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Book Review: *Ode to Numbers* by Sarah Glaz

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Synopsis

This review explores the issues surrounding mathematics poetry and its role in challenging stereotypes about mathematics and mathematicians. In *Ode to Numbers*, Sarah Glaz takes us from her childhood in Romania to her work as a professor at the University of Connecticut in the USA, with the constant thread of her love of mathematics. It is an intense emotional journey through time and place, arriving at mature reflection. The reader will encounter a wide range of poetic forms; some traditional, others inspired by mathematics. Glaz writes with originality, courage, insight, and generosity and this collection secures her reputation as an accomplished poet.

Ode to Numbers: Poems by Sarah Glaz. By Sarah Glaz, Antrim House, Simsbury, Connecticut, 2017. (Paperback US\$19.00, ISBN: ISBN 978-1-943826-40-7. 114 pages.)

Sarah Glaz has been a strong supporter of mathematics poetry for decades. She initiated and runs Poetry Day at the Bridges Conference and has edited two anthologies by the invited poets.¹ Gathering together and supporting poets with an interest in mathematics is important because of widespread antipathy to mathematics within the poetry establishment. In general, most fictional representations of mathematicians are male, socially inadequate, and/or emotionally challenged.

¹ The two anthologies are *Bridges 2013 Poetry Anthology* and *Bridges 2016 Anthology*, both published by Tessellations Publishing, and reviewed in this journal by Robin Chapman; see Chapman, R., “Book Review: Bridges 2013 Poetry Anthology and Bridges 2016 Poetry Anthology”, *Journal of Humanistic Mathematics*, Volume 7 Issue 2 (July 2017), pages 401–409, available at: <https://scholarship.claremont.edu/jhm/vol7/iss2/22>.

Novels on childhood often describe boredom or misery in the mathematics classroom and it is rare to find a book which shows mathematics teachers in a positive light. Unfortunately, few readers stop to consider that they are absorbing a stereotype from a very biased sample: few of those who love studying mathematics go on to write novels and even fewer publish a book of poems. Those who do, like Sarah Glaz, offer us all a wonderful gift.

The emergence of mathematical poetry and its wider dissemination effectively challenges the common stereotype of mathematicians. Journal articles by mathematicians generally omit reference to emotions and so fail to challenge the orthodox view. Through poetry, the reader can experience some of the emotional aspects of studying mathematics; a huge leap of the imagination for many. There has been a disappointing tradition in science poetry of simply harvesting strange words and novel ideas. This can result in beautiful well-crafted poems but often the reader knows very little more about the subject, often less, than they did before. Those with deeper scientific knowledge are often frustrated by the lack of understanding shown by such writers.

This collection, *Ode to Numbers* by Sarah Glaz, is written by an accomplished mathematician who avoids those pitfalls and therefore it can be enjoyed equally by readers from the sciences and the arts. In this, her first collection of her own poetry, Glaz takes a phenomenological approach and invites us to into her subjective world. We experience the analytic, logical, conscious brain in action but also the important role of emotion and the unconscious. It is routine for those involved in the arts to make claims for new ideas ‘arriving out of nowhere’, less common with mathematicians.

The first section of the book, subtitled *Close To The Origin*, consists of seven poems. As the name suggests, these are poems about Glaz’s childhood. The title poem describes the child’s perception of infinite time ahead with reference to the x and y axes. The next locates us in Bucharest, Romania in the intensity of its hot summers and icy winters. In “The Europe of My Childhood”, Glaz questions the fate of others in her mathematics class, “those who do not wish to learn / and those who cannot learn” and wonders about the fate of the latter group: “How did they hide / those who could not comply?”. “Do you Believe in Fairy Tales”, is a concrete poem shaped like a new moon, on the pain of new beginnings.

This is followed by an achingly touching poem about a young girl offering up her skill with mathematics for approval and praise.

The second section, entitled *Pythagoras Plays his Lyre*, delves into the history of mathematics. In addition to Pythagoras, we encounter Hippasus, Euclid, Newton, Napier, Bernoulli, Euler, Cantor, and Gödel. In these poems there is no deficit in emotional intensity. Hippasus is heaved overboard and drowned at sea for his insistence on the existence of irrational numbers in a poem which ingeniously links form with content in its use of the square root of two to generate the number of lines in each verse: 1, 4, 1, 4, 2, 1.

“Calculus” describes the intense rivalry between Newton and Leibniz and concludes with the following lines.

That abstract concepts, applicable in the beginning
merely to unseen, unsensed objects—orbits of distant stars—
could generate intense earthly passion
is inconceivable today,
when Mathematics is considered a dry discipline,
depleted of life sap, devoid of emotion,
alive only in convoluted brain cells of weird scientific minds.

In “Numbers and Letters”, Glaz reminds us that “In the beginning, letters and numbers/ looked alike, happily shared a tablet...” The relationship between words and numbers is explored further in “13 January 2009”. This poem’s structure follows the Fundamental Theorem of Arithmetic which states that every positive integer greater than one can be expressed in a unique way as a product of powers of distinct prime numbers. Each prime number is associated with a distinct phrase. For example, the phrase “Anuk is dying” is represented by the number two and is used in all lines divisible by two in the poem’s range: 1 to 13.

Sarah Glaz is a very experienced teacher and was elected a University Teaching Fellow at the University of Connecticut in 2007. She is aware that many students won’t share her love of algebra and settles for convincing them of its usefulness in modeling nature. Three poems consider practical applications: “If Not Loved Then Useful; Mysteries and Mathematical Modeling.”

The following lines are taken from “If Not Loved Then Useful” and illustrate our ability to make predictions using mathematics.

where hurricanes will hit the shore
and with what force,
the weight of passing cars across a bridge
that won't collapse,
the purity of water
flowing from your faucet,
the quality of air you breathe.

The extract above illustrates this poet's sure touch with alliteration: hit and hurricane; flowing and faucet; cars and collapse. The assonance in shore and force and also in passing, cars and collapse is also deftly handled.

The first six poems in the third section of the book, subtitled *Serendipity*, are at the very heart of this collection. Here, Glaz focuses on her own experience of conducting research in Commutative Ring Theory. We are invited to share those wonderful moments when answers seem to come unbidden, seem to rise up from the unconscious. Consider this quote from the title poem, “Serendipity”: “For how illumination comes / and where it comes from / is a mystery.” In “A Woman in Love”, we encounter the depth of her association, “I see a streak of mathematics / in almost everything.” Another poem highlights the similarity between the process of writing a poem and discovering a new mathematical proof: both “arriving from nowhere, / from a distant galaxy of thought”.

Glaz goes on to liken a “New Research Project” to the joy and burden of a new baby “And yet it is effortless action. / Who counts uninterrupted joy as burden, / a flow, which gently sweeps you off your feet / into the magic world of expectations?”. Although many will not have experienced flow while engaged in mathematics, the poem has universal appeal since flow can be experienced while engaging in any activity in which a significant level of mastery has been achieved, including less cerebral activities like dancing, singing and sport.

Her academic monograph on *Commutative Coherent Rings* (Springer, 1989), published after five years of gestation, is experienced as a gift from a “You”, unexplained but always distinguished by a capital letter.

The experience of struggling to solve a mathematical problem is also likened to a quest and Glaz describes the iterative aspect of being drawn towards each new goal in vivid imagery. Consider these two extracts from “The Journey”.

Once there the clearing seems at first a jewel
 small and vivid, an emerald winking seductively mid-forest green.
 On close inspection it is the sparkling green of water-
 it’s water for the grasses, it’s nourishment for the wild flowers.
 And soon the ground appears dappled with their magic colors:
 blue is for lemmas, orange for corollaries,
 red is for prepositions, pink for remarks,
 and purple-saved for theorems-crisscross the field.

And silently, when you acknowledge
 you have exhausted all present resources,
 know each blade of grass and every bloom
 as intimately as you know your lover’s skin,
 they lure you with the promise of a quest-
 to venture forth into dense shadows once again.

The poems in the second half of this section convey more ambivalence. In “Mathematical Models of Rejection” and “Man Among Men” she describes disenchantment with the milieu of cut-throat academic competitiveness. In “Eventually it Arrives” there is a sense that “it arrives in a strange form / almost unacceptable”. There seems to be a drift towards poetry. In “No matter what I do” she says “My garden is neglected; / I grow poems instead”. In the last poem of this section, Glaz describes herself as “late for everything” and sees “the faded hieroglyphics of ambition / lighting a patch of sky”.

In the fourth section of the book, subtitled *Late Afternoon at the Workshop on Commutative Rings*, Glaz takes us on a guided tour of conference locations in Italy, France, Portugal, The Czech Republic, Israel, and Morocco as well as the United States. The explicitly mathematical content is typically less than in previous sections, but there are fine descriptions of exotic locations. A wide range of very different poetic forms are scattered throughout this collection, and in this section, we encounter a Ghazal,

an ancient form originating in Arabia, and a Fibonacci sequence poem, in which the the syllabic count of the stanzas follows the pattern 0, 1, 1, 2, 3, 5, 8, 13 . . . and ends in 144 syllables.

In the final section, *Euclid's 5th Postulate*, there are poems of mature reflection. In "Doors". Glaz reflects on busy times in academic life "pushing doors open, / running through doors" unaware of the other doors which "close one by one, / not with a bang but softly latching on". In the titular poem, she uses the analogy of two trains on parallel tracks, one carrying words, the other numbers. After a brush with cancer, words become the preferred medium of expression.

Today, I only drive the engine of words, and it is
getting harder to watch neglected numbers jump

over tracks and barriers like wooly sheep and let
the whoosh of passing trains brush their coats.

Words fly uphill of their own will: I am the
breath, but not the driving force - not even that.

In the penultimate poem, "My Mother Speaks", Glaz imagines her mother's pleasure as she looks over her shoulder while she writes. She imagines her saying "no more mathematics— / you speak a language that is crystal clear". And Glaz does; she interweaves the languages of words and mathematics with great courage, insight, and generosity, as well as clarity. This collection secures her reputation as an accomplished poet as well as a mathematician.