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http://seelrc.org/glossos/
glossos@seelrc.org

Alexander V. Kravchenko
Irkutsk State Economics Academy

The cognitive roots of gender in Russian

1. Introduction

It will not be an exaggeration to say that modern linguistic science is in a profound theoretical and conceptual tangle. This is especially obvious in semantics as the "theory of meaning", where the chaos is striking (Devitt & Sterelny 1999). It is because so far linguistics as a science has not succeeded in bringing together in an uncontradictory fashion the two concepts of language: language as a sign system for representing knowledge and language as a communicative activity. This is largely due to methodological shortcomings of the traditional philosophy of mind based on Cartesian logic with its ontological distinction between mind and body (Priest 1991; Schlechtman 1997; Kim 1998).

The mainstream cognitive science approach to intelligence is largely computational: intelligent performance is viewed as certain symbolic processes involving representations (Fodor 1975, 1998; Newell 1990; Pylyshyn 1999; Fuchs & Robert 1999 *inter alia*). These processes account for such cognitive capacities as perception, language acquisition and processing, planning, problem solving, reasoning, learning, and the acquisition, representation, and use of knowledge (Lepore & Pylyshyn 1999). However, the concept of mental representation as used in contemporary literature is so fuzzy and elusive that its more or less consistent use unavoidably invokes one question that has to be answered prior to any productive discussion of the nature of cognition and cognitive capacities: *What is a mental representation?*

In the contemporary philosophical theory of knowledge, representations are understood as certain mental structures including intentional categories *(believe that p, wish that q)* which constitute the content of linguistic (semantic) structures at the deep

level. In psychology, representations are typically described as conceptual structures individuated by their contents (Margolis & Laurence 1999) and defined in accordance with traditional methods of analytical philosophy, that is, by positing sets of necessary and sufficient conditions that have to be met.

However, there is enough empirical evidence that refutes the very existence of rigid categories in a classical sense (Rosch 1973, 1977; Taylor 1989; Margolis 1994). Moreover, concepts, or knowledge structures rooted in intentional categorization, are much more complicated than what the traditional philosophical/semantic analysis claims them to be. Experimental data highlight the role experience plays in perception, categorization, and conceptualization. It has been shown that background knowledge affects categorial decisions (Palmeri & Blalock 2000; Gelman & Bloom 2000) and acquisition of new concepts (Nelson et al. 2000; Matan & Carey 2001), that meaning is specifically related to perception (Allwood & Gaerdenfors, 1999) which itself is influenced by categorization processes (Schyns 1997; Albertazzi 2000), and that object recognition and categorization is largely an on-going process, affected by experience of our environment (Wallis & Bülthoff 1999).

In what follows I will attempt to offer a cognitive account of gender classification of nouns in Russian, departing from traditional semantic accounts and taking as a starting premise the experiential nature of knowledge represented in grammatical categories.

2. The problem with traditional semantic classification

In Russian, the category of gender is a grammatical feature of pronouns, nouns, adjectives, and verbs in the past tense. Adjectives are marked for gender to agree with nouns, and verbs in the past tense agree with nouns and pronouns. Therefore, of primary interest to those studying gender as a grammatical category, are pronouns and nouns.

If we compare the ways gender is expressed in nouns and pronouns, we will see that they are basically inconsistent, but inconsistent in a different manner. Pronouns are marked for gender in the 3rd person singular and are unmarked in the 1st and 2nd person singular, this being a universal feature across languages (with the exception of Semitic languages).

This feature stems from the epistemic mode in which the world is categorized by means of the tripartite classification of entities into the subject of speech, the object of speech, and the matter of speech (Кравченко1992). The primary epistemic contrast "I - you" reflects the first and most important step in cognitive categorization which is the phenomenological core of language as a system of representation. The phenomenological nature of this epistemic contrast renders explicit gender identification irrelevant since such identification is not an issue in a canonical situation of utterance. Third person pronouns, on the contrary, reflect the twofold differentiation of real world objects on a primary feature "animate/inanimate", and a secondary feature of gender. This classification is, obviously, pragmatic in that it is predetermined by the two existential imperatives for humans: survival (an animate object is a high-ranking source of danger) and procreation.

According to standard academic grammars, most nouns in Russian are marked for gender, with the exception of pluralia tantum nouns and the so-called "common gender nouns" such as *сирота* 'orphan', *умница* 'smart one', *работяга* 'laborer', etc. (Шведова, Лопатин 1989). To quote an authoritative source, "the category of nominal gender is a non-formative syntagmatically revealed morphological category manifest in the ability of singular nouns to relate preferentially to the gender forms of those word forms that agree (or are coordinated, in case of predicates) with the noun" (Русская грамматика 1980, 1: 465). However, definitions of this kind fail to give any rationale behind the gender classification of nouns, although common sense tells us that such a classification could hardly be irrational (cf. Lakoff 1987).

Yet, inclusion of nouns in a specific gender class seems to be arbitrary both on grammatical (morphological) and semantic criteria. Whereas in the case of 3 person pronouns the grammatical marker for gender is morphologically consistent (Rus. *он*/a/o 'he/she/it'), it is not true about nouns. In Russian, alongside with the typical morphemes ***-а***, ***-я*** (*жен**а*** 'woman/wife', *земл**я*** 'earth'), feminine gender can be expressed by the so-called zero morpheme (*кость* 'bone', *плоть* 'flesh', *шаль* 'shawl, *сажень* 'arch. linear measure unit') typical for masculine nouns (*гость* 'guest', *тать* 'arch. thief', *плетень* 'wicker fence'). Likewise, the ***-а*** , ***-я*** morphemes which typically mark nouns as feminine may be found in masculine nouns (*мужчин**а*** 'man', *пап**а*** 'dad', *дяд**я*** 'uncle').

The neuter gender is typically marked by the ***-o*** and ***-e*** morphemes, but the morpheme ***-я*** is not uncommon in neuter nouns (*дитя* 'child', *пламя* 'flame'), while the ***-o*** and ***-e*** morphemes are found in masculine nouns as well (*домишко* 'little house, *dimin*.', *голосище* 'loud booming voice', *подмастерье* 'apprentice'). As data indicate, the grammatical category of gender of nouns seems to reflect a rather arbitrary classification, since there is no consistently used formal feature that would unambiguously identify the gender of a given noun.

In Russian, morphological gender markers are tied mostly to word formation (derivational) processes: *лис* 'male fox' - *лиса* 'female fox', *волк* 'male wolf' - *волчица* 'female wolf', *повар* 'male cook' - *повариха* 'female cook', *снег* 'snow, *m*' - *снежинка* 'snowflake, *f*', etc. In all such cases the masculine noun form appears to be primary, as the word formation process follows the direction "masculine —> feminine", similar to the pronominal paradigm *он* 'he' —> *она* 'she'.

In Indo-European, the ***o***-suffix was used to refer to male objects, whereas female objects were marked by the ***ā***-suffix and ***-iē , -ī-*** . According to Brugmann (1889), at first none of these suffixes had anything to do with sex distinctions. He hypothesized that, probably, the idea of female nature inherent in the root of one or two words — possibly, **genā* 'wife (= woman)', *mātā* 'mother' — was transferred onto the suffix, which began to be used to differentiate between male and female species. It was only due to the contrast with ***-ī-*** that the ***-o-*** form began, later on, to be used to refer to male species, and it always remained the primary means of naming any animate creature without indicating gender distinctions.

It is difficult to find semantic justifications for classifying nouns into different gender classes. If, in the case of animate nouns, their gender can be explained through gender distinctions of their respective referents, it cannot be done so in the case of inanimate objects. Why are *день* 'day' and *вечер* 'evening' masculine, *ночь* 'night' — feminine, and *утро* 'morning' — neuter? Why are *пень* 'tree stump', *кистень* '*arch*. a kind of mace', *ларь* 'chest' masculine, and *тень* 'shade, *сажень* '*arch*. linear measure', *гарь* 'burnt out part of forest' — feminine? Why is *дуб* 'oak' a "he", and *береза* 'birch tree' — a "she"? Is there any logic at all in how Russian nouns are classified into different gender groups?

3. The hypothesis

If we assume that pronouns have ontogenetic primacy over nouns (Кравченко 1996), then it can be hypothesized that gender differentiation of pronouns was the next step in creating the taxonomic model of the world, the first step being categorization of all phenomenologically accessible reality into two realms: speech act participants (in a canonical utterance situation, the speaker and the addressee) and the rest of the world. This, basically, made the epistemic contrast "I - you" the ultimate point of reference in natural language, all possible referents being subsumed by the concept "it" (= "the matter of speech") as anything that is not immediately embraced by the first concept.

It can be further hypothesized, that in the course of time non-gender specific identification of the matter of speech (*оно* 'it') gave way to the contrast *он - оно* ('he - it') on the "animate/inanimate" feature. Circumstantial evidence for this is found in the fact that, typically, nouns denoting animate creatures (names of species) that can be considered as prototypes for respective classes, are masculine: *волк* 'wolf', *заяц* 'hare', *медведь* 'bear', *орел* 'eagle', *голубь* 'pigeon', *воробей* 'sparrow', *карп* 'carp', *окунь* 'bass', etc. The animalistic past of language also helps explain why many inanimate nouns, especially names of elements and natural phenomena such as *ветер* 'wind', *гром* 'thunder', *дождь* 'rain', *град* 'hail', *снег* 'snow', *иней* 'frost', *мороз* 'severe cold', *огонь* 'fire', *воздух* 'air' are masculine: the attributing of the feature "animate" to an object depended on whether that object belonged to the self-propelled or non self-propelled class (Premack 1990).

At first, it seems, the contrast *он она* 'he - she' reflected natural gender distinctions of humans. Then, it was extended to other animate objects and, finally, to any obviously inanimate objects, the extension being based on analogy and functional association. The analogy principle can be traced in gender characteristics of some nouns that are names of natural objects, when the prototypical features that distinguish man from woman can be attributed to those objects, cf.: *дуб* 'oak, *m*' — "big, strong, sturdy" vs. *рябина* 'mountain ash, *f*' — "slim, thin, yielding", *огонь* 'fire, *m*' — "powerful, dangerous" vs. *вода* 'water, *f*' — "soft, caressing, soothing", *земля* 'earth, *f*' — "mother of everything living", etc.

The functional association principle in noun gender classification may be found in groups of names of certain artifacts: *нож* 'knife, *m*', *топор* 'ax, *m*' — implements used by man as provider and protector, *ложка* 'spoon, *f*', *плошка* 'bowl, *f*', *чашка* 'cup, *f*' — implements used by woman as a hearth keeper; *лук* 'bow, *m*' vs. *стрела* 'arrow, *f*' — dependence relationship (hierarchical subordination); *корень* 'root, *m*', *ствол* 'trunk, *m*' vs. *крона* 'tree-top', *ветвь* 'branch, *f*' — one as the foundation and support for the other. Numerous examples of this kind make it possible to hypothesize that the category of gender in Russian reflects the workings of a certain system of classifiers that are cognitive in nature and structured around a secondary epistemic contrast он/а - *оно* ("he/she — it"), i. e. *the grammatical category of noun gender is a reflection of the basic world taxonomy as represented by the system of personal pronouns*.

4. Case study

A case study of gender characteristics of names of animals in Russian seems to provide supportive data to this hypothesis. As is seen from the table, animals common in the geographic area historically populated by Eastern Slavs can be divided into three main groups: 1) animals dangerous for man, 2) animals useful for man (with two subgroups — (a) source of food, (b) source of warm hide/fur), 3) other animals (of no particular practical interest).

Nouns that are names of species (in a scientific classification) belong, as a rule, to the masculine class. In the predator group, however, two names (which are names of species) belong to the feminine class (*рысь* 'lynx', *лиса* [*лисица*] 'fox'). Although the noun *рысь* does not have an opposite gender correlate, the nouns *лиса, лисица* are derived from the masculine noun *лис*. In the scientific classification, it is the feminine noun *лисица* that is used as a name of species. It is derived from the masculine noun on the same pattern as the feminine nouns *медведица* 'female bear', *волчица* 'female wolf', whereas the meaning 'female fox' is represented by the form *лиса*, which is also used as the name of species in the naive classification. How can such inconsistency be accounted for?

If we assume, following Bickerton (1990), that words and concepts in natural language are generated by functional utilitarianism, the above inconsistency may be explained by a certain naive set of classifiers, such as

1) the size of animal (big vs. not big),

2) immediate danger to man (animal, an encounter with which is life threatening vs. animal, an encounter with which is not life threatening),

3) edibility (edible vs. inedible),

4) possibility to use the animal's hide for warm clothing (furry vs. non-furry animal),

5) visually distinguishable gender of the animal.

As the table shows, gender differences among names of predators (Group 1) reflect consistent differences among their referents on the first and second classifying features: the bear and the wolf are relatively big in size and are reputed (at least, in folklore) man-eaters, while the fox and the lynx are of noticeably smaller size (and, respectively, of lesser strength), so they do not stalk humans. It is worthy of note that this differentiation on the feature "danger" is analogous to that between man and woman in the primeval society where the main social functions enjoyed by men were the providing of food and the waging of war (both involved the killing of living creatures).

Species names for edible animals (Group 2a) are, for the most part, also masculine. Exceptions are *коза* 'goat, *f*', *лань* 'fallow deer, *f*', *косуля* 'roe, *f*' which are all feminine. *Козел* 'goat, *m*' is a species name in the scientific classification, although it is derived from *коза* 'goat, *f*' (which, like the noun *лиса* 'fox, *f*' is a species name in the naive classification). This may be due to unification of the semantic paradigm of species names.

Morphological similarities between the Old-Slavic stems in the nouns *олень* '(red deer) stag' and *лань* 'fallow deer, *f*', as well as existence of an etymological correlate *laňe, laň* 'female deer' in Czech indicate that, probably, *лань* as a species name was the result of a later semantic shift in the name of female red/fallow deer. This may account for the absence of a morphological correlate with the meaning 'male' for *лань*. Absence of a similar correlate for the noun *косуля* 'roe, *f*' may be the consequence of the word formation pattern that gender contrasted nouns follow: noun, *m* + derivational suffix —>

noun, *f* (compare with the noun *рысь* 'lynx, *f*' which does not have a gender contrasted correlate).

That species names *лань, косуля* (alongside with *коза* as a species name in the naive classification) belong to the feminine class may, at least partially, be explained by the fact that they denote animals considerably smaller in size than their cousins — the red deer, the elk, and the moose (compare with a similar distinction in the predator group). The fact that there are derived feminine nouns in Group 2a may be due to the fact that it is possible to visually distinguish males and females of the species: the tusks of a boar, the antlers of a stag or moose, and the horns of a goat are of noticeably bigger size with males, rather than females. As for the noun *зайчиха* 'female hare', it can be put down to the productive word formation pattern "masc. noun stem + fem. suffix".

In Group 2b (fur animals) most of the species names are also masculine (11 out of 17, or two thirds). The noun *норка* 'mink, *f*' is the result of metonymic transfer from the fem. noun *нора* 'burrow', so its gender characteristic does not relate to a naive system of classifiers. The species name *куница* 'marten, *f*' descends from Old-Rus. *куна* 'marten pelt worth 1 dirham' (cf. the pair *лиса* - *лисица* 'fox, *f*') which suggests that there might have existed in Old-Rus. the masculine noun **кун*.

The feminine gender of *выдра* 'otter' and *выхухоль* 'desman' relate to the tripartite world classification common to many so-called "primitive" languages: **water** (fish), **air** (birds), **earth** (mammals) (Levi-Strauss 1962). If we assume that this taxonomic principle was effective in Russian, then the feminine gender of *выдра* and *выхухоль* would be accounted for by the fact that the animals belongs to the domain "water" (i. e. the fish class, and "fish" in Russian is feminine). In case of *выдра* 'otter, f' we have clearcut etymological evidence as its root is traced to the Indo-European stem *udra 'water'. It is worthy of note that little children who have not yet acquired the scientific classification of the world, use the words *рыба* 'fish, *f*', *рыбка* 'fish, *diminutive*, *f*' to refer to different aquatic creatures such as tadpoles, small crustaceans, etc.

The feminine gender of *росомаха* 'wolverine', *белка* 'squirrel' seems to be unmotivated, but only because language in its modern state does not allow us to trace the original classification principle and the rationale behind it. However, Черных (1994)

suggests, that modern Russian *росомаха* is the transformed Old-Russian masculine noun *росомах* ‘evil spirit’. As for *белка*, according to the same source it is the result of substantivization of the adjective *бела* ‘white, f’ which in Old-Russian was part of the name *бела вевeрица* ‘white squirrel, f’. In its turn, *вевeрица* is a derived suffixal feminine noun of the same morphological class as *лисица* ‘fox, f’. Thus it appears that in Group 2b 14 names out of 17 (~ 85%) are, originally, masculine.

None of the nouns in Group 2b have opposite gender correlates (i. e. they are not registered in dictionaries), although in common speech feminine nouns are easily derived by adding suffixes to the masculine noun stems, e. g. *соболиха* ‘female sable’, *сурчиха* ‘female marmot’, *барсучиха* ‘female badger’, *бобриха* ‘female beaver’, *бурундучиха* ‘female chipmunk’, *кротиха* ‘female mole’. At the same time, feminine nouns do not yield masculine correlates as might be expected, and the following forms are not allowed: **выдр* ‘male otter’, **кун* ‘male marten’, **росомах* ‘male wolverine’, **белк* ‘male squirrel’, **норк* ‘male mink’.

Table. The naive taxonomy of wild animals

	Species name (with feminine nouns in italics)	Meaning	Opposite gender correlate	Classification feature				
				Relatively big in size	Immediate danger	Food	Hide/fur used for clothing	Visually distin-guished gender
1	медведь	bear	медведица	+	+	+	+	—
	волк	wolf	волчица	+	+	—	+	—
	лиса, лисица	fox	лис	(+)	(+)	—	+	—
	рысь	lynx	—	(+)	(+)	—	+	—
2a	зубр	European bison	зубриха	+	(+)	+	+	+
	кабан	boar	кабаниха	+	(+)	+	(+)	+
	олень	red deer (stag)	оленуха	+	—	+	+	+
	изюбрь	elk	—	+	—	+	+	+
	лось	moose	лосиха	+	—	+	+	+
	козел	goat	коза	(+)	—	+	+	+
	лань	fallow deer	__	(+)	—	+	+	(+)
	косуля	roe	—	(+)	—	+	+	(+)
	заяц	hare	зайчиха	—	—	+	+	—
2b	соболь	sable	—	—	—	—	+	—
	песец	polar fox	—	—	—	—	+	—
	хорь	weasel	—	—	—	—	+	—
	горностай	ermine	—	—	—	—	+	—
	колонок	kolinsky	—	—	—	—	+	—
	сурок	marmot	—	—	—	—	+	—
	барсук	badger	—	—	—	—	+	—
	енот	raccoon	—	—	—	—	+	—
	бобр	beaver	—	—	—	—	+	—
	бурундук	chipmunk	—	—	—	—	+	—
	крот	mole	—	—	—	—	+	—
	выдра	otter	—	—	—	—	+	—
	выхухоль	desman	—	—	—	—	+	—
	куница	marten	—	—	—	—	+	—
	росомаха	wolverine	—	—	—	—	+	—
	белка	squirrel	—	—	—	—	+	—
	норка	mink	—	—	—	—	+	—
3	еж	hedgehog	ежиха	—	—	—	—	—
	хомяк	hamster	—	—	—	—	—	—
	суслик	gopher	—	—	—	—	—	—

In Group 3 (other animals) all the species names are masculine, and only one has an opposite gender correlate: *еж* 'male hedgehog' — *ежиха* 'female hedgehog'.

Now, why are some feminine nouns that can be derived from masculine nouns on a productive pattern, registered in dictionaries (e. g. *медведица* 'female bear', *волчица* 'female wolf', *оленуха* 'female red deer') while others (such as *барсучиха* 'female badger', *бобриха* 'female beaver', etc.) are not? Apparently, this classification inconsistency is rooted in human experience, that is, in the possibility for female animals followed by their young to be more or less frequently observed by man. Since in the old times hunting was the main source of food, man had a lot of opportunities to observe wild boar or deer with their young. On the contrary, animals from Group 2b and Group 3 live mostly in burrows, and the litter usually stays inside when their mother goes hunting — an exception, probably, being the hedgehog. As for feminine nouns *медведица* 'female bear', *волчица* 'female wolf' registered in dictionaries as independent words, their existence may be justified by the functional-utilitarian principle which is reflected in the way man's empirical experience is represented in language. On the one hand, if a hunter encounters a litter of bear or wolf cubs, he is most likely to expect to see their mother, rather than the father, who cannot be far. On the other hand, an encounter with a mother bear is more dangerous as she tends to be more aggressive in protecting her cubs. So, gender distinction between large dangerous predators is clearly pragmatic and undoubtedly informative.

5. Conclusion

Although necessarily sketchy, the suggested analysis of mechanisms at work in the case of Russian nominal gender classification indicates that traditional accounts of gender as a grammatical category fail to grasp the essence of its meaning, while a cognitive approach may provide deeper insights into the relationship between grammar and man's cognitive activity, making explanation of grammatical facts comprehensible rather than confusing. The proposed approach to an analysis of a specific grammatical category as a means for categorizing experience may be productive in analyses of other grammatical categories, bringing to light cognitive processes and categorization principles ignored or neglected by traditional semantic analysis.

References.

Кравченко А. В. (1992) *Вопросы теории указательности: Эгоцентричность. Дейктичность. Индексальность [Issues in the theory of indication: Egocentricity. Deixis. Indexicality]*. Издательство Иркутского университета.

Кравченко А. В. (1996) *Язык и восприятие: Когнитивные аспекты языковой категоризации [Language and perception: Cognitive aspects of linguistic categorization. Irkutsk University Press]*. Издательство Иркутского университета.

Шведова Н. Ю., Лопатин В. В. (ред.) (1989) *Краткая русская грамматика [Abridged Russian grammar]*. Москва: Русский язык.

Русская грамматика [Russian grammar] (1980) Москва: Наука.

Черных П. Я. (1994) *Историко-этимологический словарь современного русского языка*. Т. 1-2. *[Historical etymological dictionary of Modern Russian language. Vol. 1-2]*. Москва:Русский язык.

Albertazzi, L. (Ed.) (2000). *Meaning and cognition*. John Benjamins.

Allwood, J., Gaerdenfors, P. (Eds.) (1999). *Cognitive semantics: Meaning and cognition.* Amsterdam, Philadelphia: John Benjamins.

Bickerton. D. (1990). *Language & species*. The University of Chicago Press.

Brugmann, K. (1889). *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen* / B. 2, H. 1: Wortbildungslehre. Strassburg: Karl J. Trübner.

Devitt, M., Sterelny, K. (1999). *Language and reality. An introduction to the philosophy of language* (2nd edition). The MIT Press.

Fodor, J. A. (1975*). The language of thought*. New York: Crowell.

Fodor, J. A. (1998*). Concepts: Where cognitive science went wrong*. Oxford: Clarendon Press.

Fuchs, C., Robert, S. (Eds.) (1999). *Language diversity and cognitive representations.* Amsterdam, Philadelphia: John Benjamins.

Gelman, S. A., Bloom, P. (2000). Young children are sensitive to how an object was created when deciding what to name it. *Cognition, 76,* 91-103.

Kim, J. (1998). *Mind in a physical world: An essay on the mind-body problem and mental causation*. Cambridge, MA: The MIT Press.

Lakoff, G. (1987). *Women, fire, and dangerous things*. The University of Chicago Press.

Lepore, E., Pylyshyn, Z. (Eds.) (1999). *What is cognitive science?* Blackwell.

Levi-Strauss, C. (1962) La pensee sauvage. Paris.

Margolis, E. (1994). A reassessment of the shift from the classical theory of concepts to prototype theory. *Cognition, 51*, 73-89.

Margolis, E., Laurence, S. (Eds.) (1999). *Concepts*. Cambridge, MA: The MIT Press.

Matan, A., Carey, S. (2001). Developmental changes within the core of artifact concepts. *Cognition, 78*, 1-26.

Nelson, D. G. K., Frankenfield, A., Morris, C. & Blair, E. (2000). Young children's use of functional information to categorize artifacts: three factors that matter. *Cognition, 77,* 133-168.

Newell, A. (1990). *Unified theories of cognition*. Cambridge, MA: Harvard UP.

Palmeri, T. J., Blalock, C. (2000). The role of background knowledge in speeded perceptual categorization. *Cognition, 77,* B45-B57.

Premack, D. (1990). The infant's theory of self-propelled objects // *Cognition*. Vol. 36, # 1.

Priest, S. (1991). *Theories of the mind*. The Penguin Books.

Pylyshyn, Z. (1999). What's in your mind? In E. Lepore & Z. Pylyshyn (Eds.), *What is cognitive science?* Blackwell.

Rosch, E. H. (1973). Natural categories. *Cognitive Psychology, 4*, 328-350.

Rosch, E. H. (1977). Human categorization. In N. Warren (Ed.), *Studies in cross-cultural psychology*. *Vol. 1*. - N.Y.: Academic Press.

Schlechtman, M. (1997). The brain/body problem. *Philosophical Psychology, 10 - 2*, 149-164.

Schyns, P. G. (1997). Categories and percepts: a bi-directional framework for categorization. *Trends in Cognitive Sciences, 1,* 183-189.

Taylor, J. R. (1989). *Linguistic categorization: Prototypes in linguistic theory*. Oxford: Clarendon Press.

Wallis, G., Bülthoff, H. (1999). Learning to recognize objects. *Trends in Cognitive Sciences*, *3*, 22-31.