

# Workshop Schedule

**Events for:  
Thursday, March 4th - Sunday, March 7th**

## Thursday, March 4th

4:30pm **Predrag Cvitanovic, Georgia Tech, Math Colloquium**

**Title:** Do clouds solve PDEs?

**Abstract:** A not very ma-the-matical, mostly conceptual tribute to Mitchell J. Feigenbaum's and his friends 2AM thoughts about what was to be accomplished and much laughter about how it all turned out. Spoiler: not for a second did we believe that clouds are supercomputers in the sky. Instead of cranking Newton's time-evolution laws for fluids we sought insights into shapes in the sky. Or in brains. Perhaps theories where there is no time, there is only repertoires of spatiotemporal patterns. This is the opening talk of the Feigenbaum Memorial Conference  
<http://scgp.stonybrook.edu/archives/30373>

## Friday, March 5th

9:00am **Gemunu Gunaratne, University of Houston**

**Title:** Cycles and Robust Mode Analysis

**Abstract:** In 1983, Mitchell Feigenbaum suggested to the speaker, the use of unstable cycles and their eigenvalues to construct a systematic approach to organize chaotic motions and to compute dynamical invariants of the associated strange attractors. These ideas can be naturally extended to spatio-temporal dynamics through the use of Koopman operator theory and dynamic mode decomposition. We propose to identify robust constituents in a complex flow through dynamic modes common between multiple, nominally identical realizations of an experiment. This simple approach yields known flow constituents in multiple fluid and combustion flows. We also speculate that changes in the nature of flow constituents in realistic configurations (airplane engines?) may signal potential structural or material changes in the system.

10:00am **Robert MacKay, University of Warwick**

**Title:** Renormalisation of period-doubling for volume-preserving flows

**Abstract:** After some reminiscences about Feigenbaum and a review of our paper on period-doubling in area-preserving maps, I will recall my proposal for a period-doubling renormalisation operator on volume-preserving vector fields. I will flesh it out and emphasise how it fits with the Feigenbaum-Sullivan strategy of turning the scaling properties of marginally unstable critical dynamics into those for hyperbolic dynamics, and pose the question of whether the view enables a formulation of renormalisation on smooth conjugacy classes.

11:00am **Jean-Pierre Eckmann, University of Geneva**

**Title:** Feigenbaum's unpublished book on "Reflections on a Tube"

**Abstract:** Before his untimely death, Mitchell Feigenbaum has left with some of his friends files for a book with the title "Reflections on a Tube". I will summarize some of the contents of this astonishing piece of work which combines classical mathematical physics of optics with psychophysiology. The optics part studies in detail how images are reflected in a tube (known as anamorphs). After showing that the visual system is presented with the two (not one) reflected images (both of which do not image a real object) he went on to explain that we choose preferentially one of them. The question is the "which" and "why"? Starting from this discovery, Feigenbaum derived other aspects of his observation, dealing with the vision of fish, the "broken" pencil in water, or aspects of the floor of swimming pools. All these examples show two possible images. To me, his study shows mathematical physics at its best: From a careful analysis of a basically simple problem one uses the result to reach out to a multitude of seemingly unrelated subjects.

1:30pm **Informal session**

**Title:** TBA

Saturday, March 6th

Sunday, March 7th

10:00am **Konstantin Khanin, University of Toronto**

**Title:** TBA

11:00am **Mikhail Lyubich, Stony Brook University**

**Title:** Renormalization ideas in Dynamics: How Feigenbaum's discovery changed the World.

**Abstract:** We will give a general idea of the renormalization worldview in Dynamics and overview its numerous occurrences, with the main focus on Holomorphic and Real one-dimensional dynamics. It will include the following themes: the MLC problem and its connection to the Quadratic-like Renormalization responsible for the shapes of baby Mandelbrot copies, the Regular or Stochastic picture of the logistic family, construction of Julia sets of positive area, and Pacman Renormalization responsible for self-similarity of the Mandelbrot set near the main cardioid.

12:00pm **Dennis Sullivan, Stony Brook University**

**Title:** TBA