1154-60-185 **William A Massey*** (wmassey@princeton.edu), ORFE Department, Sherrerd Hall, Princeton University, Princeton, NJ 08544. *A Feynman Approach to Dynamic Rate Markov Processes.*

Physics successfully uses mathematics to describe nature but it also broadens this language by inspiring the creation of new mathematics. A prominent example of this positive feedback loop is the development of calculus and differential equations by Isaac Newton to invent 17th century physics.

In this talk, we use more physics inspired mathematics to understand the random evolution of time-inhomogeneous or dynamic rate Markov processes. First, we use the 19th century physics concept of a Hamiltonian for time-homogeneous or constant rate Markov processes. The Kolmogorov forward and backward differential equations, that govern the dynamics of Markov transition probabilities, parallel the Heisenberg and Schrödinger pictures of early 20th century quantum mechanics.

Richard Feynman during the middle in the 20th century created a new framework for quantum mechanics. By reintroducing the 18th century physics concept of a Lagrangian, he incorporates both of these quantum pictures and includes relativistic effects. He then introduces an operator calculus to formulate the time-ordered exponential. Applying these techniques to dynamic rate Markov processes gives us a transition probability analysis that reveals their fundamental sample path structure. (Received August 21, 2019)