Using Mathematics to Make Poetry

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Abstract

Guided by an experienced teacher, this Bridges workshop invites experiments with word-arrangements using mathematical forms and strategies—encouraging formation of patterns that become poems. Some activities involve altering prior texts using mathematical operations while others create new texts with patterns of number or geometry. Participants need no prior experience in poetry writing — writers and non-writers alike will be encouraged to play with language; moreover, teachers seeking to combine mathematical ideas with poetry in their classrooms will find useful possibilities here. Connections to mathematical topics (such as permutations and the Catalan numbers) will be included; however, the primary goal of this workshop is to give participants experiential awareness of ways that mathematical concepts and structures can influence the beauty and effectiveness of words.

Workshop Activities – Background Information

As with mathematics, poetic discovery may begin with experimental mixing of symbols and ideas—both new and old—in an effort to discover truth and to say it in a fresh and meaningful way.

The discoverer of Vitamin C was Hungarian biochemist Albert Szent-Gyorgyi -- who won the 1937 Nobel Prize for Medicine. Szent-Gyorgi offered this summary of the creative process: *discovery* is seeing what everyone has seen and thinking what no-one else has thought. Poets and visual artists join mathematicians and research scientists in that quest to see and say something new.   The way that one thought leads to new thoughts and on to a big idea is nicely illustrated in this little poem, "The Roasted Swan Sings," by Mark Baechtel. [5], [14]:

The Roasted Swan Sings

after the Carmina Burana

The arrow in its flight
becomes the turning spit;
the axis of the world
if we but thought of it.

This workshop will offer participants strategies for turning word-play into poems, applying mathematical techniques "to discover what no one else has thought." These are the sorts of activities we will engage in together:

1. Create a poem by substituting new nouns into an existing poem. For example, replace each noun in Robert Frost's "Fire and Ice" [3] with a noun 7 words later in a particular dictionary; here are the first two lines of Frost's poem and a new version of these lines:

| Some say the world will end in fire | Some say the wound will end in ire, |
| Some say in ice. | Some say in lice. |

2. Permute the nouns of an existing stanza to form a new stanza. For example, in the first three lines of Carl Sandburg's "Precious Moments" [15] we can interchange each odd-numbered noun (counting from the beginning) with the even-numbered noun following it to obtain:

Bright vocabularies are transient as rainbows	Bright rainbows are transient as vocabularies
Speech requires blood and air to make it	Blood requires speech and work to make it
Before the word comes off at the end of the tongue,	Before the air comes off at the tongue of the end,

3. Build words into geometric shapes:

Here is a syllable-based triangle:

> one
> added
> forever
> joined by zero,
> matched with opposites—
> these are the integers.

And a letter-based triangle:

> I
> am
> one
> when
> sleep
> seizes,
> several
> whenever
> wide-awake.

A syllable-square:

> Any flat map
> we draw we may
> color with four
> colors only.

And a letter-square:

> SAFE
> AREA
> FEAR
> EARN

4. Create a portrait – of yourself or a close associate, of your childhood home, of a scene or event -- using numbers. Or start with a particular number important in your life and create a list of the ways in which it matters to you. Or take a number and tell the significance of each of its digits; for example, with $\sqrt{2} \approx 1.41421 \ldots$ we might begin thus:

> 1 is the number of me, when I am entire.
> .
> 4 is the number of my children,
> 1 is the number of books I can read at a time,
> 4 is the corners of a rectangle,
> 2 is the chairs on my porch,
> 1 is how many calluses I have from holding a pencil too tight.
> . . .

5. Describe the "personality" of a mathematical object; for example, we have from Guillevic [8] these opening lines for "Acute Angle":

Failing to make it	One can always
as a circle	become an angle.

6. Generate (by hand or using [12]) all possible permutations of a list of words—seeking insight from the variety of the arrangements. For example:

two,true,theorems	two,theorems,true	true,two,theorems
true,theorems,two	theorems,two,true	theorems,true,two

7. Deepen the effects of words in a given order by coupling them with the same words in reverse order in a word-palindrome poems – reversing the initial words of a poem to complete it:

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> Epsilon approaches zero as zero approaches epsilon.
> Numbers ending never count to infinity to count never ending numbers.

8. Use number-patterns to govern the lines and stanzas of a poem. In addition to well-known traditional forms such as the Haiku, limerick, sonnet, pantoum, and sestina, there are forms based on number patterns such as the factoring of integers, Fibonacci numbers, and Pascal's triangle (See [2], [5], [9], [11], [13])

Here, phrases about winter are built into a ten-line poem structured by prime factorizations of the integers from 1 to 10:

<div align="center">

cold

winds howl

geese go south

nights long   tea steeps

temperatures fall low

ponds freeze   snowmen grow

toboggans slide down hillsides

sun hides   ice coats   spring waits

wood-fires flame   snowballs fly

winds howl   groundhogs hibernate

</div>

This next stanza has line-lengths based on the first seven Fibonacci numbers. One tradition (though not always held) in reading poetry is that a single line corresponds to a breath. With this view, short lines are slow and choppy while long ones have a smooth, fast pace [6].

> This
> week
> I am
> attending
> the Bridges meetings
> in Coimbra. I want all to see
> math's connections to poetry. Let us count the ways.

9. Use numbers to describe the poem itself [10]:

> This poem
> contains 14 words
> (if we count numerals
> as words) and 62 symbols.

Each distinct mathematical attribute adds a different quality to the poem in which it is used. The poet's task is to find not only good words but a form that enables best expression.

Historical Note

Many clever strategies used to create poems were first devised by the OULIPO (**OU**vroir de **LI**ttérature **Po**tentielle -- roughly "Workshop of Potential Literature"), founded in France in the 1960s by a group of writers and mathematicians. Ongoing (with new members) in 21st century, the OULIPO group continues to meet and to invent procedures for creating new literature. (See [9] and [11].)

References and Further Reading

References [1] and [5] offer background for some mathematical topics that may be involved in structuring and classifying poems – topics such as partitions and permutations and (for counting rhyme schemes) the Catalan and Bell numbers.

[1]   Marcia Birken & Anne C. Coon, *Discovering Patterns in Mathematics and Poetry* (Editions Rodopi, 2008).

[2]   Dominique Fitzpatrick-O'Dinn, *Table of Forms*,   http://www.spinelessbooks.com/table/tableofforms.html (accessed 15 February 2011).

[3]   Robert Frost, *The Poetry of Robert Frost: The Collected Poems*, (Holt, 1979).

[4]   Sarah Glaz & JoAnne Growney, Eds., *Strange Attractors: Poems of Love and Mathematics* (A K Peters, 2008).

[5]   JoAnne Growney, Blog, "Intersections – Poetry with Mathematics," http://poetrywithmathematics.blogspot.com (accessed 15 February 2011)

[6]   JoAnne Growney, "Mathematics with Poetry," *JOMA* (October, 1962), http://mathdl.maa.org/mathDL/4/?pa=content&sa=viewDocument&nodeId=1262 (accessed 15 February 2011).

[7]   JoAnne Growney, Webpage, "Poetry, Mathematics, Art, Translation," http://joannegrowney.com (accessed 15 February 2011).

[8]   Guillevic, *Geometries*, Englished by Richard Sieburth (Ugly Duckling Presse, 2010).

[9]   Harry Mathews & Alastair Brotchie, Eds., *Oulipo Compendium, Revised Edition* (Atlas Press, London, 2005).

[10] Mathemetrics Spree, http://poetry.about.com/library/weekly/aa062602a.htm (accessed 15 February 2011).

[11] Warren F. Motte, Jr. *OULIPO: A Primer of Potential Literature* (University of Nebraska, 1986).

[12] Permutations Generator, http://users.telenet.be/vdmoortel/dirk/Maths/permutations.html (accessed 15 February 2011).

[13] *plus* magazine, http://plus.maths.org/content/ (accessed 15 February 2011).

[14] J.W.Potter, D. Rieves, G. Stein, Eds., *Cabin Fever* (The Word Works, 2003).

[15] Carl Sandburg, *The Complete Poems of Carl Sandburg: Revised and Expanded Edition* (Houghton Mifflin Harcourt, 2003).