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period

From Heraclitus to Philip Glass, a lineage seeks change through repetition. Einstein never sunbathes on the same beach twice. And then there are cartographers of repetition. Rarely found, they defy approximate values. In school, they reject first-order expansions and celebrate the individuality of the sine function. Is it precisely 76 years that separate two passages of Halley's Comet? 76 years or 2,398,328,352 seconds—but what is a second? Why stop there? In his shortest story, Borges conceives of an empire where the art of cartography had reached such a degree of perfection that the map of the empire coincided with it, point by point. Similarly, numbers: only the litany of decimal digits, one by one to the end, serves, in principle, to know them. Except there is no end.

The third way is periods. The area of the unit circle: six words are enough to condense the infinite sequence, the encyclopedia of all knowledge. There is nothing like the sound hole of a violin to turn up the volume. In his private writings, Leibniz begins to lengthen the sums, his hand indulging in the joy of the long esse: the symbol of the integral is born. In the beginning, the spirit of geometry still marches in step with nature. Elliptic integrals to express the period of revolution of a planet, the time it takes for a pendulum to return to its initial position. The era when it was believed that the hairy stars crossed the sky in a straight line seems long gone. Today we read Newton as we read a novel. At Halley's death, the comet still travels the immense ellipse. One day it will return, descend, and rise again.

Then, in a shift in thinking, we began to call all integrals of algebraic functions periods. This opened the door to volumes in very large dimension, negative and even imaginary numbers. The quadrature of these domains, like that of the circle, boils down to a simple equality of periods. A reversal of breath for all these old questions of transcendence. According to Kontsevich and Zagier's conjecture, the equality of periods leaves no room for chance. It obeys only the alchemy of three rules of calculation: linearity, change of variables, and Stokes' formula.

We come later, but the vertigo remains. The same vertigo that we still feel in the photograph of the photograph, when the comet crosses the gelatin emulsion. It is aphelion. Never in mathematics have desire and reality been so far apart.

Javier Fresán