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Gömböc the Great

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Gömböc the Great

Abstract

A sonnet written about the mathematics behind the self-righting shape of some tortoise shells.

Keywords

tortoise, gömböc, mathematics, poetry, sonnet

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Cover Page Footnote

Footnote: At time of writing, 1st author is 13 years old.

Gömböc the Great

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I'm an 8th grade student in Saskatoon, Saskatchewan, Canada. Our class was asked to compose sonnets, staying true to their structure, about something from 'nature'. I decided to do a sonnet about natural structures – very meta!

In science, I had been learning about amphibians and reptiles, and among my favorites were turtles and tortoises. I had also witnessed some 3D printing happening at the College of Engineering where my mother works (the second author). A professor had challenged students to create a 3D logo, and some were having problems making theirs stand upright. That brought me to the intersection of math and tortoises, and a realization of their stability. I learned of the mathematician Vladimir Arnold and the challenge he posed in 1995 to provide both a mathematical proof and a physical example of mono-monostatic shapes; 3D, convex shapes which have just one stable and one unstable point of equilibrium. I thought that it was so interesting that the problem was solved by Hungarian scientists Domokos and Várkonyi with the help of tortoises. Some tortoises evolved mono-monostatic carapaces to right themselves and gain protection from a predators' chomp. Amazing.

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Gömböc the Great

An enduring species, loved in math circles
Is the unwavering Indian Star Tortoise
Don't ask one to sprint or do hurdles
But their mono-monostatics sure are gorgeous

Monostatic means just one point of rest
The extra mono- adds one point of roll
An evolutionary champion, brilliantly convex
Its righting response is a thing to extol

With it could Arnold's math challenge be settled?
Nature and *Science* popularized the proof
Revealed by studying thousands of pebbles
And Indian Stars at the Budapest Zoo.

Nature, the mathematician, made the tortoise gömböc.
Much more robust than a curvy rock.