula representing the compositional interpretation with the information coming from lexical meaning postulates.

See also homework problem 3 for relevant issues to think about between now and Lecture 5.

5. Adjective classification.

(Kamp and Partee 1995, Partee 1995). Adjective classifications as related to formal/lexical integration.

The goals are to illustrate (i) formal semantic methods of investigation of semantic properties of lexical meanings that affect their combinatory potential with other meanings in a compositional semantics; (ii) how "semantic features" or "conceptual primitives" could be given either specific or relative content by means of meaning postulates.

5.1. The Intersection Hypothesis.

(1) Hypothesis: Given the syntactic configuration $[_{CNP}$ ADJ CNP], the semantic interpretation of the whole is ADJ $\cap$ CNP (set intersection, predicate conjunction)

(2) *carnivorous* = {x | x is carnivorous}
mammal = {x | x is a mammal}
carnivorous mammal = *carnivorous* $\cap$ *mammal*
= {x | x is carnivorous and x is a mammal}

As a general hypothesis about the interpretation of ADJP CNP constructions, the intersection hypothesis is falsified by the examples of nonintersective adjectives in the following sections, but it is a correct account of the semantics of combining nouns with restrictive relative clauses, and it holds for *some* adjectives, called **intersective**.

5.2. Nonintersective Adjectives.

An adjective like *carnivorous* is **intersective**, in that Meaning Postulate (3) holds for any N.

(3) *carnivorous* N = *carnivorous* $\cap$ N

But what about *skillful*?

(4) Francis is a skillful surgeon.
Francis is a violinist.
Therefore Francis is a skillful violinist. [Not valid]

Skillful is not intersective, but it is **subsective.**

(5) Subsectivity: *skillful* N $\subseteq$ N

5.3. Nonsubsective Adjectives.

The adjectives *former, alleged, counterfeit* are neither intersective nor subsective.

(6) (a) *former senator* $\neq$ *former* $\cap$ *senator*
(b) *former senator* $\not\subset$ *senator*

Nonsubsective adjectives may either be "plain" nonsubsective (no entailments at all, no meaning postulate needed), or **privative**, entailing the negation of the noun property.

(7) Meaning postulate for **privative** adjectives:
counterfeit N $\cap$ N = $\varnothing$

(8) Additional examples of each type:

(i) intersective: *sick, carnivorous, blond, rectangular, French*.

(ii) non-intersective but subsective: *typical, recent, good, perfect, legendary*.

(iiia) non-subsective and privative: *would-be, past, spurious, imaginary, fictitious, fabricated* (in one sense), *mythical* (maybe debatable); there are prefixes with this property too, like *ex-, pseudo-, non-*.

(iiib) plain non-subsective: *potential, alleged, arguable, likely, predicted, putative, questionable, disputed*.

5.4. Adjectives as Functions; Intensionality.

The simplest general rule for interpretation of ADJ + CNP combinations: Adjectives are *functions* that map the semantic value of the CNP they combine with onto the value of the ADJ + CNP combination.

Types (extensionalized): CNP: $e \rightarrow t$; ADJ: $(e \rightarrow t) \rightarrow (e \rightarrow t)$

(The relevant semantic values of CNPs must actually be *properties* rather than *sets*, i.e., *intensions* rather than *extensions*. Intensionality is not being discussed here.)

Meaning postulates specify various restrictions on these functions, characterizing various subclasses of adjectives. "Semantic features" may be seen as labels for meaning postulates which give them determinate content.

Intersective adjectives and only those can be interpreted in type $e \rightarrow t$. On Montague's "worst case" strategy, *all* adjectves would have to be interpreted as type $(e \rightarrow t) \rightarrow (e \rightarrow t)$ (unless two separate syntactic categories were recognized), and the fact that intersective adjectives behave "as if" of type $e \rightarrow t$ would be captured by a meaning postulate of the following form:

- **Intersective** adjectives:

$\exists P_{e \rightarrow t} \forall CNP' \forall x[ADJ'(CNP')(x) \leftrightarrow P(x) \,\&\, CNP'(x)]$

(Think of P as a related predicative sense of the same adjective.)

Allwing multiple types and type-shifting, the intersective ones can be treated as lexically of type $e \rightarrow t$, which automatically guarantees their intersectivity and eliminates the need for a meaning postulate. Type-shifting rules, introduced on Day 4, will give them homonyms of type $(e \rightarrow t) \rightarrow (e \rightarrow t)$ when needed.

Note the application of different type-driven translation rules for combining ADJPs of different types with CNPs: the higher-type ADJPs will combine by function-argument application, the lower-type ones by predicate conjunction.

5.5. Meaning postulates for adjective classes, reformulated.

These meaning postulates apply to adjectives of type $(e \rightarrow t) \rightarrow (e \rightarrow t)$.

- **Subsective**: $\forall x[ADJ'(CNP')(x) \rightarrow CNP'(x)]$
- **Nonsubsective**: no meaning postulate; this class is "noncommital".
- **Privative**: $\forall x[ADJ'(CNP')(x) \rightarrow \neg CNP'(x)]$

5.6. Is tall *intersective or subsective?.*

(1) a. Tom is a tall 14-year-old.
b. Tom is a basketball player.
c. ?? Therefore Tom is a tall basketball player.

Does that mean that *tall* is not intersective? No; perhaps it is intersective but vague and context-dependent. How can we tell the difference?

First argument. Keep the ADJ-N sequence constant but change other aspects of the context. That can help to show whether it is the intension of the noun that is crucial.

(2) a. My two-year-old son built a really tall snowman yesterday.
b. The linguistics students built a really tall snowman last weekend.

Further evidence that there is a difference between truly nonintersective subsective adjectives like *skillful* and intersective but vague and context- dependent adjectives like *tall* was noted by Siegel (1976b): the former occur with *as*-phrases, as in *skillful as a surgeon*, whereas the latter take *for*- phrases to indicate comparison class: *tall for an East coast mountain*. (An adjective can be nonintersective and **also** vague, and then one can use both an *as*-phrase and a *for*-phrase: *very good as a diagnostician for someone with so little experience*.)

This classification is nevertheless controversial. You will be invited to think about it some more as one of this session's homework problems.

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Appendix 1. Example: *Mary's former favorite teacher*

This example concerns the integration of the formula representing the compositional interpretation with the information coming from lexical meaning postulates.

Major issue: the difference between "complete" definitions ("iff" definitions) and working with (sets of)meaning postulates which are not complete definitions but include "one-way" entailments. To show: how we get such entailments as that Mary's former favorite teacher is someone who once was her favorite teacher and no longer is, and who therefore was her teacher at some time in the past, but there is no entailment that that person is no longer her teacher.

Conclusion will be: In the general case, we cannot expect the result of the integration of compositional formula and lexical meaning postulates to be representable as a single formula. In general, what we should be able to do is to show how any particular entailment we are interested in does (or does not follow) from the combination of compositional and lexical semantic information (or from those supplemented with information from other sources - factual, contextual, etc.)

Illustrate by considering "Mary's former favorite teacher" two ways: one way with complete definitions, and a single resulting formula; the other way with one incomplete definition, and showing that no single formula can then be derived which represents "the meaning of the sentence" including all the lexical information.

This example is also a good lambda-exercise.

A.1. Starting points.

Basic parts:

lexical item	**syntactic category**	**semantic type**	
teacher	TCN	type <e,<e,t>>	
favorite	TCN/TCN	<<e,<e,t>>,<e,<e,t>>>	(also TCN/CN)
former	TCN/TCN	<<e,<e,t>>,<e,<e,t>>>	(also CN/CN)
Mary	NP	e	
Mary's	DET; specifically, NP/TCN	<<e,<e,t>>,e>	
's	(NP/TCN)/NP	<e, the type above>	(and another variant for GQs)

Combination: [**TR**(*Mary's*)]**(former (favorite (teacher**)) : function-argument application 3 times.

Relevant meaning postulates:
(note: meaning of *favorite* corrected from Partee (1983) after discussion with Borschev, Paducheva, and Rakhilina: changed "likes ***x***" to "likes ***x*** as an ***R***". More discussion in Lecture 5.)
For *favorite*, we consider two variants, with the same lexical information, but in one case that information is assumed to be just part of the meaning of *favorite*, a constraint on possible interpretations but not a definition; in the other case we put the same information into an "iff" form, treating it as a definition. For *former*, we assume that the meaning postulate given below constitutes a definition.

(i) **"Incomplete definition":**
favorite(*R*)(*y*)(*x*) → [*R*(*y*)(*x*) & *y* likes *x* as an *R* better than any other *w* such that *R*(*y*)(*w*)]

(ii)**"Complete definition":**
favorite(*R*)(*y*)(*x*) ↔ [(*R*)(*y*)(*x*) & *y* likes *x* as an *R* better than any other *w* such that *R*(*y*)(*w*)]

In this second case, we can give a definition of **favorite** in lambda-terms, as follows (in the first case, we cannot.)
(iii) **favorite = λ*R*λ*y*λ*x*[*R*(*y*)(*x*) & *y* likes *x* as an *R* better than any other *w* such that *R*(*y*)(*w*)]**

(iv) **former(*R*)(*y*)(*x*) ↔ PAST [*R*(*y*)(*x*)] & ¬ *R*(*y*)(*x*)**
former = λ*R*λ*y*λ*x*[PAST [*R*(*y*)(*x*)] & ¬ *R*(*y*)(*x*)]

A.2. First part of derivation, same for both versions.
Let's make it a complete sentence: Mary's former favorite teacher jogs.

1. **jog(Mary's (former(favorite(teacher))))** ≡ (by def. of **Mary's**)

2. **jog(λ*R*[ιz[*R*(Mary)(*z*)]](former(favorite(teacher))))** ≡ (by λ-reduction)
Mary's ***R***

3. **jog(ιz[former(favorite(teacher))(Mary)(*z*)])** ≡ (by def. of **former**)

4. **jog(ιz[λ*R*λ*y*λ*x*[PAST [*R*(*y*)(*x*)] & ¬ *R*(*y*)(*x*)](favorite(teacher))(Mary)(*z*)])** ≡ (by λ-reduction) ***R***

5. **jog(ιz[λ*y*λ*x*[PAST [favorite(teacher)(*y*)(*x*)] &**
¬ favorite(teacher)(*y*)(*x*)] (Mary)(*z*)]) ≡ (by λ-reduction)

6. **jog(ιz[λ*x*[PAST [favorite(teacher)(Mary)(*x*)] &**
¬ favorite(teacher)(Mary)(*x*)](*z*)]) ≡ (by λ-reduction)

7. **jog(ιz[PAST [favorite(teacher)(Mary)(*z*)] & ¬ favorite(teacher)(Mary)(*z*)])**

Now we get to **favorite**, and it splits into two cases. 8a, with ≡ definition, 8b, just with → entailments.

A.3.a. Continuation of derivation, with definition.

8a. **jog(ιz[PAST [λ*R*λ*y*λ*x*[*R*(*y*)(*x*) & *y* likes *x* as an *R* better than any other *w* such that *R*(*y*)(*w*)] (teacher)(Mary)(*z*)] & ¬ λ*R*λ*y*λ*x*[*R*(*y*)(*x*) & *y* likes *x* as an *R* better than any other *w* such that *R*(*y*)(*w*)] (teacher)(Mary)(*z*)]) ≡** (by λ-reduction on ***R***, twice)

9a. **jog(ιz[PAST [λ*y*λ*x*[teacher (*y*)(*x*) & *y* likes *x* as a teacher better than any other *w* such that teacher(*y*)(*w*)](Mary)(*z*)] & ¬ λ*y*λ*x*[teacher (*y*)(*x*) & *y* likes *x* as a teacher better than any other *w* such that teacher(*y*)(*w*)](Mary)(*z*)]) ≡** (by λ-reduction on y, twice)

10a. **jog(ιz[PAST [λ*x*[teacher (Mary)(*x*) & Mary likes *x* as a teacher better than any other *w* such that teacher(Mary)(*w*)](*z*)] & ¬ λ*x*[teacher (Mary)(*x*) & Mary likes *x* as a teacher better than any other *w* such that teacher(Mary)(*w*)](*z*)]) ≡** (by λ-reduction on x, twice)

11a. **jog(ιz[PAST [teacher (Mary)(*z*) & Mary likes *z* as a teacher better than any other *w* such that teacher(Mary)(*w*)]] & ¬ [teacher (Mary)(*z*) & Mary likes *z* as a teacher better than any other *w* such that teacher(Mary)(*w*)]])**

That's it, and all the compositional and lexical information is there in one formula; of course, seeing what follows from this may still require some "theorem-proving" techniques.

A.3.b. Working with 1-way entailment.

favorite(*R*)(*y*)(*x*) → [*R*(*y*)(*x*) & *y* likes *x* as an *R* better than any other *w* such that *R*(*y*)(*w*)]

What is on the right-hand side cannot be substituted in the formulas above because the interpretation of the iota operator includes a part where **favorite** would be inside the antecedent of a conditional. So even in this simple case no substitutions are possible.

But if we do some theorem-proving, we can show that from the formula 7 plus this meaning postulate, lots of things do follow, e.g.:

A person jogs who was Mary's favorite teacher.
A person jogs who is not now Mary's favorite teacher.
A person jogs who may or may not be Mary's teacher now.
(These are also entailments of 8a.)

A.4. Basic issues here.

Given a sentence S translated compositionally into an MG formula φ and a set of all Meaning Postulates **MP** for all the lexical items in S:

A model **M** for φ plus its lexical content is a model in which {φ} ∪ **MP** is satisfied.

Finding a "formula" that says all of that is secondary. It just must be true that all of the contents of **MP** are *true* in **M**; interactions with negation, conditionals, etc., are then automatic.

Do we need more "local" interactions of **MP** with parts of φ? Certainly we need richer formulas to show differences among presupposition, entailment, etc., but there is no evidence so far that we need different devices to explain disambiguation effects, constraints on cooccurrence, etc. We will explore this issue further in the next days.

HOMEWORK 3.

Try from 1 to 3 of these; choose problems that are interesting and the right degree of "challenging" for you. Some are "exercises", some are open problems, some are somewhere in between.

Note: Feel free to substitute examples in your native language (or any language you have worked on) for the English examples below and work on "your" versions of these problems. Many or most of the issues will probably be mostly the same, but note any interesting differences between your language and English.

1. Try doing a derivation for *A former teacher of Mary's jogs.* If that's too easy, do *A former teacher of every student's jogs*, using the Quantifying In rule from Lecture 2 to quantify *every student* into the open sentence *A former teacher of* he_3*'s jogs.* (The quantifier phrase will therefore have wider scope than *former*.)

2. (advanced) Try to explain the non-ambiguity of scope of *each student's favorite example* (*each student* must have wider scope than the iota-operator in the genitive interpretation) and the ambiguity of scope in *everyone's favorite movie*. Descriptively, *each student* has only a distributive reading, while *everyone* can have either a distributive or a group reading. See if you can turn these observations into a formal account.

3. When we return to the genitive in Lecture 5, we will take a closer look at the meaning of *favorite* as well. To be thinking about: In *Mary's favorite teacher*, the implicit *R* in "likes *x* as an *R* better than ..." in the interpretation of *favorite* is understood as the relation **teacher**; this is the same relation that is understood in the normal interpretation of *Mary's teacher*. That is predicted by our rules. The same thing seems to occur, but is not predicted, in *Mary's chair* and *Mary's favorite chair*: a default relation something like "habitually sits in" seems to be evoked both in the interpretation of the genitive *Mary's chair* and in the interpretation of *favorite* in this case — the chair Mary likes to sit in more than any other. How general is this phenomenon and how should it be explained? In particular, does it have implications for the lexical entries of one-place CN's like *chair*? (References: Partee and Borschev (in press), Jensen and Vikner (new manuscript in progress.))

4. How many meanings, and of what types, can you detect for *new* in:

new movie, new medicine, new movie star, new mother, new teacher, new car, new theater, new home, new job, new friend. [Note: *new* is simpler than *old*, since *old* is the antonym of *young* as well as of *new*.

Try combining the above phrases with *Mary's* and with *a*. Try to explain why in some cases there seems to be some sort of meaning shift when you switch from *a* to *Mary's*.

[For partial answers, see Section 4.4. of Partee and Borschev (in press: Tbilisi paper, circulated, and will be Lecture 5. Also see notes below in Homework Help.]

5. Consider the three-way contrast among adjectives of the classes of *carnivorous*, *tall*, *skillful*. *Carnivorous* and *skillful*, according to the adjective classification discussed in

this handout, are respectively intersective and non-intersective but subsective. There are two different possible accounts of *tall*, one classifying *tall* together with *carnivorous* (intersective, type e → t, which BHP prefers), another classifying it together with *skillful*, (subsective, type (e → t) → (e → t), which VBB prefers). On each account, the *tall* subclass would be a distinct subclass of its type, differing in substantial ways from other subclasses of the same type. Look for any arguments you can find, syntactic, semantic, or syntactico-semantic, for whether *tall* should be classed with *carnivorous* (and if so, how to describe the difference between the *tall* subclass and the *carnivorous* subclass) or with *skillful* (and how to describe the two different subclasses in that class then.) One suggestion: consider the behavior of comparatives. Another suggestion: consider the interpretation of adjectives in predicate position, where there is no (at least no overt) Adjective- Noun construction. But those are only suggestions — you can look for other kinds of evidence in addition or instead.

HOMEWORK HELP.

1. See the derivations of *Mary's former favorite teacher jogs* in Appendix 1; this question is a slightly simpler variation. This one uses the postnominal genitive and an indefinite article, and omits *favorite*. Otherwise it is the same. This is not a trick question; it is just an exercise.

Question 4, Second part:
About shifts when used with *a* vs. *Mary's*. The genitive demands a relational reading, either "inherent" or "free ***R***", whereas the default (but not obligatory) reading with *a* will be non-relational. This is perhaps clearest with the pair *a new mother* and *Mary's new mother*. The first is a normal expression, and uses the one-place predicate reading of *mother*, and the (20b) reading of *new*: hasn't been a mother long — true shortly after the birth of one's first child. But *Mary's new mother* requires a relational reading, and by far the "strongest" candidate is the inherent relation *mother-of*, which would in turn require the reading (20c) for *new*: hasn't been a mother of for long. Pragmatically unusual though it may be (e.g. Mary could be a foster child who keeps being sent from foster mother to foster mother), this seems to be the only available reading unless we are in a very special context where for instance social workers are assigned to look after new mothers, and Mary is a social worker. The contexts in which the inherent-relation *mother* can fit such an expression are at least as odd as the contexts which could support a "free ***R***", probably odder, but the linguistic pressure from the inherent relation is nevertheless evidently very strong, since the (odd) inherent-relation reading is definitely the "default" reading of *Mary's new mother*, we believe.

Note that while *a* permits, and probably prefers, a plain CNP, it can occur with TCNP as well, especially as object of the verb *have*; that requires a whole special story (there exists an abstract for a never-written paper by Landman and Partee about that), but there is obviously a connection betweeh *have* and genitives.