Yueheng Lan

CONTACT INFORMATION

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EDUCATION

Georgia Institute of Technology, Atlanta, GA, USA

Ph.D. in *Physics*, Dec 2004; Minor: Mathematics.
Thesis: *Dynamical systems approach to 1-d spatiotemporal chaos - A cyclist's view*

Northwestern University, Evanston, IL, USA

M.S. in *Physics*, Dec 2000.

Beijing University, Beijing, China

B.S. in *Physics*, July 1997
Minor: Electrical Engineering

RESEARCH INTERESTS

- Signal transduction, graph theoretic analysis and evolution analysis of cell reaction networks, cell migration, systems biology.
- Pattern formation, coherent structures and spatiotemporal chaos in fluids and complex systems.
- Non-equilibrium statistical mechanics, stochastic processes, field theory, nonlinear and complex dynamics, semiclassical calculations.
- Exact solutions, renormalization group approach to nonlinear differential equations and complex systems.
- Algorithms, computer simulations and computational biology and physics.

PUBLICATIONS

1. "*The anatomy of an NFkB regulation network through graph decomposition and dynamical systems analysis*", Y. Lan and I. Mezić, to be submitted(2008).
2. "*Elimination of fast variables in chemical Langevin equations*", Y. Lan, T. C. Elston and G. A. Papoian, submitted(2008).
3. "*Chaotic Spin Dynamics of a Long Nanomagnet Driven by a Current* ", Y. Lan and Y. C. Li, submitted(2008).
4. "*Unstable recurrent patterns in Kuramoto-Sivashinsky dynamics* ", Y. Lan and P. Cvitanović, Phys. Rev. E 78, 026208(2008).
5. "*On the dynamics of Navier-Stokes and Euler equations*", Y. Lan and Y. C. Li, J. Stat. Phys. 132, 35-76(2008).
6. "*The Stochastic Dynamics of Filopodial Growth*", Y. Lan and G. A. Papoian, Biophys. J. 94, 3839(2008).
7. "*Evolution of complex probability distributions in enzyme cascades*", Y. Lan and G. Papoian, J. Theor. Biol. 248, 537(2007).
8. "*Stochastic resonant signaling in enzyme cascades*", Y. Lan and G. Papoian, **Phys. Rev. Lett.** 98, 228301(2007). Selected to The Virtual Journal of Biological Physics Research.

9. "*Newton's descent method for the determination of invariant tori*", Y. Lan, C. Chandre and P. Cvitanović, Phys. Rev. E 74, 046206(2006) [nlin.CD/0508026].

10. "*A variational approach to the stochastic aspects of cellular signal transduction*", Y. Lan, G. Papoian and P. Wolynes, J. Chem. Phys. 125, 124106(2006). Selected to The Virtual Journal of Biological Physics Research.

11. "*The interplay between discrete noise and nonlinear chemical kinetics in a signal amplification cascade*", Y. Lan and G. Papoian, J. Chem. Phys. 125, 154901(2006).

12. "*Experimental evidence for the Volume Conjecture for the simplest hyperbolic non-2-bridge knot*", S. Garoufalidis, Y. Lan, Algebr. Geom. Topol. 5(17), 379(2005).

13. "*Stationary modulated-amplitude waves in the 1D complex Ginzburg-Landau equation*", Y. Lan, N. Garnier and P. Cvitanović, Physica D 188, 193-212(2004) [nlin.PS/0208001].

14. "*Variational method for finding periodic orbits in a general flow*", Y. Lan and P. Cvitanović, Phys. Rev. E 69, 016217(2004) [nlin.CD/0308008].

15. "*Analyzing intramolecular dynamics by fast Lyapunov indicators*", E. Shchekinova, C. Chandre, Y. Lan and T. Uzer, J. Chem. Phys. 121, 3471(2004).

16. "*Periodic structures on plasma surface*", Y. Lan and M. Y. Yu, Phys. Plasmas 11(8), 4146-4147(2004).

17. "*Turbulent fields and their recurrences*", P. Cvitanović and Y. Lan, in Proceed. of 10. Intern. Workshop on Multiparticle Production: Correlations and Fluctuations in QCD, N. Antoniou, ed. (World Scientific, Singapore 2003) [nlin.CD/0308006].

Conferences and Invited Talks

1. The Institute of Theoretical Physics, Chinese Academy of Science, Beijing, Jan 2008.
   Talk:"*Graph theoretic and dynamical systems analysis on a gene regulation network for complexity reduction*".

2. Peking University, Beijing, Dec 2007.
   Talk:"*Wielding noise in signal transduction networks*".

3. APS March Meeting, Denver, Mar 2007.
   Talk:"*Stochastic modeling of filopodial growth*".

4. Dynamics Days, Boston, Jan 2007.
   Poster:"*Stochastic resonant signaling in cell enzymatic cascades*".

5. University of Missouri, Missouri, Aug 2006.
   Talk:"*A variational approach to noisy signal transduction*".

6. Georgia Institute of Technology, Georgia, Dec 2005.
   Talk:"*Managing noisy signal transduction*".

7. University of Missouri, Missouri, Sep 2005.
   Talk:"*Spatiotemporal dynamics and invariant structures*".

8. The Fall Western Section Meeting of the American Mathematical Society, New Mexico, Oct 2004.
   Talk: "*Spatiotemporal recurrent patterns in the Kuramoto-Sivashinsky equation*".

9. Los Alamos National Lab, New Mexico, Feb 2004.
   Talk: "*Periodic orbits, variational method and spatiotemporal dynamics*".

10. Dynamics Days, North Carolina, Jan 2004.
    Oral Presentation: "*Coherent structures in 1-d spatiotemporal chaos*".

11. International Conference on Pattern Formation and Self-Organization in Nonlinear Complex Systems, Beijing, June 2001.
Poster: "*Stability of patterns in a modified CGLe*".

ACADEMIC EXPERIENCE

University of California, Santa Barbara, California, USA
Postdoctoral Research Associate **Apr, 2007 - current**

- Graph theoretic approach and dynamical systems analysis applied to large-scale networks.

The University of North Carolina, Chapel Hill, North Carolina, USA
Postdoctoral Research Associate **Jan, 2005 - Mar, 2007**

- Novel analytical techniques for treating noisy signal transduction process.
- Discovered the constructive role of noise in general reaction networks.
- Proposed multi-paths approach to the stochastic biochemical reactions.

Georgia Institute of Technology, Atlanta, Georgia, USA
Research Assistant **Jan, 2000 - Dec, 2004**

- Proved the existence of periodic structures in the 1-d complex Ginzburg-Landau equation and proposed a new formulation for its steady solutions.
- Developed variational methods for finding periodic orbits and invariant tori in general flows.
- Investigated coherent structures in 1-d Kuramoto-Sivashinsky equation by application of periodic orbit theory.
- Numerically identified different regions of motion in Hamiltonian systems and studied the nature of crossings between these regions.

Georgia Institute of Technology, Atlanta, Georgia, USA
Teaching Assistant **Jan, 2001 - May, 2002**

- Nonlinear Dynamics, Classical and Quantum Chaos.

Northwestern University, Evanston, Illinois, USA
Research Assistant **June, 1999 - Dec, 2000**

- Studied chaotic field theory and searched exact solutions in 1-d complex Ginzburg-Landau equation.
- Numerically pursued the concept that recurrent patterns in 1-d Kuramoto-Sivashinsky equation are organized by small invariant objects like stationary points, periodic orbits and various connections;
- Performed semiclassical calculations for the spectra of Helium atom by using periodic orbit theory.

Northwestern University, Evanston, Illinois, USA
Teaching Assistant **Sept, 1997 - May, 1999**

- Quantum Mechanics, Relativistic Quantum Field Theory and Nonlinear Dynamics
- Undergraduate labs: Optics, Electromagnetism and Mechanics.
- Discussion leader: Mechanics

Optical Institute of China Daheng Corporation, Beijing, China
Research Associate **Oct, 1995 - Oct, 1996**

- Computer simulation of optical diagnosis of the offset and coplanarity of chip leads.

HONORS AND AWARDS

- *Travel allowance to IMA Workshop: Stochastic Models for Intracellular Reaction Networks*, Institute for Mathematics and Its Applications (Minnesota), 2008.
- *National Science Foundation Grant (NSF) 0715225*, participation in writing the proposal, 2007.
- *Travel Grants for Dynamics Days in 2004 and 2007*, Dynamical Systems Organization.
- *Miller's Scholarship*, University of Missouri, 2006.
- *Gilbert Amelio Fellowship*, Georgia Institute of Technology, 2004.
- *Successful completion of Quarters of the International Scholar Programs for Teaching Excellence*, Northwestern University, 2000.
- *Honorable Mention in the International Mathematical Contest in Modeling*, Beijing University, 1996.
- *Second Prize in Challenge Cup Science Competition*, Beijing University, 1996
- *Huikai Scholarship*, Beijing University, 1994.

SKILLS AND EXPERTISE

- Large-scale network decomposition and analysis, nonlinear control of multi-agent systems.
- Expertise in treating stochastic systems, including stochastic PDEs, ODEs and master equation approach.
- Good knowledge in systems biology and cell migration.
- Expertise in finding periodic orbits in general flows, especially in high-dimensional flows.
- Analytical, topological and geometrical methods to analyze a dynamical system.
- Time series analysis, methods and skills.
- Fortran, C, C++, Matlab, Mathematica and Maple programming.

REFERENCES

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