

**BIOGRAPHICAL SKETCH**

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NAME John Rinzel	POSITION TITLE Professor of Neural Science & Mathematics (NYU)		
eRA COMMONS USER NAME (credential, e.g., agency login) rinzeljm			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	MM/YY	FIELD OF STUDY
University of Florida, Gainesville, FL	B.S.	05/67	Engineering Science
New York University, New York NY	M.S.	10/68	Applied Mathematics
New York University, New York NY	Ph.D.	05/73	Applied Mathematics

**A. Personal Statement**

The goals of the proposed training are to develop skills and knowledge for the PhD student, Sara Steele, in computational modeling and psychoacoustics so that she can formulate, implement and analyze, models and experimental protocols for auditory scene analysis. The proposed research will focus on the dynamics of auditory perception for ambiguous scenes. We will develop computational and mechanistic models in parallel with performing psychophysical experiments on human subjects for a widely-studied paradigm, the alternating triplet pattern of ABA\_ABA\_ tone sequences. I have 40 years of research and training experience, as a computational neuroscientist, investigating and modeling the dynamics of neuronal systems. and, continuously, in auditory processing for the past 15 years. I have sponsored over 40 postdocs and PhD students in computational and experimental neuroscience (including in vitro electrophysiology of auditory brainstem, since 1999, and psychophysics of visual perceptual bistability, since 2004). In 2011, I dedicated my sabbatical year (supported by a K-18 NIDCD Research Career Development award) to developing skills and knowledge in auditory psychoacoustics and perception, mentored by Dr E Sussman and Dr S Shamma. I developed software, performed experiments and gathered data on the bistability dynamics for ABA\_ABA\_ and formulated models and ran simulations on the dynamics. I have worked successfully with S Steele over the recent months in applying a novel model to already published and to our preliminary behavioral data for the buildup phenomena. We are setting up a sound booth in my lab for the behavioral experiments. We have the resources and skills for the training of Steele and for the research that she proposes. The co-sponsoring by Dr E Sussman (Albert Einstein College of Medicine) will complement and enhance both the training and research components of the endeavor. I have established a fruitful working relationship with Dr Sussman during my sabbatical year.

**B. Positions and Honors****Positions and Employment**

1968-70,

1973-75 Mathematician, Division of Computer Research and Technology, National Institutes of Health

1975-97 Chief and Research Mathematician, Mathematical Research Branch, NIDDK, National Institutes of Health (Chief, '81-'97)

1997- Professor, Center for Neural Science and Courant Institute of Mathematical Sciences, New York University

**Adjunct/Visiting Appointments include (among others)**

1980 Dept Math, University of British Colombia (6-month sabbatical)  
1975-1979,  
1989-1997 Dept of Math, University of Maryland, College Park  
1995-1997 Dept of Biomedical Engineering, Johns Hopkins University  
1998- Laboratory of Biological Modeling, NIDDK, National Institutes of Health  
2002 Mathematical Biosciences Institute, Ohio State University (4 month leave from NYU)  
2010- Chair Professor, Center of Neural and Cognitive Computation, TNLinst, Tsinghua University, Beijing

### **Other Experience and Professional Memberships**

AMS-SIAM Committee on Mathematics in the Life Sciences, 1983-2002.  
Program Committee: Computation and Neural Systems Meetings, 1993-1995.  
SIAM Activity Group on Life Sciences, Vice-Chair, 2003-2005; Chair, 2005-2007.  
Organizing Committee: Year in Mathematical Neuroscience at Mathematical Biosciences Institute, Ohio State University, 2002-2003 and 2012-2012.  
Board of Governors, Mathematical Biosciences Institute, Ohio State University, 2002-2005  
Member of: Acoustical Society of America, American Association for the Advancement of Science, Society for Industrial and Applied Mathematics (SIAM). Society for Mathematical Biology, Society for Neuroscience

### **Honors**

1986 USPHS, Medal of Citation; 1992 USPHS, Outstanding Service Medal  
Aisenstadt Chair, Centre de Recherches Mathematiques, Montreal, 2007.  
D.G. Marquis Award as co-author of the best paper published in Behavioral Neuroscience in 2011,

## **C. Selected peer-reviewed publications (out of 129 total peer-reviewed pubs)**

### **Most relevant to the current application**

Shapiro A, Moreno-Bote R, Rubin N, **Rinzel J**: Balance between noise and adaptation in competition models of perceptual bistability. *J Comput Neurosci* **27**: 37-54, 2009.  
Moreno-Bote R, Shapiro A, **Rinzel J**, Rubin N: Alternation rate in perceptual bistability is maximal at and symmetric around equi-dominance. *J Vision* **10(11)**: 1–18, 2010.  
Mathews PJ, Jercog P, **Rinzel J**, Scott LL, Golding NL: Control of submillisecond synaptic timing in binaural coincidence detectors by Kv1 channels. *Nature Neurosci* **13**: 601-609, 2010. PMC3375691.  
Jercog P, Svirsakis G, Kotak V, Sanes D, **Rinzel J**: Asymmetric excitatory synaptic dynamics underlie interaural time difference processing in the auditory system. *PLoS Biology* **8**: 6, e1000406, 2010. PMC2893945  
Matell MS, Shea-Brown E, Gooch C, Wilson AG, **Rinzel J**: A heterogeneous population code for elapsed time in rat medial agranular cortex. *Behav Neurosci*. **125**:54-73, 2011. PMC3078766

### **Additional recent publications of importance to the field (in chronological order)**

**Rinzel J**, Terman D, Wang X-J, Ermentrout B: Propagating activity patterns in large-scale inhibitory neuronal networks, *Science* **279**:1351-1355, 1998.  
Agmon-Snir H, Carr CE, **Rinzel J**: A case study for dendritic function: improving the performance of auditory coincidence detectors, *Nature* **393**:268-272, 1998.

Svirskis G, Kotak V, Sanes DH, **Rinzel J**: Enhancement of signal-to-noise ratio and phase locking by a low threshold outward current in auditory neurons. *J Neurosci* **22**:11019-11025, 2002.

Svirskis G, Kotak V, Sanes D, **Rinzel J**: Sodium along with low threshold potassium currents enhance coincidence detection of subthreshold noisy signals in MSO neurons. *J Neurophys* **91**:2465-2473, 2004.

Shea-Brown ET, **Rinzel J**, Rakitin BC, Malapani C: A firing-rate model of Parkinsonian deficits in interval timing. *Brain Res* **1070**: 189-201, 2006.

Moreno-Bote R, **Rinzel J**, Rubin N: Noise-induced alternations in an attractor network model of perceptual bistability. *J Neurophysiol* **98**: 1125-1139, 2007.

Shapiro A, Curtu R, **Rinzel J**, Rubin N: Dynamical characteristics common to neuronal competition models. *J Neurophysiol* **97**: 462-73, 2007. PMC2702527

Gai Y, Doiron B, Kotak V, **Rinzel J**: Noise-gated encoding of slow inputs by auditory brainstem neurons with a low-threshold K<sup>+</sup> current. *J Neurophysiol*, **102**: 3447-3460, 2009. PMC2804414

Gai Y, Doiron B, Kotak V, **Rinzel J**: Slope-based stochastic resonance: How noise enables phasic neurons to encode slow signals. *PLoS Comput Biology*, **6(6)**:1-15, e1000825, 2010.

Marti D, **Rinzel J**: Dynamics of Perceptual Categorization. *Neural Computation* in press.

## **D. Research Support**

### **Ongoing Research Support**

R01 DC008543-01      Rinzel (PI)      09/01/07 - 08/31/12, NCE to 8/31/13

Biophysical Specializations Enrich Temporal Selectivity of MSO Neurons

Goals are to test hypotheses about dynamical and biophysical mechanisms at the cellular level for neuronal temporal processing in the auditory brain stem, particularly in the medial superior olive. The study includes experimental (in vitro, gerbil) and computational components (mechanistic and information processing models).

Role: PI

New York University Research Challenge Fund      Rinzel(PI)      06/01/12 – 5/31/13.

Dynamics of Auditory Streaming.

This grant is supporting the purchase of a sound proof booth, and some subject compensation, for the psychophysical experiments that will be conducted in the Rinzel lab on the dynamics of streaming and perceptual alternations for ambiguous stimuli.

Role: PI

### **Completed Research Support**

R01 MH62595-01      Rinzel (PI)      04/01/01-3/31/05

Nonlinear Dynamics of Neuronal Temporal Processing.

We tested hypotheses about dynamical and biophysical mechanisms for neuronal temporal processing in inferior colliculus auditory brain stem. The projects involved mechanistic modeling of neurons and electrophysiology (in vitro, gerbil).

Role: PI

NIH/NIDCD, DC011602-01 Rinzel (PI)      04/01/2011 - 3/31/2012

K-18 Career Development Award for Established Investigators: Bistability and alternating streams during perceptual ambiguity. Mentors: Dr E Sussman (human psychophysics with EEG, Albert Einstein College of Medicine) and Dr S Shamma (electrophysiology in auditory cortex of awake ferrets, performing tasks).

Swartz Foundation Grant for Computational Neuroscience      Rinzel & Rubin (co-PIs)      01/25/05-01/24/08

Dynamics and Mechanistic Models of Perceptual Bistability: Binocular Rivalry and Plaids

We developed, analyzed, and tested (simulation and psychophysics) mechanistic models for the rhythmic alternation of 2 or more perceptions in visually presented ambiguous stimuli.

Role: Co-PI.

Program Director/Principal Investigator (Last, First, Middle):

Swartz Foundation Grant for Computational Neuroscience Rinzel (PI) 11/24/08-11/23/11, 09/01/11-08/31/12  
Computational Modeling of Cognitive Dynamics

Goal is to develop, analyze, and interpret mechanistic models for the dynamics of perception and cognition during various tasks: perceptual search and grouping, segmentation, and sudden-insight problem-solving.

Role: PI