

# Quantum Gravity 160.2: Acceleration Explicit in Sine–Gordon Equation

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From Osher Doctorow

Curiously enough, almost nobody has remarked about the fact that the Sine–Gordon Equation embodies a fundamental property of Forces and Accelerations at least in the Classical physics domain: the second derivative with respect to time, Dtt. The tendency to ignore Force as a fundamental quantity is a major trend of the last few decades (it was in fact a major trend during Einstein's career).

When we look at the Sine–Gordon Equation:

$$1) Dtt(v) - Dxx(v) + \sin(x) = 0$$

we see the "acceleration" term with Dtt (in a more generalized context of "acceleration" than only operating on position or coordinate x, say). But since I have pointed out the close relationship of this to Probable Causation/Influence (PI) equations, which automatically involve Causation, the relationship to acceleration and hence Force becomes especially important. Forces "Cause" things or processes to happen, about as directly as we have ever seen them or perceived them or to happen.

But the Sine–Gordon Equation also thereby tells us something rather surprising about the second spatial derivative term Dxx(v), namely that it is a "Spatial Force" effect of the "Time Force" operator Dxx (assuming constant or almost constant mass).

Since quantities like Dxx keep occurring almost everywhere in QM and GR, it seems to be an important lesson. Causation through time often acts via an "analog" (second derivative) Causation through space. The corresponding time Causation is either embodied in Dtt or Dt (second or first partial derivatives respectively).

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