CHAPTER 20

A SAD TALE

We’ve had a few laughs, now for a change in mood. Meet our Master of Mathematics

Those who have tears, prepare to shed them now as you learn the sad tale of a troubled young mathematical genius, Évariste Galois. He’s 16. Irritated. Hot-headed. Angered. Impatient. Nervous. He’s taking an entrance exam to join the most prestigious center for the study of mathematics in the country. He considers those interviewing him – the judges of his future education – not intelligent enough to grasp his accomplishments. He stands next to the blackboard at the École Polytechnique, near Paris, running his fingers frustratedly through his beautiful black hair while his examiners ask him inane questions that are of no interest to him. He doesn’t want to demonstrate his mastery of minutiae. He wishes to explain the new mathematics he’s developed. The mathematical prodigy has never been good at communicating his thoughts, perhaps because to him, things were too evident to need elaboration. To have a future in mathematics, he requires admittance to the prestigious institution, but he fails the examination. A year later, he reapplies, but once again the exam goes badly. He allegedly bounces an eraser off the head of the chief examiner and stalks out. There will be no further opportunities.¹

A couple of days before failing this problem solver’s second and last attempt to enter the École Polytechnique, Évariste’s “father committed suicide after a bitter political dispute with the village priest.”² During his second examination, he was asked a question about ‘arithmetic logarithms.’ He replied that there were no ‘arithmetic logarithms,’ only ‘logarithms and refused to answer the question.³ He published his first paper on continued fractions,⁴ (which was discussed in [Two: All about ‘e’ (Well, Almost All)].

Galois’ goal was to discover the necessary and sufficient conditions under which an algebraic equation of any degree could be solved, using only rational operations (addition, subtraction, multiplication, division) and extraction of roots.⁵ More about Galois later.

THE PROBLEM

Consider snowflakes, spiders’ webs, honeycombs, sunflowers, or even the entire Milky Way Galaxy. What do all of these things have in common?
What might a hand-held rectangular mirror reveal to you about these shapes? What did positioning a straight-edged mirror over the shapes reveal? Does it matter where you put the mirror? Does this have anything to do with the type of shape?

The mathematical topic with which this problem of this entry is symmetry. The naturally occurring figures, Butterflies, seeds, snowflakes, spiders’ webs, etc. are all symmetrical. Symmetry derives from Greek symmetria, meaning “agreement in dimensions, due proportion, arrangement.” In mathematics, symmetry is a reflection, rotation or translation (that is, moving without rotating, resizing or anything else) of a plane figure that leaves the figure unchanged although its position may alter.