# Improper Levels of Abstraction

Michael J. Burns

## Abstract

Good analysis and physics is to be faithful in describing the mathematical systems that are out there. But vectors are a far too specialized tool for their assigned role in academic physics, and algebra is entirely too general. Rejecting the bad requires understanding what is better. And this good analysis impels evaluating mathematical systems for their viability rather than their falsifiability.

## Bad Abstractions

Algebraic equations have only partial presence out there. If they were the prime reality to be studied, then the broad algebraic possibilities would be more prominent than the specific geometric theorems that do reveal themselves.

As another kind of distortion, vectors hardly exist, whether in mechanics or electromagnetism. The cross product is actually a bivector, the E and B fields are parts of a 2-form, and the electromagnetic potential, A, is a 1-form in the Lorentz gauge.

The famous cosmological equation is the point where all of the compensating errors in traditional mechanics break down, and begin to go uncompensated. The correct argument here is geometric and not algebraic.

Quantum mechanics is confusing by inheritance from the problems in mechanics. And vacuum energy is a problem, as everyone knows. But geometry requires that it be very close to zero in large spaces.

This bad quality of translation contributes to propagation of the false impression that mathematical systems are not there.

Causality is not to be taken as a metaphysical principle. But some particular mathematical systems have versions of this property, so that they can passively overlap in a kind of context, as Leibniz described for his monads.

Spinoza criticizes dualism as follows. Dualism is an appeal to magic, an arbitrary forcing of cooperation between two mathematical systems that would not of their nature do so. But academics do resort to this in their notion of the foundations of physics.

And the principle of falsifiability happens to be exactly wrong for the foundations of physics, because mathematical integrity is paramount for this task.

## Good Analysis and Synthesis

It is to recognize the coordinate free geometry, and the logic of quantum states, which systems compete [in a manner of speaking] for full existence in the nonsymbolic world out there.

It derives from Spinoza’s principle of possibility - writ large and writ small.

Writ large, the principle asserts that things, whether symbolic or non, are composed of possibility.

And, writ small, it asserts that, for mathematical systems in the nonsymbolic realm, there can be no cosmic censor and no cosmic enforcer. Both of these last are misapplications of causality, since they are beyond any possible context enabling reliability.

Realism and universality require an extended argument for comprehension.

But there is a different sort of universality that is equivalent to realism. Namely, the assertion should be made that, for any given coherent context, there is a set of mathematical systems that completely cover the expressive properties of that context.

## Context

The mathematical systems significant to observers are not arbitrary (barring fiction), and therefore not designed or falsifiable. But they derive from the coherence of their context. And the context merely consists of the mathematical systems present, unless an observer is indulging in fiction.

A context may be accidental, and therefore unreliable to other components of the universe, but the important contexts are hard to escape, and they are very expressive.

And it is coherence of the context that makes the difference between physics and symbolic fiction.

One notable kind of coherence is demanded by the Bianchi identities of geometry - “The boundary of a boundary is zero.”. These are topological properties, which when translated to the weird traditional language of mechanics, yield the conservation laws.

Philosophers do not get things entirely wrong, since they use a propositional logic that is not so different from the coherence posited by the context of quantum logic.

## Prevalence of Mathematical Systems

There are unique historical accidents out there, with their own incident mathematical systems. But these do not repeat in history, this being so for their inherent vulnerability to exclusion by other mathematical systems. Or their lack of expressiveness makes for a logical inability to exclude the competing systems.

Some mathematical systems can survive partial logical exclusion, manifesting a partial existence. But mathematical systems with the simplest of premises can resist logical exclusion from the universe. And the most expressive systems have the logical extent to regulate, transform or exclude the competition.

Students can evaluate candidate mathematical systems for their viability (and distinguish them from their partial translations into other systems) by referring to their simplicity and expressiveness.

And so the universe becomes the logical sum of the more viable mathematical systems that are possible out there.

## Nontriviality

Academic motivation will not recognize significance in important challenges to hegemony.

The triviality is an illusion, that is due to both insufficient familiarity with the relevant examples, and to the ill motivated failure to pursue those examples. Spinoza noted that illusions apply to ideas that are not clearly understood.

Freudian philosophers write of the cultural neurosis. But they note that the only treatment for a culture is to persist in resistance.

Many of these points are argued more at length in my other papers.