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### Research Interests

- Computational and mathematical modeling of complex systems
  - Spatially-explicit, Individual-based ecosystem models (virtual ecosystems) to study population persistence, multiannual population fluctuations, effect of habitat fragmentation and climate change on population extinction, species with different life strategies, genetic variability.
  - Mathematical Ecology; Computational Ecology; Population and Community Ecology; Food Webs
  - Physiologically-structured population dynamics
  - Ecology and evolution of infectious disease: computational and mathematical modeling
  - Nonlinear dynamics: stability/instability, nonlinear oscillations, bifurcations, deterministic chaos
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### Education

Ph.D. Mathematics (Mathematical Modeling), Sofia University, Bulgaria, 1985  
M.Sc. Mathematics (Mathematical Modeling), Sofia University, Bulgaria, 1979

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### Research and Professional Experience

8/01–present Computational Mathematician, Center for Applied Scientific Computing, LLNL  
1/01–7/01 Visiting Professor, Dept. of Mathematics, Texas A&M University, College Station  
10/00–7/01 Participating Guest, Center for Applied Scientific Computing, Lawrence Livermore National Laboratory  
9/99–9/00 Visiting Professor, Dept. of Mathematics, UCSC, Santa Cruz  
1992–1999 Senior Research Associate, Math. Modeling, Institute of Mathematics, Bulgarian Academy of Sciences  
1991–92 Visiting Professor, Dept. of Mathematics, University of Southern California, L.A.  
1990–91 Visiting Professor, Dept. of Mathematics, University of Wyoming, Laramie  
1987–89 Junior Research Associate, Math. Modeling, Institute of Mathematics, Bulgarian Academy of Sciences  
1984–1987 Junior Research Associate, Group for Math. Modeling in Biology, Bulgarian Academy of Sciences

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### Honors

- Honorary Acceptance for undergraduate study in the Faculty of Mathematics, Sofia University as a finalist of the National Olympiad in Mathematics, 1979
  - Yearly High Academic Achievements Stipends, Sofia University, 1975–1979
  - Invited speaker and session organizer (recent):
    - Mathematical Modelling of Population Dynamics, International Conference, Bêdlewo, Poland, 2002, invited speaker
    - DESTOBIO 2000, International Conference, Purdue University, 2000, plenary speaker
    - Alcala 2nd International Conference on Mathematical Ecology, Spain, 2003, session organizer
    - Lecturer: International Summer School "Mathematics in Cell Physiology and Proliferation", Termoli, Italy, 1999
    - Alcala 1st International Conference on Mathematical Ecology, Spain, 1998, invited speaker and session organizer
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### Professional Service and Memberships

**Reviewer for:** *Mathematical Biosciences, Theoretical Population Biology, Discrete and Continuous Dynamical Systems-B, Applied Numerical Mathematics, Mathematical and Computer Modeling, Zentralblatt fuer Mathematics*

**Committees:**

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Computational and Mathematical Population Dynamics, International conference, Trento, Italy, June 2004, organizing committee member  
Alcala 2nd International Conference on Mathematical Ecology, Spain, September 3-8, 2003, scientific committee  
International Conference on Deterministic and Stochastic Modelling of Biointeraction (DESTOBIO'00), Purdue University, 2000 - scientific committee  
International Conference on Deterministic and Stochastic Modelling of Biointeraction (DESTOBIO'97), Sofia, 1997, chair

**Societies:** Society of Mathematical Biology

## Publications

### Manuscripts

Kostova, T., T., Carlsen, The Effect of Habitat Inhomogeneities and Fragmentation on the Population Density and the Time to Extinction of Prairie Vole Populations, submitted to Proceedings of the 2<sup>nd</sup> Alcala Conference of Mathematical Ecology, December 2003, Also available as Lawrence Livermore National Laboratory Technical Report UCRL-PROC-201639

Kostova, T., T., Carlsen, "The Effect of Area Size and Predation on the Time to Extinction of Prairie Vole Populations. Simulation Studies Via SERDYCA: a Spatially Explicit Individual-Based Model of Rodent Dynamics", submitted to Ecological Complexity, November 2003. Also available as Lawrence Livermore National Laboratory Technical Report UCRL-JRNL-201153

Kercher J.R., Hindmarsh A.C., and T. Kostova, "Limit Cycles for a Class of Ordinary Differential Equations." Also available as Lawrence Livermore National Laboratory Technical Report UCRL-144111, LLNL, 2002

Thomas W. Bates, Ph.D.; Christine Paulson, B.S.; Tanya Kostova, Ph.D.; Frank Chuang, Ph.D.; John Chang, Ph.D.; Marie-Anne Descalle, Ph.D.; Nada Bagheri, B.S.; Pete Estacio, M.D., Ph.D.; Bill Colston, Ph.D.; Fred Milanovich, Ph.D., "A system for continuous monitoring of person-to-person contact, with reference to utilization in public health investigations", manuscript submitted to *Computer methods and programs in biomedicine 2003*. Also available as Lawrence Livermore National Laboratory Technical Report UCRL-152342

### Book chapter

Efroymson, R. A., Carlsen, T. M., Jager, H. I., Kostova, T., Carr, E. A., Hargrove, W. W., Kercher, J., and Ashwood, T. L., "Toward a Framework for Assessing Risk to Vertebrate Populations from Brine and Petroleum Spills at Exploration and Production Sites," *Landscape Ecology and Wildlife Habitat Evaluation: Critical Information for Ecological Risk Assessment, Land-Use Management Activities, and Biodiversity Enhancement Practices, ASTM STP 1458*, L. Kapustka, H. Galbraith, M. Luxon, and G. R. Biddinger, Eds., ASTM International, West Conshohocken, PA, 2004. Also available as Lawrence Livermore National Laboratory Technical Report UCRL-JC-152537

### Peer reviewed journal articles

Kostova T., Carlsen T., Kercher J., "Individual-Based, Spatially Explicit Model of an Herbivore and its Resource: The Effect of Habitat Reduction and Fragmentation", *Comptes Rendus Biologies*, v. 327(3)(2004), pp.261-276. Also available as Lawrence Livermore National Laboratory Technical Report UCRL-JC-148434

Kostova, T., Ravindran R., and Maria Schonbek, "FitzHugh-Nagumo Revisted," *International J. Bifurcation & Chaos*, in press, to appear 2004.

Kostova T., "An Explicit Third-Order Numerical Method For Size-Structured Population Equations," *Numerical Methods for Partial Differential Equations*, v.19, no. 1, pp.1-21, 2003

Kostova, T., "The Age-Dependent Model: Numerical Check of Stability/Instability of a Steady State," *Mathematical and Computer Modelling*, 31 (2000), pp. 415.

Kostova, T., Jia Li, and M. Friedman, "Two Models for Competition Between Age Classes", *Mathematical Biosciences*, 157 (1999), pp. 65–89.

Kostova T., and B. Chen, "Two-Parameter Bifurcations of Multiple Steady States of a Reaction-Diffusion Equation," *Mathematica Balkanica*, new series, 13(1-2) (1999), pp. 169–182.

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- Kostova, T., and Jia Li, "Oscillations and Stability Due to Juvenile Competitive Effects on Adult Fertility," *Comp. Math. Applic.*, 32(11) (1996), pp. 57–70.
- Kostova, T.V., and F. Milner, "An Age-Structured Model of Population Dynamics with Dominant Ages, Delayed Behavior, and Oscillations," *Mathematical Population Studies*, 5(4) (1995), pp. 359–375.
- Kostova, T.V., "Asymptotic and Oscillatory Behavior of Solutions to Nonlinear Delay Equations," *Journal of Mathematical Analysis and Applications*, 177(2) (1992), pp. 415–431.
- Milner, F., and Kostova, T.V., "Some Examples of Nonstationary Populations of Constant Size," *Lecture Notes in Biomathematics*, 92 (1991), pp. 219–234.
- Kostova, T.V., and F. Milner, "Nonlinear Age-Dependent Population Dynamics with Constant Size," *SIAM J. Appl. Math.*, 22(1) (1991), pp. 129–137.
- Kostova, T.V., and N.H. Chipev, "A Model of the Dynamics of Intramolluscan Trematode Populations: Some Problems Concerning Oscillatory Behaviour," *Comp. Math. Appl.*, 21(5) (1991), pp. 1–15.
- Kostova, T., Numerical Solutions to Equations Modelling Nonlinearly Interacting Age-Dependent Populations, *Comp. Math. Appl.*, 19, 8/9, 95-103, 1990
- Kostova, T.V., Numerical Solutions of a Hyperbolic Differential-Integral Equation, *Comp. Math. Appl.*, 15, 6-8, 427-436, 1988
- Kostova, T.V., Marchecheva, M., Numerical Solutions to the Gurtin-MacCamy Equation, *Math. Balkanica*, v.3, 3-4, 264-277, 1988
- Kostova, T.V., Asymptotic Behaviour in Michaelis-Menten Type Equations with Time - Dependent Input, *Comptes Rendus Acad. Bulg. Sci.*, 38, 10, 1291 - 1294, 1985
- Kostova, T.V., Asymptotic Stability in Michaelis - Menten Type Equations, *Comptes Rendus Acad. Bulg. Sci.*, 38, 9, 1125-1128, 1985,
- Kostova, T.V., Estimates of the Real Parts of Eigenvalues of Complex Matrices, *Compt. Rend. Acad. Bulg. Sci.*, 38, 1, 15-18, 1985
- Kostova, T.V., Estimates of the Perron Root Sensitivity and Other Corollaries of a New Representation of the Solution of Linear Differential Equations, *Comptes Rendus Acad. Bulg. Sci.*, 37, 12, 1601-1604, 1984
- Kostova, T.V., Markov, S.M., Vassilevski, P.S., Dynamical Model of Short-Term Memory, *Annual of the Univ. Sofia, Fac. Math. Mech.*, 173, 129 -154, 1979

### Peer-reviewed proceedings articles

- Kostova, T.V., "Oscillations in Age-Dependent Population Dynamics," in *Proceedings of the International Conference of Differential Equation and Applications to Biology and to Industry*, Claremont, 1994.
- Kostova, T.V., Numerical Solutions of the Age-Structured Population Model, *ZAMM*, 69, 4, T168 - T170, 1989
- Kostova, T.V., Numerical Solutions of Some Hyperbolic Differential-Integral Equations, *Teubner-Texte zur Mathematik*, Band 107, 210-214, 1988
- Markov, S., Kostova-Vassilevska, T., A Dynamical Model of Synaptic Transmission, *In: Dynamical Systems and Environmental Models*, Akademie-Verlag Berlin, 1987
- Markov, S.M., Kostova, T.V., A Model of Synapse Transmission, Boundary and Interior Layers: Computational and Asymptotic Methods: Proceedings of the BAIL Ist Conf. held at Trinity College, Dublin, June, 1980, pp.1360-1364

### PhD Thesis

- Kostova, T.V., Asymptotic Stability and Other Problems Generated by a Model of Synaptic Transmission, *Ph.D. Thesis*, (Bulgarian), Sofia University, 1985

### Recent International Presentations

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T. Kostova, T. Carlsen, "Effect of Fragmentation on the Time to Extinction of Prairie Vole Populations in Tallgrass Prairie", presented at Alcalá 2nd International Conference On Mathematical Ecology, 09/05-09/09, Alcalá de Henares, Spain

Kostova, Tanya, Tina Carlsen, and Jim Kercher, "Individual-Based Modelling of Territorial Mammals: Effect of Habitat Reduction and Fragmentation," *Int. Conf. Math. Population Dynaics.*, invited talk, Bedlewo, Poland, June 24-28, 2002.

### **Editorial Work**

"Epidemiology, cellular automata, and evolution, Part I," selected papers from the *Conference on Deterministic and Stochastic Modelling of Biological Interaction (DESTOBIO'97)* Sofia, Bulgaria, August 28–31, 1997. Editors: Z. Agur, J. Cushing, O. Diekmann, M. Gyllenberg, H. Heesterbeek, P. Jagers, M. Kimmel, T. Kostova, F. Milner and C. Mode, *Math. Biosci.* 156(1-2) (1999), Elsevier, New York, 1999 pp. i–viii and 1–342.

"Deterministic models with applications in population dynamics and other fields of biology, Part II," selected papers from the *Conference on Deterministic and Stochastic Modelling of Biological Interaction (DESTOBIO'97)* Sofia, Bulgaria, August 28–31, 1997. Editors: Z. Agur, J. Cushing, O. Diekmann, M. Gyllenberg, H. Heesterbeek, P. Jagers, M. Kimmel, T. Kostova, F. Milner and C. Mode. *Math. Biosci.* 157(1-2) (1999), Elsevier, New York, 1999 pp. i–viii and 1–376.

### **Software**

SERDYCA - Spatially Explicit Individual-Based Model of Rodent Dynamics, 2003 (C++)

Implementation of an explicit 3<sup>rd</sup> order method for numerical solving of size-structured population dynamics equations, 2003 (Fortran)

Candev, M., N. Chipev, and T. Kostova, "ModSim - a user-friendly software for modelling and simulation," user's manual and code, 1999, distributed by Exeter Software, [www.exetersoftware.com](http://www.exetersoftware.com).