3
A history of semantics

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1 Naming

Human beings name things in their environment. The name helps to distinguish and identify the denotatum (thing named) and is essential to communication with fellow humans about such denotata. (Denotation is the relation between language expressions and things or events in worlds – not just the world we live in, but any world and time that may be spoken of.) Reference is a speaker's use of a language expression in the course of talking about its denotatum (Allan 2014; Strawson 1950). In Plato's *Cratylus* (Plato 1997) c. 385 BCE, Socrates advances the hypothesis that the earliest name-giver selected a name that captures the essence of its denotatum that is in some way iconic (as with onomatopoeic bird names like *cuckoo*). On this hypothesis the meaning of a word would be 'natural' because directly recognizable from the form of the word. Many of the Ancients sought to demonstrate that names are far more descriptive than the facts allow. For example, Socrates in *Cratylus* 406c derives the name Dionusos (god of Bacchanalia) from *didous ton oinon* 'giving wine'. He recognizes the implausibility of such accounts (426b–427b, 434e–435c), but a clear statement that names are symbols that denote by convention is first found some 25 years after *Cratylus* in Aristotle's *On Interpretation* 16a3, 16a20 (Aristotle 1984).

It is generally accepted today that language expressions have meaning by convention, but this invites the question: How does the convention get established? The most acceptable explanation is the Kripke (1972) notion of 'baptism', i.e. the initiation of a name-using practice, which is a variation on a long-established view that a history of conventional usage characterizes the vocabulary in the language and allows successive generations to communicate easily.

Before we leave the matter of proper names, Peter Abelard (1079–1142), Walter Burley (c. 1275–1345), John Stuart Mill (1806–1873), and a handful of today's philosophers believe that proper names and indexicals (determined by the situation of utterance) make 'direct reference'; that is, that they have no semantic content but directly pick out the referent. By contrast, common names refer distributively to individuals, while collectives (*herd*, *pair*) and quantified nominals (*three ducks*) pick out distributively a contingently determined set of individuals. This ignores the fact that in every language most personal proper names identify characteristics of the referent: *Elizabeth* is appropriate to females and not males and is of European origin, *Měi* 美 is appropriate to females only and is of Chinese origin, *Kofi* is of Akan origin and it is appropriate to males not females. So, most proper names

do have a minimal semantics that identifies some basic characteristics of the typical name bearer. However, Frege (1892) was wrong to attribute encyclopaedic information about a particular name bearer (such that Aristotle was the tutor of Alexander) as the semantics of the name. There is still controversy about the status of proper names in linguistic semantics, but the notion that names make direct reference and have no semantic content extinguishes the semantic difference between *Cicero is Cicero* and *Cicero is Tully* which have the same truth value and make identical reference.

2 Realism vs. nominalism

Around 200 CE Alexander of Aphrodisias adopted Aristotle's suggestion (*On Interpretation* 16a3) that the relation of words to their denotata is mediated through the mind, a view championed by Boethius (c. 480–524) as a major influence on the medieval Latin tradition in philosophy. Another contention of Alexander is that universals (*all dogs*, *all coal*) do not exist in reality but only in the mind. Some thoughts derive from real entities, but universals don't, they are mental abstractions: here's a controversy that echoes through the Middle Ages into the modern era. Boethius added a twist of his own by claiming that the mental abstractions derive from reality by application of intelligence, reason, imagination, or the senses.

Peter Abelard (1079–1142) promulgated the doctrine that universals are mere words (*nomina*), i.e. he is a nominalist (see King (2004)). He rejected Boethius' mentalistic criterion for universals on the basis that it could only derive from an aggregation of individuals, yet there could be no prior criterion for such aggregation. According to Abelard, natural kinds are ordained by God and could have been otherwise: frogs could have had reason, men could have been amphibians. He concludes that universality is not a feature of real-world objects, it is merely linguistic: humans speak of similarities that they perceive distributed among individuals referred to using the same noun or verb. Sentences refer to the world and not to someone's understanding of the world, thus *If something is human it is animal* is a truth about the world such that an individual can understand the concept human without previously entertaining the concept that the human is animal. Language is not a medium for the transmission of ideas from one human to another, but conveys information about the world – a position taken up later by Gottfried Leibniz (1646–1716) and Noam Chomsky (b. 1928, see Chomsky 1975). Abelard recognized that true entailments necessarily follow from true premises. *If Socrates is a human being then Socrates is an animal* is necessarily true since 'whatever the species is predicated of, so too is the genus' (Rijk 1970: 323).

William of Ockham (c. 1285–1349) identified two kinds of signification: 'primary', which allows for correct reference, and 'secondary', which applies to predicates that denote their nominal counterparts, for instance *brave* denotes bravery. There was also *suppositio* 'supposition', which identifies what kinds of reference are made by the speaker using the nominals within a proposition and consequently figure in the statement of truth conditions. For Ockham, as for Abelard, mental language is primary, spoken language secondary, written language tertiary. The truth of a proposition and true synonymy are defined only for mental language (see Spade 2002). On universals Ockham was a nominalist who began with ideas similar to Abelard, but came to believe that universals simply predicate something of many individuals; thus he recast the universal *all men are animal* in terms of a particular: *if something is a man, it is animal* (a move directly echoed in Discourse Representation Theory, Kamp 1981). The medieval view was that 'understanding is of universals, but sense-data derive from particulars' (Spade 2002: 162). For Abelard and Thomas Aquinas (1225–1274), knowledge

was the effect of sense-data (*species*) transmitted from entity to mind, but Ockham rejected this on the ground that universals would necessarily have to exist in the entities, which is impossible because everything but God is contingent.

Walter Burley/Burleigh (c. 1275–1345) was a realist critical of Ockham's nominalism. For Burley semantic distinctions derive from ontological differences between the entities denoted. Individuals are the *significata* of singular names and universals are the *significata* of general names. *Man* applies as a general term to all men because it denotes the universal *humanity* that is present in and essential to each man in the real world. *Humanity* has no extension distinct from that of *man*. (The extension of a language expression designates something that exists in a particular world.) After 1324, Burley no longer claimed that universals are constitutive parts of the individuals of which they are predicated, though they do reveal the substantial nature of the particular. Each particular is a token for a universal such that the extension of a general name is a set of such particulars. Propositions are the creation of cognitive acts; they relate to the real world by combining the things to which their constituents refer. The truth of *man is animal* is a fact about the real world because the denotata of *man* and *animal* exist in the real world. In *De puritate artis logicae* 1324–8 Burley discusses the difference between *Twice you ate a loaf of bread* in which 'loaf of bread' refers to two loaves fused for this mode of expression and the fallacious *A loaf of bread you ate twice*, which refers to a particular loaf that cannot be eaten twice (Burley 2000: §93). Today, the first of these would be dealt with in event-based semantics (see below). Burley noticed problems with sentences such as *Every man who has a donkey sees it* (Burley 2000: §130–32; Seuren 2006; Geach 1968; Kamp 1981; Groenendijk and Stokhof 1991). As Burley points out, a man who owns two donkeys might see only one of them, thus allowing for the truth of *some man who has a donkey doesn't see it* leading to the contradictory consequence *therefore some man who has a donkey is not a man who has a donkey*. Clearly something here needs to be explained. I return to the modern treatment of the semantics of donkey sentences later.

John Locke (1632–1704) in his *Essay Concerning Humane Understanding* reiterated the notion that language is conventional, disclaiming any inherent or necessary link between a word and its denotatum (Locke 1700: III.ii.1). 'Ideas' provide the mind with representations of objective qualities of objects (such as size, shape, or weight) and also secondary qualities such as colour, taste, or smell which are subjective (*ibid.* Book II). To understand thinking and knowing one must understand language as the means of thought and communication (Book III). Locke claimed that words only mean what they are understood to mean; consequently, usage must be the sole arbiter of meaning (III.ii.2). Linguistic forms represent the ideas of things and not the things themselves (III.ii.5). Sometimes words are used even when there are no ideas corresponding to them as with generic terms and universals – which Locke suggests are creations of the mind, through abstraction; they denote 'nominal essences'. Like Alexander of Aphrodisias, Abelard, Ockham, and Thomas Hobbes (1588–1679) before him, Locke was a nominalist (Locke 1700: III.iii.11f). Locke's views on universals (and many other things) were challenged in Leibniz's *Nouveaux Essais sur l'entendement humain* (Leibniz 1981 [1765]).

3 The earliest forays into lexical semantics

In the Western Classical Tradition of linguistics (see Allan (2010)), lexical semantics began with etymologies and glossaries of literary works that gave way to word lists with attributed meanings (both monolingual and bilingual) resembling modern dictionaries. The *Lexeis* ('Glossary') of Aristophanes of Byzantium (c. 257–180 BCE) offered glossaries of poets and dramatists (Aristophanes of Byzantium 1986). The most celebrated Renaissance dictionary

was Ambrogio Calepino's (c. 1450–1510) *Cornucopiæ* first published in 1502. A milestone in modern lexicography was Samuel Johnson (1755). Today, the application of lexicographical techniques to digitized corpora has revolutionized lexicography (see Hanks (2013)). However, attempts at the systematic representation of dictionary meanings by e.g. Russian lexicographers Jurij Apresjan (2000) and Igor Mel'cuk (1984–1991) in terms of semantic primitives have not been widely adopted.

The interesting aspect of ancient etymologies like Isidore of Seville's *Etymologiae* (Isidore 1850) is that, unlike etymologists since Ménage (1650) who seek to map the diachronic development of the meanings and forms of the word, the ancients sought to explain the meaning of the word in terms of its perceived component forms (Robins 1997: 27). They assumed that knowledge is embodied in word meanings and can be elucidated via reference to the original meaning; hence the original forms and meanings of words in what would today be called the proto-language were, supposedly, finessed. Although the explanations in ancient etymologies are most often faulty, they do focus attention on the meaning of the word and on the existence of lexical networks based partly on the semantic relations among listemes (language expressions whose meaning is not determinable from the meanings – if any – of their constituent forms but which have to be memorized as a combination of form and meaning). Today's version of such lexical relations is the wordnet; see www.globalwordnet.org.

Modern use of the term *semantics* stems from an article by Michel Bréal (1832–1915) in which he defined it as 'the science of significations' (Bréal 1883: 133). The term gained much wider currency with the publication of *Essai de sémantique: Science de significations* (Bréal 1897) translated as *Semantics: Studies in the Science of Meaning* (Bréal 1900). He regarded semantics as an essential but neglected part of linguistic study. A hearer 'goes straight to the thought behind a word' modulating the sense (decontextualized meaning) so as to capture the intention of the speaker (*ibid.* 107). Bréal agreed with William Whitney (1875: 87) that speakers understand language without recourse to etymology; so, the search for mythical 'true meaning' gave way to a search for the patterns and causes of semantic change. Words are signs of thoughts, and meanings change in line with speakers' needs to communicate; cf. Whitney (1867: 20). Old words are used in new contexts, and thereby their meanings subtly change: the 'customary office of a word [is] to cover, not a point, but a territory, and a territory that is irregular, heterogeneous, and variable' (Whitney 1875: 110). This opens the way for prototype and stereotype semantics (see below). For Bréal, semantic change has to be studied with an eye to the contexts and uses of terms in former times. The system operates through rational inference. He was unusual in looking not only at lexical meaning but also language functions (Bréal 1897: 189). Like Hermann Paul, whose *Prinzipien* Bréal (*ibid*. 307) was praised for its contribution to semantics, Bréal sees the multiple meanings in decontextualized language reducing to one meaning or 'valeur' in reference. The use of *value* by Whitney and Bréal is tied to referential import, whereas Saussure (1916) uses the term to mean 'differential value' within the semantic field as part of the language system. For Bréal, language doesn't merely describe or narrate; it is used in a variety of what today would mostly be called illocutionary functions (commanding, taking possession, persuading, pleasing, promising, questioning, and exclaiming).

4 Componential analysis

In the seventeenth century there were many attempts to identify a 'philosophical language' common to all mankind (Lodwick 1972 [1647–1686]; Dalgarno 1661; Wilkins 1668; Leibniz

1765). These prefigure twentieth-century proposals for universally applicable semantic primitives and the notion of componential analysis, which seeks to identify the sense of a listeme in terms of one or more semantic components. The principal means of accomplishing this has been through the structuralist method of contrastive distributional analysis (see Chapter 12), though there is no consistent one-to-one correlation between semantic components and the morph(eme)s of any language. Listemes that share semantic components are semantically related. Semantic components reflect the characteristics of typical denotata, hence there is a hierarchy of semantic components which corresponds to perceived hierarchies among denotata. For instance, FELINE is a semantic component of *cat* and entails the semantic component ANIMAL which is also, therefore, a component of *cat*. This suggests a thesaurus-like structure for semantic components. It follows that the set of semantic components for a language can be discovered by identifying all the relationships that can be conceived of among the denotata of listemes. In practice, this could be everything in all worlds, actual and non-actual. There have been numerous attempts to carry out such a task; among the most successful was *An Essay Toward a Real Character and a Philosophical Language* (Wilkins 1668) although this had no demonstrable influence on twentieth-century componential analysis. Since the nineteenth century, anthropologists had been comparing widely differing kinship systems in culturally distinct societies by interpreting them in terms of universal constituents that equate to semantic components (see Kroeber (1909)). Two of the earliest articles in the componential analysis of meaning, Lounsbury (1956) and Goodenough (1956), appeared consecutively in the same issue of the journal *Language* and both were analyses of kin terms. They showed that semantic analysis could be carried out using approved methods of structural analysis, similar to those used to filter out the phonetic components of the Sanskrit stop phonemes. For instance, Lounsbury's paper begins with a comparison of Spanish and English kin terms: *ti-o*, *hij-o*, *abuel-o*, *herman-o* ('uncle', 'son', 'grandfather', 'brother') vs. *ti-a*, *hij-a*, *abuel-a*, *herman-a* ('aunt', 'daughter', 'grandmother', 'sister'). English has no gender morphs corresponding to the Spanish suffixes *-o* and *-a*, but gender is nonetheless a significant component in the meaning of the English kin terms. Their covert gender must be compatible with the sex of the person denoted; consequently, it is anomalous to call one's uncle *aunt*, or one's sister *brother*. Hence, too, the anomaly of **My brother is pregnant*. And when the terms *aunt* and *uncle* are extended as terms of respect to an older generation, they are assigned according to the sex of the referent. There are syntactic consequences: the personal pronoun anaphoric to *uncle* is *he/him*; the one for *aunt* is *she/her*. *Father*, *uncle*, and *aunt* have in common that they are FIRST_ASCENDING_GENERATION. *Father* and *uncle* additionally have in common that both are MALE, whereas *aunt* is FEMALE. *Aunt* and *uncle* are both COLLATERAL, whereas *father* is LINEAL. The meaning relationships between *father*, *uncle*, and *aunt* can be seen from the semantic components identified.

Componential analysis in semantics was influenced by the adaption of distinctive feature analysis based on the methodology of Prague school phonology to morphosyntax. Roman Jakobson (1936) identified the distinctive 'conceptual' features of each case in Russian. Zellig Harris (1948) analysed the verb paradigm of Hebrew using the categories of tense, person, and gender on a distributional basis that corresponds to Jakobson's analysis in terms of conceptual features. A third strand in the development of componential analysis was semantic field theory. The semantic field of a listeme is determined from the conceptual field in which its denotatum occurs; its structure is the structure of the conceptual field. The notion of semantic field is found in Humboldt (1836) and it was later developed by Trier (1931), Porzig (1950), Weisgerber (1950), and Geckeler (1971). In *Structural Semantics*, Lyons (1963) examined the meanings that can be ascribed to words such as *téchnē* 'skill',

epistḗmē 'knowledge', *sophía* 'wisdom', *aretḗ* 'virtue', etc. in the semantic fields of knowledge and skill in Plato's works. Lyons was motivated by Trier's survey of the shifting field of High German *wîsheit*, *kunst*, and *list* but unlike Trier's subjective speculations, Lyons presents a rigorous analysis using techniques derived from works such as Saussure (1916), Harris (1951), and Chomsky (1957). Few scholars have undertaken extensive analysis of a semantic field, but Bendix (1966) analysed the field of *have* and its counterparts in Hindi and Japanese, Lehrer (1974) analysed the fields of cooking and sound, and Backhouse (1994) is an extensive study of taste terms in Japanese. A conceptual field such as colour, kinship, or cooking terms is covered by a number of listemes in a language, each denoting a part of the field. Different languages, and at different times in history any one language, may divide the field differently among listemes. The differential value (Saussure's 'valeur') of a listeme is that part of the conceptual field that it denotes in contrast with the part denoted by other listemes in the same semantic field. To generalize: when new objects and new ways of doing things come into existence there is a change in the conceptual field that leads to a change in the semantic field resulting from the adding of listemes or the semantic extension of existing ones. Seemingly closed fields such as case inflexions or kin terms should permit exhaustive componential analysis in which every term within the field is characterized by a unique subset of the universal set of semantic components defining the field. However, these systems invariably leak into other fields when meaning extensions and figurative usage are considered. Furthermore, an exhaustive componential analysis of the entire vocabulary of a language is probably unachievable, because it proves impossible to define the boundaries, and hence all the components, of every field.

Semantic primes and their interpretations constitute the vocabulary of the semantic metalanguage. We may suppose that semantic components are composed from semantic primes, but what are these primes and how many are there? A semantic prime is reminiscent of Morris Swadesh's 'basic vocabulary' created to plot diachronic relationships between unwritten languages. It consists of names for things common to the experience of all human communities: the sun, human body parts and functions, etc. (Swadesh 1955).

Proponents of Natural Semantic Metalanguage (NSM) believe that semantic primes (originally named *primitives*) and their elementary syntax exist as a minimal subset of ordinary natural language (Goddard 1994: 10). Seventeenth-century seekers after a universal language including Lodwick (1652), Dalgarno (1661), and Wilkins (1668) had proposed primitive semantic components. Arnauld and Nicole (1996 [1662]) recognized that the meanings of most words can be defined in terms of others, but that ultimately there are some undefinable semantically primitive words. Uriel Weinreich (1962: 36) identified a discovery procedure for a semantic metalanguage built upon natural language. The idea was to stratify the language into (a) a central core of semantic primes whose members are definable only circularly and by ostensive definition such as 'colour of the sky' in the entry for *blue*. (b) The next stratum out uses items whose definitions contain only core items without (further) circularity. (c) Each more peripheral stratum uses items from the preceding strata without circularity. Anna Wierzbicka has been carrying out this programme in a cross-language context since 1972, searching for a universal set of semantic primes expressed principally through the vocabulary of English, but also other languages. The number of semantic primes has grown from 14 in Wierzbicka (1972) to 63 in Goddard (2009).

It is important to consider the playoff between the effectiveness of a semantic definition and its accuracy. This requires that the purpose of the semantic analysis be identified. For whom or what is the resulting semantic specification designed? NSM semantic definitions are not designed to be used by machines that simulate language understanding; they are

intended to be easily accessible to a non-native speaker of the language. But every such person will already know what, say, a cup is, so a brief description would be sufficient (see Cruse (1990: 396); Allan (2001: 280f)).

Componential semantics presupposes a checklist of properties to be satisfied for the correct use of the decomposed expression (Fillmore 1975: 123). For example, the default denotatum of *bird* is bipedal, has feathers, and is capable of flight. But there are several species of flightless birds (e.g. emus, penguins); a downy chick and a plucked chicken are featherless, but nonetheless birds; and a one-legged owl and a mutant three-legged hen are also birds. So the notion of a checklist of essential properties for the denotatum is problematical (see Chapter 12). Prototype and stereotype semantics are alternatives to checklist theories of meaning.

5 Prototype and stereotype semantics

The prototype hypothesis is that some denotata are better exemplars of the meaning of a lexeme than others, therefore members of the category denoted by the lexeme are graded with respect to one another. For example, a bird that flies, such as a pigeon, is a better exemplar of the category of birds than a penguin, which doesn't (see Chapter 7).

How are prototypes discovered? Battig and Montague (1969) asked subjects to list as many vegetables, or fruits, or diseases, or toys, etc. as they could in 30 seconds. They hypothesized that the most salient members in each category would be (a) frequently listed and (b) high on the list. They found, for instance, that a carrot is the prototype for vegetable, i.e. the best exemplar of the category because it was listed frequently and early. A tomato belongs to two categories: it is a vegetable in folk belief and technically a fruit. On the Battig and Montague scale, a tomato ranked 6th as a vegetable and 15th as a fruit. George Lakoff (1972) interprets such rankings in terms of fuzzy sets of objects with a continuum of grades of category membership between 0.0 and 1.0. The carrot is the best instance with a value 1.0, a tomato has the value 0.68 (and 0.14 membership in the fuzzy set 'Fruit'), and a pickle is graded only 0.006 of 'Vegetable'. Any entity assigned a value greater than 0.0 is a member of the category, i.e. the pickle is a vegetable no less than the carrot. What the fuzzy set membership value indicates is how good or bad an exemplar of the category a certain population of speakers perceives that entity to be. A tomato is vegetable-like because it is eaten, often with other vegetables, as part of an hors d'oeuvre or main course. It is not eaten, alone or with other fruits, for dessert. A tomato is fruit-like because it grows as a fruit well above the ground and not on or below it. Also, it is often eaten raw and the extracted juice is drunk like fruit juices. It is our practice of eating tomatoes as if they are vegetables rather than fruit that explains their relative ranking in each category (see Chapter 7).

Eleanor Rosch carried out a series of experiments on prototype semantics summarized in Rosch (1978). Rosch (1973) found that the common cold is a very poor exemplar of 'Disease' – which conflicts with the Battig and Montague finding. The discrepancy between the two findings is explained by the fact that Rosch gave her subjects only six diseases to rank (cancer, measles, malaria, muscular dystrophy, rheumatism, cold) and a cold is the mildest of them. Obviously, establishing the prototype depends upon the experiences and beliefs of the population investigated. Consequently, the claimed prototypicality ranking is valid for the community surveyed, but not for all speakers of the language, or even the same subjects on a different occasion.

Ludwig Wittgenstein (1953: §§66–71) wrote of some categories being defined not by a checklist of properties but by 'family resemblances'. George Lakoff (1987) adopted this notion into prototype theory identifying chains of similarities among members of a category. Take the example of the word *mother* and the category 'Mother'. The prototypical mother

is the woman who produces the ovum, conceives, gestates, gives birth to and then nurtures a child (giving rise to the traditional definition of *mother*). Radiating from this are more peripheral attributes of a *mother*. The natural or biological mother produces the ovum, conceives, gestates, and gives birth to the child. The genetic or donor mother supplies the ovum to a surrogate mother in whose womb the genetic mother's ovum is implanted and in whose body the foetus develops through to birth. The nurturant mother may be the genetic mother, a surrogate mother, adoptive mother, or foster mother. In addition there is a *stepmother*, a *mother-in-law*, while polygamous societies and other social systems offer additional complexities. Figurative extensions arise: e.g. the prototypical or natural mother is the source for *necessity is the mother of invention*. There is a set of identifiable resemblances among these uses and meanings of the word *mother*, but no set of properties common to all of them. Some extended meanings are figurative (e.g. *mother superior*), and a very important development in late twentieth-century studies of meaning was the general acceptance, following Lakoff and Johnson (1980), that metaphor and metonymy are all-pervasive in language and not clearly demarcated from 'literal' meaning.

Hilary Putnam (1975) proposed a stereotype semantics such that the meaning of a language expression is a minimum set of stereotypical facts constituting a mental image, mental construct, or Gestalt with the attributes of the typical denotatum, including pragmatic connotations (see Allan (2007)). Putnam expressly allows for experts to have considerably more knowledge at their command than their fellows – which raises the question: Do the words *elm* and *beech* have the same stereotype and meaning for a botanist as they do for an inner-city dweller who can't distinguish an elm from a beech? Presumably not. However, if the botanist were to point out and name an elm, the inner-city dweller would know that referent is not a beech, even if s/he could still not recognize another elm thereafter.

How is 'a (stereo-)typical denotatum of *e*' distinguishable from 'as-good-an-exemplar-as-can-be-found among the class of things denoted by *e*'? Presumably, the stereotype properly includes the prototype. For instance, whatever the stereotype of *vegetable* may be, it properly includes the prototype carrot and the peripheral onion. The stereotypical *vehicle* includes the prototypical car and/or bus together with the peripheral horse-drawn wagon. We should, therefore, favour the stereotype in giving the semantics of language expressions, despite the fact that most adherents to prototype semantics often incorrectly subsume stereotype semantics and ignore Putnam.

6 Frame semantics

Frames (Goffman 1974; Fillmore 1982) identify the characteristic features, attributes, and functions of a denotatum, and its characteristic interactions with things necessarily or typically associated with it. For example, a restaurant is a public eating-place; its attributes are: (1) business premises where, in exchange for payment, food is served to be eaten on the premises; consequently, (2) a restaurant has a kitchen for food preparation, and tables and chairs to accommodate customers during their meal. Barsalou (1992: 28) describes attributes as slots in the frame that are to be filled with the appropriate values. The frame for *people* registers the fact that people have the attributes of age and sex. The attribute sex has the values male and female. It can be represented formally by a function BE_SEXED applied to the domain D={x:x is a person} to yield a value from the set {male, female}. The function BE_AGED applies to the same domain to yield a value from a much larger set. Knowledge of frames is called upon in the proper use of language. Attributes for events include participants, location, and time of occurrence, e.g. the verb *buy* has slots for the attributes

buyer, seller, merchandise, payment: these give rise to the thematic structure (valencies, case frames) of the verb (see Chapter 23). An act of buying occurs in a certain place at a certain time (a world~time pair with values relevant to evaluation of truth, see below). The 'lexical semantic structures' of Pustejovsky (1995) can, hypothetically, systematically describe semantic frames for every listeme. To sum up, frames provide a structured background derived from experience, beliefs, or practices, constituting a conceptual prerequisite for understanding meaning. The meaning of a language expression relies on the frames, and it is these that relate listemes one to another.

7 Semantics within syntactic structures

Most semantic relations extend beyond listemes to the syntactic structures that combine them. Although the semantics of propositions has been considered within philosophy since Plato, Aristotle, and the Stoics, the first step within linguistics was undertaken by a philosopher, Jerrold J. Katz and a cognitive scientist, Jerry A. Fodor in Katz and Fodor (1963) 'Structure of a semantic theory'. It was Katz who was largely responsible for establishing semantic theory as one component of a transformational generative grammar. The principal semantic component was the 'semantic marker', which names a concept that any human being can conceive of; hence, the theory is applicable to all natural languages (Katz 1967, 1972).

Katz sought to establish a theory of meaning (sense) that would do all of the following: define what it is; define the form of lexical entries; relate semantics to syntax and phonology by postulating semantic theory as an integral component of a theory of grammar; establish a metalanguage in which semantic representations, properties, and relations are expressed; ensure the metalanguage is universal by correlating it with the human ability to conceptualize; identify the components of meaning and show how they combine to project meaning onto structurally complex expressions. Essentially, these are goals that should be met by any semantic theory – though what is meant by 'component of meaning' and the integration of semantics with phonology and syntax may be radically different within different theories. Missing from Katz's conditions is the requirement that the meaning of language expressions needs to be related to the real and imaginary worlds people speak and write of. Furthermore, Katz's theory offered no account of utterance or speaker meaning.

Katz's semantic theory is interpretative. The earliest version was geared to the syntactic model of Chomsky (1957) and was fatally flawed (see Bolinger (1965); Weinreich (1966)). In later versions Katz's theory was designed to assign meanings to the output of autonomous syntactic rules of a transformational generative grammar of the kind described in Chomsky (1965) but he never updated it to accommodate later developments in generative syntax. Nor did Katz ever validate the vocabulary and syntax of his theory, and we can only learn to interpret his metalanguage by abduction from his examples, among which there is little consistency, and so his semantic markers remain only partially comprehensible. There were at least five differently structured semantic readings for *chase* given by Katz himself (Katz 1966, 1967, 1972, 1977b; Katz and Nagel 1974) and an additional two in Janet Fodor (1977) (see Allan (1986) for extensive discussion). We can interpret Katz's semantic markers for *chase*, for instance, because they use English words whose meanings we combine to match up with our existing knowledge of its meaning (something like *X is quickly following the moving object Y with the intention of catching it*). Katz has claimed (as have others) that the English used in the semantic metalanguage is not English, which is used only as a mnemonic device. However, the only way to make any sense of the metalanguage is to translate it into a natural language. That is why analysing *bachelor* into {(Human), (Adult), (Male), (Single)},

as did Katz and Nagel (1974: 324), is a more enlightening semantic analysis than, say, {(48), (41), (4D), (53)}. Formalism, especially unconventional formalism, can only be justified if it increases explicitness of statement and rigour of analysis, and promotes clarity of expression.

Katz's semantic theory was the first to try to comprehensively integrate linguistic semantics with syntax. Logicians had taken steps in this direction since the Stoic period, and Prague school linguists had studied aspects of functional sentence perspective a decade or so earlier but, in spite of its shortcomings, Katz's conception of the syntax~semantics interface was far more wide-ranging and influential, and it did identify the parameters that other theories needed to engage with. A major limitation was the absence of any proper treatment of pragmatics and no obvious extension beyond sentences to texts. These faults are also to be found in most of its rivals.

8 Alternatives to Katzian semantics

Noam Chomsky was educated in the Bloomfieldian school that eschewed semantic theory as speculative subjectivism. For him semantics was at best an add-on for the syntactic base, a position affirmed by Katz and later by Ray Jackendoff. The *Aspects* theory developed in Chomsky (1965) had a level of deep structure at which the meaning of each sentence constituent was syntactically specified and the meaning 'projected' upwards through nodes in the phrase marker to semantically interpret the sentence. Deep structure was separate from a level of surface structure at which the form of the sentence (as used in everyday utterance) was specified. This conception of grammar leads naturally to the view that pairs of formally distinct but semantically equivalent expressions arise from the same deep structure by different transformations, e.g. (a) *X caused Y to die* and *X killed Y* or (b) *X reminds me of Y* and *X strikes me as similar to Y* or (c) *my mother* and *the woman who bore me*. In generative semantics (the term was first used by Lakoff in 1963 [Lakoff (1976)], the earliest published use is Bendix (1966: 12)), the initial structures in a grammar are semantic rather than solely syntactic. It grew directly from reaction to the 'standard theory' of Katz and Postal (1964) and Chomsky (1965) with its emphasis on syntactic justification. Lakoff (1965), originally conceived as an extension of standard theory, postulates phrase markers that terminate in feature bundles like those in *Aspects*; Lakoff differs from Chomsky in proposing that listemes be inserted into only some terminal nodes, the rest functioning as well-formedness conditions on lexical insertion and semantic interpretation, which preceded other transformations. Gruber (1965) contains lexical structures that have most of the syntactic characteristics of standard theory trees, but some terminal nodes are semantic components. Some transformations operate prior to lexical insertion. For instance, from the prelexical structure VP[V[MOTIONAL, POSITIONAL] PrepP[Prep[ACROSS] . . .]], lexical insertion will put either the verb *go* under the V node and the lexeme *across* under the Prep node, or alternatively map the single verb *cross* into a combination of both the V and Prep nodes. The latter was a radical innovation: because semantic interpretation is made before transformations such as passive apply, semantics and syntax are interdependent. A similar conclusion was reached in Postal (1966, 1970, 1972) and Lakoff and Ross (1976 [1967]). Weinreich (1966) and McCawley (1968a) showed that lexical insertion is semantically governed and that syntactic structure is merely the skeleton for semantics. Thus, in generative semantics, initial symbols represent semantic components set into structures that are a hybrid of predicate logic and natural language syntax – both well-established conventional systems. These structures could be rearranged in various ways by transformations before lexical forms were mapped onto them. Meaning is determined directly from the initial semantic structure.

9 Conceptual semantics

For Ray S. Jackendoff, semantics is a part of conceptual structure in which linguistic, sensory, and motor information are compatible (see Jackendoff (1983, 2007)). Jackendoff, although not subscribing to prototype or stereotype semantics, believes that word meaning is a large, heterogeneous collection of typicality conditions (i.e. what's most likely the case, such as that a bird typically flies) with no sharp distinction between lexicon and encyclopaedia. According to Jackendoff, every content-bearing major phrasal constituent of a sentence corresponds to a conceptual constituent. S expresses STATE or EVENT. NP can express almost any conceptual category. PP expresses PLACE, PATH, and PROPERTY. Jackendoff is principally interested in the semantic structure of verbs, with a secondary interest in function-argument structures in the spatial domain. He makes no attempt to decompose nouns semantically, treating them as semantic primitives. In his view, only kin terms and geometric figures admit of satisfactory semantic decomposition. By contrast, he finds that verbs decompose into comparatively few classes (as also in Role and Reference Grammar, see Van Valin (1993, 2005)).

Jackendoff's vocabulary of semantic primitives is very much larger than the set used by NSM researchers (see above). The syntax of his lexical conceptual structure (LCS) is a configuration of functions ranging over arguments. For instance,

(1) *Bill drank the beer* $[_{\text{Event}}\text{CAUSE}([_{\text{Thing}}\text{BILL}]^{\alpha}_{\text{A-actor}}, [_{\text{Event}}\text{GO}([_{\text{Thing-liquid}}\text{BEER}]_{\text{A-theme}}, [_{\text{Path}}\text{TO}([_{\text{Place}}\text{IN}([_{\text{Thing}}\text{MOUTH OF}([_{\text{Thing}}\alpha])])])])])]$

Conceptual semantics shows that a semantic decomposition of verbs making extensive use of just a few primitives is a feasible project. The syntax of LCS is a function-argument structure similar to that of predicate calculus, so that someone acquainted with predicate calculus can construct a lexical conceptual structure despite the fact that Jackendoff does not employ standard logical formulae. Although LCS makes no use of logical connectives, some of the more complex formulae imply conjunction between the function-argument structures in a lexical conceptual structure. There are a score of primitive verbs so far identified, so although the set of functions is restricted, the vocabulary of primitive arguments is unbounded. Conceptual semantics integrates with a version of Chomskyan syntactic theory.

10 The importance of truth conditions

Donald Davidson (1967b: 310) said that 'to give truth conditions is a way of giving the meaning of a sentence'. Truth is dependent on worlds and times: *Marilyn Monroe would have been 74 on June 1, 2000* is true (she was born June 1, 1926). McCawley (1968a, b) was one of the first linguists to adopt and adapt truth conditions and predicate logic into grammar (see McCawley (1993 [1981])). The importance of truth conditions had often been overlooked by linguists, especially those focusing on lexical semantics. Hjelmslev (1943), Lyons (1968), and Lehrer (1974) all suggest that the nine listemes *bull*, *calf*, *cow*, *ewe*, *foal*, *lamb*, *mare*, *ram*, *stallion* – which constitute a fragment of a semantic field – can be contrasted with one another in such a way as to reveal the semantic components in Table 3.1.

The basis for claiming that BOVINE or MALE is a semantic component of *bull* cannot be a matter merely of language. It is a relation speakers believe exists between the denotata of the terms *bull* and *male* and *bovine* (i.e. things in a world that these terms may be felicitously used to refer to). Doing semantic analysis of listemes, it is not enough to claim that (2) is

Table 3.1 A componential table

BOVINE	*bull*	*cow*	*calf*
EQUINE	*stallion*	*mare*	*foal*
OVINE	*ram*	*ewe*	*lamb*
	MALE	FEMALE	YOUNG
	ADULT		

linguistic evidence for the claim that MALE is a semantic component of *bull*, because (3) is equally good until a basis for the semantic anomaly has been established that is independent of what we are seeking to establish – namely the justification for the semantic components identified in Table 3.1.

(2) A bull is male.
(3) A bull is female.

The only language-independent device available is an appeal to truth conditions, and this takes us to the denotata of *bull* and *male*. In fact what we need to say is something like (4).

(4) In every admissible possible world and time an entity which is a bull is male and in no such world is an entity which is a bull a female.

Note that the semantic component MALE of Table 3.1 must be equivalent to the relevant sense of the English word *male*. Thus, the assumption is that semantic components reflect characteristics of typical denotata as revealed through their intensions across worlds and times. In any case, they provide the justification for postulating the semantic components in Table 3.1 as a set of inferences such as those in (5).

(5) For any entity x that is properly called a *bull*, it is the case that x is adult and x is male and x is bovine.

In fact it is not part of a general semantic characterization of *bull* that it typically denotes adults; one can, without contradiction, refer to a *bull calf*. Rather, it is part of the general naming practice for complementary sets of male and female animals. Nor is *bull* restricted to bovines; it is also used of male elephants, male whales, male seals, male alligators, etc. The initial plausibility of Table 3.1 and (5) is because it describes the (stereo)typical bull. The world of the English speaker is such that *bull* is much more likely to denote a bovine than any other species of animal, which is why *bull elephant* is usual, but *bull bovine* is not. This reduces (5) to something more like (6).

(6) For any entity x that is properly called a *bull*, it is the case that x is male and probably bovine.

What is uncovered here is that even lexical semantics is necessarily dependent on truth conditions together with pragmatically probable conditions (see Chapter 1).

11 The development of formal semantics

Charles Sanders Peirce (1839–1914) is celebrated for being a founder of pragmatics, but he also made extensive and highly original contributions to mathematical logic. He introduced into logic the material-conditional operator and operators like NAND and NOR. Peirce (1870) invented the notion of a variable and a syntax for the logic of relations of arbitrary adicity. By 1883 he had developed a syntax for quantificational logic. However, it is Gottlob Frege (1848–1925) who usually gets the credit for developing the first system of formal logic using a metalanguage modelled on the language of arithmetic (Frege 1879). The distinction made in Frege (1892) between *Sinn* ('sense') and *Bedeutung* ('denotation; reference') is comparable with Arnauld and Nicole's (1965 [1662]) comprehension~extension, Hamilton's (1876) intension~extension, or John Stuart Mill's (1843) connotation~denotation though it is uncertain whether he was directly influenced by any of these. Frege noted that $a = a$ and $a = b$ are obviously statements of different cognitive value, as we can see from the fact that although *the morning star* refers to Venus and *the evening star* also refers to Venus, the two phrases differ in sense and intension. Frege distinguished senses from ideas (concepts), which some of his followers have failed to do. Ideas are particular to individual language users, senses form 'a common store of thoughts which is transmitted from one generation to another'. Although he doesn't say so, this view is compatible with sense being a property of the language itself, which is, of course, transmitted across generations. The fact that truth is assigned to the reference of propositions led him to raise questions about what have come to be called opaque and intensional contexts.

In *Foundations of Arithmetic* Frege asserts (echoing James Harris and Jeremy Bentham) that words have meaning only in virtue of being constituents of sentences that have sense (Frege 1884: 70). In other words, meaning is a function of context. This context principle is the top-down counterpart to the bottom-up principle of compositionality often assigned to Frege, e.g.

> [E]very sentence, no matter how complicated, can be seen as the result of a systematic construction process which adds logical words one by one.
>
> (Gamut 1991 I:15)

And it is found in Frege (1963 [1918]: 1), which states that we can 'distinguish in the thought corresponding to parts of a sentence, so that the structure of the sentence serves as an image of the structure of the thought'. But it is a principle that goes back at least as far as Plato's *Sophist*.

It became clear during the twentieth century that an indefinite noun phrase requires the hearer to create a subset x from a set y such that $x \subset y$ as in *Two coffees, please* (a set of two from the set of all possible coffees relative to the context of discourse). Bertrand Russell (1905) presented a theory of definite descriptions in which a sentence such as (7) has the logical translation (8) for some x such that x is a lamb, and for every y such that if y is a lamb then y is identical to x, such that x is sick.

(7) The lamb is sick.
(8) $\exists x(Lx \ \& \ \forall y(Ly \rightarrow y{=}x) \ \& \ Sx)$

The definite indicates a readily identifiable referent by equating set x with set y (perhaps by naming it) such that a definite article is similar to a universal quantifier. This has become known as the quantificational reading of the definite article and some people believe that the referential use of a definite description rests on prior understanding of its quantificational

meaning (Kripke 1977; Bach 2004). There is a contrary view, refuting the quantificational analysis in favour of direct reference, that effectively sees the use of definites as analogous with pointing, thus rendering the definite unanalysable (Kaplan 1978; Devitt 2007). The controversy shows no sign of abating.

Since about the time of Cresswell (1973) and Keenan (ed.) (1975), there have been many linguists working in formal semantics. Formal semantics interprets formal systems, in particular those that arise from the coalescence of set theory, model theory, and lambda calculus with philosophical logic – especially the work of Richard Montague (Montague 1974; Dowty et al. 1981), and the tense logic and modal logic such as Prior (1957) and Kripke (1963, 1972). By and large, formal semantics has ignored the semantics of listemes such as nouns, verbs, and adjectives – which are typically used as semantic primes (but see Dowty 1979). It does, however, offer insightful analyses of secondary grammatical categories like number and quantification, tense, and modals.

Event-based semantics was initiated by Davidson (1967a). The idea is to quantify over events, thus *Ed hears Jo call out* is a complex of two events as shown in (9), where there is the event *e* of Jo's calling out and the event *e′* of Ed hearing *e*.

(9) $\exists e$[call out(Jo, *e*) & $\exists e'$ hear(Ed, *e, e′*)]

Following a suggestion of Parsons (1980, 1990) participant roles can be incorporated as in (10), *Max drinks the beer*.

(10) $\exists e$[drink(*e*) & agent(*e*, Max) & patient(*e*, the beer)]

This facilitates the nonspecification of the characterizing statement *Max drinks* in (11).

(11) $\exists e$[drink(*e*) & agent(*e*, Max)].

There is always the question of how the meanings of complex expressions are related to the simpler expressions they are constructed from: this aspect of composition is determined by model theory in Montague semantics, which is truth conditional with respect to possible worlds. Where traditional predicate and propositional logic was concerned only with extension (existence) in the (real) world, intensional logics allow for existence in a possible (hypothetical) world. Just as intensions are comparable with 'sense', extensions are comparable with 'reference' or, better, denoting something within a particular model or set of models (see Chapter 4).

12 Dynamic semantics

As a rule, any two successive references to an entity involve some kind of change to it on the second reference. For instance:

(12) Catch $_{[}$a chicken$_{1\,]}$. Kill $_{[}$it$_{2]}$. Pluck $_{[}$it$_{3]}$. Draw $_{[}$it$_{4\,]}$. Cut $_{[}$it$_{5\,]}$ up. Marinade $_{[}$it$_{6\,]}$. Roast $_{[}$it$_{7\,]}$. When you've eaten $_{[}$it$_{8]}$, put $_{[}$the bones$_{9\,]}$ in the compost.

All nine subscripted NPs refer to the creature identified in 'a chicken$_1$', which refers to a live chicken. After 2 it is dead, after 3 featherless, after 5 dismembered, after 7 roasted, and after 8

eaten. 9 refers to the chicken's bones after the flesh has been stripped from them. Thus 7, for instance, refers not to the chicken in 1, but to the caught, killed, plucked, drawn, cut up, and marinaded pieces of chicken. Heim (1983, 1988) described this as updating the file on a referent. These successive states of the chicken are presented as updates in the world~time pair spoken of. The dynamic aim is similar in Discourse Representation Theory (DRT) (Kamp 1981; Kamp and Reyle 1993) where the interpretation of one in a sequence of utterances (a discourse) is dependent on co-text such that the next utterance is an update of it. DRT has been especially successful in capturing the complex semantics of so-called donkey sentences (see above). For instance, (13) (in a move presaged by Ockham) paraphrases as (14).

(13) Every girl who owns a pony loves it.
(14) If a girl owns a pony, she loves it.

A discourse representation structure (DRS) for (14) is (15). The arrow ⇒ indicates that the second box is a consequence of the first. The left-hand box is interpreted first, then the right-hand box. Notice that the anaphor for a-pony-loved-by-the-girl-who-owns-it is z, and it does not occur in the left-hand box. The DRS for (13) is (16).

(15)

x y		z
girl(x) pony(y) x owns y	⇒	z = y x loves z

(16)

x y			z
girl(x) pony(y) x owns y		every x	z = y x loves z

(17)

x			y
girl(x)		every x	pony (y) x owns y

Notice that (16) does not say that *Every girl owns a pony*, whose DRS is (17). DRT is undergoing extensions in the twenty-first century; see Asher and Lascarides (2003), Jaszczolt (2005, 2009).

13 Conclusion

This essay has sketched a history of semantics, but much is omitted. I began with concerns about what names are and where they come from, then turned to the persistent realist vs. nominalist controversy as it concerns universals. I reviewed various opinions about the relationship between human minds, language expressions, and aspects of their meanings such as sense and intension, reference and extension. In the Western Classical Tradition, lexical semantics began with etymologies and glossaries of literary works that gave way to word lists with attributed meanings (both monolingual and bilingual) resembling modern dictionaries. Study of semantic relations among listemes gave rise to lexical semantics.

Componential analysis began in the eighteenth century but in its modern form from the mid-twentieth. There have been very few exhaustive studies of the semantic components in any semantic field and componential analysis is moribund. There is also a serious problem determining what counts as a semantic prime, despite the efforts of proponents of the Natural Semantics Metalanguage. Prototype semantics, stereotype semantics, and frame semantics complement rather than replace componential analysis. The contribution of syntax to the meaning of utterances was at last incorporated into semantic theory, though the efforts of Katz and Jackendoff really need to be augmented by the techniques of dynamic semantics. And the contribution of pragmatics has been completely ignored in this essay (see Allan (2001, 2010)).

Further reading

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Related topics

Chapter 1, (Descriptive) Externalism in semantics; Chapter 2, Internalist semantics: meaning, conceptualization and expression; Chapter 4, Foundations of formal semantics; Chapter 5, Cognitive semantics; Chapter 10, Semantics and pragmatics; Chapter 12, Lexical decomposition.