

# Center for Applied Mathematical Sciences Distinguished Lecturer, Fall 2017



## H. Thomas Banks

LeRoy B. Martin Jr. Distinguished Professor  
Distinguished University Professor, Mathematics  
Director, Center for Research in Scientific Computation  
N.C. State University

### Modeling Bumble Bee Population Dynamics with Delay Differential Equations or What's the Buzz about Global Bumblebee Decline?

#### Abstract:

We report on our continuing efforts between our group at NCSU and ecologists at California State University, Monterey Bay and the Swedish University of Agricultural Sciences, Uppsala. To provide a tool for projecting and testing sensitivity of growth and death of populations under contrasting and combined pressures, we developed a non-linear, non-autonomous delay differential equation (DDE) model of bumblebee colonies and resources model that describes multi-colony bumble bee population dynamics. We explain the usefulness of delay differential equations as a natural modeling formulation, particularly for bumble bee modeling. We then introduce a specific spline-based numerical method that approximates the solution of the delay model. We demonstrate that the model satisfies sufficient conditions to assure the subsequent theoretical developments therein in order to attain convergent approximate solutions. We report on our recent efforts on studies of response to toxic substances, in particular our simulations related to growth, death and sublethal responses to neonicotinoid exposure.

**Monday, October 23, 2017**

**Kaprielian Hall**

**Reception: 3:00 p.m.  
KAP 410**

**Lecture: 3:30 p.m.  
KAP 414**

**Wine & Cheese: 4:30 p.m.  
KAP 410**

**CAMS Director:**  
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Tom Banks received his Ph.D. in applied mathematics from Purdue University in 1967. To date he has mentored 48 Ph.D. students including USC professors Gary Rosen and Chunming Wang. Tom Banks was the founding director of CAMS at USC.

He is well known for his research contributions to a broad range of applied mathematics including control and parameter estimation for delay and partial differential equations; computational methods; statistical and mathematical methods for inverse problems; modeling in biological and physical problems.

His honors and awards includes Outstanding Research Achievement Award, Air Force Office of Scientific Research, 1990 and 1996; Outstanding Research Achievement Award, NC State Alumni Association, 1996 and 2008; IEEE Control Systems Technology Award, 1996; SIAM W.T. & Idalia Reid Prize in Applied Mathematics, 2002.

He is a Fellow of IEEE, the Institute of Physics, SIAM and AAAS.