Modulor Poetry

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Abstract

This paper introduces a new constraint-based poetic form that is inspired by, and uses proportions from, Le Corbusier's *Le Modulor*, an intricate system of measurements based on the golden ratio. We define the constraints of a *modulor poem* and introduce an example written by the author. We use this example to illustrate how the poem can be deconstructed into 22 plus sub-poems, just as the *Le Modulor* tiling that the poem is embedded within can be deconstructed into several *Le Modulor* rectangles.

Introduction

There are several poetic forms based on the golden ratio that focus on different aspects of this remarkable number. Some use consecutive Fibonacci numbers to constrain the number of lines per stanza or the number of syllable counts per line (or both). Examples include a two-stanza form introduced by Sarah Glaz in [1] which uses consecutive Fibonacci numbers for the number of lines and number of syllables in each stanza. The use of such constraints emphasize the proportion ϕ and in these forms ϕ resonates as a ratio, either visually when the poem appears on the page, or temporally when the poem is read aloud. In contrast, Glaz uses the decimal expansion of $\phi = 1.6180339 \ldots$ to create a second form, in which the sequence of digits constrains the number of syllables per line. Here ϕ is used as a touchstone, and one could argue that any irrational number would do equally well, although the extreme syllable lengths at the start of this form (1-6-1-8-0) create a difficult challenge that once surmounted contributes to the form's charm.

The modulor poetry form introduced here does not focus on either aspect of ϕ, so it doesn't require Fibonacci numbers of lines or syllables. It focuses instead on ϕ's most wonderful feature in my view, and an often overlooked one – its additive property. I first saw this property leveraged to full potential in the *Le Modulor* system of measurement created by Swiss-French architect Le Corbusier (1887–1965). This led me to a deeper understanding and appreciation of what ϕ can achieve.

At Bridges 2024, a chance conversation with Sarah Glaz about Le Corbusier's *Le Modulor* led to an exchange of ideas and a challenge to find a new form of poetry to highlight this set of measurements. This challenge resulted in the creation of a poetic form not only inspired by Le Corbusier's measurement system but also embedded within one of the infinitely many *Le Modulor* tilings defined by Le Corbusier. It also led to the writing of my first *modulor poem*.

Le Corbusier's Le Modulor and the Mathematics of the Golden Ratio

The *modulor poetry* form pays homage to *Le Modulor* by embedding a poem in a tiling that uses exact proportions defined by Le Corbusier [4]. These proportions are an intrinsic requirement of the form, unlike other contrapuntal poetic forms which have been extensively explored in many wonderful ways by a variety of poets, including the author [3]. Because of modulor poetry's reliance on *Le Modulor* proportions, some understanding of the design principles of *Le Modulor* [4] is required.

Jay Kapraff [2] identifies "repetition, harmony and variety" as the three principles that "lie at the basis of beautiful design", first proposed by Roman architect Vetruvius [6]. *Repetition* refers to the use of a small number of proportions on different scales. This is referred to as *the law of repetition of ratios*. Kapraff claims that harmony follows from using "a small set of lengths…with many additive properties which enables the whole to be created as the sum of its parts while remaining entirely within the system." Use of the golden ratio ϕ can help ensure both repetition and harmony and *variety* is achieved in *Le Modulor* by combining two geometric sequences, called the *blue* and the *red* series.

The definition of ϕ as the unique ratio for which the proportions of greater to lesser and whole to greater are equal ensures that it satisfies the quadratic equation $\phi^2 - \phi - 1 = 0$. It follows that for any integer value of n, $\phi^n + \phi^{n+1} = \phi^{n+2}$. One consequence of this identity is that any geometric sequence $a_n = a\phi^n$ with common ratio ϕ satisfies the Fibonacci recurrence relation.

Thus, measurements chosen from such sequences satisfy additive properties that stay within the system, required to achieve *harmony*. Furthermore, the equality of the ratios of greater to lesser and whole to greater reduces the number of distinct ratios, which helps achieve the law of *repetition* of ratios.

Le Corbusier's *Le Modulor* consists of two geometric sequences with common ratio ϕ interwoven to create a system of lengths that can be combined or broken down in multiple ways to create various rectangular proportions. Each sequence extends infinitely in both directions. The sequences are called the *blue series* $\{b_n\}$ and *red series* $\{r_n\}$ defined for any integer n by

$$b_n = 2d\phi^n \text{ and } r_n = d\phi^n .$$

Le Corbusier chose d with architectural considerations in mind, but in the context of poetry, fixing a value for d detracts from its flexibility. When constructing a *modulor tiling* to embed a poem, the poet should choose any value of d that facilitates typesetting.

When the blue and red series are placed in increasing order we have alternating blue and red terms

$$\ldots, b_{-4}, r_{-2}, b_{-3}, r_{-1}, b_{-2}, r_0, b_{-1}, r_1, b_0, r_2, b_1, r_3, b_2, r_4, b_3, r_5, b_4, r_6, \ldots \;.$$

By having two interlaced sequences, the gap between adjacent terms in *Le Modulor* is small enough that it accommodates the design of a wide variety of objects. Thus, it achieves the third objective of *variety* by expanding the set of ratios from powers of ϕ to include ratios that involve a factor of 2 as well.

Defining Modulor Rectangles and a Modulor Tiling

We define a *modulor rectangle* as any rectangle with length to width proportions from Le Corbusier's blue and/or red series. Figure 1 shows a way of constructing all modulor rectangles. The horizontal and vertical lines define lengths from the red and blue series (with $d = 1$), ordered in increasing length along the x and y axes. If the image were continued indefinitely, all modulor rectangles would eventually appear. We've labeled those visible in Figure 1 by numbers, used for reference below.

Note that rectangles labeled with triangular numbers 1, 3, 6, 10,… along the main diagonal are squares, whereas the rectangles 4, 8, 13, 19,… that lie two rows above the main diagonal are golden rectangles. The rectangles below the main diagonal are reflections (about the diagonal) of those above. Overall, relatively few modulor rectangles are golden, but most do involve ϕ as a ratio.

We define a *modulor tiling* to be any tiling of a modulor rectangle using only modulor rectangles. While a tiling of a square or 2:1 rectangle with other squares or 2:1 rectangles trivially meets this definition, it would be disingenuous to call such a tiling a modulor tiling, so we add the restriction that at least one of the modulor rectangles in the tiling must have irrational proportions.

Figure 2 shows a possible tiling of a golden rectangle. Using the proportions from Figure 1, it's possible to verify that these rectangles form a tiling as shown, and that the tiled rectangle is golden. Once one modulor tiling is found, others can be generated easily. The tiling can be reflected vertically or horizontally, or it may be rotated through a right angle. It is also possible to permute some of the rectangles. In Figure 2, rectangles 13 and 14 can be interchanged. As well, 3! orderings of rectangles 1, 16 and 4 will lead to more variations. I'd avoid placing rectangle 16 on the far right since one vertical line dividing the rectangle is visually jarring. Many more modulor tilings can be found in Chapter 3 (pp. 91–99) of [4].

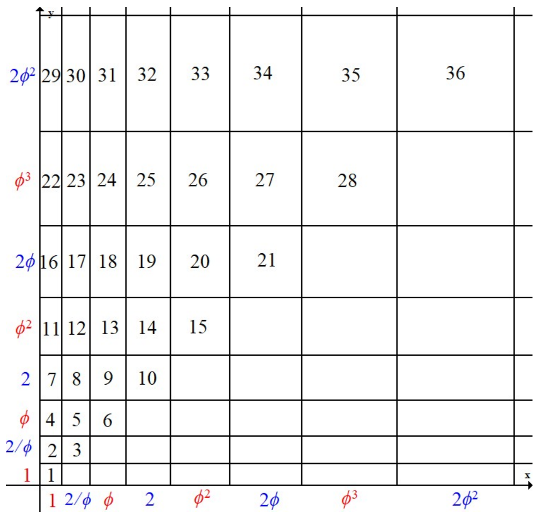

Figure 1: *Modulor Rectangles*.

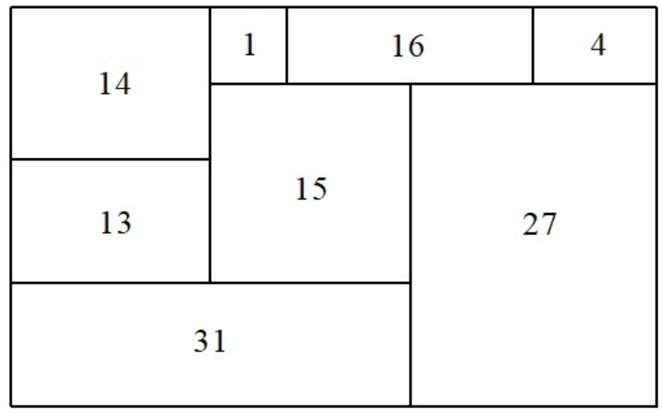

Figure 2: *A Modulor Tiling*.

Defining Modulor Poems

There are two overarching requirements for a poem to be considered a *modulor poem*. First, the poem must be embedded in a modulor tiling, as defined in the last section. As shown in the example from Figure 3, this embedding places a separate poem in each modulor rectangle of the tiling. Each of these poems is called a *tile poem*. Tile poems should fill their tile sufficiently so that remaining white space is not overly distracting. Tile poems must use the same font size and line spacing so that poetic lines in adjacent tiles on the left and right align, to facilitate reading horizontally across tile poems.

The next constraint, while the most rewarding, also provides the greatest challenge for the poet. This constraint ensures that the poem emulates the additive and combinatorial spirit of *Le Modulor*. The embedding of tile poems must permit them to be concatenated with other tile poems to form larger poems called *combination poems*, according to well-defined rules. The concatenation rules are:

(1) Beginning at the start of any tile poem and reading across, the reader can ignore any vertical line encountered in order to read across two or more horizontally adjacent tile poems.

(2) When a horizontal line is reached (signifying the end of any tile poem in the combination) the combination poem ends at the end of the current line. For example, when reading the first 3 poems across the top in “Come to Dust” from Figure 3, the combination poem ends with “fade away” despite the fact that the first poem contains more lines. This is because the second poem (as well as the third) only contains 2 lines.

(3) The exception to rule (2) is that both vertical and horizontal lines are ignored when reading the combination poem comprised of all tile poems together.

The modulor poem “Come to Dust” shown in Figure 3 is inspired by two lines

Golden lads and girls all must / As chimney sweepers come to dust

from the song “Fear no More the Heat of the Sun” in Shakespeare’s play *Cymbeline*, [5] (p. 904). Phrases from these lines are embedded in tiles 14 and 1. “Come to Dust” is my first modulor poem and by far the most complex, allowing 22 possible combination poems according to the defined constraints. In fact additional poems can be read from the poem if we ignore rule (2). Diagonally connected tiles may also successfully combine into a poem and the reader is free to explore these as well.

“Come to Dust” was written as a proof of concept. I was uncertain I’d succeed with the complex tiling I chose (Figure 2). However, the poem wrote itself, quickly and easily. Perhaps this is because it is written in the style of “Variations on a Theme” which made it easy for the tile poems to fit together. It was easy to riff on the “golden” theme, and the choice seemed fitting for a first example of the form. Some mathematical references crept in inspired by the phrase “come to dust” although mathematical content is not required. I have since written other modulor poems and found them challenging to write, even simple ones.

Come to Dust
by *Lisa Lajeunesse*

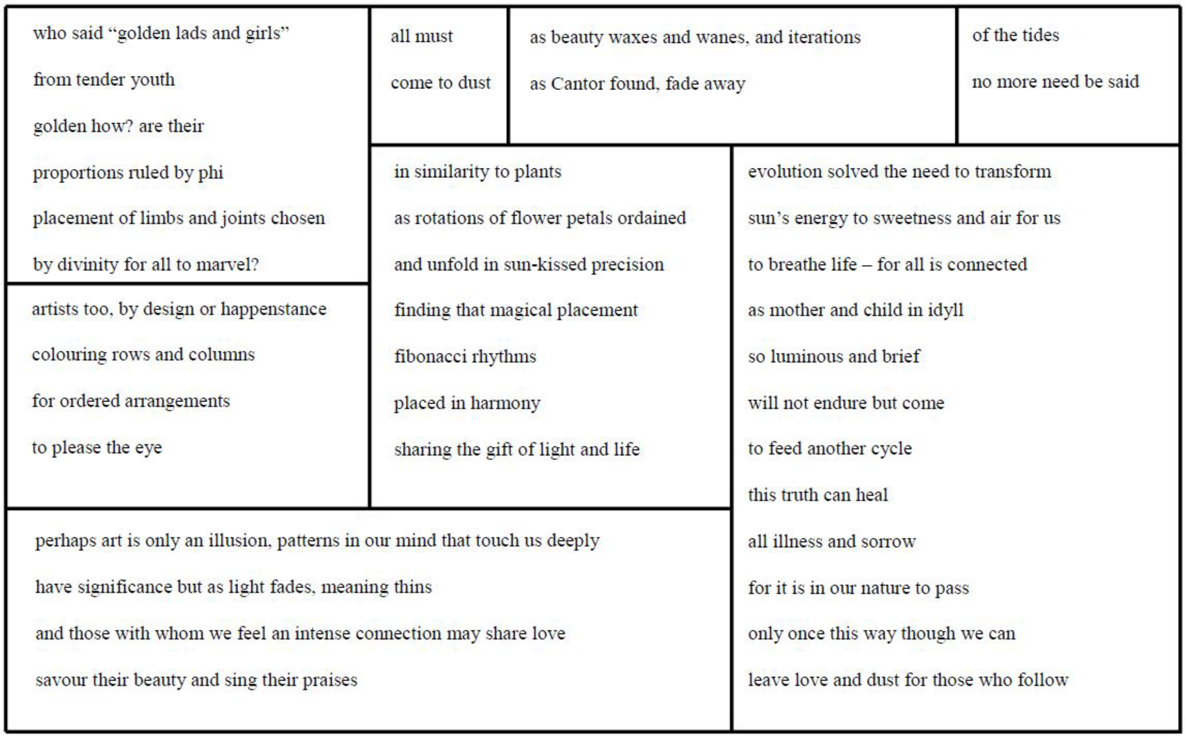

Figure 3: Modulor Poem.

Conclusion

Modulor poetry celebrates Le Corbusier’s *Le Modulor* in two respects. The poem’s embedding in a modulor tiling retains the visual beauty of Le Corbusier’s original measurement system. Secondly, the additive property of Le Corbusier’s system is reflected in the ability to combine tile poems in multiple ways.

While the combination poems in modulor poetry create constraints that are a considerable challenge for the poet, it is hoped that its beauty entices poets to tackle the challenge of writing poetry in this form.

References

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