

Zeno's Singularity

Although human ingenuity is remarkable, and though human genius has produced astounding science and monumental technological achievements, yet every day we witness terrible catastrophes that seem to belie the greatness of our abilities. Every week we get news of multi-storied buildings collapsing, passenger jets crashing, or of train derailments causing the death of hundreds of people. After long and costly investigations, many of these incidents are usually attributed to some form of human error, either as a basic flaw in the original design, or a production glitch or faulty maintenance. At the time of writing this essay, the news media carried stories of: (1) the collapse of the I-95 highway near Philadelphia over an exploded oil tanker truck, (2) a fire in the *HQ E-Bike Repair Shop* in New York City caused by an overheated Lithium-ion battery, and (3) the implosion of the Titan submersible in very deep waters.

In this essay, I will concentrate on the apparently simple, everyday epistemic errors of some, that cause the grief and misery of countless others. In so doing, I will quote one of *the Seven Cardinal Sins of Philosophy*, from an essay of the same name I wrote seven years ago. To wit, the sin of "Confusing the macro, meso and microcosmic levels of discourse." I will try to show that science and technology err when they attempt to apply the tools and terminology of one epistemic level to the raw materials of another (in common parlance: "Using a cannon to swat a fly.").

One of the earliest examples of the contradictions ensuing from using the same yardsticks to different types of data, are the paradoxes of Zeno of Elea (c. 490 – 430 B.C.). Simplicius of Cilicia (c. 480 – 560 A.D.) interpreted Zeno as claiming in his paradoxes that "it is impossible to traverse an infinite number of things in a finite time". This argument presents Zeno's problem not with finding the *sum*, but rather with *finishing* a task with an infinite number of steps: how can one ever get from A to B, if an infinite number of (non-instantaneous) events can be identified that need to precede the arrival at B, and one cannot reach even the beginning of a "last event"?

Aristotle's version of Zeno's Arrow Paradox reads as follows: "If everything when it occupies an equal space is at rest at that instant of time, and if that which is in locomotion is always occupying such a space at any moment, the flying arrow is therefore motionless at that instant of time and at the next instant of time but if both instants of time are taken as the same instant or continuous instant of time then it is in motion." — *Physics VI:9, 239b5* *

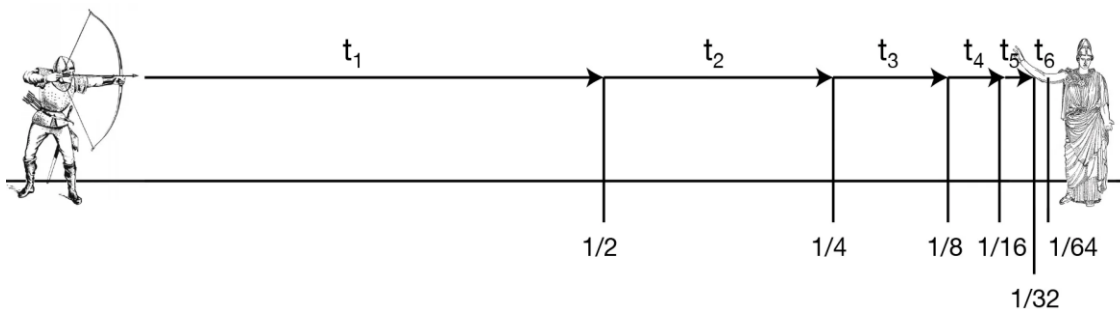


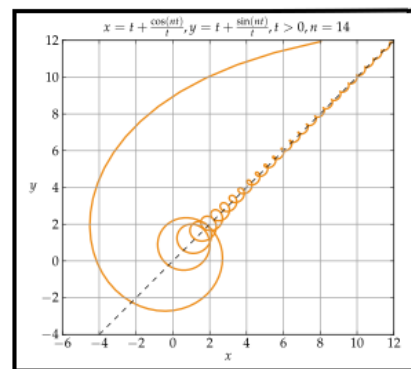
Illustration of Zeno's Arrow Paradox

Some mathematicians and historians, such as Carl Boyer, hold that Zeno's paradoxes are simply mathematical problems, for which modern calculus provides a mathematical solution. However, certain modern philosophers say that Zeno's paradoxes remain relevant metaphysical problems. For instance, Kevin Brown and Francis Moorcroft hold that mathematics does not address the central point in Zeno's arguments, and that solving the mathematical issues does not solve every issue the paradoxes raise. *

I believe this approach hits the nail on the head (and with the proper hammer). Zeno's arrow would have to shrink proportionately as it got closer and closer to the target, until it became infinitesimally small, and ultimately shrink to the subatomic level to become unmeasurable in time and space, and thus never reach the target. Therefore, the logic of Zeno transcends the possibility that mathematics or calculus can truly solve his paradoxes.

Furthermore, the addition of the observer's relative point-of-view, using a variety of ever-changing tools, renders the exercise possible only as an **asymptotic probability** understood in terms of the Heisenberg Principle, so that the speed and location of the arrow cannot both be measured exactly at the same time as it arrives at the subatomic level.

At this point, the reader might ask: What does "asymptotic" mean? In modern usage, an **asymptote** of a curve is a line such that the distance between the curve and the line approaches zero as one or both of the x or y coordinates tends to infinity. However, the word asymptote is derived from the Greek ἀσύμπτωτος –which simply means "not falling together." The term was introduced by Apollonius of Perga (c. 240 – 190 B.C.). **



In a series of essays published in 1950, Albert Einstein appears to acknowledge that the **asymptotic nature of science** prevents us from ever truly achieving a unified knowledge of physical reality. Spotting a clear aporia, he wrote that ... "the translation of the law of inertia into the language of the general theory of relativity...is similar to a building, one wing of which is made of fine marble (the left part of the equation), but the other wing of which is built of low-grade wood (right side of the equation). The phenomenological representation of matter is, in fact, only a crude substitute for a representation which would correspond to all known properties of matter." Einstein also stated that: "The De Broglie-Schrödinger wave fields were not...a mathematical description of how an event actually takes place in time and space... Rather they are a mathematical description of what we can actually know about the system [of classical mechanics]. They serve only to make statistical statements and predictions of the results of all measurements which we can carry out upon the system." ***

To summarize, it is my contention that many of the fatal errors mentioned in the first paragraph above can be attributed to the epistemic error that one can use the tools and mechanics efficient for one set of operations at the human sensory level in normal time/space, to act upon or solve the problems of operations occurring at the sub-molecular or subatomic level at speeds approximating that of Light. And furthermore, that these asymptotic anomalies and aporias will increase as we continue to develop and apply multi-gigabyte technologies to communications, industry, and finance.

If Zeno's modern emulators keep on our paradoxical archery, we will soon traverse an event horizon to hit a singularity target of unimaginable extinction.

Written by © Pascual Delgado, June 23rd 2023

* https://en.wikipedia.org/wiki/Zeno%27s_paradoxes

** <https://en.wikipedia.org/wiki/Asymptote>

*** *Essays in Physics by Albert Einstein*, Philosophical Library, Inc., New York (1950), pp. 38, 39 and 62).