Subject, Structure, and Metaphor in Mathematical Poetry

E. R. Lutken

Saint Joseph, LA, USA; erlutken@gmail.com

Abstract

Poetry and mathematics share attention to human understanding in ways that contain both precision and depth; poetry in distillation of thought into words and mathematics into symbols and numbers. The interface of poetry and mathematics often brings a fresh and insightful energy to the process. In this workshop, participants will explore poetry involving mathematics as subject, structure, and metaphor. Participants will read poems, discuss them, and write their own in each of these categories. The workshop will emphasize how these exercises can be used in the classroom but should be helpful to any who write poetry.

Introduction

In Olga Taussky-Todd's poem, "Number Theory," she states the case beautifully that both poetry and mathematics are capable of evoking a true passion:

> "Number theory is like poetry
> they are both of the same kind
> they start a fire in your mind." [9, p. 69]

Students especially, however, gravitate towards the area in which they feel most comfortable or have the most innate ability, and may eventually ignore the wonders of the other. Poetry involving mathematics can give to those more receptive to language, sound, and narrative a way to appreciate numbers, relations, and concepts of mathematics, and to those drawn to mathematics, a greater appreciation of poetry. At best, this enrichment translates into such passion, and heightens creativity in both fields.

Workshop Activities

Mathematics as Subject

Perhaps the most straightforward poems considered in this workshop are those with mathematics as subject. The subject might be a number, set, equation, proof, theorem, historical figure, etc. These poems typically use poetic images to elucidate the traits of the subject. Sarah Glaz's poem "I am a Number" [7] and my poem "Zero" [8, p.18] are examples that may add a poetic dimension to the concept of numbers. Below is another example, titled "π":

Trapped on planes,
circles and lines find each other,
centered, locking arms.
The faithful connection
always, always the same
for each and every pair.
Ruled by an irrational constant,
its measure, a sequence
never repeating. [8, p. 25]

A clerihew is another type of subject poem that specifically features a famous person in a humorous light. The form was invented by Edmund Clerihew Bentley [3], and consists of two couplets, with the rhyming pattern AABB. The first couplet begins with the person's name, then a rhyming line follows. The second couplet typically has a different meter and rhyme, and usually references something about the person. (For those interested, even serious poets have written clerihews. W. H. Auden wrote a book of them [2].) Two examples from my poem "Math History in a Few Bad Clerihews":

Ada Lovelace
Ignored her place
And programmed a computer
That's smarter than you are

Edward Lorenz
Bought a Mercedes Benz
Sadly, the initial conditions
Caused expensive chaotic collisions [8, p. 78]

Participants will have the choice to write a short poem about a number or a clerihew about an historical figure. Some suggestions of numbers or persons will be provided if needed.

Mathematics as Structure

Beyond rhythm and meter, there are many types of invented poetic forms inspired by mathematics. Some have shapes, syllabic counts, patterns, or forms that echo mathematic relations. The book *Against Infinity* contains some examples, such as the poem "Infinity" by Bernhard Frank [9, p. 25] showing the word "chains" intertwined in a form perhaps reminiscent of a lemniscate. One particularly amusing example is this poem attributed to Lewis Carroll, which reads the same across and down:

I often wondered when I cursed,
Often feared where I would be –
Wondered where she'd yield her love
When I yield, so will she.
I would her will be pitied!
Cursed be love! She pitied me… [5, p. 19]

This might be more easily visualized in Figure 1.

I	often	wondered	when	I	cursed
Often	feared	where	I	would	be
Wondered	where	she'd	yield	her	love
When	I	yield	so	will	she
I	would	her	will	be	pitied
Cursed	be	love	she	pitied	me

Figure 1: *Lewis Carroll's poem illustrated without punctuation.*

My poem "And Over and Again" [8, p. 32] uses what I believe to be a new poetry form. The Sieve of Eratosthenes, a method for finding primes, shapes its structure. I've written a shorter poem titled "Sand" for demonstration purposes, employing William Blake's famous phrase "to see a world in a grain of sand" from "Auguries of Innocence" [4] and using grids in Figures 2-4 to illustrate the method:

		2	**to**	3	**see**	4	into
5	**a**	6	dark	7	**world**	8	shadow
9	images	10	flowing	11	**in**	12	starlight
13	**a**	14	wind	15	ruffling	16	wild
17	**grain**	18	fields	19	**of**	20	breakers
21	spindrift	22	lapping	23	**sand**	24	dunes

Figure 2: *The first stanza of "Sand" placed in a numbered grid, to apply the Sieve of Eratosthenes.*

The algorithm works as follows. The first prime in this series is 2. All multiples of 2 are then eliminated. Proceeding to 3, all remaining multiples of 3 are eliminated. Thus, composite numbers are eliminated in an iterative fashion. In the sample poem, there are words corresponding to numbers < 25. Nine prime words will be identified in the process. Figures 3 and 4 show the stepwise elimination of the words.

		2	**to**	3	**see**	4
5	**a**	6		7	**world**	8
9	images	10		11	**in**	12
13	**a**	14		15	ruffling	16
17	**grain**	18		19	**of**	20
21	spindrift	22		23	**sand**	24

Figure 3: *The words labelled with multiples of 2 have been removed.*

		2	**to**	3	**see**	4
5	**a**	6		7	**world**	8
9		10		11	**in**	12
13	**a**	14		15		16
17	**grain**	18		19	**of**	20
21		22		23	**sand**	24

Figure 4: *The remaining words labelled with multiples of 3 have been removed.*

The poem "Sand" then consists of 5 stanzas. The first stanza contains all of the initial words, then the other left-justified stanzas contains those words remaining after each elimination. The right-justified stanzas are made up of the words that have been eliminated at each step:

To see into a dark world.
Shadow images flowing in starlight.
A wind ruffling wild grain fields of breakers.
Spindrift lapping sand dunes.

Into dark shadow
Flowing starlight
Wind, wild fields
Breakers lapping dunes

To see a world.
Images in a ruffling
grain of spindrift sand.

Images ruffling spindrift

To see a world in a grain of sand

Writing poems using either of these structures is harder than one might think. It is important to pick words with flexible meanings, often particularly helpful are those that can be different parts of speech. In this exercise, we'll each try to write a 3 by 3 word or 4 by 4 word poem, or a poem using the sieve technique for the prime numbers < 25. For those preferring to write the poems by hand, templates will be provided.

Mathematics as Metaphor

Difficult concepts can be illustrated through the use of metaphor, the bread and butter of poetry. As Aristotle [1] described, "Metaphor consists in giving the thing a name that belongs to something else." Its use involves creative thinking, not only in identifying similarities in disparate things or concepts, but in identifying their differences. As James Geary [6] pointed out in his book *I is an Other,* "The paradox of metaphor is that it tells us so much about a person, place or thing by talking about what that person, place, or thing is not… A metaphor is both detour and destination, a digression that gets to the point."
Mathematics furnishes an excellent source of metaphors, in part because it shares with poetry an emphasis on economy of expression. In A. E. Stalling's poem "Sine Qua Non" the idea of absence is beautifully illustrated:

"… The void stars hang in, the interstice of lace,
The zero that still holds the sum in place." [10]

In this exercise, participants will concentrate on mathematics as the driving force, i.e., will identify mathematical ideas and discuss their translation into poetry. A simple metaphor of subtraction, for example, is used in the last couplet of this first sonnet titled "Arithmetic" :

One cupcake bite, I'm back in first grade:
chalkboard dust, spelling *apple* and *you*,
counting by tens, selling lemonade,
three take-away one, the struggle to tie shoes.
Mid-east wars have been going solid since,
a seventeen-year count of money and lives.
I should know but can't remember much
more than black hair, his laugh, piggy-back rides.
Statisticians seem to agree near six trillion

dollars, but casualties are another story,
from one hundred thousand to a million
depending on who's taking inventory.
And every one who died must have left someone
lost, blank, wondering about the subtraction. [8, p.77]

In the next sample poem titled "Rational Function" with the epigraph f(x) = 1/x, the metaphor is indicated in the structure as well as the content of the poem.

Domain:
Skylark of our assembly-line neighborhood,
shinnying up smooth tulip trees,
racing slippery trails in the mid-town woods,
plunging into raked piles of papery leaves,
she knew how to skip a rock, whistle
loud, climb a rope, catch a fish
with a piece of twine and a safety pin.
She could braid grass, play the fiddle,
and she dove into love in a splash
with a sandy-haired sculptor full of ambition.

Function:
He worked methodically,
tapping phrases with his chisel:
You look so beautiful when…
The salad fork goes on the far left.
Don't you have something dressier?
It's a luxury resort, the best.
To make a proper impression …

Co-domain:
At a cocktail party, she's on display,
elegant curve to her dress, balanced
on spike heels, hair textured, sprayed
to look windblown, the cadence
of her voice flawless, lipstick
precisely aligned with the vermillion border
surrounding a vacuous smile, her eyes alone
furtive, far away, the only break
in a slick-magazine-style order
of life turned to stone. [8, p. 47]

In general, poems should speak for themselves, but in the spirit of the open discussion in a workshop, here are some of my thoughts on the poem. The headings of the stanzas, underlined as in the original poem, give the reader the idea of input, process, and output. The first stanza paints a picture of the person through some selected details. The second stanza, in dialogue form indicated by italics, relates some experiences which modify the person's character, and the third, more details indicating what the person has become. Of course, this is not a function, the details do not follow relationships between the actual mentioned characteristics with specific outputs, but the differences in this and an actual function may give us some thoughts as well. Also, what might the expression "1/x" in the epigraph mean? Or the title "Rational Function"?

For this last exercise, participants will write short poems based on mathematical metaphors from a selection of prompts including, but not limited to those listed below:

Subtraction as loss

Zero as void

Negative numbers as debt

Integrals as cumulative sums of brief experiences

Incompleteness Theorems as limits of understanding

Geometry as underlying beauty

Irrational numbers as inscrutable qualities

Mathematical knots as relationships

Fractals as patterns of social evolution

Complexity as social models

References

[1] Aristotle. *Aristotle's Rhetorics and Poetics.* Modern Library, 1954.

[2] W. Auden. *Academic Graffiti.* Random House, 1972.

[3] E. Bentley. *The Complete Clerihews of E. Clerihew Bentley.* Oxford University Press, 1981.

[4] W. Blake. *Complete Writings with Variant Readings.* Oxford University Press, 1972.

[5] M. Gardner. *The Universe in a Handkerchief.* New York: Copernicus, 1996.

[6] J. Geary. *I is an Other.* Harper Perennial, 2011.

[7] S. Glaz. *Ode to Numbers.* Antrim House, 2017.

[8] E. Lutken. *Manifold: Poetry of Mathematics.* 3: A Taos Press, 2021.

[9] E. Robson and J. Wimp (editors). *Against Infinity: An Anthology of Contemporary Mathematical Poetry.* Primary Press 1979.

[10] A. Stallings. *Hapax.* TriQuarterly Books, Northwestern University Press, 2006.