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# Perturbation - For Nature Computes On A Straight Line (In Seven Balancing Acts)

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*“Muss es sein? Es Muss sein!”  
“Must it be? It Must be!”<sup>1</sup>*

## Biblical Overture

“When I consider thy heavens,  
the work of thy fingers,  
the moon, the stars which thou hast ordained;  
What is Man,  
that thou art mindful of him?”

-The Bible, *Psalm 8, 3-4*

## Act 1: The Glow of Epiphany

The simplicity and the inexorable logic of it all stared her in the face in its kaleidoscopic glory. In that fleeting moment of perceptual acuity and meditative abstraction, her mind had visualized in crystal-clear, holographic detail the answer to her all-encompassing Equation, the Divine Spark swirling in the Holy Grail. It was her *Theory of Everything*, a physicist’s reductionist explanation for the mystery of Existence. It was a mathematical rune which bridged the schism between what is *observed* and what is *explained* at the deepest, most fundamental level.

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<sup>1</sup> Beethoven, Opus 135

Layers of complexity were pleated into that structure of elegant and profound sagacity, nary a mathematical crack showing. Symmetric in form, compact in its expression and coherent in its manifold implications, the equation appeared eager to unfurl its general solution to a supernal mind. Here it was: the kernel of Truth, the complete grain of salt. It could not but **be** true, she thought. "Even the good Lord must have bowed in front of *fait accompli*," a brief moment of blasphemous arrogance urged her. As she looked on admiringly over the mathematics of it, a whispered breath of a metaphysical feather could have knocked her down.

## **Act 2: Assaying the Unassailable**

A pragmatic doubt remained, spanning the chasm between her blueprint and reality. Did the equation compute? It *had* to, she was convinced. But *did* it, really? Did all of Creation burgeon and bloom from that seemingly comprehensive formulation? Was this coalition of symbols the primum mobile? Or was it just another of Nature's fabulation, a cul-de-sac of a researcher's heartbreak? As a mathematician, she knew that Truth commands proof beyond innate beauty, demanding logically flawless demonstration. It insists on the calculating rigor of a mechanic in addition to the discerning eye of an artist. She did not have the power to answer the questions for the moment. The equation's forbidding complexity was stubbornly integrated with its delectability, and its austerity held the promise of impregnability against all the computational power which the Continuum could muster against it. Its Form was an open book, no doubt, but its Meaning was diffuse, its oracular truth swimming sub rosa in patient repose.

Thus were they lodged at a stalemate, the Mathematician and her symbols in siren chant — two knights at the fork of uneasy detente . . .

## **Act 3: Simplicity**

The algebra did not mock her, but she felt humbled nonetheless. As a bucking goat, the untamed knot was calling for a coaxing and cajoling before it would cow down. She realized that a simplification of the system was needed before its ramparts could be scaled. "*In perturbed form must this bear be prodded*", she thought.

She set about to work on simulating the equation's first-cousin on her computer.

Furiously the soul of her mighty machine churned its ferocious qubits by the millions . . . calculating the first dyad of the linearized function.

#### Act 4: Let There Be Light!

We know what followed.

We call it History. Big Bang. Inflation. Divine Creation.

In our phase of existence, it was the seed of all that is and all that will be in Time's eternal drunkenness, inflating from naught to ought, and perhaps back to naught. Our multiverse breathed and heaved. To the piper's eleven tunes the membranes fluttered, atop looped quantum gravity's weave and sieve. The stars formed amidst matters dark, swift photons came to light, and all of Existence became a magician's sleight-of-hand delight. As Creation's Wheel turned the heavens, Heraclitus's river of a myriad millennia rolled downhill with its vast reservoir of entropy. A thousand and one nights the camel carried in Arabia, and saw the raconteur's Story of Magic unfold ...

Indeed, that Weaver of Tales was right, Horatio! There are more things in the Heavens than in Philosophy's tome ...

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. .  
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And yet ...

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. .  
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#### Act 5: Humility's Pedestrian Thought

. . . And yet ... In Absolute Reality, though — *as you know now* — it was a more mundane, a far more prosaic situation. The Cosmos ... *Our Cosmos* ... in its entirety... is a mere digital flow; a simple, make-shift crutch used by our Maker against a formidable foe ... It is a vector evaluation of the Equation's straight-line part, relying on a forced imposition of superposition; a loose hook cast into the linear **Bit** of the towering **It**.

And thus it is ...

Our universe . . . the computer God had deployed in Her first step toward the solution of the ultimate mystery.

Our universe . . . a mere first-order approximation's grease . . . merrily simulating, deriving, calculating the beta term of Quintessence's Taylor Series.<sup>2</sup>

All our richly-textured Reality and fancies reduced to a single computational thought of perturbation analysis . . . a stepping stone for God to reach the transfinite, the transcendent, the Unknown. With humble eyes do we see our Deity now, reaching for the 'Existential' beyond Sartre, and our World just a baby-step of contrivance in Her quest to reveal Her own *raison d'être* . . .

### Act 6: Tuning Fine in Flawed Design

. . . Which, of course, leaves some haunting questions in cosmic balance: What about *us*? How come *Life*? Where do *Sentience* and *free-will* fall in the Deity's common parlance?

Are *we*, with all our hubris and pretense, an error in that simulation? A mistake in its luminous code? A calculation glitch in the simulation's exquisite software?

Or are we the Error Term in the expanded infinite series, the unmodeled fire which breathed and rose self-aware?

Are we the "epsilon" God could not fathom in Her master equation, a term which needed to hide all the higher order effects, with all of their (hopefully) convergent implications?

Are we in this simulation God's planned ignorance of approximation which came alive unplanned?

Or are we Her Creation's irreducible command?

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<sup>2</sup> A function  $f(x)$ , under suitable conditions, can be expanded around a point  $x = x_0$  in an infinite series called the "Taylor Series". The zeroeth term of the series is the value of the function at  $x = x_0$ . The  $n$ th term of the series equals  $f^{(n)}(x_0)x^n/n!$ , where  $f^{(n)}(x_0)$  is the  $n$ th order derivative of  $f(x)$ , evaluated at  $x = x_0$ . The linear expansion of  $x$  collects together all the terms involving derivatives of second and higher order into an omnibus term called the *error term*. If the error term is "small enough" in some neighborhood of  $x = x_0$ , then the linear expansion of  $f(x)$  is a "good enough" representation of  $f(x)$  for values of  $x$  in that neighborhood. The expansion can be extended to functions of multiple variables. Perturbation analysis involves using lower order expansions of a function under consideration to investigate its behavior, especially if you do not know the detailed specification of the function but have some idea about its lower order terms.

A chaff of minor irritation or Reality's unformulated Essence?

An error in Research or Destiny's finest hour?

Weeds and worms or Eden's fragrant bower?

Riddle me straight, Dante! Reveal me true!  
Preach all who hear from your circled rostrum:  
Are we to think we all be . . . just Erratum  
or, per chance, the Emyprean's Desideratum? . . .

.  
. .  
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### **Act 7: The Bard's Coda**

“and now remains  
that we find out the cause of this effect  
or rather say,  
the cause of this defect,  
for this effect defective comes by cause. . .  
thus it remains  
and the remainder thus”

- Shakespeare, *Hamlet*, Act 2, Scene 2