Folk Verse Form in English

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Quatrains in English folk verse are governed by laws that regulate the patterns of truncation (non-filling of metrical positions) at the ends of lines. Each of the possible truncation patterns (we claim 26) is adhered to consistently through multiple stanzas and defines a verse type. The descriptive goal of this article is to account for why these and only these truncation patterns exist.

Our crucial hypothesis is that the function of truncated lines is to render salient *certain layers in the natural constituency of the quatrain, that is, the line, the couplet, or the quatrain as a whole. It is impossible to render all three salient at once, so the saliency constraints conflict. Moreover, each saliency constraint also conflicts with ordinary constraints of metrics, which require the filling of the available metrical positions with appropriate syllables and stresses. The 26 well-formed quatrain types each represent a particular prioritization of the conflicting constraints.*

We formalize this in Optimality Theory: the inventory of types is derived as the factorial typology of our constraint set; namely, the set of outputs of all grammars obtained by freely ranking the violable constraints. We also account for differing text frequencies in our data corpus by assigning each constraint a range of possible strengths, and from this develop an Optimality-theoretic account of gradient well-formedness judgments.

1. Stating the Problem

Among the other well-formedness judgments they can make, English speakers can assess the goodness of verse quatrains. Consider the nursery-rhyme quatrains below. In each, the line is felt to have four major beats, of which the fourth is often “silent”; that is, observed as an obligatory pause (∅) in the recitation (Burling 1966:1420, Attridge 1982:87-88):

(1)a. 3343

3 Hickory, dickory, dock, ∅
3 The mouse ran up the clock, ∅
4 The clock struck one, the mouse ran down,
3 Hickory, dickory, dock. ∅

b. 4443

4 One little, two little, three little Indians,
4 Four little, five little, six little Indians,
4 Seven little, eight little, nine little Indians,
3 Ten little Indian boys. ∅

The reader should have no difficulty reciting these quatrains while tapping sixteen times on a table, one tap to each underlined syllable or ∅. It is also not hard to find other songs that show similar patterns of overt versus silent beats, described in formulae above like “3343”.

Now consider modified versions of these songs, with different arrangements of 4 and 3:

(2)a. *3434

3 *Hickory, dickory, dunn, ∅
4 The frightened mouse ran up the clock
3 Just after the clock struck one, ∅
4 Hickory, dickory, plickory, dock.

b. *3444

3 *Nine little Indian boys: ∅
4 One little, two little, three little boys,
4 Four little, five little, six little boys,
4 Seven little, eight little, nine little boys.

We have observed that listeners find examples of *3434 and *3444 crashingly bad, and indeed often laugh at them. Further, our inspection of extensive data has not revealed any quatrains of the *3434 or *3444 variety. Surely, this indicates that there are ill-formed quatrain types.

Supposing for the moment (as we will argue) that the basis of quatrain well-formedness is not simply membership in a list, there is a well-defined analytical problem: to establish which quatrain types are well-formed, which are not, and what kind of rule system could determine which is which. Ideally, this system should be grounded in general principles of rhythmic and linguistic structure.

The quatrain well-formedness problem turns out to be more difficult than we had imagined when we undertook it. There are more categories of line than just "3" and "4", and the combination of these additional varieties is likewise not free; thus hundreds of varieties must be considered. Developing a grammar that generates all and only the well-formed quatrains turns out to be a rather delicate task.

This article describes the progress we have made on the problem. Our work may be of interest beyond the field of metrics for two reasons. First, our solution makes use of the notion of "factorial typology" in Optimality Theory (Prince and Smolensky 1993), not just as a means of checking the typological plausibility of our constraints, but as the core analytical device. Second, we have found that our data and theoretical model make possible an Optimality-theoretic attack on the long-standing problem of gradient well-formedness judgments.

2. Art Verse, Folk Verse, and Children's Verse

Quatrains are available for study from many sources: (a) the canon of English literature; (b) popular verse and song of every description; (c) authentic folk verse, a now moribund tradition, sung mostly without accompaniment by ordinary people and transmitted orally; (d) children's verse such as nursery rhymes, of mostly folk origin, mostly sung or chanted, and to this day transmitted in part by word of mouth. Of these four, we have made only a very casual examination of art verse and popular verse, have examined a large body of folk verse, and have supplemented our folk verse study with songs and chants remembered from our own childhoods.

We were guided in this choice by an idea from Burling 1966, a seminal paper on cross-linguistic patterns of children's verse. Burling found that children's verse types from unrelated, geographically distant languages tend to resemble one another very strikingly, far more than their art verse counterparts do. As an explanation for the resemblances Burling makes an appeal (p. 1435) to "our common humanity", which we take to be a somewhat poetic invocation of the view that certain aspects of cognition are genetically coded. This could occur either directly or, perhaps, indirectly, at a more abstract level from which the observed systems derive. Thus it seemed that children's verse would be a good place to start.

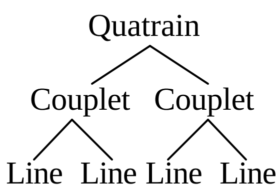
The folk verse we studied, though more complex and irregular than children's verse, has the compensating advantage of having been musically transcribed and published in great quantities; and, as will become apparent, it obeys essentially identical laws of quatrain form. Art verse and popular verse apparently also normally obey our laws, but since they are the productions of exceptional individuals, they might well be expected to involve greater complexity and idiosyncrasy, so we have largely avoided them in this study.

We also wanted to stick to verse that is chanted or sung, a point on which both children's verse and traditional folk verse qualify. This is partly because sung and chanted verse is understudied, and partly because its scansion is often clearer. For example, as will be seen below, there is a major distinction between line types in chanted and sung verse that disappears in the orthographic form in which art verse is transmitted.

3. Elements of Quatrain Form and Metrics

The fundamental basis of folk verse is a (largely) binary hierarchy. Thus a quatrain is not just a sequence of four lines; it is a pair of pairs, with the following structure:

(3)



The justification for this structure is presented in Burling 1966, Abrahams and Foss 1968:62, Stein and Gil 1980, Attridge 1982, Zwicky 1986, Hayes 1988, and Hayes and Kaun, in press. Basically, the higher levels of bracketing are frequently indicated by the patterning of rhyme (ABCB, AABB, ABAB) and by a rough correspondence with phonological phrasing: the higher the break in the constituency of the metrical pattern, the more likely it will coincide with a major phrasing break (Attridge 1982; Abrahams and Foss 1968:62). Moreover, the higher the metrical break, the larger the phonological break that will normally be aligned with it. For an account of phonological phrasing in English and its application to metrics, see Hayes 1989.

To scan folk verse requires representations of the alignment of syllables in time and their arrangement into strong and weak metrical beats. In our opinion, some earlier work on the metrics of sung and chanted verse has suffered from the lack of an explicit representation for these phenomena. The grid representations innovated by Liberman (1978) and extended to musical theory by Lerdahl and Jackendoff (1983) serve this purpose well. Here is a grid representation for a line of folksong:

(4)

```
            x                       x                       x                       x
x           x           x           x           x           x           x           x
x     x     x     x     x     x     x     x     x     x     x     x     x     x     x     x
|     |     |           |     |     |           |     |     |           |           |
It    was   late        in    the   night       when  the   squire      came        home
```

Karpeles 1932, #33A

The grid consists of a sequence of columns of *x*'s or other symbols, where each column may be associated with an event in time (in the present case, a syllable). The height of a grid column is intended to depict the strength of the rhythmic beat associated with the event. For the study of sung or chanted verse, we assume all grid rows to be performed isochronously, or more precisely, isochronously in theory; that is, abstracting away from various structural and expressive timing adjustments.

Isochrony holds of every row, so that in (4), the top row is aligned with the isochronous syllable sequence {*late*, *night*, *squire*, *home*} and the second row with the isochronous sequence {*It*, *late*, *in*, *night*, *when*, *squire*, *came*, *home*}. The third row down is likewise isochronous, though not every *x* on this row is aligned with a syllable. Thus our informal underlining system indicates the syllables aligned to the four strongest positions of the grid.[1]

There are a number of different grids to which songs may be composed. They vary in length and in beat spacing. While the grid in (4), which is probably the most common, has strictly binary alternation of strong and weak beats, there are many grids that are ternary at at least one level:

(5)

```
            x                       x                       x                       x
    x       x       x       x       x       x       x       x       x       x       x       x
    x   x   x   x   x   x   x   x   x   x   x   x   x   x   x   x   x   x   x   x   x   x   x
x
    |   |   |       |       |       |       |       |   |   |       |       |       |
    See the wa-     ters    a-      glid-   ing     hear the night- in-     gale    sing
```

Ritchie 1965, p. 46

Another source of grid diversity is the location of strong beats relative to the next lower level. For example, in the grid of (4), the first fully strong beat does not occur until the third grid position. In another grid, rather less common, the first strong beat occurs initially:

[1] We have found that readers sometimes have difficulty in apprehending a rhythmic structure from a visual representation. To ease this task, we have made a tape recording containing chanted versions of all examples in this article. A copy of this recording may be obtained by sending a blank cassette with a suitable self-addressed envelope to the first author at the address given at the end of this article.

(6)

```
x                           x                           x                           x
x             x             x             x             x             x             x             x
x      x      x      x      x      x      x      x      x      x      x      x      x      x      x      x
|             |      |      |      |      |      |      |             |             |             |
Chick-        ens    a      crow-  ing    on     the    Sour-         wood          moun-         tains,
```

Karpeles 1932, #216C

A brief survey of the grid structures attested in English folk verse is provided in the Appendix to this article.

4. Rhythmic Cadences

Our main topic is the principles of form that distinguish differing quatrain types even when the grids they use are the same. These quatrain types may be defined by the distribution of *rhythmic cadences.* A cadence, generally speaking, is an ending within rhythmic or musical form. Cadences defined tonally are the crucial anchoring points in Western tonal music. We define a rhythmic cadence as a characteristic grid placement of the final syllable or two of the line. The three most common rhythmic cadences are listed in (7).

(7)a. “3”

```
              x                           x                           x                           x
x             x             x             x             x             x             x             x
x      x      x      x      x      x      x      x      x      x      x      x      x      x      x      x
|             |             |      |      |             |             |                           |
As            bright        as     the    sum-          mer           sun                         Æ
```

Ritchie 1965, p. 36

b. “Green O”

```
              x                           x                           x                           x
x             x             x             x             x             x             x             x
x      x      x      x      x      x      x      x      x      x      x      x      x      x      x      x
       |      |             |             |             |             |                           |
       A-     mong          the           leaves        so            green,                      O
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Sharp 1916, #79

c. “4”

```
              x                           x                           x                           x
x             x             x             x             x             x             x             x
x      x      x      x      x      x      x      x      x      x      x      x      x      x      x      x
|      |      |             |             |             |      |      |             |             |
Lit-   tle    Mus-          grave         stood         by     the    old           church        door
```

Ritchie 1965, p. 36

The cadence we call “3”, following earlier work, initiates no syllables after the third strong position of the line; all subsequent positions are filled either by pause or by lengthening of the line-final syllable, more or less in free variation. The symbol ∅ denotes the "silent beat" that occupies the fourth strong position in the line.

"Green O", which we name after the example of it in (7b), fills the third and fourth strong positions, but initiates no syllable between them. The Green O cadence has been noticed by Zwicky (1986)[2] and by Attridge (1982:104). We will ordinarily designate it with the abbreviation "G".

"4" designates a cadence in which the fourth strong position is filled, with the proviso that any line that fits the description of "G(reen O)" will be designated as such, and not as "4"; that is, there has to be at least one syllable between the third and fourth strong beats.

We also define a "3 feminine" cadence, in which the last strong position to be filled is the third, but an additional syllable (always with weaker stress than its left neighbor) is placed in the interval between the third and fourth strong beats. Here is an example:

(8) "3-Feminine"

```
          x                   x                   x                   x
x         x         x         x         x         x         x         x
x    x    x    x    x    x    x    x    x    x    x    x    x    x    x    x
|         |         |    |    |         |         |         |         |
She's     gone      with the  gyp-      sen       Dá-       vy        Æ
```

Karpeles 1932, #33A

The term "feminine" to describe line endings with falling stress sequences is taken from traditional metrics. Our abbreviation for 3-feminine will be "3_f".

It is worth mentioning that "Green O" is also a feminine cadence: in the vast majority of G lines, the final syllable bears weaker stress than the penult. This will be important in the analysis below. Since they are both feminine cadences, G and 3_f are not distinguished in written verse.

These definitions of the cadences largely generalize to meters other than (4). A few other cadences are mentioned in the Appendix.

5. The Typology of Quatrains

As noted in the introduction, the rhythmic cadences are important because their distribution defines quatrain types: within limits, every quatrain in a song must have the same pattern of rhythmic cadences. This section presents the typology of quatrain types. Our discussion elaborates on findings of Attridge (1982) and earlier work.

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[2] Who mistakenly calls it a "violation". To the contrary, Green O is a commonplace and characteristic phenomenon in folk verse.

We base our assessments of quatrain well-formedness on a database of 1028 traditional folk songs of the Southern Appalachians, taken from the published collections of Karpeles 1932 and Ritchie 1965. The patterning of the database, where sparse, has been amplified by children's songs and by our own well-formedness judgments. The database is discussed in detail in section 13.

Anticipating the analysis to follow, we present the quatrain inventory in a taxonomy that matches categories generated under our analysis.

5.1 Couplet-Marking Types

Consider a quatrain in 4343:

(9) 4343

4 There's <u>two</u> little <u>broth</u>ers <u>going</u> to <u>school</u>.
3 The <u>old</u>est to the <u>young</u>est <u>called</u>: ∅
4 Come <u>go</u> with <u>me</u> to the <u>green</u> shady <u>grove</u>
3 And I'll <u>wres</u>tle <u>you</u> a <u>fall</u>. ∅ [3]

Karpeles 1932, #12I

4343, traditionally called "common meter" (Malof 1970), is the most frequent instance of what we will call a "couplet-marking" quatrain type. We anticipate that readers who recite it in rhythm will hear "first one couplet, then another"; that is, the couplet constituency is perceptually salient. We discuss the basis of this intuition below.

There are several other couplet-marking quatrain types. In the examples below, Green O cadences are marked with long hyphens for clarity.

[3] We will list in footnotes some examples of songs and chants familiar to many American children that also embody the patterns in the text. For 4343 these are numerous and include: "Hey Diddle Diddle, The Cat and the Fiddle", "Jack Sprat", "Little Jack Horner", "Old King Cole", "Old Mother Hubbard", "Rub-a-Dub-Dub, Three Men in a Tub", "The Queen of Hearts", "Old MacDonald Had a Farm" (first quatrain), and "Oh Where, Oh Where Has My Little Dog Gone?".

(10)a. 4G4G

4 The squire come home late in the night,
G Enquiring for his la———dy.
4 She answered him with a quick reply:
G She's gone with the gipsy Da———vy. [4]

Karpeles 1932, #33J

b. 43_f43_f

4 Send for the fiddle and send for the bow,
3_f And send for the blue-eyed daisy; ∅
4 Send for the boy that broke my heart
3_f And almost sent me crazy. ∅ [5]

Karpeles 1932, #127C

c. G3G3

G The war———fare is rag———ing
3 And Johnny you must fight. ∅
G I want———to be with———you
3 From morn———ing to night. ∅ [6]

Karpeles 1932, #113A

d. 3_f33_f3

3_f Last night as I lay on my pillow, ∅
3 Last night as I lay on my bed, ∅
3_f Last night as I lay on my pillow ∅
3 I dreamed little Bessy was dead. ∅ [7]

Karpeles 1932, #152B

5.2 Quatrain-Marking Types

Here is an example of 4443, which we will call a "quatrain-marking" type:

[4] More 4G4G: "Jack and Jill", "Little Bo-Peep", "See-Saw, Marjorie Daw", "Pop! Goes the Weasel", "Yankee Doodle."

[5] More 43_f43_f: "Billy Boy", "Six Lumberjacks".

[6] More G3G3: "Goosey, Goosey, Gander" (second quatrain), "I've Been Workin' on the Railroad" (first quatrain), "The Eensy-Weensy Spider" (first quatrain), "Sing a Song of Sixpence" (first quatrain).

[7] More 3_f33_f3: "I Have a Little Dreydl", "The Yellow Rose of Texas" (first quatrain).

(11) 4443

4 There was a little ship and she sailed upon the sea,
4 And she went by the name of the Merry Golden Tree,
4 As she sailed upon the low and the lonesome low,
3 As she sailed upon the lonesome sea. ∅ [8]

Ritchie 1965, p. 80

Readers who share our intuitions will find that in such a stanza, the whole quatrain sounds like a single, uninterrupted unit. Here are some other quatrain-marking cases:

(12)a. 444G

4 Next morning a burning sun did rise
4 Beneath the eastern cloudless sky,
4 And General Beauregard replied:
G Prepare to march to Shi———loh. [9]

Karpeles 1932, #136

b. 4443_f

4 London Bridge is falling down,
4 Falling down, falling down,
4 London Bridge is falling down,
3_f My true lover. ∅[10]

Ritchie 1965, p. 14

c. GGG3

G When boys go a-court———ing,
G A-court———ing, a-court———ing,
G When boys go a-court———ing,
3 And then they stay all night. ∅ [11]

Karpeles 1932, #269B

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[8] More 4443: “Mary Had a Little Lamb”, “Polly Put the Kettle On”, “Jimmy Crack Corn” (chorus), “The Muffin Man”, “Old MacDonald Had a Farm”, (second quatrain), “Three Blind Mice” (second quatrain), “Battle Hymn of the Republic” (first quatrain).

[9] More 444G: “Here We Go Round The Mulberry Bush”, “Skip to my Lou”, “My Little Red Wagon.”

[10] More 4443_f: “Michael Finnegan.”

[11] More GGG3: “Go Tell Aunt Rhody”, “Ring Around the Rosie”, “Battle Hymn of the Republic” (second quatrain), “For He’s A Jolly Good Fellow/The Bear Went Over the Mountain” (first and last quatrains).

d. $3_f3_f3_f3$

3_f Up Eliza, poor girl; ∅
3_f Hoot Eliza, poor girl; ∅
3_f Up Eliza, poor girl; ∅
3 She died on the train. ∅ [12]

Karpeles 1932, #244B

5.3 Line-Marking Types

3333, of which an example appears below, is what we will call a “line-marking” construction:

(13) 3333

3 Lilly, lilly hoo, ∅
3 Sweet Lilly I love you, ∅
3 Lilly, lilly hoo, ∅
3 Sweet Lilly I love you, ∅ [13]

Karpeles 1932, #65R

In it, we expect the reader to hear all the lines perceptually separated from one another. GGGG is another type of line-marking quatrain:

(14) GGGG

G Father get ready when He calls———you,
G Father get ready when He calls———you,
G Father get ready when He calls———you
G To sit on the throne with Je———sus. [14]

Ritchie 1965, p. 50

We have been unable to locate an authentic folk song instance of $3_f3_f3_f3_f$, analogous to 3333 and GGGG. A children’s song from the collection of Raffi (1980), whose songs in general have the quatrain forms seen here, does contain verses of this type (15a); and a concocted folksong verse (15b) strikes us as well formed:

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[12] More $3_f3_f3_f3$: “Go Round and Round The Village.”

[13] More 3333: “Three Blind Mice” (first quatrain), “Here We Go Looby-Loo” (chorus), “Jingle Bells” (verses), “This Little Piggy Went To Market” (on which see Burling 1966, 1421-1412).

[14] More GGGG: “Goosey, Goosey, Gander” (first quatrain).

(15) $3_f 3_f 3_f 3_f$

a. 3_f Willoughby, wallaby, wustin, ∅
3_f An elephant sat on Justin, ∅
3_f And Willoughby, wallaby, wanya, ∅
3_f An elephant sat on Tanya. ∅

Raffi 1980, p. 92

b. 3_f The first time I saw darling Corie ∅
3_f She had whisky in a tumbler, ∅
3_f She was drinking away her trouble, ∅
3_f And a-going with a gambler. ∅

(construct, after Karpeles 1932, #152B)

We will assume below that $3_f 3_f 3_f 3_f$ is in fact well-formed.

5.4 The Metrically-Replete Quatrain

The typology of quatrain types implied so far provides no place for 4444 (called "long meter"), which is attested in many examples such as the following:

(16) 4444

4 She fold her arms around him without any fear.
4 How can you bear to kill the girl that loves you so dear?
4 Polly, O Polly, we've no time to stand,
4 And instantly drew a short knife in his hand.[15]

Karpeles 1932, #49A

We do not perceive this quatrain as belonging to the "line-marking" variety. Instead, we will refer to it as "metrically replete", since (by our definition of "4") it can fill its grid with more syllables than any other quatrain type.

5.5 "Long-Last" Constructions

3343, often called "short meter", was exemplified by (1a) above. A folk song example is given below.

[15] More 4444: "Baa, Baa, Black Sheep", "Humpty Dumpty", "Rock-a-Bye Baby", "Pat-a-Cake, Pat-a-Cake, Baker's Man", "Oats, Peas, Beans And Barley Grow", "Starlight, Star Bright", "Georgy Porgy", "To Market, To Market To Buy A Fat Pig", etc.

(17) 3343

3 O the sea (∅) how it rolls, ∅
3 The cold, chilly wind how it blows. ∅
4 We're poor sailors struggling in the deep
3 And the landlords safe on the shore. ∅ [16]

Karpeles 1932, #42A

3343 is an example of what we will call a "Long-Last" construction. We anticipate that the reader in reciting it will perceive a line, relatively separate from its surroundings, followed by a similarly separated line, followed by a relatively integral couplet; thus the longest unit comes last.

Our folksong database includes no instances of the Long-Last construction GG4G, but we know of three of them from our childhoods:

(18) GG4G

a. G What are little boys made———of?
G What are little boys made———of?
4 Snakes and snails and puppy-dogs' tails,
G And that's what little boys are made———of.

b. G It's rain———ing, it's pour———ing,
G The old man is snor———ing,
4 Went to bed and bumped his head
G And couldn't get up in the mor———ning.

c. G A tis———ket, a tas———ket,
G A green and yellow bas———ket,
4 Wrote a letter to my love
G And on the way I dropped———it.

In principle, one might expect also to find 33G3 and 333_f3, to fill out the paradigm below:

(19)	4343	4G4G	G3G3	3_f33_f3
	3343	GG4G	?	?

But here the data "peter out", as it were. The only examples of 33G3 we have found occur in stanzas that are ambiguous between two quatrains and one (see Hayes and MacEachern, forthcoming, for discussion and references concerning this phenomenon).

[16] More 3343: "The Good Old Duke of York", "She'll Be Comin' Round the Mountain", "Peas Porridge Hot", "The Farmer in the Dell", "Here We Go Looby-Loo" (verses).

They seem to us to be perhaps better analyzed as 44 couplets within a larger 4444 quatrain:

(20) ?33G3

3 Young Johnny's been on sea, ∅
3 Young Johnny's been on shore, ∅
G Young Johnny's been on is———lands
3 That he never was before. ∅

OR:

4 Young Johnny's been on sea, young Johnny's been on shore,
4 Young Johnny's been on islands that he never was before. [17, 18]

Karpeles 1932, #58B

We will refer to such cases as "semiquatrains", and discuss them further below.

333_f3 is of more marginal status than 33G3: we have found no clear examples of it even as a semiquatrain. The more awkward status of 333_f3 compared to 33G3 can be checked by reciting the 33G3 form (20) above as a 333_f3 instead:

(21) ??333_f3

3 Young Johnny's been on sea, ∅
3 Young Johnny's been on shore, ∅
3_f Young Johnny's been on islands ∅
3 That he never was before. ∅

For now, we will somewhat artificially treat 33G3 as fully well-formed and 333_f3 as fully ill-formed. Later, when we develop an account of gradient well-formedness, we will be able to integrate these quatrains into the system more accurately.

5.6 Quatrain Types with Three Different Cadences

In our data corpus there are a few cases of quatrains in which three different cadences appear:

(22)a. 3_f343

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[17] More 33G3, both semi-quatrains: "There Was a Crooked Man", "The Eensy-Weeny Spider" (second quatrain).

[18] The rest of the quatrain is: "What's happened to you Johnny, since you have been on sea? / Nothing in this wide world, only what you see on me."

3_f It's miles I have travelled, ∅
3 Some forty miles or more, ∅
4 A milk-cow with a saddle on
3 I never saw before. ∅ [19]

Karpeles 1932, #38B

b. G343

G I would not marry a black———smith,
3 He smuts his nose and chin; ∅
4 I'd rather marry a soldier boy
3 That marches through the wind. ∅

Karpeles 1932, #272A

c. 3_f3G3

3f O Wil———liam, O William, ∅
3 It's for your sake alone, ∅
G I left———my old fa———ther,
3 My mother and my home. ∅

Karpeles 1932, #157A

Although these are not common, and we cannot find children's song analogues for (22b,c), we will include them in the target set for our analysis: we judge (22a,b) to be perfect, and (22c) seems roughly as good as the similar 33G3 (20). As we would expect, our only example of 3_f3G3 is in a semiquatrain.

5.7 Quatrain Types with Free Variation

In the normal case, all the stanzas in a song employ the same quatrain type. But there is a significant minority of songs in which some positions in the quatrain are allowed to display different cadences in different stanzas, in free variation. The most common of these free variation types is variation between 4 and G; other types occur, but to keep the problem of manageable size we will ignore them here. In what follows, the symbol "F" is to be interpreted: "position that may be filled with either 4 or G". The choice between the two is actually not random, as we will show below.

Our data corpus attests only one quatrain type with F, namely F3F3. The following song manages to show all four logical possibilities in the first quatrain of the first four stanzas (each stanza has two quatrains, of which only the first is given here).

[19] More 3_f343: "Frosty the Snowman."

(23) F3F3

Stanza 1: 4343

4 Young Edward came to Em-i- ly
3 His gold all for to show, ∅
4 That he has made all on the lands,
3 All on the lowlands low. ∅

Stanza 2: G343

G Young Emily in her cham———ber
3 She dreamed an awful dream; ∅
4 She dreamed she saw young Edward's blood
3 Go flowing like the stream. ∅

Stanza 3: G3G3

G O father, where's that stran———ger
3 Came here last night to dwell? ∅
G His body's in the o———cean
3 And you no tales must tell. ∅

Stanza 4: 43G3

4 Away then to some councillor
3 To let the deeds be known.
G The jury found him guil———ty
3 His trial to come on. ∅

Karpeles 1932, #56A

5.8 Data Summary and Description

To sum up to this point: we assume that the inventory of well-formed quatrains with cadences drawn from the set {4, F, G, 3_f, 3} must include at least the following:

(24)

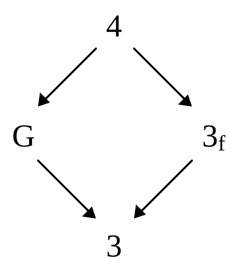
Metrically Replete	Line-Marking	Couplet-Marking	Quatrain-Marking	Long-Last	Three-Cadence
4444	GGGG	4G4G	444G	GG4G	G343
	$3_f3_f3_f3_f$	43_f43_f	4443_f	3343	3_f343
	3333	4343	4443	33G3	3_f3G3
		G3G3	GGG3		
		3_f33_f3	$3_f3_f3_f3$		
		F3F3			

We will consider the possibility below that more data should be added to the set, but the cases given above account for the great bulk of the quatrains we have seen (in the data sample described below, over 95% of all quatrains) and can serve as a starting point for analysis.

Before developing the account, it is worth pondering the data in a pretheoretical way. Clearly, the quatrains in (24) are a far-from-random set, so it should be possible to characterize them with general principles rather than as an arbitrary list.

One intuitive characteristic of the data is that patterns of same versus different are repeated using different cadences; see for example the quatrain-marking types, all with *same-same-same-different*. Another intuitive characteristic is a kind of scale, which looks like this:

(25)



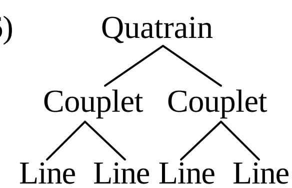
Looking at the cases of the third column in (24), one can see that *within a couplet*, 4 can precede G, 3_f, and 3; G can precede 3; and 3_f can precede 3, but other orders are not attested (and indeed sound odd if one constructs a hypothetical example). The same kind of obligatory precedence relations appear to hold elsewhere in the chart. There appears to be some scalar property that is possessed by the different cadences in different amounts.

The data also show some puzzling asymmetries. For example, F fails to show the kind of free combination that other cadences show, and is attested for only one quatrain type. There are asymmetrical quatrains like 3343 in which the *second* couplet (43) has nonmatching lines, but there are no asymmetrical quatrains like 4333 in which it is the *first* couplet whose lines do not match. We address these asymmetries below.

6. Cadentiality and Saliency

In this section we begin to develop a theoretical account of our data. The basis of our theory is the idea that quatrains have a binary constituent structure, repeated below in (26):

(26)



As noted earlier, the linguistic structure of quatrains (phonological phrasing and rhyme) is typically arranged to illuminate this bracketing. Our suggestion is that the rhythmic cadences are likewise so arranged.

Suppose, roughly following Lerdahl and Jackendoff 1983, that the surface events of a rhythmic pattern induce the listener to perceive a hierarchical *grouping structure*. We suggest the following partial account of grouping perception.

It is known that in speech as well as in music, there is a kind of slowing down at the ends of phrasal units. In phonetics, the phenomenon is known as final lengthening, and is well documented (see, for example, Beckman and Edwards 1990, Wightman et al. 1992). A tendency to slow down at the ends of musical phrases is likewise known to musicians, and has been demonstrated phonetically by Bengtsson and Gabrielsson (1983).

Turning this tendency around, we can posit that final lengthening is itself a *cue to phrasehood*; that is, a kind of constituency marker. Our hypothesis will be that the rhythmic cadences are ranked according their ability to induce the perception of a group ending. The groups that the cadences thus mark are the natural constituents of folk meter, namely line, couplet, and quatrain.

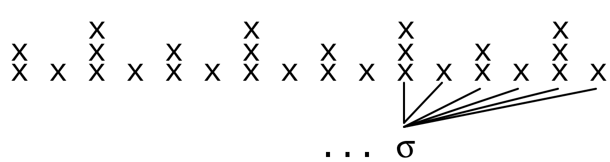
We will use the term *cadentiality* to mean "the degree to which a line ending possesses the ability to induce the perception of a group ending". We hypothesize that the rhythmic cadences we have examined here can be ranked in cadentiality as follows.

(27) Cadentiality Hierarchy

3 >> 3_f >> G >> 4
more cadential ... less cadential

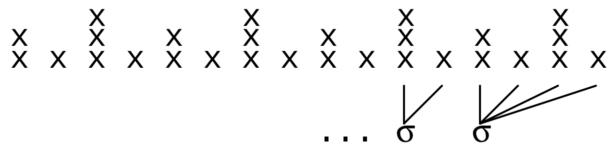
Such a hierarchy is deducible from the lengths, in metrical beats, of the final and penultimate syllables of a cadence. These are shown in the following diagrams.[20]

(28)a. "3":

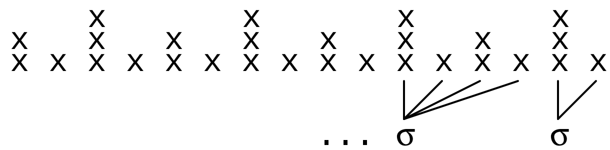


b. "3_f":

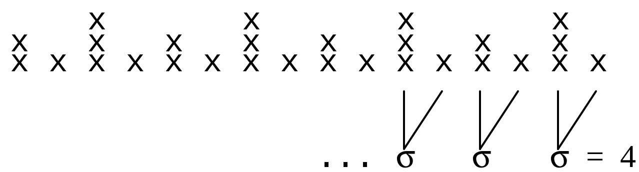
[20] These diagrams assume that the grid space occupied by each syllable is initiated at the beginning of the syllable, and lasts until the beginning of the next syllable or the end of the line. If in actual fact, there is a pause, so that a syllable does not extend phonetically across its entire domain, the *perceptual* outcome is likely to be the same, since as Selkirk (1984) has argued, final lengthening and pausing are perceptually and functionally very similar.



c. “G”:



d. “4”:



Bringing together the numbers from (28), we find the following:

(29)

Cadence Type	Number of Grid Positions, Final Syllable	Number of Grid Positions, Penultimate Syllable
3	6	varies
3_f	4	2
G	2	4
4	2	varies: 1-3, usually 2

Evidently, the cadentiality of a particular line type is determined primarily by the number of grid positions assigned to its final syllable. For the one case where two cadences tie on this measure, cadentiality is determined by the number of beats assigned to the penult. We assume, then, the cadentiality hierarchy of (27), with the rationale for it provided by (28)-(29).

As stated earlier, the function of cadentiality is assumed to be the highlighting of constituency: intuitively, a particular constituent (line, couplet, or quatrain) is rendered salient by the patterning of rhythmic cadences of greater or lesser cadentiality. Pursuing this intuition, we adopt the word “salient” as a technical term of the theory, defining it as follows:

(30) Defn.: *Salient*

A metrical constituent is *salient* if

(a) Its final cadence is more cadential then all of its nonfinal cadences.
(b) All of its nonfinal cadences are uniform.

Under this definition, the salient couplets are: 4G, 43_f, 43, $G3_f$, G3, and 3_f3. The salient quatrains are 444G, 4443_f, 4443, $GGG3_f$, GGG3, and $3_f3_f3_f3$. Intuitively, we suggest that the listener will notice a constituent as salient provided that (a) its terminus is cadential; (b) the unit is not disrupted by an internal cadence of equal or greater cadentiality, or by a perceived internal nonuniformity (for example, G443).[21]

For cases of "F", we evaluate forms on a worst-case basis: thus FG is not salient, because one of its two instantiations, GG, is not salient. F3 is counted as salient because both of its instantiations, 43 and G3, are salient.

The definition in (30) qualifies all lines as (vacuously) salient. This apparent problem disappears if (30) is supplemented with an additional, gradient criterion of saliency. Intuitively, a salient constituent is more salient if its final cadence is more cadential. Lines fall into a hierarchy of saliency if assessed by this gradient definition; that is, 3 >> 3_f >> G >> 4; and those couplets and quatrains that qualify as salient by the all-or-nothing definition (30) can likewise be placed along the gradient scale X3 >> $X3_f$ >> XG according to their final cadence. (Couplets and quatrains ending in 4 cannot qualify as salient by the all-or-nothing criterion, and thus do not appear in this scale.)

In the analysis to follow, both all-or-nothing saliency and the gradient type will be crucial. Our notation for well-formedness amalgamates the two, as follows:

(31)

Notation	Meaning	Examples
***	Not salient at all	[34], [3_f443]
**	Salient, ends in G	[444G], [4G], [G]
*	Salient, ends in 3f	[4443_f], [$G3_f$], [3_f]
✓	Salient, ends in 3	[GGG3], [43], [3]

7. Analytical Strategy

At this point we will summarize the apparatus so far invoked and outline how the analysis will go on from here. We have defined a notion of cadentiality, defined formally as in (27) and functionally as the propensity to induce the percept of grouping. Constituents are felt to be salient or highlighted whenever their internal cadences are

---

[21] Our account of saliency traces its ancestry to the "Connectivity Constraint" and "Terminal Interval Constraint" of Stein and Gil 1980:203-4 fn.; in our view, Stein and Gil were on the right track in proposing these notions, but underestimated their importance.

uniform and inferior in cadentiality to their final cadences. The degree of salience will be proportional to the latter's cadentiality.

A major goal of the metrical system of English folk verse, in our view, is to render salient the major structural units: lines, couplets, and quatrains. This is done by placing the final syllables of lines in appropriate arrangements of cadentiality. Just which units are chosen to be rendered salient is an option available to the folk poet.

Below, we make this point by parsing all the quatrains of (24) into their salient units.

(32)

Quatrain	Saliency of Lines[22]	Saliency of Couplets	Saliency of Quatrains
[4][4][4][4]	4: ***	2: ***	***
[G][G][G][G]	4: **	2: ***	***
$[3_f][3_f][3_f][3_f]$	4: *	2: ***	***
[3][3][3][3]	4: ✓	2: ***	***
[[4][3]][[4][3]]	2: ***, 2: ✓	2: ✓	***
$[[4][3_f]][[4][3_f]]$	2: ***, 2: *	2: *	***
[[4][G]][[4][G]]	2: ***, 2: **	2: **	***
[[G][3]][[G][3]]	2: **, 2: ✓	2: ✓	***
$[[3_f][3]][[3_f][3]]$	2: *, 2: ✓	2: ✓	***
[[4][4][[4][3]]]	3: ***, 1: ✓	1: ***, 1: ✓	✓
$[[4][4][[4][3_f]]]$	3: ***, 1: *	1: ***, 1: *	*
[[4][4][[4][G]]]	3: ***, 1: **	1: ***, 1: **	**
[[G][G][[G][3]]]	3: **, 1: ✓	1: ***, 1: ✓	✓
$[[3_f][3_f][[3_f][3]]]$	3: *, 1: ✓	1: ***, 1: ✓	✓
[[3][3][[4][3]]	1: ***, 3: ✓	1: ***, 1: ✓	***
[G][G][[4][G]]	1: ***, 3: **	1: ***, 1: **	***
[3][3][[G][3]]	1: **, 3: ✓	1: ***, 1: ✓	***
[[G][3]][[4][3]]	1: **, 2: ✓, 1: ***	2: ✓	***
$[[3_f][3]][[4][3]]$	1: *, 2: ✓, 1: ***	2: ✓	***
$[[3_f][3]][[G][3]]$	1: *, 2: ✓, 1: **	2: ✓	***

[22] In this column, "***" must strictly speaking designate the minimum degree of saliency on the gradient scale, rather than absolute nonsaliency. The distinction is not crucial here, though it is elsewhere in the analysis.

Every quatrain on the list (except 4444, for which we will have a separate account) manages to make at least *some* unit of structure salient to at least *some* degree.

We will now posit a reason for why there are so many possible quatrain types: each one represents a way of prioritizing conflicting ends. There is no way to marshal the rhythmic cadences to make *all* units salient,[23] so to some extent, a choice has to be made.

In fact, there is more at stake than this. The most heavily cadential line endings are also the most metrically *truncated*: to serve their cadential function, they must fail to fill quite a few positions at the end of the metrical grid (see (7a,b) and (8)). As we demonstrate in section 10, the metrical system prefers to deploy syllables and stresses so as to manifest the grid pattern of the line. Insofar as the grid is populated instead with substantial gaps, this task goes unaccomplished. There is thus another trade-off: highly cadential line types like 3 do an excellent job of articulating higher-level bracketing structure, but they are distinctly inferior at articulating line-internal beat structure.

The diversity of well-formed quatrains, then, reflects a diversity of ways in which these various conflicting factors can be prioritized.

A wide-employed approach to grammatical description based on the resolution of conflicting priorities is Optimality Theory (Prince and Smolensky 1993). Optimality Theory construes grammatical processes precisely as the selection of an optimum candidate from a competing set of possibilities, following a strictly prioritized hierarchy of constraints.[24] Our analytical strategy invokes Optimality Theory in the following way. First, we state in explicit form, as Optimality-theoretic constraints, the principles we have been discussing, along with a few others to be developed below. Second, we assume a trivial GEN function (Prince and Smolensky 1993), consisting simply of a list of the 625 (= 5^4) logically possible quatrains that can be constructed from the five cadence categories 4, G, 3_f, 3, and F.[25] Third, we will stipulate some of our constraints to be "undominated"; that is, inviolable, so that no candidate that violates any of the inviolable constraints will survive to win the competition among candidates. Fourth, we construct from the remaining, violable constraints the *factorial typology* (Prince and Smolensky) of the analysis. The factorial typology consists of the set of candidates that win the competition under at least one ranking of the constraints.

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[23] Even if a broad range of cadentiality is used, e.g. in 4G43, the uniformity requirement on non-final cadences (30b) prevents the quatrain from being counted as salient.

[24] Since Optimality Theory is now the basis of a massive literature, we will not lengthen our paper with a summary of its mechanics. A useful published introduction may be found in McCarthy and Prince 1994. The use of the theory here is quite simple and should be relatively intelligible in context.

[25] Necessarily, this GEN is idealized: in principle, a real GEN would include all deployments of syllables in all conceivable grids. To use our simple GEN legitimately, we must assume that there exist additional, inviolable constraints that would exclude things such as illegal grids (on which see Lerdahl and Jackendoff 1983, Chap. 4), or the wrong grid for the song in question, or impossible rhythmic cadences like "2". Thus our working GEN can be conceived of as the real GEN as filtered through many additional constraints not stated here. We see no other choice for keeping the problem at hand within attackable size.

What will emerge from this process is a list of quatrain types, each one of which represents the best available quatrain under some particular ranking of the violable constraints. Under the assumption that ranking of the violable constraints is indeed free, this list should constitute the complete set of well-formed quatrain types, and as such may be checked against corpus data and intuitive judgments for its correctness. We claim that this scheme appropriately formalizes our view that each possible quatrain type exists because it is the best outcome under some specific prioritization of conflicting principles.

In the sections to follow, we implement this analytical strategy. Sections 8-11 complete the set of formal principles on which our analysis depends; section 12 finishes up the formalization and derives the predicted outcomes; and section 13 assesses the predictions against the data.

8. Parallelism

Merely arranging the cadences into salient lines, couplets, and quatrains will not alone suffice for an adequate theory of quatrain structure. For instance, [43][4G] consists of two reasonably salient couplets, but it is not a well-attested quatrain type, and sounds ill-formed (see (66c) below). We will hypothesize that quatrains like 434G are out because they violate a requirement of PARALLELISM: intuitively, well-formed structures like 4343 and 4G4G show a parallelism that is lacking in ill-formed 434G.

Formalizing parallelism is a bit tricky: it cannot hold true at all levels, because in (say) 4343, the lines of each couplet (4 and 3) are not parallel. Rather, it seems that parallelism holds true in well-formed quatrains only at the coarser levels of analysis: in 4343, parallelism at the higher level of couplet suffices, even though sister lines of couplets are not parallel. Formalizing this intuition, we propose the following:

(33) Defn.: *maximal analysis*

Let C_1, C_2, ... C_n be a sequence of adjacent metrical constituents exhausting the material of a quatrain Q. If for each C of C_1, C_2, ... C_n:

(a) C is salient by the all-or-nothing definition (30); and
(b) there is no salient constituent C' dominating C;

then C_1, C_2, ... C_n is the *maximal analysis* of Q.

Intuitively, the maximal analysis of a quatrain is the largest sequence of salient constituents comprising the quatrain. Notice that even a quatrain like 4444 has a maximal analysis, since by our definition (30) 4 is salient (albeit minimally so by our gradient definition).

For the set of quatrains in (24), the maximal analyses are the following:

(34)

Metrically Replete	Line-Marking	Couplet-Marking	Quatrain-Marking	Long-Last	Three-Cadence
[**4**][**4**][**4**][**4**]	[**G**][**G**][**G**][**G**] [$\mathbf{3_f}$][$\mathbf{3_f}$][$\mathbf{3_f}$][$\mathbf{3_f}$] [**3**][**3**][**3**][**3**]	[4**G**][4**G**] [4$\mathbf{3_f}$][4$\mathbf{3_f}$] [4**3**][4**3**] [G**3**][G**3**] [3_f**3**][3_f**3**] [F**3**][F**3**]	[444**G**] [444$\mathbf{3_f}$] [444**3**] [GGG**3**] [$3_f3_f3_f$**3**]	[**G**][**G**][4**G**] [**3**][**3**][4**3**] [**3**][**3**][G**3**]	[G**3**][4**3**] [3_f**3**][4**3**] [3_f**3**][G**3**]

It can be seen that for all of these well-formed quatrains, the units of the maximal analysis terminate in identical cadences, shown in boldface. (This is vacuously satisfied where the maximal analysis is the whole quatrain.) We suggest that this is the proper basis for a Parallelism constraint, which we state as follows:

(35) Parallelism

The cadences ending the units of the maximal analysis of a quatrain must be identical.

Stated as in (35), Parallelism is never violated in a well-formed quatrain. The Parallelism constraint does a large amount of descriptive work in our analysis: of the 625 logically possible quatrains, all but 57 are excluded as Parallelism violations.

We note in passing that the maximal analysis and Parallelism seem to be intimately related to rhyming: the cadences of the maximal analysis usually rhyme with each other.

9. Long-Last Constructions

A quatrain like 3343 is of special interest for its asymmetry. If one switches the order of the couplets of 3343, yielding 4333, the result sounds quite awkward. We carry out this procedure below on our earlier example (17) of 3343:

(36) 4 *<u>We're</u> poor <u>sai</u>lors <u>strug</u>gling in the <u>deep</u>,
3 And the <u>land</u>lords <u>safe</u> on the <u>shore</u>. ∅
3 O the <u>sea</u> (∅) how it <u>rolls</u>, ∅
3 The <u>cold</u>, chilly <u>wind</u> how it <u>blows</u>. ∅

In fact, all five asymmetrical quatrains in the inventory of (24) lack a well-formed inverted "partner" in this sense. Apparently, when the couplets of a quatrain are non-identical, there is some principle that dictates an order. Our suggestion is that this principle is the well-known idea stated below:

(37) Long-Last Principle

In a sequence of groups of unequal length, the longest member should go last.

For 3343, the implementation of the principle goes something like this: the maximal analysis of 3343 is [3][3][43], with the longest salient unit in final position. Ill-formed [43][3][3] violates the principle.

The Long-Last principle has been noticed repeatedly in previous work. We briefly digress to review some of the empirical evidence for it.

(a) Stereotyped phrases with conjunction tend to place the longer member second: *soup and sandwich*; *men and women*; *ladies and gentlemen*; *Arm and Hammer; bacon, lettuce and tomato* (Sadeniemi 1951:30-36, Malkiel 1959).

(b) As Piera (1980) noted, when a metrical tradition divides its lines into two unequal parts, the longer part typically goes second. One example of this is the French decasyllable, where the caesura (obligatory word break) divides the line into 4 + 6 syllables:

(38) Freres humains qui après nous vivez
σ σ σ σ / σ σ σ σ σ σ (Villon, "L'epitaphe Villon")

Long-first divisions do occur, but typically only in the mature phases of an art verse tradition, when the basic possibilities of the unmarked configuration come to feel overutilized (Piera 1980, Hayes 1988).

(c) In Finnish folk metrics, specifically the meter of the folk epic *Kalevala*, words are preferentially placed in order of increasing length within the line (Sadeniemi 1951, Kiparsky 1968).

What remains is to define exactly what a Long-Last construction is in the context of English folk quatrains. We have opted to analyze the three-cadence quatrain types of (22) as somewhat loose Long-Last constructions, and therefore have adopted a relatively broad definition of Long-Last:

(39) Defn.: *Long-Last Construction*

A quatrain is a Long-Last construction if:

(a) its second couplet is salient by the all-or-nothing definition (30);
(b) both its first and second lines are more salient (by the gradient definition of sect. 6) than the third line.

Our claim is that quatrains satisfying this criterion will be experienced as "line + line + couplet". The relatively salient initial lines will be perceived as units, and the salient final couplet will also be perceived as a unit. All five of the Long-Last quatrains in our target set (3343, 33G3, 3_f343, 3_f3G3, and G343) meet the formal criterion of (39).

The Long-Last effect also seems to benefit from *cohesiveness* in the final couplet. That is, if the third line is 4, the least cadential of all line types, then the two lines of the final couplet will most easily be felt to form a single unit. Indeed, in most of the Long-Last quatrains we have seen, the third line is a 4. The effect seems to be gradient, in that the Long-Last effect works best when the third line is a 4, less well when the third line is a G, and least well when the third line is a 3_f (compare (17), (20), and (21) above). Later, we will encode this pattern with a hierarchy of constraints; for now, we will simply define cohesiveness:

(40) Definition: Cohesive

A couplet, if salient, is *cohesive* inversely to the salience of its first line.

By this definition, 43, 43_f, and 4G are fully cohesive couplets; G3 and $G3_f$ are less cohesive, and 3_f3 is least cohesive.

The cohesiveness requirement suggests why the cases of 33G3 we have found occur (and sound better) in "semiquatrains"; that is, quatrains that are also treatable as couplets within larger quatrains: the closer spacing of strong beats at the subquatrain level lessens the sense of rhythmic miscohesion created by the G line.

To summarize, our account of Long-Last constructions requires them to have a salient final couplet and two initial lines more salient than the third. We will further elaborate and propose constraints requiring the final couplet to be relatively cohesive, as defined in (40).[26]

10. Matching the Metrical Grid

As noted above, the deployment of the more salient rhythmic cadences to articulate higher-level grouping is in conflict with the need to realize the metrical grid pattern. In this section we formalize the latter requirement. These constraints, which are simply the ordinary metrical constraints of folk songs, are treated in more detail in Hayes and Kaun (in press).

10.1 Fill Strong Positions

The metrical grid of a line is better manifested to the extent that its positions are filled with syllables. This is especially true of the strongest metrical positions. As one of a set of constraints requiring various parts of the grid to be filled, we posit the following:

(41) Fill Strong Positions

---

[26] Attridge 1982: 94-95 advances an interesting alternative account of Long-Last constructions based on an aesthetic principle that favors AABA structures, in areas going beyond metrics. This idea has considerable appeal, but provides no obvious basis for the cohesiveness requirement on Long-Last structures. It also needs amplification in order to rule out quatrains like *4434.

Fill the four strongest positions in the line.

While (41) is a general constraint, for purposes of quatrain structure it has the specific consequence of forbidding the use of 3 and 3_f (see (7a) and (8)). In fact, Fill Strong Positions is seldom violated *other than* in the fourth strong beat, where the violation serves the purpose of rendering some constituent salient: of the 670 folk verse lines studied by Hayes and Kaun (in press), only one has an unfilled strong position other than the fourth.

10.2 Avoid Lapse

The 3 and G cadences (7a,b) are metrically defective for a different reason: the grid region between the third and fourth strong beats receives no syllabic manifestation. For present purposes the relevant constraint can be stated as in (42):

(42) Avoid Lapse

Avoid sequences in which no syllable is placed in the interval between any two of the four strongest positions in the line.

Again, the constraint is fully general, but violations of it arise principally at the end of the line, to obtain high cadentiality. For example, in the corpus of folk song lines examined by Hayes and Kaun (in press), only 6 violations occur between the first and second or second and third strong positions, out of 670 lines total. But between the third and fourth strong positions, violations of Avoid Lapse are commonplace: they occur with any 3 or G line, motivated by the cadentiality this supplies.

By the definition (42), 3_f is not a Lapse violation, though it does violate Fill Strong: the syllable forming the feminine beat (see (8)) ensures representation in the interstrong interval, even though the last strong beat is itself not filled.

10.3 Match Stress

Syllables in folk metrics are under pressure not only to fill the grid, but to match their stress pattern to it: sequences of rising stress tend to fill rising grid sequences, and analogously with falling (Jespersen 1933, Hayes 1983, Hayes and Kaun (in press)). This fact is the key to the presence of what we have called “F” (free variation between 4 and G) in the system. It turns out that the distribution of endings in F lines is not free at all, but depends entirely on the stress pattern of the ending of the line. Below, we sort out all the F lines of the song given earlier in (23), according to whether they are 4 or G:

(43)a. “G” lines

G The jury found him **gúil———ty**
G Young Emily in her **chám———ber**
G O father, where’s that **strán———ger**
G His body’s in the **ó———cean**

b. “4” lines

4 That he has made all on **the lánds**,
4 She dreamed she saw young Ed**ward’s blóod**

4 Young Edward came to Em-**i-ly**
4 Away then to some coun**cillor**

As can be seen, G is used for lines with feminine endings (falling stress), and 4 is used elsewhere; that is, for masculine endings (with rising stress) and pyrrhic endings (lines ending with two stressless syllables). This pattern holds for all quatrains with F lines.

We claim that, at least in songs that include G and F cadences, the odd-numbered strong positions are stronger than the even-numbered ones.[27] Formally, this means there is a fourth grid layer, shown in (44). Given this, a Green O cadence provides a good match for a feminine ending:

(44)

```
        x                               x
        x               x               x               x
x       x       x       x       x       x       x       x
x   x   x   x   x   x   x   x   x   x   x   x   x   x   x   x
|       |   |   |       |       |       |               |
Young   Em- i   ly      in      her     chám-           ber
```

Other possibilities for placing the feminine ending seem quite unpalatable:

(45)a.

```
        x                               x
        x               x               x               x
x       x       x       x       x       x       x       x
x   x   x   x   x   x   x   x   x   x   x   x   x   x   x   x
|       |       |       |       |       |       |       |
Young   Em-     i-      ly      in      her     chám-   ber
```

[27] The reason to believe this is that Green O lines virtually always have a feminine ending, with the penultimate syllable bearing more stress than the final. Given the way the rest of the system works, this may be presumed to reflect a need to match a corresponding falling sequence on the metrical grid.

b.

```
            x                                               x
            x                       x                       x                       x
x           x           x           x           x           x           x           x
x     x     x     x     x     x     x     x     x     x     x     x     x     x     x     x
|           |           |           |                       |           |           |     |
Young       Em-         i-          ly                      in          her         chám- ber
```

In particular, (45a) involves a gross mismatch of the stress pattern of *chámber*, whereas (45b) involves a gross mismatch of appropriate syllable durations. Both of these problems are discussed in Hayes and Kaun (in press).

If one considers instead endings with rising stress, such as (43b) *the lánds* or ... w*ard's blóod* instead, exactly the opposite considerations will hold: the better textsetting will invariably be with a 4 cadence, not a G. Final level-stressed sequences also appear to prefer 4; apparently G cadences actually *require* a falling-stress sequence,[28] so that 4 remains as the only possible outcome for a pyrrhic ending.

Our claim, then, is that apparent "free variation" between 4 and G is not actually free. The choice between the two depends on the poet's choice of words: a line with a feminine ending will naturally be set with G, and a line with a masculine or pyrrhic ending will be set with 4. In principle, one could derive this by integrating a complete theory of metrics into the grammar for quatrain structure. To keep the size of the problem manageable, however, we propose as a stopgap the following constraint:

(46) Match Stress

Employ G in feminine endings, 4 elsewhere.

The actual constraints that force this behavior in F lines are more general (Hayes and Kaun, in press), and will not be stated here. Note that the scope of (46) covers only G and 4, since to keep the problem manageable we have artificially restricted our account of free variation to G ~ 4 alternation, the most common type.

10.4 Summary

We posit that the influence of metrics on quatrain structure is as follows: the constraints Fill Strong and Avoid Lapse require "filled-in" grids; each bans gaps in ways that rule out certain rhythmic cadences. Match Stress forces variation in the rhythmic cadences for certain positions, requiring G or 4 depending on the text selected by the poet; thus in our terms, F. The three metrical constraints can be summarized in a coarse way by considering *only* their effects on the choice of rhythmic cadence:

[28] To see this, consider a Green O setting of a pyrrhic line: **"Young Edward came to Emi——ly." This grossly ill-formed textsetting (a) misplaces the initial stress of *Emily*; and (b) assigns great length to a very short penult, producing a durational mismatch (Hayes and Kaun, in press).

(47)

Constraint	Cadences Banned
Fill Strong	*3, *3_f
Avoid Lapse	*3, *G
Match Stress	*all but F

11. Stanza Correspondence

The use of “F” as a conjunction of cadence types raises a peculiar possibility, namely that the set of salient domains could vary from stanza to stanza in the same song. For example, in an “FG” couplet, the choice of 4 for F yields [[4][G]], with every domain salient, whereas the choice of G for F yields [G][G], with only the two lines salient. The same holds for 4F, with [[4][G]] and [4][4] as the two possibilities. In fact, we have found no quatrains that permit such variation, either with these hypothetical cases or any other similar form. We therefore posit the following inviolable constraint:

(48) Stanza Correspondence

In a song, the set of salient domains must be invariant across stanzas.

Saliency for purposes of this constraint must be construed as the all-or-none variety defined in (30). The Stanza Correspondence constraint is largely responsible for the limited distribution of the F cadence.

12. Completing the Analysis

We will now bring together all the analytical ingredients discussed in the preceding sections, and arrange them into an explicit Optimality-theoretic analysis.

12.1 Formalizing Saliency of Constituents

Recall from section 7 that all levels of quatrain structure “like” to be salient; and the more salient, the better. The saliency constraints stated below help to generate quatrains that render some particular level of structure salient; for example, a high ranking of the constraint Couplets are Salient is necessary to generate 4343.

To keep the grammar of manageable size, we have formulated just three constraints in this domain, one for each level of structure. Roughly, these are:

(49) Lines are Salient

Assess violations for any non-salient line, according to its degree of non-saliency.

(50) Couplets are Salient

Assess violations for any non-salient couplet, according to its degree of non-saliency.

(51) Quatrains are Salient

Assess violations to the extent that the quatrain level is nonsalient.

A delicate question in rendering these constraints explicit is what the trade-off is between the *severity* of individual violations and the *number* of violations (for lines and couplets) at various points in the quatrain. We have assumed that any domain of a lesser degree of saliency should be considered to be a worse violation than any number of domains of a greater degree of saliency. Thus, in hypothetical GGG4, the single violation of Lines are Salient with 4 is considered worse than the combined effect of the three lesser violations with G. In practice, this idea can be implemented numerically, as follows:

(52) Line Saliency Numbering System

100 “demerits” for each 4 cadence
10 “demerits” for each G cadence
1 “demerit” for each 3_f cadence
0 “demerits” for each 3 cadence

(53) Couplet Saliency Numbering System

100 “demerits” for each non-salient couplet (in the absolute definition of (30))
10 “demerits” for each salient couplet ending in G
1 “demerit” for each salient couplet ending in 3_f
0 “demerits” for each salient couplet ending in 3

(54) Quatrain Saliency Numbering System

100 “demerits” for each non-salient quatrain (in absolute definition of (30))
10 “demerits” for each salient quatrain ending in G
1 “demerit” for each salient quatrain ending in 3_f
0 “demerits” for each salient quatrain ending in 3

This approach to constraints that are multiply and gradiently violable is a numerical implementation of the treatment worked out in Prince and Smolensky 1993:sect. 5.2.1.2. The reader is referred to Prince and Smolensky’s version for an approach that avoids arithmetic scrupulously, which but for convenience we would have extended to our own constraints with equivalent effect.

12.2 Formalizing Long-Last Constraints

We adopt three constraints governing Long-Last constructions. Most fundamentally, there is a constraint that favors Long-Last as a quatrain:

(55) Prefer Long-Last

Avoid any quatrain that is not a Long-Last construction.

The definition of Long-Last assumed here was stated in (39).

Further, we mentioned above a gradient constraint requiring the final couplet of a Long-Last construction to be cohesive—more literally, for the third line of a Long-Last construction to be of low cadentiality. For this constraint, we employ a different method from above ((52)-(54)) in assessing violations of different degrees: here, it turns out to be crucial to implement the range of cohesiveness by positing separate constraints that define cut-off points along it. This is the method outlined in Prince and Smolensky 1993:sect. 8:[29]

(56)a. Total Long-Last Cohesiveness

Avoid Long-Last constructions whose third line is not 4.

b. Partial Long-Last Cohesiveness (inviolable)

Avoid Long-Last constructions whose third line is not 4 or G.

As can be seen, we place the outermost limit of well-formedness on Long-Last constructions whose third line is G, while favoring those whose third line is 4. A less arbitrary account that does justice to the gradient well-formedness judgment is given in section 15.

12.3 Complete Constraint List and Implementation

Drawing on the discussion above, we state the full set of constraints as follows:

(57)a. Constraints on Saliency of Domains

Lines are Salient (49)
Couplets are Salient (50)
Quatrains are Salient (51)

b. *Parallelism* (inviolable) (35)

---

[29] Prince and Smolensky note (p. 135) that the multiple-constraint approach to continua is more powerful, since it allows constraints from other families to be ranked amidst the scalar constraint family; whereas the single-constraint approach that we followed for (52)-(54) does not. Our experience bears this out: we have been unable to replicate the effects of (56a,b) with a single scalar constraint, but (in simpler grammars, where it was computationally feasible) we have been able to replicate the effects of (52)-(54) with multiple constraints at cut-off points along the continuum. We have stayed with the single-constraint approach to (52)-(54) because the multiple-constraint approach would introduce too many constraints for the factorial typology to be computed easily.

c. *Stanza Correspondence* (inviolable) (48)

d. Constraints Pertaining to Long-Last Constructions

Prefer Long-Last (55)
Total Long-Last Cohesiveness (56a)
Partial Long-Last Cohesiveness (inviolable) (56b)

e. Metrical Constraints

Fill Strong Positions (41)
Avoid Lapse (42)
Match Stress (46)

As described earlier, the predictions made by our constraint set may be tested by the method of factorial typology: we (a) rank all three inviolable constraints at the top of the grammar; (b) examine all 8! (= 40,320) possible rankings of the eight freely rankable constraints; (c) determine which of the 625 logically possible quatrains is the winner for each of the 40,320 rankings; (d) collating the results, determine which of the 625 possibilities is the winner for *at least one* ranking. If the analysis is correct, this set should be coextensive with the set of well-formed quatrains. We have carried out this task on a desk computer, with subsequent checking of a subset of the results by hand.[30]

To see how a candidate emerges from a particular constraint ranking, consider the abbreviated candidate table ("tableau") under (59) that generates G3G3. The table assumes the constraint ranking under (58):

(58) All inviolable constraints >> Couplets are Salient >> Fill Strong Positions >>
Lines are Salient >> All other constraints

Since space limitations preclude listing all 625 candidates, we have included only those that obey the inviolable constraints and maximally satisfy Couplets are Salient, thus surviving the first two phases of selection. Of these, only those that have just two violations of Fill Strong survive the next phase of culling, and of these, Lines are Salient then selects the unique winner G3G3 (marked with ☞) at the next stage. All other constraints, and their ranking with respect to each other, turn out to be irrelevant in selecting this quatrain, though they matter on other rankings. Following Prince and Smolensky's (1993) notation, /!/ indicates the constraint violation that culls out a candidate, and violations occurring past the crucial selection phase are shaded over.

[30] We wish to emphasize the importance of machine checking. Our own experience, in which machine-coded grammars have revealed winning candidates that slipped through an earlier process of hand checking, suggests to us that hand-calculated factorial typologies of all but the simplest constraint sets should be considered unreliable.

(59)

Quatrain	CoupS	FillSB	LinesS	TotalLL	QuatrS	LongLast	*Lapse	Match
☞ G3G3	0	2	20	0	100	1	4	4
G343	0	2	110!	0	100	0	3	4
43G3	0	2	110!	0	100	1	3	4
G3F3	0	2	110!	0	100	1	4	3
F3G3	0	2	110!	0	100	1	4	3
4343	0	2	200!	0	100	1	2	4
F343	0	2	200!	0	100	1	3	3
43F3	0	2	200!	0	100	1	3	3
F3F3	0	2	200!	0	100	1	4	2
3_f3G3	0	3!	11	1	100	0	3	4
$G33_f3$	0	3!	11	0	100	1	3	4
3_f343	0	3!	101	0	100	0	2	4
433_f3	0	3!	101	0	100	1	2	4
3_f3F3	0	3!	101	1	100	0	3	3
$F33_f3$	0	3!	101	0	100	1	3	3
3_f33_f3	0	4!	2	0	100	1	2	4
all others	> 0!							

By repeating the process for each of the 40,320 candidate tables, one obtains the following quatrains; each is the victor for at least one ranking (often, for thousands of rankings). They are listed according to the typology laid out in section 5.

(60)

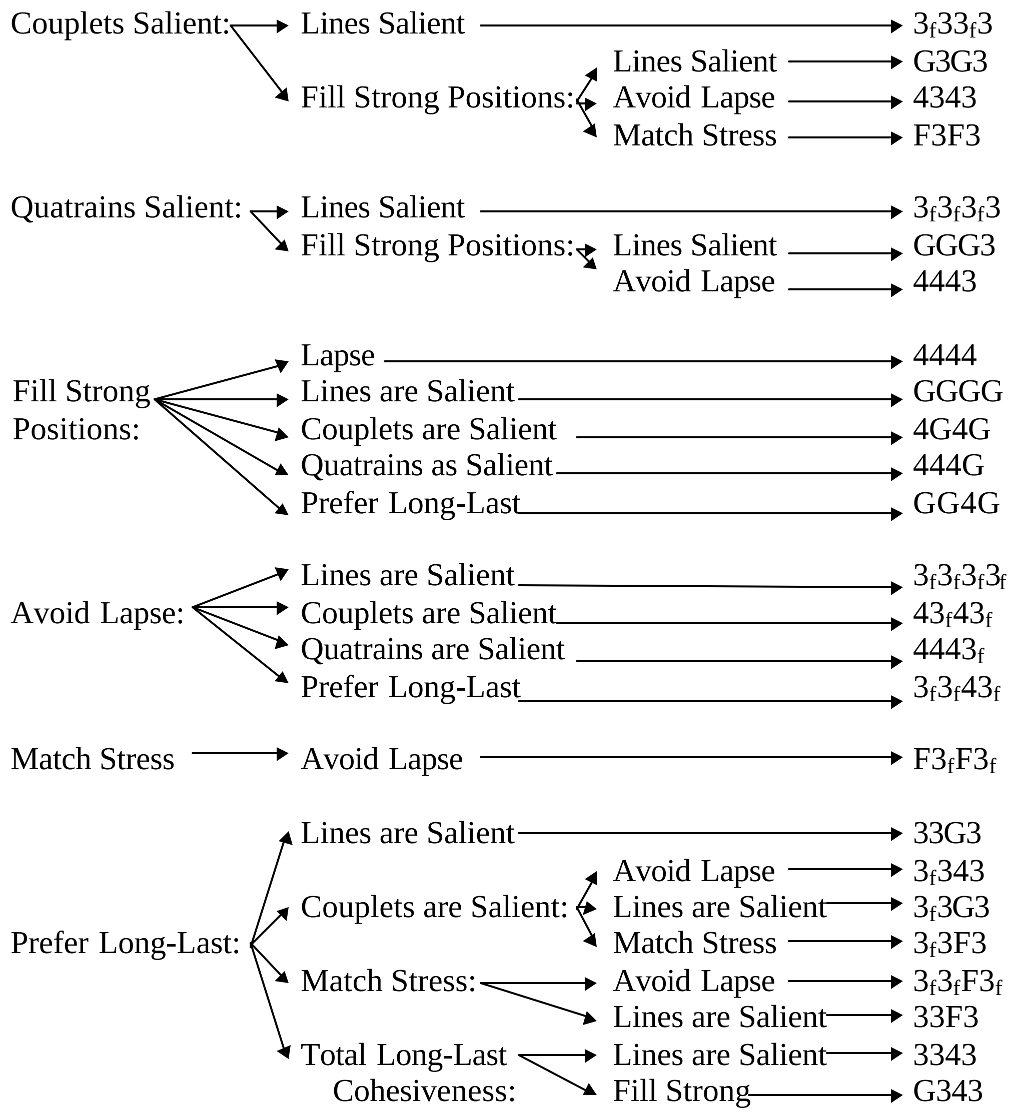
Metrically Replete	Line-Marking	Couplet-Marking	Quatrain-Marking	Long-Last	Three-Cadence
4444	GGGG	4G4G	444G	GG4G	G343
	$3_f3_f3_f3_f$	43_f43_f	4443_f	3343	3_f343
	3333	4343	4443	33G3	3_f3G3
		G3G3	GGG3	**$3_f3_f43_f$**	**3_f3F3**
		3_f33_f3	$3_f3_f3_f3$	**33F3**	
		F3F3		**$3_f3_f43_f$**	
		$F3_fF3_f$			

This set includes all the members of the working-hypothesis set (24). It also includes a few additional quatrains, shown in boldface, which will be examined below.

To justify the rankings that yield each of (60) would consume a great deal of space, so in the interest of economy we outline a ranking procedure that can generate any of the quatrains listed. Where a column has no entry (and anywhere after the third column), it doesn't matter how the remaining constraints are ranked, so long as they are below the listed constraints.

(61)

Ranked First	Ranked Second	Ranked Third	Outcome
Lines Salient	⟶	⟶	3333



It can be seen that the outcomes and the constraint rankings that generate them are orderly. Roughly, the categories "Line-marked", "Couplet-marked", and "Quatrain-marked" from section 5 emerge from high ranking of the relevant saliency constraints. Further, highly-ranked Avoid Lapse and Fill Strong Positions limit the ability of the saliency constraints to induce the more cadential line types, thus leading to additional quatrains. The Long-Last quatrains are more complex in their origin, but nevertheless seem on inspection to be relatively symmetrical as well.

13. Empirical Evaluation

To get a clearer idea of the set of well-formed quatrains, we inspected various corpora of English folk songs. These were mostly taken from the monumental body of field research carried out in the early twentieth century in rural areas of the English-speaking world by Cecil J. Sharp and Maud Karpeles: rural England (Karpeles 1974), Newfoundland (Karpeles 1970), and the Southern Appalachians. The Appalachian material is what we have examined the most carefully, by coding it in a database. Our database includes 1028 songs, 951 from Karpeles 1932 and an additional 77 from Ritchie 1965. [31]

We established the stanzaic pattern of rhythmic cadences for all the songs where this was feasible. [32] The particular counts reported below are somewhat filtered. First, we have counted only quatrains: either whole stanzas, or clear quatrain constituents within stanzas. Some non-quatrain stanzas are discussed in section 16. We have included only quatrains that are indicated as such by the editor's capitalization and lineation; thus some songs that we would be tempted to analyze as two quatrains, with short lines, are treated by the editor as one quatrain, with long lines. Further, we have limited ourselves to quatrains written with just the cadences 4, G, F, 3_f, and 3. (For the other cadences, see Appendix.) Where a song includes more than one quatrain per stanza, we have counted each quatrain separately. With this filtering and unpacking, the 1028 songs yielded a total of 627 quatrains.

Following these procedures, our survey produced the count of quatrain types listed below. We first give the number of quatrains found whose existence is predicted by our analysis.

(62) Predicted by the Analysis

Metrically Replete		Line-Marking		Couplet Marking		Quatrain-Marking		Long-Last		Three-Cadence	
4444	203	GGGG	3	4G4G	38	444G	7	GG4G	0	G343	6
		$3_f3_f3_f3_f$	2	43_f43_f	21	4443_f	1	3343	6	3_f343	2
		3333	1	4343	188	4443	35	33G3	1	3_f3G3	1
				G3G3	26	GGG3	2	$3_f3_f43_f$	0	3_f3F3	0
				3_f33_f3	28	$3_f3_f3_f3$	1	33F3	0		
				F3F3	29			$3_f3_f43_f$	0		
				$F3_fF3$	0						
				f							

For the quatrains claimed by our analysis to be ill-formed, we break the cases down into cases with and without refrain, for a reason to be mentioned shortly.

(63) Not Predicted by the Analysis

[31] For background on English folksong (as distinguished from its popularized modern descendents) the reader is referred to Sharp 1907, Karpeles 1973, Abrahams and Foss 1968, and the prefaces to Karpeles 1932.

[32] In a number of songs, one finds a pervasive stretching and/or compression of the tempo, of a type discussed by Abrahams and Foss (1968:144-145). These tempo alterations, which are written into the musical notation with multiple time signatures, occasionally obscure the meter to the point that determining the pattern of rhythmic cadences would be quite subjective. We have omitted these cases (about 10% of the total) from our counts.

Quatrain	Cases with Refrain	Cases without Refrain	Total Cases	Quatrain	Cases with Refrain	Cases without Refrain	Total Cases
4433	5	1	6	$3_f3_f3_f4$	0	1	1
43_f4G	0	4	4	4434	1	0	1
4344	2	1	3	433_f3	1	0	1
$4G43_f$	1	1	2	434G	0	1	1
4G43	2	0	2	4GF3	0	1	1
4F43	0	1	1	3_f333	0	1	1
44G4	1	0	1	**Totals**	**14**	**12**	**26**
44G3	1	0	1				

To describe the data in bulk: 601 out of 627 quatrains, or 95.9%, are well-formed according to the analysis. Were the quatrains randomly distributed, one would expect only 4.2% to be well formed, since the analysis licenses only 26 of the 625 logically possible quatrains.

In assessing this outcome, one must consider two classes of cases: quatrains that are supposed to be bad according to the theory but nevertheless exist, and quatrains that are supposed to exist but are unattested.

13.1 Quatrains Attested but Ungenerated

We note first an important empirical generalization made by Hendren (1936:21-23): quatrains of irregular structure tend to include or fully comprise a *refrain*, defined here as any textual material that is invariant across stanzas. We do not know why Hendren's generalization should be true, but it is undeniably valid for our data: in our corpus, quatrains with refrain material fall outside the predictions of the analysis in 14 of 130 cases (10.8%), whereas in the population of stanzas without refrain, the "ungrammaticality rate" is only 12/497, or 2.4%.[33]

In our judgment, the refrain/non-refrain distinction involves not just corpus frequencies, but intuitive well-formedness as well: some refrain examples sound fairly well-formed to us where analogous non-refrain examples seem rather lame. Compare the real refrain quatrain (refrain material shown in bold) in (64a) with the concocted example in (64b):

(64)a. 4G43 in Refrain:

4 There was an old woman lived on the seashore,

---

[33] Cf. Zwicky and Zwicky 1987:532 on the irregular metrics of refrains.

The distribution of refrains in our corpus (see also Hendren 1936:chap. 8) is quite lawful: refrains usually form metrical constituents (line, couplet, occasionally quatrain); and they are virtually always located at the end of larger metrical constituents (e.g. $[XX_r][XX_r]$, $[XXXX_r]$, $[[XX][X_rX_r]]$, $[[[XX_r][XX_r]]$ $[[XX][X_rX_r]]]$, $[[XXXX][X_rX_rX_rX_r]]$). We do not yet see a clear connection between this fact and the license for irregularity in refrains, but one seems possible.

G **Bow——— down,——— bow——— down,**
4 There was an old woman lived on the seashore,
3 **And thou hast bent to me,**

Karpeles 1932, #5L (first quatrain)

b. ?4G43, No Refrain

4 The squire come home late in the night,
G Enquiring for his la———dy,
4 She answered him with a quick reply,
3 She's up and left her home. ∅

(construct, after (10a))

For cases like this, we propose to continue to draw the line at a place excluding 4G43 in non-refrain quatrains. We discuss below what might be needed to permit 4G43 in refrains.

Among the non-refrain counterexamples to our analysis, we find some that can be reconstrued as being in compliance with the theory, under certain assumptions. These are cases in which a line starts early, thus "stealing" beats from a neighboring line's metrical pattern:[34]

(65) 3_f Jimmy Randal (∅) went hunting ∅
3 All about in (∅) the dark. ∅
3? He shot Mol——(∅)——ly Varn / **And** ∅
3 he missed not (∅) his mark. ∅

Karpeles 1932, #50D

In a case such as this, it is not clear whether the line labeled **3?** here should be regarded as a 3 or a 3_f—the latter choice would render the quatrain a perfectly normal 3_f33_f3. In this particular case, consistency would seem to favor the 3_f analysis, since all seven of of the remaining stanzas have completely uncontroversial 3_f endings (for example, *bósom*, *úncle, amóng them*) in the analogous position. We have found that, in general, the data are more coherent if such "stolen beats" are *not* counted as part of the preceding line (so we have in fact always scanned them this way). Cases like (65), however, suggest that stolen beats should perhaps be assigned intermediate status. See Attridge 1982:104-5 for related discussion.

In the end, however, we must appeal to the reader for agreement with our intuitive judgment that a small number of moderately ill-formed quatrains have made their way into the data corpus. (How this happened is matter of speculation; perhaps they are due to memory lapse on the singer's part, or perhaps because minor unmetricality just adds a certain zest of unexpectedness to a song.) Below, we list representative examples of the

[34] Further discussion of these line boundary bracketing mismatches, which are relatively rare, may be found in Hayes and MacEachern (forthcoming).

quatrains decreed to be ill-formed under our analysis, so the reader may assess them intuitively.

(66)a. *4$3_f$3G

4 As <u>I</u> came <u>o</u>ver new <u>Lon</u>don <u>Bridge</u>,
3_f One <u>mis</u>ty <u>mor</u>ning <u>ear</u>ly, ∅
4 I <u>o</u>ver<u>heard</u> a <u>ten</u>der-hearted <u>girl</u>
G A-<u>plead</u>ing for the <u>life</u> of <u>Geor</u>———<u>gie</u>.

Karpeles 1932, #34D

b. *$3_f3_f3_f$4

3_f <u>What</u>'ll we <u>do</u> with the <u>ba</u>by? ∅
3_f <u>What</u>'ll we <u>do</u> with the <u>ba</u>by? ∅
3_f <u>What</u>'ll we <u>do</u> with the <u>ba</u>by? ∅
4 O we'll <u>wrap</u> him <u>up</u> in <u>ca</u>li<u>co</u>.

Karpeles 1932, #228

c. *434G

4 <u>What's</u> old <u>wom</u>en made <u>of</u>, made <u>of</u>,
3 <u>What</u>'s old <u>wom</u>en made <u>of</u>? ∅
4 <u>Reels</u> and <u>jeels</u> and <u>old</u> spinning <u>wheels</u>,
G And <u>that's</u> what old <u>wom</u>en are <u>made</u>———<u>of</u>.

Karpeles 1932, #227A

Our judgment is that all the quatrains above sound at least moderately odd, (66b,c) more than (66a). Insofar as our judgments in this area match those of the original participants in the tradition, these examples should not seriously undermine the theory. The relative scarcity of such cases in the data reinforces this view.

The quatrains in the corpus that sound odd to us include some with refrain:

(67)a. 4344

4 The <u>first</u> land<u>lord</u> was <u>dressed</u> in <u>white</u>,
3 **I <u>am</u> the <u>li</u>li<u>no</u>, Æ**
4 He <u>asked</u> her <u>would</u> she <u>be</u> his <u>wife</u>,
4 **And the <u>ro</u>ses <u>smell</u> so <u>sweet</u> I <u>know</u>.**

Karpeles 1932, #6B

b. 43$3_f$3

4 **<u>Sol</u>dier <u>boy</u>, <u>sol</u>dier <u>boy</u>,**
3 **<u>Sol</u>dier <u>boy</u> for <u>me</u>; Æ**
3_f **If <u>ev</u>er <u>I</u> get <u>mar</u>ried Æ**
3 **A <u>sol</u>dier's <u>wife</u> I'll <u>be</u>. Æ**

Karpeles 1932, #272A, second quatrain

Thus refrains do not appear to be a blanket license for metrical deviance.

Often, the aberrant cases seem to be providing hints about their well-formedness. For instance, our only case of *43_f43 (Karpeles 1932, #28C) is actually a completely normal 4343 quatrain in three of its four stanzas; apparently the use of a 43_f43 quatrain is a one-time-only response to the need to use a feminine ending. Often, a quatrain counted as deviant in our theory occurs in a song of which variants exist whose quatrains do obey our principles. For example, the version we know of (66c) (namely, (18a)) is the well-formed GG4G; likewise Ritchie's (1965) version of (66b) adds "O" to the end of the first three lines, turning the quatrain into a sensible 4444. We find that while strange quatrains are usually alone in their batch of variants, regular quatrains (by our rules) are accompanied by metrically similar variants. This suggests that irregular quatrains may be diachronically unstable.

13.2 Quatrains Generated but Unattested

We must also consider cases in which the analysis predicts well-formedness for quatrain structures that are unattested. The relevant structures are GG4G, $3_f3_f43_f$, $3_f3_fF3_f$, 33F3, 3_f3F3, and $F3_fF3_f$. Of these, the first is likely an accidental gap in our corpus, since the instantiations of it in nursery rhymes we have found (18) seem metrically perfect. For the others, we construct examples below and provide our judgment.

(68)a. $3_f3_f43_f$

3_f And when you find my Maisie, ∅
3_f And send for the blue-eyed daisy; ∅
4 Send for the boy that broke my heart
3_f And almost sent me crazy. ∅ [35]

(construct, after (10b))

b. 33F3

3 Young Johnny's been on sea, ∅
3 Young Johnny's been on shore, ∅
G Young Johnny's been on is———lands
3 That he never was before. ∅

3 What's happened to you, son, ∅
3 Since you have been on sea? ∅
4 Nothing in this lonely world
3 Only what you see on me. ∅

(construct; adapted from Karpeles 1932, #58B)

c. 3_f3F3

3_f Young Johnny's been a-sailing, ∅
3 Young Johnny's been on shore, ∅
G Young Johnny's been on is———lands
3 That he never was before. ∅

3_f What's happened to you, Johnny, ∅
3 Since you have been on sea? ∅
4 Nothing in this lonely world
3 Only what you see on me. ∅

(construct; adapted from Karpeles 1932, #58B)

d. $3_f3_fF3_f$

3_f And when you find my Maisie, ∅
3_f And send for the blue-eyed daisy; ∅
4 Send for the boy that broke my heart
3_f And almost sent me crazy. ∅

3_f And when you find my honey, ∅
3_f And gather all your money; ∅
G Think on my heart that's bro———ken,

[35] Many limericks, e.g. "There was an old man from Nantucket", are in $3_f3_f43_f$. The status of this chanted verse form as folk verse is not clear to us.

3_f And tell her it was funny. ∅

(construct)

e. $F3_fF3_f$

G Mammy loves her dar———ling
3_f And Mammy loves her baby; ∅
4 Go to sleepy, go to sleep,
3_f Go to sleep, my little baby. ∅

4 Mammy loves and Pappy loves
3_f And Mammy loves her baby; ∅
G Go to sleep, my dar———ling;
3_f Go to sleep, you little baby. ∅

(construct, after Karpeles 1932, #233)

Of these, (68a) seems perfect; (68b,c) are about as good as other Long-Last constructions that end in G3, and (68d,e) seem a bit awkward, specifically in the places where they have $G3_f$ couplets. We comment on the problematic cases further below.

14. The Role of Optimality Theory

For the moment, we will claim a certain degree of descriptive success, and consider the role that Optimality Theory has played in our account.

First, OT provides a way of taking a set of raw structural preferences and turning it into an explicit grammar. The grammar described above forms a concrete, falsifiable hypothesis, whereas our earlier discussion of structural preferences in the system was intuitive but vague.

Second, OT provides a natural account for why there is such a diversity of quatrain types: the inherent goals being striven for are in conflict, and each outcome represents a particular resolution of the conflict by assignment of priorities.

Finally, OT makes it possible to rule out certain forms without actually formulating a constraint against them (cf. Prince and Smolensky 1993:sect. 9.1). Fully 26 of the 52 candidates that obey our inviolable constraints never emerge as a winner, because there is simply no prioritization for which they are the best outcome. For example, *4333 is out because there is no constraint that can force a salient first couplet while *at the same time* enforcing two salient Lines in the second couplet. (Were there a “Long-First” constraint, it would permit 4333, but as we indicated above, such a constraint appears to be rhythmically unnatural.) Likewise, our system correctly excludes quatrain types that mix 3_f and G (except G as a variant of F), because 3_f and G meet contradictory requirements: G maximizes saliency with an overriding Fill Strong constraint, whereas 3_f maximizes saliency with an overriding Avoid Lapse constraint. If both Fill Strong and Avoid Lapse are placed at the top of the hierarchy, the result is not an alternating mix, but rather a sequence of "4" lines, which obey both constraints.

15. Gradient Effects

Two issues deserve discussion with respect to evaluating our analysis: the greatly unequal corpus frequencies of attested quatrains (seen in (62)), and the existence of cases that intuitively have an intermediate level of well-formedness.

15.1 Modeling Corpus Frequency

Concerning corpus frequency, we are quite willing to posit that some quatrain types are missing by accident. The grounds for this claim are as follows: we hold that the experienced participant in a singing tradition does not memorize a large set of quatrain types; rather, the quatrain types are themselves only the overt manifestation of the principles that generate them. If it happens that the space of possibilities characterized by these principles is not fully explored by a particular folk tradition, then that should not be surprising—there is nothing in the system to guarantee that a complete exploration will take place. The crucial evidence for this view is precisely that one can examine novel quatrain forms (such as (68a)) that are textually non-existent, but are fully implied by the structural principles responsible for existing forms. Insofar as these novel forms sound well-formed (especially in contrast to non-generated forms like those of (2) and (66)), then we are justified in labeling them as accidental gaps in the corpus.

That said, it remains an interesting problem to arrive at an account of the large frequency differences among types, which surely are not random. The following generalizations hold (see (62)): (a) Couplet Marking is strongly favored over Line Marking, Quatrain Marking, and Prefer Long-Last as a principle of quatrain construction. (b) The metrical principles Avoid Lapse and Fill Strong tend to be ranked together: either both quite strict (imposing the 4 cadence) or both quite lax (yielding 3). 4 and 3 are in fact the most common cadence types. This suggests perhaps that Avoid Lapse and Fill Strong belong to a constraint family ("Fill Grid"), which behaves roughly as a unit. (c) The paucity of F cadences suggests that Match Stress is seldom a highly ranked principle in the grammar.

A plausible approach to frequency, then, might be to assign *ranges of strictness* to the constraints, and model actual frequencies by letting the constraints vary—completely at random—within their strictness ranges. That is, the originator of a folk song, being familiar with the diversity of quatrain types, tacitly knows that the constraints vary in strictness, and knows their characteristic ranges. The choice of strictness within these ranges, being arbitrary, would proceed at random.

We have implemented a very simple model based on these assumptions, in which each violable constraint occupies a range of width 1, on a scale of arbitrary strictness units. The ranges we have found that best fit the data are as follows:

(69)

Parallelism	(inviolable)
Partial Long-Last Cohesiveness	(inviolable)
Stanza Correspondence	(inviolable)
Couplets are Salient	.900 - 1.900
Total Long-Last Cohesiveness	.895 - 1.895
Fill Strong	.876 - 1.876
Avoid Lapse	.800 - 1.800
Quatrains are Salient	.492 - 1.492
Lines are Salient	.272 - 1.272
Match Stress	.111 - 1.111
Prefer Long-Last	.009 - 1.009

These values were found by means of an iterated, hill-climbing machine search.[36] With a few exceptions, our model fits the corpus data fairly well:

[36] Details of the search: (a) Outer loop: perturb each constraint range in turn by a random amount. For each perturbation, execute inner loop. If accuracy improves, keep the altered constraint range. Repeat until no further improvement occurs. (b) Inner loop: determine predicted frequencies of a candidate set of constraint ranges by letting each constraint take on a random value within its range and locating the quatrain that wins with these values. Repeat until 20,000 outcomes have been gathered. Lapse is given a special treatment, receiving at each of the 20,000 trials a value that is a compromise between tying it entirely to the strictness value of Fill Strong in its range, and letting it vary randomly within its own range. This yields the rough strictness correlation of Lapse and Fill Strong, mentioned above. (c) When (a) is complete, take the optimized constraint ranges it has computed and determine the predicted quatrain frequencies more accurately by running step (b) with these ranges for 1,000,000 trials.

(70) Predictions of Frequency Model

Quatrain	Predicted	Actual	Quatrain	Predicted	Actual
4444	202.7	203	GG4G	0.1	0
			$3_f3_f43_f$	0	0
3333	6.7	1	$3_f3_fF3_f$	0	0
$3_f3_f3_f3_f$	0.8	2	3343	0	6
GGGG	2.9	3	33F3	0	0
			33G3	0	1
4G4G	40.8	38			
43_f43_f	13.8	21	G343	6.8	6
4343	194.3	188	3_f343	1.1	2
$F3_fF3_f$	0.1	0	3_f3F3	0	0
F3F3	17.7	17	3_f3G3	0	1
G3G3	17.7	26			
3_f33_f3	30.8	28			
444G	10.4	7			
4443_f	3.0	1			
4443	28.5	35			
GGG3	4.3	2			
$3_f3_f3_f3$	6.4	1			

The weights of (69), arrived at on a purely empirical basis, also seem to match well with intuition concerning the strictness of the various constraints; thus Couplet Marking constructions are common (because they are enforced by a characteristically strict constraint), Long-Last constructions are rare (because they are enforced by a characteristically weak one), quatrains that violate Total Long-Last Cohesiveness are rare (because they are banned by a characteristically strict constraint), and so on.

15.3 Modeling Gradient Well-Formedness

More important than corpus frequency is the issue of gradient well-formedness judgments, which we have noted at various places in our data. For example, $3_f3_fF3_f$ or $F3_fF3_f$ (68d,e) strike us as somewhat awkward, but nowhere near as bad as 3434 or 3444 (2a,b). Similarly, we find that Long-Last examples fall into a continuum of well-formedness based on the cohesiveness of their final couplet: fully cohesive 3343 is better than 33G3, which in turn is better than 333_f3. How can our analysis, which in its present state rigidly classifies quatrains into well formed and ill formed categories, account for these intermediate cases?

The model developed in the preceding section for corpus frequency can be extended to handle such phenomena. Suppose that, along with its central range of permissible strictness values, a constraint may take on *peripheral* values, but only at the cost of some well-formedness. If this is so, then precisely those quatrains that can only be generated by using the peripheral values would be judged as moderately deviant. To speculate, it is easy to imagine that the listener, confronted with a quatrain that is not generated by her grammar, would tacitly attempt to place an interpretation on the input by adjusting the constraint strictness values slightly outside their natural ranges. The effect of needing to do this would emerge consciously as a sense of moderate ill-formedness.[37]

We have tested this scenario using the constraint strictness ranges obtained above from corpus-frequency evidence. In one instance, we have determined that if one posits for Match Stress a central range whose maximum falls between .801 and .899, as well as an upper periphery extending above .900, then $3_f3_fF3_f$ or $F3_fF3_f$ come out as marginal (as desired), whereas F3F3 is correctly predicted to be perfect. The reason lies in the rankings needed to derive these forms: F3F3 can be derived if Match Stress merely outranks Avoid Lapse (range: .800-1.800 units), but to derive $3_f3_fF3_f$ or $F3_fF3_f$ Match Stress must outrank Couplets are Salient (range: .900-1.900). Note that the range we must posit for Match Stress is not wildly out of line with the statistically obtained range in (69).

We have also been able to model the well-formedness continuum of 3343-?33G3-??333_f3, along with related quatrains like 33F3. In the grammar of (57), 33G3 can be derived only when the constraint Total Long-Last Cohesiveness slips below Prefer Long-Last on the strictness scale. We have detemined that if Total Long-Last Cohesiveness can never be valued below 1.009 (the range maximum for Prefer Long-Last) without incurring partial ill-formedness, then 33G3 comes out as partially ill-formed. Likewise, 333_f3 violates a constraint we have up to now assumed to be inviolable, namely Partial Long-Last Cohesiveness. We have found that if this constraint made violable, but may only *very reluctantly* be ranked lower than 1.009, then 333_f3 is generated, with a correspondingly greater ill-formedness burden attached.[38]

To contrast the two cases: $3_f3_fF3_f$ or $F3_fF3_f$ are somewhat bad because they require Match Stress to be ranked too high, whereas 33G3 and 333_f3 are somewhat bad because they require Total Long-Last Cohesiveness and Partial Long-Last Cohesiveness to be

[37] Alternatively, one might suppose that the peripheral strictness ranges are the product of acquisition, reflecting a conservative strategy on exposure to extremely rare quatrain types.

[38] In our machine implementation of gradient well-formedness, the only quatrain that gets added to the 26 generated earlier (see (60)) is in fact 333_f3. The other quatrains just mentioned are marked by our program with appropriate degrees of ill-formedness.

ranked too low.[39] Further, outlandish cases like 3434 or 3444 (2a,b) cannot be generated at all, short of introducing utterly novel constraints into the system.[40]

We thus recognize four categories of quatrains: (a) well-formed, well-attested quatrains, which derive from *statistically likely* rankings of constraints within their central ranges of strictness (for example, 4343); (b) well-formed, poorly-attested quatrains, which derive from *fully legitimate but statistically unlikely* rankings ($3_f3_f43_f$); (c) marginal quatrains; these derive from ranking certain constraints slightly outside their normal range of strictness (333_f3); (d) ill-formed quatrains, poorly- or unattested, and not derivable within the system (3434). The empirical picture looks compatible with this view.

The constraint-range approach to gradient well-formedness outlined here strikes us as promising. In it, the existence of gradient well-formedness judgments does not mean that the rules of the grammar have to be "fuzzy" or inexplicit in any way. The gradience resides solely in the constraint strictness values, which, being quantitative and continuous, can readily be handled with appropriate smooth functions. Moreover, the grammar allows for a certain amount of *projection* beyond the input data corpus: a quatrain such as $3_f3_f43_f$ can be essentially absent from the learning set yet sound perfect to listeners, because it is generated by constraints and strictness ranges that are established from robust input data. We would look forward to seeing if this approach could yield insight into the many other areas of linguistic structure where gradient well-formedness judgments are prevalent.

16. Beyond Quatrains

None of the principles on which our analysis depends are intrinsic to quatrains. In principle, then, the same formal patterns we have seen in quatrains should also occur at higher and lower levels. In this section we explore cases of this sort.

16.1 Higher Levels

Not all stanzas are quatrains. Apart from the obvious case of two-quatrain stanzas, there are stanza types that interpolate extra material or abandon the binary principle in various ways.

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[39] The case of marginal 4G43 (64) might likewise be incorporated into the system if one were to clone a more-permissive variant of the Quatrains are Salient constraint, one in which the uniformity requirement on saliency (30b) is weakened to permit cadentially-similar lines like 4 and G to cooccur in non-final position of a salient quatrain. The original, less-permissive Quatrains are Salient constraint would still be in place, as a constraint with characteristically very high strictness. In principle, this would allow 4G43 as a marginal variant only, which is what is wanted. More work needs to be done on this, however, since a weaker Quatrains are Salient constraint would also allow 4GG3, which is quite bad.

[40] An example would be the principle of Bengkulu (Burling 1966) that stipulates that it is empty beats at the *beginning* of a unit that render it salient. Bengkulu children's songs thus come in varieties like [34][34] and [3][3][34], analogous respectively to English [43][43] and [3][3][43]. Note that "3" in Bengkulu is not the same as "3" in English, so the Bengkulu forms are not as outlandish as they may initially appear.

We first consider large scale Long-Last effects. These seem to be to some extent an art verse phenomenon; the examples we give either are art verse (73), or look suspiciously like it ((72); see Reeves 1958, 21-22). All are English; the Appalachian folksong tradition from which we take most of our examples existed at a much greater distance from contaminating literary influences.

The first example, which represents a fairly common type, is the two-quatrain stanza in which the first quatrain involves two salient couplets, while the second quatrain is salient as a unit (cf. Malof 1970:123):

(71) 4 I am a sailor stout and bold,
G Long time I've ploughed the o————cean,
4 I fight for my king and country too,
G For honor and promo————tion.

4 I said: my brother sailor I bid you adieu,
4 No more to the sea to go along with you
4 I travelled the country through and through
G And still be a rambling sai————lor.

Karpeles 1974, #298A

It can be seen that such an arrangement manifests Long-Last on a large scale: its structure is [4G][4G][444G], analogous to the [G][G][4G] quatrain.

Another stanza from an English song achieves Long-Last by a kind of interpolation: a couplet is placed in the penultimate position of a quatrain, lengthening it:

(72) 4 Bold Nelson's praise I'm going to sing,
4 Not forgetting our glorious king,
4 He always did good tidings bring
G For he was a good comman————der.

4 There's Sydney Smith and Duncan too,
4 Lord Home and all the jovial crew,
4 And they were the men that were true blue,
 4 Full of care, yet I swear,
 4 None with Nelson could compare,
G Not even Alexan————der.

Karpeles 1974, #282

Similar, even more substantial Long-Last effects occur in written art verse. MacEachern 1993 discusses such an effect in Macauley's "Horatius" (from *Lays of Ancient Rome*), which is an art-verse poem heavily influenced by the folk tradition. Stanza 40 of "Horatius" shows a three-line interpolation, printed below in boldface:

(73) 3_f Herminius smote down Aruns:
3 Lartius laid Ocnus low,
4 Right to the heart of Lausulus
3 Horatius sent a blow.

3_f "Lie there," he cried, "fell pirate!
3 No more, aghast and pale,
4 From Ostia's walls the crowd shall mark
4 **The track of thy destroying bark.**
4 **No more Campania's hinds shall fly**
4 **To woods and caverns when they spy**
3 Thy thrice accursed sail."

Here, we see the erstwhile penultimate line of the stanza ("From Ostia's walls...") expanded into a complete quatrain. As a result of this interpolation, the second section obeys Long-Last on a truly impressive scale ([3_f3][44443]).

In all cases of large-scale Long-Last constructions known to us, the nonfinal cadences of final unit are 4, conforming to the Total Long-Last Cohesiveness constraint.

The Long-Last principle is perhaps also the force behind another major stanza type, the five-line stanza consisting of a quatrain plus a repetition of its final line. What is striking about such cases, which form 5.6% of our folksong data corpus, are the stratagems employed for "gluing" the fifth line into the preceding constituent, thus creating a Long-Last construction:

(74) 4 Lord Lovel he stood at his castle gate
3 A combing his milk-white steed, ∅
4 And along came Lady Nancy Bell
4 To wish Lord Lovel good speed, **good speed**,
3 To wish Lord Lovel good speed. ∅

Karpeles 1932, #21B

The maximal salient constituents here are [43][443], forming a Long-Last construction. The "glue" in question is the reduplication of *good speed* shown in boldface, which extends what would otherwise be a 3 line (yielding 43433) to a more acceptable 4.

The glue that creates a Long-Last construction is most often reduplication, but it can take on different forms as well, including an empty epithet or other expression (75a), or occasionally an early start on the next line (75b):

(75)a. 4 John Hardy was a brave and desperated man,
3 He carried his gun every day. ∅
4 He killed him a man in the Shunny camps,
4 This day he's condemned to be hung, **I do know**,
3 This day he's condemned to be hung. ∅

Karpeles 1932, #87

b. 4 Well met, well met, my own true love,
3 Well met, well met, says he. ∅
4 I've just returned from the old salt sea
G And it's all for the sake of thee, / And
3 it's all for the sake of thee. ∅

Karpeles 1932, #35U

Note that in (75b), the "gluing" effect is limited to the creation of a G line, yielding the less perfect (because less cohesive) Long-Last construction 434G3. This is true as well in a number of quatrains in which only a single syllable is reduplicated:

(76) 4 Rise up, rise up, little Matthy Groves,
3 And men's clothing put on. ∅
4 It never shall be said in the old Scotland
G I slewed a naked man,————**man**,
3 I slewed a naked man. ∅

Karpeles 1932, #23A

Finally, it must be admitted that in a minority of five-line stanzas, there is nothing in the text to induce a Long-Last structure, aside perhaps from repetition itself. Thus some 4343 quatrains are extended to 43433, and some 4444 to 44444:

(77)a. 4 O how do you like my fine feather bed?
3 And how do you like my sheet? ∅
4 And how do you like my pretty little wife
3 That lies in your arms asleep? ∅
3 That lies in your arms asleep? ∅

Karpeles 1932, #23F

b. 4 Come all you Alabama girls and listen to my noise,
4 And don't you marry the Arkansas boys. ∅
4 If you do, your portion shall be
4 Johnny cake and ven'son is all you'll see,
4 Johnny cake and ven'son is all you'll see.

Karpeles 1932, #75B

In many of these, there appears to be a purely musical device to achieve the [xx][xxx] cohesion: the fourth line ends in a non-tonic note (which is less cadential), the fifth on the tonic. But it seems likely that repetition itself, for reasons as yet unknown to us, sometimes provides the necessary cohesiveness. [41]

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[41] Possibly this might serve as the basis of another fairly common stanza type, in which a normal quatrain is followed by a repetition of its second couplet:

(i) 4 O mother, O mother, come dig my grave,
3 Come dig it wide and deep; ∅

16.2 Micro-Cadential Patterns

It was observed by Stein and Gil (1980) that many chants consisting of just a single line (such as sports or political cheers) have a particular rhythmic structure. The examples below are taken from their article.

(78)a.

```
x         x         x         x
x    x    x    x    x    x    x    x
|         |         |    |    |
One,      two,      three four five,
Once I caught a fish alive.
```

b. Ho, Ho, Ho, Chi Minh!

c. sir, sir, ya sadat ‘Hail, hail, O Sadat’ (Arabic)

d. el, el yisrael ‘*el*, *el*, Israel’ (Modern Hebrew)

As Stein and Gil point out, other logically possible renditions are considerably less satisfactory:

(79)a.

```
 x         x         x         x
 x    x    x    x    x    x    x    x
 |    |    |         |         |
*One  two  three,    four,     five,
```

b. *Ho Ho Ho, Chi, Minh!

c. *Ho Chi Minh, Minh, Minh!

These cases can be understood within our theory with a fairly minimal extension: suppose that, just as the quatrain is grouped in binary fashion into couplets and lines, the line is itself grouped into a hierarchy. Typically, the line is divided into two hemistichs, which are divided into two dipods or tripods, which are divided into two or three feet. Such a proposal finds support from the same kind of evidence that supports higher level constituency: agreement of metrical constituency with phonological phrasing, and occasionally rhyme (especially rhyming hemistichs). Naturally, the agreement of

---

4 And place fair Ellender by my side
3 And the brown girl at my feet; ∅
4 And place fair Ellender by my side
3 And the brown girl at my feet; ∅

Karpeles 1932, #19A

More generally, we do not understand the principles that govern repetition in folk stanzas. Empirically, the generalizations seem fairly clear: (a) repetition in *cadential* positions, such as $[XX_i][XX_i]$ is allowed only for refrain material; (b) non-refrain material may be repeated either in *non-cadential* position, such as $[X_iX][X_iX]$ or $[X_iX_iX_iX]$; or it may involve repetition of quatrain-final material with post-quatrain material, as in the stanzas of (74)-(77) or (i) above. Just why this distribution of repetition should be respected is a topic we must reserve for future research.

metrical and phonological groupings is more subtle and less regular at lower levels, but the patterning is definitely present on a statistical basis (Guéron 1974; Kiparsky 1977; Napoli 1978; Zwicky 1986; Hayes and Kaun, in press).

To make this idea concrete, we give below a folk song verse in which the agreement of phonological bracketing and metrical bracketing is quite salient. The grid has been simplified in noncritical ways for expository purposes.

(80)

```
[     x                             x                     ]  line level
[     x              x      ][      x              x      ]  hemistich level
[x    x    x ][ x    x    x ][ x    x    x ][ x    x    x ]  tripod level
 |    |    |    |    |    |    |    |    |    |    |
One  mor- ning,  one mor- ning,  one  mor- ning  in   May,

[     x                             x                     ]  line level
[     x              x      ][      x              x      ]  hemistich level
[x    x    x ][ x    x    x ][ x    x    x ][ x    x    x ]  tripod level
 |    |    |    |    |    |    |    |    |    |    |
 I  spied  a    fair  cou- ple   a-  mak- ing   their  way;

[     x                             x                     ]  line level
[     x              x      ][      x              x      ]  hemistich level
[x    x    x ][ x    x    x ][ x    x    x ][ x    x    x ]  tripod level
 |    |    |    |    |    |    |    |    |    |    |
The  one   was   a   la-   dy,    a   la-  dy    so   gay,

[     x                             x                     ]  line level
[     x              x      ][      x              x      ]  hemistich level
[x    x    x ][ x    x    x ][ x    x    x ][ x    x    x ]  tripod level
 |    |    |    |    |    |    |    |    |    |    |
The  oth-  er   was a sol- dier, and a brave one   I   say.
```

Karpeles 1932, #145C

In a full version of the grid, there would be one lower level to accommodate rapid sequences like *was a* and *and a* in the fourth line, and for consistency we would assign this level constituency as well, as the Foot level. The crucial thing to notice is that at every line-internal hemistich break, the words and syntax have been chosen to place a fair-sized phonological break in alignment with the hemistich break. Intuitively, the quatrain reads like (81):

(81) One morning, one morning, / one morning in May,
I spied a fair couple / a-making their way
The one was a lady, / a lady so gay,
The other was a soldier, / and a brave one I say.

Even tripod breaks are rather well marked:

(82) One morning, / one morning, / one morning / in May,
I spied a fair couple / a-making / their way
The one was a lady, / a lady / so gay,
The other / was a soldier, / and a brave one / I say.

We add in passing that the use of sub-line constituency also offers a reason for why most grids have four strong beats: it is the same binary principle that governs quatrain structure at work, recapitulated line-internally.

We return now to Stein and Gil's examples. Since these are just single lines of "verse", they must obey the rules of form in their internal structure if they are to do so at all. This is indeed the case: at the level of feet and hemistichs, the preferred pattern of rhythmic cadences comes out as 1121, which is entirely analogous in its cadentiality contour to the familiar 3343:

```
(83) [L[H x            x       ][H x          x      ]]
       [F x    x  ][F x    x  ][F x    x ][F x    x ]
          |    |       |    |     |    |      |    |
        One,   ∅     two,   ∅   three four  five,  ∅
```

Such micro-analogies can be taken further. Should one wish to count to six in rhythm, then the suitable cadence pattern seems to be 2121, analogous to 4343:

```
(84) [L[H x            x       ][H x          x      ]]
       [F x    x  ][F x    x  ][F x    x ][F x    x ]
          |    |       |    |     |    |      |    |
        One   two   three,  ∅    four five   six,  ∅
```

And if one enumerates the letters from A to G (as in the familiar alphabet song), the appropriate outcome is 2221, like 4443:

```
(85) [L[H x            x       ][H x          x      ]]
       [F x    x  ][F x    x  ][F x    x ][F x    x ]
          |    |       |    |     |    |      |    |
          A    B       C    D     E    F      G    ∅
```

The above case concerns quatrain-like microcadence patterns within a single-line structure. Burling (1966:1428) noted an analogy between the quatrain and couplet, which works in much the same way. One of his examples is a nursery rhyme:

(86)

```
[L[H x             x          ][H x           x         ]]
  [F x      x  ][F x       x  ][F x      x ][F x      x ]
     |      |      |       |      |      |      |     |
   This    old    man,     ∅     he   played   one,   ∅

[L[H x             x          ][H x           x         ]]
  [F x      x  ][F x       x  ][F x      x ][F x      x ]
     |      |      |       |      |      |      |     |
    He   played  knick-knack    on     my     thumb.  ∅
```

Formally, what occurs is a 3343 couplet, with the cadences defined at the hemistich level. Similar instances can be found throughout the examples in this article: the "embedded couplet" of (72) is 3343; the first couplet of (17) is 1121; (18c) begins with $GG2_fG$; and (65) contains $1_f1_f1_f1$.

Summing up: the "quatrain" patterns we have described are not confined to the quatrain. In long, stanzaic songs, it seems to be the quatrain level that most clearly manifests the cadential patterns. But even there, the lower levels play a role. We have examined the computer-coded folk song data corpus employed by Hayes and Kaun (in press), and found that on a *statistical* basis, our patterns of cadence hold true at all levels of structure: couplets, with their four hemistichs interpreted as if they were the four lines of a quatrain, behave rather like real quatrains; and so do lines, when one does the same with their four dipods.

17. Conclusion

We have argued that English folk verse is tightly patterned at the level of the quatrain: the various rhythmic cadences are arranged in nonrandom, essentially strategic fashion. Our analysis of this arrangement does not regulate the cadences as such; rather, the role of the cadences is to induce perceived bracketings, which are then employed to structural ends: the enhancement of metrical constituents at various levels, and the placement of long elements last. In this view, the variety of quatrain types reflects different ways in which conflicting factors are prioritized. Among these are the line-internal principles of metrics: in return for the aid their cadentiality provides in articulating quatrain structure, the shorter line types involve a sacrifice in the clarity with which the beat structure of the line is realized.

We are encouraged by the effectiveness of the factorial typology analytic strategy, and suggest it may be useful in the study of other fixed inventories of linguistic objects. We also believe that the method of assigning ranges of strength to constraints offers a plausible account of corpus frequency and gradient well-formedness.

At the most general level, we hope to have used folk verse as a positive example of a particular analytical strategy. We have striven to base our analysis on ingredients of a maximally primitive character, based on intuitively plausible (or so we think) principles of how grouping and rhythmic structure can be cued with phonological material. The Optimality-theoretic notion that well-formedness is computed by constraint ranking and candidate selection made it possible to mold primitive constraints into an explicit grammar, one capable of deriving an intricate and not fully symmetrical pattern of well-formedness. In short, OT appears to be a tool that makes possible the use of primitive analytical ingredients to capture complex descriptive results.

Appendix: Other Cadences

The set of rhythmic cadences our grammar has dealt with ({4,F,G,3_f,3}) is defined only on certain grids; other grids define different cadence types. To cover a large topic quickly, below is a list of the grids that are most commonly met with in our data. For each, we define the rhythmic cadences that the grid commonly displays, and list the quatrain types that occur for them in our Appalachian data corpus, with citations of examples. The grid columns crucial to defining the cadences are shown in boldface.

(87)

```
a.  (x)     (x)
      x   x   x   x
    x x x x x x x x
    xxxxxxxxxxxxxxxx
                  σ  =  4
              σ   σ  =  G
              σ σ    =  3f
              σ      =  3
```

The most common grid.
See main text for quatrains defined.[42]

```
b.(x)     (x)
    x   x   x   x
    x x x x x x x x
    xxxxxxxxxxxxxxxx
                σ σ  =  4f
                σ    =  4
            σ   σ    =  G
            σ σ      =  3f
            σ        =  3
```

Many quatrains defined in main text, plus:

$4_f4_f4_fG$	Ritchie 1965, p. 21
4_f44_f4	Karpeles 1932, #216C
444_f4	Karpeles 1932, #250

```
c.  (x)         (x)
      x     x     x     x
    x x x x x x x x x x x x
    xxxxxxxxxxxxxxxxxxxxxxxx
                        σ σ  =  4f
                        σ    =  4
                  σ     σ    =  G
                  σ σ        =  3f
                  σ          =  3
```

Many quatrains from main text, plus:

4_f44_f4	Karpeles 1932, #57D

[42] In principle, a 4_f cadence, using the very last two positions, is defined in this meter. But the lines written in it sound very awkward (see (45b) above for an example and discussion), and are quite rare.

```
d.   x           x
       x   x   x   x   x   x
   x x x x x x x x x x x x
   xxxxxxxxxxxxxxxxxxxxxxxx
                     σ σ     = 5_f   54_f54_f   Karpeles 1932, #34B
                     σ       = 5     5454       Karpeles 1932, #20P
                 σ σ         = 4_f   555_f5     Ritchie 1965, p. 28
                 σ           = 4

e.       x           x
   x   x   x   x   x   x
   x x x x x x x x x x x x
   xxxxxxxxxxxxxxxxxxxxxxxx
                       σ     = 6     6565       Karpeles 1932, #32A
                   σ         = 5     5565       Karpeles 1932, #259A
                                     5555       Karpeles 1932, #190

f.         x           x
     x   x   x   x   x   x
   x x x x x x x x x x x x
   xxxxxxxxxxxxxxxxxxxxxxxx
                     σ   σ   = G     5_f5G5     Karpeles 1932, #66C
                     σ σ     = 5_f   5_f55_f5   Karpeles 1932, #163A
                     σ       = 5     555_f5     Karpeles 1932, #13D
                                     5555       Karpeles 1932, #22P
```

As can be seen, there is nothing truly novel about the novel quatrain types here: one finds the same use of rhythmic cadences to mark lines, couplets, quatrains, and Long-Last constructions. While we have not formally modeled quatrains that go beyond our basic five cadences, we see no barrier to doing so, especially since the systems involved seem rather simpler.

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