# What Poetry Is Found in Mathematics? What Possibilities Exist for Its Translation?

JoAnne Growney

*The Viewpoint column offers mathematicians the opportunity to write about any issue of interest to the international mathematical community. Disagreement and controversy are welcome. The views and opinions expressed here, however, are exclusively those of the author, and neither the publisher nor the editor-in-chief endorses or accepts responsibility for them. Viewpoint should be submitted to the editor-in-chief, Chandler Davis.*

One question leads to another. And so it was that when I was invited to be part of a panel presentation[1] on the challenges of translating poetry into English—invited because of my activity in translating work by Romanian poets—I began to think about the poetry of mathematics and to ask, *What possibilities exist for its translation?*

The remarks that follow include some of the ideas presented in the conference panel—and others that came as a consequence.

## Good Mathematics Is Poetry

Writers of stature and wisdom have, without reservation, linked mathematics to poetry. Albert Einstein (1879–1955) said, "Pure mathematics is, in its way, the poetry of logical ideas." Ralph Waldo Emerson (1803–1882) observed, "If a man is at once acquainted with the geometric foundation of things and with their festal splendor, his poetry is exact and his arithmetic musical." From within the mathematical community, we have words from Karl Weierstrass (1815–1897): "It is true that a mathematician who is not somewhat of a poet will never be a perfect mathematician." More recently, from Lipman Bers (1914–1993): "…Mathematics is very much like poetry… what makes a good poem—a great poem—is that there is a large amount of thought expressed in very few words. In this sense formulas like $e^{i\pi} + 1 = 0$ or $\int \exp(-x^2)dx = \sqrt{\pi}$ are poems" [1]. My own view is that *good mathematics*—whether a formula or an elegant definition, a theorem and its proof, or a counterexample, whether verbal or symbolic—*is poetry*.

## Some Poetry Uses Mathematics Without Being Mathematics

In the blogosphere, poetry and mathematics often are connected—sometimes by elementary-school teachers making interdisciplinary assignments, sometimes by writers from India, where many who make their living in technical industries use the Internet for aesthetic expression and do not hesitate to link mathematics with poetry and the spirit. In the 2008 film, *Harold and Kumar Escape from Guantanamo Bay*, Kumar Patel ends the tale with a recitation of a mathematical love poem by David Feinberg, "The Square Root of Three" [4].

In current terminology, the adjective "mathematical" is applied to poems that fall into one of two categories: First, to poems whose structure involves particular mathematical ideas—perhaps geometric shape, or counting or substitution into a form or formula; next, to poems that make careful and deliberate use of mathematical imagery—such as circles, vectors, or parallels—to vivify the work. It cannot be said that "mathematical" poems are mathematics. Rather, they may be considered as applications of mathematics or as translations—for they can connect non-mathematicians to the power and beauty of mathematical ideas.

## Mathematics May Structure a Poem

In every age, some of the poets have shaped their work by counting. Long traditions embrace the fourteen-line sonnet with its ten-syllable lines. Five-line limericks and seventeen-syllable haiku also are familiar forms. Moreover, patterns of accent and rhyme overlay the line and syllable counts for even more intricacy. In 2006 a new syllable-count form emerged when a blogger, Gregory K. Pincus [12], began to promote the Fib. In a six-line Fib, the syllable counts are based on the first six nonzero Fibonacci numbers. Pincus offers this example [13]:

[1]Note: This panel presentation took place at the annual conference of the AWP (Association of Writers and Writing Programs, www.awpwriter.org) in Chicago, February 11–14, 2009.



Published online: 18 September 2009

One
Small,
Precise,
Poetic,
Spiraling mixture:
Math plus poetry yields the Fib.

Danish poet Inger Christensen (1935–2009) wrote a book-length sequence based on the nonzero members of the Fibonacci sequence: The first poem has one line, the second poem two, the third three, the fourth five, each number in the sequence being the sum of the previous two (1, 1, 2, 3, 5, 8, 13,…). The work stops with the letter $n$, which, as the 14th letter of the alphabet, generates a poem of 610 lines [2].

A triangle poem may be formed by lines whose syllable count increases from 1 to some fixed positive integer. A square poem has the number of syllables per line equal to the number of lines. "Elevens," a recent poem by Stanley Plumly [14], consists of eleven square stanzas with each stanza having eleven lines of eleven syllables each. Online, in the UbuWeb's collection of historical visual poetry, we find a 10 × 10 square by Henry Lok [10]. The text of Lok's poem is presented in the table.

Here are two additional squares and a triangle [8]:

If everything
is seven times
as large, does the
seven matter?

All over the world,
fashionable shoes—
trendy, hazardous,
uncomfortable—
keep women in place.

One
added
forever
joined by zero,
paired to opposites—
we build the integers.

**"Square Poem in Honor of Elizabeth I" by Henry Lok (1597)**

**For an image of this poem with its borders and embellishments, see [10].**

**For analysis of cross designs and other sub-poems within Lok's square, see [15].**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| God | Hath | pourd | forth | Rare | Grace | On | This | Isle— | And |
| Makes | Cround | your | rule | Queene | In | the | same | So | Still |
| Kings | Lawd | This | saint | Faire | that | with | truth | doth | Stand |
| Rule | so | long | time | milde | Prince | ioy | land | it | Will |
| For | proofe | you | shows | wise | of | earths | race | whome | There |
| Heauens | haue | vp | held | lust | choice | whome | God | thus | Shields |
| Your | stocke | of | Kings | worlds | rich | of | spring | and | Feare |
| States | fame | Knows | farre | Praise | Isle | which | ALl | blisse | Yields |
| Hold | God | there | fore | sure | stay | of | all | the | Best |
| Blest | is | your | raigne | Here | Builds | sweet | Peace | true | Rest |

A group of French intellectuals, the OULIPO (OUvroir de LIttérature POtentielle/Workshop of Potential Literature), have invented new ways to use mathematics in poetry [11]. A follower of OULIPO applies mathematical or other algorithms to help the mind escape the unconscious rules and limitations that stifle the new or creative and to discover the unlikely. A popular OULIPO algorithm is called $S + 7$ (for "substantif plus 7"), in English $N + 7$, and is a procedure that replaces each noun in a familiar passage (perhaps a poem) with the seventh noun that follows it in a specified dictionary. For example, we can apply $N + 7$ to the first two lines of Robert Frost's poem, "Fire and Ice" [5]:

Some say the world will end in fire,
Some say in ice.

With the help of my desktop Webster's dictionary, the website www.rhymezone.com, and side rules restricting the words to fit the form, the $N + 7$ algorithm gave me

Some say the wound will end in ire,
Some say in lice.

The new word choices are, I think, thought-provoking, and might lead the way to a new poem.

## Poems with Imagery from Mathematics

Beyond use of numbers and shapes and substitutions to aid construction of poetry, a second variety of "mathematical" poem draws on the language of mathematics as one might draw from the classics of literature, importing imagery to create or expand meaning. Here are samples of what is possible:


**JOANNE GROWNEY** began in abstract algebra at the University of Oklahoma, but soon widened her view to embrace many other arts, verbal and visual. Retired now after a teaching career at Bloomsburg University in Pennsylvania, she is a poet, still crossing disciplinary lines. It is all set forth at http://joannegrowney.com.

7981 Eastern Avenue, #207
Silver Spring, MD 20910, USA
e-mail: japoet@msn.com

| Source Poem | Sample of ''Mathematical'' Imagery |
|---|---|
| ''July 18, 2005'' by Deanna Nikaido [6] | *this light bearing equation of love* |
| ''3.141592 …'' by Peter Meinke [6] | *In school I was attracted*<br>*to irrational numbers …* |
| ''Several Hypotheses and a Proposition'' by Jacqueline Lapidus [6] | *one of these days*<br>*we'll intersect again.* |
| ''Sex and Mathematics'' by Jonathan Holden [6] | *Making love we assume*<br>*may be divined by the equation*<br>*for the hyperbola y = 1/x, …* |
| ''The Shape of Desire'' by Emily Grosholz [6] | *the frail parabolas of love* |
| ''Tales from a Sonnetarium'' by Diane Ackerman [6] | *the world is all subtraction in the end* |
| ''Geometry'' by Rita Dove [6, 7] | *I prove a theorem and the house expands* |
| ''The One Girl at the Boys' Party'' by Sharon Olds [7] | *her body hard and indivisible as a prime number* |

From Nikaido to Olds, each of these poets has employed a *bon mot* from mathematics to offer a vivid image—and, in turn, these ''mathematical'' poems interpret or translate a thin slice of esoteric mathematics into accessible poetry.

## ''The Poetry of Mathematics''

I belong to a listserve of poets who pose questions and respond on matters of interest to writers. ''How will they respond to a poem from mathematics?'' I wondered. And so, with curiosity, I wrote and posted a version of Euclid's proof that there are infinitely many primes (Book IX, Proposition 20). I—to whom many proofs are poems—selected this as a somewhat accessible sample of ''the poetry of mathematics.'' However, not one of the listserve's readers, a few of whom are mathematically literate, replied that she/he saw it as a poem. It seems, then, that a theorem-proof is—not unlike verses written in Portuguese or Arabic—a poem that requires translation. But how may we do that?

How to communicate—to those not fluent in the language of mathematics—the poetic beauty of an elegant proof is a question for which I do not have good answers. A suitable test case is Euler's identity, $e^{i\pi} + 1 = 0$, one of the equation-poems suggested by Lipman Bers. Is it translatable?

My first answer came easily—an emphatic NO: One must learn the language of mathematics to gain access to the poem-formula, to understand its beauty and the disparate entities that it connects.

After setting down my initial response and looking for my next sentence, inexplicably, my mind did some leaping: The Euler identity caused me to think of a crossing—and then a train—and then a poem by Kenneth Koch, ''One Train May Hide Another'' [9]. Much as Euler's identity focuses a cluster of meaning around a concise statement, Koch's title resonates throughout his sixty-seven-line poem and through the life of each reader with awareness of many and diverse experiences also linked to a single statement. I invite you to visit Koch's poem and see whether this connection of Koch's title and Euler's identity as interpretive-equivalent works for you.

At the AWP conference which prodded my questioning about translation of mathematical poetry, one of my fellow panelists was Cass Dalglish, a poet who has learned Sumerian and set for herself the task of translating texts written in cuneiform by the poet-prince-priest Enheduanna around 2300 BCE [3]. Among Dalglish's explorations as a translator has been interpretation with the cuneiform signs using improvisation in the manner of a jazz musician. I don't yet know how to apply this idea to translation of mathematics; perhaps it can be done by a mathematician who, unlike me, is a musician. There may be an opportunity here—not a way to explain, but a way to share the magic—using music to interpret particular joys and beauties of mathematics for the nonmathematician.

## REFERENCES


1. Albers, D.J., G.L. Alexanderson, and C. Reid, editors, *More Mathematical People,* Academic Press, New York, 1993, p. 16.
2. Christensen, Inger, *alphabet*, translated by Susanna Nied, New Directions, New York, 2000.
3. Dalglish, Cass, *Humming the Blues*, Calyx Books, Corvallis, Oregon, 2008.
4. Feinberg, David, ''The Square Root of Three,'' http://www.herecomesthescience.com/2008/04/26/square-root-of-three/.
5. Frost, Robert, ''Fire and Ice,'' http://rpo.library.utoronto.ca/poem/844.html.
6. Glaz, Sarah and JoAnne Growney, editors, *Strange Attractors: Poems of Love and Mathematics,* A.K. Peters, Ltd, Wellesley, MA, 2008.
7. Growney, JoAnne, editor, *Numbers and Faces: A Collection of Poems with Mathematical Imagery*, Humanistic Mathematics Network, 2001. Out of print; electronic version available from the editor, japoet@msn.com.
8. Growney, JoAnne, ''Square Poems,'' http://joannegrowney.com; triangle: http://mathdl.maa.org/images/upload_library/4/vol6/Growney/MathPoetry.html#Triangle.
9. Koch, Kenneth, ''One Train May Hide Another,'' http://www.poetsorg/viewmedia.php/prmMID/15592.
10. Lok, Henry, ''Square Poem in Honor of Elizabeth I,'' from *Sundry Christian Passions*, http://www.ubu.com/historical/early/early07.html (accessed May 2009).
11. Motte, Warren F., Jr., translator and editor, *OULIPO: A Primer of Potential Literature,* Dalkey Archive Press, Normal, Illinois, 1998.
12. Pincus, Gregory K., http://gottabook.blogspot.com/.
13. Pincus, Gregory K., http://gottabook.blogspot.com/2006/04/fib.html.
14. Plumly, Stanley, ''Elevens,'' *Kenyon Review* XXVI, no.2 (Spring 2004), http://www.kenyonreview.org/issues/spring04/plumly.php.
15. Roche, Thomas P, Jr., *Petrarch and the English Sonnet Sequences,* AMS Press, New York, 1989.