

Janani Ravi

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EDUCATION

2006 - Present	Virginia Tech Blacksburg, VA, USA	Graduate Research Student Genetics, Bioinformatics and Computational Biology Topic: <i>Modeling the START Transition in the Budding Yeast Cell Cycle</i> Advisor: Prof. John Tyson
2002 - 2006	Centre for Biotechnology Anna University, India	B. Tech. Industrial Biotechnology

RESEARCH INTERESTS

- Cell cycle, size control and cancer signaling pathways including apoptosis, Wnt signaling
- Evolutionary processes in cancer progression:
 - Somatic evolution based on mutation acquisition
 - Cell population dynamics
- Microbial individual and population-level behaviors like chemotaxis, cooperativity and quorum sensing
- Dynamical systems & mathematical modeling:
 - Application of bifurcation theory
 - Construction and simulation of large quantitative models of cellular processes; model refinement using experimentally determined mutant phenotypes.
 - Deterministic and stochastic modeling; agent-based modeling.

RESEARCH EXPERIENCE

Graduate Research

- Modeling the START transition in the budding yeast cell cycle
 - We have built a detailed mathematical model for the START transition in yeast integrated to our published model of the whole cell cycle (Chen *et al.*, 2004). Our model quantitatively explains over 50 known START mutant phenotypes. Furthermore, it addresses outstanding issues related to i) the mechanism (and timing) of activation/inactivation of the START transcription factor, SBF, ii) the timing of Whi5 (SBF inhibitor), Swi6 (a component of the SBF complex) export to cytoplasm, and iii) size control under varying growth conditions. We are addressing ~125 more mutants pertaining to rest of the cell cycle.
- Modeling the canonical Wnt pathway
 - We have built a simplified model based upon the core module of the Wnt canonical pathway by Lee *et al.*, 2003, and incorporated additional key regulatory interactions. Using our model, we have shown that the Wnt signaling pathway can display bistability, in agreement with preliminary experimental results.
- Modeling the nutritional effect on size control in budding yeast cells
 - We have built a basic model for the nutritional effect of size control in budding yeast cells based on the ideas represented in Tyers *et al.*, 2004. This mechanism has been incorporated into the existing model of the yeast cell cycle to explain an initial set of 21 START mutants. The model requires incorporation of further mechanistic nuances and parameter estimation/fine-tuning based on mutant phenotypes.

Undergraduate Research

- **Bachelor's thesis** (Sep'05-May'06):
 - a) Reconstruction of the cMyc signaling network for modeling cMyc deregulation in cancer. Advisor: **Dr. Debnath Pal**. Supercomputing Education Research Centre, *Indian Institute of Science, Bangalore, India*.
 - b) Construction of a generic mathematical model for cell competition and compensatory proliferation between epithelial cell populations in the wings of *Drosophila melanogaster*.
- **Summer research** (May-Jun'05): Making stable siRNA constructs for β -actin (to be used as controls in Notch experiments). Advisor: **Dr. Annapoorni Rangarajan**. Molecular Reproduction, Development and Genetics, *Indian Institute of Sciences, Bangalore, India*.
- **Summer research** (May-Jun'04): Study of the impact of MTHFR gene polymorphisms on fetal viability in the context of gender bias. Advisor: **Dr. Radha Ramadevi**. *Center for DNA Fingerprinting and Diagnosis, Hyderabad, India*.

POSTER PRESENTATIONS

1. Computational Cell Biology Meeting. *Cold Spring Harbor Laboratories* (March 2011)
2. Signal Transduction and Gene Regulatory Networks Workshop. *Mathematical Biosciences Institute, OSU* (November 2010)
3. Gordon Research Conference on Cell Growth and Proliferation. *Colby College, Maine* (July 2009)
4. Computational Cell Biology Meeting. *Cold Spring Harbor Laboratories* (March 2009)
5. Biological Sciences Research Symposium. *Virginia Tech* (February 2009)

Other Meetings

1. Joint meeting of the National Centers of Integrative and Systems Biology 2007. *Boston* (June 2007)
2. Summer Symposium on Systems Biology of Cancer at Koch Institute for Integrative Cancer Research. *MIT* (June 2007)
3. ASBMB Meeting. *Washington DC* (April-May 2007)

PUBLICATIONS (*in preparation*)

1. Ravi J, Chen KC, Tyson JJ. Modeling the START transition in the budding yeast cell cycle.
2. Thorne C, Ravi J, Chen KC, Tyson JJ, Lee E *et al*. Modeling bistability in the canonical Wnt signaling pathway.

SKILLS

- Mathematical modeling of signaling networks: preparing detailed hypothesis and wiring diagram, conversion to a mathematical model based on differential equations, simulation, parameter estimation, bifurcation analysis.
- Programming: Perl, C, C++
- Software and Tools: XPPaut, Oscill8, JigCell (ModelBuilder, RunManager), PET (Parameter Estimation Toolkit), Matlab, CRNT (Chemical Reaction Network Toolbox), Copasi, Cell Designer
- Comfortable in Unix environment.

AWARDS, ACHIEVEMENTS AND PROFESSIONAL SERVICES

1. Awarded P.E.O. International Peace Scholarship in 2007.
2. All India Topper in CBSE Board STD X in the subject English with 99%.
3. School Topper in Chemistry in CBSE Board STD XII Examination with 97%.
4. Scholarship for All India rank in National Science Talent Search Examination.
5. Scholarship from the Central Board of Secondary Education, New Delhi for securing marks within top 0.01% at the National level.
6. Gave first music (carnatic classical vocal) performance at the age of thirteen.
7. O (outstanding) grade certificate from National English Language Testing Services (NELTS).
8. Gold Medal from Central Institute for Proficiency in English Language (CIPEL).
9. Part of content development team for www.classontheweb.com and www.eversmilelearning.com
10. Organized & hosted the Biotechcellence '05 a National Level Technical Symposium.