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Mathematical and Physical Foundations for QED

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In his approach to QED, Feynman reintroduced the ordering property of time as a fundamental component of his theory. This violated Minkowski's third postulate, that time be treated as a fourth geometric component, so constrained as to naturally satisfy Lorentz covariance. His work was so physically intuitive and computationally efficient, that despite some criticism, it is the method of choice for all textbooks on the subject and has since migrated to other areas of physics. This talk reviews research on the mathematical and physical foundations of quantum electrodynamics (QED).

We provide proofs of the following results.

1. Minkowski's third postulate, that time be treated as a fourth geometric component of a four vector is incompatible with the two postulates of Einstein for two or more particles.
2. Complete analysis of the Dirac equation for Hydrogen shows that the Pauli approximation is invalid for the study of s-states and that cut-offs are all ready required before field quantization.
3. Dyson's first conjecture, that the ultra-violet divergency in QED is caused by a violation of the Heisenberg uncertainly relationship.
4. Dyson's second conjecture, that the renormalized perturbation series is asymptotic.

Primary author: GILL, Tepper (Howard University)

Presenter: GILL, Tepper (Howard University)

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