

Jawsome! – linguistic evidence for dual route models of language

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Psycholinguistic and neurolinguistic researchers (e.g. Townsend & Bever 2001; Ullman 2004) have presented evidence for dual route models of human language processing. This paper provides additional linguistic evidence. While some novel English words are straightforwardly combinatorial (e.g. *un-Eddie-like*), many headlines illustrate morphological memory-based operations that do not follow the standard combinatorial route. Such phenomena are not limited to the outputs of creative English-speaking subeditors. Nicknames in Polish, French, Indonesian and English demonstrate this second morphological route at work in everyday conversations. Similarly, for inflectional morphology, Pinker (1998) argues for dual routes: one route for regular forms, and a second for irregular as well as high-frequency inflectional forms. In this paper, these arguments are extended to syntactic co-ordination, demonstrating how syntactic intricacies flow from a neurolinguistically and psycholinguistically grounded model.

Keywords: non-inflectional morphology, blending, truncation, co-ordination, dual-route processing

1. The psycholinguistic context

For over a decade, a number of researchers in the fields of psycholinguistics and neurolinguistics have argued for “dual route processing”. Townsend and Bever (2001) synthesise much earlier experimentally based work on syntactic

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comprehension by proposing that two routes operate in parallel: the associative route and the combinatorial route. The latter involves on-line construction of entities such as binary-branching trees, wherein smaller units are combined to create larger units (cf. Chomsky’s 2012 Merge operation); the former can also result in novel entities, but in a manner based on the workings of associative memory. Idioms and other formulaic expressions (Wray 2002) thus contrast with sentences such as this one, which the reader is encountering for the first time. Pinker (1998) likewise argues that English inflectional morphology exhibits subtleties best explained by two parallel processing routes, only one of which (the associative route) handles irregularities. Subsequent work (e.g. Ullman 2004) shows that certain frequently used instances of regular suffixation are also best handled by the associative route, contrasting with words that are both regular and less frequent. This dividing line is reminiscent of top-down and bottom-up processing occurring in parallel in dual route models of reading (Coltheart, Curtis, Atkins & Haller 1993).

This paper focuses on non-inflectional morphology (§2) and the syntax of co-ordination (§3). It is argued that both provide us with purely linguistic evidence in favour of dual route models of language, in line with recent neurolinguistic work (§4).

2. Two routes for non-inflectional morphology

When a speaker of English encounters the word *Jawsome!* for the first time – be it in a newspaper headline or on the internet – the word is likely to be mentally associated with the film title *Jaws* as well as the adjective *awesome*. Both associations contribute to the likely meaning of “scarily potent or awe-inspiring”. (There is in fact a cartoon show with this title.) An examination of headlines from the 2013 Melbourne daily newspapers shows that such first encounters of new blends are far from rare. Consider the headlines in (1).

- (1) a. Pic and chews: Foodstagramms divide diners, restaurants (*mX* 10 May 2013)
- b. Nadal Madrid it again (*mX* 12 May 2013)
- c. I’m just gutt-Ed (*mX* 30 May 2013)
- d. Form Woz short-lived (*mX* 30 May 2013)
- e. Budd out of it (*mX* 2 Oct 2013)
- f. AFL’s Franklinstein (*mX* 2 Oct 2013)

- g. NAT'S FYFEDOM (*Herald Sun* Sept, 2013)
- h. Luc on the bright side (*mX* 20 Nov 2013)

(1a) blends food with the Instagram application, a phenomenon that has triggered mixed views on the desirability of disseminating low resolution images of restaurant meals via social media. In (1b), *Madrid* is associated with both the location of Nadal's victory and the verb *did*. In the same economical way, the subsequent headlines make reference to Eddie McGuire, Caroline Wozniacki, Lance "Buddy" Franklin, Nathan Fyfe and Lucas Neill. Importantly, depending on the sporting interests of the reader and on which newspapers are read, some of (1b-h) may be more easily interpretable than others. One's mental associations and who one associates with (socially or virtually) are all critical to the functioning of the associative route of word interpretation – hence the name. The novelties in (1) have not arisen via standard combinatorial (prefixation, suffixation, compounding) processes. They are perhaps to be expected as the output of creative journalists, who refer to their employers as *The Tele* (*Daily Telegraph*), *The Fin* (*Financial Review*), *The Oz* (*The Australian*), *The Hun* (*Herald Sun*) or *The Tiser* (*Advertiser*). Memory associations are such, that mentioning just one or two syllables is sufficient to convey the name of the newspaper, at least in journalistic circles. Clippings or truncations thus also show the associative route of language in action.

Arguably, however, (1) is just the tip of the iceberg. The phenomenon extends far beyond creative English-speaking subeditors. Consider the small sample of blends in (2).

- (2) a. Singlish, Spanglish, Hinglish
- b. labradoodle, spoodle, groodle
- c. Brangelina, Tomkat, Shurley
- d. dramedy, mockumentary, advertorial
- e. fishwich, apple-wich, Segsations
- f. Pajanimals, chatimals, rapimals
- g. boxercise, aquacise
- h. Pictionary, Mathletics, Fast ForWord

Whether one blends languages (Singapore English, Spanish English, Hindi English), dog breeds (labradors, spaniels or golden retrievers with poodles) or

celebrity couples of ephemerally popular culture (Brad Pitt with Angelina Jolie, Tom Cruise with Katie Holmes, Shane Warne with Liz Hurley) linguistic blends are not unusual. Furthermore, the more one is familiar with the relevant domain, the easier it is to interpret novel blended labels. Other domains showing such non-compositionally interpreted creativity include the media (e.g. a genre blending drama and comedy in 2(d)), food (fish sandwich, apple sandwich), toys (animals dressed in pyjamas, animals that chat or rap), physical activity (e.g. blending boxing and exercise) and games (e.g. a dictionary game based on pictures, or computer software marketed as mathematical athletics). For those familiar with the relevant domain, encountering part of a word in a blended lexical item is not just communicatively successful; it also reinforces affective human bonds. Data like (2) often trigger a smile: the pleasure of a puzzle solved, plus possibly a smile of smugness towards those not “in on the joke”. They reinforce social bonding: human associations.

Blends are not the only morphological innovations aligned with the associative route of language. Truncations like those in (3) are another source of pertinent data.

- (3)
- a. *prof* (for professor)
 - b. *swot vac* (for vacation time to swot for exams)
 - c. *chem* (for chemistry)
 - d. *spesh* (for VCE Specialist Mathematics)
 - e. *Roos* (for Kangaroos: the North Melbourne Football Club)
 - f. *Pies* (for Magpies: the Collingwood Football Club)
 - g. *Dees* (for Demons: the Melbourne Football Club)
 - h. *pop* (for popular music)
 - i. *indie* (for independent)
 - j. *perp* (for perpetrator)
 - k. *con trick* (for confidence trick)
 - l. *choc* (for chocolate)
 - m. *pav* (for pavlova)
 - n. *spag bol* (for spaghetti bolognese)

- o. *artic* (for articulation)
- p. *rehab* (for rehabilitation)
- q. *speech path* (for speech pathology)

Depending on whether one associates with university students (3a-b), secondary school students in Victoria (3c-d), AFL footballers (3e-g), musicians (3h-i), the underworld (3j-k), food lovers (3l-n) or speech pathologists (3o-q), the truncated labels above may or may not be interpretable. Those for which one lacks mental associations may well trigger perplexity. As noted earlier, affective connotations often accompany the products of the associative route.

Phenomena of this sort are not exclusive to modern day English. Blends can be readily found in Indonesian (*Basarnas* for *Badan SAR Nasional*, the Search-And-Rescue agency; *Kopassus* for *Komando Pasukan Khusus*, a commando unit), in Russian (*Komsomol* for *Коммунистический союз молодёжи*) and in German (*Nazi*; *Oflag* for a concentration camp for officers: *Offizierslager*). Contemporary Polish politics is fertile ground for ever new blended creations. Thus *PO-PiS*y has been used to describe the antics of the two major opposing parties (PO and PiS). Bronisław Komorowski, the current Polish President, has been described as *Bredziśław Komoruski* (where *bredzić* means “to blather”, and *Ruski* is obvious). His supporters have decried this description as highly disrespectful (roughly on par with *Juliar* for Julia Gillard in the Australian context), which once again illustrates the affective baggage triggered by the connotations typical of the associative route.

Truncations are well attested in French (e.g. *bac philo* for *baccalauréat philosophique*; *manif* for *manifestation*; *sympa* for *sympathique*) and Polish (e.g. *nara* for *na razie* “see you soon”; *matma* for *matematyka*), among other languages. Nicknames provide fertile ground for truncations across the globe and the data below reflect this process across a number of political eras over the past few decades: (4a-d) in Indonesian, (4e-f) in French and (4g-h) in Polish.

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|-----|----------------------|-----------------------|
| (4) | a. <i>Pak Harto</i> | Suharto |
| | b. <i>Bung Karno</i> | Sukarno |
| | c. <i>Gus Dur</i> | Abdurrahman Wahid |
| | d. <i>Mega</i> | Megawati Sukarnoputri |

e. <i>Sarko</i>	Nicolas Sarkozy
f. <i>Ségo</i>	Ségolène Royal
g. <i>Krzak</i>	Marian Krzaklewski
h. <i>Kwas</i>	Aleksander Kwaśniewski

Of course, nicknames can also be formed using the regular combinatorial route (e.g. via suffixation), but the extent to which the non-combinatorial, associative mechanism provides productive opportunities for jocular nicknames to be constructed on the very basis of jocular nicknames is beautifully illustrated in the following contribution to *The Weekend Australian Magazine* of 11 May 2013:

- (5) *My son Tom McNamara was captain of Sydney Uni's touch football team. No one goes by their given name. His nickname is "Tmac". I referee touch football. As his progenitor I became "Premac". My middle son also plays touch football at Sydney Uni; he became "Postmac". My youngest son now goes to Sydney Uni and he is "Threemac".*

As pointed out by Bauer (2012), blending possibilities are such that it is well nigh impossible to formulate hard and fast rules. Examples (1-5) thus stand in stark contrast to the strictly hierarchical structures generated by combinatorial route, exemplified in (6) below with the structure for *non-smoker*.

- (6) [non- [[[smoke N] v] -er N] N]

Of course, the combinatorial route can also easily generate novelties (e.g. *un-Eddie-like*, with a structure much like (6)). Such novelties are rule governed and interpreted compositionally.

An anonymous reviewer suggests, however, that an alternative scenario needs to be considered. Thus suppose that the associative route is restricted to fixed “over-learned” memorised items (as in earlier papers such as Clahsen 1999), while data such as (2) or (5) simply illustrate the ability of speakers to play with language. This paper, in actual fact, seeks to present a mechanism for such playfulness. The non-combinatorial, associative route comes across as “playful” precisely because it can apparently violate standard combinatorial rules. Human memory is associative, thus differing from computer memory or the storage and retrieval of valuables in bank safes. Thus when English-speaking primary school children occasionally utter **brang* (in line with *sing-sang*, *ring-rang*, etc.) or **writ* (in line with

bite-bit, or *light-lit*, etc.), the creative potential of the route originally restricted to over-learned phenomena such as irregular past tense formation is illustrated.

This section thus demonstrates how non-inflectional morphology can be drawn upon to add to the evidence base for dual route processing. Hence, in addition to the duality of inflectional morphology argued for by Pinker (1998), it is possible to see the hallmarks of duality (an associative route as well as a combinatorial route) on another linguistic level. We turn next to syntax, where at least with respect to on-line sentence comprehension, it has been argued that two parallel routes neatly capture decades of experimental results. In fact, Townsend and Bever (2001) have printed their one-line summary twice (in contrasting colours) on the cover of their book: *we understand everything twice*.

3. Two routes for the syntax of co-ordination

At least one traditionally minded grammarian (David Crystal in Crystal, Fletcher & Garman 1976) has distinguished between major syntax (involving parts of speech, subjects, objects, etc.) and minor syntax (involving hard-to-classify turns of phrase). Despite the unfortunate deprecating connotations of the label “minor”, this distinction can be seen as the start of an enlightening discovery pursued by researchers such as Wray (2002) exploring what distinguishes formulaic from (standard) non-formulaic language. Idioms and fixed expressions turn out to be just the tip of an iceberg, as shown by Jackendoff (1997) and Culicover (1999). This section will explore co-ordination, suggesting that some of the perhaps unexpected restrictions on co-ordination follow from the availability of dual routes.

While traditional treatments have typically attributed a flat (ternary-branching) structure to co-ordination, there has been mounting evidence for binary branching for garden-variety combinatorial co-ordinations such as XP-*and*-YP. Huddleston and Pullum (2002) propose the fairly theory-neutral structure in (7):

- (7) [[XP _{Coordinate 1}] [conj [YP] _{Coordinate 2}]]

Evidence such as intonation breaks, and real-life phrases and clauses beginning with *and* or *but*, is adduced in favour of a constituent (labelled Coordinate 2) that comprises the conjunction plus the second conjunct (YP). Needless to say, several theoretically committed authors have explored versions of (7) that conform to X-bar theory. Fernandez-Salgueiro (2008), for example, explores (8) in which B represents a Boolean operator (such as a conjunction):

- (8) [DP [B [DP]_{BP}] DP]

But is there evidence for a second parallel possibility: an associative route to coordination? The remainder of this section investigates this hypothesis.

Certainly there are idioms and fixed phrases that incorporate conjunctions: *fish and chips*, *far and away*, *aid and abet*, *tried and true*, and so forth. These are standardly viewed as lexicalized (e.g. by Huddleston and Pullum 2002). More interestingly there are also quasi-fixed formulas centred on the word *and*. Consider the formula *nice and X*. Someone from Queensland who enjoys Melbourne weather may describe it as *nice and cool*; a comparable Tasmanian might opt for *nice and warm*. The point is that, despite appearances, these phrases do not actually conjoin two equal adjectives. As Huddleston and Pullum (2002) point out, the phrases actually convey something along the lines of “nice on account of being cool/warm”. The evaluative component of meaning and the associated affect could be seen as surprising, until one recalls the discussion of affective and evaluative associations in §2. The associative route actually predicts such states of affairs. Moreover, apparent category violations (e.g. *nice and slowly*) should also now be seen as less troublesome; if licensed by strong associations, the potential ungrammaticality of category mismatch is obviated by obviating the combinatorial route of language processing.

Huddleston and Pullum (2002) remind us of further semantic quirks of the coordination construction: some clauses are ambiguous between a distributed (cf. 9a) and a joint (cf. 9b) reading.

- (9) a. *Kim and Lou know German.*
b. *Kim and Lou are a happy couple.*

Payne (1985) uses the features [+Separate] (for 9a) and [-Separate] (for 9b) to account for such differences. Arguably, however, they follow from the availability of dual routes. The joint or [-Separate] reading has a number of special properties not unexpected from the associative route. Thus one might notice co-occurrence with special lexical items (e.g. *each other*; or *couple*, as in 9(b)). There are also fewer possibilities for independently modifying each conjunct (*Kim and probably Lou* is possible in 9(a) but not 9(b)). There is thus a tighter alignment between the joint reading and what we have already seen of the associative route. The fact that the referents of the relevant conjuncts (Kim and Lou above) are also then “associated” might not be without significance.

A well known peculiarity of co-ordination is the preferential ordering of conjuncts. While *Kim and Lou* and *Lou and Kim* mean the same thing, conjuncts are in fact not always readily interchangeable. There are well attested preferences based on traditional status hierarchies (e.g. *men and women*; *Mr and Mrs*) or on degrees of proximity (e.g. *near and far*; *here and there*). As might be expected, status preferences can be overridden when one’s mental associations question the traditional status asymmetry between males and females. All this is very much in line with the associative route.

Not unexpectedly, conjuncts are not freely interchangeable in idioms (*?*chips and fish*; *?*abet and aid*, etc.). Significantly, the same holds for formulaic co-ordinations such as *nice and warm* or *nice and cool* (under the evaluative interpretation). Conjuncts are stored in memory in a particular order.

Even more interestingly, the associative route can apparently override the dictates of prescriptive grammarians. For instance, the commonly occurring phrase *between you and I* can be straightforwardly explained. Politeness considerations prescribe *Kim and I*, which governed by a preposition should then yield *between Kim and me*. However, if the mental association between the last two words in *Kim and I* is inordinately strong (as it may be when a school system relies on oft-repeated tips and short-cuts rather than grammar lessons), educated users of English can be easily tempted to utter what prescriptivists would proscribe as barbarisms: *between Kim and I*. In fact, the situation is rendered even more curious by users of English using phrases such as *me and Kim* in subject position. This too can be made sense of by invoking the associative route of language. Suppose one does not wish to

associate with school teachers, or has been deprived of the opportunity to make a choice. In this instance, in the absence of strong and overt prescriptive associations, the more subconscious ordering preference of “near before far” should come to the fore. It predicts *me and Kim*, given that *me* is the strong form of the first person pronoun. Because the associative route can even obviate case-based features of the combinatorial route, *me and Kim* can thus actually be found even in subject position.

A final peculiarity worth exploring is multiple co-ordination. Unlike the logical connectives of the Propositional Calculus, natural language conjunctions such as *and* allow multiple conjuncts:

(10) *A, B, C and D*

It is worth exploring how the combinatorial route may have to be tweaked to account for (10). A structure such as (7) or (8) has multiple possibilities for *A and B and C and D*. One of these is a left branching configuration, so that the rightmost instance of the conjunction *and* is highest. If the conjunctions to the left of this rightmost *and* are all “deleted under identity”, (10) would result. However, for this to work, an extended version of c-command seems to be required, and it would need to be motivated independently. (Classically, for X to c-command Y, neither X nor Y dominates the other, and every branching node dominating X dominates Y.) Moreover, (10) is far easier to process than left-branching constructions such as *my father’s mother’s sister’s brother*. One should therefore look to the associative route for a possibly neater account. A not unnatural move is to capitalise on the very nature of association. If *B* is simply brought to mind (“associated”) with *C and D*, one might expect *B, C and D*. With one more association, (10) would then be predicted. Can this be independently motivated? The ordering preference of “short before long” predicts that one should not encounter misorderings (e.g. * *C and D, B*). Arguably, the special intonation of (10) can help us here too. Affective expressions are often accompanied by specific intonation, while the combinatorial route adheres to garden variety rules. The associative route thus makes available a special prosodic way to mark the associations in (10).

4. Possible synthesis?

Chomsky (1981) made the point that eliminating redundancies has served his research programme well, even though optimisation has been more characteristic of physics than biology (where, in his view, language belongs). However, he goes on to add: “But it may be that this guiding intuition is mistaken. Biological systems – and the faculty of language is surely one – often exhibit redundancy” (p.14). Even at the level of gross anatomy, animals typically have two lungs, two kidneys, two nostrils etc. This paper is an argument for humans having language consisting of two routes.

The past two decades have seen a veritable explosion of neuro-imaging studies. Powerful arguments have been made for two routes of language processing. Hickok and Poeppel (2004, 2007), for example, present evidence that speech processing makes use of a dorsal stream (sound-to-action) as well as a ventral stream (sound-to-meaning). The latter crucially involves lexical associative memories. The former is responsible for sequencing, and must cope with subunits combining into larger units. Kosslyn and Miller (2013) somewhat daringly extend this picture from vision and speech to much of human cognition. The dorsal stream is responsible for planning: it is combinatorial. The ventral relies critically on stored memories or associations. The latter include emotional memories – a notable linguistic feature, we would argue, of how the associative route seems to function in non-inflectional morphology and syntax. Ullman (2004) likewise brings together neurolinguistic and psycholinguistic research. In his view, the language faculty uses both declarative and procedural memory – in our terms, the associative and the combinatorial route, respectively.

The foregoing may also shed light on why research in morphology and syntax has for decades been fragmented into rival “schools of thought”. Some have felt that “real linguistics” should be grounded in communication, usage and corpora, decrying formalist approaches as non-empirical. Others have taken exactly the opposite approach, arguing that linguistic science (following Galileo’s stance) should begin with explicit idealisations. Perhaps rival schools of thought have essentially been inspired by different “routes of the language faculty”... Perhaps brain science provides possibilities for rapprochement... I say “perhaps” because while such a scenario might well be described as “jawsome!”, the proposed

picture may actually prove to be “flawsome” (a term used by some advertisers to indicate that which is praised for being “good enough”). It is worth seeing if either of these scenarios holds up to further scrutiny.

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