Pragmatics is integral to the lexicon

Keith Allan

Abstract

Pragmatics is necessarily integral to the lexicon because the sense of a listeme normally corresponds to a description of the concepts that comprise the salient properties of its typical denotations in their typical contexts. Context is understood as "what is said about what at some world"; it includes what the locution reveals about the author's attitude to what is spoken of and/or the persons addressed. The artificial metalinguistic lexicon is a (partial) model of the natural (biological) mental lexicon. The metalanguage that captures the meaning of a listeme is precise, comprehensive, and succinct, yet necessarily equivalent to the natural language expression through which a user identifies the conceptual content described. In the model, a listeme entry is a networked quadruple consisting of a uniquely tagged formal representation $_{f000}$ F linked via a decision process to a morphosyntactic category $_{f000}$ M_{s000} linked with the semantic component $_{s000}$ "S" linked with an encyclopedic component $_{se000}$. The tags model neurons in the wetware. The commands in the decision procedure (&, &OR, XOR, IF, ELSE, ELIF, GOTO, OUTPUT, TENABLE, OUPUT, NEXT ITEM) are constructs that model synapses in the wetware. The lexicographic model is demonstrated for two nouns, *cup* and *bitch*, the homonymous verbs derived from them, and the conjunction, *and*.

Keywords

context, decision procedure, encyclopedia, lexicon, metalanguage, model

1. Introductory remarks

This essay argues that the dictionary/lexicon requires input from a pragmatic source, namely the encyclopedia, on the understanding that the encyclopedia functions as a structured large database containing exhaustive information on many, potentially all, branches of knowledge. Dictionaries are publications created by human intention as practical aids to understanding language; they are artificial models¹ of the mental lexicon, an evolutionary endowment of the

¹ Ideally such models are demonstrably rational abstractions from natural language developed by applying the analyst's experience and intuitions to inferences drawn from occurrences of actual speech events. The relation of model to reality 'is not analogous to that of soup to beef but rather

biological human being. A lexicon (sc. mental lexicon) is a bin for storing the meanings of so-called 'listemes'², namely, those language expressions whose meaning is not properly determinable from the meanings, if any, of their constituents. The lexicographic semantic descriptions of a listeme are composed in a semantic metalanguage. The basic requirement for the metalanguage is to satisfactorily communicate the meaning of a listeme in the (natural) object language using an expression in the (artificial) metalanguage. So, the semantic metalanguage is, effectively, a translation of the object language (cf. Carnap 1937: 228) and, in order for the metalanguage to be understood and used by human beings, it must be communicable in a natural language. Consequently, the artificial metalanguage description will always be equivalent to the natural language expression through which it is interpreted. This is not to suggest complete conceptual identity between the two, only that they be as close to identical as is fit for purpose.

Traditional dictionaries plainly incorporate pragmatic material. For instance, the entry for the noun *bogan* in the *Oxford English Dictionary* 2025 (hereafter *OED*), in addition to information about its various pronunciations and its meaning ("An unfashionable, uncouth, or unsophisticated person, esp. regarded as being of low social status"), includes such encyclopedic information as: (i) contextual guidance to its usage, '*Australian* and *New Zealand colloquial (disparaging)*'; (ii) historical information – the year of first record, '1984'; (iii) examples from published texts that offer co-textual guides to usage (https://doi.org/10.1093/OED/5441856749). Also, (iv), the *OED* entry for the noun *dog* includes encyclopedic information about domestic dogs:

Dogs are believed to have been domesticated from the wolf, *C. lupus*, in the Mesolithic period, and there are now numerous breeds that vary greatly in size, shape, and colour. Some now live in a wild or feral state: cf. sense I.3b. (https://doi.org/10.1093/OED/6646229330)

Haiman 1980: 331 baldly claimed that 'Dictionaries *are* encyclopedias', which is certainly true of some existing dictionaries, for example *The New Grove Dictionary of Jazz* (Kernfield 1994). The *New Oxford Dictionary of English* (Pearsall and Hanks 1998) includes

of check number and overcoat' (Einstein 1973: 294). The model of the mental lexicon is a model of a cognitive phenomenon that makes no claim to accurately describe the cognitive phenomenon itself (i.e. exactly what goes on in the human mind and/or brain) any more than the Model S P100D diecast scale model of a Tesla car (https://shop.tesla.com/en_au/product/diecast-1_18-scale-model-s) replicates how a real Tesla automobile operates. In other words: the model and the natural phenomenon modelled are ontologically distinct entities (see Allan 2003; 2024a).

² The term 'listeme' was first used by Di Sciullo and Williams 1987.

4500 place names, 4000 biographical entries, and 3000 other proper names because such dictionaries function not only as an inventory of listemes and their linguistic properties but also as a cultural index to the language and collective beliefs of its speakers – thus closely corresponding to human lexical abilities and traditional encyclopedias. As will be further demonstrated in Sections 4–7, encyclopedic information catalogues contexts for listemes.

It has been recognized for millennia that context is essential in ascertaining the appropriate sense of a listeme, for example in Aristotle's *Rhetoric* 1408^a10 (c.360 BCE Aristotle 1984: 2245), in Quintilian's Institutes (c.95 CE Quintilian 1920–22, XI.i.2), and in Augustine's De genesi ad litteram I.xix.38 (c.415 CE Augustine 1836). Allan 2018; 2023 distinguished three aspects of context: C1, C2, and C3. C1 is the world (and time) spoken of, which is largely identified from co-text; essentially, C1 captures "what is said about what at some world", including what the locution reveals about the author's attitude to what is spoken of and/or to the persons addressed. C2 captures who does the saying to whom, and where and when this takes place. C3 is the situation of interpretation. To oversimplify the difference between them: a law, C1, is enacted by parliament in C2; the judiciary interprets the law in C3. Sylvia Plath wrote *The Bell Jar*, C1, a doleful account of the life of 19-year-old Boston MA girl Esther Greenwood who is in a troubled relationship with her mother, is academically accomplished and an aspiring poet, wins a literary talent competition, moves to New York, engages in partying, and experiences unrewarding sex in fractious liaisons. She suffers such debilitating depression that she is hospitalized and undergoes electroconvulsive therapy. Her mental instability makes Esther feel she is trapped under a bell jar. C2: Plath composed the novel in London during 1961 and 1962. C3: cluey readers will recognize that the book is largely autobiographical (I read the book in Australia in 2024). Final examples: Consider teenage BFFs Sally and Ruth side-by-side scrolling through images on a phone (C2) when Sally says 'Bitch.', C1, (not Bitch? or BITCH!) in response to an image of (i) a dog, (ii) Rachel necking with Sally's boyfriend Ed, (iii) Ruth laughing at a bar with a cocktail in hand. Ruth in C3a and we in C3b might interpret C1 as follows: in (i) Sally is labelling the dog female; in (ii) Sally is disparaging Rachel; in (iii) Sally is engaged in banter directed at her friend. Malinowski wrote that, in different contexts, a stick may be used for the different purposes of digging, punting, walking, fighting, etc. (Malinowski 1931). As we see, exactly the same is metaphorically true of language expressions: a word which is an insult in one context may be an expression of camaraderie or endearment in another (and vice versa). But whatever a speaker/writer/signer intends C1 to mean may be misunderstood by the audience in C3. Suppose Ruth in C3a does not in fact share our interpretation of, say, (iii): Ruth may be seriously offended rather than teased – but this is not something that a lexicographic semantic

description can, nor should, manage. In lexicography 'context' is to be understood as C1, because C2 and C3 are only relevant when included in C1, the context that the listeme denotes.

Section 2 introduces some terminology identifying what appears in a semantic description. Section 3 compares alternative models of lexicographic description, favoring a metalanguage heavily reliant on natural language. Sections 4–7 show that the lexical meanings ('senses') given in entries for listemes are based upon, and must necessarily directly reflect, contextual information derived from the encyclopedia. Section 8 summarizes the discussion.

2. Grounds for what appears in the semantic representation

Following not only the *OED*, but Lyons 1977 and Allan 2001; 2006; 2024b, I name each semantic representation in the lexicon/dictionary a **sense** of the listeme. The sense of a listeme normally corresponds to a description of the concepts (see the next paragraph) that comprise the salient properties of the typical **denotation**. The denotation of a listeme λ is what λ is normally used to refer to in some possible world, *w*, real or imagined. World *w* provides context, C1, for the encyclopedic information about the typical denotation. Its **reference** is what the speaker/writer/signer is using the listeme to talk about – be it intensional, extensional, or non-existent. Information about denotata (potential referents) is stored in their encyclopedia entries. It is this information from which the senses of isomorphic listemes are abstracted. Such abstraction from particular contexts is evident in the ontogenetic development of listemes by children (Clark 1973; Gentner and Boroditsky 2001; Tomasello 2003).

A **concept** is the mental representation of an entity, event, notion, and/or idea, more succinctly, a cognitive representation. Consider the comparatively simple concept TWO identified by the word *two*. It is *duo* in Latin, *deux* in French, *dos* in Spanish, *zwei* in German, $\vec{\mathbb{R}}$, *èr* in Chinese, and *i*¹*i*¹*i*, *aithnayn* in Arabic. The concept is also symbolized as *II* and *ii* in roman, $\vec{-}$ in Chinese, $\vec{\mathsf{r}}$ in Arabic, *2* in a decimal system, and *10* in a binary system. Thus, for Latin: *duo*, *II*, and *ii* are alternative representations. It is impossible to represent the concept TWO without recourse to the words or symbols of a natural language. With respect to the decimal number system this holds true for English *two* and *2*, but what about the binary number system symbol *10*? It is properly read as *one zero* and certainly not as *ten*. Perhaps an individual person can think about concepts without this linguistic constraint, but that individual is unable to communicate their unconstrained thought to either another human being or to an AI program without recourse to natural language. We could symbolize the

concept TWO or as **two'** or by using any of the symbols above, but every one of these representations is in a natural language (albeit in marked format). Consequently, to be understood by others, concepts are necessarily symbolized using a natural language expression.

3. Alternative models of lexicographic description

The *OED* (https://doi.org/10.1093/OED/9042216684) gives, inter alia. the meaning of *bull* as (1)–(2).

- (1) 'I.1.a. The male of any bovine animal; most commonly applied to the male of the domestic species (*Bos taurus*); also of the buffalo, etc.'
- (2) 'I.2. The male of certain other large animals, as the elephant, alligator, whale, etc.'

There is no regular term for the class of large animals whose males are called *bulls*, females *cows*, and young *calves*, so in Allan 2001 I coined the term **bozine* to label this class of animals. Sense (1) will be cancelled in favor of sense (2) where the animal is contextually specified as proboscid, hippopotamid, giraffid, cetacean, pinniped, crocodilian, etc. rather than a bovine. Allan 2011 proposed that the choice between sense (2) and sense (1) can be captured in (3).

(3)
$$\forall x \begin{bmatrix} \lambda y[BULL(y) \land ANIMAL(y)](x) \rightarrow \lambda z[MALE(z) \land *BOZINE(z)](x) \\ \lambda y[BULL(y) \land ANIMAL(y)](x) +> BOVINE(x); CRED \ge 0.8 \end{bmatrix}$$

In (3) the lambda-operator identifies an individual as having a number of properties jointly; \land symbolizes logical conjunction, +> indicates (defeasible) nonmonotonic inference with a credibility rating greater than or equal to 0.8 on a scale from 0–1 that can be glossed "probably". (3) as a whole can be interpreted "For all *x*s, if *x* is a member of the set of bulls that are animals³ *x* is a male *bozine and probably a bovine".

Three comments are pertinent. First, the semantic metalanguages of the *OED* and Allan 2011 are obviously different. Second, the relative status of (1) compared with (2) is implicit in the *OED* but explicit in (3) (Allan 2011). Third, the credibility rating assigned in (3) was based on intuition and has no statistical backing. Let's begin with the first of these: the lexicographic descriptions in the *OED* use only a slightly modified form of standard English;

³ The listeme *bull* is not always used of animals: it may refer to a papal edict; an iron rod used in the process of blasting; a coin; a constellation; a locomotive; a policeman; a positive state of the stock market; a condemnation.

however, Allan 2011 employs a (quasi-)formal metalanguage with the significant concepts taken from standard English *bull, animal, bovine* plus the non-standard **bozine* to denote the set {bovines, proboscids, hippopotamids, giraffids, cetaceans, pinnipeds, crocodilians}. \forall is based on English *all* (and its counterpart \exists on English *exist*). Although (quasi-)formal languages are valuable under some circumstances, they tend to obfuscate the purpose of lexicographic semantic descriptions; consequently, today I prefer to render (3) in the form of (4).

(4) If *bull* names an animal, then it is probably a male bovine; if not a bovine it is a male proboscid, hippopotamid, giraffid, cetacean, pinniped, or crocodilian.

Note that the initial condition 'If *bull* names an animal' identifies one context for interpretation, 'if not a bovine' identifies a different context (and footnote 3 recognizes yet more potential contexts).

The second and third comments are interdependent because it is the credibility rating of the nonmonotonic inference which makes explicit the relative status of (1) and (2). Allan 2011: 170 sought to formalize such credibility ratings in respect of proposition *p* such that CRED $1 = \Box p$, "it is necessarily true that *p*"; 0.9 = "most probably *p* (is true)"; 0.8 = "probably *p*"; $0.7 = \diamond p$, "*p* is possible"; 0.6 = "perhaps *p* is (just) possible"; 0.5 = "*p* is indeterminable, $(\diamond p \ge 0.5) \ge (\diamond \neg p \le 0.5)$ "; 0.4 = "it is just possible that *p* is false, it is not impossible that *p*"; $0.3 = \diamond \neg p$, "possibly not-*p*"; 0.2 = "*p* is probably false"; 0.1 = "it is almost impossible (very unlikely) that *p*"; CRED $0.0 = \Box \neg p$, "*p* is necessarily false". Because within a lexicon the choice among these ratings is entirely dependent on the context of the listeme in a spoken, written or signed utterance, today I prefer a decision procedure (see Section 4) that depends on such contexts, as does – in practice – a lexical entry in the *OED* (and its peers).

4. An exemplary listeme entry for the noun *cup*⁴

I postulate that:

(5) The semantic metalanguage must be at the same time precise, comprehensive, and succinct.

Allan 2020a; b; 2024a criticized the semantics of the English noun listeme *cup* presented in the *OED*, in the work of Bill Labov (Labov 1973), Jerry Katz (Katz 1977), Anna Wierzbicka

⁴ Section 4 is based on Allan 2024a but examples (6) and (7) contain significant revisions to examples (2) and (3) in that publication.

(Wierzbicka 1984), and Cliff Goddard (Goddard 2011) for not adhering to one or more of the necessary conditions in postulate (5). I shall not repeat those criticisms here, but I maintain the claim that the lexicographic description in (6) complies with all the conditions stated in (5). In (6) the basic listeme entry is a networked triple consisting of a formal representation, tagged here $_{f000}$, linked to a morphosyntactic category⁵ which is also linked with the semantic component of the triple, the latter tagged $_{s000}$: e.g. $_{f001}N_{s002}$ (where N=noun). The many possible senses of the listeme *cup* derive from the salient properties of different kinds of denotata specified from the encyclopedic data linked to this listeme. In the model, (6), se000 is a link from the semantic component to the encyclopedic component of the entry. The subscripts (f000, s000, se000) are identity tags comparable with a strong password and, in the model, may be represented by any sequence of symbols so long as they are consistent for every instance. These identity tags model neurons in the wetware.⁶ The commands in the decision procedure, & ("conjunction"), &OR ("inclusive disjunction"), XOR ("exclusive disjunction"), IF ("on condition that"), ELSE ("if not"), ELIF ("else if"), GOTO, OUTPUT, TENABLE ("given the context, this sense is/seems to be applicable to the denotatum" so, OUPUT the data), NEXT ITEM, are constructs that model synapses in the wetware.⁷

(6) f100cup /kAp/ & f100Ns201-204 & s201 "drinking vessel" [context 1]: IF TENABLE, GOTO se201a XOR se201b XOR se201c XOR se201d ELIF s202 "prize" [context 2]: IF TENABLE, GOTO se202 ELIF s203 "garment" [context 3]: IF TENABLE, GOTO se203a XOR se203b ELIF s204 "eukaryote" [context 4]⁸: IF TENABLE, GOTO se204 ELSE OUTPUT 'Inappropriate Listeme' & GOTO NEXT ITEM

 $_{se201a}$ "f100*cup* is a flat-bottomed hollow oblate hemispheroidal drinking vessel, an impermeable physical artefact (entity) with a vertical handle and a container with a capacity of about 250ml, it is a typical Western style cup for containing drinks such as

⁵ I use this phrase to allow that a lexicon might include information on each morpheme of say *anti-dis-establish-ment-arian-ism* and/or on the meaning relations among, for example, *abduce, abduct, adduce, conduce, conduct, deduce, deduct, educe, induce, induct, introduce, produce, reduce, seduce, traduce – and their derived nominals.*

⁶ Neurons are fundamental units of the brain and nervous system; they are cells responsible for receiving sensory input from the external world and for sending commands out. Wetware is the human brain.

⁷ Synapses: each neuron has a few to hundreds of thousands of synaptic connections with other neurons.

⁸ *Eukaryote* is not a well-known term and, in reality, *life form* is more likely, though less accurate.

tea or coffee, that is typically accompanied by a matching saucer", e.g. *a cup of tea, tea cup* [context 1a]: IF TENABLE, OUTPUT & GOTO NEXT ITEM ELSE GOTO se201b

^{se201b} "f100*cup* is a flat-bottomed hollow oblate hemispheroidal drinking vessel, an impermeable physical artefact with a vertical handle and a container with a capacity of about 125ml, it is a typical Western espresso style coffee cup (demitasse) that is often accompanied by a matching saucer", e.g. *4pcs Ceramic Small Coffee Cup* [context 1b]: IF TENABLE, OUTPUT & GOTO NEXT ITEM ELSE GOTO se201c

se201c "f100*cup* is a flat-bottomed hollow oblate hemispheroidal drinking vessel, an impermeable physical artefact, a container with a capacity of about 125 ml, it is a typical Chinese style tea cup and/or a typical Middle-Eastern style tea or coffee cup", e.g. *small kung fu tea cup* [context 1c]: IF TENABLE, OUTPUT & GOTO NEXT ITEM ELSE GOTO se201d

se201d "f100*cup* is a flat-bottomed hollow tapered cylindrical drinking vessel, a container which is an impermeable physical artefact having a diameter less than its depth and made of water-proof paper, plastic, polystyrene, or similar material with a capacity between approximately 250–500ml, it is a throw-away cup that typically lacks a handle and invariably lacks a saucer", e.g. *Uncoated Paper Coffee Cups - Insulated, Disposable, he was using a recycled jam tin as a cup* [context 1d]: IF TENABLE, OUTPUT & GOTO NEXT ITEM

se202 "f100*cup* is an impermeable physical artefact often having a diameter less than its depth offered as a prize for a race or athletic contest", e.g. *Rugby Football League Challenge Cup*: IF TENABLE, OUTPUT & GOTO NEXT ITEM

se203a "f100 *cup* is a hollow hemispheroidal physical artefact of textile fabric that is one of a pair which constitute the principal parts of a brassiere, each cup being shaped to contain and support one of a woman's breasts"⁹, e.g. *cup sizes get larger as the letters go up in the alphabet*: IF TENABLE, OUTPUT & GOTO NEXT ITEM ELSE GOTO se203b

⁹ Like other items of clothing, the configuration of the bra is determined by the configuration of the human body, consequently bra cups are paired, typically connected by a band below that circles the chest.

se203b"f100 *cup* is a hollow oblate hemispheroidal physical artefact worn as a shield by sportsmen to contain and protect male genitals", e.g. *cups are metal inserts that fit inside the jock strap*: IF TENABLE, OUTPUT & GOTO NEXT ITEM

se204"f100*cup* is a hollow oblate hemispheroid that forms the woody seat of a naturally occurring entity that contains an acorn (its cupule), it is an acorn-cup", e.g. *cup-shaped* structure of hardened bracts at the base of an acorn: IF TENABLE, OUTPUT & GOTO NEXT ITEM

Two comments: (i) the assumption in the first paragraph of (6) is that inappropriate use of the listeme halts progress from the lexicon through any of the encyclopedia entries $_{se201a}$ to $_{se204}$; (ii) there exist several more senses of the noun *cup* (see *OED*), so $_{s204}$ is not its last possible sense.

A listeme entry should be a model of semantic interpretation that seeks to identify rather than to simplify the conceptual content of the listeme. Many semanticists and lexicographers (for example Goddard 2011; Weinreich 1962; 1980; Wierzbicka 1972; 1984) would say that 'oblate hemispheroidal' is inappropriate in a lexicon entry because both terms are uncommon in everyday English. This is undoubtedly true, but nevertheless I would claim that because 'flat-bottomed hollow oblate hemispheroidal drinking vessel' is at the same time concise and precise, it is therefore appropriately succinct for this lexicographic semantic description.

We can clearly see the relevance of conceptualizations of what *cup* is. The primary motivation for what has become a standard for drinking cup sizes in $_{se201a} - _{se201d}$ is their functionality as manipulable with a single hand by an adult human being. The typical cup's volume of about 250ml is apparently modelled on the volume of two human hands cupped; the demitasse volume of about 125ml is modelled on the volume of a single cupped human hand. The fact that cups manufactured for human use only approximate the standard cup sizes matches the fact that human hand sizes vary a great deal, with consequent variation in their cupped volume.

There are transferred uses of *cup*: for instance, the sense _{se202} "prize": gives rise to the synecdoche of, for example, a horse race (an event) at which a cup (an entity) is presented, e.g. *The Melbourne Cup* (https://en.wikipedia.org/wiki/Melbourne_Cup). Context readily distinguishes these different interpretations.

With respect to se203a, the motivation for the bra cup metaphor is the cup's function as a breast container which, in turn, determines its configuration. Because a woman's breast is, typically, a hemispheroidal protuberance, the garment designed to contain it is necessarily a

hollow hemispheroid. The English *cup* metaphor is therefore similar to metaphors found in other languages. Compare *bra cup*, Dutch *kopje* [cup] *beha*; Turkish *kup* [bowl] *bedeni* and *kap* [container] *sütyen*, Italian *coppa* [bowl] *del reggiseno*, Polish *rozmiar miseczek* [bowl]; Hungarian *melltartó kosár* [basket]; French *bonnet* [cap] *de soutien-gorge*: all are cognitively motivated, fit for purpose, names; they are not completely arbitrary.

The procedure demonstrated in (6) demonstrates how the model of a listeme entry might work for the audience because it starts from the formal specification and models audience interpretation. A speaker, writer, or signer proceeds from a concept of the denotatum in some such way as is modelled in (7). It is notable that each of se201a, se201b, se201c, se201d is a different context.

(7) IF denotatum x is "drinking vessel" [context]: GOTO se201a XOR se201b XOR se201c XOR se201d

 $_{se201a}$ "*x* is a flat-bottomed hollow oblate hemispheroidal drinking vessel, an impermeable physical artefact (entity) with a vertical handle and a container with a capacity of about 250ml, it is a typical Western style cup for containing drinks such as tea or coffee, that is typically accompanied by a matching saucer" [context 1a]: IF TENABLE, OUTPUT f100**cup** /kAp/ & f100Ns200 & GOTO NEXT ITEM ELSE GOTO se201b

 $_{se201b}$ "*x* is a flat-bottomed hollow oblate hemispheroidal drinking vessel, an impermeable physical artefact with a vertical handle and a container with a capacity of about 125ml, it is a typical Western espresso style coffee cup (demitasse) that is often accompanied by a matching saucer" [context 1b]: IF TENABLE, OUTPUT f100**cup** /kAp/ & f100Ns200 & GOTO NEXT ITEM ELSE GOTO se201c

 $_{se201c}$ "x is a flat-bottomed hollow oblate hemispheroidal drinking vessel, an impermeable physical artefact, a container with a capacity of about 125 ml, it is a typical Chinese style tea cup and/or a typical Middle-Eastern style tea or coffee cup": IF TENABLE, OUTPUT f100**cup** /kAp/ & f100Ns200 & GOTO NEXT ITEM ELSE GOTO se201d

 $_{se201d}$ "*x* is a flat-bottomed hollow tapered cylindrical drinking vessel, a container which is an impermeable physical artefact having a diameter less than its depth and made of water-proof paper, plastic, polystyrene, or similar material with a capacity between approximately 250–500ml, it is a throw-away cup that typically lacks a handle and invariably lacks a saucer": IF TENABLE, OUTPUT $_{f100} \mbox{cup}$ /k_Ap/ & $_{f100} N_{s200}$ & GOTO NEXT ITEM

And so forth.

Reviewing (6)–(7) it is obvious that the satisfaction of any particular condition is pragmatic because it is determined by the context (Allan 2018; 2023; Gernsbacher 1990; Giora 2003; Stalnaker 1978; 2014; and others). Inappropriate conditions may be cognitively evoked but will be suppressed.

5. A lexicon entry for the verb *cup*

The semantics of verbs entail at least minimal contextual reference to one or more nominals, here represented by X and Y. Each such nominal plays a role such as actor or undergoer - to borrow self-explanatory terms from Role and Reference Grammar (Van Valin 2005; Van Valin and LaPolla 1997).

(8) f100**cup** /kAp/ & f100V_{s300} & s300"X_{ACTOR} cups Y_{UNDERGOER} such that X forms Y into a cupshape" [context 0]: IF TENABLE, GOTO se300 ELIF "X_{ACTOR} cups Y_{UNDERGOER} such that X applies a cup or cups to skin" [context 1]: IF TENABLE, GOTO se301 ELSE OUTPUT 'Inappropriate Listeme' & GOTO NEXT ITEM

se300"X_{ACTOR} cups Y_{UNDERGOER} such that X forms Y into a cup-shape for some purpose", e.g. *I cupped a match to let them see my face in a dramatic shadow* (Thomas 1940: 117); *Women feel at peace when they cup their own breasts* (https://nypost.com/2023/ 11/22/health/why-women-love-cupping-their-breasts-according-to-science): IF TENABLE, OUTPUT & GOTO NEXT ITEM

 $_{se301}$ "X_{ACTOR} cups Y_{UNDERGOER} such that X applies a cup or cups to a person's skin (Y) as therapy in order to create suction pulling the skin into the cup to increase blood flow": IF TENABLE, OUTPUT & GOTO NEXT ITEM

In se300 the illustrative quote from Dylan Thomas implies that a hand, Y, was cupped in order to hold a lighted match as the instrument for more dramatically revealing X's face. In the quote from the *New York Post*, woman X's hand or hands Y form a cup-shape. In se301 therapist X applies a glass or plastic cup to person Y's skin.

6. Listeme entries for the noun and verb bitch

Primarily, the noun *bitch* ($_{f500}$ **bitch** /btf/ & $_{f500}N_{s600}$) denotes a female canine. Figurative uses of the noun derive from, perhaps apocryphal, encyclopedic information about female canines,

namely that a bitch in estrus is unconstrainedly willing to mate, and is, therefore, a cause of repugnance to humans. Thus, to insult a person as a *bitch* likens them to a repugnant animal. (Many offensive terms invoke reviled creatures: *louse, mongrel, pig, rat, swine, turkey, vixen, worm*, etc.). *Bitch* affords the added overtone of sexual misconduct, an infamously frequent (and often groundless) denunciation of a woman, cf. *I'm not going to whore for you, you bastard, I'm your sister not your bitch*. As we see in (10), the verb *bitch* ($_{f500}$ **bitch** /bitʃ/ & $_{f500}$ V_{s700}) derives solely from the insulting senses of the corresponding *noun*. Where the abusive noun *bitch* is used contronomynously as an expression of camaraderie or amicable banter¹⁰, antagonistic offence is replaced by the teasing upbeat assertion of agreeable solidarity.

 (9) _{f500}bitch /bitʃ/ & _{f500}N_{s600-602} & _{s600}"dog-like carnivorous animal" [context 0]: IF TENABLE, GOTO _{se600a} XOR _{se600b} ELIF _{s601}"person" [context 1]: IF TENABLE, GOTO _{se601a} XOR _{se601b} ELIF _{s602}"inanimate" [context 2]: IF TENABLE, GOTO _{se602} ELSE OUTPUT 'Inappropriate Listeme' & GOTO NEXT ITEM

se600a"f500bitch is a female of the family Caninae (dogs, dingos, wolves, coyotes, jackals, foxes,¹¹ etc.)" [context a]: IF TENABLE, OUTPUT & GOTO NEXT ITEM, ELSE GOTO se600b

se600b"f500bitch is a female of the family Hyaenidae, tribe Hyaenini (hyenas)"
[context b]: IF TENABLE, OUTPUT & GOTO NEXT ITEM

se601a"f500bitch is a disparaging term usually applied to female persons but occasionally males, as an insult implying the person is confrontational, malicious, or otherwise aggravatingly disagreeable", e.g. *ICE arrested Juanita for calling the Secretary of Homeland Security a bitch*: IF TENABLE, OUTPUT & GOTO NEXT ITEM ELSE GOTO se601b

¹⁰ Whereas, **insult** assails the target with offensively dishonoring or contemptuous speech or action and/or treats the target with scornful abuse or offensive disrespect thus demeaning, affronting or outraging the target by manifest arrogance, scorn, contempt, or insolence, **banter** is a form of competitive verbal play and upmanship which needles an interlocutor with critical observations on their physical appearance, mental ability, character, behavior, beliefs, and/or familial and social relations in circumstances where it is mutually understood that there is no serious attempt to wound or belittle the interlocutor.

¹¹ There needs to be some link noting that a bitch fox is also known as a *vixen*.

{se602}"{f500}*bitch* is a disparaging term applied to some troublesome or unpleasant situation or inanimate object": IF TENABLE, OUTPUT & GOTO NEXT ITEM

(10) f500bitch /bitʃ/ & f500Vs700 & s610 "X_{ACTOR} grumbles or is disparaging about Y_{UNDERGOER}"
 [context 10]: IF TENABLE, GOTO se610 ELIF s611 "X_{ACTOR} spoils Y_{UNDERGOER}" [context 11]: IF TENABLE, GOTO se611 ELSE OUTPUT 'Inappropriate Listeme' & GOTO NEXT ITEM

se610"IF X_{ACTOR} bitches or bitches about Y_{UNDERGOER} then X grumbles or is disparaging about Y & Y is some animate or inanimate thing or situation", e.g. *Don't bitch me* [Y], *buster* [X]; *Feminists* [X] *aren't supposed to bitch about each other* [Y]: IF TENABLE, OUTPUT & GOTO NEXT ITEM

se611"IF X_{ACTOR} bitches Y_{UNDERGOER} then X spoils something [Y] provoking this disparaging complaint", e.g. *Those bozos bitched the job, Sally was broken-hearted*: IF TENABLE, OUTPUT & GOTO NEXT ITEM

(10) is appropriate for a listener or reader, but the speaker or writer acts from the idea to identify the form, as we saw in (7) with respect to the nominal *cup*. Consider the paths to accessing the verb *bitch* suggested in contexts (11) and (12).

- (11) IF X_{ACTOR} is to grumble or disparage Y_{UNDERGOER} & Y is some animate or inanimate thing or situation OUPUT _{f500}bitch /bit f/ & _{f500}V_{s610} & GOTO NEXT ITEM
- (12) IF X_{ACTOR} spoils $Y_{UNDERGOER}$ & Y is some inanimate thing or situation OUPUT f500**bitch** /bitʃ/ & f500V_{s611} & GOTO NEXT ITEM

7. A lexicon entry for and

In the sequence α and β 'and' may conjoin nominals, predicates, adverbials, clauses, sentences, etc. Whatever is felicitously conjoined is grouped together such that there is always some plausible reason for the relevance of ' β ' to ' α ' that gives integrity to α and β . Thus (13) is nonsensical unless it establishes a context for a narrative that reveals a relevant relationship between the two events.

(13) The Prime Minister of Australia was speaking at the UN [α] and it was snowing in Moscow [β]. This relevance factor is called upon in Sue's single word utterance 'And?' in (14) which seeks information on the relevance in context C2 of Jed's prior statement [α], here delivered in his response [β].

(14) Jed: 'I'm quitting my job.' [α]Sue: 'And?'Jed: 'I'm going to travel around Australia.' [β]

A consequence of the relevance condition is that α and β are normally of the same grammatical category, e.g. in (13) and (14) both are clauses, in (16) and (17) both are nominals, in (21) and (22) both are adjectives, and so forth. It follows that the conjunction of nominal and adjective in (15) is rare and therefore explicitly marked.

(15) Donald and couth don't go together, but Donald and narcissistic do.

In the sequence α and β , whatever is denoted by ' α ' is precedent ($\alpha < \beta$) because of context (i) convention (e.g. α and β is idiomatic, and/or α supposedly has higher status than β , and/or α is more familiar than β ; and/or α is formally shorter – has fewer syllables – than β); context (ii) α backgrounds β (α establishes background for/to β); context (iii) α legitimizes β ($\alpha \leq \tau \beta$).

Informationwise, β is added to α , so *and* is additive. Compare the kind of addition in (16), which may be glossed "two is a number and three is (also) a number" with the more blatant mathematical addition in (17) which may be glossed "2+3 = 5; two and three (added) make five".

- (16) Two and three are numbers. [true]
- (17) Two and three are five. [true]

It appears to be the semantics of the predication that indicates the difference, not the conjunction itself, see (18).

(18) Two and two are five. [false]

(18) is false, but there is nothing wrong with the conjunct, because *Two and two are four* is true. It is of course the semantic content of the α and β conjunct that determines the appropriate predication: in (16) the stative predication reveals that a characteristic property of 'three' (being a number) is added to a similar characteristic property of 'two' (also a number) – hence the plural form 'numbers' in the predicate. In (17), it is the semantic content of 'three', namely "3, or THREE (the concept)" that is added to the semantic content of 'two', "2, or TWO", to make or total "5, FIVE". The clue is that the predicate is a rational number and so

are each of α and β . Furthermore, the predicate may be marked as singular in the synonymous yet grammatical *Two and three is five*.

The sequence in (17) follows convention in that 'two' conventionally precedes 'three' and, furthermore, β denotes an increase of some kind on α , see also (19)–(22). Thus, although *Three and two are/is five* is certainly grammatical and sensical, it is marked and unusual: its conjunction is comparable with *sisters and brothers* or *women and men* compared with *brothers and sisters, men and women*. The latter not only has the traditional patriarchal male precedence [α] over female [β] (cf. *Mr and Mrs Bell* versus *Mrs and Mr Bell*) but also the conventional shorter (one syllable) [α] before longer (two syllables) [β].

In (19)–(22) the conjuncts are idiomatic and therefore follow convention, and – as noted previously – β denotes an increase of some kind on α :

- (19) I counted a hundred and one dalmatians.
- (20) Sue measured out one and a half kilos of sugar.
- (21) Harry grew taller and taller. The light got brighter and brighter. The river got deeper and deeper.
- (22) Alice grew smaller and smaller. The light got dimmer and dimmer. The water in the dam got lower and lower

With a diminishing trajectory, as in (22), the β conjunct identifies greater smallness, dimness, lowness. In (19), the integer 'one' [β], "1, ONE" is literally added to the integer "100, ONE HUNDRED". In (20), although it is feasible that there were two events such that Sue first measured out one kilo of sugar and then as a separate action measured out another half kilo of sugar, such a sequence of two events is not justified by (20). However, it is necessarily true that a measurement of one kilo would logically and chronologically precede (exist before) another half kilo was added to total 1½ kg of sugar. There is a similar chronological sequence between α and β in (19), (21), and (22). There is none in (16)–(18) nor in *Men and women have separate changing rooms*. In such conjuncts the precedence of α is not chronological but conventional, as discussed.

Consider (23):

(23) Joe and his wife have a couple of kids.

(23) may be glossed "Joe has a couple of kids with his wife" and it contrasts with the most likely interpretation of *Joe and his sister have a couple of kids* which, excluding the socially

improbable incestuous relationship,¹² would be preferably reported as *Each of Joe and his* sister has a couple of kids. In (23) neither α nor β is a proposition: Joe has a couple of kids and his wife has a couple of kids is not a felicitous paraphrase of (23) because it implies that each of them has a couple of kids with other people, creating a family of six¹³ rather than of four, as in (23).

In (24), it is logically precedent that the existence of the prince is established [α] as background to him being described [β].

(24) There was once a young prince and he was quite ugly.

(24) proves that the sense of English *and* includes logical "&" (or " Λ ") because the truth of (24) depends on the truth of each of α and β : if 'there was once a young prince' is a true proposition and 'he was quite ugly' is also a true proposition then, the complex proposition in (24) is also true. The same kind of proof is also available from (16) and (25)–(28), but not with respect to (17)–(20) and perhaps not (21)–(22) although every instance of English *and* intuitively includes the sense "&" (logical conjunct).

In (25) the implication is that Sue's pregnancy $[\alpha]$ chronologically preceded the marriage $[\beta]$ and perhaps provides cause or reason for it. In (26) the burial $[\alpha]$ occurs earlier than and provides cause for the upcoming meeting of the papal conclave to elect his successor $[\beta]$.

(25) Sue got pregnant and married her boyfriend.

(26) Pope Francis has been buried and the conclave is yet to meet.

In (25) and (26) both α and β are propositions with potential truth values. In (27), stopping crying [α] is a reason to be rewarded with an icecream [β], it must also chronologically precede the reward. In (28), Sam's being underage [α] is a reason for her not to drink alcohol [β].

(27) Stop crying and I'll buy you an icecream.

(28) Sam's underage and shouldn't be drinking.

Once again, both α and β are propositions with potential truth values, confirming that English 'and' has the sense of logical "&".

¹² Which would only be felicitous if reported explicitly as *Joe has a couple of kids with his sister*.

¹³ Each of Joe and his sister has a couple of kids implies two families each of four unless at least one is a single parent.

Reversing the relative sequence of α and β in conjuncts like (25)–(28) is possible but usually requires restatement making the relationship between the conjuncts explicit:

- (25') Sue married her boyfriend after/*and she got pregnant. Sue married her boyfriend and got pregnant, but not in that order.
- (26') The conclave has yet to meet even though/* and Pope Francis has been buried.
- (27') I'll buy you an icecream if/*and you (first) stop crying.
- (28') Sam shouldn't be drinking because she's underage.

Sam shouldn't be drinking and she's underage (if felicitous) seems to yoke together two independent, unrelated propositions, which is why it looks better punctuated as in (28") where Sam's being underage is not offered as a cause for her not drinking, but is simply an additional fact about her.

(28") Sam shouldn't be drinking. And she's underage.

The listeme entry for and is something like (29).

(29) f900and /ænd/ & f900CONJ_{s900} & s900"α & β" &
 se900"β is a relevant addition to α" IF TENABLE, GOTO se901 &OR se902 &OR se903
 &OR se904 ELSE OUTPUT 'Inappropriate Listeme' & GOTO NEXT ITEM

se901"α \prec β by convention because α and β is idiomatic", e.g. a hundred and one, three and a half, Mr and Mrs, slowly and carefully; &OR "α is shorter than β", e.g. Sam's underage and shouldn't be drinking, men and women; &OR "α supposedly has higher status than β", e.g. husband and wife, Lord and Lady Carnarvon, the Prime Minister and Cabinet; &OR "α is more familiar than β", e.g. Joe and his wife, the Pope and some penitent: IF TENABLE, OUTPUT & GOTO NEXT ITEM ELSE GOTO se902

 $_{se902}$ " α backgrounds β ", e.g. Sam's underage and shouldn't be drinking, Joe and his wife, It was snowing and Harry had forgotten his gloves: IF TENABLE, OUTPUT & GOTO NEXT ITEM ELSE GOTO $_{se903}$

 $_{se903}$ " α legitimizes β ", e.g. Jake reached for the switch and turned on the light, Sue got pregnant and married her boyfriend, Eric was driving too fast and hit a tree: IF TENABLE, OUTPUT & GOTO NEXT ITEM ELSE GOTO $_{se904}$

 $_{se904}$ " $\alpha \prec^{T} \beta$ ", e.g. call Sally and ask her to come over, Sue got pregnant and married the father, he struck a match and lit the fire: IF TENABLE, OUTPUT & GOTO NEXT ITEM

8. Summing up

This essay has sought to establish that pragmatics is necessarily integral to the lexicon because the sense of a listeme normally corresponds to a description of the concepts that comprise the salient properties of its typical denotations. Proper interpretation of a listeme normally depends on its context, more particularly, the world (and time) spoken of (the C1 of Allan 2018; 2023), which captures what is said about what at some world and includes assumptions about the author's attitude to what is spoken of and/or to the persons addressed. C1 context is largely recognizable from co-text – a significant reason for the examples of listeme use within entries in the *OED* and similar publications. Each sense of the listeme together with encyclopedic data on its potential denotation identifies relevant contextual information for apt interpretation of the listeme on any occasion of its use.

Semantic metalanguage must be precise, comprehensive, and succinct yet be equivalent to a natural language expression used by the user to identify the conceptual content of the listeme. The lexicographical listeme entries demonstrated in Sections 4–7 model the mental lexicon. The artificial model and the biological mental lexicon are distinct ontological entities: the model portrays but does not clone what goes on in the human mind and/or brain. In the model, a listeme entry is a networked quadruple consisting of a (subscript) tagged formal representation f000F linked via a decision process to a morphosyntactic category M linked with the semantic component S: f000F & f000Ms000 & s000"S". s000 is linked with an encyclopedic component se000. The subscripted tags model neurons in the wetware; commands in the decision procedure are constructs that model synapses in the wetware: &, &OR, XOR, IF, ELSE, ELIF, GOTO, OUTPUT, TENABLE, OUPUT, NEXT ITEM. The model was demonstrated in Sections 4-6 with reference to two nouns, cup and bitch, and the homonymous verbs derived from them. Section 7 demonstrated how the model applies to the conjunction, and. It was shown that encyclopedic information catalogues context for listemes and each sense of a listeme is in part determined by its context, which may necessarily include the functions of syntactic co-constituents. Although most attention was given to the way the model of a listeme entry might work for the audience, examples (7), (11), and (12) suggested the way a speaker, writer, or signer proceeds from a concept of the denotatum to choosing the appropriate form of linguistic expression.

To conclude: pragmatic information is pervasive in the lexicon and integral to its content.

Acknowledgment

This essay celebrates the memory of Jacob Louis Mey (1926–2023). I first encountered Jacob in the flesh at a meeting of the editors of the *Encyclopedia of Languages and Linguistics 2nd Edition* (Brown 2006) where he was conspicuous for claiming that almost every topic was in the purview of pragmatics – for which topic he was the general editor. This was not a power grab by Jacob but rather an expression of his conviction that pragmatics is relevant to all branches of linguistics. Consequently, I presume that Jacob would approve a demonstration that pragmatics is integral to the lexicon even if he disagreed with some parts of my discussion. As a founding editor of the *Journal of Pragmatics*, and more generally, Jacob was always willingly eclectic, scholarly, and generously offered constructive criticism and helpful observations on ideas and papers submitted for his perusal. Peace be upon him.

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