# Revealing hidden patterns in the meter of Homer's *Iliad*

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## Abstract

In his 1942 paper, "The Localization of Metrical Word-Types in the Greek Hexameter" [1], Eugene O'Neill, Jr. demonstrated a phenomenon he called *localization*, that is, the tendency of words of a particular metrical shape always to fall in the same few places in the line, although other locations were equally possible given the nominal metrical rules of hexameter verse. For example, words shaped ⏑⏑– – fell in only one of the five possible positions over 96% of the time, across seven different authors spanning several centuries. He referred to this restriction of word placement beyond the stated rules of metrical composition—which he found to be "practically universal in the hexameter"—as the line's "inner metric." While O'Neill did not explicitly claim that the authors deliberately imposed this inner metric upon the verse, he did attribute it to "a striving for perfection of Form," which was in his mind characteristically Greek.

Because he was working by hand, O'Neill was able to study only 1000 lines of each author. In this study, we extend his methods to the entirety of the *Iliad*, using metrical data from the Chicago Homer[2], kindly shared with us by Dr. Martin Mueller. Having first validated O'Neill's approach by replicating his results, we turned our attention to those words which O'Neill found to be among the least localized. Consider words of the shape – –. Figure 1 shows the distribution of this word-type among its 11 possible positions. While there is clearly a preferred site, there are numerous secondary options.

We classified all words of this shape according to their individual distributions among the 11 possible sites and found that the overall distribution could be decomposed into 7 different sub-types, each of which preferred a different one of the possible positions (Fig. 2). This shows that the phenomenon of localization is in fact far more intricate than O'Neill had imagined—complex enough, we feel, to rule out conscious control on the part of the author. This complexity is perhaps especially striking in the case of the *Iliad*, which is widely agreed to have been composed in an illiterate, or only recently literate, society.

If localization is not controlled by the author, then by what? We have tested the correlation of word localization with syntactic, phonological, and semantic features. Table 1 gives the correlation between membership in the seven localization sub-types and four word features: whether a word is a proper name; whether it is a noun or a verb; the presence of initial consonants; and the presence of final consonants. Only part of speech was not significantly correlated with sub-type membership. (We are looking into repeating the test with a more detailed set of morphological features rather than simply verb/noun/neither.) Yet while these features explain part of the words' localization behavior, they clearly do not tell the whole story.

Each of the seven sub-types contains at least one form which is completely localized, occurring nowhere other than that sub-type's preferred location; but these are surrounded by a penumbra of other, more or less localized forms. Higbie [3] postulates that in the composition of a line, two

localized components may compete for the same place; in these cases the less-strongly localized one can be displaced to a secondary position. Our paper also examines displacement in an attempt to test this hypothesis. We also hope to shed further light on whether localization is an intrinsic feature of the word or something imposed on it by the interaction of factors such as those in Table 1 and other outside forces.

While we continue to look for the factors control localization, we are also looking for the mechanisms by which the "inner metric" is imposed upon (or generated within) the verse. While there are, as O'Neill observed, "right and wrong" places for a word, there is nothing obvious to stop a poet from putting a word in the wrong place. If philologists have been unable to articulate these patterns previously without the aid, not only of writing, but of digital computers, then how did they remain so consistant across the ancient authors O'Neill studied?

We believe that this communication between texts, across authors and centuries, is best understood in the framework of *intertext*, a term coined by Julia Kristeva to refer to the web of connections between all texts in a society—not only literary, but also mundane and even oral [4]. David Huron [5] has shown that music displays similarly intricate and consistant patterns of frequency within a given genre, and that listeners have a finely-tuned sense for these frequencies. That sense manifests itself only subjectively, as musical "qualia", with the listener himself wholly unaware of the math involved. In a recent study at the University at Buffalo (also submitted to DHCS 2012), we and others have discovered that readers detect allusion, pointed literary text reuse, in a way that is finely-tuned to word frequency. We therefore suspect that something similar is happening here: that the singers and authors of Greek Epic have internalized the pattern of frequencies within metrical lines over lifetimes of exposure to the genre, and that this gives later authors, even those separated by centuries, a consistent "ear" for the line's inner metric.

We are currently working on extending this work, not only to other Greek authors, but also to the English iambic pentameter. If this subtlety of pattern is truely the product of an innate human ability, then O'Neill is wrong to identify it as characteristic of the Greeks, and we should be able to discover something similar in the English Epic tradition.

## References


[1] Eugene G. O'Neill, Jr. The localization of metrical wordtypes in the Greek hexameter. *Yale Classical Studies*, 8:105–78, 1942.

[2] *The Chicago Homer*. Ahuvia Kahane and Martin Mueller, Editors. `http://digital.library.northwestern.edu/homer/`. Dr. Mueller generously sent us a copy of the underlying database, from which we made our calculations.

[3] Carolyn Higbie. *Measure and Music: Enjambement and Sentence Structure in the* Iliad. Oxford University Press, New York, 1990.

[4] Julia Kristeva. Word, Dialogue and Novel. In *The Kristeva Reader*, Toril Moi, Editor. Columbia University Press, New York, 1986, pp. 34—61.

[5] David Brian Huron. *Sweet Anticipation: Music and the Psychology of Expectation.* MIT Press, Cambridge, MA, 2006.

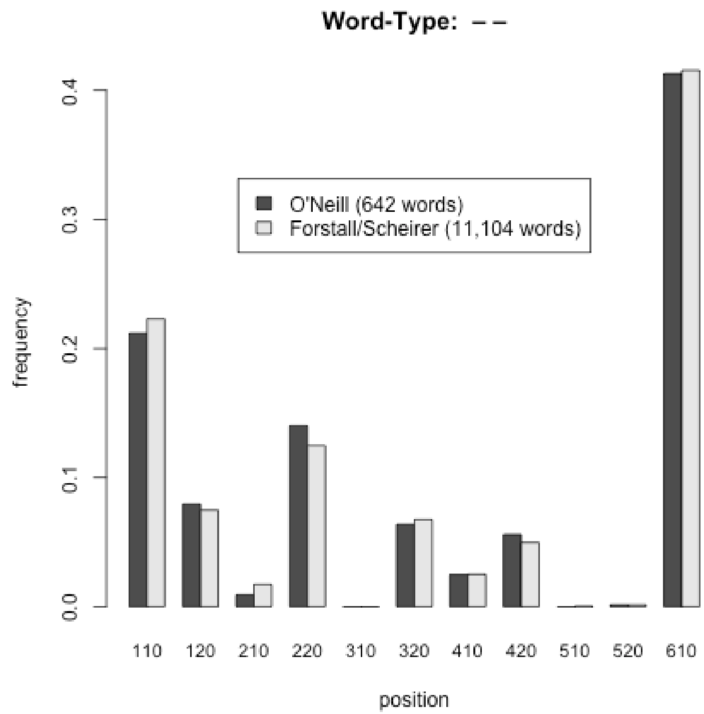


Figure 1: Distribution of words shaped – – among the 11 possible positions in the hexameter line. Positions are labelled according to Martin Mueller's [2] system: 110 indicates the first half of the first foot, 120 is the second half of the first foot, 210 is the first half of the second foot, and so on. The second half of the sixth foot is not shown, since a two-syllable word cannot begin there. The value on the y-axis gives the portion of all words shaped – – which begin at each position. O'Neill's data, hand-calculated from the first 1000 lines, are shown by dark bars; our data for the entire *Iliad*, by light bars.

Table 1: Test of correlation between class membership and each of several word features: whether the word is a proper name; whether it is a noun, verb, or neither; the presence of initial consonants; and the presence of final consonants. Correlation (Pearson's product moment) was measured using R's *cor.test* function. Only part of speech was not significantly correlated with sub-type membership. This relationship may change with a more detailed part-of-speech analysis.

| factor | 95% conf. interval | p-value |
|---|---|---|
| proper name | (-0.275, -0.097) | $5.62 \times 10^{-5}$ |
| part of speech | (-0.167, +0.016) | 0.10 |
| initial cons. | (-0.247, -0.068) | $6.69 \times 10^{-4}$ |
| final cons. | (-0.217, -0.037) | $6.24 \times 10^{-3}$ |

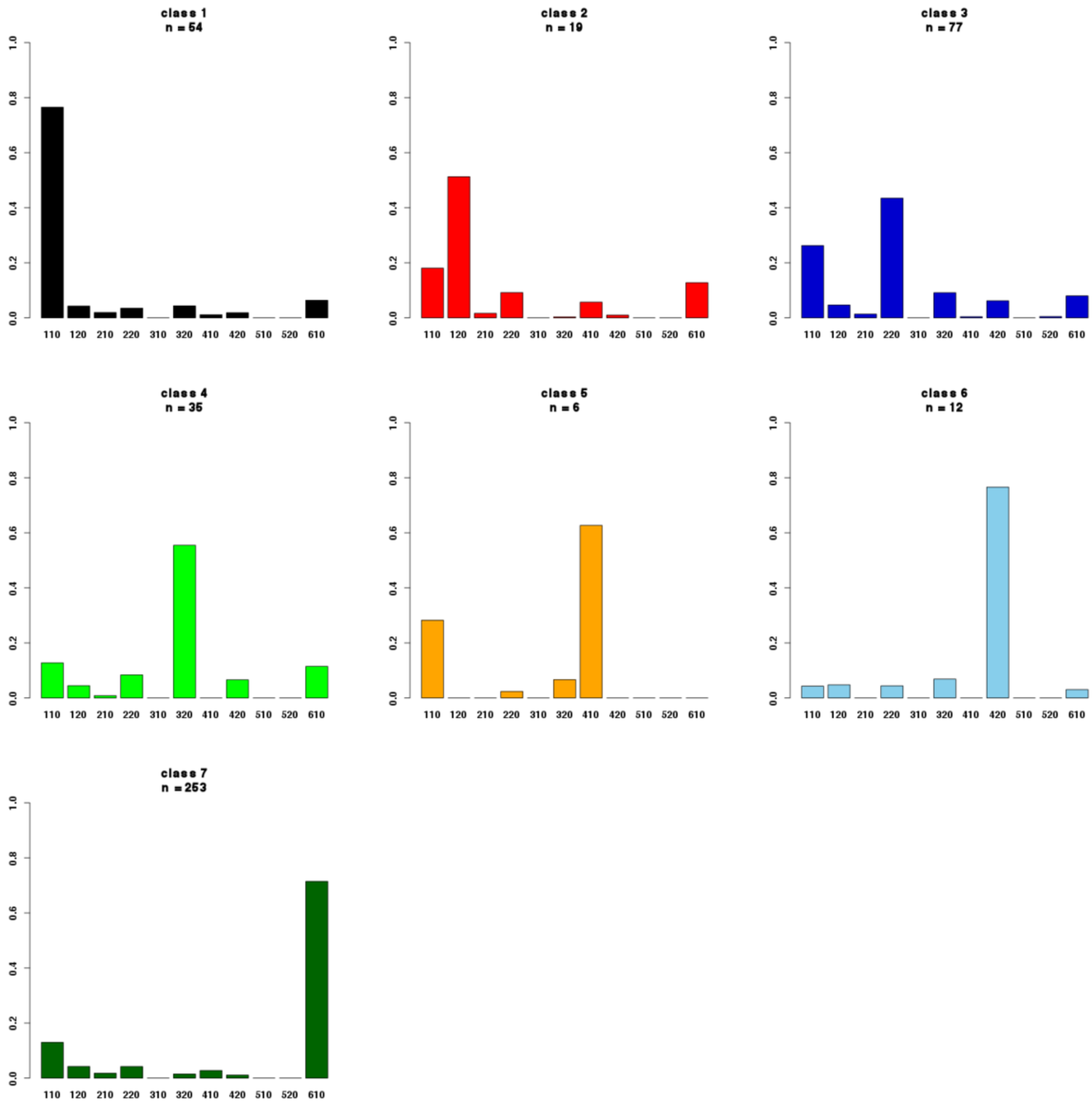


Figure 2: Distributions of the seven sub-types. All these words have the same metrical shape, – –, but each sub-type is localized to a different position in the line. Together they compose the overall distribution shown in Fig. 1.