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November 21, 2025

Editorial Office
Foundations of Physics
Springer Nature

Dear Editors,

I am pleased to submit my manuscript **"A Theoretical and Computational Implementation of a Participatory 'It From Bit' Universe"** for consideration for publication in *Foundations of Physics*.

This work provides the first rigorous mathematical and computational implementation of John Wheeler's "it from bit" vision of a participatory universe. This manuscript demonstrates that participatory dynamics can be formulated with mathematical precision and studied through validated computational models.

Summary of Contributions. The manuscript constructs an informational gauge theory on principal G-bundles where agents are represented as smooth sections of associated statistical fiber bundles. Agents carry beliefs, priors, and gauge frames over a base manifold, interacting through gauge-covariant transport operators with coupling strengths determined by information-theoretic attention weights. The framework yields several key results:

1. **Emergent geometry**: Pullback-induced Riemannian Fisher-Rao metrics on the base manifold arise naturally from agent belief structures, with decomposition into observable, "dark", and "hidden" sectors.

2. **Hierarchical emergence**: Computational simulations demonstrate spontaneous formation of 13-scale meta-agent hierarchies through consensus dynamics, with validated top-down feedback loops realizing Wheeler's "self-excited circuit".

3. **Connection to machine learning**: Standard transformer attention mechanisms emerge rigorously as the zero-dimensional, gauge-fixed limit of the framework, validated through language modeling experiments achieving competitive performance with 25% fewer parameters.

Relevance to Foundations of Physics. This work addresses core foundational questions: the relationship between information and physical reality, the emergence of geometric structure from observer dynamics, and the mathematical formulation of observer-dependent physics. The framework connects gauge theory, information geometry, and variational inference in a novel synthesis relevant to ongoing debates about emergent spacetime, and the role of observers in physical theory.

I have been careful to distinguish between what the framework rigorously establishes (the mathematical structure, computational demonstrations, and transformer emergence) and what remains speculative (connections to physical spacetime and consciousness). The manuscript acknowledges open problems and epistemic limitations explicitly.

Related Work. Companion papers focusing specifically on the transformer architecture derivation and implementation have been submitted to the Journal of Machine Learning Research. The present manuscript focuses on foundational and philosophical aspects appropriate for *Foundations of Physics*.

This manuscript has not been published elsewhere and is not under consideration by any other journal. There are no conflicts of interest to declare.

Thank you for considering this submission. I believe this work will be of significant interest to readers concerned with foundational questions about information, geometry, and the structure of physical theory.

Sincerely,

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