RUSSIAN MORPHOLOGY AND LEXICAL THEORY

[1998 Note: This was my phonology generals paper. It contains a certain amount of misanalysis and misinformation, some of it silly in retrospect. But it was also the paper that invented Lexical Phonology, developed in the following year in an MIT generals paper by K.P. Mohanan and then taken up by Paul Kiparsky. The paper was written pre-PC, on a Smith Corona electric typewriter. In 1984, when I was teaching at UMass, there was a plan to include this paper in a Working Papers volume that was never produced. At that time, a typist was hired, who retyped the paper in MacWord. That is the version available here. I have not proofread the manuscript in this version, except to get some hacheks right, so typos and formatting errors abound.]

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0.0   INTRODUCTION

The structure of this paper is somewhat unusual, so a word of warning is necessary. What I have tried to do is to collect a number of apparently unrelated observations about Russian phonology and morphology, for example:

-----the fact that a solution to a problem with the rule of "yer-lowering" suggests a semantically counterintuitive bracketing of prefixed verbs;

-----the fact that Russian morphology is level-ordered, and that the levels appear to have crucially different semantic properties;

-----the fact that the inputs to higher levels of the morphology are almost all actually occurring words, while imputs to the lowest level are often non-words;

-----the fact the WFRs (word -formation rules) obey the Adjacency Condition of Siegel (1977) and of Allen (1978);

 -----the fact that post-cyclic rules of Russian phonology are generally exceptionless;

 -----and I have tried to show that a number of these observations can be explained by relatively simple assumptions about the workings of word-formation components in the lexicon.

As a result, the early sections of the paper do not always follow one from another, but are often concerned with apparently unrelated topics. I hope that the later sections succeed in showing the connections between them, and justify their having been brought up.[1]

1.0   YERS, THE CYCLE AND LEXICAL EXCEPTIONS IN PHONOLOGY

This section serves as an orientation to forms and issues I will return to in later sections. I begin with a brief recapitulation of the classic arguments for the existence of underlying lax high vowels ("yers") in Russian, based on material from Lightner (1972), supplemented by adaptations of Gussmann's (1978) arguments from Polish. This is necessary background to a discussion of the ordering and functioning of the neutralization rules which apply to these segments. To solve some problems posed by theses rules, I will present a new hypothesis about the morphological structure of prefixed verbs, supported by evidence from other languages. This discussion will be picked up again in Parts 3 and 4, where we will be discussing the workings of word-formation components in the lexicon. The reader will forgive the

long gap between this initial discussion and our later return to these themes. Finally, I will make some observations about exceptions to phonological rules, which, though not fully justified here, will be found, in Part 5, to be consistent with independently motivated properties of the lexicon.

1.1   Evidence for lax high vowels in Russian: Russian surface vowels e̲ and o̲ alternate with zero in several apparently disparate environments. In the declensional paradigm, the vowel alternate appears before a zero inflection, while the zero alternate appears before a syllabic inflection:[2]

(1) a.   den'   Nom Sing   dn'-a   Gen Sing   'day'
   b.   lën   Nom Sing   l'n-a   Gen Sing   'flax'
   c.   pës   Nom Sing   psa-a   Gen Sing   'dog'
   d.   nemec   Nom Sing   necm-a   Gen Sing   'German' (noun)
   e.   okon   Gen Plur   okn-o   Nom Sing   'window'

Two arguments suggest that these forms contain an underlying vowel, rather than an inserted vowel. The first is the unpredictability of the vowel alternate, as shown by the following near-minimal pairs:

(2) a.   osël   Nom Sing   osl-a   Gen Sing   'donkey'
   b.   posol   Nom Sing   posl-a   Gen Sing   'ambassador'

(3) a.   kalëk   Gen Plur   kal'k-a   Nom Sing   'calque'
   b.   palok   Gen Plur   palk-a   Nom Sing   'stick'

The palatalization of l̲ in kal'ka is predictable if a front vowel follows it underlyingly, but not if the vowel of kalëk is inserted.

The second argument against an insertion analysis is the impossibility of stating a phonological environment for an insertion rule, as shown by the following minimal pairs:

(4) a.   kostër   Nom Sing   kostr-a   Gen Sing   'campfire'
   b.   kos tr   Gen Plur   kostr-a   Nom Sing   'boon' (textile)

(5) a.   lasok   Gen Plur   lask-a   Nom Sing   'weasel'
   b.   lask   Gen Plur   lask-a   Nom Sing   'caress'

(Other examples are found in Townsend, 1968, p. 71.)

For the moment, let us call the underlying vowels which show up as e̲ and o̲ E̲ and O̲. We need to assume that these vowels are distinct from other occurrences of e̲ and o̲ because of worlds like polët-a ('flight' Gen Sing) and pot-a ('sweat' Gen Sing), with non-deleting e̲ and o̲. We need to discover (1) the environment in which E̲ and O̲ are realized as e̲ and o̲ and (2) the underlying nature of E̲ and O̲.

Turning to the first question, we note that E̲ and O̲ become e̲ and o̲ before an apparently zero ending in the noun declension and in the past tense of the verb:

  (6) a.   žëg-l   Masc Sing   žg-l-a   Fem Sing   'burned'
      b.   šëd-l   Masc Sing   vas-l-a   Fem Sing   'went'

(žëg-l becomes žëg by later rules; and šëd-l and šed-l-a become šël and šla, respectively.)

E̲ and O̲ also become e̲ and o̲ before certain derivational suffixes:

  (7) a.   den'-k-a   Gen Sing   'day' (diminutive)
      b.   len'k'a   Gen Sing   'flax' (diminutive)
      c.   nemec-sk-ij   Masc Nom Sing   'German'   (adj.)
      d.   okon-n-yj   Masc Nom Sing   'window-like'

Some derivational suffixes do not change E̲ and O̲ to e̲ and o̲:

  (8) a.   dn-ev-n-oj   Masc Nom Sing   'daily'
      b.   l'n-jan-oj   Masc Nom Sing   'flaxen'
      c.   ps-in-oj   Masc Nom Sing   'canine'

Significantly, it turns out that those derivational suffixes which trigger the change to e̲ and o̲ themselves contain E̲ and O̲, which yield e̲ and o̲ before a zero ending and before other derivational affixes containing E̲ and O̲:

  (9) a.   den-ëk   Nom Sing   'day' (diminutive)
      b.   len-ok   Nom Sing   'flax' (diminutive)
      c.   okon-en   Masc Sing   'window-like' (predictative)
(10) a.   den-ëk-ek   Nom Sing   'day'   (double diminutive)

b.   den-ëk-k-a   Gen Sing

(Velar palatalization rules yield <u>denëÌek</u>, <u>denëÌka</u>.)

These data suggest a preliminary rule turning <u>E</u> and <u>O</u> into <u>e</u> and <u>o</u> before another <u>E</u> or <u>O</u> in the next syllable:

(ll)   E, O $\rightarrow$ e, o / __ $\begin{matrix} C_o \\ O \end{matrix}$ {E}

By a subsequent rule, <u>E</u> and <u>O</u> unaffected by (11) delete:
(12)   E, O $\rightarrow$ Ø

"Zero" endings which trigger (11) can now be seen as occurrences of <u>E</u> or <u>O</u>, which will delete by (12). Thus, such an analysis neatly explains the distribution of vowel alternates in forms with a vowel-zero alternation. It remains to answer the second question formulated above: What is the underlying nature of <u>E</u> and <u>O</u> ? First note that <u>E</u> becomes <u>j</u> after vowels, when (11) has not applied. (Only foreign roots end in vowels.)

(13)   a.   kofe   'coffee'   (n.)   kofe-jn-yj   'coffee'   (
        b.   čile   'Chile'   čili-jc-a   'Chilean' (n. Gen Sing)
                                      čili-jsk-ij   'Chilean'   (adj. Nom Sing)

We can account for this by a rule ordered between (11) and (12), which we can tentatively write as:
(14)   E $\rightarrow$ j /V __

In view of (15), a likely candidate for <u>E</u> would be some form of /i/. In fact, forms with <u>E</u> often show morphological alternates with <u>i</u> in derived imperfective verbs:

(15) a.   čest'   (underlying <u>cEt-tE</u>)   Inf   'read'   (read)
     b.   čt-u   (underlying <u>čEt-ou</u>)   1 Sing
     c.   cit-at'   Inf   'read'   (imperf)

(16) a.   žëg   (underlying <u>žEg-l-O</u>)   Past Masc Sing   'burn'   (perf)
     b.   žg-l-a (underlying <u>žEg-l-a</u>)   Past Fem Sing
     c.   pod-žig-at'   Inf   'burn'   (imperf)

The infinitive desinence, normally -tE, surfacing as -t' in most verbs, appears as -ti in some verbs, further suggesting the identification of E with some kind of i. Since

there already exists an i which does not undergo (11) and (12), as in (15c) and (16c), we must use some feature to distinguish the E-variety of i from other occurrences of e. Lightner suggests that the distinction is one of tenseness. The segment we have been calling E he identifies with a lax ĭ while the i of words like čitat' and podžigat' he identifies with a tense i. Rule (11) can then be stated as a lowering rule from ĭ to e. The morphological variation of (15-16) will be the result of a minor tensing rule.

We want to be able to state (11) as a simple lowering rule for both E and O. To do this, we assume that O is underlyingly a lax ŭ. In fact, O shows morphological variants with the unrounded equivalent of u, y. If O is a lax ŭ, we can derive these forms by the same tensing rule suggested above for ĭ, with an appropriate unrounding rule.

Following Lightner, therefore, we will identify E and O with underlying ĭ and ŭ. We will call these segments yers. We can now restate (11), (14) and (12) as rules of yer-lowering, glide formation and yer-deletion, respectively:

(17)   YER-LOWERING

$$
\begin{bmatrix} -\text{cons} \\ +\text{syl} \\ +\text{hi} \\ -\text{tns} \end{bmatrix} \longrightarrow [-\text{hi}] \ / \ \underline{\quad} \ C_0 \begin{bmatrix} -\text{cons} \\ +\text{syl} \\ +\text{hi} \\ -\text{tns} \end{bmatrix}
$$

(18)   GLIDE FORMATION

$$
\begin{bmatrix} -\text{cons} \\ +\text{syl} \\ +\text{hi} \\ -\text{tns} \end{bmatrix} \longrightarrow [-\text{syl}] \ / \ V \ \underline{\quad}
$$

(19)   YER-DELETION

$$
\begin{bmatrix} -\text{cons} \\ +\text{syl} \\ +\text{hi} \\ -\text{tns} \end{bmatrix} \longrightarrow \emptyset
$$

The ordering of these three rules is extremely interesting. Were it not for the necessarily intervening rule of glide formation, the ordering yer-lowering and yer-deletion would be predicted by Kiparsky's (1973) "Elsewhere Condition", which only applies to adjacent rules. In the next section, however, we shall argue that the ordering of yer-lowering before yer-deletion arises from different causes. Specifically, we will argue that the lowering rule is cyclic, while the deletion rule is post-cyclic.

1.2 <u>Cyclicity and the Yer-Rules</u>: Nothing we have said so far predicts what will happen to a sequence of more than two yers. We have seen such a sequence in (10a), where the diminutive suffix <u>-ĭk</u> has been applied twice to the root <u>dĭn-</u>, and the resulting noun-stem is followed by the nominative singular ending <u>-ŭ</u>. In the sequence of four yers found there, all but the last were lowered. This seems to suggest left-to-right interation of the rule:

(20)   UNDERLYING   dĭn-ĭk-ĭk-ŭ
        Y-LOWER 1   e
                       2   e
                       3   e
        Y-DELETION   Ø
        Other Rules   denekek → denëček[3]

As Worth (1967) has apparently observed[4], cyclic application of yer-lowering to left-branching words like (21) would predict the left-to-right application of the rule. If yer-lowering were cyclic, however, yer-deletion would have to be post-cyclic, applying after all application of yer-lowering, thus:

(21)   UNDERLYING   [[[[dĭn] ĭk] ĭk] ŭ]
        cycle 1:   ----
        cycle 2: Y-LOWER   e
        cycle 3: Y-LOWER   e
        cycle 4: Y-LOWER   e
        Y-DELETION   Ø
        Other Rules   denekek → denëček

If yer-deletion were also cyclic, no yer could lower except the innermost, and that could lower only because the strict cycle condition (see Part 3) would prevent yer-deletion from applying there:

```
(22)                    UNDERLYING      [ [ [ [ dĭn] ĭk] ĭk] ŭ]
        cycle 1:                          ----
        cycle 2: Y-LOWER              e
               Y-DELETION                          Ø
        cycle 3: Y-LOWER             ----
               Y-DELETION                                   Ø
        cycle 4: Y-LOWER             ----
               Y-DELETION                                        Ø
                             *denkk
```

It may be that some rules must apply iteratively, and must specify their directionality. If this should be the case, we need more evidence to decide whether the left-to-right application of yer-lowering in words like deněček is a fact about the lowering rule or is an artifact of cyclic application. In particular, we need sequences of yers contained in bracketings different from (21), sequences such that cyclicity and left-to-right iteration would make different predictions about the output of yer-lowering.

One case which is problematical for a left-to-right stipulation and which was pointed out to me by Morris Halle, is provided by verbal prefixes. Many prefixes end in ŭ. This ŭ can lower to o by the yer-lowering rule. For example, consider the
derivation of the form podo-žg-l-a. The prefix podŭ- combines with the verb root žĭg ('burn') with the meaning 'set on fire'. -l is the marker of the past tense, and -a is a feminine singular ending. The surface form is derived regularly:

```
(23)                    UNDERLYING      podŭ-žĭg-l-a
        Y-LOWER                      o
        Y-DELETION                              Ø
                             podožgla
```

The masculine form of podožgla differs from the feminine only in the desinence, which is -ŭ instead of -a. The result is a sequence of three yers. Here, however, left-to-right iteration of yer-lowering yields the incorrect output:

```
(24)                    UNDERLYING      podŭ-žĭg-l-ŭ
        Y-LOWER  1                         o
                 2                    e
        Y-DELETION                              Ø
        Other Rules           podožěgl  → *podožëg
```

The proper form is <u>podožëg</u>, with deletion, not lowering, of the prefixal yer. Of course, this result looks consistent with right-to-left iteration of yer-lowering:

(25)   UNDERLYING   podŭ-žĭg-l-ŭ
        Y-LOWER 1   e
        Y-DELETION   Ø   Ø
        Other Rules   podžegl → podžëg

It would be queer indeed if yer-lowering applied from left to right in derived nouns (and other derived contexts), but from right to left in prefixed verbs. Lightner (1972, 1973) gives an ingenious solution to this problem, preserving left-to-right iteration of yer-lowering by restating yer-lowering and yer-deletion, with a negative environment, in reverse order, with an extra rule dropping prefixal yers before undropped root yers in between.

An interesting cyclic solution is available, however, which does not require any additional phonological rules to work, nor phonological exotica like negative environments. The clear generalization behind the difference between (23) and (25) is that prefixal yers only lower before unlowerable yers in the following verb root.

To capture this generalization, we need to let lowering apply within a verb root, before applying to a prefix. This can happen if yer-lowerting is cyclic and if prefixes are structurally exterior to the rest of a verb. Thus:

(26)   UNDERLYING   podŭ [[[žĭg] l] ŭ]]
        cycle 1:   ----
        cycle 2:   ----
        cycle 3: Y-LOWERING   e
        cycle 4:   ----
        Y-DELETION   Ø   Ø
        Other Rules   podžegl → podžëg

This solution would explain the behavior of almost all yer-final prefixes in similar environments (for example, <u>s-čël</u> / <u>so-čla</u> 'consider'; <u>v-teret'</u> (Inf) / <u>vo-tur</u> (1 Sing) 'rub in'). More examples are found in Lightner (1972, p. 371).

There is a problem, however. While the bracketing shown in (27) yields the

correct result when the phonological rule of yer-lowering is applied to it, it is at odds with one's intuitions about the semantic correlates of morphological structure. In most cases, in Russian as in English, the combination of a prefix and a verb root acts semantically like a verb in its own right, often bearing an idiosyncratic meaning not compositional of the usual meanings of the verb and prefix. So, while podŭ- usually denotes something like 'up to' as a prefix, and žĭg, unprefixed, is glossed as 'burn', the combination of podŭ- and žĭg acquires the related, but unpredictable meaning 'set on fire'. Even less predictable meanings are found in other prefix-verb combinations. For example, we have seen that s-čel/so-čla shows behavior similar to pod-žёg/podo-žgla, suggesting the same constituent structure. The prefix sŭ- in other contexts is glossable as 'down from', while the somewhat archaic verb root čĭt means 'read'. The combination, however, means 'consider (x as y)', or sometimes 'tally'.

Such idiosyncratic meanings are preserved under the addition of inflectional and

derivational suffixes. Thus, while the phonology of words like podožgla and podžёg suggests the bracketing of (27a) below, the semantics seems to suggest the bracketing of (27b):

(27) a. [prefix [[root] inflection]]

b. [[prefix [root]] inflection]

(Note that the assumption of (27b) as a phonological bracketing, with cyclic yer-lowering, would yield forms like *podožёg.)

Looking at data exclusively from Russian, we have no way to decide whether we should accept an analysis like (27a), which complicates lexical semantics, or an analysis like (27b), which complicates the phonology. No standard evaluation metric can decide between these analyses. Note that the phonological solution (27a) will entail a rule of semantic interpretation which will associate prefix with verb root. If we can show that this rule has some sort of universal status, and must be posited to resolve different phonological problems in other languages, we will have an argument for this solution.

Crucial evidence is found in English and in Warlpiri, an Australian language. I will discuss the arguments briefly, and hope to return to them in another paper.

The English data involves negated comparatives. Comparatives in -er can be formed from a limited class of adjectives. Roughly speaking, -er seems able to attach to monosyllabic adjectives and to disyllabic adjectives in orthographic -y (as well as some other disyllables, cf. ?pleasanter, ?politer). It does not attach to most disyllabic adjectives, and never attaches to adjectives of more than two syllables:

(28) a. blacker, softer, riper, tougher, truer, poorer, etc.

    b. happier, heavier, luckier, merrier, sunnier, etc.

    c. *directer, *activer, *complexer, *Jewisher, *homeliker, etc.

    d. *terribler, *eloquenter, *summerliker, *feverisher, etc.

I do not know the precise generalization here; nevertheless, the basic facts are reasonably clear. Now consider some -er comparatives formed from adjectives negated with the prefix un-:

(29)   untruer, unclearer, unhappier, unluckier, unlikelier, etc.

-er attaches to apparent trisyllabic roots like unhappy, unlucky, unlikely, and to disyllabic roots to which it should not normally attach, like untrue, unclear. Note that we cannot say that the presence of un- completely amnesties the syllabicity condition on the attachment of -er, since -er cannot attach to apparent tetrasyllables like uneloquent or unsummerlike: *uneloquenter, *unsummerliker.

An obvious solution is to suppose that the prefix un- is not present at the stage at which -er is attached. This solution will yield the following bracketings:

(30)   [un [[happy] er]] , [un[[lucky] er]] , [un[[true] er]] , etc.

The problem is formally identical to our problem in Russian, except that the phonological difficulties which would be induced by accepting the semantic bracketing as morphologically real are of a different nature. The fact that we can factor out the same sort of semantic difficulty from the two examples suggests that the semantic problem is the real one, and not the phonological problem, and that the phonologically motivated bracketings of (27a) and (30) should be considered morphologically real. We will need a special rule of semantic interpretation, with some sort of universal status, to yield the correct readings for such forms.

Nash (1979) provides an example from Warlpiri which suggests the same sort of solution. I will only sketch the arguments here, since the matter is discussed at length in Nash's paper.

Walpiri is an inflected, suffixing language in which, much as in Russian, verbal roots often combine with preverbal elements to yield forms with idiosyncratic

meaning. For example, the word pardi-mi means 'arise + NONPAST', while tirl-pardi-mi means 'open (as of an eye) + NONPAST'. Despite this, Nash suggests that the morphological structure of preverb-verb combinations is:

(32)   [preverb [[verb root] inflection]]

His primary motivation for assigning this structure is to make independently needed rules of cyclic stress assignment work correctly. I will not discuss this argument, though it is persuasive. Additionally, he notes that regressive vowel harmony, triggered by a past-tense nomic morpheme's vowel u̲, does not extend to a preverb:

(33) a. [[[kiji] rninji] nu] → kuju-rnunju-nu   'go and throw + PAST'
     b. [tirl [[pi] ngu]] → tirl-pu-ngu, *turl-pu-ngu   'split + PAST'

This fact can be naturally explained, given the bracketings above. Vowel harmony is a rule operating at a level lower than that of prefixation. (See Part 3 for some discussion of such rules.)

Finally, he notes that conjugation membership is partially dependent on the number of syllables in a verbal root. Conjugation membership of a verb with a preverb, much as in the case of English comparatives, does not consider the syllables of a preverb. This is easily explainable, with our "counterintuitive" bracketing. A preverb is not present at the level at which well-formedness of conjugation membership is determined.

Once again, if the structure in (33) is correct for Warlpiri verbs, we will need a semantic rule to assign meanings to preverbs and verb roots together, exclusive of inflection. In Part 4 , we will indicate how such a rule might be formulated in a theory of lexical semantics. For the moment, we note that the existence of such a rule as a universal makes possible the Russian bracketing of (27a), and enables us to

maintain out cyclic solution to the problem of yer-lowering. We will therefore assume that yer-lowering is a cyclic rule in Russian, and that yer-deletion is a post-cyclic rule.

1.3 Cyclic Rules and Exceptions: An interesting fact can now be observed. While the rule of yer-lowering, like many rules, has a reasonable number of lexical exceptions, the rule of yer-deletion is absolutely exceptionless.

Examples of exceptions to yer-lowering have been pointed out by several authors (Townsend, 1968; Isačenko, 1970). For example, while yer-lowering applies correctly in the root of [[[igur] ĭn] yj]   'pertaining to games', yielding igornyj, it does not apply in the genitive plural form of the root [[igŭr] ŭ']   'games', which is igr and not *igor. To take another example, [sŭ [[vŭrat] it']]   'to lead

astray' surfaces as <u>sovratit'</u>, showing correct application of the rule of yer-lowering. The verbs [otŭ [[vŭrat] it']] 'avert' and [razŭ [[vŭrat] it']] 'corrupt', however, do not show yer-lowering, yielding <u>otvratit'</u> (*<u>otovratit'</u>) and <u>razvratit'</u> (*<u>ratovratit'</u>).

In contrast, no exceptions to the rule of yer-deletion are ever found. As a result, no Russian word surfaces with an unlowered and undeleted yer.

This looks like an important fact, which a grammar of Russian should explain. Interestingly, this sort of contrast in exceptionality is found elsewhere. A number of rules, like the rule of yer-lowering, have exceptions. Crucially, these rules -- for example, some other yer-lowering rules we will discuss in Part 2, or the rule of "transitive softening" before j -- can be shown to interact with other rules in a way that shows they must, or can be cyclic. Exceptions to such rules appear both in lexicalized words and in spontaneous coinages (cf. Panov, 1968, pp. 24 et seq., for some discussion of transitive softening in nonce words).

By contrast, rules like palatalization before front vowels, fronting of <u>y</u> to <u>i</u> after velars, or the change of underlying <u>w</u> to <u>v</u> in most dialects show no unmotivated

exceptions. These rules do not have to be ordered before any cyclic rules, and, moreover, violate recent formulations of the strict cycle condition (see Part 3) by applying to segments in environmentts wholly contained by the first cycle of a word.

This suggests that the appropriate distinction may be between cyclic and post-cyclic rules. Only cyclic rules, apparently, admit unmotivated exceptions.

The word "unmotivate' is an out, since words belonging to non-native vocabulary in Russian are often exceptional with regard to post-cyclic rules, at least in the standard language. The rule of palatalization before front vowels, for example, applies in the native word <u>d'elo</u> 'business', but is not supposed to apply in a word like <u>tenis</u> or <u>investor</u>. <u>Nekul'turnyj</u> Russians, however, often apply these rules in foreign words too (cf. Avanesov, 1968, pp. 187-93).

I will not develop this point further in this paper. I bring it up simply because it will be interestingly consistent with a theory of the operation of word-formation rules and cyclic phonological rules I will develop in Parts 3 and 4. If the observation should turn out not to be correct, however, it will not be inconsistent with this theory either, if a few stipulations are made. I will return to this point in Part 5.[5]

In the next section we turn to morphology -- specifically, to a justification of the notion of morphological levels in Russian. In Parts 3 and 4 , we shall attempt to unite some of the observations made in this part and the next in a theory of the operation of word formation in Russian.

2.0 LEVELS IN RUSSIAN MORPHOLOGY

This section deals with the operation of word formation rules in Russian. I will show that Russian fits rather well into the framework of Allen (1978) in many ways. In particular, the constraints of level-ordering and the adjacency condition, as

applied to the operation of affixation, explain certain important restrictions on Russian word-formation. I will be dealing only with the former in this section.

2.1 Level-Ordering: The idea of morphological levels, proposed by Siegel (1977) and by Allen (1978) for English, claims that WFRs (word-formation rules) are grouped in distinct blocks or levels. Within each level, WFRs are not extrinsically ordered. The levels themselves, however, are linearly ordered. This claim has been well-motivated for English, but has not, to my knowledge, been investigated in other languages. In this section, I will show that a level-ordered morphology turns out to work excellently as an explanation for various problems in Russian word formation.

First let us see how this system works in English. English has two negative prefixes, in- and un-, both of which are, for the most part, constrained to attach only to adjective brackets (see below on this sort of constraint). They differ in the sort of derived adjectives to which they can attach. For example, while both in- and un- can attach to adjectives in -ic:

(34)   in[$_A$[$_N$organ] ic]   un[$_A$[$_N$organic] ic]
-- only un- can attach to adjectives in -ful:
(35)   *in[$_A$[$_N$soul] ful]   un[$_A$[$_N$soul] ful]

Using the framework of a level-ordered morphology, Allen explained these facts by saying that in- and -ic are both "Level I" affixes, while un- and -ful are "Level II" affixes. An ordering hypothesis states that Level I affixes must be applied before Level II affixes. Thus, to an adjective derived by affixation of the Level I suffix -ics can be added either the Level I prefix in- or the Level II prefix un-, as in (34). To an adjective derived by affixation of the Level II suffix -ful, however, only another Level II affix, such as un-, can be added. Subsequent attachment of a lower-level affix like in- would violate the ordering hypothesis, explaining the contrast found in (35).

The explanatory adequacy of this explanation arises from the consistency with

which combinatorial properties of affixes can be determined by their level-membership, and from the interesting correlations noted by Allen between level-membership and various phonological and semantic properties of affixes.

For example, Allen has noted that <u>in-</u>, but never <u>un-</u>, can cause a retraction of stress: '<u>impotent</u>, <u>impious</u>, '<u>infinite</u>, etc. Note that this retraction also occurs with non-negative <u>in-</u>, which one might assume to be a different morpheme: '<u>illative</u>, '<u>irritant</u>. This suggests that stress-retraction is not a morpheme-specific property of <u>in-</u>. In general, Level I affixes cause perturbations of root stress patterns, while Level II affixes are stress-neutral.

Furthermore, a regular rule of nasal assimilation applied to <u>in-</u> which does not affect <u>un-</u>: <u>illegal</u>, <u>impotent</u>, <u>irrational</u>, cf. *<u>ullawful</u>, *<u>umpowerful</u>. Selkirk (forthcoming) argues, in effect, that <u>-ment</u> in words like <u>government</u>, <u>internment</u>, etc., is a Level I affix. If this is so, it is worth noting that, in at least some dialects of American English, nasal assimilation applies before this suffix too: <u>gover(mm)ent</u>, <u>inter(mm)ent</u>. In all cases, this nasal assimilation rule feeds a degemination rule which also is limited to Level I affixes: <u>i(l)egal</u>, <u>i(r)ational</u>, <u>gover(m)ent</u>, cf. <u>u(nn)atural</u>, <u>clea(nn)ess</u> (where <u>-ness</u> is a Level II affix).

Allen further notes that the semantics of words with <u>un-</u> (and of other results of Level II affixation) are more transparent and compositional than those of words with <u>in-</u>. Thus, <u>incredible</u> "means more than" <u>not believable</u>, which is precisely what the corresponding <u>uncredible</u> means.

Such observations lend credence to the theory of level-ordered morphology. What is problematical about Allen's theory, however, is the way in which she must express correlations between morphological level-membership and phonological and semantic properties. In this she is limited by the traditional view of the ordering of components in linguistic theory. In the standard theory, a large syntactic gulf separates the output of morphological rules, conceived as a set of properly bracketed

words, from the input to the phonological component.[6] Similarly, the assignment of meaning to derived words, while not much discussed, has been tacitly assumed to follow the morphological construction of well-formed bracketings, which the semantic interpretation will depend on.

Consider a word like impiousness. The word is derived from a root pious, to which has been attached the Level I prefix in-, yielding the bracketing [$_A$in [$_A$pious]]. Then a Level II suffix -ness is attached, yielding [$_N$[$_A$in [pious]] ness]. This form is an acceptable output of Allen's morphological component, and can be inserted into the syntactic base by the operation of lexical insertion. Syntactic rules will apply. Following the syntax is the phonological component. This component contains a rule of nasal assimilation. How will it know whether to apply this rule to the prefix in- ?

We have seen that this rule applies only to Level I affixes; the morphology must therefore produce some sort of coding of level-membership as part of the affixation process, in order to provide proper triggers for later rules like nasal assimilation.

In traditional phonology, the device of boundaries appears to be an appropriate medium for this coding. In Allen's system, lower levels of the morphology attach affixes with weaker boundary symbols than higher levels -- for example, + for Level I affixes and # for Level II affixes. Rules like nasal assimilation will simply include + in their environment and will not apply over #. Boundaries could likewise provide the triggers for different sorts of semantic interpretation.

As Allen notes, the boundary approach offers a choice of two ways of stating the ordering hypothesis: as a condition on the application of word-formation rules or as a surface filter on the relative embedding of the boundaries:

(36)   The Ordering Hypothesis (two versions)

   a.   Level n affixation precedes Level n+1 affixation.

   b.   A cyclic node containing a stronger boundary may not be dominated by a
         cyclic node containg a weaker boundary.

We have seen how *insoulful would be ruled out by version (a).   Version (b) would rule it out if its derived structure were [in+[$_N$[$_A$soul]#ful]] . # is stronger than +, and is contained by a cyclic node dominated by one containing +.

Under the boundary analysis, (36b) is clearly to be preferred. To intrinsically order the levels of the morphology as they apply and to identify them uniquely with boundaries at the same time, would be

overkill, since the boundaries themselves can do the work of ordering affixation processes. As we have seen, traditional theory makes such boundaries essential as triggers for later rules.

However, the notion of boundaries as phonological units has been called into serious question recently, most notably by Rotenberg (1978). I have no new arguments against boundaries; however, in Part 3 I will be presenting a theory which appears to work without the use of boundaries, and can capture the semantic and phonological facts noted by Allen. I will, therefore, take the perhaps uncautious step in this section of assuming that boundaries are not linguistic units, and will generally assume an ordering hypothesis closer to (36a).

2.2 Level Ordering in Russian

2.2.1   Both derivational and inflectional morphology are extremely rich in Russian. One would thus expect to find Russian a good testing ground for a theory of word formation. In this section I will provide evidence for the validity of level ordering in Russian morphology.

I will start by formalizing an obvious notion common to all work in morphology, which has not been stated formally in the generative literature, to the best of my knowledge. We assume that WFRs attach an affix to a closed pair of labelled brackets, either a root or stem, or an output from a previous WFR, and create a new pair of outer labelled brackets. These brackets, of course, are labelled with category symbols, which may be decomposable into syntactic features.

In Russian, as in English, the possibilities of attachment by a WFR of a given affix are limited by the lexical specification of the category labels to which it may be attached. The lexicon will also specify the category labelling of the new outer brackets created by the WFR. Using a notation from Soviet Applicational Grammar (e.g. Shaumjan, 1973), we will assume that each affix is specified as bearing the relation   to two categories $\underline{x}$ and $\underline{y}$, where $\underline{x}$ is the label on the bracketing to which the affix can attach, and $\underline{y}$ is the label on the new bracketing created by the attachment. For example, an affix which attaches to nouns and creates adjectives would be said to have the specification NA. The well-formedness condition on affixation can be stated as (37):

(37)   Apply xy only to the structure $[_X \ldots]$.

In the case of derivational suffixation, which is extremely productive in Russian, the inflectional system provides a generally reliable discovery procedure by which the linguist may determine a suffix's specification, and, in fact, for determining what is a suffix, at least from an underlying phonological representation. A suffix is a string to which can be added purely inflectional affixes, yielding a possible word of Russian, which itself is attached to a string meeting this description. This informal procedure will generally identify the suffixes of Russian.

An affix's _y_-specification under (37) depends on the nature of the inflection which can be added. WFRs of suffixation form verbs, nouns and adjectives (with regular adverbial forms) in Russian, each of which has a distinct inflectional paradigm.

An affix's x-specification depends on the _y_-specification of the items to which it is attached. Note that the most embedded constituent, the root of a derived word, may be said to have a _y_-specification with no x-specification. It appears to be the case in Russian that a suffix can have more than one x-specification but no more than one _y_-specification.

It is important to remember that a specification represents a condition on the application of a WFR to a given affix. It is not an intrinsic property of an affix, and is not accessible to other rules. In Part 3, we will see that WFRs must be constrained from making reference to the category labels of internal bracketing. It is thus essential that they not be allowed to look at the specifications of internal morphemes.

Our informal procedure for morphological decomposition has not relied at all on the semantics of affixation. This is deliberate. Previous work on Russian morphology, such as the grammar of Ívedova et al. (1970), has often foundered on the lack of one-to-one correspondence between semantic function and affix, and has been forced

to consider such strings as -tel'n, transparently a compounding -tel and -ĭn (see below), as single morphemes, missing obvious morphological generalizations as a result. The lack of simple correspondence between morpheme and meaning we take to be an interesting fact about morphology and lexical semantics (see discussion in Part 4), and not an obstacle to morphological analysis.

We now turn to the mechanics of level ordering in Russian morphology.

2.2.2   The suffix -tel is a VN, forming agentive nouns (but see Isačenko, 197[?], for discussion of its meaning) from verb-stems. (I am glossing over the difference between verb stems, including a

verb's theme vowel, and verb roots in this and future discussions. The final ļ is palatalized in inflection, and may be lexically palatalized (another issue I will ignore here). Thus, where -tĭ is the infinitival desinence and the nominative singular desinence is ŭ, we find pairs of words like:

(38) a.   [[uči$_V$] tĭ]   'to teach'   (→uči')

      b.   [[[uči$_V$] tel'$_N$] ŭ]   'teacher'   (→učitol')

(39) a.   [[pisa$_V$] tĭ]   'to write'   (→pisat')

      b.   [[[pisa$_V$] tel'$_N$] ŭ]   'writer'   (→pisatel')

The suffix -ĭn is primarily a NA, forming adjectives from nouns, although it does attach non-productively to a number of verb roots. Thus, where -yj (underlying -oj) is an adjectival desinence (Nom Sing Masc), and -a is a nominal desinence (Nom Sing):

(40) a.   [[bilet$_N$] ŭ]   'ticket'   (→bilet)

      b.   [[[bilet$_N$] ĭn$_A$] yj]   'ticket'   (adj)(→biletnyj)

(41) a.   [[[sud$_N$] ĭb$_N$] a]   'fate'   (→sud'ba)

      b.   [[[sud$_N$] ĭb$_N$] ĭn$_A$] yj]   'judicial'   (→sudebnyj)

As predicted by general convention (37), -ĭn can attach to derived nouns in -tel. In many cases, for semantic reasons, the hypothetical noun in -tel to which it is attached is not attested and may be possible only as a nealogism (cf. English doer, goer, etc.). Nonetheless, in all cases the supposed noun in -tel is morphologically well-formed, and can be accepted by a native speaker as a possible, but non-occurring entry in his dictionary. Some examples are:

(42) a.   [[reši$_V$] tiv]   'decide'   (→rešit')

      b.   [[[[rešil] tel$_N$] ĭn$_A$] yj]   'decisive'   (→rešitil'nyj)

(43) a.   [[žela$_V$] tiv]   'desire'   (→želat')

      b.   [[[[žela$_V$] tel$_N$] ĭn$_A$] yj]   'desirable'   (→želatel'nyj)

The forms rešitel' and želatel' have about the same sound to a Russian ear as decider and desirer have to an English speaker's ear.

Note that the reverse order of affixation obviously violates (37):

(44) a.   *[[[[reši$_V$] ĭn$_A$] tel'$_N$] Ø]   b.   *[[[[žela$_V$] ĭn$_A$] tel'$_N$] Ø]

Now let us consider another suffix, whose meaning is somewhat akin to -tel. The suffix -ĭc attaches to a variety of categories, among them adjectives and verb roots, and forms nouns. We will say that its specification is N. Thus:

(45) a. [[[nem$_A$] ĭc$_N$] ŭ]   'German'   (→nemec)

     b. [[[mertv$_A$] ĭc] ŭ]   'dead man'   (→mertvec)

     c. [[[pis$_V$] ĭc$_N$] ŭ]   'scribe'   (→pisec)

Condition (37) predicts that the NA suffix -ĭn should be attachable to -ĭc. Uniformly, however, this is not the case:

(46) a. *[[[[nem$_A$] ĭc$_N$] ĭn$_A$] yj]   (→*nemečnyj)

     b. *[[[[mertv$_A$] ĭc] ĭn$_A$] yj]   (→*mertvečnyj)

     c. *[[[[pis$_V$] ĭc$_N$] ĭn$_A$] yj]   (→*pisečnyj)

The very few apparent exceptions to this generalization are cases where the sequence -ĭc is plausibly not an independent morpheme, where it cannot be said to be attached to a recognizable root (but see 4.2.1):

(47) a. [[kuznĭc$_N$] ŭ]   'smith'   (→kuznec) / *kuznit', etc.

     b. [[[kuznĭc$_N$] ĭn$_A$] yj]   'smith'   (adj) (→kuznečnyj)

(48) a. [[konĭc$_N$] ŭ]   'end'   (→konec) / *konit', etc.

     b. [[[konĭc$_N$] ĭn$_A$] yj]   'ultimate', 'finite'   (→konečnyj)

(49) a. [[čepĭc$_N$] ŭ]   'woman's cap'   (→čepec) / *čepit', etc.

     b. [[[čepĭc$_N$] ĭn$_A$] yj]   'woman's cap'   (adj) (→čepečnyj)

There is, however, another NA which can follow -ĭc. This is -ĭsk. Such formations are extremely common and are accepted by every informant. Like -ness-affixation in English, the very productivity of the process discourages lexicographers from including its outputs in dictionaries. A moment's check with an informant, however, will show the contrast between intuitions of impossibility for the words of (46) and intuitions of grammaticality for words like:

(50) a. [[[[nem$_A$] ĭc$_N$] ĭsk$_A$] ij]   'German'   (→nemeckij)[7]

     b. [[[[mertv$_A$] ĭc$_N$] ĭsk$_A$] ij]   'of a dead man'   (→mertveckij)

     c. [[[[pis$_V$] ĭc$_N$] ĭsk$_A$] ij]   'scribal'   (→piseckij)

Not only can -ĭsk productively follow -ĭc; it can also follow -tel:

(51) a. [[[[uči$_V$] tel$_N$] ĭsk$_A$] ij]   'of a teacher'   (→učitel'skij)

     b. [[[[pisa$_V$] tel$_N$] ĭsk$_A$] ij]   'of a writer'   (→pisatel'skij)

Thus, -ĭn can follow one noun-forming suffix, but another, while -ĭsk can follow both.   This is the paradigm case of level-ordered morphology.

We need only assume the following schema of level-membership:

(52)   Level I   Level II
        -ĭn   NA   -ĭsk   NA
        -tel   VN   -ĭc   N

-- and the combinatorial properties of the suffixes are neatly explained, using general principle (37) and an ordering hypothesis, as in (36). Level I affixes must always apply before Level II affixes, if a well-formed word is to result.

The assumption that Russian morphology is level-ordered explains the properties of a reasonably large class of productive suffixes that I have investigated, and explains almost all gaps found in the list of possible combinations that would be permitted by general convention (37) alone. In section 2.2.5, I will lay out the evidence for the level-membership of a number of derivational suffixes. First, however, I will present some semantic and phonological evidence, which supports the distinction I am drawing between two levels of Russian derivational morphology. The semantic evidence, in particular, parallels Allen's observations on semantic differences between the levels of English derivation.

2.2.3   The semantic contrast between Level I -ĭn and Level II -ĭsk is reminiscent of the contrast noted by Allen between Level I in- and Level II un- in English. Derivations in -ĭn are much more prone to lexical idiosyncracies of meaning than are derivations in -ĭsk. More striking than this, however, is the peculiarly complex method of semantic interpretation necessary for -ĭn derivatives, as opposed to -ĭsk derivatives.

Recall that -tel is a suffix which is added to verb stems to yield agentive nouns. Interestingly, as the reader may have gleaned from the glosses of (42-43), all trace of agentiveness disappears from the meaning of words secondarily derived from -tel nouns by affixation of -ĭn. This is not true of -tel nouns to which -ĭsk has been added, which include the agentive meaning in the semantics of the derived word. Thus (giving surface forms, for convenience):

(53) a. dušit'   'to strangle'

    b. dušitel'   'strangler'

    c. dušitel'nyj   'suffocating' (of a room, etc)

    d. dušitel'skij   'of a strangler'   (of a rope, etc)

54. a. mučit'   'to torture'

    b. mučitel'   'torturer'

    c. mučitel'jyj   'excruciating', 'agonizing'

    d. mučitel'skij   'of a torturer'[8]

In general, the meaning of adjectives in -ĭn seems to be derivable, when not idiosyncratic, from the meaning -ĭn and of the innermost, root morpheme, with a total disregard of what meaning may be associated with intervening suffixes. Thus, consider the following words:

(55) a. [[sud$_N$] Ø]   'court'

    b. [[[sud$_N$] ĭb$_N$] a]   'fate'   (→sud'ba)

    c. [[[[sud$_N$] ĭb$_N$] ĭn$_A$] yj]   'judicial' (→sudebnyj)

The addition of the independently occurring, albeit minimally productive suffix -ĭb to the root <u>sud</u> changes the meaning idiosyncratically from <u>court</u> to <u>fate</u>. The subsequent addition of -ĭn, however, switched the basic meaning back to <u>court</u>. Parallel examples are provided by -tel nominalizations which have acquired an idiosyncratic meaning, not entirely derivable from the verb root they are formed from. Subsequent addition of the Level II affix -ĭsk preserves this idiosyncracy, while -ĭn affixation produces words with their own idiosyncratic meanings:

(56) a. starat'   'try'

    b. staratel'   'prospector'

    c. staratel'nyj   'assiduous', 'painstaking'

    d. staratel'skij   'of a prospector'

(57) a. rodit   'give birth to'

    b. roditel'   'parent'

    c. roditel'skij   'parental'

(58) a. sledovat'   'follow'

    b. sledovatel'   'detective', 'investigator'

    c. sledovatel'no   'consequently' (adv from adj)

    d. sledovatel'skij   'of a detective'

Two semantic facts distinguish these affixes. First, -ĭn adjectives are interpreted by "looking inside" morphologically complex bases from which they may be formed, by disregarding idiosyncratic meaning created by interior affixes and any other semantic contribution of such affixes. -ĭsk adjectives, and all Level II affixes, as far as I know, lack this ability. In Part 4 I will suggest a mechanism which can predict this result.

Second, words formed by Level I affixation seem generally much more prone to idiosyncratic meaning than words formed by Level II affixation. This is a general tendency, and not a strict condition. For example, the root [nem$_A$] 'dumb' combines with the affix -ĭc to yield [[[nem$_A$] ĭc$_N$] ŭ] (→nemec) 'German', where -ĭc is a Level II affix. Nonetheless, the tendency is clear enough. I do not know why this should be, but the parallel with the situation in English is sufficiently striking to suggest some sort of universal result of the notion "level-ordering".

2.2.4   As far as I can tell, no major rules of Russian phonology seem to make a crucial distinction between the two levels of derivational suffixation. Nonetheless, properties of at least one rule may refer interestingly to the distinction between the levels. This rule, a minor yer-lowering rule, has numerous exceptions, but they are only found at Level II. At Level I the rule is nearly exceptionless. The argument is weak because only two affixes are involved. Still, if level-ordering is what is at stake, it presents crucial difficulties for a boundary-based theory of morphological levels. Clearly, there is no meaningful way stating a difference in a rule's proneness to exceptions which depends on the boundaries it can operate over. A boundary can be written into a rule to determine application or non-application, but it cannot govern exceptionality. In Part 3, I will suggest that cyclic phonological rules apply in the word-formation process. If the Levels are viewed as components in that process, and a

notion of rule "strength" (cf. Labov's (1972) notion of phi-values for variable rules) can be developed, it will be a simple matter to state that a rule operates with varying strengths at different levels.

First, let us introduce a new suffix: -ĭstv. This applies productively to nouns and to some adjectives, and creates abstract nouns. We can specify it tentatively as   N. Some examples are:

59. a.   [[avtor$_N$] ŭ]   'author' (→avtor)
    b.   [[[avtor$_N$] ĭstv$_N$] o]   'authorship' (→avtorstvo)
60. a.   [[bogat$_A$] yj]   'rich'
    b.   [[[bogat$_A$] ĭstv$_N$] o]   'riches' (→bogatstvo)

We can establish that -ĭstv is a Level I affix, since -ĭn can apply to it:

61. a. [[[[gosudar_N] ĭstv_N] ĭn_A] yj]   'national' (→gosudarstvenyj)[9]

    b. [[[[otvet_N] ĭstv_N] ĭn_A] yj]   'responsible' (→otvetstvenyj)

Now let us consider some rules of Russian phonology that apply to sequences of segments created by some of the suffixes we have been looking at. The first is a well-known palatalization which effects the following changes:

(62)

$$
\left\{
\begin{array}{l}
k \longrightarrow \check{c} \\
g \longrightarrow \check{z} \\
x \longrightarrow \check{s} \\
c \longrightarrow \check{c}
\end{array}
\right\}
\quad
/ \underline{\quad}
\begin{bmatrix}
-cons \\
-back
\end{bmatrix}
\qquad \text{PALATALIZATION}
$$

This rule applies before ĭ in -ĭstiv, -ĭsk and -ĭn.[10] In the case of the first two suffixes, however, (30) normally feeds a rule which lowers ĭ after high coronals. I will call this rule "neo-ordering", to distinguish it from the more general yer-lowering rule discussed in Part 1, which neo-lowering precedes (and bleeds):

(63)

$$
\left\{
\begin{array}{l}
+lax \\
+hi \\
-back
\end{array}
\right\}
\quad \longrightarrow \quad [\,-hi\,] \; /
\left\{
\begin{array}{l}
+cons \\
-syll \\
+hi \\
+cor
\end{array}
\right\}
\qquad \text{NEO-LOWERING}
$$

Thus, for example, the derivations of <u>božestvo</u> 'deity' and <u>božeskij</u> 'divine' (obs.), 'fair' (colloq.) (from <u>bog</u> 'god') are:

(64)	[[[bog] ĭstv] o]		[[[bog] ĭsk] ij]
PAL	ž		ž
NEO-L	e	e	
	božostvo		božeskij

Evidence that neo-lowering must bleed the environement of regular yer-lowering (rule 17) is provided by the necessity of derivations like:

(65)   [[[[vladel] ĭc] ĭsk] ij]

```
CYCLE 3:        PAL                      č
                NEO-LOWER                     e
                YER-LOWER                -----------
POST-CYCLE:  YER-DEL                   Ø
                Other Rules:  vladel'českij     'of a proprietor'
```
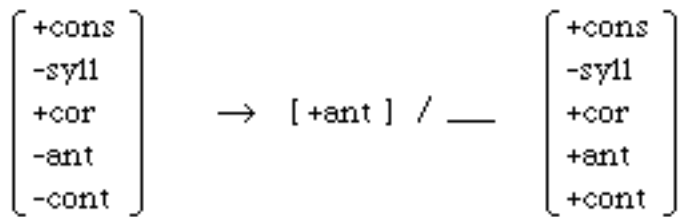
If yer-lowering preceded neo-lowering, the output would be *vladelečeskij.[11] Note that, if neo-lowering must precede yer-lowering within a cycle, we can assume that neo-lowering itself is cyclic, and along with it the palatalization rule which precedes it. This will explain why surface counterexamples to these rules are found in the first cycle of derived and underived words, given the constraint against application of cyclic rules on the first cycle suggested by Mascaro (1976) and Halle (1978), as part of the strict cycle condition.[12] Relevant examples would be words like gid 'guide', with non-application of palatalization (*žid, with that meaning), and čtu 'I read', from [[čĭt] ou] , with non-application of new-lowering (*četu).

If these rules are cyclic, then we should not be surprised that some of them admit of exceptions. Exceptions to palatalization are almost non-existent in derivatives of common nouns ([[[beg] ĭstv] →begstvo (*bežestvo) 'flight' being almost unique). Exceptions to neo-lowering, however, are common, and it is with these that we are concerned. As we noted above, exceptions are almost completely restricted to the environment before -ĭsk. Exceptions before -ĭstv are almost non-existent.

The only example of irregular non-application of neo-lowering before -ĭstv that I have found is in the root of muželožstvo 'sodomy' and skotoložstvo 'bestiality'. Perhaps traditional disapproval of these activities has been reflected in the erratic phonology.

To understand the examples with -ĭsk, one more rule must be noted. When neo-lowering irregularly fails to apply after č, whether that č is underlying or derived from k or c, a further rule applies, which changes it to c. The rule is only noted before reflexes of -ĭsk, since neo-lowering almost never fails before -ĭstv, to create the environment for this rule. Since the rule is apparently exceptionless in common nouns, and no surface counterexamples are found, we can assume that it applies after the post-cyclic yer-deletion rule, and write it as a simple assimilation rule:[13]

(66)

$$\begin{bmatrix} +\text{cons} \\ -\text{syll} \\ +\text{cor} \\ -\text{ant} \\ -\text{cont} \end{bmatrix} \rightarrow [+\text{ant}] \ / \ \underline{\quad} \ \begin{bmatrix} +\text{cons} \\ -\text{syll} \\ +\text{cor} \\ +\text{ant} \\ +\text{cont} \end{bmatrix}$$

Thus, we find exceptions to neo-lowering, sometimes with application of (66), like the following:

(67)	Base	Expected	Occurring
'catcher'	lovĭc-	*lovčeskij	lovecskij[14]
'merchant'	kipĭc-	*kupčeskij	kupecskij (also kupečeskij)
'fool'	durak-	*duračeskij	duracskij
'man'	muž-	mužeskij	mužskoj
		'masculine'	'male'
'colleague'	kolleg-	*kolležeskij	kolležskij

With (67) compare:

(68)		Base	Occurring	
	kupĭo-	kupečestvo[15]	*kupecstvo	'merchant class'
	durak-	duračestvo	*duracstvo	'folly'
	muž-	mužestvo	*mužstvo	'courage'

While the rule involved is not central to Russian phonology, the point raised by (67-8) is interesting. Both -ĭsk and -ĭstv are extremely productive affixes. Speakers appear to know that they can violate neo-lowering before -ĭsk but not before -ĭstv. In particular, noun-stems ending in the morpheme -ĭc (of which there are many) freely yield adjectives in both -ečeskij and -ecskij. Obviously, there is no way to express this fact in the statement of neo-lowering itself. An addendum like "always before -ĭstv, sometimes before -ĭsk" is not in itself very enlightening. The worst solution, obviously, would be to split the rule of neo-lowering in two, and to assign each rule a different strength, as the notion was developed above, in the different environments in which they apply. Yet the notion of "strength" seems relevant since standard theory has no way of counting the number of exceptions to a given rule. The difference in levels gives us a handle on what is going on. If a rule admits of

exceptions, it will have more of them at higher levels of the morphology. (The exceptionlessness of word-level rules, as discussed in Part 1, is the more striking for this.)

I do not want to press this point too hard, since a firm generalization can hardly be based on the behavior of two morphemes. On the other hand, a functional explanation may be available for the phenomenon, if it is level-related. Remember that the application of Level I affixes typically results in less semantic transparency than application of Level II affixes. While the meaning of almost any adjective in -ĭsk is predictable from the meaning of the form to which -ĭsk is attached, the meaning of a form in -ĭstv is not. It seems to be the case that, as a factor of performance, semantic transparency of derived words tends to be connected with non-application of phonological rules.

A good example of this is provided by Langendoen & Bever (1973). In considering double negative constructions in English like:
(69)a.   a not unhappy man
     b.   a not unfriendly man

---they note that the construction is only possible when the negative constituent is semantically separable from the root. If the combination un + adj has acquired an idiosyncratic meaning, for example, the double negative construction is not possible:
(70) a. *a not unearthly scream
     b.   *a not untoward remark

Note that un- is a Level II prefix in English, and that meanings of un- compounds are typically compositional. This contrasts with in- compounds, whose meanings are often slightly adrift from the meanings of prefix and root. To my ears, double negatives with in- adjectives are often somewhat worse than (69), though not impossible:
(71)   a. ?a not incredible proposal
     b.   ?a not inconsequential remark

(But cf. a not impossible solution, a not inconceivable outcome.) Crucial for our point is the fact that in- compounds with irregular stress retraction onto the prefix are even less acceptable than compounds with idiosyncratic meaning in these double negatives:

(72)   a.*a not infinite number
         b. *a not impotent man

It appears that application of phonological rules obscures semantic analysis of derived words, at least in performance. Thus, one might expect that Level II-derived words, which are semantically more compositional and regular than Level I-derived words, will tolerate more exceptionality in the application of phonological rules. Indeed, the intuitions of one of my informants suggest that application of neo-lowering in -ĭsk compounds may be becoming less common, perhaps as the suffix increases in productivity. Forms like <u>kupečeskij</u> (the "correct" form), for example, are losing out to forms like <u>kupecskij</u> (the colloquial form).

Thus, if the differences noted in the exceptionality of neo-lowering are level-related, it may be that these differences arise from performance factors involving semantic interpretation. At any rate, it is clear that boundaries offer little hope of explanation in this case.

<u>2.2.5</u>   Having given some general evidence supporting the notion of morphological levels in Russian, I will devote this section to the presentation of the evidence in more detail.

The data suggest at least two levels of affixation among the suffixes, although certain unproductive suffixes like <u>-ĭb</u> (cf. (55)) do not seem to apply to Level I derivatives, and may constitute a lower level of derivation. My grounds for assigning affixes to various levels rest quite simply on the expected empirical consequences of the ordering hypothesis (36) and general convention (37). Within the limits of these conditions, each affix should be attachable after any affix of the same or lower level, and should not be attachable after an affix of a higher level. Striking confirmation of the level-ordering hypothesis is provided by the consistency with which this seems to work. I have found a few exceptions, and these are discussed in the notes at the end of this section. Of course, a counterexample in an individual word is of little significance

in morphology. It is always possible for a speaker to learn a new word. What is at issue is how naturally such a new word can be coined, and how regular such coinage is. The intuitions of Russian speakers seem to be quite clear about the possibility of different types of derived coinages.

The suffixes I have examined organize themselves thus:

(73)   <u>Level I</u>   <u>Level II</u>
        -ĭn   NA   -ĭsk   NA
        -ost   AN   -ĭc   N
        -ĭstv   ANN   -(e)n/tĭj   VN
        -tel   VN

-ova   NV

Within Level I, suffixes can be combined freely, governed by general convention (37), up to several degrees of embedding. The examples below are actual words from the reverse dictionary in Zaliznjak (1977). Our claim, however, is not that every such combination is an actually occurring word, but that every such combination is a morphologically possible word in Russian.

Examples:
74. a.   [[[[[sud$_N$] ĭb$_N$] ĭn$_A$] yj]   'judicial'   (→sudebnyj)
    b.   [[[[partij$_N$] ĭn$_A$] ost$_N$] ĭ]   'partiness'   (→partijnost')
    c.   [[[[[rad$_A$] ost$_N$] ĭn$_A$] ost$_N$] ĭ   'joyousness'
    (→radostnost')
    d.   [[[[[[poverx$_?$] ĭn$_A$] ost$_N$] ĭn$_A$] ost$_N$] ĭ]   'superficiality'
                                                         (→poverxnostnost')[16]
    e.   [[[[glav$_N$] ĭn$_A$] ĭstv$_N$] o]   'supremacy'   (→glavenstvo)
    f.   [[[[gosudar$_N$] ĭstv$_N$] ĭn$_A$] yj]   'national'   (→gosudarstvenyj)
    g.   [[[[laska$_V$] tel$_N$] ĭn$_A$] yj]   'hypocoristic'
    (→laskatel'nyj)
    h.   [[[[laska$_V$] tel$_N$] ĭstv$_N$] o]   'caressing'
    (→laskatel'stvo)

    i.   [[[[bŭdi$_V$] tel$_N$] ĭn$_N$] ost$_N$] ĭ]   'vigilance'   (→bditel'nost')
    j.   [[[[[sled$_N$] ova$_V$] tel$_N$] ĭn$_A$] o] 'consequently' (→sledovat)
    k.   [[[[[sĭde$_V$] tel$_N$] ĭstv$_N$] ova$_V$] tiv] 'witness'   (→sĭdetel'stvovat')[17]
    l.   [[[[[glav$_N$] ĭn$_A$] ĭstv$_N$] ova$_V$] tĭ]   'hold command' (→glavenstvotat')
    (affixation at Level I)

75. a.   [[[[ruga$_V$] tel$_N$] ĭsk$_A$] ij]   'of a swearer'   (→rugatel'skij)
    b.   [[[[[sĭde$_V$] tel$_N$] ĭstv] ova$_V$] nĭj$_N$] e]   'witnessing'
    (→sĭdetel'stvovanij)
    c.   [[[upraĭ$_V$] enĭj$_N$] ĭc$_N$] va]   'worker in administration'
    d.   [[[[upraĭ$_V$] enĭj$_N$] ĭsk$_A$] ij]   'administrational'   (→upravlenskij)
    e.   [[[[upraĭ$_V$] enĭj$_N$] ĭc$_N$] ĭsk$_A$] ij]   'administrative'[18]
                                                 (→upravlenčeskij)
    (affixation at Level II)

Notes on examples:

1. Contrary to the predictions of (36) and (37), -ĭsk does not attach to -ost or to -ĭstv. There may be a semantic reason for this. Both -ost and -ĭstv form abstract nouns (like English -ness and -hood), which, for example, lack semantically well-formed plurals as a result. The Level II suffix -(e)n/tĭj (about which see below) also forms abstract nouns, corresponding to English -(t)ion nouns and gerundives. Like its English counterparts, the suffix -(e)r/t also forms nouns which can have a non-abstract meaning as well as an abstract one. When -ĭsk attaches to such words, the meaning is compositional only of the non-abstract meaning.

    For example, the verb upraĭt' 'to administer' yields a nominalization upravlenije, which has both meanings of the English word administration, i.e. a body of people who administer and the process of administering. As seen in (75), -ĭsk can apply to this word, but the meaning of the result is compositional only of the former, non-abstract meaning.

    Thus, we can account for the non-application of -ĭsk to -ost and -ĭstv by saying that -ĭsk does not attach to bases with [+abstract] meaning. More precisely, this will be a condition on the semantic representation produced from such affixation, but we have not explored this matter further.

2. Violations of the ordering hypothesis occur rarely. As we saw above, -ĭn cannot aply to -ĭc. This is also true of -ĭstv. Similarly, -ost and -ĭstv cannot apply to -ĭsk:

(76)   a.   [[[mertv$_A$] ĭc$_N$] ŭ]   'dead man'   (→mertvec)
        b.   *[[[[mertv$_A$] ĭc$_N$] ĭn$_A$] yj]   (→*mertvečnyj)
        c.   *[[[[mertv$_A$] ĭc$_N$] ĭstv$_N$] o]   (→*mertvečestvo)
(77)   a.   [[[brat$_N$] ĭsk$_A$] ij]   'fraternal'   (→bratskij)
        b.   *[[[[brat$_N$] ĭsk$_A$] ost$_N$] ĭ]   (→*bratskost')
        c.   *[[[[brat$_N$] ĭsk$_A$] ĭstv$_N$] o]   (→*bratščestvo)

    A few counterexamples are noted in Zaliznjak:

    a)   Citing some examples of -ĭn applied to -ĭc in (47-9) above, we noted that in all three cases it was plausible to say that -ĭc had been reanalyzed into the base and was not a separate morpheme.

    b)   Cases of application of -ĭstv to -ĭc are somewhat more numerous, but are still few in number. Zaliznjak shows a group of three examples with an irregularly lowered yer in -ĭc (molodečestvo 'dash', kuznečestvo 'smithying', kupečestvo 'merchant class'). Thirteen other examples, some of them unknown to my informants, have regular phonology (e.g. poštaanec 'participant in an uprising', poštančestvo 'participation in an uprising'). -ĭc may be switching to Level I in the contemporary language, but the oddness and rarity of the examples suggests that it is still quite firmly in Level II.

c)   Zaliznjak shows only two examples of -ost after -ĭsk (svetskost' 'worldliness' and detskost' 'childishness'). The rareness of this combination is also noted by Heltberg (1970), and is semantically surprising. One would suppose that there would be an objective need for a suffix like -ost', expressing roughly the same notion as English -ness, following -ĭsk. That -ost does not generally follow -ĭsk despite this functional need argues for some independent constraint, like level-ordering, preventing this possibility.

d)   No examples of -ĭstv occur after -ĭsk, nor will my informants accept such words as possible.

3.   The verbalizing suffix -ova- I have listed as Level I, since it fairly freely follows the Level I suffix -ĭstv, but does not seem to follow Level II suffixes. On the other hand, it does not follow Level I -tel or -ost either, and its place in the system of Levels seems unclear.

4.   The suffix we have written as -(e)n/tĭj is phonologically troublesome, and its status as a single affix may be doubtful. The e appears after a verb root in -i, and is absent after roots in -a (-aj, in the "one stem" verb system). The n is preferred to the t, and is the productive alternate.   t appears after roots ending in a consonant or a vowel other than -i or -a, as well as in a few idiosyncratic roots.   ĭ tenses to i as a matter of style.

What is striking is that the distribution of e, n and t is identical in these nominalizations to their distribution in the past passive participle (e.g. upravlenyj 'administered'). Furthermore, the sequence -ĭj occurs, also alternating with -ij, in the nominalizations of various adjectives, although it is non-productive. These facts would all suggest that the suffix we have written as -(e)n/tĭj is really the past participle suffix -(e)n/t and a deadjectival nominalizing suffix -ĭj.

Superficial futher support for this argument comes from the fact, which the reader will have noted in (75), that the sequence -ĭj is missing before other affixes,

suggesting that it is a separate morpheme. (An exception is žitejskij 'worldly', from žitĭe/žitie 'life'.) However, to assume that the string left by superficial truncation of -ĭj is the past participle affix (an adjectival affix) creates both morphological and semantic difficulties.

For one thing, -ĭsk can attach to this sequence. We have seen that -ĭsk only attaches to nominal bases. Furthermore, while the level-ordering hypothesis predicts that the Level I affix -ĭn will not be applicable after a Level II affix, one of my informants can be forced to accept affixation of -ĭn to nouns

in -(e)n/tĭj, in which case the -ĭj is missing and a clearly geminate n is heard, e.g. upravlennyj 'of the administration'. -ĭn similarly never attaches to adjectives.

Also, remember that the meaning of adjectives formed from nouns by affixation of -ĭsk is typically a clear composition of the meaning of the base and the meaning contributed by -ĭsk. A word like upravlenskij 'administrational' clearly contains the meaning of upravlenije 'administration' just as sledovatel'skij (cf. (58)) 'of a detective' contains the meaning of sledovatel' 'detective'. One will have to complicate the semantics unnecessarily if words like upravlenskij are to be derived from past participles.

There may also be phonological difficulties with the analysis of -(e)n/tĭj as a participial derivative. While stress in passive participles tends to be idiosyncratic, being partially governed (Halle, forthcoming) by features associated with individual verbs, the stress in -(e)n/tĭj nominalizations is always on the vowel preceding n/t. Furthermore, a stressed e in participles regularly becomes o (orthographic ё), indicating, in the system of Halle (forthcoming), an underlyingly lax e. The stressed e in -(e)n/tĭj never becomes o, indicating that it is underlyingly tense. (This difference is predictable, however, in the system of Lightner, 1966).

The analysis of -(e)n/tĭj as two morphemes is presumably historically correct, but it may be synchronically false. In both monomorphemic and bimorphemic

analyses we will need to explain why -ĭj regularly disappears before other derivational affixes. Under the bimorphemic analysis, we might say that -ĭj belongs to a higher derivational level, a Level III, and thus explain why no affix can follow it. Under the monomorphemic analysis, we may wish to write a truncation rule, as in Aronoff (1976). Under the theory to be presented in Part 3, this will be difficult, for technical reasons. An alternate solution is to say that -(e)n/tĭj is lexically specified as [-derivation] , which will prevent derivational affixation from applying to it. An allomorph -(e)n/t will be specified as [-inflection] , which will prevent anything but derivational affixation from applying to it. We will be considering similar questions later. For the time being, we will assume the monomorphemic analysis, although the question remains far from settled.[19]

3.0   THE CYCLE, ADJACENCY, AND ERASURE OF LABELLED BRACKETING

In the previous section, we have had a glimpse of the innards of Russian morphology, and have made some observations on the nature of morphological levels and on their interaction with lexical semantics and cyclic phonology.

Before returning to data from Russian, this section will concern itself with some theoretical issues in the relationship between morphology, phonology and semantics. In particular, I will suggest a reformulation of the Adjacency Condition of Siegel (1977) and Allen (1978) as a Bracketing Erasure Convention in word-formation. The operation of this convention will make it necessary for cyclic phonological rules to be seen as applying in the lexicon, as part of the word-formation process. This theory, in fact, will make a separate stipulation of the principle of cyclic application of phonological rules unnecessary, since this sort of application will follow as a consequence of the nature of WFRs. In Part 4, we will see how cyclic application of semantic projection rules, a little-discussed feature of standard theory, will similarly have to take place in the lexicon (a less surprising result), and the principle of cyclic application will once more not have to be stipulated. We will see that morphological levels can be fruitfully viewed as separate components of the lexicon, containing specific mechanisms, some of which may represent lexical universals.

3.1 <u>Cyclicity and Strict Cyclicity</u>: Let us begin by considering recent formulations of the principle of cyclic rule application, and its revision as the strict cycle condition of Kean (1974), Mascaro (1976) and Halle (1978).

Halle, following Mascaro, has given a minimal definition of the principle of cyclic application, which, in standard theory, must be stipulated as part of Universal Grammar:

(78)   Given the nested constitutents

$$[_n \cdots [_{n-1} \cdots [_1 \cdots _1] \cdots _{n-1}] \cdots _n]$$

a set of cyclically ordered rules C will apply to the domain
$[_j \ldots _j]$ only after having applied to the domain $[_{j-1} \ldots _{j-1}]$.

Note that a condition like (78) must apply after the operation of WFRs, which create the structure it has reference to. In standard theory, it has been assumed, as a null hypothesis, that WFRs and phonological rules, being formally distinct operations, apply in discrete groups. WFRs apply as a block, in the lexicon. These rules define an infinite set of morphologically possible words in a language. The output of these rules provides the input to a filter, which feeds a <u>dictionary</u>, containing only actually occurring words of the language (cf. Halle, 1973). Dictionary entries, complete with constituent structure, provide the input to lexical insertion transformations in the syntactic base. The constituent structure is accessed by post-syntactic phonology.

In standard theory, it is essential that constituent structure be preserved under lexical insertion, in order for subsequent cyclic phonological rules to conform to (78). On the other hand, recent work in syntax has suggested the usefulness of a restriction on the functioning of syntactic transformations,

which prohibits them from analyzing constituents below the level of the word. In other words, although word-internal IC structure must be preserved in the syntactic component, syntactic rules cannot refer to it. Following Selkirk (forthcoming), we may call this the <u>Lexical Integrity Hypothesis</u>, which she states in its strongest form as:

(79)   <u>Lexical Integrity Hypothesis</u>
         No syntactic transformation may involve lexical structure.

     We will return to this condition very soon. Let us examine first some conditions which have been imposed on the functioning of cyclic phonological rules. An early observation (for example, SPE) suggested that cyclic rules can be constrained from referring to bracketing more deeply embedded than the current cycle. SPE expressed this constraint as a Bracketing Erasure Convention, which we might state as:

(80)   <u>Bracketing Erasure Convention - SPE</u>
         Given the nested constituents
             [n · · · [n-1 · · · n-1] · · · n]
         the <u>first</u> rule of cycle j is: Erase brackets j-1.

     If this principle were tenable, it would mean that on any given cycle no rule could know the constituency of any segment within its purview. This principle has turned out to be too strong to allow the operation of another constraint on cyclic phonological rules, the Strict Cycle Condition. This condition has been formulated in a number of ways, as summarized in Halle (1978). Its original motivation was to prevent cyclic rules from applying on later cycles to domains exhaustively dominated by earlier cycles. Clearly, if brackets are erased as in (80), such a condition will not be operable. Erasure of all internal bracketing at the beginning of each cycle will make material newly available on a given cycle indistinguishable from material already available on earlier cycles. The conflict between these two principles appears to have gone largely unnoticed in the published literature, and the erasure condition (80) seems to have died a quiet death. This point is noted only in an early, unpublished paper by Kean (1971), as far as I can tell.

     A recent statement of the Strict Cycle Condition by Halle (1978) shows this conflict:

(81)   <u>Strict Cycle Condition</u>
         A cyclic rule R applies properly on cycle j only if either
         a) or b) is satisfied:

         a)   R makes specific use of information, part of which
              is available on a prior pass through the cyclic rules,

and part of which becomes first available on cycle j.

There are three separate cases subsumed under a):
R refers specifically to some A and B in:
    i. $[_j XAY \ldots [_{j-1} \ldots B \ldots] Z]$;
    ii. $[_j Z [_{j-1} \ldots B \ldots] XAY]$;
    iii. $[_j X [_{j-1} \ldots A \ldots] Y [_{j-1} \ldots B \ldots] Z]$

b)   R makes specific use of information assigned on
        cycle j by a rule applying before R.

Clearly, a Bracketing Erasure Convention like (80) will make a) impossible. In order to incorporate the Strict Cycle Condition in the theory of phonology, however, the Bracketing Erasure Convention need not be eliminated, but only weakened. All that is necessary to accommodate (81) is to be able to tell, on each cycle j, material that is first available on j from material that has been available on earlier cycles. The appropriate weakening of (80) is very simple:

(82)   <u>Bracketing Erasure Convention - Revised</u>

Given the nested constituents
$[\,_n \ldots [\,_{n-1} \cdots n-1] \cdots n\,]$
the <u>last</u> rule of cycle j is: Erase brackets j-1.

Under (82), the most external set of internal brackets will always persist through a cycle, allowing implementation of the Strict Cycle Condition, while still putting severe constraints on reference to internal bracketing by phonological rules.

Strikingly, in the two papers I know of in which arguments crucially depend on maintenance of internal brackets during the cycle, the crucial bracketing which must be preserved is only the most external of the internal brackets on any cycle -- just those brackets that would be preserved under the Bracketing Erasure Convention (henceforth BEC) of (82). In Dell & Selkirk (1978), a backing rule in French must refer to a morphological feature [+Learned], which, it is argued, is a feature in labelled bracketing. The only occurrences of [+Learned] which the rule can look at, however, are those found on the most external internal brackets on any cycle. More deeply embedded occurrences of the feature do not matter to the rule.

Similarly, in Grimshaw (1977), a lengthening rule in Attic Greek must know on a later cycle that a vowel to be lengthened is contained within a verb stem. In all the examples cited, the cycle on which the rule applies immediately dominates the verb-stem cycle. Under the BEC, this would be the only cycle on which the verb-stem label would be available.

If all examples should turn out to be of this sort, it would provide excellent evidence for the correctness of the revised BEC as a condition on the operation of the cycle. The BEC shouled be borne in mind during the next section.

3.2 The Adjacency Condition and the BEC

For the moment, we suspend discussion of phonology to consider the process of word-formation.
Allen (1978), and independently Siegel (1977), has motivated by a semantic argument an Adjacency Condition on morphological rules:

(83)   No WFR can involve X and Y, unless Y is uniquely contained
          in the cycle adjacent to X. (= Allen (57))

The original semantic motivation for this condition is somewhat dubious,

particularly in view of arguments I will be presenting for an autonomous semantic representation in the process of word-formation (see also Williams, forthcoming, for some factual counter-arguments), but a more important consequence of this condition, as discussed by Allen, can easily be captured in the framework I will be presenting.

Allen points out that the Adjacency Condition (83) represents:

> "an important additon to morphological theory, since it
> limits the number of conceivable types of rules and
> conditions on rules . . . In particular, given the Adjacency
> Condition, it becomes impossible for a WFR to refer to any
> conceivable property of the base at any possible cyclic
> depth. Rules which crucially involve the notions denominal,
> deverbal, and deadjectival are not allowed within a theory
> of morphology governed by the Adjacency Condition.
> For example, a rule which states that suffix X may attach

only to denominal adjectives cannot be formulated, given
the Adjacency Condition, since such a rule relates two
items which are not in adjacent cycles; e.g.:

$$[\, [\, [\, Y_N \,] \, Q_A \,] \, X \,]$$

Allen's investigations of English, and my investigation of Russian have not turned up any counterexamples to this result of the Adjacency Condition.

Note that under the Adjacency Condition the rule attaching X in Allen's ilustration may refer neither to the labelled brackets dominating Y nor to any feature of Y itself. In other words, no condition on the affixation of X can take Y's existence into account. On the other hand, the "unique containment" provision of the Adjacency Condition allows both the labelled bracketing of Q and properties of Q as a morpheme to be taken into account by the rule affixing X. While there are cases where this seems to be required, I shall suggest that this possibility may also be excluded.

First, however, let us consider the domain of the Adjacency Condition. As stated in (83), it is necessarily a condition only on the application of WFRs. It does not, for example, generalize to cyclic phonology. For example, the cyclic rule of yer-lowering in Russian can be triggered by a yer in a non-adjacent cycle:

(84) $[[[\, z\breve{\imath}g] \, l] \, \breve{u}]$

    YER-LOWER   e   /
    YER-DEL   Ø
    Other Rules: žëg
          (/ = "in the environment of")

In standard theory, one would not expect a phonological analog of the Adjacency Condition, since there is no reason to suppose that WFRs and cyclic phonological rules share any formal properties.

Let us now suppose, as suggested earlier, that WFRs can be constrained more tightly than indicated by the Adjacency Condition, and can be prevented from looking at any properties of the morpheme in the adjacent cycle besides the labelling of its outer brackets. In this case, all the Adjacency Condition would have to state would be a restriction against reference to any but outermost brackets.

Clearly, the BEC will have just this effect. We need only apply this erasure convention after the application of each WFR, and we will ensure that no subsequent WFR will be able to refer to any but the outermost bracketing in a string. Let us see how this will work. To a base X, with labelled bracketing a, we affix Y with labelled bracketing b:

(85) $[\, _b \, [\, _a X_a] \, Y_b]$

Now we erase internal bracketing, as provided for by the BEC:

(86) $[_b XY_b]$

Note that not only the information carried by the internal bracketing, but also the morpheme division which it showed (assuming a theory without boundary symbols, see 2.1 above), is obliterated by the BEC. Subsequent application of a WFR can only look at the information available in (86).[20]

3.3 The Bracketing Erasure Convention and the Cycle

Obviously, one condition is better than two, if the revised single condition can be made consistent with a reasonable and explanatory theory of grammar. Let us suppose that the Adjacency Condition is, as we claim, a reflex of a BEC, and see what consequences this will have for linguistic theory as a whole.

One immediate difficulty in the standard framework is presented by the existence of cyclic phonological rules. Successive erasures of internal bracketing in the lexicon will yield underlying phonological representations without bracketing, and will make application of the cyclic convention (78) impossible. Recall that our revised BEC was first motivated phonologically by the desire to allow the maximum erasure of bracketing on each cycle, while retaining enough for the Strict Cycle Condition (81) to operate.

This difficulty only exists if cyclic phonological rules apply after all WFRs, as they do in the standard theory. Clearly, the only way cyclic phonological rules can properly apply at all, given the BEC in the morphology, is if cyclic rules also apply in the morphology, after the application of each WFR. We propose that the process of word formation consists of the following steps:

(87) a. Subject to condition (37), apply an affix $[_b Y_b]$ to a base $[_a X_a]$.
         This will yield $[_b Y [_a X_a]_b]$ or $[_b [_a X_a] Y_b]$.

       b. Apply all cyclic phonological rules, subject to the Strict Cycle
           Condition (81).

       c. Erase inner brackets, according to the BEC, yielding a string
           $[_b YX_b]$ or $[_b XY_b]$.

We assume that this procedure is a universal characterization of the workings of the morphological components of the lexicon .

A significant result follows from this assumption about cyclic phonological rules. The very condition of cyclicity, as given in (78), will not need to be stipulated in the theory of grammar, since cyclic application of phonological rules will be dictated by the form of WFRs specified in (87a). Since words are built by successive affixation to an internal constituent, application of a phonological rule after each affixation will cause the rule to apply "cyclically", just as specified in (78). Since every cycle j-1 is formed by a WFR before a cycle j, phonological rules applying after each WFR will naturally apply to cycle j-1 before j. On grounds of parsimony, this is a nice result, removing the necessity of mentioning the principle of cyclicity in a formulation of universal phonological theory. We will still need a separate statement of the "Strictness Condition" on the application of cyclic rules, however, since this will not derive from any characteristics of WFRs.

3.4 Lexical Integrity

Another nice result of the BEC and (87) is that most of the Lexical Integrity Hypothesis (79) will not have to be stipulated. Words will be inserted into the syntactic base without internal bracketing. Furthermore, without boundaries, the very identity of word-internal morphemes will be obscured by the action of phonological rules. It follows that no syntactic transformation will be able to look at word-internal structure, since it will not be able to analyze subconstituents of words.

The BEC will not, of course, stop syntactic rules from having access to purely phonological properties of words. Since this seems to be a reasonable constraint, this, at least, will still have to be stipulated:

(88)   No syntactic transformation may involve phonological
          properties of lexical items.

This is plainly a less far-reaching stipulation than the original Lexical Integrity Hypothesis. One would hope that some general principle of Lexical Insertion might account for (88).

3.5 Morphological Irregularities

The collapsing of constraints which must be stipulated in Universal Grammar has value in itself, since, if correct, it helps put into focus the nature of the linguistic system. One hopes, however, that such collapsing will have salutory empirical consequences. Otherwise, the improvement is purely conceptual.

In this section I will suggest one nice empirical consequence of the theory we have been developing, which suggests the correctness of the BEC as applied to morphology.

The reader will recall that in Part 1 we solved a problem with the operation of the rule of yer-lowering in Russian by suggesting that the rule applied cyclically. This necessitated a semantically counterintuitive bracketing for Russian verbs with prefixes. In that section we justified this bracketing by citing examples from English and Warlpiri where a similarly counterintuitive bracketing seemed necessary. In this section, we can show that the behavior of morphologically irregular verbs under prefixation actually forces this bracketing in Russian, given the BEC in morphology.

We noted in Part 1 that, for example, the prefix podŭ- and the verb stem žvig combine to form a verb meaning 'to set on fire'. The root žvig as an independent verb is glossable as 'burn'. The semantic relation betwen prefixed and unprefixed verb, though apparent, is idiosyncratic. The proper application of yer-lowering in the past tense of this and phonologically parallel verbs presupposes the following sort of bracketing:

(89)   [prefix [[verb root] inflection]]

We noted that this bracketing ran against the grain of the semantics of such verbs, in which the prefix and verb root seem to function together, with the inflection as a separate semantic element.

Note an important implication of the structure in (89), particularly if cyclic phonology operates in the lexicon . It implies that all inflectional morphology is

added to verb roots in the lexicon, and is not filled in by the syntax. This issue has been a topic of hot debate recently (cf. Lieber, 1979); so this result is of some interest. We will return to this issue briefly below, as well as to the semantic problems of structures like (89).

For now, we are interested in some facts about morphological irregularity in prefixed verbs. A number of Russian verbs are irregular in one way or another. What is striking is that these irregularities are always preserved under prefixation, even when the meaning of the prefixed verb is idiosyncratic and bears no necessary relationship to the meaning of its root. For example:

(90)

	Infin	1 Sing	2 Sing		Irregularity
a.	byt'	budu	budeš	'be'	diff. stems Inf/Pres
b.	zabyt'	zabudu	zabudeš		'forget'
c.	pribyt'	pribudu	pribudeš	'arrive'	

(91)

	Infin	1 Sing	2 Sing	
a.	exat'	edu	edeš	'drive'
b.	pereexat'	pereedu	pereedeš	'cross', 'move'
c.	sexat'	sedu	sedeš	'drive down', 'move'

(92)

	Infin	1 Sing	3 Sing	1 Plur	Irregularity
a.	dat'	dam	dast	dadim	'give'/1 sing des/redup plur/ no theme vowel in Sing
b.	izdat'	izdam	izdast	izdadim	'publish'
c.	prodat'	prodam	prodast	prodadim	'sell'

For all verbs, prefixed and unprefixed, the grammar will need a means of expressing the fact that some verbs show different stems in different morphological environments, and that some verbs (dat', vesti) have exceptional desinences. Two species of formal mechanism have, in general, been proposed to handle these sorts of facts, and it is not clear what empirical differences might be found between them.

SPE assumed a set of "readjustment rules" converting expected forms into irregular forms (cf. also Lieber's morpholexical rules). We might write rules like this thus:

(93)   a.   by →bud/ ___] PRESENT SYSTEM
       b.   ex →ed/ ___] PRESENT SYSTEM

(94)   a.   da →dadi/ ___] PRESENT SYSTEM PLURAL
       b.   -u →-m/ [da] ___
       c.   -tĭ →ti/[certain verbs] ___

Alternately, the lexical input to the word-formation rules could list irregular forms, with a redundancy rule relating them to other forms of the same word, e.g:

(95)   [by, +INFIN SYSTEM] = [bud, + PRESENT SYSTEM]

The second approach, or something like it, seems more natural, since it does not force a choice of one form as underlying the other. However, I do not intend to try to choose here. What is crucial about rules like (93-94) or (95) is the level at which they must apply.

It can be shown that rules like (93-94) or (95) must refer to morphemes, and not merely to phonological strings. For example, while the segmentable verb iz-dat' (iz occurs elsewhere) has an irregular 1 Plur form iz-dadim, the unsegmentable gadat' 'guess' (ga- does not occur elsewhere) does not have a 1 Plur form *gadadim, but a regular form gadajem. Similar examples can be adduced for other irregular forms.

If we accept the morphological BEC proposed above, it is clear that rules like (93-94) or (95) must apply at a stage when a root morpheme is still identifiable.

Suppose a verb like zabyt'/zabudu had the semantically intuitive bracketing:
(96) a.   [[za [by]] tiv]   b.   [[za [bud]] u]

Given our BEC, it is clear that there would be no way to capture the alternation by/bud that it shares with other byt' compounds. In the lexicon, we would prefix za to, let us say, by:
(97)   [za [by]]

Then, after all cyclic phonology had applied on the outer cycle, we would erase inner brackets:
(98)   [zaby]

Now we would add the 1 Sing ending -u (underlying -ou):
(99)   [[zaby] ou]

At this point, given rules like (93a) or (95), there will be no way we can know that *zabyu is not the correct surface form. A readjustment rule like (93a) could not identify the morpheme by in the string zaby, nor could a redundancy rule like (95). We would be forced to write a separate rule for zaby, and individual special rules for all the numerous other compounds formed by prefixation to by (seventeen, according to Zaliznjak). An obvious generalization would be lost.

By contrast, consider the semantically counterintuitive bracketing of (89), that we needed in Part 1 to make yer-lowering yield the correct results. Under this analysis, the prefix in a prefixed verb is applied after inflectional morphology, yielding bracketings like:

(100) a.   [za [[by] tĭ]]   b.   [za [[bud] u]]

This bracketing presents no problems under the BEC for morpholexical rules like (93a) or redundancy rules like (95). To a root like by, for example, we might attach the Sing desinence -u (underlying -ou):

(101)   [[by] ou]

At this stage, affixation of -ou will bring features with it identifying it as a present system desinence. A rule like (93a) or (95) will now apply, and will tell us that the correct form of the verb root in this case is bud (underlying boud). To the correct result allowed by such rules, we can now attach a prefix:

(102)   [za [[boud] ou]]

        My argument here is a "bootstraps" argument. I believe that bracketings like (89) are independently motivated by the behavior of yer-lowering in Russian, and are found to be necessary in other languages as well. I have argued above the theoretical advantages of the BEC and the reorganization of phonology and morphology which it entails. It may be that both these proposals are wrong. Nonetheless, the fact that they both motivate the same bracketing for prefixed verbs, that under both analyses no other bracketing is possible, suggests that there is something right about both proposals. If we are correct in our arguments, the cost of abandoning the BEC in the morphology would be a host of conditions like Adjacency, the Cycle, and the full Lexical Integrity Hypothesis. Furthermore, it would not be possible to say anything precise about the place of prefixation in the grammar of languages like Russian. The phonological cost of abandoning our analysis of yer-lowering seems to be a complicated analysis like that of Lightner (1973), cited in Part 1. In addition, we have seen that the BEC is a desirable constraint on cyclic phonology in any case. The cost of our analysis, as far as I can tell, is the necessity of an interpretive rule which can identify roots and prefixes and associate them, assigning correct idiosyncratic meanings. In Part 4 we will suggest that such mechanisms are independently motivated anyway.
        We will not develop the point here, but it should be noted that our arguments about the bracketing of prefixed verbs in Russian will extend to many other languages.[21] For example, we will need a bracketing as in (89) to handle English facts like:

(103) a.   come   came
       b.   become   became
       c.   overcome   overcame

(104) a.   stand   stood
       b.   withstand   withstood

c.　understand　　　　understood

(105)　a.　take　　　　　　　　　　　took　taken
　　　b.　undertake　　　undertook　　　undertaken
　　　c.　mistake　　　　mistook　　　　mistaken

We will also need bracketing like:
(106)　a.　[co [here]]　　　[co [[hes] ion]]　　　[co [her] ent]]
　　　b.　[ad [here]]　　　[ad [[hes] ion]]　　　[ad [her] ent]]
　　　c.　[in [here]]　　　[in [[hes] ion]]　　　[in [her] ent]]
(107)　a.　[de [lude]]　　　[de [[lus] ive]]
　　　b.　[e [lude]]　　　[e [[lus] ive]]
　　　c.　[al [lude]]　　　[al [[lus] ive]]

3.6 Identification of Morphemes after Erasure of Bracketing:

　　　At this point, we will tie a loose thread in our argument. Recall that one difference between the Adjacency Condition and Bracketing Erasure Convention lay in the ability of a WFR to identify internal morphemes. The Adjacency Condition permits a WFR to refer to any properties of the morpheme previously affixed, while the BEC permits a WFR only to look at the labelling of that morpheme's outer brackets.

　　　Obviously, certain conditions on WFRs do depend on properties of the morpheme most recently attached. For example, in the Russian noun, it is the outermost affix that determines the declensional class and gender of the whole. Russian nouns can be of three genders, distributed over two feminine declensional patterns and one masculine and neuter pattern. In addition, animate masculine nouns have an accusitive desinence identical to the genitive. For example, the singular desinences are:

(108)　Decl:

	I		II	III
	Masc	Neuter	Fem	Fem
NOM	ǔ		o　a	ǐ
GEN		a	i	i
DAT		u (ou)	e	i
ACC	ǔ/a		o　u	ǐ
INSTR	om		oj	ju
PREP	e		e	i

All nouns in _-tel_, for example, are I-Masc. All nouns in _-ĭstv_ are I-Neut. Nouns in _-ost_ are III.
Each noun-forming affix, as well as every nominal root, must be specified for gender and declensional
class. The question is where this specification is placed in the morpheme. The matching of declensional
pattern to noun stem, since it is solely dependent on the outermost constituent of the noun stem, can be
said to obey the Adjacency Condition. In our theory, this suggests that the specification of an affix's
declension-membership and gender is a part of the label on its outer bracketing. This is nice, because it
could not be elsewhere, since no other feature of the outermost constituent of a stem is accessible at the
declensional level, under the BEC.

In other words, an affix, besides being specified as a CC, where C stands for a categorial feature
complex, will also bear features in the right-hand slot of its specification, indicating the declensional
class and gender of declensional affixes that may be attached to it, e.g:
(109)

$$
\text{-tel}: \triangle V \begin{bmatrix} N \\ +I \\ +\text{masc} \\ +\text{anim} \end{bmatrix} \qquad \text{-ĭstv}: N \begin{bmatrix} N \\ +I \\ -\text{masc} \end{bmatrix} \qquad \text{-ost}: A \begin{bmatrix} N \\ +III \\ +\text{fem} \end{bmatrix}
$$

Declensional affixes will bear these same features in their left-hand specification, and will thus
attach by general convention (37). The grammar will want to capture the fact that, alone among the
features mentioned above, the gender of a noun-stem is

carried over onto an inflectional desinence, and remains part of a word's outermost bracketing, where it
is accessible to agreement rules. Declensional class never seems to figure in such rules in Russian. I do
not know how to do this here. The specification of nominal desinences will look like:
(110)

$$
\text{-ŭ}: \triangle \begin{bmatrix} N \\ +I \\ +\text{masc} \\ \alpha\,\text{anim} \end{bmatrix} \begin{bmatrix} N \\ +\text{sing} \\ +\text{masc} \\ \begin{Bmatrix} +\text{nom} \\ \alpha\,\text{acc} \end{Bmatrix} \end{bmatrix}
$$

Our theory does not predict why features of declensional class and gender cannot appear in the left-
hand slot of an affix's specification, i.e. why no derivational affixation is limited by the declensional
class or gender of other affixes or roots. It may simply be the case that ability to refer to declensional

and gender features in the left-hand slot of a specification is part of the definition of an inflectional affix. For now, this remains an isolated observation.

Since the only properties of an affixed morpheme that can be referred to by rules applying on the next cycle are features written on the morpheme's outermost bracketing, our theory suggests that morpholexical irregularities wil not be found in affixes. This is in general true. Clearly, rules like those in (93-94) or (95) could not apply to affixes if their identities were obscured by erasure of bracketing.

Russian offers only two exceptions to this generalization. Masculine nouns in -janin (indicating nationality or citizenship) and some words in -in lose the sequence -in in the plural and form genitive plurals like feminine and neuter nouns, in ŭ. Additionally, nouns in -janin have an exceptional nominative plural desinence in e, instead of i:

(111)

	Nom Sing	Nom Plur	Gen Plur	(surface forms)
a.	graždanin	graždane	graždan	'citizen'
b.	rimljanin	rimljane	rimljan	'Roman'
c.	kievljanin	kievljane	kievljan	'Kievan'
d.	tatarin	tatary	tatar	'Tatar'
e.	xazarin	xazary	xazar	'Chazar'

Nouns denoting 'young of a species' have a masculine affix -ёnŭk in the singular, which alternates with a neuter affix -ĭnt in the plural (NB: ĭnC →jaC):

(112)

	Nom Sing	Nom Plur		
a.	kitёnok	kotjata	'kitten'	(kot 'cat')
b.	myšёnok	myšata	'baby mouse'	(myš 'mouse')
c.	oslёnok	osljata	'baby ass'	(osёl (osĭl-) 'ass')
d.	orlёnok	orlajata	'baby eagle'	(orёl (orĭl-) 'eagle')
e.	psёnok	psjata	'puppy'	(pёs (pĭs-) 'dog')

My only suggestion for handling these data is to resort once more to writing information relevant to the choice of idiosyncratic forms on the brackets of the morphemes in question. For example, given a system of redundancy rules, as in (95), we could say that there existed two allomorphs: janin, marked [-plural] , and jan, marked [+plural, +nom plural in -e] . An appropriate convention would prevent a [+plur] inflectional suffix from attaching to a [-plur] noun stem, and vice versa. A similar solution would be available for -ёnŭk.[22]

Such a solution, of course, paves the way for an undesirably weak theory of morphology. If we can write morpholexical features on the bracets of affixes, why can't we write features that would get

around the BEC, like [+I attached to a noun] ? In the absence of an explicit theory of what can and cannot be part of a bracketing label, we must be wary of allowing bracket labels to be an escape hatch from all difficulties. Clearly, for example, we wish to exclude the information in the left-hand slot of an affix's specification from the affix's outer brackets. What other information can or cannot be included within the present theory is an empirical question that I have not tried to resolve.

I should emphasize once more, however, that such problems as are presented by -janin and -ënǔk are exceptional in Russian.   Few affixes show the sorts of morpholexical irregularities we have seen above. This is what one would expect, perhaps, if our solution above were correct, but if morpholexical bracket labels were a highly marked and costly option in word-formation, difficult for the language learner.

4.0   Levels, Lexical Semantics, and the Organization of the Lexicon

In the remaining sections, I will sketch an interpretation of the notion of morphological levels developed in Part 2 within the theory I have been presenting. I will suggest that, within the derivational system, levels represent language-particular word-formation components inside the lexicon. These function as small lexicons in their own right, marking words as occurring or non-occurring, and specifying semantic idiosyncracies. In examining the process of filtering occurring from non-occurring words, I will develop a theory of lexical semantic interpretation which will help explain some interesting facts about the distribution of words and meanings in the levels. Within this system, however, much remains to be worked out, and all remarks should be taken as speculative.

4.1 Levels: In Part 2, we gave two possible interpretations of the Level-Ordering Hypothesis, following Allen. The second of them assumes a theory in which levels are uniquely associated with particular boundary symbols. We repeat them here:

(113)   a.   Level n affixation precedes Level n+1 affixation.
          b.   A cyclic node containing a stronger boundary may not be
                dominated by a cyclic node containing a weaker boundary.

At that time we stipulated that we would assume that phonological and morphological theory does not include boundaries as segments. We noted the necessity of having such boundaries in standard theory, if the application of later phonological rules depends on information about a given affix's Level-membership. The boundary must be present to code information about level-membership for later phonology to refer to. We showed that, within the system of derivational morphology in Russian, no rule's application was limited to a given level, but that the proneness of at least one rule to lexical

exceptions did seem linked to the difference between the levels. This is contrary to the situation in English, where Allen shows a number of phonological rules depending on a distinction between Level I and Level II affixes. I assume that this difference is essentially accidental, and that, if languages are

universally allowed to distinguish levels of derivational affixation, the "strength" of a rule and its very application are both conditionable by the levels.

As we have seen, in standard theory, the conditioning of phonological rules by level-membership provides strong evidence for interpretation b of the Level-Ordering Hypothesis. Clearly this is not true in the theory developed here. We need to assume that rules which make reference to differences between levels are cyclic. I do not know if there is evidence against this assumption in English, where the rules concerned are nasal assimilation, degemination and the minor rule of stress retraction. If the assumption is tenable, then, since phonological rules apply in situ after affixation of each morpheme, we neeed only specify, at each level of affixation, what phonological rules are operative.

What this suggests is that levels of morphology are essentially components of the lexicon, each with its own reigning phonology. Phonological rules will not mention boundaries or other coding devices for level-membership, but will simply be listed or not listed, or listed with varying strength in the phonological systems of the various levels.

In one respect only, the boundary approach is superior. Presumably, the unmarked case is for phonological rules to be maximally uniform among the levels. In our theory, this must be stipulated in some way. In boundary theory, with an appropriate convention allowing the omission of boundaries when not relevant, the classical evaluation metric will predict that a rule which does not have to mention boundaries will be more valued than one which does. I leave this problem for further study.

If we are right in claiming that the so-called levels of morphology are separate morphological components, we would expect them to act as components. The Level-Ordering Hypothesis suggests that they are mutually ordered -- i.e. the output of the rules of one feeds the rules of the next. It turns out that we can say more than this.

Semantic facts and "occurrence" facts suggest that each level has the complex properties Halle (1973) and Allen (1978) attribute to the lexicon as a whole. Each level acts as a filter, separating morphologically well-formed real words of the language from well-formed, accidentally non-occurring words of the language, and assigning idiosyncratic meanings to words where necessary.

Evidence for this is striking. Recall that the Level I affix -ĭn attaches productively to noun stems to form adjectives. However, there are a large number of adjectives in -ĭn[23] which do not appear to contain any recognizable, independently occurring noun-stem:

(114) a. jasnyj   *jas   'clear'
       b. važnyj   *važ   'important'
       c. tesnyj   *tes   'crowded'
       d. burnyj   *bur   'stormy'
       e. ugr'umnyj   *ugr'um   'gloomy' (cf. ugr'umost')

Similarly, we know that the Level I affix - ost attaches productively to adjective stems to form abstract nouns. However, there is a somewhat smaller, but sizable number of abstract nouns in -ost in which -ost is not attached to any independently occurring adjective stem:[24]

(115) a. t'agost'   *t'agyj   'burden' (but t'aga = 'friction')
       b. pakost'   *pakyj   'filth', 'dirty trick'
       c. prelest'   *prelyj   'charm'

A smaller number of examples like this are found with -tel and -ĭstv:

(116) a. znamenatel'   *znamenat'   'denominator' (cf. *denominate)
       b. voitel'   *voit'   'warrior' (poet)   'rowdy' (colloq.)
                                                  (cf. voĭn-ĭn-yj (-> vojenyj) 'martial')

(117) a. tožestvo   tože   'also'?   'equality'
       b. količestvo   *kolic etc.   'quantity'
       c . kačestvo   kak-oj   'what kind'?   'quality'
       d. estestvo   estĭ   'is'?   'nature'

I have, however, been unable to find any such examples with Level II suffixes.[25] Such examples may exist, but they are surely very few. Examples with Level I suffixes, particularly -ĭn, are numerous.

Of course, it may be a coincidence that we find adjectives in -ĭn, abstract nouns in -ost and nouns in -tel and -ĭstv which look like derived words formed from non-occurring bases. It may be that such words are simply unanalyzable. Nonetheless, one will still be faced with the need to explain why such coincidences are not found with Level II affixes. (Recall that the small number of nouns in -ĭc not formed from occurring bases, discussed in 2.2.2, do not act like Level II derivatives, and probably are real coincidences.)

To explain this, let us first note the commonplace observation that words in many languages can be formed by affixation to bases that are not themselves occurring words. This is an old conclusion of work in generative morphology, and one that we have been assuming throughout. What we want to know is why Level II affixation almost always applies to bases that <u>are</u> words.

My proposal is that the Level I component, and, in fact, every <u>word-formation component</u> of the lexicon, acts like the lexicon of Halle (1973). The input of each component is a <u>dictionary of bases</u> and a <u>list of</u> <u>affixes</u>. The bases come with meanings, when such exist, as do the affixes. Word-formation rules successively attach affixes to a base. The output is then fed into a filter which, as in Halle's article, separates occurring from non-occurring words and assigns idiosyncratic meanings where necessary. The result of this process, in each component, is a list of actually occurring forms. These forms are projected as the dictionary of bases for the next word-formation component.

Thus, level n, where n > 1, will have as its input only words which have been passed on to it by the filtering mechanism of level n-l. We may think of the random output of WFRs in each component as constituting a <u>provisional dictionary</u>, which the

filtering mechanism pares down to a <u>permanent dictionary</u> (cf. similar notions for the lexicon as a whole in Allen, l978).

Figure 1 represents this picture schematically:
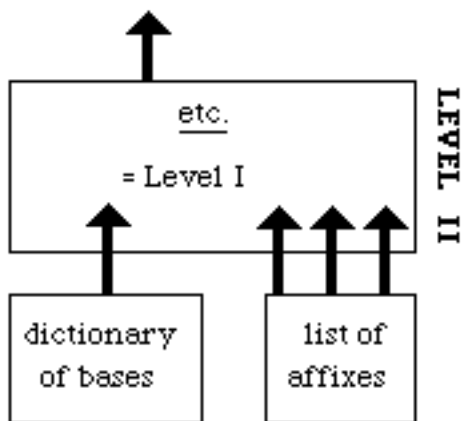
figure l

The dictionary of bases providing the input to the lowest level of the morphology, Level I, will thus be the only dictionary of bases in the lexicon which has not resulted from a filtering process, and will be the only dictionary of bases to include non-occurring forms. Thus, our model provides an examplanation for the presence of non-occurring forms as bases at Level I, but not at Level II, in Russian.

Note that similar facts hold in English. Level I affixes are found on all manner of non-occurring words: <u>intransigent</u> (*<u>transigent</u>), <u>overwhelm</u> (*<u>whelm</u>), <u>elegant</u> (*<u>elege</u>), <u>aggression</u> (*<u>aggress</u>), etc. With a very few exceptions (<u>unsightly</u> (*<u>sightly</u>), <u>unwieldy</u> (*<u>wieldy</u>)), Level II affixes like <u>un-</u> or <u>-ness</u> are found attached to actually occurring words. We may assume that the explanation is the same.

4.2 <u>The Filter and the Semantics of Derivation</u>: Limiting ourselves for the moment to the mechanism of derivational suffixation in Russian, it is worth considering how the filter which blocks non-occurring words might work. A discussion of this issue will help us define the mechanism of semantic interpretation in the word-formation process.

4.2.l In considering this filter, there are a number of types of data we must look at. The first is represented by (ll4-7). These are morphologically complex words formed by affixation to a morphologically simple base which does not occur independently, e.g., <u>važnyj</u> 'important' (*<u>važ</u>); tesnyj 'crowded' (*<u>tes</u>). Intuitions about words like *<u>jas</u> and *<u>tes</u> are clear. What is wrong with them is that they do not mean anything. Like English forms such as *<u>wieldy</u> and *<u>sightly</u>, they can be given an interpretation by a conscious decomposition of their derivatives, but the words remain humorous and unnatural. As a first approximation, we may say that the filter of a word-formation component will have to rule out words which do not "mean" anything. We must necessarily be coy about the meaning of the term "meaning" here, but we may claim at least that words come in ordered pairs of form and meaning (F,M), and that a filter in each word-formation component will throw out possible words in which M is null:
(ll8)   *(F,M), where M = Ø.
    We will revise this shortly.

4.2.2 If the filter is to rule out words in this way, we must look more closely at the role of semantic interpretation in the theory we are proposing. It is a well-known fact that some morphologically complex words appear to have meanings that are 'compositional" of the meanings of their morphemes arranged in a constituent structure. Other morphologically complex words appear to have idiosyncratic

meanings, or, like <u>važnyj</u> and <u>tesnyj</u>, to have necessarily idiosyncratic meanings, being formed from a meaningless base.

Let us consider compositional meaning first. To my knowledge, the nature of lexical rules of semantic composition has been little studied. I will not be shedding much new light on the subject here. Intuitively, it appears that compositional meaning is derived cyclically, being built up from most embedded to least embedded constituents (cf. Katz and Fodor's (l964) system for interpretation of syntactic trees). Thus, in English, [[industri] al] means 'pertaining to industry', [[[industri] al] ize] means 'to create industrial conditions', [[[[industri] al] iz] ation] means 'the process of industrializing', and [[[[[industri] al] iz] ation] al] means 'pertaining to industrialization'. Similar examples can be created in Russian.

Obviously, if brackets are erased in the process of word-formation, at least some semantic interpretation of lexical items must be done as part of the process of word formation. At the very least, a hierarchical list of meanings must be built up in an autonomous semantic representation as words are built up by WFRs. (Notice that once more we will not need to stipulate the principle of cyclic application, since it will result from the nature of WFRs.)

This semantic representation will feed rules of composition, which will yield compositional meanings, whatever they may look like. In most cases, perhaps, these rules will be of the simple sort necessary for <u>industrializational</u> and other such words. We have seen in Part l and Part 2, however, that more complex mechanisms are sometimes necessary.

The suffix <u>-ĭn</u>, for example, as we saw, appears to "erase" the meanings of affixes intervening between it and the root of a derived word. Let us assume that interpretation of a root x, by general convention, places a semantic label/root on the meaning of x. We will need this label later to interpret prefixed verbs. <u>-ĭn</u> will trigger a special semantic rule which will delete all meaning in semantic representation except its own and the meaning labelled/root. I do not know what such rules should look like, but an approximation might be:

(ll9)   x/root - y -<u>ĭn</u>   → x/root - <u>ĭn</u>   (x, y meanings, <u>ĭn</u> the meaning of <u>ĭn</u>)

It might be supposed that idiosyncratic meaning differs from compositional meaning in simply being assigned to a whole word, at the dictionary level. In other words, a compositionally derived semantic representation might simply be discarded in favor of a word-sized idiosyncratic meaning associated with the same lexical item. This cannot be right, however. This follows from the existence of words formed

by further affixation at a given level to a form with idiosyncratic meaning. In many cases, the idiosyncratic meaning is preserved under this affixation. For example, we noted in (56) above that the word <u>staratel'nyj</u>, from <u>starat'</u> 'try' by affixation of <u>-tel</u> and <u>-ĭn</u>, carries the idiosyncratic meaning 'assiduous', 'painstaking'. This meaning is preserved under affixation of <u>-ost</u>: <u>staratel'nost'</u> 'painstakingness', 'assiduousness'. This suggests that idiosyncratic meaning is a property, not of words, but of groups of morphemes.

We will need rules of idiosyncratic meaning assignment to apply to lexical semantic representations. We will want to use such rules, not only to derive idiosyncratic meanings for words formed from actually occurring bases, but also for words like <u>tesnyj</u> and <u>važnyj</u>, formed from bases which do not occur. In the light of examples like these, it would not be feasible to require such rules to map meanings of the usual sort into idiosyncratic meanings, since we have already seen that the reason *<u>tes</u> and *<u>važ</u> do not occur is that they lack meanings. To handle this, I suggest that

rules of lexical semantic interpretation do not operate on meanings per se, but rather on abstract meanings, which are mapped by later rules onto a set of concrete meanings. These abstract meanings may be regarded as purely arbitrary designations uniquely associated with bases and affixes. Rules like (ll9) will be reformulated to apply to abstract meanings. In addition, rules of idiosyncratic meanings assignment will operate on abstract meanings, having as output other abstract meanings. These rules apply to autonomous semantic representations, and, moreover, appear to be crucially ordered after fully formed semantic representations have been built up -- that is, they do not apply cyclically, as part of the affixation process. This can be shown by an ordering argument.

Recall the paradigm exhibited in Part 2 (55) of the derivation of words with the root <u>sud</u>, which we repeat:

(l20)   a. [[sud$_N$] Ï]   'court'   (→ sud)

       b. [[[sud$_N$] ĭb$_N$] a]   'fate'   (→ sud'ba)

       c. [[[[sud$_N$] ĭb$_N$] ĭn$_A$] yj]   'judicial'   (→ sudebnyj)

We want to capture the fact that <u>sud</u> + <u>ĭb</u> yields the idiosyncratic meaning 'fate', while subsequent addition of <u>-ĭn</u> yields a word compositional only of itself and <u>sud</u>. The latter fact will follow from a rule like (ll9), but (ll9) itself must be ordered <u>before</u> the rule of idiosyncratic meaning assignment that says:

(l2l) Abstract Meaning of <u>sud</u> - Abstract Meaning of <u>ĭb</u> → 'fate'

   (or Abstract Meaning thereof)

---since the action of this rule will eliminate the independent semantic status of <u>sud</u>. What is important is that, while rule (ll9) of <u>ĭn</u> interpretation must precede rule (l2l), the affixation of <u>ĭn</u> follows the affixation of <u>ĭb</u> in the word-formation process. Thus, a rule like (l2l) cannot be assumed to apply immediately upon affixation of the relevant morphemes, but must wait until a stage after further affixation has taken place. It seems reasonable to suppose that this stage is the level-final stage at which the building up of a semantic representation is complete.

On the other hand, it might be objected that we do not necessarily want the left side of a rule like (l2l) to be unrecoverable. If it were not, then our ordering argument would fall through. One could imagine that the assignment of idiosyncratic meaning in semantic representation leaves original meanings intact. Certain cases of polysemy might seem to require this, where a word may have both a 'literal' and 'idiosyncratic' meaning. I will have nothing to say about polysemy here. (It may indicate optional application of rules of idiosycratic meaning assignment instead.) The assumption of irrecoverability of input in semantic rules like (l2l) has an important result, which bears on our discussion of morphological levels.

Recall that in Part 2 (56-8) we saw that, while Level I affixation of -<u>ĭn</u> to bases with agentive suffix -<u>tel</u> caused the loss of the semantic content of -<u>tel</u>, affixation of the Level II suffix -<u>ĭsk</u> invariably preserved this content. What is more, in cases where the base noun in -<u>tel</u> itself bore an idiosyncratic meaning, this meaning was preserved under affixation of -<u>ĭsk</u>, though not under affixation of -<u>ĭn</u>. An example given in (58) was:

(l22) a. starat'   'try'
       b. staratel'   'prospector'
       c. staratel'nyj   'assiduous',   'painstaking'
       d. staratel'skyj'   'of a prospector'

As we have just seen, the meaning of adjectives in -<u>ĭn</u>, which do not contain the meanings of nouns in -<u>tel</u> from which they may be derived, can be obtained by ordering rule (ll9) of -<u>ĭn</u> interpretation before rules of idiosyncratic meaning assignment. This is possible in our theory, because both rules apply to the full semantic representation of words at Level I. Clearly, however, since -<u>ĭsk</u> is a Level II affix, no interpretive rule involving -<u>ĭsk</u> can precede rules of semantic interpretation which must apply at Level I. If the inputs to rules of idiosyncratic meaning assignment are unrecoverable, the meaning of an adjective derived by affixation of Level II -<u>ĭsk</u> to a Level I base with idiosyncratic meaning must include that idiosyncratic meaning. [27] Indeed, it appears to be the case that, while a Level II

affix's interpretation may occasionally be able to "look inside" the meaning of Level II affixes to which it is attached,[28] it can never look inside the meaning of Level I affixes. This is predicted, if idiosyncratic meaning is assigned at each level, and if the assignment rules are unrecoverable.

It should be emphasized again that these results follow naturally only in a theory under which morphological levels are distinct components in the lexicon. One could imagine a theory of lexical semantic interpretation which could achieve the same results by making the action of semantic rules depend on boundaries, but the stipulations such a theory would have to make would be many and clumsy. (For example, one might say that rules applying within the domain of a weaker boundary can apply in non-cyclic orders, but most precede all rules applying properly within the domain of a stronger boundary.)

4.2.3 Finally, we return to our original question in this section, about the nature of the filtering mechanism which separates possible non-words from actually occurring words. We have suggested that a feature of this mechanism was a filter like (ll8), ruling out words to which no meaning has been assigned. This will rule out *tes and *važ, without our theory of abstract meanings, since they will have no meaning assigned to them. It will also rule out Level II derivatives like *tesskij and *važskij (or *važeskij), since the roots *tes and *važ will have been filtered out at Level I, before affixation of -ĭsk at Level II. It will not, however, rule out Level I derivatives like *tesstvo and *važestvo, since these words at Level I will not be, strictly speaking, meaningless, since they will contain the meaning of the suffix -ĭstv. This is why we need the notion of "abstract meaning" developed above. Unless a "meaningless" morpheme's abstract meaning has been mapped into another abstract meaning by a rule of idiosyncratic meaning assignment, it will not be mappable into a concrete meaning, and will be ruled out by a revision of ll8):
(l23)   *(F,M), where M contains an abstract meaning.
A "meaningless" morpheme is one whose abstract meaning does not map onto a concrete meaning.

Thus, we assume rules of idiosyncratic meaning assignment applying to abstract meaning, like:

(l24) a. Abstract Meaning of tes - Abstract Meaning of ĭn → 'crowded'
        (where 'crowded' is an Abstract Meaning)

      b. Abstract Meaning of vaz - Abstract Meaning of ĭn → 'important'
        (where 'important' is an Abstract Meaning)

These rules will also apply in the presence of the abstract meanings of other morphemes. Thus, <u>važ</u> and <u>ǐn</u> can be factored out of <u>važnost</u>' 'importance', where <u>-ost</u> has its regular meaning.

It is important to stress the limited status of our notion of 'abstract meaning'. I use the term 'meaning', because it is something to which rules of semantic interpretation can apply, and because it can act like a 'meaning' with regard to other morphemes (cf. English <u>unwieldy</u>, in which it feels as if the morpheme <u>un</u> is negating something). What is crucial about the concept for our purposes, however, is simply that it provides a unique label for morphemes to which semantic rules can refer. This is its only essential function.

<u>4.2.4</u> Our filtering mechanism must have other resources besides (l23), in order to exclude all non-occurring words at each level. Some semantic mechanism, for example, must exclude words like *<u>iditel</u>' 'goer' and *<u>videtel</u>' 'seer', presumably by the same criteria which exclude their English glosses.

Additionally, one may wish to invoke a "blocking principle" like that proposed by Aronoff (l976), which prevents words of identical meaning from coexisting in the dictionary. The results of such a principle can be clearly seen in adjectives in <u>-ǐn</u>. Rule (l19) claims that no contribution to the meaning of adjectives in <u>-ǐn</u> is made by anything except the root morpheme and <u>-ǐn</u>; intervening morphemes contribute

nothing. Thus, a principle like the blocking principle should preclude the existence of more than one word in <u>-ǐn</u> with the same root, unless one of them should be assigned an idiosyncratic meaning. This seems to be true. Thus, the possible word *<u>pisatel'nyj</u> (<u>pisat</u>' 'write') is blocked by the existence of <u>pis'mennyj</u> (<u>pis-ǐm-ǐn-yj</u>) 'pertaining to writing', 'written'. *<u>suditel'nyj</u> (<u>sudit</u>' 'judge') is blocked by <u>sudebnyj</u> 'judicial'. <u>sušestvenyj</u> (<u>sušestvo</u> 'essence') (<u>sušestv-ǐn-yj</u>) has the meaning 'essential', while <u>sušestvitel'nyj</u> (<u>sušestv-i-tel-in-yj</u>) has the meaning 'substantive' (gramm.). The verb that this last word should be derived from, *<u>sušestvit</u>' (with verbalization by <u>-i</u>), is blocked by the existence of <u>sušestvovat</u>' (with verbalization by <u>-ova</u>). <u>proizvodstvenyj</u> 'productional', as Jane Simpson has pointed out to me, irregularly preserves the meaning of <u>proizvodstvo</u> 'production', while <u>proizvoditel'nyj</u> means 'productive'.

We may therefore suppose that blocking, like filter (l23), is an important means of filtering the infinite list of possible non-words entered in a level's provisional dictionary down to the list of occurring words, which forms the dictionary of bases for higher levels of derivation. The true role of blocking in the Russian lexicon, however, demands further study.

4.3 Inflection and Prefixation in the Lexicon: I have used the word "word" loosely in the preceding sections, to refer to the outputs of derivational word-formation components. Of course, the outputs of these components must actually undergo inflectional affixation before words can result.

We have noted earlier that, if our general theory and our analysis of prefixed verbs are correct, inflectional affixes must be added to stems in the lexicon, and not by later syntactic rules, as has sometimes been suggested (cf. Chomsky, l965).

Let us assume, for lack of contrary evidence, that the rules of inflection apply in a component of the lexicon similar in structure to the word-formation components discussed in previous sections. The rules of inflection will yield lists of inflected

lexical items, which will be filtered to exclude non-occurring items. Since inflection adds predictable and unique meaning to stems in most cases, we will need to suppose a much less rich apparatus of semantic interpretation in this component. Nonetheless, Halle (l973) has called attention to some cases of idiosyncratic meaning in inflectional paradigms. In particular, the instrumental case of some Russian nouns has a special temporal meaning: zimoj 'in winter', osenju 'in fall', dnem 'in the day, but *oktjabrem 'in October'. We may assume that these cases can be covered by rules of idiosyncratic meaning assignment, as in the previous section. Since these nouns also have more normal meanings in the instrumental case, we must assume that the idiosyncratic meaning rules are optional here.

As for the filtering mechanism in the inflectional component, we note that some Russian nouns and verbs are defective in their paradigms. For example, the noun čelovek 'person' lacks a plural, except for a partitive genitive. Similarly, a number of verbs, as discussed in Halle (l973), lack the l Sing form of the present system. I have no insightful way of explaining these gaps. As Ívedova et al. (l970) note, many of the missing forms in the verbal system are felt to be dysphonious or confusingly homonymous with forms of other verbs. She goes on to point out that such dysphony and homonymy are found in other verb forms, where they have not caused a defective paradigm. Halle uses this fact to reject the original explanation, yet this is perhaps not right. It may be that the forms which are not used are in fact filtered out for the reasons Ívedova cites. In certain other cases, the offending forms may be given legitimacy by brute force listing in the dictionary of the inflectional component. We must use such force majeure in any case for the occasional exception to our generalization that forms filtered at one level will not be projected into the dictionary of a higher level (cf. unsightly and unwieldy, where un is a Level II affix, and below, on prefixed verbs). Presumably, brute force listing is an option which the lexicon can employ under duress.

If our analysis of prefixed verbs is correct, the output of the inflectional component will provide the input to a prefixing component, at least in the case of verbs. Evidence for this ordering of the components is further provided by the fact that Russian verbs which are defective in their paradigm remain defective under prefixation. If the relevant forms are assumed to have been filtered in advance, in the inflectional component, this fact follows straightforwardly. Examples:

(l25) a. pobedit'   no l Sing   'conquer'
          ubedit'   "   'persuade'
      b. čudit'   "   'act oddly'
         načudit'   "   "
         otčudit'   "   'alienate'

Further evidence for our ordering of components is provided by the fact that the overwhelming number of prefixed verbs are formed from roots which occur as independent verbs. There are a certain number of intractable exceptions. For example, (l25a) illustrates the verbs pobedit' and ubedit', which do not correspond to an actually occurring verb *bedit'. The sizable cluster of verbs in -(n)ĭmt' (perfective)/-(n)imat' (imperfective), such as ponjat'/ponimat' 'understand', snjat'/snimat' 'take', obnjat'/obnimat' 'hug', etc., do not arise from any actually occurring verb (although the root is related to imet' 'have'). We must assume, in our theory, that these verbs possess abstract meanings which are irregularly not filtered out at earlier levels, even though they do not convert to non-abstract meanings.[29]

In light of our previous discussion, it is clear how prefixed verbs can undergo semantic interpretation. We saw, in our discussion of the semantics of ĭn, that it was necessary to mark the meaning contributed by the root of a complex word in semantic representation. This marking will be accessed in the semantic interpretation of prefixed verbs. The rules will be of the general form:

(l26) Abstract Meaning of Prefix - Abstract Meaning/Root →   idiosyncratic meaning.

In the case of nouns derived by the affixation of -ost to adjectives with idiosyncratic meaning, we saw that rules of idiosyncratic meaning assignment can apply in the presence of meanings irrelevant to the rule. So here rules like (l26) will ignore the meanings contributed by inflection. The meaning of an entire prefixed verb will ultimately be compositional of the meaning derived by a rule like (l26) and the meaning contributed by inflection.

Similarly, the ordering of components assumed here requires that nouns and adjectives formed from prefixed verbs will also have "counterintuitive bracketing". For example, from podžigat' 'set fire to' (imperfective of podžeč) can be derived the noun podžigatel' 'arsonist'. This will have the bracketing [pod [[[žiga] tel'] Ï]] . I know of no phonological evidence bearing on this point, but it is clear that rules of the form of (l26) will have no problem applying to structures like this.

The necessity of rules like (l26) to interpret constructions like English negative comparatives and Warlpiri verbs, discussed in Part l, suggests that rules of this type have some universal status. What property of prefixation should play a role in Universal Grammar remains unclear. It may be the endocentric character of prefixation that is relevant here, but cross-language data must be examined before conclusions can be drawn.

Margaret Allen and Edwin Williams (personal communications) have called attention to phrasal constructions which seem to require rules of the form of (l26), perhaps generalized to:

(127)   In the structure [x [... [y] ..]]
        associate meaning of x and meaning of y

For example, a [transformational [[grammar] ian]] is 'one who does transformational grammar', where transformational and grammar are x and y in the structure shown in (127). Similar examples are numerous:

(128)   a.   a nuclear physicist is a doer of nuclear physics
           b.   a jazz musician is a performer of jazz music
           c.   a higher-order mathematician is a doer of higher-order math

In the autonomous semantic theory presupposed here, it might not be surprising if boundaries between non-semantic components (e.g. lexicon and syntax) should turn out not to correspond to boundaries between semantic components. Thus, a rule like (127) might range over both lexically derived and syntactically derived semantic representations.

Finally, a note about English. Clearly, the structure of English morphology will be somewhat more complex than that of Russian morphology, since prefixation is found at Level I as well as Level II. We indicated in 3.5 above that morpholexical irregularities suggest that English nouns like cohesion, adhesion, etc. have the structure [prefix [[hes] ion]] . Clearly *hesion is not a word of English, nor are most of the roots of Latinate prefixed words. We may speculate that, while prefixation still is

made to follow suffixation at Level I, a filter does not intervene between the two processes. It is also feasible to say that inflection applies after prefixation in these cases, since no inflectional irregularities are noted. The point, obviously, demands another paper than this.

4.4   Summary: At this point, let us schematize the model of the Russian lexicon we have posited:

LEVEL II

etc.

= Level I

dictionary
of bases

list of
affixes

Occurring Forms

Conversion to
Concrete Meaning

LEVEL I

filter

provisional dictionary

WFRs, cyclic
phonology, BEC

etc.

Semantic
Rules

abstract

meanings

Semantic

Representation

dictionary
of bases

list of
affixes
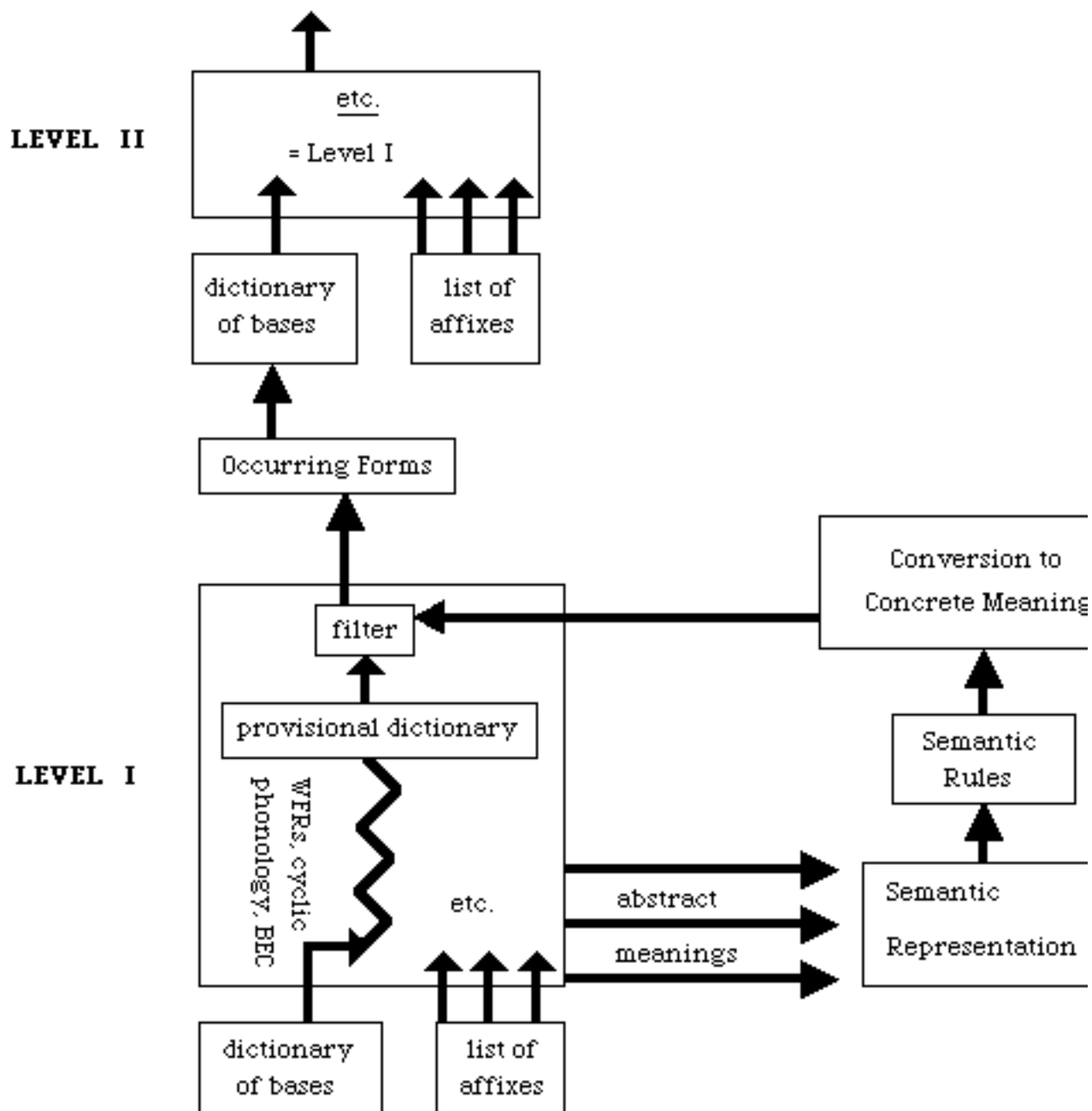
Finally, we will summarize the main claims of Parts 3 and 4.

---A bracketing erasure convention applies in the morphology, whose results subsume the independently motivated Adjacency Condition and most of the Lexical Integrity Hypothesis.

----Cyclic phonological rules apply in the lexicon after each word-formation rule, before erasure of bracketing, subject to a Strictness Condition (the "strict" in "strict cycle"). For languages with simple affixation processes, at least, this assumption seems to subsume the Cyclicity Condition on the ordering of phonological rules.

----The existence of these properties and the behavior of irregular verbs under prefixation justifies the "counterintuitive bracketing" of prefixed verbs proposed in Part 1.

----A consequence of these proposals is an enrichment of what is allowed in a label on bracketing, although it may still be possible to impose substantive constraints on bracket labels.

----"morphological levels" are separate word-formation components generating possible words and filtering out non-words.

---This filtering process depends at least in part on independently motivated mechanisms of autonomous semantic representation at the lexical level. Representations are built up in the process of word-formation at each level, and sematic rules apply to these representations once they are completely built up. These semantic rules may in some cases range over syntactic as well as lexical semantic representations.

----One observation we have not explained is the fact that the semantics of Level II compounds is less idiosyncratic overall than the semantics of Level I compounds.

5.0 Afterword: Cyclic Rules and Exceptionality

The theory presented here seems able to account for the observation we made at the end of Part 1, that only cyclic rules appear to admit unmotivated exceptions. In our theory, cyclic rules apply in the lexicon, after each application of a WFR. The output of these rules, at each level, becomes part of that level's dictionary.

Traditional theory has handled lexical exceptions by assuming that morphemes carry features for each rule they could undergo, specifying whether or not they undergo that rule. The unmarked state is for a morpheme to be marked positively for undergoing all major rules of the phonology which can apply to it. In such a theory, we could capture our observation about exceptionality by saying that all post-cyclic rules are obligatiory and adding the stipulation:

(129)   No post-cyclic rules can refer to rule features.

This would make sense with a traditional arrangement of the components of the grammar, or with the one assumed here. Note that in the theory presented here, erasure of brackets would make word-internal morphemes unidentifiable to post-cyclic rules; however, without a condition like (129), word-sized exception features could still be looked at by post-cyclic rules.

The theory argued for in this paper suggests another way of expressing this fact, however. Since the dictionary at each level will contain forms to which all cyclic rules have applied, one may assume that forms which are phonologically irregular are simply listed in the dictionary. The blocking principle will rule out the occurrence of parallel regular forms with the same meaning.[30] What remains to be worked out is how this system will capture the intuitively clear difference between derived forms which are phonologically irregular and forms which are completely suppletive.

Such a theory would have one nice consequence. Standard theory, by associating exception features with morphemes, predicts that exceptions will be linked to morphemes, and not to words. Our theory suggests the opposite, which appears to be generally true. For example, the yer in the root i̯gŭr- 'game' lowers completely regularly in the adjective igornyj, but fails to lower before ŭ in the genetive plural of the root noun, which is igr, and not *igor. Similarly, the yer in kupĭc- 'merchant' quite properly fails to lower in declensional forms like kupca (Gen Sing), but lowers irregularly in kupečestvo, where the lowering of the second yer bleeds the environment for the lowering of the first (cf. section 2.2.4 for argumentation).

Post-cyclic rules do not feed any dictionary, so the irregular non-application of phonological rules at this level would, at best, result in free variation. If lexical exceptions to cyclic rules are simply the result of brute force entry in the dictionary, then we can say that phonological rules at all levels are obligatory, and eliminate free variation at the post-cyclic level.

NOTES

1. I want to thank Morris Halle for his endless help. I have also benefited from conversations with Margaret Allen, Joan Bresnan, Paul Kiparsky, John McCarthy, Joel Rotenberg, Jane Simpson, Donca Steriade, Tim Stowell, Edwin Williams and members of the MIT Workshop in Phonology. Special thanks to Andrei Navrozov and Victoria Schiller for native intuitions and patience. All guilt rests with the author.

2. Orthographic ё, a reflex of e under stress, is phonetically 'o.
' indicates fronting (palatalization). e and ё almost always palatalize preceding consonants, which I have left unmarked in transcription.

3. Actually, k becomes č here before ĭ, i.e. before yer-lowering. "Other Rules" throughout merely indicates irrelevant phonological changes, with no claim about their ordering.

4. This article is cited in Worth (1968) and in Isačenko (1970), but I have been unable to find the original article.

5. The observation, of course, is reminiscent of the condition on "non-automatic neutralization rules" proposed by Kiparsky (1973A), that they apply only in derived environments. Recent work has suggested that this generalization is better made about cyclic rules, as the Strict Cycle Condition. If my observation is correct, it restores a portion of Kiparsky's original formulation by claiming that all non-automatic rules (rules with lexical exceptions) are cyclic rules.

6. This gulf is necessary if inflectional endings are syntactically derived, since phonology applies to inflectional endings. We consider this point below in text.

7. nemeckij is, of course, listed in dictionaries.

8. The reader wil forgive the gruesome vocabulary. The full paradigm of (53-54) is reconstructable in terms of possible words for any verb stem, but not all verb stems allow the full list as occurring words.

9. Yers are lowered after the sequence obstruent + sonorant, in a rule which, like neo-lowering below, bleeds regular yer-lowering. n is orthographically doubled in words like this, but the doubling has no morphological or phonetic correlate.

10. I have not attempted a precise characterization of the palatalization rule (62) here. It appears to include the independently motivated First Velar Palatalization (cf. SPE p. 420 ff.) and a piece of the Dental Palatalization. The exclusion of other dentals (with exceptions in isolated words, cf. student, studenčestvo, studenčeskij) is puzzling.

Lightner solves the problem by deriving surface cases of c here from underlying k, which is subject to the Velar Palatalization (p. 149).

11. (65) represents by far the most common pattern, although examples of irregular yer-lowering in this environment occur, e.g. kupečeskij, kupečestvo (a level-ordering violation) from root kupči-.

12. The rule also does not apply before declensional affixes, cf. brodjagi 'hoboes'.

13. Most proper names tend to be exceptions to all these rules. While (34) does apply to a few proper names, e.g. Kalmyk, kalmycskij, most proper names show neither phonological, nor neo-lowering, nor the change of č to c:

Base	Expected	Occurring
Taganrog	*taganrožeskij	taganrogskij
Íax 'shah'	*Íašeskij	Íaxskij
Grinvič	*grinvičeskij, *grinvicskij	grinvičskij

See below in text for some remarks on the interaction of semantic transparency, presumably desired in these cases, with the non-application of phonological rules.

14. We want to derive words like this regularly via (66) rather than calling them exceptions to palatalization for two reasons. First, palatalization has practically no exceptions, except as noted in note 13. We would have to explain why exceptions were only found with c. Second, we need rule (66) anyway for words like durasckij below.

15. See note 11.

16. po-verx's category is something of a mystery. -ĭn does attach to some PP-like constructions, e.g. bezlosandyj 'horseless', bez lošadi 'without a horse'.

17. svide- is at least etymologically the prefix sŭ- added to the root vide- 'see', so the IC structure may not be exactly as I have given it.

18. An exception to the normal total semantic transparency of -ĭsk. The meaning of -ĭc, seen in (75c), is lost in this word.

19. An analysis that might combine the best of both solutions could say the -(e)n/tĭj was bimorphemic, and that -ĭj had a zero allomorph which appeared in derivation.

20. Our principle is slightly weaker in one respect than the Adjacency Condition, since, as stated, it does not prevent a phonological condition on a WFR from looking at properties of what would be nonadjacent cycles, were bracketing preserved. I do not know if this is a bad result. Certainly syllable-counting conditions and stress-sensitive conditions on WFRs might be expected to violate the Adjacency Condition, though I have no data on such rules.

21. Similar conclusions are reached by Makkai (1969). Within the stratificational framework she concludes that two levels of representation are necessary for such verbs in Romance languages, a morphological level to handle morpholexical irregularities with one grouping, and a semantic level to capture the natural semantic groupings (though her terms are different) -- a conclusion surprisingly like our own.

22. One might like to derive the suffix -ënŭk from two suffixes: -ĭn, which does not appear elsewhere to create nouns, and -ŭk, a regular diminutive-forming suffix, which attaches to nouns. The irregularity in the plural would then consist merely in the substitution of -t for -ŭk (for the alternation k-t elsewhere in Russian, cf. Lightner, p. 161). This analysis is presumably historically correct. If it were synchronically right, however, it would be a clear violation of our interpretation of the Adjacency Condition. -ŭk does not alternate with -t when not preceded by -ĭn. To properly capture the alternation, the rule involved would need to refer to three cycles, the cycle on which a plural affix was added, the cycle containing -ŭk, and the

cycle containing -ĭn. Such a rule would not violate Allen's statement of the Adjacency Condition, if we could view it as "involving" -ŭk, since both the plural affix and -ĭn would be contained by adjacent cycles. Under our theory, however, affixation of a plural desinence will render -ĭn inaccessible, since the bracket separating it from -ŭk will have been erased.

Phonological evidence, however, suggests that the synchronic analysis of -ën<u>ŭ</u>k as -in + <u>ŭ</u>k is incorrect. Forms like <u>psënok</u> (*<u>pesënok</u>), <u>oslënok</u> (*<u>oselënok</u>) show unlowered yers in noun-stems before <u>-ënŭk</u>. This is quite regular (cf. list in Zaliznjak), and shows that <u>e</u> must be regarded as underlying in <u>-ënŭk</u>. If, as we have argued, yer-lowering is cyclic, historical reanalysis of <u>-ĭnŭk</u> as <u>-ënŭk</u> upon the merger of the two affixes would be motivated by the Strict Cycle Condition of Halle (1978) (but not that of Clements, presented in the same paper). The first yer could not lower, since it would be tautocyclic with the second yer. Since it did not drop, but maintained its lowered form as <u>ë</u>, we must assume that the <u>ë</u> was reanalyzed as underlying. Of course, there is no evidence against a synchronic analysis as <u>-ën</u>+<u>ŭk</u>/<u>-ĭn</u>+<u>t</u>, but such an analysis has little apeal. (But cf. Lightner, p. 184, who claims that <u>enC</u> also yields <u>jaC</u>.)

23. We know that these adjectives end in <u>-ĭn</u> because the yer lowers in the predicative "short form" before <u>ŭ</u>: <u>jasen</u>, <u>važen</u>, etc.

24. I am excluding a large class of adjectives which contain a <u>k</u> absent from the <u>-ost</u> nominalization, e.g. <u>nizkij</u>, *<u>nizyj</u>, <u>nizost'</u>. I do not know how these should be handled.

25. I ignore the numerous nouns which add a combining morph like <u>-in</u> or <u>-ov</u> before affixation of <u>-ĭsk</u>, e.g. <u>mater-in-skij</u> 'maternal', <u>mord-ov-skij</u> 'snoutish'; also Latinate words with combining morph <u>-ik</u> (→ <u>ič</u>/ <u>ĭ</u>) before <u>-ĭsk</u>, e.g. <u>ximer-ič-eskij</u> 'chimerical'. These might be handleable by morphological mechanisms like those used in Part 3 to account for irregularities in verbs.

26. This rule implies that more than one intervening morpheme's meaning should be erased. This seems to be the case. The sociolinguist Panov (1968) comments on nonce-forms like <u>sistem-ĭn-ost-ĭn-yj</u> (→ <u>sistemnostnyj</u>) 'systematic', that they seem to have the same meaning as the standard words like <u>sistem-ĭn-yj</u>. Such examples are hard to find, however.

27. Unless it should have an idiosyncratic meaning of its own.

28. As in note (18).

29. Other exceptions are formed by derived imperfective verbs containing the affix <u>-yv</u>, which are commonly formed from prefixed perfective verbs and do not have unprefixed counterparts. For example, the verb <u>pokazat'</u> 'show' forms an imperfective verb <u>pokazyvat'</u>, while the root verb <u>kazat'</u> 'seem' does not correspond to any verb *<u>kazyvat'</u>. Still another class is provided by denominal nouns

with the prefix <u>o(b)-</u>: <u>oburžuazit'</u> 'make bourgeois', <u>obruset'</u> 'Russify', I have no account for these examples.

30. Occasionally one finds doublets, in which the same combination of affixes and root yields two words with different phonology and different meaning, e.g. from
[[[otĭc] ĭstv] o] (<u>otec</u> 'father') is derived regular <u>otčestvo</u> 'patronymic' and <u>otečestvo</u> 'fatherland'; from [[[muž] ĭsk] oj]   (<u>muž</u> 'husband', 'man') is derived <u>mužeskij</u> 'masculine' (gramm.) and <u>mužskoj</u> 'male'. The different meanings in these cases are predicted by the blocking principle.

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