

Theories of morphological analysis: a mini-review

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Abstract.

This paper presents a short review of arguments in favor of inferential-realizational, rule-based, Word and Paradigm theories of morphology, and against lexical-incremental, morpheme-based, Item and Arrangement theories. Morpheme-based theories are assumed by most linguists who do not specialize in morphology, while most contemporary morphologists favor Word and Paradigm theories, developed particularly in work by Peter H. Matthews, Stephen R. Anderson, Mark Aronoff and Gregory T. Stump.

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I met Cristina Burani when I had just completed my PhD in Linguistics (University of Pisa, 1989), working on derivational morphology. Cristina practically adopted me, and throughout the Nineties I cooperated with her and other colleagues at the Istituto di Psicologia del CNR in Rome in a number of experiments devoted to assessing the role of derivational affixes in processing derived words. The assumptions under which I operated at the time were those that I have now come to recognize as typical of so-called “morpheme-based” (Anderson, 2015) or “lexical-incremental” (Stump, 2001) or “Item and arrangement” (Hockett, 1954) models of morphology. However, at that time, I had no awareness that such models represented only one of a number of possible options available to understand the way in which morphologically complex words (both inflected and derived) come about. I took for granted that morphologically complex words were composed of two or more (usually bound) entities, called morphemes, and I spent years happily (well, more or less happily...) counting the frequency of specific roots and affixes in the then available corpora of written Italian.¹ At the end of the Nineties, my cooperation with Cristina came to an end, for a number of partially unrelated reasons: increasing teaching and administrative responsibilities at the University of L’Aquila left me little time for research, and in this little time I was becoming more and more interested in inflectional morphology, rather than in derivation. Applying a morpheme-based model to the analysis of Italian inflection proved extremely frustrating (see my desperate attempt in Thornton, 1999), and forced me to look beyond what I had tacitly and unquestioningly assumed so far, to understand how the morphology of a language works.

In this mini-review I will try to share what little wisdom I have acquired in the process of exploring alternative models of morphological analysis, and argue in favor of Word and Paradigm, rule-based, inferential-realizational theories of morphology.

Several characterizations of models of morphological analysis are available. The earliest outline of possible alternatives was offered by Hockett (1954), who recognized three models, called Item and Arrangement (IA), Item and Process (IP), and Word and Paradigm (WP). Anderson (2015) reduces the alternative to two options, which he calls morpheme-based and rule-based. Stump (2001) offers a quadripartite typology, which will be illustrated below.

¹ The importance of having reliable frequency data was felt so much that we embarked in creating a new resource, CoLFIS (Bertinetto et al., 2005).

A very clear statement of how an IA, morpheme-based model operates is given by Bloch (1947, pp.399-400): “Any sentence, phrase or complex word can be described as consisting of such-and-such morphemes in such-and-such an order. [...] The preterit form *waited* [...] consists of two morphemes, /weyt/ and /ed/, occurring in that order. The meaning of the first morpheme is a particular action that we need not specifically describe here; that of the second is ‘past time’ or the like”.

Let us note in passing, but not dwell upon, the fact that the IA model is characterized as valid for both morphology and syntax, and let us concentrate on morphology. Examples of complex words that seem to comply with such a model are often cited: Anderson (2015) uses *unavoidable* ‘not possible to avoid’, where *un-* expresses ‘not’, *-able* expresses ‘possible’ and *avoid* expresses ‘to avoid’, leaving no part of both form and meaning of the complex word unaccounted for; Carstairs-McCarthy (2005) cites *unhelpfulness*; Burani (2006) cites Italian *deindustrializzazione* ‘deindustrialization’. Maybe it is not an accident that these examples are all of derived lexemes, not of inflected forms of lexemes. Carstairs-McCarthy (2005, p.20) explicitly observes that in dealing with derivational morphology there is “less temptation to deviate from the rough-and-ready sense of ‘morpheme’”, i.e., that of a Saussurean sign, which unites a signifier and a *signifié* and is not further analyzable in smaller units that are still signs. In inflectional morphology, instead, although one can find examples of inflectional forms that lend themselves to an IA analysis without causing immediate difficulties (such as Bloch’s example *waited*), it is very common to find forms that defy an IA analysis completely, such as Italian *è* ‘be.PRS.IPFV.IND.3SG’ and *fu* ‘be.PST.PFV.IND.3SG’, or English *am* ‘be.PRS.IND.1SG’, to cite just three of the innumerable examples in which it is impossible to segment the signifier of a word form in meaningful units each of which corresponds to a part of the word’s meaning.

This problem has led most contemporary morphologists (although not most contemporary linguists whose main field is not morphology, unfortunately) to abandon morpheme-based theories of word structure and embrace theories that fall within the model that Hockett called Word and Paradigm. Stump (2001, pp.1-12; see also Stump, 2016, pp.8-30) gives a very useful presentation of criteria that can be used to classify morphological theories, and distinguishes four families of theories. He first contrasts lexical and inferential theories (and credits Andrew Spencer for suggesting the term “inferential”, cf. Stump, 2001, p.277, fn. 2). These two kinds of theories give different answers to the fundamental question of what is the nature of the association between an inflected word’s morphosyntactic properties (also called grammatical feature values: that is, things such as **TENSE**: PRESENT,

NUMBER: SINGULAR, etc.) and the signifier of the word form that has such properties. In lexical theories, the association between a set of properties and a signifier is listed in the lexicon, much in the same way as the association between a “lexical morpheme” and its meaning is: so, e.g., English -s would be the signifier of a morpheme whose meaning is ‘3SG.PRS.IND’; in inferential theories, instead, rules express the association between a lexeme and its inflected forms, with no requirement that specific morphosyntactic properties be linked to specific bits of the signifier of a word form. The distinction between lexical and inferential theories cross-cuts another distinction, between incremental and realizational theories. In incremental theories, there is a requirement that inflected words acquire certain morphosyntactic properties “only as a concomitant of acquiring the inflectional exponents of those properties” (Stump, 2001, p.2), while in realizational theories “a word’s association with a particular set of morphosyntactic properties licenses the introduction of those properties’ inflectional exponents” (Stump, 2001, p.2). Stump strongly advocates in favor of inferential-realizational theories, and presents a number of arguments that support such theories against alternative ones.

A first argument comes from the existence of extended and overlapping exponence, i.e., the fact that sometimes a given property is not expressed by just a single exponent within a word form, and often an exponent expresses more than one property: a well-known illustration of the intricacies of such multiple exponence relations has been offered by Matthews (1991, pp.168-184), who took as an example the ancient Greek form *elélykete* ‘you had unfastened’. Matthews (1975) exemplifies with Italian conditional forms: in a form such as *canterebbero* ‘they would sing’ (‘sing.PRS.COND.3PL’), the property ‘3rd person’ is expressed both by the portion *-bbe-* (which appears only in 3rd person forms of the present conditional) and by the portion *-ro*, which appears only in 3rd person plural forms of Italian verbs (cf. *videro* ‘they saw’); in their turn, *-bbe-* is also one of the exponents of the property ‘conditional’, and this is a case of overlapping exponence; *-ro* is also an exponent of the property ‘plural’, and this is a case of cumulative exponence.² Lexical

² Matthews (1991) distinguishes several kinds of exponence relations, i.e. relations between portions of the form of an inflected form and its meaning: **simple** exponence is the one-to-one relation between a portion of form and a property of meaning (e.g. *-ed* and ‘past’ in *waited*); **cumulative** exponence is the case (very familiar from Indo-European languages) in which a single element of form expresses more than one property and these properties are always expressed together in the language (e.g. *-o* in Italian *buono* ‘good.M.SG’ expresses cumulatively **GENDER:** MASCULINE and **NUMBER:** SINGULAR); **overlapping** exponence is the situation in which a certain property is expressed by some

and incremental theories would have problems justifying the appearance of the same meaning twice, carried (individually or in a cumulative or overlapping manner) by two different exponents within a word, while inferential and realizational theories do not imply a ban on extended or overlapping exponence.

A second strong argument against lexical theories is the existence of cases of underdetermination, a situation in which “the word form realizing a particular morphosyntactic property set does not contain exponents of all the properties in that set” (Stump, 2016, p.17). Stump’s most readily understandable example is English *cut*, which can correspond to several forms of the paradigm of the verb ‘cut’ (the infinitive, a non-3rd person present indicative form, a past tense form, a past participle form, the imperative...). Lexical-incremental, morpheme-based, IA theories have faced this problem by recurring to the theoretical construct of the zero-morph: if we need a piece of signifier to express a certain property in a word form, but this piece is not audible, we can posit a morpheme which has nothing (‘zero’) as its signifier, but carries the relevant property as its meaning. This solution has been widely adopted in the description of inflection by American structuralists in the Forties, and just as widely criticized by modern morphologists who adhere to rule-based, inferential-realizational, WP models of morphological analysis. Let us see how Bloch (1947) introduces a zero morph within his morpheme-based, IA analysis of English verb inflection. After analyzing *waited* ‘wait.PST’ as the concatenation of the two morphemes *wait-* ‘wait’ and *-ed* ‘past’, Bloch addresses the issue of how to analyze other past tense forms, such as *passed*, *lived*, *put* and *took*. Comparison of *waited*, *passed* and *lived* reveals “three phonemic shapes of the preterit suffix. In general, the choice among them depends on the last phoneme in the base”; *put* “contains an additional shape of the same suffix, namely zero” (Bloch, 1947, p.402). Bloch’s analysis of *put* ‘put.PST’ is then that this form is made up of two morphemes, *put* ‘put’ and zero ‘past’. It would appear that at the cost of accepting that some morphemes can have zero as

exponent which also expresses other properties, but cumulation of the expression of the two properties is not general in the language (e.g. in ancient Greek the endings *-te* and *-st^{he}e* cumulatively express **PERSON**: SECOND and **NUMBER**: PLURAL, and in addition *-te* expresses **VOICE**: ACTIVE and *-st^{he}e* **VOICE**: PASSIVE, but voice is expressed also by other means in Greek verb forms, so its expression is not always cumulated with the expression of person and number, but sometimes overlaps with it); **extended** exponence is the case in which more than one element of form expresses a single property (e.g. in English *sold* ‘sell.PST’ the property ‘past’ is expressed both by the vowel *-o-* in the stem — vs. *-e-* in the present *sell* — and by the suffix *-d*).

their signifier, a morpheme-based model of morphological analysis can be saved. But more problems arise in the analysis of forms such as *took* 'take.PST', *sang* 'sing.PST' and *went* 'go.PST'. "How shall we describe, now, the preterit form *took*? [...] Either *took* is one morpheme or it is two morphemes; the possibility of it being more than two may be neglected as improbable" (Bloch, 1947, p.400). The solution Bloch adopts is that *took* is two morphemes: but which morphemes, exactly? The reasoning is the following: "Some verbs [...] have a base with two different morpheme alternants: one that appears when the base is used alone and before certain of the inflectional suffixes, another that appears before certain other suffixes" (Bloch, 1947, p.404). *Take* is one of these verbs: in Bloch's analysis, the lexical morpheme *take* appears as the "alternant" *take* before the suffixes *-s* '3SG.PRS', *-en* 'PST.PTCP' and *-ing* 'gerund', while it appears as *took* before the suffix \emptyset 'past'. This analysis, which makes crucial appeal to a zero morph, was soon criticized: Nida (1948, p.415) observed that such an analysis "means assigning a meaning-difference to certain covert elements rather than to overt distinctions" and continued: "it appears to me as strikingly contradictory to treat overt distinctions as meaningless and covert distinctions as meaningful" (Nida, 1948, p.415); even stronger criticism was expressed by Haas (1957, pp.34-35), who wrote: "It seems perverse to regard the very obvious phonemic difference between *went* and *go* as irrelevant to the semantic difference between the two expressions, and to suppose instead that the presence of some elusive zero suffix in *went*, as against the still more elusive absence of such from *go*, could serve to make the distinction". These criticisms are echoed more than half a century later by Anderson (2015, p.21), who writes, about *sang*: "We might say that the past tense morpheme here has a zero allomorph, and that *sang* is a predictable allomorph of *sing* that appears before this past tense zero. [...] it involves saying that the thing we cannot see, the zero, is what signals that the verb is past tense, while the thing we can see, the vowel change, is analyzed as a mechanical concomitant of this. The result does not correspond to any plausible intuition about how form and content are related". Anderson (2015, p.20) also observes that "describing this situation by appeal to a 'zero morph' does not provide a solution to the problem, but only a name for it". However, Bloch's analysis is still advocated by some contemporary "lexical" theories, such as the lexical-realizational Distributed Morphology (DM; Halle & Marantz, 1993): a DM analysis of *sang* maintains that the \emptyset 'past' morpheme competes with *-ed* 'past'; since \emptyset 'past' subcategorizes for a smaller class of verbs than *-ed* 'past' (which is the default suffix for the expression of the property 'past'), it is selected by virtue of Pāṇini's principle (also known as Elsewhere Condition); this zero suffix then triggers a rule of

readjustment that changes the lexical morpheme's vowel (obtaining *sang* from *sing*). Stump (2001, p.10) observes that in DM analyses "again and again, both within and across languages, a default affix is overridden by an empty affix whose presence triggers a readjustment rule; this recurrent pattern is portrayed not as the consequence of any overarching principle, but as the accidental effect of innumerable piecemeal stipulations in the lexicon of one language after another. If one searched the languages of the world for a class of overt and phonologically identical affixes having the same sort of distribution that Halle and Marantz must logically attribute to their proposed class of empty affixes, one would inevitably come back empty-handed".³ The fact that lexical and incremental theories force the analyst to posit dubious entities such as zero affixes is then considered as proof of the inadequacy of such theories.

A further argument against lexical and incremental theories is the fact that, in describing the meaning content of an inflected form as contributed by the several morphemes that make it up, a choice is forced to distinguish between "properties of content and properties of context" (Stump, 2001, p.10). For example, in Italian past perfective forms such as *amai* 'love.PST.PFV.1SG', *temei* 'fear.PST.PFV.1SG', *sentii* 'hear.PST.PFV.1SG' a morpheme which has the signifier *-i* can be recognized; the meaning of this morpheme could be described either as '1SG' in the context 'PST.PFV' (since '1SG' is expressed by *-o* in other contexts, e.g. in the present indicative forms *amo* 'love.PRS.IND.1SG', *temo* 'fear.PRS.IND.1SG', *sentio* 'hear.PRS.IND.1SG') or as 'PST.PFV.1SG'. The first option analyzes '1SG' as the content of *-i*, and 'PST.PFV' as the context in which *-i* '1SG' can be inserted, while the second option analyzes the bundle 'PST.PFV.1SG' as the content of *-i*. In Stump's (2001, p.11) words, "The problem is that there is no universally applicable criterion which determines whether a property belongs to an affix's content or to the context for which it subcategorizes". Lexical, morpheme-based theories force us to decide between the two analyses; in inferential-realizational theories, instead, there is no need for this decision. Such a theory would generate forms such as Italian *vidi* 'see.PST.PFV.1SG' or *amai* 'love.PST.PFV.1SG' in the following way: first, a rule of stem selection would select the appropriate stem of the lexeme (Stem 5 *vid-* in the case of 'see', since the 'PST.PFV.1SG' cell belongs to the paradigm partition that

³ Stump uses "empty affix" here rather than "zero affix": this is unfortunate, since "empty affix" is a term usually employed to designate the mirror-image of zero affixes, i.e. affixes that have overt phonological form but no meaning, such as thematic vowels in Latin and Romance, interfixes, linking elements in compounds, and the like.

selects Stem 5, and the default stem *ama-* in the case of 'love', where Stem 5 is re-indexed to the default stem)⁴; then, a realization rule would insert *-i* in the context 'PST.PFV.1SG'; nothing in this series of operations specifies which portion of the signifier carries which portion of the meaning, but together these rules specify that *vidi* is 'see.PST.PFV.1SG' and *amai* is 'love.PST.PFV.1SG'.

Further arguments against lexical and incremental theories will not be reviewed for lack of space: the interested reader is referred to Stump (2001, 2016) for a very rich presentation and to Anderson (2015) for a short but very complete overview.

Inferential-realizational theories do not incur in the problems illustrated above: there is no need to posit zero morphs, since there is no requirement that a specific part of the signifier of an inflected form be the (only) overt exponent of a specific part of its meaning. A further advantage of inferential-realizational theories is that they easily accommodate non-concatenative means of exponence, such as tone or stress shifts, which can be introduced by realization rules but cannot be reduced to the concatenation of a specific morph.⁵

The exact working of an inferential-realizational theory (of which there are several varieties, including Stump's Paradigm Function Morphology and Anderson's A-morphous Morphology) is very technical, and cannot possibly be illustrated in this short review. But I hope to have shown that it deserves to be considered as a valid alternative to lexical-incremental, morpheme-based models. It is unfortunate that morpheme-based models are still considered as the only 'true' model of morphological analysis by most scholars who are not morphologists, while most prominent contemporary morphologists have come to the conclusion that "the term 'morpheme' has hindered rather than helped our understanding of how morphology works" (CarstairsMcCarthy, 2005, p.22), and regret the fact that "linguists continue with disconcerting regularity to regard analyses such as the decomposition of *unavoidable* into *un+avoid+able* as if it provided a perfectly general model of word structure" (Anderson, 2015, p.25).⁶

⁴ The analysis of Italian verb stems and their distribution in paradigm partitions assumed here follows Pirrelli & Battista (2000), who applied to Italian verbs the concept of morphomic stems introduced by Aronoff (1994).

⁵ Anderson (2015, p.32) clearly states that "Inferential-realization theories represent [...] the complete abandonment of the traditional concept of the morpheme".

⁶ In the text I have dealt mainly with inflection, but many recent contributions argue that lexeme formation is as much amenable to paradigm-based,

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realizational theories as inflection; for two different but compatible approaches see Bonami & Strnadová (in press) and Masini & Audring (2019).

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