

## Two-Track Mind: Formulaic and Novel Language Support a Dual-Process Model

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This chapter presents a historical and critical survey of phraseology, the study of formulaic language, in the context of analytic, experimental, and biological approaches. It begins with Weinreich's (1969) early reluctance to explore the topic in a scholarly way and follows a circuitous path through linguistic, psychological, and neurological studies, culminating in current views of formulaic language as an integral component of speech performance and language competence (Fillmore, 1979; Locke & Bogin, 2006; Pawley & Syder, 1983). Linguistic and psychological studies have grappled with the question of whether idioms (as a prime example of a formulaic expression) are best described as compositional, i.e., composed of constituent parts, or unitary, i.e., processed as whole units. The preponderance of the evidence supports a *dual-process model of language*, whereby novel expressions and formulaic expressions differ essentially in how they are learned or acquired, stored, and processed (Kempler & Van Lancker, 1993; Kuiper, 2009; Van Lancker Sidtis, 1973, 2004, 2008; Wray & Perkins, 2000). Novel expressions are made up of lexical items assembled by grammatical rules; these communicate new information. In contrast, formulaic expressions, known in their unitary shape to the language user, are acquired and processed according to unique properties. Biological studies provide strong evidence for this distinction, as damage to different brain areas produces different effects on the two modes of language, novel (or propositional) and formulaic (Van Lancker Sidtis, Kempler, Ahn, & Yang, 2011). It is the purpose of this chapter to describe and clarify this distinction.

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## Background

Before the advent of generative grammar, a little-known field study laboriously documented actual use of proverbs by citizens in a small German village over a period of three years (Hain, 1951). More recently, with the advent of computerized corpora of spoken and written language, more information about the presence of formulaic expressions in natural discourse has been gained (Aijmer, 1996; Altenberg, 1998; Fellbaum, 2002; Moon, 1998). However, serious scientific attention to formulaic expressions has evolved slowly. In a 1969 book chapter entitled “Problems in the analysis of idioms” (published two years after his demise in 1967), the linguist Uriel Weinreich apologized for taking up “so unfashionable a topic,” that for many “would surely smack of the most outlandish romanticism” (p. 23). How the scholarly world has changed in 40 years! Since then, hundreds of serious articles touching on the structure and use of idioms have appeared. (Entering “idiom studies” as a Google search term in October 2009 yielded 1,720,000 links; entering “formulaic language” brings up 532,000.) Now, formulaic language, the broader rubric which encompasses idioms as well as an extremely large array of other fixed, familiar expressions, is a legitimate field of study (e.g., Coulmas, 1994; Sidtis, 2011; Van Lancker, 1988, 1994; Van Lancker Sidtis, 2008, 2010; Wray, 2002).

## Description of Formulaic Expressions

Describing formulaic expressions is simple but not easy. Simply put, they differ from all other utterances in that they are not novel – not newly created. It is not so easy to provide a comprehensive description to such a heterogeneous set (Figure 17.1). The properties of formulaic expressions – stereotyped form, conventionalized meaning, and appropriate, contextual usage conditions – are known to the native speaker. Stereotyped form includes word order and specific lexical composition as well as phonetic, prosodic, and vocal features that typically appear with a given formulaic expression. Although the canonical version, or “formuleme,” has its signature stereotyped form, in actual usage most formulaic expressions are modified. They can undergo word addition, morphemic alteration, and various kinds of constituent movement. A speaker utilizing a formuleme will take care that it remains recognizable. This is the constraint governing flexibility. (The many studies devoted to the question of formulaic expression flexibility will be summarized below.) Prosodic shape, including intonation, voice quality, and phonetic detail, is usually specified. The expression *I wouldn't want to be in his shoes* must have a sentence accent on the next to last word. The wildly popular *What-ever!* favored by younger speakers features an aspirated voiceless stop and hyperarticulated syllables. Often formulaic expressions must be spoken with specialized vocal material to make the grade: the American comedian Steve Martin's *Well, excuse me!* and, from a popular dialect in New York, *Fuggedaboutit* (*Forget about it*) come to mind.



The third property, the sociolinguistic or appropriate contextual usage conditions governing the use of formulaic expressions, is probably the most subtle. Circumstances surrounding the communication, in which the formula appears, must have specific characteristics to constitute native usage. Fine-grained and detailed contingencies of formality, register, and social context adhere to the utterances and cause them to stand out when these are violated. Sometimes it is difficult to say why a formulaic expression isn't "right" in that discourse unit. Often those that are not right in contextual terms are generated by second-language speakers. These contextual errors can be heard in international interviews and diplomatic presentations. (Second-language speakers are also apt to err in details of stereotyped form or conventionalized meaning, as is well understood in second-language learning studies; Weinert, 1995).

These three properties, stereotyped form, conventionalized meaning, and contextual conditions characterize the formulaic utterance and belong to it, as part of language competence, and are all known to the speaker/listener. This personal knowledge can be viewed as the fourth property. Familiarity in the form of memorial knowledge, which belongs to every formulaic expression, is the least discussed by speech scientists. Yet language users know these expressions along with their properties (Bell & Healey, 1992; Jackendoff, 1994). What is meant by saying that speakers *know* the expression? This fact is abundantly obvious in the world around us, for example, in newspaper advertisements and headlines. In a recent example in a home-town paper, advertising copy by a group called *careerbuilder.com* trumpets a headline: "We have over 600,000 jobs." Under this statement two lines appear: "One of them is right for you. Heck, dozens are right for you." The addition of "heck," a speech formula in the form of an expletive, indicates knowledge of normal usage by the advertisement's writer and expectation by the writer of like knowledge in the readership. Further this stylistic turn appeals to a conversational, intimate level of discourse.

In many cases, humor is constructed around the play between literal and idiomatic meanings of ditropic expressions – sentences and phrases that allow for both a literal and an idiomatic interpretation, such as "The coast is clear." A high proportion of cartoon humor is made up of precisely this specialized kind of pun. In a cartoon by Barsotti, for example, a king, opening a present with a look of surprise at the contents of the box, says "Why, this is fit for me!" Again, this, like so many other efforts at humor, illustrates that the readership of the magazine in which the cartoon appeared (*The New Yorker*) is familiar with ditropic ambiguity, and that the readers will recognize the allusion to the formulaic expression *This is fit for a king*. It is only because of these two features – the ditropic pun and familiarity with the underlying formulaic expression – that the cartoon achieves humor.

There is evidence from many sources that speakers are familiar with a large array of formulaic expressions. Anecdotally, listeners smile and nod on hearing lists of these expressions. Native speakers explicitly endorse knowing them. In class at the university, for example, students quickly understand the notion of formulaic expressions and immediately begin contributing examples (Van Lancker Sidtis, 2011). This

is a very natural, easy concept for language users. In addition, formal studies have shown that people identify formulaic expressions when presented with lists randomized with novel expressions (Van Lancker Sidtis & Rallon, 2006).

The four factors – form, meaning, context, and personal knowledge – distinguish formulaic expressions in principle and practice from novel ones, and lead to the proposal that formulaic and novel language are qualitatively different from the points of view of linguistic analysis and speaker performance. First to be reviewed in this chapter are linguistic studies, which consider formal, structural properties. As some of these questions are addressed by probing speakers' responses, linguistic studies morph into psycholinguistic approaches, which measure users' performance. Finally, the review proceeds to evidence from neurological disorders that show how formulaic and novel language are stored and processed according to disparate cerebral mechanisms.

### Linguistic and Psycholinguistic Studies of Formulaic Expressions

A burning question in linguistic approaches has always been: What is a structural descriptive approach to formulaic expressions? Attempts to answer these questions have utilized analytic tools as well as psychological testing. Two camps have jostled back and forth between presenting analytic solutions and proposing that formulaic expressions are unitary, similar to lexical items (Titone & Connine, 1999). Weinreich's (1969) treatment of idioms proposed a structural-analytic solution which was not viable. Some scholars then classified the idiom as a fixed lexical item (Heringer, 1976; Swinney & Cutler, 1979), while others continued to consider idioms as a compositional (Burt, 1992; Gibbs, 1980, 1994), positing various degrees of "frozenness" in idioms (Gibbs, Nayak, & Cutting, 1989). Structural descriptions were presented about flexibility versus frozenness, compositionality and semantic transparency (Cacciari & Tabossi, 1988, 1993; Estill & Kemper, 1982; Gibbs & Gonzales, 1985; Nunberg, Sag, & Wasow, 1994). Fraser (1970) proposed that the alleged relative fixedness of idioms was related to which transformations they could undergo. Some time later, Cutler (1982) suggested that the proposed frozenness parameter reflected the age of the expression. Subsequent studies of aphasic speakers showed no effect of a frozenness parameter in performance on idiom recognition (Papagno & Genoni, 2004).

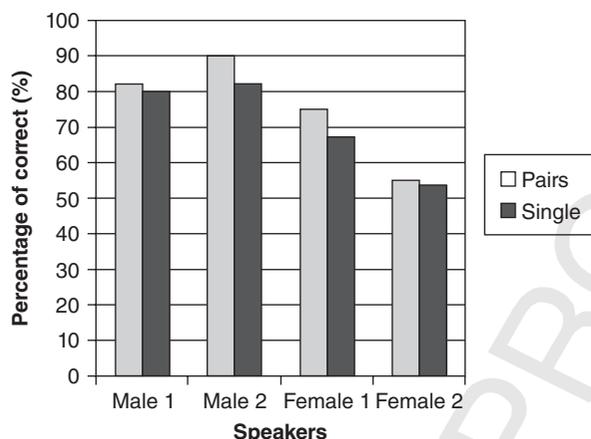
#### Comprehension studies: how do listeners process idioms?

Using idioms, speakers convey ideas and emotions using words that do not refer to their usual lexical meanings. *She's skating on thin ice* can be said without referring to skating or ice, but to convey the idea of risky behavior. Three models proposed to explain this are literal-first (serial) processing, literal and idiomatic (parallel)

processing, and direct access of idiomatic meaning. Bobrow and Bell (1973) proposed that idioms are lexical items stored in memory and that upon encountering an idiom, the comprehension device first attempts a literal interpretation. After failing, the idiom retrieval mode kicks in and the idiom is selected from the look-up list. Thus, serial processing predicts greater response time latencies for idioms than for literal utterances because literal interpretation is the first step in any language task. However, studies revealed that visual classification was faster for idioms than for matched literal phrases (Swinney & Cutler, 1979), suggesting that idiomatic meaning is processed in parallel with literal meaning, and that idioms are stored and retrieved whole.

The question remains as to how fixed expressions can undergo syntactic modifications and maintain their pragmatic identity and conventionalized meaning. For example, one could say *For years, she had been totally skating on really the thinnest ice*, and listeners, depending on context, could assume the nonliteral meaning, as examined in indirect questions (Gibbs, 1981). Experimental approaches to these questions involve measuring production errors, response time, accuracy in recall and recognition memory tasks, and various kinds of rating surveys (Gibbs & Gonzales, 1985; Gibbs, Nayak, Bolton, & Keppel, 1989). The various findings of syntactic and lexical flexibility have led to hybrid psycholinguistic models (Cacciari & Tabossi, 1988; Smolka, Rabanus, & Rösler, 2007), which integrate both literal-first and idiomatic-only approaches. However, the heterogeneity of formulaic expressions and the variety of flexible variants have defied linguistic description in credible structural terms (Hillert & Swinney, 2001). This stalemate can be resolved by considering the notion of the *formuleme*, which is the canonical form of the expression known to the speaker and can be manipulated using grammatical rules.

Support for the psycholinguistic distinction between formulaic and novel expressions comes from the fact that native speakers distinguish idiomatic from literal expressions on the basis of the auditory signal alone in both production and perception. An early study by Lieberman (1963) revealed different articulatory patterns for words when produced in a formulaic or novel context. Van Lancker and Canter (1981) demonstrated that listeners could distinguish literal from idiomatic meanings of ditropic sentences (those with balanced ambiguity between literal and idiomatic meanings, such as “It broke the ice”) produced by native speakers, without benefit of other context, and acoustic analyses indicated that pitch contours, pausing, and word length were significantly involved in distinguishing the meanings (Van Lancker, Canter, & Terbeek, 1981). Recently, similar studies were conducted on Korean ditropic sentences. When the sentences were auditorily presented singly or in pairs, native listeners of Korean were able to discriminate between idiomatic and literal meanings. In a second task, listeners provided goodness ratings for each utterance, indicating to what extent each item was a good idiomatic or literal exemplar. There was a significant correlation between recognition performance and goodness ratings, reflecting listeners’ knowledge of these categories. Acoustic analysis indicated that literal sentences had significantly longer durations and duration variations, while idiomatic sentences were characterized by greater variation in intensity.



**Figure 17.2** Performance results for Korean ditropic sentences in the listening study, in which utterances were heard singly and as randomized pairings. Listeners successfully recognized idiomatic and literal meanings by 3 of the 4 speakers. The first 3 speakers were born and raised in Korean. The fourth speaker (second female) had spent 3 years in early childhood in the US.

Another significant difference was seen in the last two syllables of sentences: idiomatic sentences featured rising fundamental frequency contour significantly more often, while literal sentences were produced with falling fundamental frequency contour (Figure 17.2).

These results indicate that literal and idiomatic utterances have a separate status and that acoustic cues serve to distinguish them. These findings more generally support the notion that propositional and formulaic language form different categories in grammatical competence. Further support for this view comes from studies showing that people remember idioms as chunks rather than composite forms (Horowitz & Manelis, 1973; Osgood & Hoosain, 1974; Pickens & Pollio, 1979; Simon, 1974), a result also obtained for Chinese idioms (Simon, Zhang, Zang, & Peng, 1989).

### Production studies in normal speakers

Several creative approaches to studying the production of formulaic expressions have been designed. Speech-error elicitation experiments showed that idioms are not devoid of information about their syntactic and semantic structure (Cutting & Bock, 1997). Interference in the form of blending errors – *The way the cookie bounces; It's not rocket surgery! Well, that's all water over the bridge* – was more likely to occur between idioms sharing the same syntactic form, and the resultant word substitutions were in the same grammatical class. Indeed, during speech

production, speakers can discern grammatical form and lexical meaning in these expressions, and hence syntactic and semantic operations can be performed on any formulaic expression. However, the properties of formulaic expressions reviewed above – stereotyped form, conventionalized meanings, conditions of use, and familiarity – must all be recognized in a veridical model of language competence. These facts about formulaic expressions are revealed in surveys, sentence completion studies, and word association studies (Clark, 1970; Van Lancker Sidtis & Rallon, 2004). A series of idiom production experiments by Sprenger (2003) using a priming paradigm addressed these questions. These studies yielded the notion of *superlemma*, which corresponds to the idea proposed in this article of canonical form or *formuleme*. Similarly, more extensive analysis of speech errors involving idioms derived from a very large database suggests that “idioms are both compositional and noncompositional at the same time, at different levels of processing” (Kuiper, van Egmond, Kempen, & Sprenger, 2007, p. 324). This superlemma or *formuleme* is stored and processed as a whole, but because it contains syntactic and semantic information of various kinds (as does any linguistic entity in the speaker’s repertory), it can link to other parts of the lexicon and grammar. These and other studies lead to the perspective that formulaic and novel language exist side by side.

### Dual-process model of language competence

The dual-processing model states that formulaic expressions, which by definition have stereotyped form, conventionalized meanings, contextual constraints, and familiarity to a language community (Kitzinger, 2000), exist in harmony with the grammar, which consists of rules and a lexicon (Lounsbury, 1963). Inconsistencies arising from idiom studies can be explained by the normal interplay of formulaic and novel processing, such that formulaic expressions, depending on the intent and verbal creativity of the speaker, can be altered using standard grammatical processes. The interesting point is not that formulaic expressions can be semantically transparent and composed and are therefore alterable, but that there is a *known entity to analyze and to alter*.

### Cerebral Processing: Comprehension Studies

Although the original observations on preserved automatic speech were made in the speech of persons with severe aphasia, most experimental studies of brain processing related to this topic address *comprehension of idioms*. Early such studies identified the right hemisphere as involved. Using frozen metaphors such as *heavy heart* in a picture matching task, Winner and Gardner (1977) found that persons with right hemisphere damage performed poorly. A similar result was obtained later

using a similar picture matching task for recognition of idioms and speech formulas (Kempler & Van Lancker, 1996), called the Familiar and Novel Language Comprehension test (FANL-C). In this protocol, 20 formulaic expressions, such as *I'd like to give you a piece of my mind*, are matched with 20 novel expressions, each with four line drawings provided for a pointing response. Studies using this protocol indicate greater deficits in recognizing formulaic expressions than novel expressions following right hemisphere damage, with the converse observed in left hemisphere damage (Kempler & Van Lancker, 1993; Kempler, Van Lancker, Marchman & Bates, 1999; Van Lancker & Kempler, 1987). Broader research has suggested that appreciation of social and linguistic context is also diminished in right hemisphere damage (Brownell, Gardner, Prather, & Martino, 1995; Gardner, Brownell, Wapner, & Michelow, 1983; Joannette & Brownell, 1990); these qualities are called upon for successful processing of formulaic language. However, a few recent articles highlight a role of the left hemisphere in comprehension of idioms with less evidence attaching to a significant involvement of the right hemisphere (Papagno & Genoni, 2004; Papagno, Tabossi, Colombo, & Zampetti, 2004; see also Cacciari & Papagno, Volume 1, Chapter 18). Some of these discrepancies may be attributed to the different task demands in processing the material (Kacinek & Chiarello, 2007; Papagno & Caporali, 2007). Further, it has often been observed that both hemispheres participate in a given cognitive function but may do so using different strategies (Drews, 1987; Bogen, 1969). The finding that persons with right hemisphere damage performed better than the left-brain-damaged group on idiom recognition is difficult to interpret, given the weight of other findings about right and left hemisphere functions (Papagno, Curti, Rizzo, Crippa, & Colombo, 2006). Severity, location, and size of lesions may differ importantly in groups studied. Presence or absence of subcortical damage has been seen to influence cognitive performance, but only recently have contributions of subcortical structures been considered; these are reviewed in the production section below. In a creative comprehension study using functional brain imaging, passive listening to affective-prosodic interjections, a primitive version of formulaic expressions, elicited bilateral temporal as well as subcortical activation (Dietrich, Hertrich, Alter, Ischebeck, & Ackermann, 2008).

### Production studies in neurological disorders

Whether there is an underlying language ability that equally supports comprehension and production of language remains a debated question in most realms of the language sciences (see review in Van Lancker Sidtis, 2006). Earlier theories utilized the notion of the ideal speaker–hearer, for whom general grammatical knowledge could be assumed and described. However, in performance, as is well known from studies of aphasia, striking differences in ability to produce novel utterances are observed in production compared to comprehension. This dissociation is also true for formulaic language. In some cases, production of formulaic language is preserved alongside impaired performance in comprehension, and the reverse is also

seen. Formulaic language abilities are dissociated in comprehension and production modes.

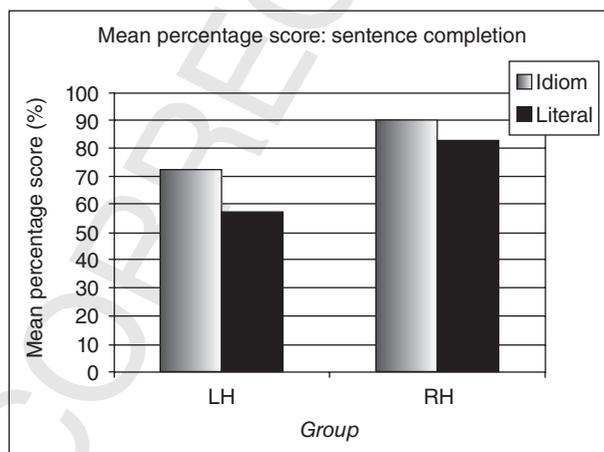
*Cerebral participation in novel and formulaic speech production* As is well known, production of novel utterances engages left-sided cortical areas of the brain including the inferior frontal gyrus (Broca's area), sensorimotor strip, and supplementary motor area via the neural pathways described above, aroused by the reticular formation and the aqueductal grey matter in the brainstem, exchanging commands via the pyramidal and extrapyramidal tracts to the peripheral nervous system (cranial and spinal nerves). Auditory monitoring is enabled by the superior temporal gyrus. Complex motor gestures are executed and monitored by the basal ganglia with participation by the limbic system, which modulates emotion. Integration of motor speech gestures is aided by the thalamus and the cerebellum, especially the right cerebellum. Integration of cortical and subcortical systems, coordinating cognitive and affective streams of information, characterizes all communicative performance (Panksepp, 2003). Damage to any of these structures may interfere with production of spontaneous, novel language.

Modern notions of formulaic language arise from earlier discussions surrounding the phenomenon of "automatic speech" as consistently observed in aphasia. The term "automatic speech" (Hughlings Jackson, 1874) indexed preserved vocalizations in severe neurogenic language deficit, including emotional outbursts, swearing, *yes*, and *no*, among many others. The terms "voluntary" and "propositional" were used to refer to contrasting novel or newly created utterances. The dichotomy has also been seen as corresponding to conscious versus nonconscious, routinized versus constructed, or holistic versus combinatorial. A closer look at the use of these expressions brings more confusion than clarity. "Low level" grammatical processes in spontaneous speech, such as subject-verb agreement, proceed automatically. On the other hand, emotional utterances may be voluntarily produced and human speech is imbued with affect (Panksepp, 2003). Recurrent, nonlinguistic aphasic utterances (such as *bi di bi di*) can be delivered "voluntarily." Comparisons with nonhuman communication are not enlightening. Research in nonhuman animals indicates that calls may be produced with referential and intentional content (Cheney & Seyfarth, 1980, 1990; Marler, 1998). In humans, reflexive and volitional control systems join to produce vocal sound, and volitional control of activity involves both cortical and subcortical systems (Ludlow, 2005). Therefore, while much of formulaic language derives from categories subsumed under the previous rubric "automatic speech," current use favors the newer, generic term.

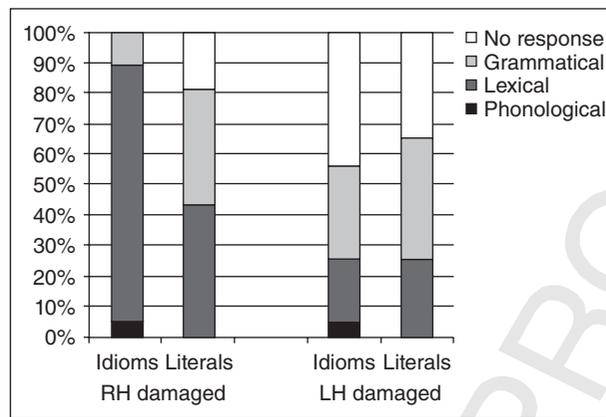
Formulaic (formerly automatic) speech, comprising over-learned, recited, and/or emotional utterances of various kinds, including counting, speech formulas (salutations and conversational fillers), swearing, nursery rhymes, familiar lyrics and familiar songs, and all other such expressions known by native speakers (see Figure 17.1; Code, 1994; Hughlings Jackson, 1874; Van Lancker, 1993; Van Lancker & Cummings, 1999; Wray, 2002; Wray & Perkins, 2000) depend on neurological

mechanisms that differ from spontaneous speech. There is evidence for significant right hemisphere control modulation of production of formulaic expressions beyond the centuries-old observation of preserved automatic speech in aphasia following left hemisphere damage. (Some have insisted that intact left hemisphere structures are modulating any residual speech.) A dramatic demonstration comes from a postsurgical interview of a normally developing, right-handed adult who underwent left hemispherectomy for treatment of brain cancer (Van Lancker & Cummings, 1999). The subject was profoundly aphasic, but produced residual speech consisting of well-articulated expletives (*goddammit*), pause fillers (*well, uh*), and sentence stems (*I can't, that's a*), all classical examples of formulaic speech. He also performed pragmatically appropriate gestures, such as sighing, laughing, and *tsk*. Further support arises from mouth asymmetry studies, showing greater left-sided openings for counting and greater right-sided opening for word generation in aphasic subjects (Graves & Landis, 1985).

A controlled study indicated superior processing of formulaic compared to matched novel speech production tasks in aphasic subjects in all but the repetition tasks (Lum & Ellis, 1999). A similar, more extensive design examined performance of unilaterally brain-damaged subjects on repetition, sentence completion, and comprehension tasks (spoken and written) involving matched formulaic (idioms and speech formulas) and novel expressions (Van Lancker Sidtis et al., 2011). Significant differences for utterance types were found for sentence completion (Figure 17.3) and for comprehension using the FANL-C, replicating earlier findings



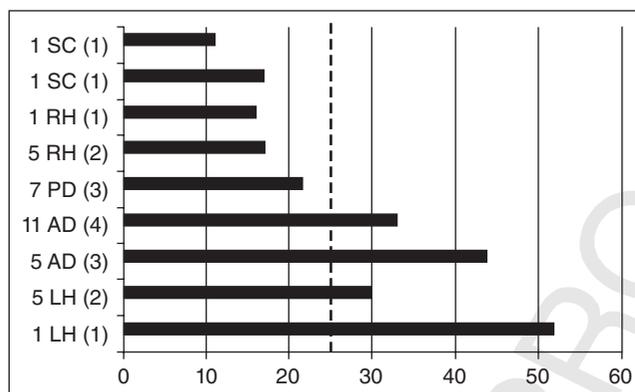
**Figure 17.3** Mean percentage correct responses for the sentence completion task is seen on the vertical (Y) axis. Responses on idioms are compared with matched novel utterances using the Comprehension Nonliteral Language Protocol (Van Lancker Sidtis et al., 2010). Left hemisphere (LH) damaged subjects completed significantly more idioms than literal (novel) utterances; performance on the two tasks did not differ significantly for right hemisphere (RH) damaged subjects.



**Figure 17.4** Right (RH) and left hemisphere (LH) damaged subjects show different error patterns on sentence completion for idiomatic and novel (literal) exemplars. The right hemisphere group made more lexical errors, suggesting deficient processing of formulaic language.

(Kempler & Van Lancker, 1996). Repetition accuracies for formulaic and novel utterances did not differ overall, but the left and right hemisphere damaged groups showed different error profiles, with the right hemisphere group committing more lexical errors on idiom repetition (Figure 17.4). These results support the claim for different cerebral representation of formulaic and novel language, but indicate that the contrast is best revealed not in repetition, but when tasks resemble spontaneous speech. (Recent studies have revealed significant differences in speech measures for spontaneous and repeated modes – Kempler, & Van Lancker, 2002; Sidtis, Rogers, Godier, Tagliati, & Sidtis, 2010 – further supporting the notion that meaningful differences between formulaic and novel speech are better sought in spontaneous than in repeated or read speech.) In a related study, left- and right-brain-damaged persons differed in producing the contrasts in ditropic sentences (those with either an idiomatic or literal meaning), in that contrastive timing cues were more successfully executed by the right hemisphere damaged group (Belanger, Baum, & Titone, 2009).

Other approaches have examined the incidence of formulaic expressions in the spontaneous speech of persons with neurogenic disease. Discourse studies using speech of persons who had suffered left or right hemisphere stroke revealed that, compared to normal speakers, the proportion of formulaic language was significantly lower following right hemisphere damage and significantly higher in patients with left hemisphere damage and aphasia (Van Lancker Sidtis & Postman, 2006; Speech samples A and B, Appendix I). In a later study, a left hemisphere damaged subject with transcortical sensory aphasia, whose semantic deficit was profound, yielded the highest proportion of formulaic expressions (Speech sample C, Appendix I), while proportions of formulaic language in two right hemisphere damaged



**Figure 17.5** Overview of neurogenic effects on formulaic language production from four discourse studies, showing proportions of words in formulaic expressions on the horizontal axis and patients on the vertical axis (SC = subcortical damage; RH = right hemisphere damage; LH = left hemisphere damage). Results are taken from single case and group studies (first number indicates number of subjects in study). Number in parenthesis refers to publications: (1) Sidtis et al. (2009); (2) Van Lancker Sidtis and Postman (2006); (3) Rogers et al. (2010); (4) Bridges and Sidtis (2010). The dotted line represents an average from 24 age- and education-matched normal-control subjects. Here it can be seen that subcortical and right hemisphere damage results in a lower proportion of words in formulaic expressions, while Alzheimer's disease and left hemisphere damage is associated with a larger proportion of words in formulaic expressions.

subjects were low, in agreement with the group study above (Sidtis, Canterucci, & Katsnelson, 2009; Figure 17.5).

In functional brain imaging studies in humans, bilateral activation for both propositional and selected types of formulaic speech (counting, Pledge of Allegiance) has been reported (Blank, Scott, Murphy, Warburton, & Wise, 2002; Bookheimer, Zeffiro, Blaxton, Gaillard, & Theodore, 2000). These and similar inconsistencies between robust, often-replicated findings from the clinical lesion literature and imaging results indicate that functional imaging results must be interpreted with caution (see review by J. Sidtis, 2007). In contrast, in another brain imaging study, measures of cerebral blood flow for naming and counting differed. Using partial least squares analysis of PET (positron emission tomography) regional cerebral blood flow, Van Lancker, McIntosh, and Grafton (2003) identified three latent variables as naming-vocalization, naming, and counting. The first two latent variables were significantly associated with Broca's area and the third corresponded with diffuse representation and basal ganglia sites.

*Subcortical contribution to formulaic language* Previous decades emphasized the human cortex as the mediator of the higher cognitive functions unique to humans, highlighting language as an exclusively human function with primarily cortical

representation. Recently, significant functionality for human behavior is attributed to basal ganglia/limbic systems (Lieberman, 2002), the mediators of motoric and emotional behaviors (Marsden, 1982; Panskepp, 1998, 2003). Recent studies reveal an important contribution of the basal ganglia to initiation, execution, and monitoring of human speech and language (MacLean, 1990; Marsden, 1982). Unique kinds of learning are associated with the basal ganglia (Graybiel, 1998; Knowlton, Mangels, & Squire, 1996); these include acquisition and execution of gestures that are compatible with processing of formulaic expressions.

The limbic system, in integration with basal ganglia structures, modulates mood, emotion, attention, and arousal. Affective functions are held to have a status in human behaviors as valued as cognitive functions: "A proper neuronal conceptualization of affective processes may be essential for making sense out of many brain functions" (Panskepp & Burgdorf, 2003, p. 536). Emotional vocalizations in humans and in nonhuman animals are likely the result of coordinated activity in limbic-basal ganglia nuclei. As mentioned above, formulaic expressions typically incorporate affective and attitudinal nuances. As will be discussed below, some have associated formulaic expressions with emotional cries in human and nonhuman vocalization.

Clinical and experimental evidence suggests a role of subcortical nuclei in production of formulaic language (Van Lancker Sidtis, 2004). In three published cases, subcortical damage led to significantly reduced incidence of formulaic expressions (Sidtis et al., 2009; Speedie, Wertman, T'air, & Heilman, 1993; see Figure 17.5; Speech sample C in Appendix I). Other studies show impoverished production of formulaic expression in Parkinson's disease, an illness of the basal ganglia (Illes, Metter, Hanson, & Iritani, 1988; Rogers, Sidtis, & Sidtis, 2010). Conversely, dysfunction of the basal ganglia/limbic system in persons with Tourette's syndrome is associated with hyperstimulated incidence of expletives (coprolalia; see Van Lancker & Cummings, 1999). In humans, formulaic and emotional vocalizations occurred when subcortical sites were electrically stimulated during stereotaxic surgical techniques, usually for treatment of epilepsy (Petrovici, 1980; Schaltenbrand, 1965). During a functional magnetic resonance imaging (fMRI) study using a naming task, instead of correctly naming pictures depicting *drown*, *yelling*, *clapping*, and so on, some subjects emitted formulaic expression, such as *help*, *yay*, and *hey*. In this study, right sided and subcortical structures showed an activation response that was not present when the correct action names were produced (Postman-Caucheteux, 2007).

*Formulaic utterances in an evolutionary perspective* Formulaic utterances bear a resemblance to animal calls, and thus may offer clues to the evolution of vocal control mechanisms (Code, 2005; Wray, 2000). Animal vocalization indicates warnings and facilitates social interactions. Similarly, some formulaic language in humans, such as swearing and other interjections, are likely mediated by limbic system structures and, presumably, were originally intended to perform the social functions of repulsing intruders and expressing anger and dissatisfaction. In humans,

the older system may continue to perform, in ways only partially understood, in singing and in emotional and routinized vocal behaviors.

Thus it has been proposed that emotional and over-learned utterances foreshadowed human language (Code, 2005; Wray, 1998, 2000). Indeed, there is evidence of a hierarchical system that has evolved, consisting at an earlier period of emotional responses mediated by subcortical nuclei and modulated through right hemisphere cortical networks, and having an essential relationship to modern day formulaic expressions (Jaynes, 1976; Van Lancker, 1979). It has long been known that while human language is cortically represented, animal vocalizations can be elicited only by stimulation of subcortical nuclei (Jürgens, 2002; Ploog, 1975). Some scholars have proposed that subcortical structures, which are evolutionarily “old,” have also (in addition to cortical lobes) been highly elaborated in the human (Lieberman, 2002). In this view, routinized vocal behaviors occur as species-specific vocalizations in nonhuman mammals, and survive in humans as emotional and formulaic vocalizations. Either alongside the emotional systems or arising out of them, depending on one’s viewpoint, are combinatorial systems, seen only in humans and modulated by left hemisphere cortical mechanisms.

### Language development and autism

Normal language acquisition involves two differentiated processes, whereby children acquire whole expressions and then later work out the compositional properties (Locke, 1993, 1995; Peters, 1977, 1983). These two modes of acquiring language appear to proceed in tandem throughout childhood and into adolescence, following different maturational schedules (Kempler, et al., 1999). In some developmental disorders, the holistic mode predominates; this is often seen in persons on the autistic spectrum.

Repetition appears to be an innate function in learning and is a normal occurrence in conversational speech (Wolf & Sidtis, 2010). In child language acquisition, the term *imitation* is used to refer to this ubiquitous phenomenon, and children are heard to imitate the speech around them. However, the role and requirement of frequency of exposure for successful acquisition of grammar has long been under debate. For acquisition of formulaic expressions, it is arguable that frequency of exposure is not a crucial factor. Elsewhere we have proposed that formulaic expressions, because of their special qualities of nonliteral meaning, affective nuances, and context dependency, are subject to rapid uptake in language development by children and adolescents (Reuterskiold & Sidtis, submitted). This learning process is comparable to other kinds of one-trial learning, as seen in imprinting or flashbulb memories (Brown & Kulik, 1977; Horn, 1985). It is supported by recent studies documenting incidental learning of phonetic and linguistic material following single or brief exposure to an utterance (Goldinger, 1996; Gurevich, Johnson & Goldberg, 2010). This copying of verbal material appears as an isolated functionality and is seen in its purist form in some autistic children.

The contrast between novel and formulaic language assumes extreme manifestation in autism, but little understanding of its meaning has emerged (Bogdashina, 2005). Here we also see an abrupt dissociation between production and comprehension. Echolalia, the copying of whole utterances spoken by self or others, is observed in many children diagnosed with autism; meaning comprehension of these expressions is minimal (Cohen & Volkmar, 1997). In addition to near exact repetition of the speech of others, some children show mitigated repetition, in which pronouns and grammatical endings are changed appropriately: *Are you happy today?* Is repeated as *Am I happy today?* and may further appear several times as *I am happy today*. Prosody is often altered and takes deviant shapes. In the language disorder of autism, grammatical and lexical competence is severely impoverished or nonexistent. The initiative to speak may also be only weakly present or not present at all. In these cases, the preserved formulaic mode, manifest in repetition and perseveration, is distorted and pathological, in that it does not function to acquire the very large number of socially appropriate and nonliteral expressions, as in normal language learning, but some communicative function is occasionally seen using these expressions (Dobbinson, Perkins, & Boucher, 2003; Prizant, 1983; Prizant & Duchan, 1981). In extreme cases, the formulaic mode is limited to mimicking advertisement jingles, sayings, and other salient expressions in the media, copying rhythmic as well as articulatory features (Paul, 2004).

### Formulaic language in Alzheimer's disease

The dissociation between production and comprehension of formulaic language emerges clearly in Alzheimer speech. Anecdotally, persons with the moderate to severe cognitive deficits associated with probable Alzheimer's disease have been observed to produce an array of formulaic utterances (*Excuse me! Good-bye; See you later*) with normal expression, long after semantic abilities have been severely compromised. Preliminary findings in our laboratory reveal a proportion of formulaic expressions in Alzheimer spontaneous speech that is significantly higher than matched normal control subjects (Bridges & Sidtis, 2010; Rogers et al., 2010; see Figure 17.5). Formulaic expressions appear to constitute a portion of what has been previously referred to as "empty speech" in Alzheimer's disease (Speech Sample E, Appendix I). Despite retention of a repertory of formulaic expressions in production, comprehension of idioms and social speech formulas is impaired in Alzheimer's disease (Kempler, Van Lancker, & Read, 1988; Papagno, Lucchelli, Muggia, & Rizzo, 2003), reflecting the dissociation between production and comprehension mentioned above.

Interestingly, the form of the formulaic expression may be distorted in Alzheimer speech: *No but they come home every little while; It's way back in the head; Made up mind to; Not a very going out man*. These errors take a different shape from the formulaic speech errors observed in normal subjects (Cutting & Bock, 1997; Kuiper et al., 2007). In addition to these distortions of form, pragmatic constraints are also

often violated, in that the social context is inappropriate. The Alzheimer patient may say *It's nice to see you again* to a stranger. While formulaic expressions are retained to a greater degree than abilities to produce novel utterances, the cognitive disorder does affect formulaic form, meaning, and pragmatic constraints. Preservation of formulaic language in Alzheimer's disease lends support to the thesis of subcortical involvement in formulaic language, as Alzheimer's disease afflicts cortical layers, leaving basal ganglia intact until late in the disease progression.

### Conclusions: Dual-Process Processing of Novel and Formulaic Language

An overview of psychological and neurological observations leads to a model of normal language competence comprising two disparate modes. These processing modes differ primarily in the nature of the units, or building blocks, that are produced and comprehended. Formulaic expressions have been called giant lexical units or superlemmas. Although this perspective remains controversial, most findings have supported what has been called "the lexical hypothesis." The term "lexical" is less than useful because formulaic expressions have several properties that distinguish them crucially from words: wide-ranging intraphrase flexibility, mandatory affective and attitudinal nuances, and, in many cases, considerable length. More appropriate is the term "formuleme," referring to the canonical expression known to native speakers in terms of its form, meaning, and pragmatic contingencies. Formulemes are stored as a whole with a range of unique characteristics pertaining to phonetic, lexical, and prosodic form and conventionalized meaning encompassing an array of social and affective connotations. Pragmatic contingences constrain the social settings that are appropriate for the expression. In contrast, novel expressions are formed using grammatical rules to select and arrange lexical items into strings. Psychological and neurological evidence reviewed above indicates that formulaic and grammatical modes of competence are processed differently and that they are in continuous interplay with each other. Even more striking is the fact that native speakers know – by heart – the form, meaning, and pragmatics of hundreds of thousands of such expressions. Personal familiarity with the canonical shapes, or formulemes, overshadows other factors, such as whether or not idioms are transparent or compositional when manipulated by speakers.

Evidence from several subdisciplines in the language sciences supports the view that formulaic and novel expressions are stored and processed according to different principles. Speakers' performance in psychological experiments lends support to the notion of formulaic expressions as holistically stored and processed, in contrast to novel expressions, which are by definition composed by rules. Neurological evidence further reveals that these differences between novel and formulaic pattern differently for production and comprehension modes. Comprehension of idioms, as a subset of formulaic language, is impaired in damage to both cerebral hemispheres, but production of formulaic expressions is significantly higher in left

hemisphere than right hemisphere damage. Autistic and Alzheimer subjects produce an overabundance of formulaic expressions but show deficient ability to comprehend them or to utilize them according to pragmatic principles; the basal ganglia are preserved in Alzheimer's disease until very late in the disease progression. Production of formulaic expressions is diminished in Parkinson's disease, in which basal ganglia are compromised from the beginning of the disease progression. Comprehension of formulaic expressions is undertaken by both hemispheres according to different strategies, while production of formulaic expressions relies more heavily on a right-hemisphere-subcortical circuit.

### Implications for Evaluation and Treatment in Communicative Disorders

Evaluation techniques in neurogenic language disorders in current standard practice take only minimal notice, if any, of formulaic language. In aphasia, occasional elicitation of so-called "automatic speech," such as counting to 10 or 20 and recitation of nursery rhymes, is limited and reveals only the tip of the iceberg that constitutes formulaic language competence. During evaluation of spontaneous speech, clinicians seldom distinguish between formulaic expressions and novel speech as present in the speech sample. For initial intake as well as for assessment of recovered speech ability, this distinction is of prime importance in understanding the language profile of the patient. In Speech Sample F (Appendix I), an aphasic patient has recovered a quantity of speech in the fifth training period. Of 139 words, 64% appear in standard formulaic expressions, and 7% (*big, small*) are probably idiosyncratically processed formulaic expressions (words and phrases adapted into the formulaic mode). In right hemisphere damage, the paucity of formulaic language in conversation could impact the patient's communicative function. Such failures have been misread by family members and acquaintances as recalcitrance or mood disorder. When correct identification in type of recovered speech – formulaic or novel, is performed, more enlightened treatment can proceed. For example, in cases where the prevailing mode of disordered or recovered speech is formulaic, as in left hemisphere damage and autism, this kind of speech might be supported and molded toward the ends of improved functional socialization and communication. Where it is impoverished, in right or subcortical damage and Parkinsonism, treatment utilizing conversational formulas could be designed.

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## Appendix I. Speech Samples

(Formulaic expressions are underlined)

- A Subject with left hemisphere damage and aphasia (from a group study of 5 subjects; Van Lancker Sidtis & Postman, 2006)  
 Do I work?  
Christ I work every damn day and half night  
 'cause it's 'cause what else you going to do?  
Go crazy? Doing . . .  
Well 'tis long story but . . .  
 That property that we built . . .  
There's a long story.
- B Subject with right hemisphere damage (from a group study of 5 subjects; Van Lancker Sidtis & Postman, 2006)  
 I worked at General Electric for forty something years.  
And I ran a big machine . . . about as big as this room.  
And I worked in jet engines . . . all my life . . . ever since  
well I worked on superchargers  
 before before jets came into being  
 in 1941 I worked on superchargers till I went in . . .  
 I enlisted in the Air Force . . . or the army.
- C Subject with transcortical sensory aphasia (single-case studies; Sidtis, Canterucci, & Katsnelson, 2009)  
**Patient:** I came, I saw, I conquered.  
**Clinician:** *What else did you use to do? . . . Were you an engineer?*  
**Patient:** Yes, I was an engineer. It's more important.  
It's that I . . . I said good morning. I said good morning.  
And . . . or . . . I didn't even say good morning.

I just said Hi, how are you? How are you? And we . . . we . . . Hi, good morning. How are you. It was 9, 8:30, 9:00.  
 I decided to . . . I did very, very well, and then, all of a sudden.  
It's a long story. But I think I know what I'm talking about. I hope so. I hope so, too.

- D Speech of a subject with subcortical damage (the first SC [subcortical] case on Figure 17.5; Sidtis, Canterucci, & Katsnelson, 2009)  
 I felt wonderful, it was a great day.  
Um, I didn't think I was gonna graduate and I made it through college.  
 We had a party and my grandmother was there, my father's mother, and my friends were there, and it was just a great day.  
Well, I woke up and I was in unfamiliar surroundings,  
 I was in the hospital and I didn't know what had happened,  
 and I was depressed because I couldn't move my left side of my leg,  
 and my arm was hurting and I had a sore in the palm of my hand,  
I guess where I had been pressing.
- E Speech of an Alzheimer subject (sample taken during group study; Rogers, Sidtis, & Sidtis, 2010)  
Honey. And I have other things to do for others.  
So I just (sighs)  
What do you need I- I nine (?) and n-  
and just uh a couple of things and-  
and then and please don't come to me  
 when I could be there or there or there okay?
- F Recovery of fluent speech in an aphasic patient after five training sessions (sample from Dr Jacqueline Stark, Vienna, Austria)  
**Test 1** Uh. TV? My Monday is uh . . . bank uh. TV . . . my . . . Monday uh bank. hm.  
**Test 5** Uh . . . uh good morning . . . uh . . . um . . . me uh I want a . . . big big ter// uh terevision, all right? Um, big. All right? And uh . . . money? Yes. Fine . . . um . . . big and. uh . . . small um . . . TV. yes . . . uh small um . . . Uh . . . sky and cricket ands . . . tennis and . . . uh soccer and movies and news and . . . all right? Um . . . right. Uh . . . where? Ah! All right! Boah! nice! Wow! Big! And small! Ho-ho, Jesus! Uh . . . price? What? two thousand . . . oh Jesus! hm . . . wait. um . . . hm hm hm. yes . . . alright . . . um . . . I. will uh . . . I will phone and uh . . . uh. woman, yes? And uh um . . . wife, yes. Um . . . maybe all right . . . maybe uh. two thousand? Oh, Jesus. All right. Uh phone and wait, all right? Uh . . . oh, Jesus! Hi! Jane um . . . phew . . . uh . . . w hat is the matter? Money? Oh, Jesus . . . all right . . . all right! thank you! see you! Uh salesman . . . uh . . . money, yes . . . fine . . .