

# 國立清華大學數學系學術演講

## NTHU MATH Colloquium

- 講題      Blowing Hot Air at Big Bangs
- 講者      Prof. Willie Wong (Michigan State University)
- 時間      2023.11.20 (Mon.) 16:00 – 17:00
- 地點      第三綜合大樓**2樓 Room 201**
- 茶會      15:30, Room 707

### **Abstract**

Our understanding of the early universe is based, at least in part, on cosmological big bang solutions in general relativity. The cosmological assumption requires the solutions to be spatially homogeneous, and its imposition came from two considerations. On the practical and mathematical side, Einstein's equations form a system of nonlinear geometric partial differential equations, and there are no general theories that can be applied to provide global asymptotics for generic solutions. The symmetry assumption, on the other hand, reduces the equations of motions to a finite dimensional dynamical system, making its analysis more tractable. On the physical side, the "working assumption" is that when viewed from the largest scales, the inhomogeneities (stars, planets, galaxies) average out and the matter content of the universe can be approximated by a compressible fluid. The subject of this talk is our attempt to probe, mathematically, whether this latter physical "working assumption" is justified. In a joint work with Shih-Fang Yeh, we show that on the cosmological timescale, certain cosmological big bang scenarios are susceptible to instabilities generated through nonlinear self-interactions of the constituent matter.

The goal of this talk is to provide some mathematical context for this result, and briefly describe the instability mechanism involved.

\*歡迎參加，敬請張貼\* <http://www.math.nthu.edu.tw>