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TOWARD A FRAME-BASED LEXICON

The semantics of RISK and its neighbors

Charles J. Fillmore and Beryl T. Atkins

In these pages we present some initial results of a large-scale inquiry into a semantic field centered in the English lexeme RISK.[1] The kind of description we seek to justify could not easily be represented in a standard print dictionary, for reasons that soon become clear, but we imagine, for some distant future, an online lexical resource, which we can refer to as a "frame-based" dictionary, which will be adequate to our aims. In such a dictionary (housed on a workstation with multiple windowing capabilities), individual word senses, relationships among the senses of polysemous words, and relationships between (senses of) semantically related words will be linked with the cognitive structures (or "frames"), knowledge of which is presupposed for the concepts encoded by the words. A user's keying in of a word to be looked up will cause a window to appear that will display relationships between particular lexical meanings and specific lexicosyntactic patterns. Each of these lexico-syntactic patterns will have its components indexed with specific parts or aspects of the associated frame. The language used in the description of this indexing will contain category names founded on the characteristics of the relevant underlying frames. Accompanying each such description will be provided the means for giving the user access to descriptions of the associated conceptual frames, allowing the user who wishes to be reminded of the properties of the frames associated with a given word to open an additional window that presents information about it, and which identifies those categories derived from the frame that are used in the meaning descriptions.[2]

The frame descriptions will themselves contain pointers allowing access to other expressions in the language whose meanings are founded

on the same schema, thus giving the system the character of a thesaurus as well.

The dictionary must be, in principle, capable of allowing its users access to *all* the information that speakers possess about the words in their language; that is, it will not be limited by the usual space and marketability concerns that constrain decision making in the production of traditional commercial dictionaries. Nor can the type of dictionary imagined here be constructed, directly or indirectly, from the information contained in even a very large collection of existing commercial dictionaries. One reason for this is that the necessary links to the background frames are generally not made available in print dictionaries. Another reason is that research into the lexicon inevitably uncovers much more information about words than standard dictionaries have room for.

Frame semantics versus semantic field theories

The methods and assumptions behind "frame semantics" are different in a number of respects from those associated with familiar theories of semantic fields. Semantic analyses within field theories posit systems of paradigmatic and syntagmatic relationships connecting members of selected sets of lexical items. A major activity for lexical semanticists influenced by the field notion is that of cataloguing the kind of interitem relations that can be defined for the elements of a lexicon, and characterizing the kinds of lexical sets that are structured in terms of such relationships.[3]

Semantic theories founded on the notion of *cognitive frames* or *knowledge schemata*,[4] by contrast, approach the description of lexical meaning in a quite different way. In such theories, a word's meaning can be understood only with reference to a structured background of experience, beliefs, or practices, constituting a kind of conceptual prerequisite for understanding the meaning. Speakers can be said to know the meaning of the word only by first understanding the background frames that motivate the concept that the word encodes. Within such an approach, words or word senses are not related to each other directly, word to word,[5] but only by way of their links to common background frames and indications of the manner in which their meanings highlight particular elements of such frames.

A simple example: day names

As an example of one such background frame, we can ask what is necessary for understanding the names of the days of the week. In a semantic field approach, one could say of the English words MONDAY, TUESDAY, WEDNESDAY, etc. that they comprise a closed class of words, related to each other by the *successor* relation, a relation that in this case defines a *cycle*. The terms in the set can then be said to be interdefinable, with

reference to their position in the cycle as established by the relationship, and by means of the "part of" relationship that each of them holds to another word, WEEK, which names the entire cycle.

A frame-based description of these same words would concentrate on the manner of their fit into the complete system of *calendric terms*.[6] What holds such words together is the fact of their being motivated by, founded on, and costructured with a specific schematization of experience. In the case of the weekday names and other related words, we can appeal to a frame made up of knowledge about (a) the natural cycle created by the daily apparent travels of the sun, (b) the standard means of reckoning when one day cycle ends and the next one begins, (c) the conventional calendric cycle of 7 days, with a subconvention specifying the beginning member of the cycle, and (d) the practice in our culture of assigning different portions of the weekly cycle to work and nonwork.

An implicit awareness of this particular organization of our physical and social world provides the conceptual background for a fairly large body of lexical material, including common nouns like WEEK and DAY, their adjectival derivatives, the individual weekday names, and a small number of special categories such as WEEKDAY, WEEK-END, and FORTNIGHT. This particular subsystem articulates with other calendric structures such as that of the MONTH and the larger cycle, the YEAR, definable (in one way) as the cycle comprising a sequence of months. Any description of the structure and meaning of a phraseological unit such as "Friday, February 23rd, 1990" must appeal to this whole set of interconnected notions.

Commercial transaction verbs

The frame semantic descriptions we seek to develop need to be integrated into a theory of the lexicon within which grammatical and semantic information come packaged together. Each lexical item, or idiomatized phrase, can be associated with what can be called its *valence description*, a description that specifies, in both semantic and syntactic terms, what the expression requires of its constituents and its context, and what it contributes to the structures that contain it. The most developed systems of valence descriptions concern the grammar and meanings of verbs. A clear example involving semantically related verbs with difference valences can be provided for the domain of commercial transactions.

We can characterize the *commercial transaction frame*, informally, by constructing a scenario in which one person acquires control or possession of something from a second person, by agreement, as a result of surrendering to that person a sum of money. The needed background requires an understanding of property ownership, a money economy, implicit contract, and a great deal more. This schema incorporates ("inherits") many of the structural properties of a simple exchange frame, but it adds to that base a

number of further specifications regarding ownership, contractual acts, and the trappings of a money economy.

The categories derivable from the commercial transaction frame that are needed for describing the lexical meanings linked to it include, in the first instance, *Buyer, Seller, Goods*, and *Money*, the essential props and players in any commercial event scene. With respect to the simple category *Money*, we find it necessary, in a careful analysis, to distinguish the monetary value of the goods as determined by the Seller (or negotiated between Seller and Buyer) from the amount of money the Buyer actually transmits to the seller. From this we derive such secondary categories as *Cost, Tender*, and *Change*. (The difference between the Cost and the Tender is the Change.) Further elaborations of the scenario, for structurally more complex members of the lexical field, have to do with negotiations of the cost ("bargaining," "discount"), differences between the time of the Goods-transfer and the time of the Money-transfer ("credit"), the possibility of total or piecemeal transfer of money ("time payment"), the difference between price and value, the difference between the value of the tender and the actual physical currency that is tendered, and so on.

A display of some of the primary verbs in this lexical field, and the manner in which the grammar of active sentences built around them allows expression of the categories taken from the frame, is given in Table 1. For each verb or verb use (given as row headings), the table simultaneously shows (as column headings) the elements of the commercial transaction frame that must or may be given linguistic realization, and (in the cells) the nature of such realizations.[7] The word "subject" in a cell indicates that, in the use of the verb represented by its row, the verb's subject represents the category labeled by its column. "D-Obj" means "direct object" and "I-Obj" means "indirect object" (i.e., the first member of a double-object construction). A preposition in a cell means that the indicated elements can be represented by a preposition phrase headed by that preposition. Parentheses signal optionality; square brackets signal omissibility under conditions of "definite" anaphora (i.e., in a context in which the identity of the object

Table 1 The Semantic and Syntactic Valence (Active Voice) of the Verbs from the Commercial Transaction Frame.

	Buyer	*Seller*	*Goods*	*Money*
BUY	Subj	(from)	D-Obj	(for)
SELL	(to)	Subj	D-Obj	(for)
CHARGE	(I-Obj)	Subj	(for)	D-Obj
SPEND	Subj	NULL	for/on	D-Obj
PAY	Subj	[I-Obj]	[for]	D-Obj
PAY	Subj	(to)	for	D-Obj
COST	(I-Obj)	NULL	Subj	O-Obj

representing the category is "given" in the conversational context). Looking at the SPEND row in Table 1, we can construct a sentence of the type *Harry spent twenty dollars on a new tie*. The Buyer is represented as the subject, the Money as the direct object, and the optional mention of the Goods is marked with the preposition ON. The Seller cannot be introduced into the sentence (hence the entry NULL in the Seller cell for SPEND). (There is a difference (not revealed in the table) between FOR and ON, the former requiring the understanding that the exchange took place.)

The risk frame

Whereas our main concern in this chapter is the single word RISK, the family of words that are the object of the larger research effort are all of those English words whose semantic descriptions share some reference to *the possibility of an unwelcome outcome*. These are words that are understandable only to someone who is capable of realizing that the future is uncertain, and that among the alternative possible futures that one faces are some that one might not want.

The words in this set include: RISK, DANGER, PERIL, HAZARD, VENTURE, etc.; their neighbors in semantic space, words like GAMBLE, INVEST, EXPOSE, etc.; and derivatives of all of these, VENTURESOME, RISKY, INVESTMENT, PERILOUSLY, etc. The whole set includes verbs, nouns, adjectives, adverbs, and conventionalized phrases.

The vocabulary items considered here all fit into what we can call the RISK frame, as do the individual meanings of the polysemous word RISK. The RISK frame crucially involves two notions—Chance and Harm—that we can represent with diagrams borrowed from *decision theorists*.[8] The diagrams make use of nonlooping directed graphs with unidirectional paths whose nodes are circles or squares, each having two or more exiting paths. The circles represent *chance* and the squares represent *choice*. The circles, or chance nodes, are associated with possibilities, and for all the word meanings in our set, one of the paths leading from the chance node leads to an undesirable state of affairs, which we refer to as *Harm*, and the probability of entering this path is assumed to be greater than zero (i.e., there is a chance of encountering Harm) but less than one (i.e., there is a chance of avoiding it).

The RISK frame requires two subframes, depending on whether the language accessing it does or does not explicitly represent the state of being at risk as resulting from someone's action. When we need to represent the idea of simply being *in danger*, or *at risk*, we will only need a graph containing a chance node leading to Harm (represented by "H"), as in Fig. 1 ("Risk-Running"). But many of the words in our set involve somebody *making a choice*, with that choice leading to the possibility of Harm, as in Fig. 2 ("Risk-Taking")' Because Fig. 1 is a subpart of Fig. 2, it is shown that
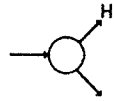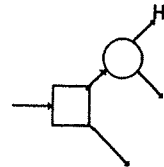
Fig. 1 Risk-running.

Fig. 2 Risk-taking.

all instances of *taking* risks include instances of *running* risks. The "deciding actor" feature is "marked" in the case of risk-taking, unmarked in the case of risk-running.[9]

Within decision theory the person who is seen as choosing a path that leads to the possibility of harm has in mind a Goal, and the decision is one that opens a path for which there is both the possibility of achieving that goal and the possibility of encountering harm instead. We could represent that by putting "G" for goal at the end of the second arrow exiting from the chance circle in Fig. 2.[10] In the semantics of RISK as an English word, however, the presence of a Goal is not a necessary component; hence it is not represented in Fig. 2.[11]

The choices and possibilities, and the negatively and positively valued alternative outcomes, make up part of the basic scenarios associated with RISK, somewhat analogously to the understandings we have of the basic outlines of the commercial transaction scenario. Corresponding to the categories defined within that scenario—Buyer, Seller, Money, Goods, Tender, Cost, Change, and the rest—we now describe the categories that will prove useful in a valence description of RISK and its semantic companions.

The categories

The categories that we propose for these purposes are the following:[12]

Chance: the uncertainty about the future (represented by the circles in Figs. 1 and 2). This notion can be expressed linguistically as a noun like CHANCE or POSSIBILITY, or, making it explicit that Harm is a possible outcome with the set of words under examination, the nouns RISK or DANGER.[13]

Harm: a potential unwelcome development (the outcome labeled "H" in Fig. 1 and 2). The two categories Chance and Harm make up the core

of our understanding of all the words in our set. The Harm can be linguistically expressed as a nominal object or gerundial complement of the verb RISK (e.g., RISK DEATH, RISK LOSING MY JOB), as a clausal complement to the nouns RISK and DANGER (e.g., THE RISK THAT SHE WILL LEAVE ME), or as a nominal of a gerundial object of the preposition OF complementing the nouns RISK and DANGER (e.g., THE RISK OF DEATH, THE DANGER OF LOSING MY JOB).

Victim: the individual who stands to suffer if the Harm occurs (the person who travels the path leading to the circle in Figs. 1 and 2).

This category can be introduced in a preposition phrase headed by TO (e.g., THE DANGER TO THE CHILDREN), as the object of certain verbs (e.g., PUT SOMEONE AT RISK, ENDANGER SOMEONE), or as the subject of certain verbs (e.g., HE RUNS THE RISK OF RUINING HIS REPUTATION).

Valued Object: a valued possession of the Victim, seen as potentially endangered. The most typical linguistic presentation of the Valued Object is as the direct object of RISK (e.g., HE RISKED HIS HEALTH IN TAKING THAT JOB), but in some environments it can be introduced as the object of the preposition WITH (e.g., YOU'RE TAKING RISKS WITH YOUR CHILDREN'S LIVES IN DRIVING LIKE THAT) and others in which it can be introduced by TO (e.g., THERE'S A CONSIDERABLE RISK TO OUR HEALTH IN LIVING IN THIS COMMUNITY; it should be noticed that for PUT X AT RISK, X may be either Victim or Valued Object, whereas with RISK, X may only be the Valued Object).[14]

(Risky) Situation: the state of affairs within which someone might be said to be at risk (represented by the path leading to the circle in Figs. 1 and 2).

The Situation can be described by an adjective (LIVING NEAR THIS TOXIC WASTE DUMP IS RISKY / HAZARDOUS / DANGEROUS, etc.), or it can be the subject of a sentence expressing the presence of risk, with such predicates as (THIS ACTIVITY) OFFERS CONSIDERABLE RISK / HAS UNKNOWN HAZARDS / INVOLVES LITTLE RISK, etc.

The notions listed so far can all be seen as fitting either Fig. 1 or Fig. 2. Those that follow, all involving someone making a choice, specifically fit situations representable by Fig. 2.

Deed: the act that brings about a risky situation (represented in Fig. 2 by the corner of the square connected with the path leading from the square to the circle).

The Deed—the "action" counterpart of the Situation—can be represented in the main clause of a sentence, its risky character represented in an adjunct phrase, as in HE CRITICIZED HIS BOSS AT THE RISK OF LOSING HIS JOB, or it can be subordinated as a gerundial clause, as in THEY RISKED DROWNING (BY) SWIMMING IN THAT PART OF THE RIVER. It can also be represented as a nominal or gerundial object of the verb RISK, as in WE DECIDED TO RISK A TRIP INTO THE JUNGLE and WE DECIDED TO RISK GOING INTO THE JUNGLE.

Actor: the person who performs the Deed that results in the possibility of Harm occurring (the person who makes the decision represented by the square in Fig. 2).

In most of the Actor-involved sentences in our collection, the Actor and the Victim are identical (when you "take a risk" you typically endanger yourself), but, as mentioned earlier, there are some expressions indicating situations in which what one person does endangers another: YOU (= Actor) PUT ME (= Victim) AT RISK. (The verb RISK, as noted, appears not to be used in such expressions.)

The following four categories are always secondary components of their clauses, and, because they all concern the Actor's intentions, they are closely related to each other and conceivably permit interparaphrasability (i.e., they may be instances of a single category). Nevertheless, they are included within the category list for the RISK frame because they fit into the RISK schema perfectly, and their presence must be taken as licensed by some but not all senses of the words in our set. They have been separated from each other because of the differences in the grammatical means of their expression; they are all subtypes of what we called *Goal* earlier—roughly, what an Actor has in mind at the time of performing the Deed.

(Intended) Gain: the Actor's hoped-for gain in taking a risk.

It is typically introduced as the object of the preposition FOR (e.g., YOU'VE RISKED YOUR HEALTH FOR A FEW CHEAP THRILLS).

Purpose: what an Actor intends to accomplish in performing the Deed.

In the examples given here, Purpose is represented mainly in the form of "purpose clauses": TO + VP or IN ORDER TO + VP (e.g., YOU RISKED ALL THAT JUST TO MAKE ONE POINT?).
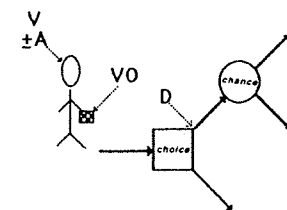
Fig. 3 H = Harm, G = Goal, D = Deed, VO = Valued Object, V = Victim, A = Actor.

Beneficiary: the person for whose benefit something is done.

This category, too, is most often introduced by FOR (e.g., YOU RISKED YOUR LIFE FOR SOMEONE YOU DON'T EVEN KNOW).

Motivation: the psychological source of the Actor's behavior.

What we are calling Motivation can be expressed with FOR, OUT OF, etc. (e.g., HE RISKED LOSING OUR FRIENDSHIP OUT OF SPITE, SHE RISKED HER HEALTH FOR VANITY).

There is a brute force character to this list, to be sure; but we can at least be sure that the roster of categories needed for describing the meanings and the grammar of the words in our set go far beyond anything envisioned by current theories of thematic roles or deep cases.[15] Our claim is that in describing the meaning of a word we are necessarily engaged in describing the categories expressed by the phrases built up around that word, interpreted against a particular background frame.

Figure 3 is intended to give a simple visual representation of the main categories from the preceding list.

Some results of the study

Our aim was to survey a large corpus of attested uses of RISK in such a way as to be able to say something about the elements of every clause in the corpus in which RISK, as noun or verb, plays a role. The RISK citations used in this study were taken from a 25,000,000-word corpus provided to IBM, Hawthorne, by the American Publishing House for the Blind. The extraction of all the RISK sentences in the corpus, accomplished through the courtesy of IBM's Roy Byrd and Slava Katz, yielded 1,770 examples. We have recorded, for each sentence in the collection, certain grammatical facts about the target word and the categories from the RISK schema that are represented in the sentence, and the lexical and grammatical means of

their representation.[16] The main observations reported later concern the verb, but we have also included certain observations about RISK as a noun.

Observations about nominal RISK

Noun-phrases with RISK at their head can occur in all the usual syntactic positions (e.g., as subjects of their clauses, as direct or oblique objects of verbs, as prepositional objects in adverbial expressions, and so on). As subjects we found them (1) with predicates indicating the extent or seriousness of the probability of Harm (e.g., THE RISK WAS CONSIDERABLE), and (2) in existential sentences bearing quantifiers (e.g., THERE'S QUITE A BIT OF RISK IN THIS, THERE WAS NO RISK OF FAILURE).

RISK occurred in the predicate-phrase AT RISK (e.g., THESE CHILDREN ARE AT RISK) and in adverbial phrases of the kind AT THE RISK OF X, AT X RISK, WITHOUT RISK, WITHOUT X RISK (OF Y), etc. (e.g., HE INSULTED HIS FATHER AT THE RISK OF LOSING HIS INHERITANCE, YOU COULD WALK THROUGH THE YARD WITHOUT ANY RISK OF BEING NOTICED).

As the phrasal head of the direct object of a verb, the most common cases involved the verbs RUN (107 instances) and TAKE (170 instances). We have found no dictionary that offers an account of the difference between RUN A RISK and TAKE A RISK. (A careful examination of the semantic difference between the two will be given in Fillmore & Atkins, forthcoming.)

There were four main classes of verbs, other than RUN and TAKE, occurring with RISK as direct object. Verbs in the first group represent the Actor's cognitive awareness: *KNOW* THE RISK, *UNDERSTAND* THE RISK, *APPRECIATE* THE RISK, *CALCULATE* THE RISKS. The existence of such examples supports the idea that in some of its uses the noun represents something computable, the computation involving the negative value of the Harm, the positive value of the intended Gain, and the probabilities associated with each. In *BALANCE THE RISKS* we are comparing two such computations. Examples from the corpus are:

But if, *knowing* the risks, you embark on this outing do you have a claim at all? ⟨427 1259⟩

"You don't *understand* the risks a police officer takes." ⟨256 3904⟩

No one knows how to *calculate* the risk of a future catastrophe. ⟨224 391⟩

And you had to *balance* its risks against the hazards of pregnancy. ⟨208 677⟩

The verbs of a second group represent acts of avoiding or reducing, such as *AVOID* THE RISK, *MINIMIZE* THE RISK, *ELIMINATE* THE RISK,

denoting decisions to select alternative paths to the one leading to Harm, or to reduce the probabilities of getting onto the Harm path. Buying insurance, or not standing under a lone tree in an electric storm, are ways of doing these things. Examples from the corpus are:

The investor who is morbidly preoccupied with *avoiding* risk should stay out of the market altogether. ⟨479 996⟩

Risks of accident at sea can be *minimized* by raising the standards of seamanship. ⟨181 1996⟩

Proceeding by stages, with extreme precautions, we try to *eliminate* the slightest risk of accident or even minor mishap. ⟨5 2587⟩

The verbs in the third class represent the relation between a Situation (as subject) and the probability of Harm, as in *INCURS* RISK, *ENTAILS* RISK, *OFFERS* LITTLE RISK, *INVOLVES* CONSIDERABLE RISK, etc. Examples are:

I recognized that an activist domestic program *involved* great political risks. ⟨313 8⟩

The leveling of incomes *offers* the risk that a comfortable middle class may supply no patrons interested enough in architecture to aspire to the best. ⟨33 107⟩

This manner of presentation *incurs* the risk of rationalizing on the one side and confusion and lack of perspective on the other. ⟨526 184⟩

Cogar realizes, of course, that starting out with so expensive a plant *entails* big risks. ⟨225 332⟩

And the verbs in a fourth group represent the relation between the Victim and the probability of Harm, as in *FACE* THE RISK, *ASSUME* THE RISK, *SHOULDER* THE RISK, *BEAR* THE RISK, and the like. Taking a high deductible on an insurance policy is a decision to face the risks for which the insurance is being purchased. Examples from the corpus:

The only people to remain exposed in the operation are, in theory, the tankers' owners *facing* the risk of Arab reprisals. ⟨154 470⟩

We must *assume* the risks, play according to the rules of the game; and, if it comes at last to that, lose with serenity. ⟨10 1263⟩

There is a growing consensus that the risks of life should not be *borne* by the individual but should be spread through the society. ⟨409 797⟩

RISK as a verb

There is a great deal to say about RISK as a noun, but the portion of our study that is our main focus here involves the patterns we found with RISK as a verb.

The verb RISK always has either a nominal or a gerundial direct complement. For simplicity's sake, we refer to them both as (direct) objects, distinguishing between them as nominal objects and gerundial objects. There are three main RISK-schema categories represented grammatically as objects: Valued Object, Harm, and Deed. Because the Valued Object is always a "thing," it is represented only by nominal objects; because Harm is an "event" and Deed is an "act," these can be represented verbally (most commonly in gerundial form) or nominally (e.g., as a nominalization of a verbal notion or as a metonym of an event or an act).

Valued Object as Grammatical Object. As noted, we find the Valued Object element realized only in nominal form (i.e., as a typical direct object). Possibilities for adding to such clauses adjuncts or circumstantial adverbial phrases expressing various other notions include the following:

The Situation can be introduced in a prepositional phrase with IN or ON:

> **RISK** $^{\text{VO}}${**NP**} $^{\text{Sit}}${**Prep NP**}

Valued Object as D-Object, Situation as PP

Examples:

> He was being asked to risk
> $^{\text{VO}}${his good name}
> $^{\text{Sit}}${*on* the battlefield of politics}. ⟨14 1532⟩

> Others had risked
> $^{\text{VO}}${all }
> $^{\text{Sit}}${*in* the war}. ⟨344 3678⟩

> It would be foolhardy to risk
> $^{\text{VO}}${human lives }
> $^{\text{Sit}}${*in* the initial space flights}. ⟨348 2516⟩

> You may find yourself risking
> $^{\text{VO}}${ever-greater sums }
> $^{\text{Sit}}${*in* ever-more-ambitious campaigns}. ⟨479 3556⟩

The Beneficiary can be indicated with the preposition FOR, or with the phrasal preposition FOR THE SAKE OF:

> **RISK** $^{\text{VO}}${**NP**} $^{\text{Ben}}${**FOR NP**}

Valued Object as D-Object, Beneficiary as PP

Examples:

> Why did he risk
> $^{\text{VO}}${his life }
> $^{\text{Ben}}${*for* a man he did not know}? ⟨359 2583⟩

> But specialists in the U.S. State Department . . . declared that there was no point in risking
>
> $^{\text{VO}}${a friendship with 80 million Arabs}
> $^{\text{Ben}}${for the sake of a few thousand Jews.} ⟨314 94⟩

The Actor's intended Gain shares with Beneficiary the ability to be marked by the preposition FOR, but it also can be marked by the phrasal preposition IN EXCHANGE FOR):

> **RISK** $^{\text{VO}}${**NP**}$^{\text{G}}${**FOR NP**}

Valued Object as Object, Gain as PP

Examples:

> The men and women of the French resistance, who had fought the underground and risked
> $^{\text{VO}}${everything}
> $^{\text{Gain}}${*for* this day} . . . ⟨404 929⟩

> It would always be worthwhile, for instance, to risk
> $^{\text{VO}}${the Apache}
> $^{\text{Gain}}${*in exchange for* a chance to destroy a light cruiser}. ⟨320 89⟩

The Actor's Motivation (in the sense defined earlier) can be marked with the preposition FOR, but also in a number of other ways:

> **RISK** $^{\text{VO}}${**NP**} $^{\text{Mot}}${**FOR NP**}

Valued Object as D-Object, Motivation as PP

Examples:

> ready to risk
> ^{VO}{everything }
> ^{Mot}{*for* what he believes}. ⟨311 784⟩

> She had risked
> ^{VO}{so much }
> ^{Mot}{*for* the sake of vanity}. ⟨447 306⟩

> I have risked
> ^{VO}{all that I have}
> ^{Mot}{*for* this noble cause}. ⟨173 5279⟩

> A speculator is someone who has money and is willing to risk
> ^{VO}{it}
> ^{Mot}{*in hope of* making more}. ⟨479 3087⟩

A Purpose phrase can be added to a Valued-Object complement, in an infinitive phrase or in a variously marked THAT-clause:

> **RISK ^{VO}{NP} ^{Purp}{Infinitive}**

Valued Object as D-Object, Purpose as Infinitival

Examples:

> Why should he risk
> ^{VO}{his life}
> ^{Purp}{to try to save Brooks}? ⟨179 851⟩

> But he was willing to risk
> ^{VO}{his neck}
> ^{Purp}{to make up for fouling things up before}. ⟨301 1945⟩

> They . . . considered it worthwhile to risk
> ^{VO}{a large expeditionary force}
> ^{Purp}{to get the hero out of the country}. ⟨448 702⟩

> How could it be wrong to risk
> ^{VO}{one's life}
> ^{Purp}{in order that everyone should be equal}? ⟨295 1981⟩

> He pleaded with the council to send Ireland a bishop who could lead the men and women who were risking
> ^{VO}{their lives}
> ^{Purp}{so that their faith could continue to exist}. ⟨338 1589⟩

When the Deed is represented by a Gerund, this can be done either with or without a BY or IN subordinator, as shown in the following two groups:

> **RISK ^{VO}{NP} ^{D}{BY/IN Gerund}**

Valued Object as D-Object, Deed as PP/Gerund

Examples:

> He was unwilling to risk
> ^{VO}{his newfound independence }
> ^{D}{*by* invest*ing* in such a dubious concern}. ⟨97 1132⟩

> Better be blamed for weak leadership than risk
> ^{VO}{the cause}
> ^{D}{*by* attempt*ing* too much}. ⟨344 3083⟩

> He had risked
> ^{VO}{two of his submarines }
> ^{D}{*by* send*ing* them to the edge of the American beaches}. ⟨507 1894⟩

> Never again did Japan risk
> ^{VO}{big ships}
> ^{D}{*in* supply*ing* either New Guinea or cut-off garrisons in the Solomons}. ⟨504 2410⟩

> **RISK ^{VO}{NP} ^{D}{Gerund}**

Valued Object as D-Object, Deed as Gerund alone

Examples:

> No one could doubt his obvious chagrin at not being able to risk
> ^{VO}{his neck }
> ^{D}{jump*ing* horses over fences}. ⟨143 432⟩

> . . . the unknown ordinary people who risked
> ^{VO}{their lives}
> ^{D}{carry*ing* messages between the lines}. ⟨387 1078⟩

The corpus contained one example of the Deed expressed infinitivally.

RISK ^{VO}{NP} ^D{Infinitive}

Examples:

he had risked
^{VO}{his life}
^D{to guide them}. ⟨83 3308⟩

Harm as Grammatical Object. The second major role expressible as a nominal or gerundial direct complement is Harm. With nominal expression, we have these:

RISK ^H{NP}

Harm as D-Object, no adjuncts.

Examples:

Not wanting to risk
^H{any repetition of the Cuban crisis}, . . . ⟨60 750⟩

Leafy vegetables can be consumed without risking
^H{a great weight gain}. ⟨184 137⟩

The board was risking
^H{a liquidity crisis}. ⟨326 286⟩

Scholars were unwilling to risk
^H{the loss of the benefits they were receiving from the Manchu invaders}. ⟨336 603⟩

Don't try to touch the kitten; you'll only risk
^H{a bite}. ⟨499 1611⟩

The gerundial Harm complement of RISK can be either phrasal (its subject interpreted as the subject or RISK) or clausal.

RISK ^H{Gerund}

Harm as Gerundial Object, no adjuncts

Examples:

The paper is too successful and risks
^H{becoming complacent}. ⟨46 875⟩

Any moderate risked
^H{being called a traitor}. ⟨97 1765⟩

He could not risk
^H{being discharged}. ⟨159 910⟩

He could not risk
^H{Walters going over to Brady}. ⟨99 2077⟩

I would merely risk
^H{the court making a mistake and finding me guilty}. ⟨393 244⟩

Adjuncts capable of accompanying the Harm-indicating complement include Deed, expressible as IN + Gerund, and Purpose, expressible as an infinitival verb phrase optionally introduced by the complex preposition IN ORDER TO.

RISK ^H{NP/Gerund} ^D{IN Gerund}

Harm as Object, Deed as IN-Gerund

Examples:

Rather than risk
^H{waking Peggy}
^D{in searching for my pajamas},

I crept into bed in my underpants. ⟨339 2368⟩

RISK ^H{NP/Gerund} ^{Purp}{[IN ORDER] Infinitive}

Harm as Object, Purpose as Infinitival
In these cases, of course, the Subject will be interpreted as Actor rather than Victim.

Examples:

Some of the large firms are willing to risk
^H{initial losses}
^{Purp}{in order to get into the field ahead of US steelmakers}. ⟨322 1655⟩

Captain Prien risked
^H{treacherous tides and currents and a narrow passage}
^{Purp}{to penetrate British defenses and torpedo the battleship Royal Oak}. ⟨504 462⟩

She risks
H{the hazards of the highway }
Purp{*to* catch a glimpse of him as he addresses wayside crowds}.
⟨410 384⟩

We are prepared to risk
H{a substantial increase in unemployment }
Purp{*in order to* bring inflation to an end}. ⟨521 2131⟩

RISK H{NP} B{FOR [the sake of] NP}

Harm as Object, Beneficiary as PP

Example:

Men were not inclined to risk
H{scalping}
Ben{*for the sake of* settlers they had never seen}. ⟨344 1918⟩

RISK H{Gerund} G{FOR NP}

Harm as Object, Gain as PP

Examples:

That they should risk
H{be*ing* murdered}
Gain{*for* their pleasure}

was too senseless and capricious altogether. ⟨306 2762⟩

Deed as Object. The third type of direct complement is the Deed, representable as a nominal or as a gerundial direct object.

RISK D{NP}

Deed as NP Object, no adjuncts

Examples:

Paul decided to risk
D{a reconnaissance in town}. ⟨5 798⟩

No skipper or fisherman would risk
D{the crossing}. ⟨96 691⟩

Users were unwilling to risk
D{any software changes}. ⟨234 195⟩

He walked away, not even risking
D{a parting glance}. ⟨297 962⟩

Franklin decided to risk
D{a desperate diplomatic maneuver}. ⟨371 557⟩

Hamburg risked
D{an open break with the Hanseatic League}. ⟨408 1868⟩

RISK D{Gerund}

Deed as Gerundial Object, no adjuncts

Examples:

If he risks
D{say*ing* something highly personal} . . . ⟨39 712⟩

We were happy and it seemed foolish to risk
D{chang*ing* things}. ⟨68 3644⟩

I did not dare risk
D{leav*ing* my vantage point}. ⟨204 1157⟩

Will would never risk
D{turn*ing* up again}. ⟨204 3903⟩

In the Deed-as-object examples, the principal adjunct we found was a Purpose expression:

RISK D{NP} Purp{[IN ORDER] Infinitival}

Deed as NP Object, Purpose as Infinitival

Examples:

I didn't dare risk
D{a pause }
Purp{*to* let that sink in}. ⟨172 1567⟩

RISK ^D{Gerund} ^{Purp}{[IN ORDER] Infinitive}

Deed as Gerundial Object, Purpose as Infinitival

Examples:

We risked
   ^D{surfac*ing* }
   ^{Purp}{*to* race into a new attack position}. ⟨328 3449⟩

Lance risked
   ^D{stay*ing* at the ridge alone}
   ^{Purp}{*to* watch}. ⟨397 2216⟩

He couldn't keep up there much longer, not unless he wanted to risk
   ^D{show*ing* himself in the village}
   ^{Purp}{*to* buy supplies}. ⟨281 3304⟩

The Residue: "Derivative Syntax." On developing the preceding categorization of the segments of sentences built around the verb RISK, we found a number of examples that did not lend themselves to a direct interpretation in terms of what we took to be the RISK schema. These words, in these contexts, seemed to mean more than just RISK. Put differently, the meaning of these sentences seemed to involve more elements than what we could find in the otherwise fairly well-motivated RISK frame.

The solution seemed to lie in a theory of derivative syntax. In examining semantic relations between words, as well as the polysemy structure of a word, we will frequently find that in some of its secondary senses a word can have distributional and semantic properties that overlap the properties of certain other words (or word-classes). We might say it "inherits" some of its grammatical properties, in this use, from the associated word.

Examples of such *derivative syntax* are easy to find. For example, when "slipping" something can be seen as part of an act of "giving" something to someone, the verb SLIP can take on the syntax associated with GIVE, as in "he slipped me an envelope." When GIVE is used in the meaning "contribute," it enjoys the argument omission possibilities allowed by CONTRIBUTE, as in "I gave five dollars." And, to use even better known examples, when "smearing" something on some surface results in covering that surface, the verb SMEAR acquires the syntax of COVER, as in "I smeared the wall with mud," and when loading hay onto the truck results in filling the truck, LOAD can take on the syntax of FILL, as in "I loaded the truck with hay."[17]

To illustrate this last notion in the set of words we are exploring, we might want to say that when RISK or DANGER includes a meaning

component shared by POSSIBILITY, it acquires some of the syntactic patterns associated with POSSIBILITY, as in "there is a slight risk/danger/possibility that such-and-such will happen." With verbal RISK, some of its observed syntactic behavior is associated with its possibility of occurrence in contexts involving *exposing* (something *to* danger), *investing* (*in* something), and *betting* (*on* something). All the derived-syntax version of RISK that we found involves the "Valued-Object as Direct Object" version.

Expose. In one of these, we can paraphrase the sentence using the verb EXPOSE, and we find in the clause a secondary complement appropriate to EXPOSE, namely the TO-phrase representing the threat against which something is unprotected. The RISK phrase in these uses incorporates (and "inherits" some of the syntax associated with) the meaning of "expose."

RISK << 'expose' ^{VO}{NP} [?]{TO NP}

We would have to reinforce it before risking
   ^{VO}{it}
   [?]{*to* the waves}. ⟨75 1040⟩

He feared to risk
   ^{VO}{his two precious flattops }
   [?]{*to* enemy submarine or torpedo-bomber attacks}. ⟨520 2266⟩

In the remaining two cases, the Valued Object is deliberately offered as something capable of achieving the Goal. The first use fits the syntax of INVEST, the second fits the syntax of BET, WAGER, etc.

Invest. In this case, the "invested-in" object is introduced by the preposition IN.

RISK << 'invest' ^{VO}{NP} [?]{IN NP}

Roosevelt risked
   ^{VO}{more than $50,000 of his patrimony }
   [?]{*in* ranch lands in Dakota Territory}. ⟨6 5741⟩

Bet. The last case is one in which an act of risking is taken as superimposed (quite naturally) on the Gambling schema. An ON-phrase represents what is "bet on."

> **RISK << 'gamble, bet'** ^{VO}{NP} [?]{ON NP}

He's likely to risk
^{VO}{a week's salary }
[?]{*on* a horse}. ⟨439 791⟩

The unnamed categories in the preceding three types (the ones labeled "?") are categories that need to be named for the linked frames of exposing-to-danger, investment, and gambling. When we invest in something (nonmetaphorically), we encumber some portion of our resources in the knowledge that we stand the possibility of either losing it or receiving more in return. When we gamble on something, we predict some outcome related to that thing, in opposition with some other person or persons willing to predict a different outcome. When we expose something to danger, we make it possible that certain persons or properties (maybe not our own) will be damaged or lost. Because all these situations involve both uncertainty and danger, the notion of RISK fits into them well.

The polysemy system of verbal risk

In this section we lay out what dictionaries might present as the various senses of RISK, as found in the corpus. It is our own view that a description of the meanings of this verb would be more perspicuously presented by displaying the frame and its categories, describing the manner of introduction of associated concepts within the frame, and adding whatever embellishments a given usage requires. In this section we also offer other words from the same semantic field that share the "senses" being described.

(S1) RELATION BETWEEN ACTOR AND HARM

to act in such a way as to create a situation of (danger for oneself); "He risked death"

(S2) RELATION BETWEEN VICTIM AND HARM

to be in a situation of (danger to oneself); "You risk catching a cold dressing like that"

In the first two cases (S1 and S2), there do not appear to be other words that can show the same relationship.

(S3) RELATION BETWEEN ACTOR AND DEED

to perform (an act) which brings with it the possibility of harm to oneself; chance, hazard, venture; "He risked a trip into the jungle"

The class of RISK uses in which the verb encodes the relationship between the Actor and the Deed has near synonyms using the verbs CHANCE, HAZARD, and VENTURE, and, with somewhat different syntax, the verb DARE.

(S4) RELATION BETWEEN ACTOR AND VALUED OBJECT

to act in such a way as to expose (something) to danger; endanger, jeopardize, imperil; "He risked his inheritance"

The RISK verbs that encode the relationship between the Actor and the Valued Object permit paraphrases with verb-phrases headed by ENDANGER, JEOPARDIZE, and IMPERIL.

(S5) RELATION BETWEEN ACTOR AND VALUED OBJECT: DERIVATIVE

to act in such a way as to expose (something) to (danger); expose; "He risked his ship to torpedo attack"

The uses of RISK in which it is associated with EXPOSE shows a relationship between Actor and Valued Object. The TO-phrase represents a category available to the EXPOSE schema, representing a source of Harm.

(S6) RELATION BETWEEN ACTOR AND VALUED OBJECT: DERIVATIVE

to expose (something valuable) to loss by wagering it on (something capable of failing) in the hope of gain; bet, wager, stake, gamble; "He risked his inheritance on lottery tickets"

The uses of RISK in which it is associated with the verbs BET, WAGER, and STAKE show a relationship between Actor and Investment and permit adjunct phrases with the preposition ON, where the ON represents a chance-involved entity or event about which the outcome is a matter of contest (e.g., WE RISKED ALL THAT MONEY ON A HORSE).

(S7) RELATION BETWEEN ACTOR AND VALUED OBJECT: DERIVATIVE

> *to expose (something valuable) to loss by investing it in (some venture capable of failing) in the hope of achieving gain*

And lastly, the use of RISK in which it is associated with the verb INVEST also shows a relation between Actor and Investment, its derivative adjunct designating the purchased element in an investment (e.g., Roosevelt risked more than $50,000 of his patrimony in ranch lands in Dakota Territory). ⟨20⟩

On polysemy

Semanticists studying the polysemy structure of individual lexical items are generally unable to find what they need by examining the "senses" laid out in a typical dictionary entry. The usual lexicographic practice is to identify as separate individual senses those uses for which separate paraphrases are required to fit particular grammatical environments. Thus, if the verb RISK is paraphrased as "put at risk" in one context but "face the risk of" in another context, these must be taken as evidence for different senses of the verb. Such differences founded on differences of grammatical pattern are altogether unlike the kinds of secondary semantic developments created by such general processes as metaphor and metonymy. (Thus, in "my car died," dying is taken as a metaphor for mechanical failure; and in "I wrote to Paul," an expression of the act of writing is taken as a metonym of communicating with a series of actions in which writing is one part.) It ought to be possible to recognize the difference between the kind of polysemy resulting from a transfer of a semantic frame to a new domain (through metonymy or metaphor, for example) and the kind that reflects merely the accommodation of a word to different syntactic patterns.

The concept of "frame" makes it possible to reconsider the notion of polysemy, and to develop the consequences of this reconsideration for lexicography. Once we see the relevance of the frame notion for understanding the meanings of words, we find ourselves actually seeing the naturalness of the so-called "when"—definitions that we learned to avoid in school. It is common and easy—and "wrong"—for a definition of (say) "disappointment" to take such a form as "Disappointment is when you really wanted something to happen but then it didn't happen, and so you feel bad." The objections we heard to such a definition were precisely because they did not make it possible to distinguish between the verb "disappoint," the adjectives "disappointed" and "disappointing," and the noun "disappointment"; that is, such a definition fails because its form does not match the *grammatical* characteristics of the word being defined. Proper definitions, we were taught,

were phrases that could replace—however awkwardly—the word being defined, in the sentences in which it had the meanings we were trying to characterize, preserving that meaning. It is because of this tradition that a dictionary built along familiar lines has to regard each of the "senses" of RISK surveyed in the previous section as different.

Frame semantics makes it possible to separate the notion of the conceptual underpinnings of a concept from the precise way in which the words anchored in them get used. We need the means of associating a word (or a group of words, or a group of word uses) with particular semantic frames, and then to describe the varying ways in which the elements of the frame are given syntactic realization. We ought not to have to regard each of these varying mappings as different senses of the word.

We wish to say, for example, that in explaining uses of the verb RISK we merely need to specify the interrelations between two notions: semantic frame and syntax. There are two related frames associated with this verb— those suggested by Figs. 1 and 2—but the usage differences that need to be reported are best described, not necessarily in terms of lexical semantic differences as such, but as differences in the manner of syntactic realization of the elements of their common frame.

Standard dictionaries are not equipped to present polysemy organizations in the way suggested here, because they do not provide a means to access the details of given conceptual frames. A more appropriate representation can be provided in a frame-based dictionary-on-computer with properties outlined at the beginning of this chapter. We hope to be able to offer some somewhat less programmatic proposals on the structure and performance of such a dictionary at a later date.

Acknowledgments

Notes

1 The main product of that larger work is Fillmore and Atkins (1994). The authors are indebted to the computational facilities of the Institute of Cognitive Studies at the University of California, Berkeley; to IBM, Hawthorne, for providing the concordance lines, and the American Publishing House for the Blind for the use of the APHB corpus.
2 The frame descriptions exemplified in this chapter are intuitive and informal, though the possibility of making them more precise, or of reducing them to a well-defined set of semantic primitives, is not ruled out. The purpose of the frame

descriptions in the kind of practical dictionary we have in mind is to inform the user of the concepts needed for understanding the categories. It may not matter whether this is done through diagrams or animation, prose descriptions of states of affairs, or appeals to common human experiences.

3 Perhaps the most detailed survey of such relationships can be found in D. A. Cruse (1986), *Lexical Semantics* (Cambridge Textbooks in Linguistics).

4 Some writers make clear distinctions among such words as "frame," "schema," "scenario," "knowledge structure," and the like. For the use we put these notions to, such distinctions play no role.

5 The discussion about "words" and "word senses" could be made more precise if we were to use the term *lexical unit* to refer to the pairing of a particular "lexeme" (a family of lexical variants) with a particular sense. We allow ourselves the risk of being occasionally misunderstood, because (1) for the most part readers will probably be able to understand our intentions, and (2) we do not wish to bring to the reader's mind Cruse's prejudices (1986, p. 80) about the irrelevance of polysemy structures to lexical semantic description.

6 The discussion about calendric terms follows closely the language used in Fillmore's "Frames and the semantics of understanding," *Quaderni di Semantica* (1985, pp. 223f).

7 The table is intended as a simple demonstration of the kinds of information needed: The reality is a bit more complex; for example, the nominal complement of COST is not strictly speaking a direct object.

8 We became aware of the notation through Daniel Kahneman. A standard reference on decision theory that uses this notation is Raiffa (1970).

9 The labels have proved helpfully mnemonic, but the difference between the English phrases "run a risk" and "take a risk" appear to be somewhat more complicated than is suggested here. More details are available in Fillmore and Atkins (1994).

10 In this description, the risk-taker's aims have been labeled *Goal*. Some further discriminations are introduced later, including *Gain* (what the risk-taker hopes to acquire), *Purpose* (what the risk-taker hopes to do), and *Beneficiary* (the person the risk-taker wishes to benefit).

11 But see Fig. 3 later.

12 We are not completely happy with the labels we have chosen for the categories. In several cases words were rejected so as not to duplicate initial letters, because we wanted to use single upper-case letters in our abbreviated notations. For *Deed* we might have preferred *Act*, but we need "A" for *Actor*; for *Harm* we might have preferred *Damage*, but we need D for *Deed*. *Valued Object* is inconvenient, but all the alternatives we could think of (Assets, Capital, Fortune, Property, Treasure and Wealth) brought their own difficulties.

13 That the noun RISK is clearly associated with Harm can be seen by comparing the two sentences, "There's a possibility that the coin will come up heads" and "There's a risk that the coin will come up heads." In the latter sentence, the "coming up heads" possibility is presented as reason for worry.

14 There appear to be dialectal differences regarding the use of the reflexive pronoun as the direct object of RISK. "I want the freedom to risk myself" is acceptable in British English but not in American English.

15 The point is that in a careful description of the semantic roles associated with predicates of most verbs we need "frame-specific" semantic role categories, thus going far beyond the familiar repertories of Agent, Patient, Experiencer, etc., found in much recent discussion of the semantics and grammar of verbs.

16 A final working method has not yet been worked out, but the early steps in the analysis were accomplished with dBaseIII on IBM equipment and with the Ingres relational database on a UNIX machine in Berkeley.

17 A correct description would presumably not be one that mentioned FILL and COVER, but which recognized the semantic commonality of these two words and associated the grammatical realization pattern as fitting that meaning.

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