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Lack of Molecular Chaos and the Role of Stochasticity in Kac's *Ring* Model PRADEEP FERNANDO, PURU GUJRATI, The University of Akron — The dynamics of a system can either be deterministic or stochastic. In deterministic dynamics, there is unique *one-to-one* relationship between the initial state of the process and its evolution at a later time, while in stochastic process, there are several possible outcomes or evolved sates in future. Since the outcome is not certain, there are *one-to-many* relationships between the current states and its evolution in future. We use simple *Kac ring model* to demonstrate the properties of deterministic and stochastic dynamics. The results lead us to understand the following: 1) In deterministic dynamics, the memory of the initial state is never lost and therefore no equilibrium state will ever appear. Instead, the initial sate recurs eventually following Poincare Recurrence. In particular, molecular chaos assumption of Boltzmann cannot be justified. 2) In stochastic dynamics the system reaches equilibrium irrespective of the initial state. References: [1] P.D. Gujrati, Irreversibility, Molecular Chaos, and A Simple Proof of the Second Law, http://arxiv.org/abs/0803.1099 (arXiv:0803.1099) [2] P.D. Gujrati, Poincare Recurrence, Zermelo's Second Law Paradox, and Probabilistic Origin in Statistical Mechanics, http://arxiv.org/abs/0803.0983 (arXiv:0803.0983)

Puru Gujrati
The University of Akron

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