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Computation: The LEGO of physics

How can Everyman appreciate what theoretical physics is and what it is for? I doubt that a diet based exclusively on pulp press titles like "The Mystery of Black Holes," "Teleporting Schroedinger's Cat," "Thrills on the Edge of Chaos," or "In Search of the Last Quark" can be of much help. What we truly understand is only what we may make ourselves out of pieces we own and can play with.

Computation is such a "LEGO" kit. Computation IS dynamics that we can specify and run. It thus allows us to make worlds of our own. In this light, the eternal appeal of cellular automata is that ANYONE can create and run a nontrivial world and truly claim to know how it works. What may come as a surprise is that our physical world shows much evidence of having been constructed out of a kit of the same kind.

We'll show how QUITE SIMPLE computational models can fully capture---conceptually as well as empirically---non-frivolous aspects of physics such as relativity, the second principle of thermodynamics, and the variational principles of mechanics.

By means of kitchen experiments that they can actually run themselves we try to make our children intimately familiar with biology and evolution (breed water fleas in a fish tank) or chemistry and electricity (make a "potato clock"). What I will show you is "kitchen experiments" of theoretical physics.