

Stanca Mihaela Ciupe

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Education

- 2005 Ph.D University of Michigan, Ann Arbor, Applied and Interdisciplinary Mathematics
Advisor: Dr. Patrick W. Nelson.
Dissertation title: *Development and applications of mathematical tools in models of infectious diseases and biological phenomenon*
- 1998 M.S. Babes-Bolyai University, Cluj-Napoca, Romania, Mathematics.
- 1997 B.S. Babes-Bolyai University, Cluj-Napoca, Romania, Mathematics.

Employment

- August 2015- present Associate professor with tenure, Mathematics Department, Virginia Tech.
- August 2017-May 2018 Visiting Associate Professor, Mathematics Department, Duke University.
- February 2018 Visiting Researcher, Los Alamos National Laboratory.
- August 2011- 2015 Tenure-track assistant professor, Mathematics Department, Virginia Tech.
- August 2009-2011 Tenure-track assistant professor, Mathematics Department, University of Louisiana at Lafayette.
- August 2006-2009 Postdoctoral research associate, Duke University Medical Center, Lab. of Computational Immunol.
Sponsor: Dr. Thomas B. Kepler.
- July 2005-July 2006 Postdoctoral researcher, Santa Fe Institute and Los Alamos National Laboratory.
Sponsor: Dr. Alan S. Perelson.
- 2000 - 2005 Graduate Student Instructor, University of Michigan.
Thesis advisor: Dr. Patrick W. Nelson.
- 1999 - 2000 Teaching Assistant, The Ohio State University.

Grants and Awards

Awarded:

- PI: NSF DMS-1813011 Research Grant *Understanding the Mechanism of Protection Following Challenge and Immunization*, Sept 2018-August 2021: \$210,656.
- PI: Simons Foundation Mathematics and Physical Sciences-Collaboration Grants for Mathematicians, Sept 2016-August 2018: \$35,000.
- PI: NSF DMS-1214582 Research Grant *Understanding the antibody responses following Human Immunodeficiency Virus infection*, Sept 2010-August 2014: \$143,975.
- Virginia Tech ITSG International Travel Grant, 2014, 2015, 2016, 2018: \$2,000.
- Virginia Tech Mentoring Grant, 2012: \$1,500.
- UL Lafayette Summer Research Award, 2010: \$4,800.
- Fields Institute Travel Award to attend *Thematic Program on the Mathematics of Drug Resistance in Infectious Diseases*, 2010.
- NSF Post-doc/ Early Career Travel Award to attend the SIAM Conference on the Life Sciences, 2008, 2010.
- Landahl travel grant to attend the Annual Meeting for The Society for Mathematical Biology, 2003, 2007, 2008, 2010.
- Allen L. Shields Memorial Fellowship, University of Michigan, 2005.
- Graduate student Research Assistant, University of Michigan, 2004-2005.
- Department Fellow, University of Michigan, 2001-2002.

Research Interests

Mathematical modeling; Mathematical Biology; Theoretical immunology; Ordinary and delay differential equations;
Model selection theory; Model validation.

Publications

Peer reviewed:

- J27.** S Kadelka, BP Boribong, L Li, and SM Ciupe. Mathematical model of the bistable dynamics between primed and tolerant states of the innate immune system. *Bull Math Biol*, 81:256–276, 2019.
- J26.** L Kaderali, F Theis, VV Ganusov, SM Ciupe, R Mehr, R Ribeiro, and EA Hernandez-Vargas. Editorial: Integrative computational systems biology approaches in immunology and medicine. *Front in Microbiol*, 9:3338, 2018. doi: 10.3389/fmicb.2018.03338.
- J25.** SM Ciupe. Modeling the dynamics of hepatitis B infection, immunity, and drug therapy. *Immunol Rev*, 285:38–54, 2018.
- J24.** SM Ciupe, C Miller, and J Forde. Bi-stable behavior can explain the differences in disease outcome following SHIV infections in rhesus macaques. *Frontiers in Microbiology*, 9:1–11, 2018.
- J23.** R Nikin-Beers, J Blackwood, L Childs, and SM Ciupe. Unraveling within-host signatures of dengue infection at the population level. *J theor Biol*, 446:79–86, 2018.
- J22.** N Dorratoltaj, R Nikin-Beers, SM Ciupe, SG Eubank, and KM Abbas. Multi-scale immunoepidemiological modeling of within-host and between-host HIV dynamics: Systematic review of mathematical models. *PeerJ*, 5:e3877, 2017.
- J21.** SM Ciupe and JM Heffernan. In-host modeling. *Infectious Disease Modelling*, 2:188–202, 2017.
- J20.** A Carracedo Rodriguez, M Chung, and SM Ciupe. Understanding the complex patterns observed during hepatitis B virus therapy. *Viruses*, 9:117, 2017.
- J19.** R Nikin-Beers and SM Ciupe. Modeling original antigenic sin in dengue viral infection. *Math Med Biol*, page dx002, 2017.
- J18.** M Verma, S Erwin, V Abedi, R Hontecillas, S Hoops, A Leber, J Bassaganya-Riera, and SM Ciupe. Modeling the mechanisms by which HIV-associated immunosuppression influences HPV persistence at the oral mucosa. *PLoS One*, 12:e0168133, 2017.
- J17.** S Erwin and SM Ciupe. Models of germinal center formation during non-chronic and chronic disease. *Math Biosci Eng*, 14:655–671, 2017.
- J16.** JE Forde, SM Ciupe, A Cintron-Arias, and S Lenhart. Optimal control of drug therapy in a hepatitis B model. *Applied Sciences*, 6:1–18, 2016.
- J15.** A Leber, V Abedi, R Hontecillas, M Viladomiu, S Hoops, SM Ciupe, J Caughman, T Andrew, , and J Bassaganya-Riera. Bistability analyses of CD4+ T follicular helper and regulatory cells during *Helicobacter pylori* infection. *J Theor Biol*, 398:74–84, 2016.
- J14.** R Nikin-Beers and SM Ciupe. The role of antibody in enhancing dengue virus infection. *Math Biosci*, 263:83–92, 2015.
- J13.** SM Ciupe. Mathematical model of multivalent virus-antibody complex formation in humans following acute and chronic HIV infections. *J Math Biol*, 71:513–532, 2015.
- J12.** SM Ciupe, RM Ribeiro, and AS Perelson. Antibody responses during Hepatitis B viral infection. *PLoS Comput Biol*, 10:e1003730, 2014.
- J11.** SM Ciupe and E Schwartz. Understanding virus-host dynamics following EIAV infection in SCID horses. *J Theor Biol*, 343:1–8, 2014.
- J10.** SM Ciupe, BH Devlin, ML Markert, and TB Kepler. Quantification of total T-cell receptor diversity by flow cytometry and spectratyping. *BMC Immunol*, 14:1–12, 2013.
- J9.** SM Ciupe and S Hews. Mathematical models of e-antigen mediated immune tolerance and activation following prenatal HBV infection. *PLoS One*, 7:e39591, 2012.

- J8.** J Forde, J Volpe, and SM Ciupe. Latently infected cell activation: A way to reduce the size of the hiv reservoir? *Bull Math Biol*, 74:1651–1672, 2012.
- J7.** SM Ciupe, P De Leenheer, and TB Kepler. Paradoxical suppression of broadly neutralizing antibodies in the presence of strain specific antibodies during HIV infection. *J Theor Biol*, 277:55–66, 2011.
- J6.** SM Ciupe, A Catlla, J Forde, and DG Schaeffer. Dynamics of hepatitis B virus infection: what causes viral clearance? *Math Popul Stud*, 18:87–105, 2011.
- J5.** SM Ciupe, BH Devlin, ML Markert, and TB Kepler. The dynamics of T-cell receptor repertoire diversity following thymus transplantation for DiGeorge Anomaly. *PLoS Comput Biol*, 5:1–13, 2009.
- J4.** PW Nelson, N Smith, SM Ciupe, W Zou, GS Omenn, and M Pietropaolo. Modeling dynamic fluctuations in type 1 diabetes progression. *Math Biosci Eng*, 6:753 – 778, 2009.
- J3.** SM Ciupe, RM Ribeiro, PW Nelson, G Dusheiko, and AS Perelson. The role of cells refractory to productive infection in acute hepatitis B viral dynamics. *Proc Natl Acad Sci USA*, 104:5050–5055, 2007.
- J2.** SM Ciupe, RM Ribeiro, PW Nelson, and AS Perelson. Modeling the mechanisms of acute hepatitis B virus infection. *J Theor Biol*, 247:23–35, 2007.
- J1.** SM Ciupe, B de Bivort, DM Bortz, and PW Nelson. Estimates of kinetic parameters from HIV patient data during primary infection through the eyes of three different models. *Math Biosci*, 200:1–27, 2006.

Submitted:

- S1.** S Kadelka and SM Ciupe. Mathematical investigation of HBeAg seroconversion. 2019.

Peer reviewed book chapters:

- B1.** TA Kohler, S Cole, and SM Ciupe. *Population and Warfare: A Test of the Turchin Model in Puebloan Societies*. University of California Press, Berkeley and Los Angeles, 2009.

Published abstracts:

- O1.** M Chung and SM Ciupe. Parameter identifiability in virus infection models: an application to hepatitis B. *The 9th International Symposium on Bioinformatics Research and Applications*, 2013.

Theses:

- T1.** SM Ciupe. *Development and applications of mathematical tools in models of infectious diseases and biological phenomenon*. PhD thesis, University of Michigan, June 2005.

Unpublished results:

- U1.** SM Ciupe and PW Nelson. An asymptotic analysis of the van der Pol delay differential equation.

Presentations

2018

- Oct. Mathematics Colloquium, Virginia Tech, Blacksburg, VA.
- Sep. Biomathematics seminar, University of Florida, Gainesville, FL.
- Sep. Los Alamos National Laboratory, Los Alamos, NM.
- Sep. Biochemistry Department Seminar, Virginia Tech, Blacksburg, VA.
- Jul. Immuno-epidemiology workshop, Wollongong, Australia.
- Jul. The Annual Meeting for the Society of Mathematical Biology, Sydney, Australia (poster).
- Mar. SIAM-SEAD Meeting, Chapel Hill, NC.
- Feb. MBI Workshop, Columbus, OH.

- Feb. Simon Foundation Reverse Site Visit, NYC, NY.
- Jan. Joint AMS and MAA Meetings, San Diego, CA.
- 2017
- Nov. Biomathematics seminar, North Carolina State University, Raleigh, NC.
- Oct. 3rd Virus Dynamics meeting, Heidelberg, Germany.
- Jul. Annual Meeting for The Society for Mathematical Biology, Salt Lake City, UT.
- May The Third International Conference on Engineering and Computational Mathematics, Hong Kong.
- May Virus Dynamics; present, past, and future, Santa Fe, NM.
- May Keystone Symposium on Virus Dynamics, Keystone, CO.
- Apr. GBCB Seminar, Blacksburg, VA.
- Mar. Department of Mathematics colloquium, University of Missouri-Kansas City, Kansas City, MO.
- Feb. Mathematical Biology Seminar, Blacksburg, VA.
- Jan. Loyola Medical Center Seminar, Chicago, IL.
- 2016 Nov. AMS Special Session, Raleigh, NC.
- Oct. Virginia Tech Mathematical Biology Seminar, Blacksburg, VA.
- Jul. Annual Meeting for The Society for Mathematical Biology, Nottingham, UK.
- May. International Conference on Applications of Mathematics to Nonlinear Sciences, Kathmandu, Nepal.
- May. Biology and Medicine Through Mathematics, Richmond, VA.
- 2015 Sep. Duke University Mathematical Biology Seminar, Durham, NC.
- Aug. Viral Dynamics and Cancer Workshop, Oaxaca, Mexico.
- Jun. Annual Meeting for The Society for Mathematical Biology, Atlanta, GA.
- Mar. AMS Special Session, Georgetown, Washington DC, 2015.
- 2014 Oct. Nutritional Immunology and Molecular Medicine Laboratory Seminar, Virginia Bioinformatics Institute, Blacksburg, VA.
- Sep. Department of Mathematics Colloquium, Virginia Tech, Blacksburg, VA.
- Aug. Public Health Grand Round Seminar Series, Virginia Tech, Blacksburg, VA.
- Aug. SIAM Conference on the Life Sciences, Charlotte, NC.
- Aug. Annual Meeting for The Society for Mathematical Biology, Osaka, Japan.
- Jun. European Conference on Mathematical and Theoretical Biology, Gothenburg, Sweden.
- Apr. INFORMS Student Chapter Seminar, Virginia Tech, Blacksburg, VA.
- Feb. AWM Student Chapter Seminar, Virginia Tech, Blacksburg, VA.
- 2013 Aug. Interdisciplinary International Conference on Applied Mathematics, Modeling and Computational Science, Waterloo, Canada.
- Jul. 1st workshop on Virus Dynamics, Frankfurt, Germany.
- Jun. Annual Meeting for The Society for Mathematical Biology, Tempe, AZ.
- Jan. Disease Dynamics 2013, Vancouver, Canada.

Teaching Interests

Introductory classes, Mathematical Modeling; Mathematical Biology; Ordinary and delay Differential Equations; Asymptotic Analysis.

Teaching experience

2018 Fall Model and Simulations of Biological Systems I, Virginia Tech.
 Fall Introduction to Systems Biology, Virginia Tech.
 Fall Professionalism in Systems Biology, Virginia Tech.
 2017 Fall Math 477S Mathematical modeling with writing, Duke University.
 Spring Applied Mathematical Modeling, Virginia Tech.
 Spring Introduction to Systems Biology guest lecturer, Virginia Tech.
 2016 Fall Model and Simulations of Biological Systems I, Virginia Tech.
 Fall Elementary Differential Equations, Virginia Tech.
 Spring Model and Simulations of Biological Systems II, Virginia Tech.
 Spring Applied Mathematical Modeling, Virginia Tech.
 2015 Fall Model and Simulations of Biological Systems I, Virginia Tech.
 Fall Introduction to Systems Biology guest lecturer, Virginia Tech.
 Fall Modeling Infectious Disease guest lecturer, Virginia Tech.
 Spring Model and Simulations of Biological Systems II, Virginia Tech.
 Spring Elementary Differential Equations, Virginia Tech.

Students**Ph.D students**

Samantha Erwin, Mathematics. Defended 2017. Postdoc at NCSU in Christina Lanzas' lab August 2017-present.
 Ryan Nikin-Beers, Mathematics. Defended 2018. Postdoc at University of Florida in Libin Rong's lab August 2018-present.
 Sarah Kadelka, Mathematics. Expected 2019.

M.S. students

Ryan Nikin-Beers, Mathematics. Defended May 2014.
 Sarah Kadelka, Mathematics. Defended May 2015.
 April Saul, Mathematics. Defended May 2015.
 Andrea Carracedo Rodriguez, Mathematics. Defended March 2016.

Undergraduate students

Tara Schwagerl, Systems Biology, Fall 2017-Summer 2018.

Professional activities**Member**

American Mathematical Society.
 Society of Mathematical Biology.
 Association for Women in Mathematics.

College and department service

Co-Organizer, Mathbio Seminar.
 Faculty advisor for the AWM Student Chapter until 2017.
 Mathematics Department Career Advisor until 2017.
 Member of Executive committee, Division of Systems Biology, Virginia Tech.
 Integrated Science Vision Committee, College of Science, Virginia Tech.

Professional service

Guest editor: *Frontiers in Microbiology*.

BI Symposium Panelist.

NSF grant panelist.

The Wellcome Trust Project Grants.

Reviewer: *Bulletin of Mathematical Biology*, *Journal of Theoretical Biology*, *PLoS Computational Biology*, *Journal of Mathematical Biology*, *Journal of Mathematical Analysis and Applications*, *Mathematical Biosciences and Engineering*, *Journal of Biological Dynamics*, *Mathematical Biosciences*, *Mathematical Medicine and Biology*, *Journal of Differential Equations and Dynamical Systems*, *PLoS One*, *Journal of Royal Society Interface*, *Frontiers in Microbiology*, *Scientific Reports*, *Journal of Nonlinear Science*, *Optimization and Engineering*.

Participant and organizer

PMED Opening Workshop, SAMSI, Raleigh, NC, August 2018.

Session organizer, SIAM-SEAD Meeting, Chapel Hill, NC, March 2018.

Mini-symposium organizer, Annual Meeting for The Society for Mathematical Biology, Salt Lake City, UT, July 2017.

Virus Dynamics; present, past, and future, Santa Fe, NM, May 2017.

Keystone Symposia, Virus dynamics, Keystone, CO, May 2017.

AMS Special Session, Raleigh, NC, November 2016.

BI Symposium Panelist, Virginia Tech, Blacksburg, VA, Nov. 2016.

Systems Approaches in Immunology, Santa Fe, NM, Sept. 2016.

Viral Dynamics and Cancer Workshop, Oaxaca, Mexico, 2015.

Modelling dose responses following vaccination workshop, Aeras, Rockville, MD, 2015.

Mini-symposium organizer, AMS Special Session, Georgetown, 2015.

Mini-symposium organizer, SIAM Conference on the Life Sciences, Charlotte, NC, 2014.

Mini-symposium organizer, Annual Meeting for The Society for Mathematical Biology, Osaka, Japan, 2014.

Keystone Symposia, HIV Pathogenesis- Virus vs Host, Banff, Canada, 2014.

Mini-symposium organizer Interdisciplinary International Conference on Applied Mathematics, Modeling and Computational Science, Waterloo, Canada, 2013.

Keystone Symposia, HIV Vaccines: Adaptive Immunity and Beyond, Keystone, CO, 2013.

AASLD's Emerging Trends Conference: Reactivation of Hepatitis B. Arlington, VA, 2013.

International Conference on Computational Cell Biology, Blacksburg, VA, 2013.