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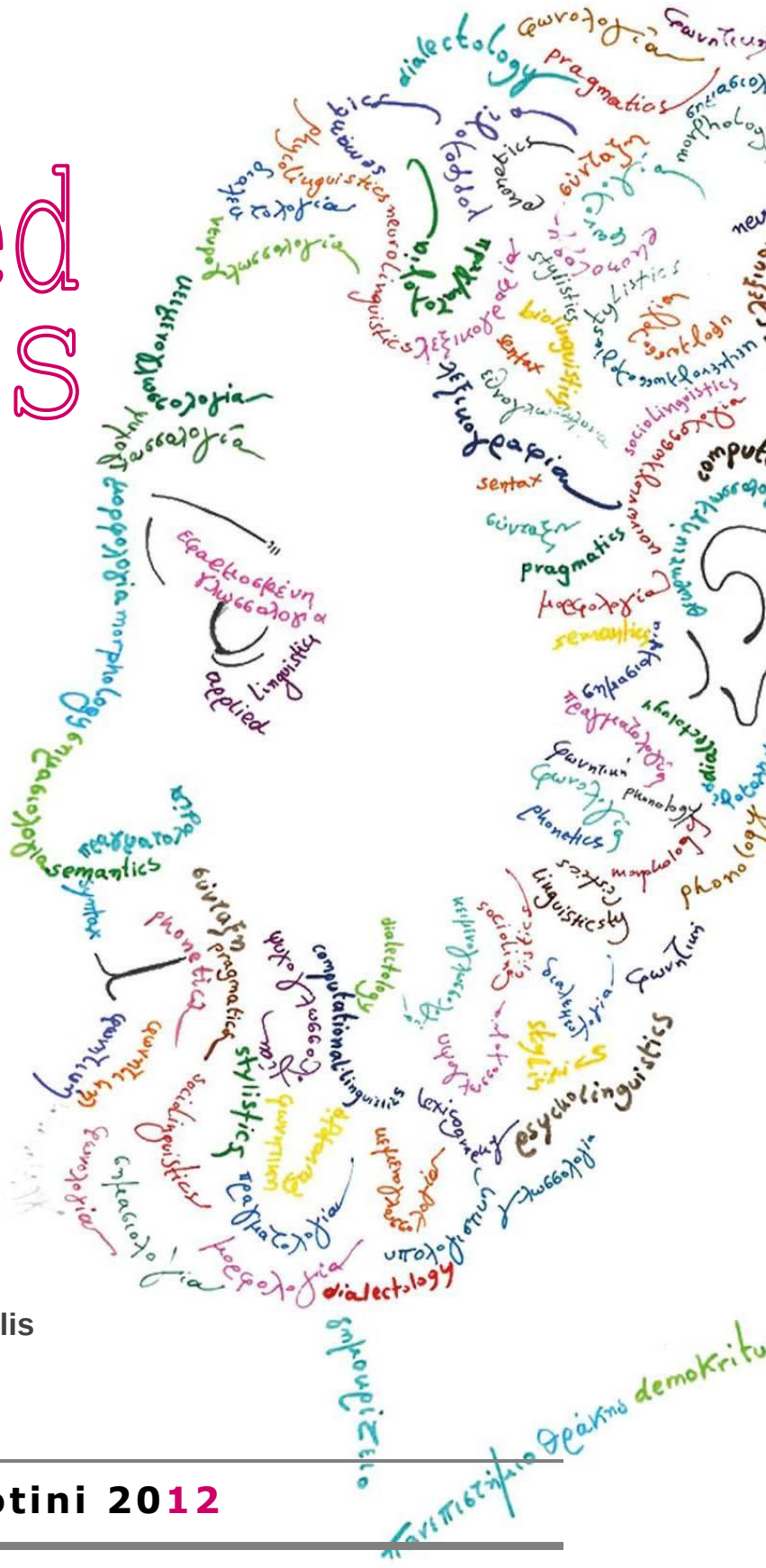

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INCORPORATING CORPUS DATA AND SEMANTIC THEORY IN MODERN GREEK LEXICOGRAPHY: A SPECIAL REFERENCE TO THE SELF-MOTION USES OF *ΠΕΤΑΩ*

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ABSTRACT

This paper aims to make a contribution towards improving Modern Greek lexicography by drawing attention to the need for empirically-grounded, theoretically-informed and user-friendly entries. Focusing on the network of the self-motion (as opposed to the cause-motion) uses of πετάω *(= fly), I first take a look at two dictionary entries pointing out their differences in content and form. To create an accurate semantic picture of the verb, I propose establishing lexical units (LUs) on the basis of a corpus-based, frame-driven, and cognitive-oriented methodology. Therefore, I present a new skeletal structure for the* πετάω *entry, and offer suggestions for making long entries more user-friendly.*

Keywords: word sense disambiguation, lexical unit, corpora, FrameNet, metaphor, metonymy

1. Introduction

The study is motivated by the observation that the treatment of *πετάω* –a polysemous manner-of-motion verb of high frequency– differs considerably between the two main comprehensive dictionaries of Modern Greek, i.e. *ΛΚΝ* (1998) and *ΛΝΕΓ* (2005). To clarify the picture, I examine the relevant data available in two electronic corpora of Modern Greek, i.e. the Hellenic National Corpus (HNC) and the Greek Web as Corpus (GkWaC).[1]

However, the wealth of semantic, contextual and stylistic evidence gleaned from the corpora is not sufficient for compiling a valuable dictionary entry; rather, a sound theoretical basis is necessary for linguistically justifying meaning discrimination. Promising theoretical perspectives in this respect are frame semantics and the cognitive theory of metaphor and metonymy. In this light, I propose a new skeletal structure for the *πετάω* entry, which (a) groups corpus-attested (self-motion) uses into sense divisions on the basis of existing frame descriptions in the English FrameNet, and (b) makes them hang together in a motivated and transparent manner by means of metaphor and metonymy.

The paper concludes with the suggestion that Greek dictionaries should integrate guiding devices into the long entries of polysemous headwords, a practice pioneered by English learners' dictionaries.

2. The treatment of *πετάω* in two comprehensive dictionaries of Modern Greek

A mere glance at the *ΛΚΝ* and *ΛΝΕΓ* entries for *πετάω* (see Figure 1) reveals that the two dictionaries differ in the presentation of the two main sense divisions of the verb, i.e. flying and throwing; the self-motion and the cause-motion uses are treated under separate entries in *ΛΚΝ* but within a single entry in *ΛΝΕΓ*. The scope of the present study is restricted to the self-motion network of the verb, and Table 1 has been drawn to summarize the main information provided by the two dictionaries.

More precisely, the middle column of Table 1 uses English metalanguage to give an overview of the relevant sense divisions in the two entries. Whereas both of them record the motion of winged creatures as the first sense, minor or major differences are spotted between the other senses. For example, motion of aircrafts and passengers forms a single sense in *ΛΚΝ* but two in *ΛΝΕΓ*, which additionally makes special mention of the use of *πετάω* with regard to pilots. The last more specialized

[1] On the basis of the form lemmatized in the HNC and the GkWaC, this work uses *πετάω* as the headword form of the lemma rather than *πετώ*. On the contrary, existing dictionaries which are not corpus-based lemmatize the abbreviated form (see Figure 1).

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senses appear in only one of the two entries, but even when uses are recorded by both dictionaries they may be ordered or labeled differently; in this respect, consider the "be efficient" and "move very quickly" senses.

More confusion is created when we compare the two entries as to the multi-word expressions (MWEs) recorded, the place in which they appear (i.e. under which sense), and the way they are presented (i.e. as subentries or examples, with a definition or a cross-reference). For instance, in *ΛΚΝ* we find *πέταξε το πουλί* under the first sense with the label «φράση» and with a cross-reference to the *πουλί* entry. By contrast, this MWE appears in *ΛΝΕΓ* in a slightly different form (i.e. *πέταξε το πουλάκι*), and under the metaphorical use of the verb in the context of missed opportunities; in *ΛΝΕΓ* the phrase is defined, exemplified, and highlighted as a subentry.

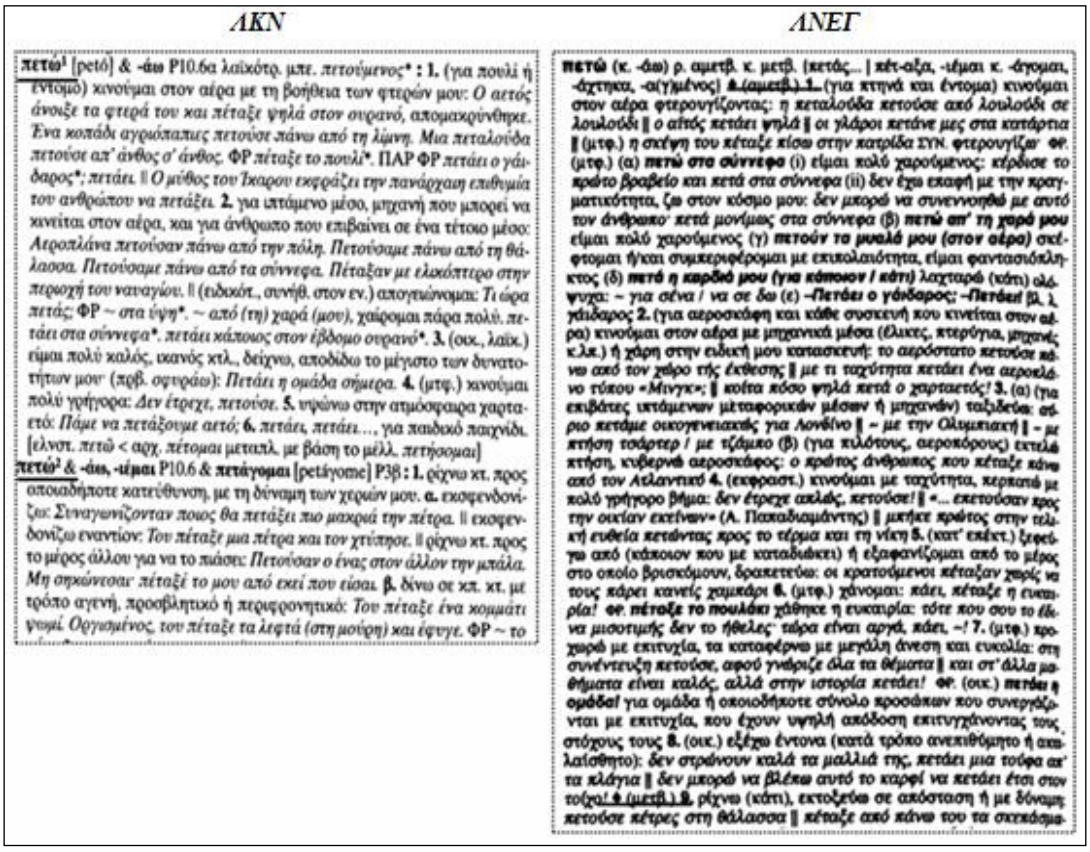

Figure 1 Partial dictionary entries for *πετάω*

ΛΚΝ		**major sense divisions**	*ΛΝΕΓ*	
integrated MWEs	**layout**		**layout**	**integrated MWEs**
- ΦΡ. *πέταξε το πουλί* - ΠΑΡ. ΦΡ. *πετάει ο γάιδαρος; πετάει*	**1**	(for winged creatures) move through the air	**1**	ΦΡ. (μτφ.) - *πετώ στα σύννεφα* - *πετώ απ' τη χαρά μου* - *πετούν τα μυαλά μου (στον αέρα)* - *πετά η καρδιά μου* - *Πετάει ο γάιδαρος; Πετάει*
ΦΡ. - *πετώ στα ύψη* - *πετώ από (τη) χαρά (μου)* - *πετάει στα σύννεφα* - *πετάει κάποιος στον έβδομο ουρανό*	**2**	(for aircrafts) move through the air	**2**	
		(for passengers) travel by aircraft	**3α**	
	—	(for pilots) operate an aircraft	**3β**	
(example) *πετάει η*	**3**	be efficient	**7**	ΦΡ. (οικ.) *πετάει η*

ομάδα	οικ., λαϊκ.		μτφ.	*ομάδα*
	4 μτφ.	move very quickly	**4** εκφραστ.	
	—	(for fugitives) disappear	**5** κατ' επέκταση	
	—	(for missed opportunities) disappear	**6** μτφ.	ΦΡ. *πέταξε το πουλάκι*
	—	protrude	**8** οικ.	
	5	make a kite rise and float in the air	**—**	
πετάει, πετάει…	**6**	a children's game	**—**	

Table 1 *ΛΚΝ* vs. *ΛΝΕΓ*: An overall picture of the treatment of *πετάω* in its self-motion uses

On the whole, the entries reviewed seem to complement each other in coverage, and to make different decisions about lumping/ splitting, ordering and labelling the self-motion uses of *πετάω*. In addition, the comparison of the two entries raises the issue of phraseological treatment; differences in the form, location and prominence of MWEs should be related to the fact that they are not as fixed as thought to be, and that computerized language corpora are not used by either of the dictionaries for identifying normal patterns of usage. These observations emphasize the need for a systematic and unified lexicographic treatment of polysemy and phraseology. To this end, I propose determining senses on the basis of corpus data and linguistic theory, and employing user-friendly guiding devices to represent them.

3. An integrated approach to word sense disambiguation

With a view to systematizing the lexicographic task of meaning discrimination, we should first specify the basic unit of description. Following Cruse (1986: 77), I do not use the word as a semantic unit but split it into lexical units (LUs) which constitute "the union of a lexical form and a single sense"; a LU "must be at least one semantic constituent" and "at least one word" (*ibid.*: 24). Keeping in mind that a single set of criteria should be used for identifying LUs irrespective of whether they are single-word or multi-word ones, I now proceed to outline the methodology devised for establishing LUs (see Table 2).

corpus-based	context disambiguates: identification of recurrent patterns of usage in concordances
frame-driven	polysemy = one word → several frames → several LUs
cognitive-oriented	polysemy = a process motivated by metonymy/ metaphor

Table 2 Establishing LUs: An integrated approach to word sense disambiguation

The first step in the process involves observing concordance lines for the target word, clustering them according to their common features, and identifying recurrent (and hence normal) patterns of usage (Moon 1987: 87; Hanks 2004: 246-251; Kilgarriff 2008: 145; Atkins & Rundell 2008: 311-312); that is why the approach is characterized as based upon corpus evidence. However, the clusters of data are not self-explanatory; rather, their analysis and interpretation needs to be driven by linguistic theory.

To this end, I employ frame semantics to decide whether a pattern qualifies for the status of a LU; separate senses generally correspond to different semantic frames (Atkins, Rundell & Sato 2003: 335-337; Atkins 2008: 256-257). In brief,

- a (semantic) frame is a structured background of experience which constitutes a kind of prerequisite for understanding the meaning of a word (Fillmore 1985: 224);
- frame semantics links situation-specific semantic roles, i.e. frame elements (FEs), to their syntactic realizations (Fillmore & Petruck 2003: 359); and
- FrameNet is an online lexical resource for English which is applying frame semantics to corpus data, and is still under development (Ruppenhofer et al. 2010: 5).

Several steps have been taken to investigate the applicability of FrameNet to other languages (German, Spanish, Japanese),[2] and it is generally argued that English FrameNet frames can be reused for the semantic analysis of other languages (Boas 2005; Burchardt et al. 2009; Subirats 2009). In this light,

[2] No similar large-scale frame-semantic analysis is currently available for Modern Greek.

the present study on *πετάω* draws on English FrameNet and demonstrates its valuable contribution to the creation of a well-structured entry in Modern Greek.

Lastly, to lend further support to the frame-driven sense distinctions, I consider whether they are motivated by cognitive mechanisms (i.e. metonymy, metaphor) and interrelated by means of a semantic network (Lakoff & Johnson 1980, 1999; Van der Meer 1999; Nikiforidou 1999). This network is organized around the synchronically prototypical sense, from which other senses are naturally derived with varying degrees of relatedness. This approach is also related to Evans's (2005: 41) cognitive-oriented model of "principled polysemy", according to which each sense of a polysemous word must contain additional meaning, and manifest specific collocational patterns and/or grammatical structures. However, the present methodology differs from Evans's (2005) model in two respects: (a) first, as already explained, the meaning criterion is defined in frame-semantic terms as involving additional or different FEs, and (b) second, corpus data determine the process rather than merely exemplify senses.

4. Exploiting available corpora

If we consider the recent observation that "there is still a lack of large reference corpora for languages other than English" (Williams 2008: 258), we can appreciate the significance of the development of a national corpus of Modern Greek (the HNC), and recognize the need to consolidate its use in lexicography. The HNC is a monitor corpus of over 47 million running words of texts written in Greek after 1990, and although it may not be truly comparable to English corpora in terms of size or balance, it can facilitate empirically grounding Modern Greek lexicography.

On account of practical issues that determine corpus research, i.e. availability, representativeness, and dependency on software tools, the present work of compiling a new entry for *πετάω* exploits an additional corpus as a secondary source of data. The GkWaC is larger than the HNC,[3] and is accessed through a state-of-the-art query system, the Sketch Engine.[4] This corpus can complement the HNC in terms of both content and functionality. On the one hand, we can test how well less frequent HNC patterns hold up in a larger Web corpus (Renouf 2007: 43), and on the other hand, the Sketch Engine (unlike the HNC query system) automatically derives lexical profiles, the Word Sketches, which can serve as a starting point for distinguishing senses (Kilgarriff et al. 2008: 297; Atkins & Rundell 2008: 110).

πετάω **GkWaC freq = 17662**

object	6274	6.1	subject	1309	3.3	modifier
σκουπίδι	355	56.63	πεταλούδα	32	34.16	έξω
μπάλα#μπαλάκι	96	44.96	γάιδαρος	21	30.55	ψηλά
πέτρα	188	39.56	νάνος	19	28.79	μακριά
φωτοβολίδα	47	39.39	πουλί	39	28.52	πάνω
κάλαθος	26	35.7	αεροσκάφος	21	23.33	κατάμουτρα
σκούφια	20	33.48	αεροπλάνο	18	21.17	χαμηλά
μούτρο	59	33.04	περιστέρι	11	20.92	κάτω
σπόντα	24	32.35	Ελευθερές	5	20.89	βιαστικά
λάσπη	62	31.69	δράστης	12	20.27	όξω
μπουκάλι	69	31.59	Αετός#αετός	5	17.73	μέσα
σύννεφο	67	29.96	γλάρος	6	17.22	χάμω
χαρταετός	24	29.68	πουλάκι	7	17.03	μαζί
γόπα	20	29.17	ελικόπτερο	8	15.75	πέρα
ρούχο	84	27.49	μπάλα#μπαλάκι	6	15.74	απάνω
κοτσάνα	17	27.22	ελέφαντας	6	14.99	επάνω
αέρας	114	27.18	αετός	6	14.62	ελεύθερα
καιάδας	18	26.99	αεροπλάνο#αερόπλανο	5	14.43	γύρω
πάτωμα	47	26.8	μέλισσα	6	13.9	πίσω
ατάκα	35	26.4	σύννεφο	7	12.69	εκεί
τσιγάρο	60	26.17	ερπετό	5	12.44	δίπλα
σπίθα	22	25.8	αμάξι	7	12.41	πού
ουρανός	78	25.6	μυαλό	13	12.0	ολόγυρα
μπάλα	63	25.38	φλόγα	5	10.19	μετά

Figure 2 The GkWaC Word Sketch for *πετάω* – truncated screenshot (May, 2010)

[3] The GkWaC contains about 100 million words, and has been constructed by downloading texts from the Internet.
[4] The Sketch Engine software can load a corpus of any language (with appropriate linguistic mark-up), and offer "word sketches, thesaurally similar words, and 'sketch differences', as well as the more familiar [query] functions" (Kilgarriff et al. 2008: 299).

Figure 2 shows a truncated screenshot of the GkWaC Word Sketch for *πετάω*; if these statistically salient collocates are first examined, it is easier to identify separate senses when scanning the HNC sentences. However, Word Sketches should not be taken at face value, because tagging errors are traced; consider, for example, *κάλαθος* in the "object" list and *σύννεφο* in the "subject" list.[5]

5. A new skeletal structure for the self-motion network of *πετάω*

The results of applying the proposed corpus-based, frame-driven, and cognitive-oriented methodology to *πετάω* are summarized in Table 3. The Table presents a coherent account of the self-motion network of *πετάω* in 5 columns. For each LU the 1st column provides one or two corpus-attested sentences which are considered typical illustrative examples of the particular LU; note that the underlines, which indicate the various collocates of *πετάω*, make it abundantly clear that each LU exhibits distinct collocational patterns. The 2nd column specifies the semantic frame evoked by the LU on the basis of the FrameNet descriptions. The 3rd one provides an informal description of the meaning of the LU in English metalanguage. The 4th column employs the cognitive theory of metaphor and metonymy to explain the non-arbitrary relationship between the semantic extensions of *πετάω*; and the last one shows how this motivated semantic network can be reflected in the skeletal structure of a dictionary entry.

Corpus-attested examples	Frame	Sense	Motivation	Structure
- *Στο πλάι μας* ***πετούν*** *<u>γλάροι</u>.* - *Πολεμικά <u>αεροπλάνα</u>* ***πετούν*** *στον ουρανό με βαρύ φορτίο.*	[Self_motion][6]	move through the air in a controlled manner using aerodynamic forces	core meaning: the primary manner of motion of a bird and an aircraft	1
Κάθε λεπτό 400.000 <u>άνθρωποι</u> ***πετούν*** *πάνω από την Ευρώπη σε σύνολο 3.500 πτήσεων.*	[Ride_vehicle][7]	travel by plane	**metonymy**: CONTENT (passengers) FOR CONTAINER (aircraft)	2a
- *Πείτε στον <u>πιλότο</u>, να* ***πετάξει*** *κατ' ευθείαν για το Κάουνας.* - *Στις Ηνωμένες Πολιτείες, οι <u>πιλότοι</u> που* ***πετούν*** *τα <u>αεροσκάφη</u> του προέδρου επιλέγονται μέσα από ειδικές διαδικασίες.*	[Operate_vehicle][8]	operate an aircraft	**metonymy**: CONTROLLER (pilot) FOR CONTROLLED (aircraft)	2b
Στη Χιλή οι <u>αεροπορικές εταιρείες</u> δεν θα ***πετάξουν*** *το βράδυ της Πρωτοχρονιάς, γιατί οι επιβάτες φοβούνται.*	[Operating_a_system][9]	provide flight service	**metonymy**: CONTROLLER (owner: airline company) FOR CONTROLLED (aircraft)	2c
- *Τα <u>δόντια</u> μου δεν* ***πετάνε*** *τόσο όταν*	[Path_shape][10]	continue upwards further than the	**metonymy**: fictive motion	3

[5] If we examine the hyperlinked concordances, we will see that both *κάλαθος* and *σύννεφο* are objects of PPs.
[6] FrameNet: "The SELF_MOVER, a living being, moves under its own power in a directed fashion, i.e. along what could be described as a PATH, with no separate vehicle."
[7] FrameNet: "In this frame a THEME is moved by a VEHICLE which is not directly under their power. The SOURCE, PATH, GOAL, or AREA of the motion may be indicated. The DISTANCE travelled or the SPEED of motion may also be indicated. A ROUTE or ROAD may be present and the MANNER in which the THEME moves may be given."
[8] FrameNet: "The words in this frame describe motion involving a VEHICLE and someone who controls it, the DRIVER. Some words normally allow the VEHICLE to be expressed as a separate constituent."
[9] FrameNet: "An OPERATOR manipulates the substructure of a SYSTEM such that the SYSTEM performs the function it was created for."
[10] FrameNet: "The words in this frame describe the 'fictive' motion of a stationary ROAD."

χαμογελάω. *- Το μαλλί του* ***πέταγε*** *σαν λοφίο.*		main part of an object	MANNER OF MOTION ALONG THE PATH FOR CONFIGURATION OF THE PATH	
- Το αυτοκίνητο τρέχει, ***πετά.*** *- Το δολάριο* ***πετά*** *στα ύψη.* ***- Πετάει η ομάδα.***	[Change_position_on_a_scale][11]	increase in speed/ value/ performance	**metaphor**: MORE IS UP (GOOD IS UP)	4
- ***Πέταξα*** *από τη χαρά μου.* *- Λογικό μοιάζει άλλωστε να* ***πετούν στα σύννεφα*** *ύστερα από μια τέτοια επιτυχία.*	[Experiencer_focus][12]	feel light with happiness	**metaphors**: EMOTION IS MOTION, HAPPY IS UP	5
- Η ευκαιρία ήταν μεγάλη, αλλά... ***πέταξε.*** *- Και όταν αποφάσισε να κάνει αλλαγές,* ***το πουλάκι είχε πετάξει.***	[Departing][13]	used for saying that you have missed the chance to do something	**metaphor**: GENERIC IS SPECIFIC experiential grounding: image of a bird flying away	6
*Δικαίωμα του δημάρχου Ευάγγελου Παπάζογλου, είναι να πιστεύει πως «****πετάει ο γάιδαρος****», όπως δικαίωμά μου είναι να τον αμφισβητώ.*	[Likelihood][14]	used for saying that a belief is irrational	**metaphor**: GENERIC IS SPECIFIC experiential grounding: donkeys (having no wings) cannot normally fly	7

Table 3 The self-motion network of *πετάω*

Unlike *ΛΚΝ* and *ΛΝΕΓ*, which assign different senses to the use of *πετάω* in the context of winged creatures and aircrafts, I lump them together within the 1st LU because the same frame, [Self_motion], is evoked, and because the manner of motion denoted is primary for both birds and aircrafts; the similarity of the examples in terms of syntactic structure (i.e. + AREA PP) lends further support to this decision. When the corpus examples evoke a set of FEs that differs from the [Self_motion] one evoked prototypically, we are dealing with a separate LU which is associated with the core one via cognitive mechanisms. More precisely, the next three LUs evoke the frames [Ride_vehicle], [Operate_vehicle] and [Operating_a_system], as indicated by the collocate types in subject position, i.e. passenger, pilot and airline company respectively. Unlike *ΛΚΝ* and *ΛΝΕΓ*, the proposed skeletal structure groups these LUs together under sense 2, in order to show that they are all derived from the 1st one through different types of conceptual metonymy. Also note that the 2c use observed in the corpus data is missing from both *ΛΚΝ* and *ΛΝΕΓ*. The next LU evokes the [Path_shape] frame which is used to describe the fictive motion of a stationary ROAD; in this case, the FE ROAD is a body part in protruding position. Although this LU is also related to LU1 by metonymy, it is presented as sense 3 rather than as 2d because it has nothing to do with aircrafts.

[11] FrameNet: "This frame consists of words that indicate the change of an ITEM's position on a scale (the ATTRIBUTE) from a starting point (INITIAL_VALUE) to an end point (FINAL_VALUE). The direction (PATH) of the movement can be indicated as well as the magnitude of the change (DIFFERENCE). The rate of change of the value (SPEED) is optionally indicated."

[12] FrameNet: "The words in this frame describe an EXPERIENCER's emotions with respect to some CONTENT. A REASON for the emotion may also be expressed. Although the CONTENT may refer to an actual, current state of affairs, quite often it refers to a general situation which causes the emotion."

[13] FrameNet: "An object (the THEME) moves away from a SOURCE. The SOURCE may be expressed or it may be understood from context, but its existence is always implied by the departing word itself."

[14] FrameNet: "This frame is concerned with the likelihood of a HYPOTHETICAL_EVENT occurring. The HYPOTHETICAL_EVENT is its only core frame element."

Table 3 arranges senses in a continuum from physical to metonymic to metaphorical motion. The last four LUs are metaphorically motivated by [Self_motion], and evoke the frames [Change_position_on_a_scale], [Experiencer_focus], [Departing] and [Likelihood]. Two points are worth noting in this respect. First, by using semantic frames and conceptual motivation as criteria for clustering corpus examples into LUs, we achieve a coherent treatment of metaphorical uses that are scattered over various places in the entries reviewed; consider senses 4 and 6 in particular. Second, note that in combining semantic and contextual criteria for determining LUs, we should pay particular attention not to elevate mere contextual variations to the status of a LU. Therefore, each one of the MWEs in 4, 5 and 6 (i.e. *πετάει η ομάδα*, *πετάω στα σύννεφα*, *το πουλάκι έχει πετάξει*) is not treated as a stand-alone LU, since it does not evoke a distinct frame. By contrast, the last MWE *πετάει ο γάιδαρος*, which appears under the 1st core sense in both *ΛΚΝ* and *ΛΝΕΓ*, fulfills the criteria for a separate LU.[15]

6. Suggestions for enhancing user-friendliness

A lexicographic analysis along these lines can improve not only the content but also the presentation of the long entries of polysemous headwords.

For example, semantic frames can be used for presenting senses as menus at the top of entries and/or as signposts at the beginning of definitions within entries. The semantic order approach, according to which literal senses precede figurative ones in entries, can help users form a coherent picture of the various uses of a word. User-friendliness can also be achieved by employing a tiered structure for conventional metonymic extensions, by adding usage notes and in particular metaphor boxes, and by foregrounding co-occurrence patterns by means of eye-catching devices (like font and highlighting).

English learners' dictionaries have paved the way for devising such guiding principles to make long entries easier to navigate, and to enhance users' language awareness. For instance, metaphor boxes have been integrated in the *MEDAL* dictionaries (print and electronic; 2002, 2007) (Moon 2004).

7. Concluding remarks

The present study has shown that Modern Greek lexicography can be systematized and modernized in the following ways:

- by combining empirical evidence (i.e. corpus data) with semantic theory, and thus using linguistically-informed judgment for making sense of the evidence rather than creating it;
- by recognizing the importance of establishing LUs in making precise (monolingual) descriptions;
- by drawing on existing frame-semantic resources to enrich current dictionary entries and to accelerate the process of establishing LUs;
- by using the cognitive mechanisms of metaphor and metonymy to make LUs hang together in a motivated and transparent manner.

These guidelines have considerable implications for training lexicographers.

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[15] Note that *πετάει ο γάιδαρος* occurs only twice in the HNC; yet, the presence of *γάιδαρος* at the top of the "subject" list of the GkWaC Word Sketch for *πετάω* (see Figure 2) helps us not to miss this familiar MWE and include it in the present corpus-based analysis.

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