David Fertig
University at Buffalo
fertig@buffalo.edu

The Regularization-Through-Derivation Effect and the Historical Development of Verbs in the West Germanic Languages

I. Introduction.

One of the major debates in the recent morphological and psycholinguistic literature is that between advocates of purely analogical and connectionist models of morphological processing, who account for all inflectional morphology in terms of forms stored in some kind of associative memory (Rumelhart and McClelland 1986; Daugherty and Seidenberg 1994; Stemberger 1994; Bybee 1988; Derwing and Skousen 1994), and proponents of a dual-mechanism approach, who argue for a fundamental distinction between irregular inflection, where they also see associative memory at work, and regular (default) inflection, which they believe involves symbolic, concatenative rules, with no storage of regularly inflected forms (Pinker and Prince 1988; Pinker 1999; Marcus et al. 1995; Clahsen 1999). One of the main kinds of evidence offered in support of the dual-mechanism hypothesis involves what Kim et al. (1991:180) refer to as the "regularization-through-derivation effect". This effect concerns words formed by the derivational operation known as conversion, or category-changing zero-derivation. This operation changes the category of a word without the addition of any overt derivational affix. In English and German, conversion can produce verbs from nouns: *to telephone*, *to bus*, *fischen* 'to fish'; nouns from verbs: *a drink*, *a freeze*, *ein Kauf* 'a purchase'; and verbs from adjectives: *to dry*, *to bare*, *grünen* 'to be/become green'.

Virtually every publication that supports the dual-mechanism hypothesis at least mentions the regularization-through-derivation phenomenon, and many discuss it in considerable detail (e.g. Kim et al. 1991; 1994; Pinker and Prince 1988:111-113; Pinker 1999:157-174; Marcus et al. 1995:201-204; Clahsen and Almazan 1998:188-191). The basic observation is that words formed by conversion are inflectionally regular. It is especially emphasized that this is true even when the phonological shape of a word might lead us to expect it to be irregular. Thus, for example, denominal or deadjectival verbs that are homophonous with existing strong verbs or that meet the conditions for membership in a strong class are nevertheless weak (regular), e.g. *braked* in spite of the homophonous strong verb *break*; *he kinged/*kung my checkers piece* in spite of the fact that all non-derived verbs ending in *-ing* are irregular.

The goals of this study are twofold. First of all, to re-examine the historical regularizations and irregularizations in German verbs in light of the regularization-through-derivation effect. We will see that there are a number of cases where this effect does appear to have played a role in diachronic developments. In section 4., however, I closely examine the dual-mechanism account of the RTDE and consider the questions of whether that account really is the best way to account for the effect and, conversely, whether the RTDE truly constitutes evidence in support of the dual-mechanism model. We will see that there are actually a number of historical developments (and non-developments) among West Germanic verbs that represent apparent exceptions to the phonomenon.

2. Diachronic predictions of the RTDE

A number of diachronic predictions follow directly from the RTDE. In this study, I am primarily concerned with the following predictions:

1. If speakers reanalyze the derivational relation of an irregular verb to a homophonous (deverbal) noun or adjective and come to perceive the verb as zero-derived from the nominal, the verb must regularize. In section 3.1, I examine cases of historical regularization where such a noun or adjective is present, looking for independent evidence that a derivational reanalysis may have played a role in the regularization.

2. Irregularization of an originally denominal or deadjectival verb is only possible if the verb has first been reanalyzed as underived. In sec. 3.2, I examine several cases that appear to be consistent with this prediction. More problematic cases will be discussed in sec. 4.4.

3. Historical regularizations and irregularizations among the German verbs

This study will only consider strong-to-weak and weak-to-strong movement among German verbs. Regularizations and irregularizations involving preterite-present verbs, rückumlauting verbs, and other irregular patterns will not be addressed. The basic facts of the developments can sometimes be surprisingly controversial. Whereas irregularizations are usually relatively straightforward, the question of what should count as a regularization can be quite complex. There are tremendous discrepancies among existing studies (e.g. Hempen 1988; Kühne 1999; Bittner 1996; Paul 1956:203-46; Behaghel 1928:458-62) in the number of regularizations of originally strong verbs that they report, and even some cases that most existing studies agree on

can be legitimately questioned. Not all aspects of the question of what should count as a historical regularization will be addressed in this study, but some of the problematic issues will come up in the discussion below.

3.1. Regularizations

Among the hundreds of cases of (apparent) historical regularization of German verbs, the ones that are most relevant for our purposes are those where there is evidence that the regularization coincided with a reanalysis of the verb as denominal or deadjectival. There are several cases where etymologists specifically mention such a reanalysis. The noun *Reihe* 'row, series' was originally derived from the once strong verb *reihen* 'to thread, string beads'. Pfeifer (1993) cites reanalysis of the direction of this derivation as a possible cause of the regularization of the verb: "[...] im Nhd. setzt sich schwache Flexion durch, vielleicht weil das Verb als denominative Ableitung empfunden wird".[i] Similarly, Kluge (1975) argues that the originally strong verb *bleuen* 'to beat' came to be perceived as derived from the adjective *blau* 'blue', with which it is etymologically unrelated, and to have the sense 'to beat until (black and) blue'. Some regard the frequent spelling *bläuen* as orthographic evidence for the reanalysis. Drosdowski (1963) claims that the originally underived strong verb *(er)grimmen* 'to become angry', which underwent regularization beginning in the 14th c., was reanalyzed as derived from the adjective *grimm* 'angry' or the noun *Grimm* 'fury'. Synchronically, there is little doubt that this verb is now perceived as deadjectival or denominal.

In a few other cases, there is phonological evidence of reanalysis. The strong verb *rächen* 'to avenge, take revenge' (< OHG *(w)rehhan*) originally had a short vowel, while the related

deverbal noun *Rache* 'revenge' (< OHG *(w)rāhha*) had a long vowel reflecting lengthened-grade ablaut, parallel to *sprechen* - *Sprache*. Since short vowels are not normally lengthened in German before *ch* (< Gmc. *k*; compare *brechen*, *sprechen*, and *stechen* from the same strong class as *rächen*), the long vowel in modern standard *rächen* can only be attributed to a reanalysis of the verb as derived from the noun, with the relation between the vowels reanalyzed as umlaut. The historically unjustified spelling with *ä* also supports the case for this reanalysis (cf. *quälen*, *wägen*, *gären*).[ii] In Dutch, on the other hand, the lengthening of the vowel in the open syllable of the cognate *wreken* was phonologically regular, allowing the direction of derivation between this verb and the noun *wraak* to remain ambiguous, while the verb also continued to rhyme with other strong verbs of the same class: *spreken*, *breken*, *steken*. Perhaps this ambiguity has played a role in the continued survival of the strong participle *gewroken* (beside the weak preterite *wreekte*).

In the case of *keimen* 'to sprout, germinate', the OHG strong verb was *kīnen*. The *-m-* in the modern verb comes from the noun *Keim* 'shoot (of a plant), germ' (Pfeifer 1993). When the phonological influence of the related noun on the verb is so blatant, it is questionable whether the modern weak verb should really be regarded as a continuation of the original strong verb at all, but many scholars do treat it as such (Hempen 1988; Kühne 1999).

In other cases, the evidence for a reanalysis of the verb as denominal is of a semantic nature. In medieval German, the basic meaning of the then-strong verb *schwären* (< MHG *swern* < OHG *sweran*) was 'to hurt (intrans.)' and that of the deverbal noun *Schwäre* (< OHG *swero*) was 'pain'. In modern German, the noun has come to mean 'festering sore', and Wahrig (1980) defines the now-regularized verb in terms of the noun: "eine Schwäre bilden" ("to form a festering sore"). Similarly, the original meaning of *schroten* was 'to cut, chop' and the derived noun *Schrot*

had the expected deverbal meaning 'a cut, a blow'. The noun developed the secondary objective meaning 'that which has been cut', and today it has the strictly objective meaning 'coarse meal (from grain)' while the now-regularized verb has developed the denominal meaning 'to grind coarsely', i.e. 'to turn into *Schrot*' (Pfeifer 1993). Other cases of regularization where this kind of semantically motivated reanalysis of direction of derivation is possible but harder to demonstrate because of the complexity of the semantic changes include: *bannen* 'to cast a spell on', previously also 'to excommunicate'; and *drillen* 'to drill'.

An interesting case is the verb *pflegen*. In its most common modern sense 'to care for, look after, maintain', this verb could be construed as derived from the originally deverbal noun *Pflege* 'care, maintenance'. In this sense the verb is always regularized., but in the somewhat grammaticalized sense 'to do something habitually', which bears no semantic relationship to the noun, the original strong forms sometimes still occur (Pfeifer 1993; Kühne 1999).

A number of cases that are commonly treated as regularization in the literature actually involve a weak verb that was originally a denominal (or deadjectival) verb, related to the original strong verb through two steps of derivation: $V_{strong} \rightarrow N \rightarrow V_{weak}$ (cf. Kim et al.'s 1991 account of the baseball verb 'to fly [out]'). Where the original strong verb has been lost from the language but the denominal weak verb still survives, sometimes having undergone semantic broadening to include the meanings of the lost strong verb, the end result can look very much like regularization. Examples of this type of development include *reuen* (with the more common prefixed form *bereuen*) 'to regret'. The weak denominal verb *(h)riuwōn*/*(h)riuwēn*, derived from the deverbal noun *(h)riuwa*, already co-existed with the original strong verb *(h)riuwan* in OHG (Pfeifer 1993). Similarly, the modern weak verb *wellen* 'to make/be wavy' is descended from the OHG weak denominal *wellōn*, derived from OHG *wella* 'wave', a deverbal formation from the

OHG strong verb *wellan* 'to turn, roll' (Pfeifer 1993; cf. Kluge 1975). In the case of *bauen* 'to build, (previously) to plant', Seebold (1970) notes that semantic considerations point to a denominal origin for the weak verb that had already largely replaced the original strong verb by the beginning of the OHG period. The history of the verb *walzen* 'to roll (a street, steel, etc.) with a roller' is rather controversial. Synchronically, there is little doubt that the modern weak verb is a denominal from *Walze* 'roller', and this may be its historical origin as well (Pfeifer 1993; Seebold 1970). Others believe that the modern weak verb is descended directly from the OHG strong verb *walzan*, in which case it would be an instance of the kind of reanalysis described in sec. xxx (Kluge 1975; Drosdowski 1963). Etymologists explicitly mention the liklihood of denominal origins for a number of other modern weak verbs that have frequently been treated as regularizations of earlier strong verbs by other scholars. These include *rechen* 'to rake' (Pfeifer 1993; Drosdowski 1963), *fluchen* 'to curse' (Seebold 1970) and the participial adjective *gesinnt* '-minded, -disposed' (Pfeifer 1993; Drosdowski 1963).

The modern weak verb *quälen* 'to torment' is the product of a combination of derivation and reanalysis. The weak verb was originally an OHG causative *quellen* derived directly from the intransitive strong verb *quelan* 'to suffer'. The modern spelling with *ä*, however, suggests that it has been reanalyzed as a denominal from *Qual* 'torment', which was also originally derived from the now-extinct strong verb (Pfeifer 1993).[iii]

In the case of *(be)neiden* 'to envy', which appears on many lists of originally strong verbs that have become regularized in the modern standard, the strong forms are actually a temporary medieval innovation. Originally, there was only the underived OHG noun *nīd* and the denominal weak verb *nīdōn* (Pfeifer 1993; Seebold 1970).

Several other verbs with attested weak forms that are usually regarded as products of historical regularization are also (at least partially) descended from OHG weak verbs that existed alongside the original strong verbs. Some of these may well have a history similar to that of *reuen* and *wellen* since there is a deverbal noun from which the weak verbs could be derived, but I can find no confirmation of this derivation. The only one of these cases that is weak in the modern standard is *falten* 'to fold' (OHG: str. vb. *faldan*; noun *fald*; wk. verb *faldōn*). The others are strong in the modern standard but frequently weak in the dialects and/or in medieval and Early Modern German: *schreien* 'to scream' (OHG: str. vb. *scrīan*; noun *screi*; wk. verb *giscreiōn*); *hauen* 'to beat, hew' (OHG: str. vb. *houwan*; noun *houwa*; wk. vb. *houwōn*); *rufen* 'to call' (OHG: str.vb. *(h)ruofan*; noun *(h)ruof*; wk. vb. *(h)ruofen*) (Pfeifer 1993; Seebold 1970).

3.2. Irregularization

Among the handful of originally denominal and deadjectival verbs that have undergone irregularization and become strong verbs in the history of German, there are several cases where the semantic connection between the verb and the underlying noun or adjective became opaque before the irregularization occurred, consistent with what we would expect based on the regularization-through-derivation phenomenon. The originally weak verb *weisen* was derived from the adjective *weise* 'wise' and originally meant 'to make wise' but had come to mean 'to show' and undoubtedly lost any connection with the adjective in the minds of speakers long before it underwent irregularization in the 16th c. (Pfeifer 1993; Fertig 2000:113-114). *Dingen*, which still shows variation between innovative strong and original weak forms in the modern standard, is derived from the noun *Ding*. The relevant OHG meaning of the noun was

'(Germanic) judicial assembly', and *dingen* meant to hold this assembly. Long before irregularization occurred, however, the noun had developed the basic meaning 'thing' and the verb had come to mean 'negotiate, hire'.

The Yiddish and Dutch cognates of *weisen* and *dingen* have also been irregularized. Some Dutch dialects also show irregularization of *erven* 'to inherit' (Haeringen 1940:250). Unlike in German, where the cognate verb *erben* is still transparently derived from the noun *Erbe* 'inheritance' and remains consistently regular, the meaning of the underlying Dutch noun *erf* has undergone narrowing to 'piece of real estate (house + yard)' and the semantic connection to the derived verb is thus no longer obvious.

The verb *preisen* 'to praise' is derived from *Preis*, a loanword from Old French. The basic meaning of the noun was 'praise' in MHG, but it had shifted to 'price, prize' before irregularization occurred in the late medieval and Early Modern period (Kluge 1975; Pfeifer 1993). Parallel semantic change in the noun and irregularization of the verb have occurred in Dutch (Haeringen 1940:249).

Schinden 'to mistreat' is cognate with the English verb 'to skin' (actually a borrowing from Old Norse). The German verb still had its original meaning when it became strong in MHG, but the cognate of the English/Norse noun 'skin' had been lost from German. Similarly, the verb *weihen* 'to consecrate, ordain, make holy' was derived in proto-Germanic from the adjective (OHG) *wīh* 'holy'. The verb remained transparently deadjectival and invariably regular throughout the Middle Ages (Kühne 1999). Although it is still weak in the standard language, it has been irregularized (participle: *gewiehen*) in many dialects following the disappearance of the adjective from the language beginning in the 16th c. (Drosdowski et al. 1963; Pfeifer 1993; Jutz 1925:298; Kranzmayer 1981:281; Schatz 1897:176; DWB). Yet another similar case is found in

Yiddish and Dutch where the cognates of *schenken* 'to give (as a gift)' have been irregularized. The originally underlying adjective, reconstructed as Germanic **skanka-* 'tilted', was lost long ago.[iv] Irregularization of Yiddish *meldn*, cognate with German/Dutch *melden*, 'to declare, report' presumably also occurred only after the underlying noun, still attested in MHG *melde*, had been lost.

In some cases, the nature of the semantic relationship between a basic noun and a denominal verb was apparently always such that the direction of derivation was subject to reanalysis. The verb *klagen* 'complain, wail, sue', for example, was originally derived from the noun *Klage* 'complaint, lament, lawsuit'. Since the noun has something close to a prototypical deverbal meaning, however, the direction of derivation could easily be reanalyzed at any time, as it arguably has been in dialects where *klagen* has become strong: *klagen-klug-geklagen* (Weldner 1991:124, 126).

An interesting combination of semantic and phonological developments opened the door to irregularization in the verb *fragen* 'to ask'. This verb is generally weak in the standard language, but irregularized strong forms like *frug - gefragen* have been in widespread use throughout the modern period (Drosdowski 1984:133; Schirmunski 1962:507-508; Kühne 1999). The semantic relationship to the noun underlying this historically denominal verb, *Frage* 'question', is still transparent, but the original strong verb from which this noun was derived was lost from German in prehistoric times. The weak denominal verb subsequently took over the meanings of the lost strong verb, allowing the directionality of its relationship to the noun to be reanalyzed. These semantic developments occurred very early, but irregularization was not possible at that time on phonological grounds. The weak verb was derived from the ablauting noun OHG *fra:ga*. The long vowel of the derived verb did not fit the pattern for the class-VI strong verbs until open-

syllable lengthening occurred in the late Middle Ages. The leveling of the Verner's law alternation in *schlagen* (previously *schlahen*) in the 16th c. perhaps further promoted the irregularization of *fragen* by providing an additional rhyming model (along with *tragen*) in Class VI (see Fertig 2000:93). The irregularization of *klagen*, along with *jagen* and *sagen*, in some dialects provides further evidence of the attractive force of this pattern (Weldner 1991:124, 126; cf. also Schatz 1897:176). The relevant semantic and phonological developments, with the exception of the leveling of the Verner's Law alternation in *schlagen*, also occurred in Dutch, where *vragen* and (in some meanings) *jagen* have been irregularized in the preterite (*vroeg(-)*/*joeg*) but have retained the original weak past participle (*gevraagd*/*gejaagd*). In some varieties of Dutch, the same development is found in *klagen* (Haeseryn 1997; Haeringen 1940).

Another case of interaction between phonological and semantic factors can be seen in the irregularization of *wünschen* 'to wish', which is always weak in the standard but is strong or shows variation between the original weak and innovative strong forms in many dialects (Schirmunski 1962:506; Roedder 1936:136; Durrell and Davies 1990:234; Schatz 1897:176) as well as in Yiddish (Weinreich 1968; Mark 1978). This verb was created as a denominal from *Wunsch* 'wish'. Semantically, reanalysis of the direction of derivation would presumably have been possible all along for this noun-verb pair since the noun has the typical deverbal meaning 'an instance of wishing'. This reanalysis was unlikely, however, in earlier tiimes (and remains unlikely in standard German) on phonological grounds since the noun had the "underived" vowel *u* while the verb has its umlauted counterpart *ü*. Furthermore, the form *wünschen*, with *ü*, is not a very good match for the prototypical shape of the present stem of any of the strong verb classes. In most German dialects and in Yiddish, however, front rounded vowels undergo unrounding: *ü* > *i*. The form *winschen*, with *i* followed by a nasal + consonant cluster, fits well into the pattern

of one of the largest strong classes, which includes verbs like *singen* 'to sing', *trinken* 'to drink', and *finden* 'to find'. The strong participles of the cognates of standard German *zünden* 'to light (a fire)' in many dialects and in Yiddish presumably also reflect this process of unrounding followed by irregularization, rather than continuation of the MHG intransitive strong verb *zinden* (Rowley 1990:432; Schatz 1897:176; Weinreich 1968; Pfeifer 1993). Moreover, the noun *Wunsch* looks like a typical ablauting deverbal for this class; compare *Fund* '(a) find' from *finden*, *Bund* 'association' from *binden* 'to bind', *Schwund* '(a) decrease' from *schwinden* 'to dwindle', *Schwung* 'swinging motion, curve' from *schwingen* 'to swing, oscillate'.

4. Reconsidering the dual-mechanism account of the RTDE

The standard account of the RTDE found in the dual-mechanism literature starts with the claim that irregular inflection cannot be a property of a morphologically complex word as a whole. It can only be a property of a single morpheme (root or affix).[v] If words derived by conversion are morphologically complex, i.e. if they have internal derivational structure, this would mean that such words could not have the irregular inflection that their phonological shape might lead us to expect. In the case of zero-derived denominal verbs, for example, irregular verbal inflection could not be linked to the underlying root because it is a noun, and it could not be linked to the derived verb as a whole because it is morphologically complex.

Dual-mechanism advocates use the regularization-through-derivation phenomenon to make several different points, which are generally not clearly distinguished in the literature. First of all, this is one of many types of evidence presented to support the crucial argument that the determination of inflectional properties cannot be reduced to a mere question of phonetic

similarity, as was attempted, for example in Rumelhart and McClelland's (1986) original connectionist model. In particular, the evidence shows that lexical items are real. I regard this issue as settled. The RTDE evidence is one important kind of demonstration that two verbs can be homophonous, and in some cases even semantically very similar, and yet have different inflectional properties, simply because they are, in fact, two distinct lexical items. Speakers' awareness that one of the verbs in question is derived from a noun (which in some cases may itself be derived from the other verb) can be the basis for them knowing that they are dealing with two distinct lexical items.

Given the proposals of some connectionists regarding purely distributed representations, demonstrating the reality of lexical items is a very important achievement, but it is ultimately tangential to the dual-mechanism debate itself. After all, dual-mechanism advocates themselves believe that all *irregular* inflection is handled by a single, analogical mechanism, and lexical items with localist representations are clearly necessary even within this analogical component (e.g. to handle homophonous verbs that follow different irregular patterns, such as English *ring* and *wring*, cf. Kim et al. 1991:177; Kim et al. 1994:177-178; Pinker and Prince 1988; 1994; Prasada and Pinker 1993; Derwing and Skousen 1994:197; Stemberger 1994; Bauer 2001:89).

Thus, to count as evidence for the dual-mechanism hypothesis (i.e. to support the claim that regular, default inflection is not handled by the same analogical mechanism as irregular inflection but instead involves concatenative rules), the RTDE clearly must do more than simply prove the reality of lexical items and the inadequacy of pure distributed phonological representation. The remaining points that dual-mechanism advocates try to make with the RTDE evidence are intertwined in a curious way. On the one hand, they argue that the RTDE can only be accounted for by positing explicit derivational structure. To make the connection to the dual-

mechanism hypothesis, they then adopt a theory that treats conversion as a special kind of derivational operation, fundamentally different from operations involving affixation, and argue that it is this special nature of conversion that forces words formed in this way to resort to default inflection.

There are a number of problems with this line of argument:

1) The particular theory of conversion adopted is not widely accepted among generative morphologists. I will argue that it is also not entirely coherent.

2) Other formal theories of conversion account for the RTDE evidence equally well, but if we adopt any of these accounts, the RTDE becomes irrelevant to the dual-mechanism debate (i.e. to the question of whether "default" inflection is fundamentally different from irregular inflection).

3) Some prominent generative morphologists, notably Lieber, have questioned whether conversion really involves explicit derivational structure at all. Ironically, it may be by accepting this position that we can make the strongest case for regarding the RTDE as support for some kind of dual-mechanism hypothesis.

I will discuss each of these points in turn in the sections below.

4.1. Williams on conversion

Most dual-mechanism proponents adopt the account of zero-derivation proposed by Williams (1981), according to which the conversion of a word from one category to another without the addition of any affix involves explicit derivational structure, but this structure is of a fundamentally different kind from that found in normal affixal derivation. An overt affix (usually

a suffix in the Germanic languages) can serve as the head of a derived word and thus determine its lexical category (N, V, A, etc.) and its inflectional properties. When a word is converted from one lexical category to another without the addition of any affix, however, the derived word is, according to this theory, "headless" or "exocentric", and consequently there is no morpheme with which inflectional properties could be associated. In the absence of a "head", the derived word must be inflected according to the regular pattern by default (Kim et al. 1991; 1994; Pinker and Prince 1988:111-113; 1994:335-336; Marcus et al. 1995:201-204; Prasada and Pinker 1993:46; Pinker 1991:533; 1999:157-174).

Most morphologists, however, to the extent that they regard conversion as involving explicit morphological structure at all, subscribe to theories that treat zero-derivation as fundamentally the same as affixal derivation (cf. Spencer 1991). These approaches fall into two classes, corresponding to the well-known distinction between item-and-arrangement and item-and-process morphology (Hockett 1954; Blevins 1999). The item-and-arrangement approach says that zero-derivation actually does involve an affix. The affix happens to have no phonological substance, but in other respects it functions like a phonologically overt affix (Marchand 1969; Olsen 1990; Kiparsky 1982a:135; 1983; Neeleman and Schipper 1993). In particular it can serve as the head of derived words and thus determine their lexical category and inflectional properties. Hale and Keyser's (1993) account of X→V conversion in terms of syntactic (head-to-head) movement is a variation on this null-suffix-as-head approach (cf. Lieber 1998; Farrell 1998). For the item-and-process approach to zero-derivation (Aronoff 1976; Anderson 1992; Beard 1995; 1998), on the other hand, affixation is not fundamental to any kind of derivation. Derivation involves performing an operation on a stem. In some cases, this operation determines the syntactic, semantic, inflectional, or other properties of the derived word, but the issue of

whether it determines any of these properties is entirely independent of the phonological component -- or lack thereof -- of the operation.[vi]

Lieber (1990:188; cf. 1981:172) calls the null-affix-as-head approach "a more or less iron-clad assumption of both traditional and current work on morphology". While this is somewhat overstated, it is certainly true that the alternative theories, taken together, have many more proponents than Williams's headless-derivation theory. A number of generative morphologists offer specific arguments against a headless account of conversion (Neeleman and Schipper 1993; Beard 1998:62; Lieber 1992:157-158). Dual-mechanism proponents offer no substantial arguments in favor of the headless-derivation approach over the alternatives. They do often argue that headlessness, or more generally the absence of a canonical lexical morpheme of the appropriate category, gives us a uniform explanation for a number of different circumstances where consistent regular inflection is supposedly found (Kim et al. 1994:203; Pinker 1999:159-167; Marcus et al. 1995:199-206). From the narrow perspective of the dual-mechanism hypothesis, there might thus appear to be an Ockham's-Razor argument in favor of the notion of headlessness, but from the perspective of morphological theory, the Razor clearly cuts the other way. Positing a special kind of formal morphological operation just to account for conversion complicates the theory quite considerably and, many would argue, unnecessarily (Olsen 1990; Lieber 1981:181; cf. also Hahn and Nakisa 2000). Note also that some of the other phenomena in question are amenable to the same kinds of alternative formal accounts as the RTDE. A number of linguists have proposed a null-suffix-as-head account of exocentric compounds for example (Kiparsky 1982b:10; Bergenholtz and Mugdan 2000:444-445). Indefrey (1999) argues much more generally that the inflectional properties of each of the non-canonical word types identified

as universal default categories in the dual-mechanism literature are in fact a "domain-specific" issue and that "default circumstances are language specific rather than universal".

Finally, there is one crucial question that Williams and his followers do not really address: If a "headless" derivational rule can determine the lexical category of a derived word -- something that is usually determined by a head -- why should we assume that that rule cannot also determine the inflectional properties of the derived word? Why should we assume that a verb like *to grandstand* necessarily has default inflection because it is headless, rather than assuming that the derivational rule that turns *grandstand* and other nouns into verbs also assigns the derived verbs to the regular inflectional class (but could in principle have assigned them to a non-default class)? After all, every English verb derived with an overt suffix, such as *-ize* or *-ify*, also belongs to the default class, but we know that this is not a consequence of headlessness or of any universal principle.[vii]

4.2. Accounting for the RTDE under other formal theories of zero derivation.

All of the theories that do not draw a fundamental distinction between zero- and affixal derivation predict that words created by a given zero-derivation process should all have the same inflectional properties, just as words formed by the addition of derivational suffixes generally all have the same inflectional properties in Germanic languages. But in contrast to Williams's theory, there is no reason why a class of zero-derived words could not be assigned to some irregular (non-default) inflectional pattern, as long as all the words formed by a given derivational process followed the same irregular pattern.[viii] And if such a class does happen to follow the regular pattern, these theories do not oblige us to say that it does so "by default".

Instead, we could maintain that the derived class is assigned to the regular pattern by a positive specification in the derivational rule or in the lexical entry for the null suffix.

How would such a theory account for the fact that words formed by conversion are in fact so often assigned to the default inflectional pattern? First of all, it is important to remember that the great bulk of the relevant evidence in the dual-mechanism literature comes from Germanic languges, and as far as the Germanic languages are concerned, there are clear historical reasons why zero-derived verbs wound up with regular inflection, reasons that have nothing to do with any supposed connection between "headless" derivation and default inflection. In addition, there are a number of synchronic reasons why most irregular patterns are not possible candidates for a derivationally defined class of words. Stump's notion of external inflection could be relevant here, as could Kiparsky's distinction between level-1 and level-3 inflection (see sec. xxx below). More generally, one could argue that the null suffix, as head of the derived word, not only determines the inflection but must also bear that inflection. This would require the inflection itself to be suffixal, which happens to rule out most irregular patterns for English and German verbs.

Along more theory-independent lines, one can point out that irregularities involving morphophonemic alternations can only apply non-vacuously to inputs that meet certain phonological conditions: umlaut only affects back vowels; devoicing only affects voiced segments, etc. Unlike suffixal irregular inflection, such an alternation cannot, by its very nature, mark a grammatical distinction in words of all phonetic shapes (Wurzel 1984:92, 169-172).[ix] This means that in cases where irregular inflectional patterns involve morphophonemic alternations, the regular pattern may be virtually the only possible candidate for use with a derivationally defined set of words.

Historically, it is easy to explain why the West Germanic zero-derived verbs have weak rather than strong inflection and to demonstrate that this originally had nothing to do with "headlessness". In the earliest attested stages of the West Germanic languages, the ancestors of the modern denominal and deadjectival verbs were not zero-derived. They were formed with one of three overt derivational suffixes: OHG *-ja-*, *-ō-*, or *-ē-* (Prokosch 1939; Braune/Eggers 1975; Campbell 1959). All three of these derivational suffixes formed their past tense and participle with the default "weak" dental suffix, but at this stage the weak inflection cannot be attributed to headlessness since the derived verbs were not headless. The overt derivational suffix *-ja-*, *-ō-*, or *-ē-* would have been the head of these verbs. The regular weakening of unstressed syllables in the High Middle Ages reduced all three derivational suffixes to schwa or *Ø* in the West Germanic languages, leaving us with zero-derived verbs which, not surprisingly, continued to form their past tense and participle in the same way that their overtly suffixed ancestors had (Mossé 1968; Brunner 1962; Paul/Wiehl/Grosse 1989).

There is also a (rather more complex) historical reason why zero-derived verbs generally do not belong to any of the irregular weak classes in modern English, such as (adopting the class designations from Pinker and Prince 1988) the "T/D-with-laxing" class (*bleed-bled*), the "overt-*t*-with-laxing" class (*sleep-slept*), the "devoicing" class (*send-sent*) or the "T/D+Ø" class (*hit-hit*).[x] The distinction between regular and irregular weak verbs in modern English is a partial continuation of the distinction between Class-2 and Class-1 weak verbs in OE, and thus ultimately a partial continuation of the distinction between verbs formed with the *-ja-* derivational suffix and those formed with *-ō-*. (The *-ē-* class, which was quite large in OHG, had been reduced by attrition to just four members in Old English.) In early Middle English, after reduction of unstressed vowels, the descendents of the class-2 (*-ō-*) verbs had a connecting

schwa before the dental suffix in the past tense, whereas in the descendents of Class-1 (*-ja-*) verbs, the dental suffix was generally attached directly to the end of the verb stem, with no connecting vowel.[xi] This distinction was in most cases obscured when syncope led to the loss of the Class-2 connecting schwa in late Middle English. Under two conditions, however, traces of the original distinction survived, leading to the inflectional irregularities that we see today in some verbs that originally belonged to the no-connecting-vowel class: 1) syncope in original class-2 verbs was blocked when the verb stem itself ended in a dental stop (*-t* or *-d*); this meant that the old class distinction was maintained largely intact for these verbs, with class-2 /schwa+d/ becoming the regular suffix for such verbs, while the non-syllabic suffixal *-t* or *-d* of class-1 was eliminated through degemination; 2) the direct contact between the verb stem and the consonantal past suffix led to certain conditioned sound changes that left some of the original class-1 verbs irregular. The most common sound changes were vowel shortening before a consonant cluster (*keep-kept*) and devoicing of the suffixal consonant (*burn-burnt*). A number of verbs show both shortening and devoicing (*leave-left*, *mean-meant*). Finally, in the *bleed-bled* and *send-sent* classes, conditions 1) and 2) both apply.

Many of the T/D+Ø weak verbs in Modern English were Class-1 verbs in Old English, including *spit*, *knit*, *shut*, *set*, *sweat*, *wet*, *spread*, probably *slit*, perhaps *cut*, and partially *put*. Others were from Old Norse, borrowed into OE as Class-1 verbs and first attested (with no connecting schwa) in early ME, including *hit*, *thrust*, *cast*, and *rid*. Still others were strong verbs in OE and apparently owe their T/D+Ø past forms to reanalysis of the suffixless strong past. These include *shit*, *burst*, *let*, *bid*, and *shed*. Finally, *quit*, *cost*, and *hurt* were borrowed from French into early Middle English at a time when the general inflectional-class distinction between verbs with and without a connecting schwa was still very much alive. Most French

borrowings were conjugated with a connecting vowel, including most of those ending in *-d* or *-t*, such as *butt* ('hit'), *mend*, *tend*, *fend*, *plead*,[xii] *treat*, *cheat*, *pleat*, *waste*, *taste*, as well as others that rhymed with weak verbs of the no-connecting-vowel class, such as *glean*. A considerable minority entered the no-connecting-vowel class, however, for reasons that are not entirely clear.[xiii] In any case, 22 of the 25 verbs in the modern T/D+Ø class belonged to the no-connecting-vowel class in early Middle English. The modern irregular forms of these 22 verbs therefore have nothing to do with any analogical attraction of the T/D+Ø class. Only three verbs appear to have genuinely been attracted into that class: *split* was borrowed from Dutch in the late 16th c.; *bet*, of controversial origin, is also first attested in the late 16th c.; and *fit*, originally derived from the adjective in the late 16th c., has, in the 20th c., developed T/D+Ø forms in certain meanings.

Similarly, *breed, bleed, feed, lead, read*, *speed* and *meet* are all from OE weak class 1, making *plead* the only verb that has (in some dialects) been attracted into this subclass. Among the other T/D-with-laxing verbs, *hide*, *light*, and *alight* were in weak class 1 in OE, while the remaining three, *slide*, *bite*, and *shoot*, were strong. All members of the "devoicing" class *send*, *lend, bend, spend, rend*, *build* and *gild* are from OE weak class 1. Rhyming verbs of other origins, such as *mend*, *tend*, *fend*, and *end* have all remained regular. *Weep*, *creep*, and *leap*, were all strong in OE, *keep* was class-1 weak, and *sleep* showed variation between strong and class-1 weak. There is some uncertainty about the origin of *sweep*, but it most likely comes from a variant of the OE strong verb *swāpan*.[xiv] The other verbs in the overt-*t*-with-laxing class, *feel*, *deal*, *mean*, *dream*, and *leave* belonged to weak class 1 in OE, with the single exception of *kneel*, which belonged to weak class 2 in OE and was always perfectly regular until *knelt* began appearing in the 19th c.[xv]

Four of the seven overt-*t* verbs with no stem change were in weak class 1 in OE: *burn*, *spill*, *dwell*, and probably *smell*. The 14th c. French borrowing *spoil* can be added to this list, since the irregular form *spoilt* is limited to meanings in which *spoil* became confused with *spill*. In some dialects, the French loanword *spell* and the original class-2 weak verb *learn* have been attracted into this class.

In OE, there were many denominal and deadjectival verbs in both class 1 and class 2. In class 1, however, the *-ja-* derivational suffix had triggered stem-vowel umlaut before it was lost. Since umlaut affected most stressed vowels in OE, the descendents of the class-1 denominals generally have a different stem vowel from the underlying noun or adjective. Thus, *feed* < *food*, *bleed* < *blood*, *breed* < *brood*, *tell* < *tale*, *sell* < *sale*, *gild* < *gold*, and *kemb* < *comb* (which now only survives in the participial *(un)kempt* but was still used in all forms as late as the 19th c.) could all be regarded as irregular zero-derived denominals.[xvi] None of these verbs is generally regarded as a zero-derived denominal, however, because the derivational umlaut pattern has had no productivity whatsoever in English (in sharp contrast to German) since it ceased to be an automatic phonological alternation in prehistoric times. It is generally assumed that speakers do not store *feed* in their mental lexicon with a structure like $[_V[_N$food]] or $[_V[_N$food] -Ø].

The upshot of all these medieval developments in the English weak verbs is that virtually all of the inherited verbs that came to be perceived as zero-derived denominals in later English had belonged to weak class 2 in Old English. Among verbs that rhyme with modern irregulars, these Old English class-2 denominals include: *weed*, *end*, *heap*, *green*, *(be)head*, *bed*, *net*, *steel* and probably *beam*, *rust*, and *spit* ('skewer'). Dual-mechanism advocates have argued that the regular inflection of such denominals must be attributed to the RTDE since their phonetic shape would surely cause them to be attracted into an irregular class if they were non-derived. In fact,

however, there have been very few cases of attraction of original class-2 verbs (or of class-1 verbs with a connecting vowel) into any of the irregular classes of modern English, and this includes non-derived verbs that rhyme with irregulars, such as *earn*, *till*, *strut*, *reap*, *shred*, *wean*, *smear*, *spare*, *stare*, *care*, *like*, *wink*, *peel*[xvii] and perhaps *play* and *seem*. The class-2 origins of the denominal verbs listed above would thus appear to be an entirely sufficient explanation for their continued regular inflection.[xviii]

Since a few vowels were not subject to umlaut in OE and, on the other hand, some nouns and adjectives themselves either had umlaut throughout their paradigms to begin with or were re-formed with front vowels in analogy with their derived verbs, we might expect to find a few Class-1 denominal verbs that 1) are homophonous with their underlying nouns or adjectives and 2) met at least one of the conditions that led to irregular weak inflection. Indeed we do find such verbs: *deal*, *dream*, *speed*, *sweat*, and *wet*. All of these verbs have at least partially retained the irregularities that they inherited from their class-1 origins, which means that if they are synchronically derived they are problematic for the RTDE. It seems unlikely that *deal* is still perceived as denominal, and the status of *speed*, *sweat*, and *dream* is perhaps unclear, but the deadjectival status of *wet* cannot be questioned. I will return to the implications of this verb for the RTDE in secs. xxx and xxx below.

This historical account shows that the denominal and deadjectival verbs in modern English and German started out weak for reasons that had nothing to do with headless derivation or inevitable default inflection. When regular sound change (phonetic reduction in unstressed syllables) turned what had been overt suffixal derivation into zero derivation and again later when syncope of schwa caused most of the verbs from the two weak classes of Middle English to come together in one large regular class, leaving just a few small classes of irregular weak

verbs that arose predictably under specific phonological conditions, we see a continuation of the historically expected inflectional behavior of the derived verbs. The absence of any large-scale reanalysis associated with the historical transition from overt suffixal derivation to zero derivation is consistent with theories that treat affixal derivation and zero derivation as fundamentally the same. The old derivational suffixes *-ja-* and *-ō-* were linked to the weak verbal inflectional pattern, and the zero-derivatiton operations into which these suffixes evolved continued to be associated with the same kind of inflection. There is no evidence here for a special kind of "headless" derivation, or for a special default status for regular inflection.

The alternatives to the headless-derivation theory of coversion are sometimes mentioned in the dual-mechanism literature (e.g. Marcus et al. 1995:203fn. 7), but without any discussion of their implications. Clahsen and Almazan (1998:188) and Clahsen (1999) actually adopt the null-suffix-as-head approach and relegate Williams's theory to a footnote, but they still do not adequately address the ramifications of this switch:

> When such derived words are inflected for the past tense, [...] the regular default affix is used (*Paul spitted the chicken*). The ungrammaticality of irregular past tense forms in such circumstances follows from the fact that the lexical entry for the irregular verb form *spat* is specified for particular syntactic categories (= 'V' in the case of verbs) which derived words such as '*spit (the chicken)*' cannot access given their morphological structure, i.e. [$_{V}$[$_{N}$ spit] -*Ø*]. (Clahsen 1999:998)

This passage seems more consistent, in two ways, with the headless-derivation approach than with the null-suffix-as-head approach that Clahsen says he is adopting. First of all, while it is true

under a null-suffix theory that denominal *spit* has no access to the past tense form of the irregular verb *spit*, it does not follow from this fact alone that the regular default past-tense inflection must be used. In principle, the Ø-suffix which is the head of the denominal verb *spit* could, just like an overt suffix, be associated with an irregular inflectional class. Secondly, under a null-suffix-as-head approach, the syntactic category of the underlying root and the category-changing nature of the derivation are quite irrelevant to the inflectional properties of the derived word. A verb derived from the verb *spit* (e.g. a causative), with the structure $[_V[_V$ spit] -Ø] would have no more access to the irregular forms of the verbal root *spit* than does a verb derived from the noun *spit*. In both cases, the Ø-suffix is the head of the derived word and as such determines its inflectional properties, just as the German suffixes *-chen* and *-lein* determine the inflectional properties of denominal diminutive nouns. The emphasis on "category-changing affixation" and "words derived from other categories" (Clahsen and Almazan 1998:188) thus appears to be a holdover from work that assumes a headless-derivation approach (cf. Kim et al. 1991:180).

Similarly, Clahsen and Rothweiler (1993) try to account for the RTDE in terms of the notion of level ordering from Lexical Phonology (Kiparsky 1982a; b; cf. Gordon 1985). If irregular inflection occurs early (level 1), regular inflection late (level 3), and conversion (category-changing zero-derivation) somewhere in between (level 2), then it will be too late for irregular inflection once zero-derivation has applied. In fact, however, level-3 inflection must include more than just default inflection, at least in German, since derivational noun-forming suffixes, such as *-er*, *-schaft*, *-heit*, *-tum*, take non-default inflection. Kiparsky's theory, like those discussed above, does not predict that zero-derived words must be inflectionally regular (where regular=default). Rather, it predicts that zero-derived words will behave just like words derived with phonologically overt (level-2) affixes.[xix] Clahsen and Rothweiler (1993:29) also stress the

significance of the category change to the RTDE, but this issue is just as irrelevant under Kiparsky's theory as under other null-suffix-as-head approaches.

4.3. Does conversion really involve explicit derivational structure at all?

As discussed above, dual-mechanism advocates argue that the RTDE is strong evidence both for a fundamental distinction between default and non-default inflection and for the psychological reality of explicit derivational word structure. As we have seen, however, the connection that they draw between these two points depends on accepting Williams's headless-derivation theory of conversion, and no compelling case has been made for this move. If we instead followed Clahsen's lead in adopting a null-suffix-as-head approach to conversion (or an item-and-process counterpart thereof) then we might continue to regard the RTDE as evidence for explicit derivational structure or formal derivational rules, but it would then not constitute evidence for the default status of regular inflection.

There is one other alternative. We can maintain a highly constrained version of morphological theory and nevertheless treat conversion as fundamentally different from affixal derivation by positing that conversion, at least in the cases under consideration here, does not involve explicit morphological structure or formal derivational rules at all. This is of course the way many non-generative linguists view conversion (see Clark and Clark 1979), but it is also the position long advocated by Lieber (1981; 1990; 1992; 2004), who argues that N/A -> V and V -> N conversion in English and German is simply a matter of "relisting" (1992:159) of lexical items, "just one form of coinage of novel lexical items", which means that "conversion verbs [...] should behave no differently from simplex coinages." (2004:94)

Lieber presents a variety of ways in which she claims conversion verbs do indeed behave like simplex coinages and not like verbs with derivational structure. The implications of Lieber's theory for the RTDE would be that there really is no RTDE, no regularization effect associated specifically with zero-derived words beyond the general tendency for newly coined words to be regular. As discussed in sec. 4., the bulk of the evidence presented in the dual-mechanism literature is actually entirely consistent with this position. The evidence merely proves the necessity of the notion "distinct lexical item". This is also true of most of the experiments reported in Kim et al. 1991 and 1994. The authors convincingly demonstrate the inadequacy of the "phonology-only" theory and of the "Semantic Centrality Hypothesis" (Kim et al. 1991:182), but with one exception, their results are what would be predicted by any model with distinct lexical items.

The case for a true regularization effect associated specifically with words formed by category-changing zero derivation, in other words the case for a difference in inflectional behavior between conversion words and simplex coinages, is based on one experiment and one claim about existing conversion words.

The claim about existing words is that "the regularization-through-derivation effect is [...] probably exceptionless" Kim et al. (1991:180n.1). If the explanation for the RTDE truly involves "abstract morphological structure" (Kim et al. 1991:209; cf. Pinker 1999:168-174), specifically the fact that "words are represented as morphological tree structures reflecting their derivaton from basic word roots" (Kim et al. 1994:174) combined with the fact that "irregularity is a property of verb roots, not of verbs", then the effect should truly be exceptionless. There would simply be no way that speakers could possibly associate irregular verbal inflection with an item that is represented in their lexicon as, for example, a noun root that is converted into a verb by a

derivational operation. If Lieber's theory is correct, on the other hand, and conversion verbs in the West Germanic languages actually have no derivational structure, then we would expect these verbs to be subject to the same analogical forces that occasionally lead to irregularization in non-derived verbs.

Kim at al. (1991) devote considerable attention to several kinds of apparent exceptions to the RTDE, i.e. cases where an apparently derived verb is inflected irregularly, and argue that in all of these cases the verbs in questions are actually not perceived as derived. I will examine these claims in the following section and also discuss a number of additional apparent exceptions to the RTDE and then consider the experimental evidence for the effect in sec. 4.5.

4.4. Apparent exceptions to the regularization-through-derivation effect

Historically, exceptions that are problematic for the dual-mechanism account of the RTDE are mostly cases of irregularization of conversion verbs in the absence of any evidence of derivational reanalysis. There is also at least one case of lack of (complete) regularization in an originally strong, non-derived verb, where it would seem hard to deny that the verb has, in fact, been reanalyzed as denominal.

The most interesting apparent exception addressed in the dual-mechanism literature is the English verb *to string*, which in some of its senses has the strong past tense and participle *strung*, even though it would appear to be derived from the noun *string*. Kim et al. (1991) adopt Kiparsky's (1983) account of this verb, according to which verbs with corresponding instrument nouns are only truly denominal if the meaning of the verb entails the use of the instrument denoted by the noun. So, for example, the verb *to tape* is (supposedly) denominal, because one

can only $tape_V$ with $tape_N$, whereas the verb *to brush* is not truly denominal because one can brush something away with one's hand or with some other object. The same holds for many uses of *to string*. Rather than denominal derivation, verbs like *brush* and *string* involve "an abstract meaning that jointly underlies the noun and the verb." (Kim et al. 1991:202n.8)

This explanation seems reasonable at first glance, but it comes at an enormous cost to the dual-mechanism account of the RTDE. Instrument noun-verb pairs with a semantic relationship parallel to that in *brush* and *string*, where the meaning of the verb does not necessarily entail the use of the instrument denoted by the noun, represent one of the major classes of what are usually regarded as clear-cut denominal verbs in both English and German (cf. Jespersen 1942:93; Don et al. 2000:949; Sanders 1988:173). Kiparsky (1983:11) lists *hammer*, *paddle*, *whistle*, *saw*, *anchor*, *comb*, and *wedge* as examples, but many of the verbs Kiparsky lists as "true" instrumental denominals actually seem to have the same kind of relationship between noun and verb. He gives the deviant sentence **Screw the fixture on the wall with nails* as evidence that *to screw* is a true denominal, but this sentence is deviant not because screwing necessarily entails the use of screws but rather because, like brushing, screwing involves a certain kind of motion: *He screwed the stick into the ground*. If we accept Kiparksy's explanation for *string-strung* then we must acknowledge that the many other instrumental noun-verb pairs with the same kind of semantic relation are no longer covered by the regularization-through-derivation effect either. One can *pin* someone to the wall with one's arm and *flag* someone down without a flag, so the theory no longer has anything to say about why the past tense of *to pin* is never *pun*, in analogy to *spin-spun*, etc., or why that of *to flag* is never *flug*, in analogy to (non-standard but widespread) *drag-drug* (cf. Murray 1998).

Even some of the favorite examples of Pinker and his colleagues are called into question by this explanation. Does braking necessarily involve the use of brakes? What about Fred Flintstone who brakes with his feet? If, as Kim et al. argue, the sentence "*Tarzan strung his bow with a vine*" shows that *to string* is not a true denominal, then what does *Tarzan spitted his boar with an elephant tusk* say about *to spit* ('skewer').[xx]

One cannot help suspecting that the irregularization of *string* has a lot to do with its phonetic shape, which is such a perfect match for the prototype of the largest class of irregular verbs in English, in other words that the phonetic hypersimilarity effects somehow override the RTDE in this case. A formal account of the RTDE in terms of explicit derivational structure cannot permit the phenomenon to interact with analogical effects in this way, but our suspicions are strengthened when we look at other phonetically similar denominal verbs. *Spring* and *sling* are of course, in the first instance, underived strong verbs, but there are also homphonous denominal verbs meaning 'to provide or fit with springs' and 'to place in a sling, to raise or lower by means of a sling' respectively. Both of these denominal verbs are usually irregular. Concerning the participial adjective *sprung* 'provided with springs', the OED notes that "the expected regular form is rare". For denominal *sling*, the OED makes no mention of a regular form at all, and the examples in the quotations are all irregular, even when the occurrence of the noun *sling* in the same passage makes the denominal status of the verb fully apparent, as in the following technical meaning of the word from pottery: "If the clay be very foul, or full of stones, it is slung; that is, as the clay issues from the pug-mill it is cut into lengths of about 2 feet with a sling, or wire-knife." A Google search reveals countless similar examples for both verbs, such as the following passage from the website of a company that sells Brooks bicycle seats:

> If someone calls me who is interested in BROOKS saddles, but needs some help in deciding which model, I first ask them if they have a preference between the sprung models and unsprung models. Most of us don't think of sprung saddles on our modern bicycle, but BROOKS springs provide a good suspension at a reasonable cost. (http://www.wallbike.com/Brooks.html)

Kim et al. (1991:181; 1994:181-182) use denominal *to ring* as their main example to illustrate the connection between headless derivation and default inflection, but in fact *rung* was quite common as the past and participle, at least through the 19th century, with meanings such as, 'put a ring in the nose of (livestock)', 'put an iron band around (a wheel)', etc. (OED, sv. *ring, v.*1).

Although *spring*, *sling*, and *ring* all involve denominals that are homophonous with existing irregular verbs, the "short-circuit hypothesis" (Kim et al. 1991:200) is of no use in explaining these exceptions since the meanings of the derived verbs are clearly based on the nouns and have no relation whatsoever with the semantics of the respective strong verbs.

There are several other apparent exceptions in English, many of which Pinker (1999) mentions in other contexts as irregular verbs without addressing the fact that they are denominal/deadjectival. The verb *to shoe*, with its irregular past-tense *shod* and alternate participle *shodden*, is perhaps no longer familiar to many speakers of mainstream American English, but for centuries it was a very common irregular verb, and transparently denominal (OED Online; Pinker 1999:71, 80; Curme 1935:289). The irregular participial form *sawn*, from the denominal verb *to saw*, first appeared in the 15th c., along with the past form *sew*. While the latter only survived in non-standard dialects (Pinker 1999:72), participial *sawn* is still used more often in the standard than *sawed* (OED; Fowler/Burchfield 1996; Curme 1935:287).

Pinker and Prince (1988:112) and Kim et al. (1991:183) discuss the irregular past form *wet* at some length without mentioning that *to wet* is deadjectival. In modern mainstream American English, the irregular past may be limited to the sense 'to make wet by urinating', but until quite recently irregular *wet* was in widespread use alongside regular *wetted* in all the verb's meanings, especially in America (OED; Jespersen 1942:35-6; Brunner 1962:261; Mencken 1936:436). Arguing for the other direction of derivation is not an option here since English does not have deverbal adjectives (Olsen 1990).

Non-standard varieties reveal still more exceptions. In the case of dialectal *het*/*heaten* as the past and participle of *to heat*, one could argue that this verb is not necessarily perceived as a denominal, but such an explanation is not available in the case of *skun* and *skan* from *to skin* (Mencken 1936:432, 434; Curme 1935:280, 290). The weak verb *to snow* was derived from the noun *snow* in the 14th c., replacing the originally strong Germanic verb (OE) *snīwan* (from which the noun *snow* had been derived as an ablauting deverbal); *to snow* presumably remains denominal, parallel to other weather verbs like *to rain*, *to hail*, *to sleet*, *to thunder*, but strong forms such as *snew* and *snown* have been common since the 14th c. and are still found in many modern dialects (OED; Curme 1935:290; Pinker 1999:72; Derwing and Skousen 1994:198-200). Occasional occurrences of *wed* for the past tense and participle of *weed* (cf. *fed*, *bled*, etc.) are attested from the 15th through the 19th century (Brunner 1962:261; OED).

The other West Germanic languages are no less problematic for claims of exceptionlessness. Again, we find a number of verbs that have undergone irregularization in spite of continued transparent denominal or deadjectival semantics. The clearest case is German *gleichen* (Dutch *(verge)lijken* Yiddish *glaykhn*) 'to be (a)like, be the same', which originated as a weak, transparently deadjectival verb derived from the adjective *gleich* '(a)like, the same'. The

connection between adjective and verb has remained fully transparent, but the verb underwent irregularization in the Early Modern period and is strong in all three modern standard languages: German *gleichen -glich - geglichen*. Like *string* in English, this verb has been attracted into what is by far the largest and most "productive" irregular class in the continental West Germanic languages. Other verbs that have been attracted into this class include several denominals discussed elsewhere in this paper (e.g. *weisen*, *preisen*, *pfeifen*, *stijven*) as well as a number of other verbs of various origins (e.g. Ger. *schreiben*, *schweigen*, Du. *belijden*, *hijsen*, *kijken*, *kijven*, *kwijten*, *spijten*, *zeiken*; non-standard Du. *vrijen*, *breien*).

The verb *salzen* 'to salt' could be regarded as a problematic case of non- (or incomplete) regularization. It was not originally created as a denominal from *Salz* 'salt', but rather was inherited from Germanic as a strong verb. Its original meaning was apparently 'to season' and it goes back to a widely attested Indo-European verbal root (Seebold 1970). In German, however, (as in English) this verb has come to mean specifically 'to put salt on', and it is thus synchronically clearly denominal, parallel to other denominal verbs like *pfeffern* 'to put pepper on', *zuckern* 'to sugar'. Nevertheless, *salzen* has retained a strong participle. The preterite has been regularized and weak forms of the participle do sometimes occur as well, but *salzen* has actually shown much more resistance to regularization than most other verbs that originally belonged to the same strong class, many of which have been completely regularized, including *schalten* 'to switch', *spannen* 'to tighten, stretch', *walten* 'to prevail, reign', *bannen* 'to cast a spell on', *walken* 'to full (cloth), cudgel', and *wallen* 'to boil, flow in waves' (Kühne 1999; Fertig 2000:116). The Dutch cognate *zouten* has also retained its strong participle.

The analogy of *salzen* is apparently even responsible for the partial irregularization of another transparently denominal verb in German, *schmalzen* 'to add lard to' derived from

Schmalz 'lard', which developed strong forms in MHG (Kühne 1999). The strong participle form *geschmalzen* still occurs in variation with the original weak participle in the modern period (Pfeifer 1993). Another transparently denominal verb, *(um)halsen* 'to embrace around the neck' from *Hals* 'neck', underwent irregularization into the same class as *salzen* and *schmalzen* in MHG (Paul/Wiehl/Grosse 1989:252; Kühne 1999), although this verb has been completely re-regularized in modern German.

A somewhat less clear case is *pfeifen* 'to whistle'. This originally weak verb and the noun *Pfeife* 'whistle, musical pipe, smoking pipe' were borrowed separately from Latin into Germanic. The noun exerted a strong semantic influence on the verb, however, so that the primary medieval meaning of the verb was 'to play music on (a) pipe(s)' (cf. the agent noun *piper*), and suprisingly it was at this point--when the basic semantics of the verb were most clearly denominal--that the verb underwent irregularization in German, giving us the MHG and modern forms *pfiff(-) - gepfiffen* (Paul/Wiehl/Grosse 1989; Kühne 1999). Subsequent semantic changes have rendered the noun-verb connection less transparent. The noun took on the meaning 'pipe for smoking' in the 17th c., and the verb is probably now used most often for whistling with the mouth (Pfeifer 1993; Drosdowski 1963).

The German dialects reveal further problematic irregularizations. In some dialects, *bluten* 'to bleed' from *Blut* 'blood' has become strong. In others we find an irregularization very similar to that of denominal *ring* in English affecting the verb *ringen* in the sense 'to put a nose ring on (a pig)' (Schirmunski 1962; Kranzmayer 1981:284; DWB). In the Cimbrian (South Bavarian) dialect island in Italy, we find irregularization of *reifen* 'to become mature, ripe' from the adjective *reif* and *knien* 'to kneel' from the noun *Knie* (Kranzmayer 1981:281-282). Some dialects even show irregularization of *geigen* 'to play the violin' from *Geige* 'violin' (Schirmunski

1962:506; Roedder 1936:135), which Olsen (1990) regards as the clearest example of an indisputably denominal German verb.

In Dutch, we find irregularization in *stijven* 'to starch (laundry)', a deadjectival verb from *stijf* 'stiff'; and *fluiten* 'to whistle, play on a flute' from *fluit* 'flute' (originally a loanword from French). Irregularization of *fuiven* 'have a party' from *fuif* 'party' is often regarded as jocular (Haeringen 1940:251; Haeseryn et al. 1997), but this seems to reflect a very common reaction that speakers have to innovative irregular forms of verbs until they become established (cf. Fowler/Burchfield 1996 on English *snuck*).

With a little imagination, one could undoubtedly come up with explanations for all of these apparent exceptions, but ad hoc explanations would undermine the theory, and principled explanations always come at a price. If the exceptions all had something in common, perhaps we could find one explanation that would account for all of them, but they seem to be all over the map, involving both denominal and deadjectival verbs, with a variety of semantic relationships between the underlying noun/adjective and the derived verb. We saw in the case of *to string* how severely a principled explanation can cut into the empirical coverage of the theory. If similar explanations were offered for all of the exceptions discussed above, one wonders whether there would be any derived verbs left for the theory to account for.

4.5. Purported experimental evidence for a regularization-conversion connection

As mentioned above, most of the experiments reported in Kim et al. 1991 and 1994 simply prove that irregular inflection must be linked to lexical items rather than just to distributed phonological and/or semantic representations. Only Experiment 5 in Kim et al. 1991, which was inspired by an earlier unpublished study by Carlson, Keyser, and Roeper (1977), actually has any

bearing on the question of whether conversion words are "represented as morphological tree structures reflecting their derivaton from basic word roots" (Kim et al. 1994:174) or are instead "just one form of coinage of novel lexical items" (Lieber 2004:94), with no derivational structure whatsoever. In this experiment, subjects were presented with sentences containing 32 nonce words that were phonologically similar to existing irregular English verbs (e.g. *dring*, *kleed*, *plive*, *smend*, *strow*). In one condition, these words were presented in an initial sentence as nouns, followed by a pair of sentences in which subjects would presumably perceive the word as a verb derived from the nonce noun in the initial sentence. The second and third sentences differed only in that one contained an irregular past tense while the other had regular *-ed*, as in the following example from Kim et al. 1991:205:

(12) b. Novel word used initially as a basic noun:

Mary got a brand new kleed for her birthday.

She liked it so much, she kled for a week.

She liked it so much, she kleeded for a week. (underlining in original)

In another condition, the nonce word in the initial sentence was simply presented as a verb in the infinitive, so that there was no suggestion that it should be understood as denominal, as in the following example (again from Kim et al 1991:205):

12. c. Jeremy's mother warned him not to kleed.

When he disobeyed and kled anyway, he was told he couldn't watch cartoons.

When he disobeyed and kleeded anyway, he was told he couldn't watch cartoons.

In all cases, subjects were asked to rate how good the regular and irregular past tense forms sounded. The results showed that subjects rated the irregular forms more highly in the latter condition, i.e. when the context did not suggest that the nonce verb was denominal. This would appear to mean that conversion words do behave differently from simplex coinages, that the inflectional regularity observed in denominal verbs goes beyond the general tendency for newly coined words to be regular. But on closer examination, it is not clear that this conclusion is really justified.

First of all, the effect found in Experiment 5 appears to be quite small. By no means did the subjects simply reject irregular inflection in the denominal condition. In fact, at least for the items included in the analysis, subjects actually rated the irregular forms higher than the regular forms even in the denominal condition, where they gave the irregulars an average of 4.60 points and the regulars 4.34 on a scale of 1 to 7.[xxi] The "derivation effect" merely consisted of a somewhat smaller margin of preference for irregulars over regulars in the denominal condition than in the underived condition, where irregulars scored 5.13 and regulars 4.38. The account of zero-derivation and the RTDE in the dual-mechanism literature does not just say that there should be a slightly stronger preference for regular inflection in derived verbs than in simplex coinages. It says, rather, that it should be utterly impossible for a speaker to associate irregular inflection with a verb that s/he perceives as a denominal. The relatively high ratings that subjects gave to irregular forms in the denominal condition would thus presumably have to be attributed to subjects frequently not perceiving the verbs in question to be denominal, even though the stimuli were specifically designed to prompt subjects to perceive them in this way, and Kim et al. (1991:205) state unequivocally that "the sentence made it clear that the verb was [...] derived from the context noun".

Secondly, nonce words do not necessarily simulate new coinages. When in real life a hearer (or a reader) is confronted with a verb that s/he has never heard, s/he obviously does not automatically assume that the verb is a new coinage. It could also be a somewhat rare (perhaps archaic or stylistically marked) existing verb, in which case, if it also happens to be a good phonological fit for one of the irregular classes, it is possible that it is irregular. Pinker and Prince (1988:122) note that "the bulk of the strong verbs are of no more than middling frequency and some of them are actually rare." Since speakers seldom, if ever, simply create new words *a nihilo*, a hearer would in fact be smart to guess that an unfamiliar verb that does not have any obvious source is an existing item. If, on the other hand, the unfamiliar verb has an obvious source as a transparent denominal based on a noun that has just occurred in the immediately preceding sentence, then the hearer would be much more likely to guess that the verb is a new coinage. The subjects in the study were told that the experiment would involve rating the naturalness of past forms of "novel words" (Kim et al. 1991:206), but the task is nevertheless ambiguous. Did subjects interpret the task as: "Imagine that such a verb existed in English" or rather as: "Imagine that somebody coined such a verb"? The denominal condition potentially disambiguates the task in favor of the latter interpretation, which could plausibly result in a bias favoring the regular inflected forms. This would appear to be a fully adequate explanation for the effect found in Experiment 5, and for the similar results from Carlson, Keyser and Roeper (1977).

5. Reconsidering the RTDE

The account of the RTDE that is emerging here looks very different from that proposed in the dual-mechanism literature in a number of fundamental and closely related ways:

1) The RTDE has nothing to do with explicit derivational structure.

2) The RTDE is far from exceptionless. In other words, words formed by conversion are by no means immune to the analogical forces that can lead to irregularization.

The RTDE is nevertheless, a real effect. Both the historical and the experimental evidence indicate that verbs formed by conversion do show a tendency to favor regular inflection somewhat more strongly that non-derived verbs of similar phonological shape.

How do we account for this effect if we adopt Lieber's theory of conversion as simply one means of coining new words? I would contend that the dual-mechanism hypothesis itself, the simple notion of a fundamental distinction between "words and rules" (Pinker 1999) provides the answer to this question. Inflectional rules, such as the *-ed* past-tense rule, are truly productive. They can be applied freely wherever they are not blocked by existing irregular forms.

The so-called "productivity" of an irregular pattern such as *fling-flung* is of a completely different nature. These patterns are generalizations across stored forms in the lexicon. They are not available for application to new items in the way that rules are. How does it happen, then, that new items occasionally come to be inflected in accordance with one of the irregular patterns. I would argue that the relevant mechanism is something akin to hypercorrection. Speakers use their knowledge of analogical patterns in the lexicon, not to provide a means of inflecting newly coined words (that's what rules are for), but rather to improve their odds of "guessing right" when they want to produce an inflected form for (what they believe to be) an existing word. Irregularization can occur when speakers guess wrong, but why would they guess at all unless they believe they are dealing with an existing item that might have stored irregular forms? If they think they are dealing with a newly coined word, there is no reason to activate the associative-

analogical network. The applicable default rule will always yield an acceptable inflected form of a new word.

Historically, transparently denominal verbs tend to stay regular because they are subject to constant re-coining. When a speaker re-creates such a verb from a noun or adjective (or when a hearer assumes it to have just been created by another speaker), s/he will automatically produce inflected forms using the default rule. Even if this re-coining only occurs occasionally, it could result in a noticably increased resistance to diachronic irregularization among denominal verbs. If phonological or semantic change (or lexical loss) obscures the relationship to the noun, however, then the verb can only be stored and transmitted as a verb, so that the application of the default rule is no longer ever automatic.

A verb that was originally non-derived but comes to look like a transparent denominal is of course indistinguishable from a true denominal and will thus tend to regularize for the same reasons that denominals tend not to irregularize.

(The remaining sections of the manuscript are still in very rough form.)

*****start here***** (Where does this leave the dual-mechanism hypothesis itself?

-Substantive differences between a null-suffix approach and the approach being advocated here???

This new account is not only more compatible with the empirical evidence, it is also welcome from the point of view of morphological theory since, as Lieber and others have shown, a formal headless-derivation rule is theoretically unappealing.

Dual-mechanism proponents make one important point that can be transferred to the new account: The crucial issue is not just whether or not an item IS new, but rather whether or not speakers _perceive_ it as new, i.e. it is not just a matter of whether or not I have stored irregular forms in my mental lexicon for a given item, but also whether I think other speakers are likely to have stored irregular forms in their lexicons. The evidence suggests that if I do not have stored irregulars for a given item AND I do not think other speakers are likely to have stored irregulars (e.g. when I am pretty sure that an item is new to the language), then I will prefer regular inflection regardless of the phonological shape of the item. This is the fundamental distinction between regular and irregular inflection, between default and non-default, between the rule-based productivity of the former and the analogical semi-productivity of the latter. This is what it means to say that -ed is _the_ (only) default for the English past tense and participle. It would be possible for another pattern to be the default for words of a particular phonological shape, but the behavior of speakers when they perceive a word to be new to the language shows that -ed is in fact the default in all cases. The dual-mechanism hypothesis looks good in the sense that rule-based default productivity does seem to be fundamentally different from word-based, analogical semi-productivity. -Consider evidence that *string* and other words started out regular.)

XX. The RTDE in a violable-constraint framework

One alternative is to admit that, while the regularization-through-derivation effect is very real, it is not exceptionless. This should hardly be surprising or disturbing to anyone in view of the current dominant trend within generative linguistics toward grammatical theories that are based on the interaction of violable constraints (McCarthy 2002; Wiese 1999). A soft-constraint treatment of English inflectional-class assignment could include a highly ranked RTDE that is

occasionally outweighed by other factors. The phonological shape of *to string*, for example, exactly matches the prototype of the largest ablauting class in English, as described by Bybee and Moder (1983). One can easily imagine that the analogical forces favoring an *ø*-past for such a verb would overrule even the highly ranked RTDE constraint. The other problematic irregularizations in English and German also tend to occur in those cases where phonetic analogical forces are strongest. *Gleichen* and intransitive *(-)bleichen* have moved into the largest strong class in German. Pfeifer (1993) mentions the analogical attraction of rhyming strong verbs such as *schleichen* and *streichen*, along with *bleichen*, in accounting for the irregularization of *gleichen* (cf. Fertig 2000:122-123; Wurzel 1984:168-169). Similarly, the influence of *greifen*, *schleifen*, *kneifen*, *pfeifen*, *reißen*, *reiten*, and *reiben* could have played a role in the dialectal irregularization of *reifen*. The most common non-standard strong form of *to skin* (*skun*) belongs to the same large class as *to string*, and *skin* is also a good match for the prototype of this class, with its initial *s*+stop cluster and its final nasal (Bybee and Moder 1983). According to Pinker and Prince's own analysis, *snow* is a perfect candidate for attraction into the *-ew*/*-own* strong class, whose "central exemplars are *blow*, *grow*, *throw*, all of the form [CRo], where R is a sonorant" (1988:116). In the case of *to wet* we can invoke both the unique history of this lexical item (see sec. xxx)[xxii] and the large size of the "T/D + Ø" irregular class to account for the stubborn survival of irregular inflection in spite of the RTDE (Bybee and Slobin 1982a; b; Pinker and Prince 1988:145-151, 185).

Standard Optimality Theory is not supposed to be able to deal with truly analogical forces (McCarthy 2002). Existing optimality theoretic accounts of English irregular verbs (Russell 1999; Stemberger 2001) simply assume that each irregular lexical item is stored in a rote (non-

associative) memory. An account like that in (xxx), which yields the correct past forms of *string* and *skin*, appears somewhat more adequate:[xxiii]

(xxx)

string + PL	[INITS &INITCLUSTER &FINNAS &FINVEL]	RTDE	[INITS &INITCLUSTER &FINNAS]	[FINNAS &FINVEL]	INITS	etc.
stringed	*		*	*	*	*
☞strung		*				

skin + PL	[INITS &INITCLUSTER &FINNAS &FINVEL]	RTDE	[INITS &INITCLUSTER &FINNAS]	[FINNAS &FINVEL]	INITS	etc.
☞skinned			*	*	*	*
skun		*				

This account captures the idea that when the phonological shape of a derived verb is very close to the prototype of a relatively robust irregular class, as in the case of *string*, the irregularizing forces of phonetic analogy can override the RTDE. A verb like *skin*, on the other hand, which we might expect to be irregular in standard English if it were not denominal, is not quite close enough to the prototype of the irregular class to overcome the RTDE. Dialects with *skun* would simply have the reverse ranking of RTDE and [INITS&INITCLUSTER&FINNAS].

This kind of unconstrained use of local conjunction violates the spirit of Optimality Theory, however. Completely unconstrained conjunction (including self-conjunction) is tantamount to weighted constraints, where lower-ranked constraints can gang up to override a higher ranked constraint, and OT with weighted constraints is essentially connectionism. The main feature that distinguishes the OT model from a connectionist network is "strict domination": The highest ranking constraint that is violated by one candidate and not by another decides which of those

candidates is preferred. The number or severity of violations of lower ranking constraints is irrelevant (McCarthy 2002).

Everyone agrees that irregular inflection involves something like a connectionist network, so it should not be surprising that when we try to model irregular inflection in OT, we wind up with the equivalent of a connectionist network. The crucial question is: How does the RTDE itself fit into this kind of hybrid OT-connectionist model? I will return to this question in the next section.

XX. The RTDE in a single-mechanism analogical model

Why do dual-mechanism advocates see the RTDE as such strong evidence for explicit morphological structure and against purely analogical models, such as Bybee's (1988; 1995; 1996a; 2001). In general, dual-mechanism proponents offer two kinds of arguments against single-mechanism analogical and connectionist approaches. First of all, they argue that some phenomena can only be explained by positing that certain specific aspects of grammatical structure are innate. A general-purpose associative-memory model cannot account for such phenomena. Secondly, they argue that it is difficult or impossible to account for both regular and irregular inflection in a single, homogeneous analogical or connectionist network, a view shared by many connectionists (e.g. Lavric et al. 2001; Westermann 1999; Zorzi and Vigliocco 1999). Dual-mechanism advocates readily admit that -- except where they see a need to posit innate structure -- the module(s) responsible for regular inflection could also be connectionist or analogical networks. After all, rule-like, categorical behavior is generally a very easy trick for such a network if that is all that it has to do. Their point is that connectionist/analogical accounts and explicit-rule-and-structure accounts of regular inflection are equally correct models of the

same reality at different levels of abstraction. If there is no evidence of analogical behavior in regulars, then regular inflection is proof of the human capacity for symbol manipulation, regardless of how that capacity is implemented in a neural model (Marcus 2001; Prasada and Pinker 1993; Clahsen 1999:1050; Wiese 1999; but cf. also Pylyshyn 2001).

I will return to the supposed evidence for innateness below. For now, I will assume that the arguments against "unitary, single-net connectionist models" (Prasada and Pinker 1993:44) are valid and that morphological processing must thus involve distinct modules. I will also accept the position that we need positive evidence in order to make a case for an analogy-based account of regulars. In other words, we need evidence for effects associated with regular inflection that are graded rather than categorical. Graded effects can involve either degree of similarity or frequency. Dual-mechanism proponents put a great deal of emphasis on the argument that phonetic-similarity effects play no role in the RTDE, as in the following passage from Kim et al. (1991:208):

> Among the theories that would have difficulty with these results are those that despense with rules and rely on "analogy" to stored, regularly inflected forms to explain the production of novel regular forms (e.g. Bybee, 1988; Stemberger, 1989). Whereas one might get away with suggesting that people inflect *rick* as *ricked* by analogy with *pick/picked*, *nick*/*nicked*, and so on, the hypothesis runs into difficulty in accounting for the current results. First, we have shown that even the more plausible analogy-driven extension of *irregular* patterns (e.g., *dring*/*drang*) is overruled when the grammatical analysis of the item suggests a nonverb derivation. Second, the computation of regulars in such cases cannot easily be driven by close similarity to stored regulars, because the similarity to

> irregulars is far higher, and in many cases there are few or no relevant stored regulars to serve as an attractor. For example, there are very few nondenominal monosyllabic verbs whose pasts end in *-inged*, *-inked*, *-itted*, *-etted*, *-edded*, and *-eeted* (possibly none for *-inged* and *-itted*). Nonetheless, when the irregular was sealed off by denominalization, subjects gave high ratings to regular past tense forms for verbs similar to these sound patterns. It is hard to see how any analogy-driven model could handle the phenomenon unless properties of morphological structure were allowed to gate the analogy process.

Such arguments seem to reflect a lack of familiarity with the analogical models that they are aimed at. As Bybee (1996b) points out in response to a similar argument from Goad (1996), phonetic-similarity effects play no role in her network model's account of the RTDE. The assumption in the dual-mechanism literature is that analogical effects based on anything other than phonetic similarity are uninteresting because they are empirically indistinguishable from symbolic rules and explicit grammatical structure. Thus, dual-mechanism advocates are the "biggest fans" of Rumelhart and McClelland's original pattern associator, which took nothing but phonetic similarity into account, and they criticize all later connectionist and analogical models for resorting to "a hack or a kludge" in order to try to incorporate other factors (Pinker 1999:117). In one very fundamental respect, however, the analogical component of the dual-mechanism model itself resembles some of these later models much more closely that it does Rumelhart and McClelland's network, since it resurrects the lexical item and associates irregular inflectional properties with entries in the mental lexicon as well as with distributed phonological

representations (cf. Kim et al. 1991:177; Kim et al. 1994:177-178; Pinker and Prince 1988; 1994; Prasada and Pinker 1993; Derwing and Skousen 1994:197; Stemberger 1994; Bauer 2001:89).

As pointed out above, dual-mechanism proponents acknowledge that an analogical model incorporating localist representations of lexical items can account for the RTDE.[xxiv] In fact, the RTDE follows naturally from the way such a network handles productive derivational morphology. Bybee's network model, like many other purely analogical models of morphology (e.g. Paul 1877; 1960[1920]; Becker 1990; cf. Esper 1973) represents derivational relations as connections among words (Bybee 1996b). These connections are inherently non-directional, but semantic factors as well as relative token frequency can give the effect of directional derivation.[xxv] An analogical theory would account for the RTDE by treating the inflectional properties of a derived word as a direct consequence of the derivational analogy that licenses the creation of that word. When we say that a new verb like *to pit*, in the sense of 'to remove the pit from fruit', first attested in the 20th century, is created "in analogy to" existing noun-verb pairs like *core*, *seed*, *gut*, *shell*, *skin*, *dust*, etc., we mean not only that the existing parallel word pairs make the new creation possible but also that they determine or influence many of its characteristics, including semantics, form, and inflection. If all inflected forms, regular and irregular, are stored in some kind of associative memory, then the analogy behind the creation of *to pit* would be not just

$core_N : core_V :: pit_N : X$[xxvi]

but rather

$[core, cores]_N : [core, cores, coring, cored, cored]_V :: [pit, pits]_N : X$

In other words, the whole paradigm of the verb *to pit* is created in analogy to the paradigms of existing denominal verbs. There is no need for any ad hoc "kludge" to handle the RTDE.

The real question is thus not whether an analogical account of the RTDE could work but rather whether it is empirically distinguishable from an account based on "abstract grammatical categories" and "structured representations" (Kim et al. 1994:175). Previous arguments in support of purely analogical theories have often been largely of a conceptual rather than an empirical nature (Paul 1877; 1960[1920]; Esper 1973; Morpurgo Davies 1978; Becker 1990). These arguments are unlikely to convince anyone who is not already a believer. The RTDE does not involve any obvious phonetic or semantic similarity effects, but I believe that the analogical account which I sketched out in the previous paragraph entails a kind of frequency effect. Since the RTDE is clearly a violable constraint, I will formulate this frequency effect in Optimality-Theoretic terms. OT constraints, though violable, are supposed to be "categorical" in the sense that they obey strict domination (McCarthy 2002:60). Connectionist/analogical constraints, by contrast, are weighted and graded. They can gang up to defeat a highly ranked constraint, and their strength can vary depending on, among other things, token and type frequency.

In analogical and connectionist models, where the notion of "direction of (zero-)derivation" reduces to semantics and relative token frequency, it seems likely that the derived status of a word would be a matter of degree. A "denominal" verb that is much less frequent than the noun on which it is based might show stronger RTDE effects than one which is only slightly less frequent than the corresponding homophonous noun. The nature of the semantic relationship between noun and verb and the number of other noun-verb pairs with a parallel semantic relationship could also affect the strength of the RTDE. If the RTDE is a result of explicit representation of derivational structure in the lexical entry, on the other hand, it should be equally strong for all denominal verbs, at least for a given speaker. The lexical entry for a verb either has a structure like $[_V[_N X]\text{-}Ø]$ or it does not. A categorical RTDE constraint could be

overruled when the phonetic analogical forces are especially strong, but the degree of analogical force necessary to overrule it should be the same for all denominal verbs. This is a clear case where purely analogical models and an OT version of the dual-mechanism model make different empirical predicitions. I do not know whether it would be possible to find enough appropriate noun-verb pairs to test these predictions experimentally, and if the experiment could be done I do not know whether it would support explicit structure or analogy. The crucial point, however, is that the differences between these theories are substantive. Derivational analogy is not merely a notational variant of explicit morphological structure. This also shows just how subtle the real differences often are between analogical theories and formal theories of morphology.

The innateness argument against analogical accounts of the RTDE involves the evidence for the effect in young children:

> Children hear plenty of verbs-from-nouns, such as *to fish*, *to plug*, *to rain* and *to screw in*. We discovered, however, that they do not hear any verbs-from-nouns that sound like an irregular verb, such as *flied out* or *high-sticked*. That means that prior experience could not have told them what to do when a verb's sound calls for one past-tense form and its structure calls for another; they tend toward the correct answer on their own. (Pinker 1999:208; cf. Kim et al. 1994:204-205)

The reasoning here is completely circular. It is the assumptions of the dual-mechanism theory that force one to posit an innate RTDE. If, on the other hand, regular as well as irregular inflected forms are stored in associative memory and the whole paradigm of each new zero-derived verb is created in analogy to the paradigms of existing zero-derived verbs, then the pressure of this analogical pattern would be latent in the lexical networks of children who have never heard a verb-from-a-noun that sounds like an irregular verb. It would reveal itself the first

time it had to compete with an analogy based on phonetic similarity. There is no need for specific prior experience or hard-wiring or anything else to tell children what to do in these circumstances.

Thus, the innateness argument really backfires. Until the data from children was introduced, it appeared that analogical accounts of the RTDE and explicit-structure accounts were more or less equally plausible. Now, however, we see that a purely analogical theory provides a natural explanation for why children who have had no previous exposure to verbs like *flied out* or *high-sticked* tend to favor regular forms for denominals more strongly than for homophonous or similar-sounding underived verbs. The dual-mechansism theory, on the other hand, can only "explain" this finding by invoking the deus ex machina of innateness.

Things become even more problematic for the dual-mechanism account of the RTDE when we expand the dual-mechanism model itself to cover derivational as well as inflectional morphology, as advocated explicitly by Hagiwara et al. (1999) and Clahsen (1999:1048) and implicitly by Pinker (1999:236-239).[xxvii] By any reasonable standard, N→V, A→V, and V→N conversion in English and especially in German would have to be assigned to the analogical rather than to the explicit-rule-and-structure component of such a gneralized dual-mechanism model. As argued by Anshen and Aronoff (1988), "regular" derivational morphology must be limited to fully productive and transparent processes, such as noun formation with *-ness* in English. Unlike *-ness* nouns, existing products of conversion, in both English and German, must always have their own entries in the dictionary because of limited productivity (Bauer 2001) and frequent semantic and other idiosyncrasies. Even Lieber (1990; 1992), normally a staunch believer in formal grammatical structure and concatenative rules, argues that conversion in

English and German must involve a simple "relisting" (1992:159) of lexical items rather than any explicit rule of grammar.

If dual-mechanism advocates embrace an analogical account of English and German conversion, as the principles of their theory would seem to require, then their account of the RTDE is no longer merely dubious; it is inherently contradictory. The appeal to innate grammatical structure is no longer possible. The evidence for the effect in young children who have never heard any verbs-from-nouns that sound like irregular verbs can only be explained by positing latent analogical attraction to the inflected forms of existing denominal verbs, and this would require that regularly inflected forms be stored in associative memory. Since there is already indisputable experimental evidence that high-frequency regulars are stored (Schreuder et al. 1999; Clahsen 1999:1052), an analogical account of the RTDE does not necesssarily pose any new problems for the dual-mechanism hypothesis, but the fact that even within a dual-mechanism model the RTDE must ultimately be recognized as an analogical effect highlights the irony of the repeated insistence that the RTDE represents proof of explicit derivational structure and an insurmountable problem for purely analogical models.

X. Conclusions

This article is intended not as a general challenge to the dual-mechanism theory of morphological processing but rather as a call to reconsider one aspect of that theory, the account of the so-called regularization-through-derivation effect, which I regard as deeply flawed. Proponents of the dual-mechanism model have offered many kinds of arguments to support it,

and I continue to find many of those arguments very persuasive. My conclusions can be summarized as follows:

1. The regularization-through-derivation effect is undeniably real. Zero-derived denominal and deadjectival verbs are significantly more likely to have regular, weak inflection than are non-derived verbs with the same phonological shape.

2. We see clear diachronic evidence of the effect at work in regularizations and irregularizations of verbs in the history of German. Irregularizations of originally denominal and deadjectival verbs are frequently preceded, for example, by semantic changes that render the derivational status of the verb opaque. In many cases of regularization there is independent evidence that the verb has been reanalyzed as being derived from an originally deverbal (or even etymologically unrelated) noun or adjective. In many other cases of alleged irregularization, we are actually dealing with a derived weak verb that was stem-homophonous and overlapped semantically with the original strong verb which it eventually replaced, in what could be called "regularization through double derivation".

3. The headless-derivation account of the regularization-through-derivation effect, which is adopted in most of the dual-mechanism literature, and the null-suffix-as-head account advocated by Clahsen (1999) make the same predictions under many circumstances. The available evidence from the German zero-derived deverbal nouns and the causative deverbal verbs, however, along with the consensus of most generative morphologists, supports the null-suffix-as-head approach or an item-and-process counterpart thereof. This means that even if we account for the regularization-through-derivation effect in terms of explicit derivational structure, it has no direct relevance for the single- vs. dual-mechanism debate. That null-derived verbs have default inflection is a fact about modern English and German,

not a necessary consequence of any morphological principle. Null-suffixes (or null-derivation operations) can be and sometimes are associated with irregular (non-default) inflectional classes.

4. The regularization-through-derivation effect is not exceptionless. The apparent exceptions that we find in English and German cannot all be explained away without doing serious damage either to the falsifiability or to the empirical coverage of the theory.

5. Many of the dual-mechanism arguments against purely analogical accounts of the RTDE only apply to models that would not even meet the requirements for the analogical component of the dual-mechanism theory itself. When we turn to more sophisticated analogical models, we see that the real question is not whether such models can account for the RTDE but rather whether they are empirically distinguishable from theories with explicit morphological structure.

6. In accordance with current trends in grammatical theory, we can regard the RTDE as a highly-ranked but nevertheless violable constraint that interacts with other constraints, such as phonetic-similarity effects, to determine the inflectional properties of a verb. An OT-inspired version of the dual-mechanism hypothesis would state that constraints favoring regular inflection are based on formal grammatical structure and are thus categorical, meaning that they interact with other constraints in accordance with strict domination, whereas the analogical effects favoring irregularity are weighted, like connectionist constraints. This hypothesis could, in principle at least, be tested by looking for evidence of gradience in effects like the RTDE, which answers the question in 5): There are real, albeit subtle, differences between analogy-based theories and explicit-structure theories of morphology.

References

Albrecht, Karl. 1881. *Die Leipziger Mundart*. Leipzig: Arnold. [Reprinted 1965. Leipzig: Zentral-Antiquariat der deutschen demokratischen Republik.]

Anderson, Stephen R. 1992. *A-Morphous Morphology*, (Cambridge Studies in Linguistics 62). New York: Cambridge University Press.

Anshen, Frank and Mark Aronoff. 1988. Producing morphologically complex words. *Linguistics* 26.641-655.

Aronoff, Mark. 1976. *Word Formation in Generative Grammar*, (Linguistic Inquiry Monographs 1). Cambridge, Mass.: MIT Press.

Aronoff, Mark. 1980. Contextuals. *Language* 56.744-758.

Bauer, Laurie. 2001. *Morphological Productivity*, (*Cambridge Studies in Linguistics* 95). New York: Cambridge University Press.

Baugh, Albert C. and Thomas Cable. 1993. *A History of the English Language*, 4th ed. Englewood Cliffs, New Jersey: Prentice Hall.

Beard, Robert. 1995. *Lexeme-Morpheme Base Morphology*. Albany: State University of New York Press.

Beard, Robert. 1998. Derivation. *The Handbook of Morphology*, ed. by Andrew Spencer and Arnold M. Zwicky, 44-65. Malden, Mass.: Blackwell.

Behaghel, Otto. 1928. *Geschichte der deutschen Sprache*, 5th ed, (Grundriß der germanischen Philologie 3). Berlin: de Gruyter.

Bergenholtz, Henning and Joachim Mugdan. 2000. Nullelemente in der Morphologie. In Booij et al. 2000, 435-450.

Birkmann, Thomas. 1987. *Präteritopräsentia*, (Linguistische Arbeiten 188). Tübingen: Niemeyer.

Bittner, Andreas. 1996. *Starke 'schwache' Verben schwache 'starke' Verben*, (*Studien zur deutschen Grammatik* 51). Tübingen: Stauffenburg.

Blevins, James P. 1999. Productivity and exponence, (Commentary on Clahsen 1999). *Behavioral and Brain Sciences* 22.1015-1016.

Bloomer, Robert. 1994. *System-Congruity and the Participles of Modern German and Modern English: A Study in Natural Morphology*. Hamburg: Buske.

Booij, Geert. 1999. Lexical storage and regular processes, (Commentary on Clahsen 1999). *Behavioral and Brain Sciences* 22.1016.

Booij, Geert, Christian Lehmann, and Joachim Mugdan, eds. 2000. *Morphologie/Morphology*, vol. 1, (*Handbücher zur Sprach- und Kommunikationswissenschaft* 17.1). New York: de Gruyter.

Braune, Wilhelm. 1975. *Althochdeutsche Grammatik*, 13th ed., ed. by Hans Eggers, (Sammlung kurzer Grammatiken germanischer Dialekte, A.5). Tübingen: Niemeyer.

Brunner, Karl. 1962. *Die englische Sprache*, (Sammlung kurzer Grammatiken germanischer Dialekte B., 6). Tübingen: Niemeyer.

Bybee, Joan L. 1988. Morphology as Lexical Organization. In Hammond and Noonan 1988, 119-141.

Bybee, Joan L. 1995. Regular Morphology and the Lexicon. *Language and Cognitive Processes* 10.425–55.

Bybee, Joan L. 1996a. Productivity, Regularity and Fusion: How language use affects the lexicon. In Singh 1996, 247-269.

Bybee, Joan L. 1996b. A Reply to Goad. In Singh 1996, 280-283.

Bybee, Joan. 2001. Phonology and Language Use. New York: Cambridge Univ. Press.

Bybee, Joan L. and Carol Lynn Moder. 1983. Morphological Classes as Natural Categories. *Language* 59.251-270.

Bybee, Joan L. and Dan I. Slobin. 1982a. Rules and Schemas in the Development and Use of the English Past Tense. *Language* 58.265-289.

Bybee, Joan L. and Dan I. Slobin. 1982b. Why Small Children Cannot Change Language on Their Own: Suggestions from the English Past Tense. *Papers from the 5th International Conference on Historical Linguistics*, ed. by Anders Ahlqvist, (*Current Issues in Linguistic Theory* 21), 29-37. Amsterdam: Benjamins.

Campbell, A. 1959. *Old English Grammar*. Oxford: Clarendon.

Clahsen, Harald. 1999. Lexical Entries and Rules of Language: A Multidisciplinary Study of German Inflection. *Behavioral and Brain Sciences* 22.991-1060.

Clahsen, Harald and Mayella Almazan. 1998. Syntax and morphology in Williams syndrome. *Cognition* 68.167-198.

Clahsen, Harald and Monika Rothweiler. 1993. Inflectional Rules in Children's Grammars: Evidence from German Participles. *Yearbook of Morphology 1992*, ed. by Geert Booij and Jaap van Marle, 1–34. Boston: Kluwer.

Crowhurst, Megan and Mark Hewitt. 1997. Boolean Operations and Constraint Interactions in Optimality Theory. (ROA#229-1197 <http://roa.rutgers.edu/>)

Daugherty, Kim G. and Mark S. Seidenberg. 1994. Beyond Rules and Exceptions. A Connectionist Approach to Inflectional Morphology. In Lima et al. 1994, 353-388.

Derwing, Bruce L. and Royal Skousen. 1994. Productivity and the English Past Tense. Testing Skousen's Analogy Model. In Lima et al. 1994, 193-218.

Di Sciullo, Anna-Maria and Edwin Williams. 1987. *On the Definition of Word*, (*Linguistic Inquiry Monographs* 14). Cambridge, Mass.: MIT Press.

Don, Jan, Mieke Trommelen, and Wim Zonneveld. 2000. Conversion and Category Indeterminacy. In Booij et al. 2000, 943-952.

Drosdowski, Günther, Paul Grebe et al. 1963. Duden Etymologie, (Der Duden in 10 Bänden 7). Mannheim: Dudenverlag.

Drosdowski, Günther et al. 1983. Duden Deutsches Universalwörterbuch. Mannheim: Dudenverlag.

Drosdowski, Günther et al. 1984. Duden Grammatik der deutschen Gegenwartssprache, (Der Duden in 10 Bänden 4). Mannheim: Dudenverlag.

Durrell, Martin and Winifred V. Davies. 1990. Hessian. In Russ 1990, 210-240.

DWB = Grimm, Jacob and Wilhelm. 1854–1971. *Deutsches Wörterbuch*, 33 vols. Leipzig: Hirzel.

Farrell, Patrick. 1998. Comments on the Paper by Lieber. In Lapointe et al. 1998, 34-53.

Fertig, David. 2000. *Morphological Change Up Close*, (*Linguistische Arbeiten* 422). Tübingen: Niemeyer.

Fowler, H.W. 1996. *The New Fowler's Modern English Usage*, 3rd ed. by R.W. Burchfield. Oxford: Clarendon.

Goad, Heather. 1996. Productivity, Derivational Morphology and Atypical Populations: Comments on Bybee. In Singh 1996, 270-279.

Gordon, Peter. 1985. Level-ordering in lexical development. *Cognition* 21.73-93.

Haeringen, C.B. van. 1940. De taaie levenskracht van het sterke werkwoord. De Nieuwe Taalgids 34.241-255. (Online at: http://www.dbnl.org/tekst/haer001taai01/)

Haeseryn, W., K. Romijn, G. Geerts, J. de Rooij, and M.C. van den Toorn. 1997. Algemene Nederlandse Spraakkunst, tweede, geheel herziene druk. Groningen: Nijhoff. (Online at: http://oase.uci.kun.nl/~ans/)

Hagiwara, Hiroko, Yoko Sugioka, Takane Ito, Mitsuru Kawamura, and Jun-ichi Shiota. 1999. Neurolinguistic evidence for rule-based nominal suffixation. *Language* 75.739-763.

Hahn, Ulrike. 1999. The dual-route account of German: Where it is not a schema theory, it is probably wrong, (Commentary on Clahsen 1999). *Behavioral and Brain Sciences* 22.1024-1025.

Hahn, Ulrike and Ramin Charles Nakisa. 2000. German Inflection: Single Route or Dual Route? *Cognitive Psychology* 41.313-360.

Hale, Kenneth and Samuel Jay Keyser. 1993. On Argument Structure and the Lexical Expression of Syntactic Relations. *The View from Building 20: Essays in Honor of Sylvain Bromberger*, ed. by Kenneth Hale and Samuel Jay Keyser, 53-109. Cambridge, Mass.: MIT Press.

Hammond, Michael and Michael Noonan, eds. 1988. Theoretical Morphology. New York: Academic Press.

Harasowska, Marta. 1999. *Morphophonemic Variability, Productivity, and Change*. *The Case of Rusyn*, (Trends in Linguistics, Studies and Monographs 110). New York: Mouton de Gruyter.

Hare, Mary and Jeffrey L. Elman. 1995. Learning and Morphological Change. *Cognition* 56.61–98.

Hempen, Ute. 1988. *Die starken Verben im Deutschen und Niederländischen,* (Linguistische Arbeiten 214). Tübingen: Niemeyer.

Hockett, Charles F. 1954. Two models of grammatical description. *Word* 10.210-254.

Indefrey, Peter. 1999. Some problems with the lexical status of nondefault inflection, (Commentary on Clahsen 1999). *Behavioral and Brain Sciences* 22.1025.

Jespersen, Otto. 1942. *A Modern English Grammar on Historical Principles, Part IV: Morphology*. Copenhagen: Munksgaard.

Jutz, Leo. 1925. *Die Mundart von Südvorarlberg und Liechtenstein*, (*Germanische Bibliothek* I., I., 15). Heidelberg: Winter.

Kim, John J., Steven Pinker, Alan Prince, and Sandeep Prasada. 1991. Why No Mere Mortal Has Ever Flown Out to Center Field. *Cognitive Science* 15.173-218.

Kim, John J., Gary F. Marcus, Steven Pinker, Michelle Hollander and Marie Coppola. 1994. Sensitivity of children's inflection to grammatical structure. *Journal of Child Language* 21.173-209.

Kiparsky, Paul. 1982a. From Cyclic Phonology to Lexical Phonology. *The structure of phonological representations* (Part I), ed. by Harry van der Hulst and Norval Smith, 131-175. Dordrecht: Foris.

Kiparsky, Paul. 1982b. Lexical Morphology and Phonology. *Linguistics in the Morning Calm*, ed. by the Linguistic Society of Korea, 3-91. Seoul: Hanshin.

Kiparsky, Paul. 1983. Word-formation and the Lexicon. *1982 Mid-America Linguistics Conference Papers*, ed. by Frances Ingemann, 3-29. Lawrence, Kansas: Department of Linguistics, The University of Kansas.

Kluge, Friedrich. 1975. *Etymologisches Wörterbuch der deutschen Sprache*, 21st ed. New York: de Gruyter.

Kranzmayer, Eberhard. 1981. *Laut- und Flexionslehre der deutschen zimbrischen Mundart*, (*Beiträge zur Sprachinselforschung* 1). Wien: VWGÖ.

Kühne, Andreas. 1999. *Zur historischen Lexikostatistik der starken Verben im Deutschen*, (*Studien zur Geschichte der deutschen Sprache* 2). Heidelberg: Winter.

Lapointe, Steven G., Diane K. Brentari, and Patrick M. Farrell, eds. 1998. *Morphology and Its Relatioin to Phonology and Syntax*. Stanford: CSLI.

Lavric Aureliu, Diego Pizzagalli, Simon Forstmeier, and Gina Rippon. 2001. Mapping dissociations in verb morphology. *Trends in Cognitive Sciences* 5.301-308.

Lieber, Rochelle. 1981. Morphological Conversion within a Restrictive Theory of the Lexicon. The Scope of Lexical Rules, ed. by M. Moortgat, H. van der Hulst, and T. Hoekstra, 161-200. Dordrecht: Foris.

Lieber, Rochelle. 1990. *On the Organization of the Lexicon*. New York: Garland.

Lieber, Rochelle. 1992. *Deconstructing Morphology*. Chicago: The University of Chicago Press.

Lieber, Rochelle. 1998. The Suffix *-ize* in English: Implications for Morphology. In Lapointe et al. 1998, 12-33.

Lima, Susan D., Roberta L. Corrigan, and Gregory K. Iverson, eds. 1994. *The Reality of Linguistic Rules*, (Studies in Language Companion Series 26). Philadelphia: Benjamins.

Long, Mary McDonald. 1944. *The English Strong Verb from Chaucer to Caxton*. Menasha, Wisconsin: Banta.

MacWhinney, Brian and Jared Leinbach. 1991. Implementations are Not Conceptualizations: Revising the Verb Learning Model. *Cognition* 40.121–57.

Marchand, Hans. 1969. *The Categories and Types of Present-Day English Word-Formation*, 2nd ed. Munich: Beck'sche Verlagsbuchhandlung.

Marcus, Gary F. 2001. *The Algebraic Mind: Integrating Connectionism and Cognitive Science*. Cambridge, Mass.: MIT Press.

Marcus, Gary F., Steven Pinker, Michael Ullman, Michelle Hollander, T. John Rosen, and Fei Xu. 1992. *Overregularization in Language Acquisition*, (*Monographs of the Society for Research in Child Development*, serial no. 228, vol. 57, no. 4). Chicago: Univ. of Chicago Press.

Marcus, Gary F., Ursula Brinkmann, Harald Clahsen, Richard Wiese, and Steven Pinker. 1995. German Inflection: The Exception that Proves the Rule. *Cognitive Psychology* 29.189–256.

Mark, Yudel. 1978. Gramatik vun der Yidisher Klal-Shprakh. New York: Congress for Jewish Culture.

Marslen-Wilson, William. 1999. Abstractness and combination: The morphemic lexicon. *Language processing*, ed. by Simon Garrod and Martin J. Pickering. Hove, East Sussex: Psychology Press.

McCarthy, John J. 2002. *A Thematic Guide to Optimality Theory*. New York: Cambridge University Press.

Mencken, H.L. 1936. The American Language, 4th ed. New York: Knopf.

Menn, Lise and Brian MacWhinney. 1984. The Repeated Morph Constraint: Toward an Explanation. *Language* 60.519-41.

Mossé, Fernand. 1968. *A Handbook of Middle English*. Baltimore: Johns Hopkins University Press. [Translated from the French by James A. Walker.]

Murray, Thomas E. 1998. More on *drug/dragged* and *snuck/sneaked*. Evidence from the American Midwest. *Journal of Linguistics* 26.209-221.

Neeleman, Ad and Joleen Schipper. 1993. Verbal prefixation in Dutch: thematic evidence for conversion. *Yearbook of Morphology 1992*, ed. by Geert Booij and Jaap van Marle, 57-92. Boston: Kluwer.

OED = The Oxford English Dictionary, 2nd ed. (with quarterly updates from the 3rd ed.). Oxford University Press. <http://dictionary.oed.com/>

Olsen, Susan. 1990. Konversion als ein kombinatorischer Wortbildungsprozeß. *Linguistische Berichte* 127.185-216.

Orsolini, Margherita, Rachele Fanari and Hugo Bowles. 1998. Acquiring Regular and Irregular Inflection in a Language with Verb Classes. *Language and Cognitive Processes* 13.425-464.

Paul, Hermann. 1956. *Deutsche Grammatik*, 3rd ed., vol. 2. Halle: Niemeyer.

Paul, Hermann. 1989. *Mittelhochdeutsche Grammatik*, 23rd ed. by Peter Wiehl and Siegfried Grosse, (*Sammlung kurzer Grammatiken germanischer Dialekte* A., 2). Tübingen: Niemeyer.

Pfeifer, Wolfgang, ed. 1993. *Etymologisches Wörterbuch des Deutschen*, 2nd ed. Munich: Deutscher Taschenbuch Verlag.

Pinker, Steven. 1991. Rules of Language. *Science* 253.530–5.

——— 1997. Words and Rules in the Human Brain. *Nature* 387.547–8.

——— 1999. *Words and Rules*. New York: HarperCollins.

Pinker, Steven and Alan Prince. 1988. On Language and Connectionism: Analysis of a Parallel Distributed Processing Model of Language Acquisition. *Cognition* 28.73–194.

——— 1994. Regular and Irregular Morphology and the Psychological Status of Rules of Grammar. In Lima et al. 1994, 321–351.

Prokosch, E. 1939. *A Comparative Germanic Grammar*. Philadelphia: Linguistic Society of America.

Pylyshyn, Zenon W. 2001. Why the mind is (still) not a network, (Review of Marcus 2001). *Trends in Cognitive Sciences* 5.499.

Roedder, Edwin. 1936. *Volkssprache und Wortschatz des badischen Frankenlandes*. New York: Modern Language Association of America.

Rowley, Anthony R. 1990. North Bavarian. In Russ 1990, 417-437.

Rumelhart, David E. and James L. MeClelland. 1986. On Learning the Past Tenses of English Verbs. *Parallel Distributed Processing: Explorations in the Microstructure of Cognition*, vol. 1, 216-271. Cambridge, MA: Bradford.

Russ, Charles V.J., ed. 1990. *The Dialects of Modern German*. London: Routledge.

Russell, Kevin. 1999. MOT: Sketch of an OT approach to morphology (Draft). (ROA#352-1099 <http://roa.rutgers.edu/>)

Sanders, Gerald. 1988. Zero Derivation and the Overt Analogue Criterion. In Hammond and Noonan 1988, 155-175.

Schreuder, Robert, Nivja de Jong, Andrea Krott, and Harald Baayen. 1999. Rules and rote: Beyond the linguistic either-or fallacy, (Commentary on Clahsen 1999). *Behavioral and Brain Sciences* 22.1038-1039.

Schatz, Joseph. 1897. *Die Mundart von Imst*. Strassburg: Trübner.

Schirmunski, V.M. 1962. Deutsche Mundartkunde, (Veröffentlichungen des Instituts für deutsche Sprache und Literatur 25). Berlin: Akademie-Verlag.

Seebold, Elmar. 1970. Vergleichendes und etymologisches Wörterbuch der germanischen starken Verben, (Janua Linguarum, Series Practica 85). The Hague: Mouton.

Seidenberg, Mark S. and Laura M. Gonnerman. 2000. Explaining derivational morphology as the convergence of codes. Trends in Cognitive Sciences 4.353-361.

Singh, Rajendra, ed. 1996. *Trubetzkoy's Orphan. Proceedings of the Montréal Roundtable "Morphonology: Contemporary Responses"*, (*Current Issues in Linguistic Theory* 144.) Philadelphia: Benjamins.

Spencer, Andrew. 1991. *Morphological Theory*. Cambridge, Mass.: Blackwell.

Spencer, Andrew. 1999. Inflectional classes, defaults, and syncretisms, (Commentary on Clahsen 1999). *Behavioral and Brain Sciences* 22.1040.

Stemberger, Joseph. 1981. Morphological Haplology. *Language* 57.791-817.

Stemberger, Joseph. 1994. Rule-Less Morphology at the Phonology-Lexicon Interface. In Lima et al. 1994, 147-169.

Stemberger, Joseph. 2001. Overtensing within Optimality Theory. (ROA#477-1101 <http://roa.rutgers.edu/>)

Stump, Gregory T. 2001. Inflectional Morphology, (Cambridge Studies in Linguistics 93). New York: Cambridge University Press.

Vogel, Petra Maria. 1996. *Wortarten und Wortartenwechsel*, (*Studia Linguistica Germanica* 39). New York: de Gruyter.

Wahrig, Gerhard. 1980. Deutsches Wörterbuch, 2nd ed. Mosaik.

Weinreich, Uriel. 1968. Modern English-Yiddish Yiddish-English Dictionary. New York: Schocken.

Weldner, Heinrich. 1991. *Die Mundart von Barchfeld an der Werra*, (*Zeitschrift für Dialektologie und Linguistik*, Beiheft 68). Stuttgart: Steiner.

Westermann, Gert. 1999. Single mechanism but not single route: Learning verb inflections in constructivist neural networks, (Commentary on Clahsen 1999). *Behavioral and Brain Sciences* 22.1042-1043.

Wiese, Richard. 1999. On default rules and other rules, (Commentary on Clahsen 1999). *Behavioral and Brain Sciences* 22.1043-1044.

Williams, Edwin. 1981. On the Notions "Lexically Related" and "Head of a Word". *Linguistic Inquiry* 12.245-274.

Wurzel, Wolfgang Ullrich. 1984. *Flexionsmorphologie und Natürlichkeit*, (studia grammatica 21). Berlin: Akademie-Verlag.

Wyld, Henry Cecil. 1927. A Short History of English, 3rd ed. London: Murray.

Zorzi, Marco and Gabriella Vigliocco. 1999. Dissociation between regular and irregular in connectionist architectures: Two processes, but still no special linguistic rules, (Commentary on Clahsen 1999). *Behavioral and Brain Sciences* 22.1045-1046.

[i] "In modern standard German, weak inflection prevails, perhaps because the verb is perceived as a denominal derivation."

[ii] This historically unjustified *ä* also occurs, however, in *jäten* 'to weed' where there is no related noun, and in the case of *Schwär(e)*/*schwären*, it occurs in both the noun and the verb.

[iii] Another case of a weak verb derived from a now-extinct strong verb that is often mistakenly regarded as a regularization is *zehren* 'to live off, eat away at' derived from OHG *zeran* 'to fight'. *Blähen* 'to billow, cause gas' and *schweifen* 'to roam' appear to have similar histories (Pfeifer 1993; Seebold 1970).

[iv] The semantic connection between the adjective and the derived verb is apparent from the original verbal meaning 'to pour a beverage into a drinking vessel', which involves tilting the vessel from which one is pouring (Kluge 1975; Pfeifer 1993).

[v] One often reads in the dual-mechanism literature that irregular inflection can only be a property of a root (e.g. Kim et al. 1991:180; Marcus et al. 1995:199). Obviously, "root" is being used loosely to refer to any morpheme that can serve as the head of a word, since it is well known that many suffixes bear irregular (non-default) inflection. This is true, for example, of virtually all German noun-forming suffixes: *-heit*, *-schaft*, *-tum*, *-er*, *-chen*, *-lein*, etc. (Marcus et al. 1995:227 fn. 18).

[vi] Stump (2001:104) may appear at first glance to be siding with Williams when he refers to zero-derived denominal verbs as "unheaded", but in fact he means something quite different by this term. In Stump's theory, all category-changing derivation, affixal or otherwise, results in unheaded words. A derivational affix can never be a head, only the underlying root can serve as head of a derived word. According to Stump's theory, the inflection of a denominal verb or a

deverbal noun does not necessarily have to be regular, but it must be "external", i.e. outside of the derivational suffix, if there is one, or outside of the root in the case of zero-derivation.

[vii] Di Sciullo and Williams (1987:39) argue that the fact that the underlying verb does not contribute anything to the argument structure of a zero-derived noun is evidence for the headless status of the conversion rule, but they also admit that there are problems with this argument (1987:39 fn.3).

[viii] The undeniable existence of homophonous overt suffixes means that a theory with null-suffix heads would have to allow for the possibility of homophonous null suffixes, which complicates predictions about all zero-derived denominal verbs, for example, necessarily inflecting in the same way.

[ix] The dual-mechanism literature makes it clear that non-default affixes are often also restricted to words that meet certain phonological conditions, but this restriction is usually not an inevitable consequence of the nature of the marker itself, as it frequently is with morphophonemic alternations.

[x] The information in this and the following paragraphs is drawn mainly from the OED, with some support from Brunner 1962, Jespersen 1942, and Mossé 1968.

[xi] There were a few OE class-1 verbs that, for phonological reasons, did have a connecting schwa in early Middle English, but only one of these verbs, *wean*, is of relevance to the present discussion.

[xii] The past tense of *plead* was always formed with *-ed* in Middle English. Irregular forms like *pled* make their first appearance in the 15th c.

[xiii] Phonetic similarity to existing verbs of that class does not seem to be the explanation. Many verbs, including several of those listed above, failed to enter the no-connecting-vowel class even

though they rhymed or nearly rhymed with several members, whereas *hurt*, for example, bore little resemblance to any existing member.

[xiv] The isolated irregular verb *lose* has a complicated history. Its most direct OE ancestor is the class-2 weak verb *losian*, but the semantic development of the verb makes it clear that it has been strongly influenced by, if not conflated with, the originally strong verb *leese*, last attested in the 17th c. Parallel to several of the other originally strong verbs in the T/D-with-laxing class (*weep*, *creep*, *leap sleep*), *leese* developed the irregular weak past *lest* starting in the 14th c. Without the influence of *leese-lest*, the irregularization of *lose* would be a mystery for virtually any theory, since *lose* bears no phonetic resemblance to any other irregular weak verb.

[xv] If the verb *lean* were a straightforward descendent of OE *hleonian*, then the variant past/participle form *leant* could be regarded as another example of analogical irregularization of an original class-2 verb. This irregular form has been quite rare compared to regular *leaned* throughout the history of this verb, however, and *leant* may actually represent either a continuation of the expected past form of OE class-1 causative *hlænan* or confusion with *lend*, which in ME was homophonous with *lean* in the present tense (OED, MED). One other class-2 verb that has developed irregular weak forms is *make*, but here the irregular past is completely idiosyncratic and thus could not have anything to do with analogical attraction of any irregular pattern.

[xvi] Irregular forms of other class-1 denominals, including *heat* (< *hot*), *fill* (< *full*), and *deem* (< *doom*) are attested in earlier stages of English and in dialects.

[xvii] Synchronically in Modern English, *peel* may be denominal, but it was certainly not denominal in Middle English since the noun is not even attested until the 16th c. The fact that the

verb always forms its past with a connecting vowel in Middle English is consistent with other evidence suggesting that it is descended from OE *peolian* (OED, see also s.v. *pill*, v.1).

[xviii] Note also that of the original class-1/no-connecting-vowel verbs that have undergone regularization in spite of a phonetic shape that made them reasonably good fits for one of the weak irregular classes, the vast majority are not (synchronically) denominal, e.g. *greet*, *need*, *dread*, *whet*, *rest*, *fast*, *last*, *start*, *yearn*, *turn*, *rear* ('raise'), *steer*, *heal*, *teem*, *fell*, *quell*, *chide*, *trend*, *blend* [<ON], *wield*, *reach*, and probably *steep*. Clear cases of such regularization among transparently denominal or deadjectival class-1 verbs are relatively rare, e.g. *right*, and perhaps *thirst*. There are also underived strong verbs that have been completely regularized in spite of strong phonetic similarity to weak irregulars, e.g. *spurn*, *yield*, *mete*, and *fret*. Again, this seems to seriously undermine the dual-mechanism assumption that regular inflection of verbs that are phonetically similar to irregulars is a remarkable fact that requires something like the RTDE to explain it. The historical reality, in English at least, is that irregularization is extremely rare and regularization is considerably more common, even among non-derived verbs that are phonetically similar to (classes of) irregulars.

[xix] Kiparsky (1982a:135; 1982b:10-14, 85n.7; 1983:7-13) actually argues that some zero-derivation processes occur at level 1 and others at level 2. Words formed by level-1 zero-derivation should in principle be susceptible to any kind of inflectional irregularity while those formed at level 2 are limited to level-3 inflection (see the discussion of *to string* in sec. xxx below). This distinction has no effect on the crucial point that level-3 inflection cannot be equated with default inflection.

[xx] Even for the verb derived from the compound noun *bowstring*, the OED entry suggests that irregular *bowstrung* is more common than *bowstringed*. One of Kim et al.'s other sentences, "*He*

strung the tree with Christmas lights", does not support their position at all since the object in question is conventionally referred to as a "string" of Christmas lights.

[xxi] These ratings are reported in Table 5 (Kim et al. 1991:207), which then gives the difference between the two ratings as ".16". Obviously, these figures do not add up. I assume that the ratings are correct and that the difference should be ".26". To the casual reader, this typographical error makes the derivation effect look larger than it really is, although the statistical analysis is presumably based on accurate numbers.

[xxii] Synchronically, the Old English class-1 origins of *to wet* would presumably be reflected by a highly ranked irregularity-favoring constraint that is specific to this single lexical item.

[xxiii] INITS = "Verbs whose stems begin with *s*- form their past tense and participle by replacing their stem vowel with *ø*." Similarly: INIT[ial]CLUSTER; FIN[al]NAS[al]; FIN[al]VEL[ar].

[xxiv] Some connectionists argue that localist representations will emerge on hidden units in response to patterns in the input and thus need not be built in to the network (Seidenberg and Gonnerman 2000:360; Westermann 1999).

[xxv] In fact, everyone agrees that the directionality of a zero-derivation is ultimately determined by the semantic and token-frequency relations between the two homophonous words (Kim et al. 1991:202; Pinker 1999:168; cf. Vogel 1996:242-245). The only difference is that the dual-mechanism theory has learners using semantics and token-frequency to decide what kind of derivational structures to create ($[_N[_VX]]$ or $[_V[_NX]]$), whereas analogical theories simply represent semantics and token frequency (Bybee's "lexical strength") directly in the lexical network.

[xxvi] I am using the "proportional" notation of traditional analogical theory for convenience here. The use of a single word, in this case *core*, on the lefthand side of the proportion is a

conventional shorthand to represent the whole set of words on which the analogy is based (cf. Paul 1960[1920]). The "X" is the "solution" to the proportion, i.e. the new form that represents an extension of the existing pattern.

[xxvii] Blevins (1999) even argues that some of the supposedly inflectional phenomena investigated in the dual-mechanism literature, such as German past participles and non-default plurals, are in fact derivational.