Stanca Mihaela Ciupe

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Education

University of Michigan, Ann Arbor, MI, July 2000- June 2005.
• Ph.D in Applied and Interdisciplinary Mathematics, awarded in June 2005.
Advisor: Dr. Patrick W. Nelson, Mathematics.
Dissertation title: *Development and applications of mathematical tools in models of infectious diseases and biological phenomenon*.
Babes-Bolyai University, Cluj-Napoca, Romania.
• M.S. Mathematics, 1998.
• B.S. Mathematics, 1997.

Employment

Aug. 2021 -	Professor, Department of Mathematics, Virginia Tech.
Aug. 2015 - Aug. 2021	Associate Professor with tenure, Department of Mathematics, Virginia Tech. Affiliations: Systems Biology; CeZap, Frailin Life Sciences Institute, Genetics, Bioinformatics, and Computational Biology.
Aug. 2017 - May 2018	Visiting Associate Professor, Department of Mathematics, Duke University.
Feb. 2018	Visiting Researcher, Los Alamos National Laboratory.
Aug. 2011 - Aug. 2015	Tenure-track Assistant Professor, Department of Mathematics, Virginia Tech.
Aug. 2009 - July 2011	Tenure-track Assistant Professor, Department of Mathematics, U. of Louisiana at Lafayette.
Aug. 2006 - Aug. 2009	Postdoctoral Research Associate, Duke University Medical Center, Lab. of Comp. 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, Department of Mathematics, University of Michigan. Thesis advisor: Dr. Patrick W. Nelson.

Research Grants

• **Arbutus Biopharma Corporation** *Modeling the pharmacokinetics of iRNA therapy in hepatitis B virus infection*, October 2021- October 2022: $ 54,130.
• **NSF DMS-2051820 Math Biology Research Grant** *Multi-scale investigation of SARS-CoV-2 infection*, Sept 2021- August 2024: $ 351,670.
• **CeZaP Faculty Research Pilot Grant, Virginia Tech** *Aerosol transmission potential of SARS-CoV-2 in exhaled breath*, joint with Nisha Duggal, Dep. Biomed. Sci. and Pathobiol. and Linsey Marr, College of Engineering, Nov 2020- July 2021: $ 20,000 (my portion $5,000).
• **Data and Decisions Research Seed Grant, Virginia Tech** *Uncovering the mechanisms of West Nile virus dynamics: A mathematical-computational-experimental interdisciplinary approach*, joint with Nisha Duggal, Dep. Biomed. Sci. and Pathobiol. and Paul Siegel, Dep. of Animal and Poultry Sci., May 2020- Dec. 2020: $ 15,000 (my portion $6,000).
• **NSF DMS-1813011 Math Biology Research Grant** *Understanding the Mechanism of Protection Following Challenge and Immunization*, Sept. 2018-Aug. 2021: $ 210,656.
• **Simons Foundation Mathematics and Physical Sciences-Collaboration Grants for Mathematicians** *Modeling the immune responses to viral infection*, Sept. 2016-Aug. 2021: $35,000 (terminated in 2018 upon acceptance of NSF DMS-1813011, amount used $14,000).
• **NSF DMS-1214582 Math Biology Research Grant** *Understanding the antibody responses following Human Immunodeficiency Virus infection*, Sept. 2010-Aug. 2014: $143,975.
• **University of Louisiana, Lafayette Summer Research Award**, 2010: $4,800.

Awards

- Luther and Alice Hamlett Undergrad Research Award, Jacob Golden, $2,000: 2020 and $1,000: 2021.
- Elected to be the chair of The Society for Mathematical Biology Immunobiology and Infection Subgroup advisory committee, 2021 – 2023.
- Elected to be a member of The Society for Mathematical Biology Immunobiology and Infection Subgroup advisory committee, 2019 – 2021.
- Virginia Tech ITSG International Travel Grant, 2014, 2015, 2018: $2,000 and 2016, 2019: $1,700.

Research Interests

Mathematical Biology; Theoretical immunology; Virus Dynamics; Disease Modeling at different scales; Ordinary and delay differential equations; Model validation

Publications

* denotes first author; $^{\#}$ denotes senior author; † denotes corresponding author.

Peer reviewed:

J34. Sarah C Kuchinsky, Francesca Frere, Nora Heitzman-Breen, Jacob Golden, Ana Vázquez, Christa F Honaker, Paul B Siegel, Stanca M Ciupe, Tanya LeRoith, and Nisha K Duggal. Pathogenesis and shedding of usutu virus in juvenile chickens. *Emerging Microbes & Infections*, 10(1):725–738, 2021.

J33. JE Forde* and SM Ciupe*. Quantification of the tradeoff between test sensitivity and test frequency in a COVID-19 epidemic-a multi-scale modeling approach. *Viruses*, 13(457):1–18, 2021.

J32. SM Ciupe$^{\star,\dagger,\#}$, BP Boribong, S Kadelka, and CN Jones$^{\dagger,\#}$. Bistable mathematical model of neutrophil migratory patterns after LPS-induced epigenetic reprogramming. *Front Gen*, 12:172, 2021.

J31. SM Ciupe*,†, NK Vaidya, and JE Forde. Early events in hepatitis B infection: the role of inoculum dose. *Proc R Soc B*, 288(1944):20202715, 2021.

J30. S Kadelka, H Dahari, and SM Ciupe†. Understanding the antiviral effects of rnai-based therapy in HBeAg-positive chronic hepatitis B infection. *Sci Rep*, 11(1):1–16, 2021.

J29. S Erwin, LM Childs, and SM Ciupe$^{\dagger,\#}$. Mathematical model of broadly reactive plasma cell production. *Sci Rep*, 10(1):1–12, 2020.

J28. S Kadelka and SM Ciupe$^{\dagger,\#}$. Mathematical investigation of HBeAg seroconversion. *Math Biosci Eng*, 16(6):7616–7658, 2019.

J27. S Kadelka, BP Boribong, L Li, and SM Ciupe$^{\dagger,\#}$. 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 Microbiol*, 9:3338, 2019. 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. *Front Microbiol*, 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. *Peer J*, 5:e3877, 2017.

J21. SM Ciupe* and JM Heffernan*. In-host modeling. *Infect Dis 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 dqx002, 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. *Appl Sci*, 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.

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.

B2. SM Ciupe* and JE Forde*. *Case Studies in Systems Biology*, chapter Virus Dynamics. Springer Nature. to appear September 2021.

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.

Advising

Ph.D students advisor

Quiyana Murphy, Mathematics, August 2021-present.

Nora Heitzman-Breen, Mathematics, August 2021-present.

Samantha Erwin, Mathematics. Defended 2017. Postdoc at NCSU in Christina Lanzas' lab August 2017-2019. Staff member at Oakridge National Labs 2019-present.

Ryan Nikin-Beers, Mathematics. Defended 2018. Postdoc at University of Florida in Libin Rong's lab August 2018-2020.

Sarah Kadelka, Mathematics. Defended 2020. Postdoc ETH Zurich, Switzerland, 2020-present.

M.S. students advisor

Quiyana Murphy, Mathematics, 2019-present.

Nora Heitzman-Breen, Mathematics, 2019-present.

Andrea Carracedo Rodriguez, Mathematics, Defended March 2016.

Sarah Kadelka, Mathematics. Defended May 2015.

April Saul, Mathematics. Defended May 2015.

Ryan Nikin-Beers, Mathematics. Defended May 2014.

Brittany Boribong, GBCB, One semester rotation in my lab Fall 2016.

Tricity Andrew, GBCB, one year rotation 2014-2015.

Undergraduate students advisor

Yuyao Wang, Mathematics, Fall 2021-Spring 2022.

Jacob Golden, Systems Biology, Summer 2020-Summer 2021.

Tara Schwagerl, Systems Biology, Fall 2018-Summer 2019.

Susanna Mostaghim, Mathematics, Fall 2016- Spring 2017.

Invited presentations

2022 Mar. CMA VIII: Eight International Conference on Mathematical Modeling and Analysis of Populations in Biological Systems, Lafayette, LA, plenary talk.

2021 Nov. Symposium on Infectious Diseases Modeling, Colombo, Sri Lanka, virtual presentation.

Jun. REU Hobart and William Smith Colleges, Geneva, NY, virtual presentation.

Jun. SMB Annual Meeting, mini-symposium talk, virtual meeting.

May. York University, Canada.

Mar. Fred Hutch Cancer Center, Seattle, WA.

Jan. Joint Mathematics Meeting, virtual because of Covid-19.

2020 Oct. AMS Fall Eastern Sectional Special Session, virtual because of Covid-19.

Oct. BEAM Seminar, Virginia Tech.

Aug. eSMB meeting, Immunobiol. and Infec. Sub. mini-symposium, virtual because of covid-19.

Jul. Joint meeting of SIAM and CAIMS, Toronto, Canada, cancelled because of Covid-19.

Jun. SIAM Life Sciences Mini-Symposium, virtual because of Covid-19.

Mar. AMS Spring Southeastern Sectional Special Session, Charlottesville, VA, cancelled because of Covid-19.

Feb. Arizona State Mathbio Seminar, Tempe, AZ.

2019 Jul. The Annual Meeting for the Society of Mathematical Biology, Montreal, CA.

Jun. Second Int. Conference on App. of Math. to Nonlinear Sciences Summer school, Kathmandu, Nepal.

Jun. Second Int. Conference on App. of Math. to Nonlinear Sciences, Pokhara, Nepal.

May. SIAM Dynamical Systems, Snowbird, UT.

Apr. Center of Disease Dynamics Workshop, Penn State, State College, PA (plenary).

Apr. Biomathematics Seminar, Penn State, State College, PA.

Contributed presentations

2019 Oct. 4th Virus Dynamics Workshop, Paris, France.

May. Biology and Medicine Through Mathematics, Richmond, VA.

2017 Oct. 3rd Virus Dynamics meeting, Heidelberg, Germany.

May Keystone Symposium on Virus Dynamics, Keystone, CO.

Poster presentations

2018 Jul. The Annual Meeting for the Society of Mathematical Biology, Sydney, Australia.

2007 Sep. CHAVI Annual Meeting, Duke University, Durham, NC.

Professional activities

Editorial service

Associate editor: Journal of Theoretical Biology, 2020 - present.
Associate editor: Bulletin of Mathematical Biology, 2020 - present.
Guest editor: Frontiers in Microbiology, 2017-2019.

Member

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

Outreach

University of Michigan AIMS graduate student panel, March 2021.
Association of Women in Mathematics student chapter *Graduate School Panel*, Fall 2020.
Faculty Advisor for the Association for Women in Mathematics Chapter, Virginia Tech, 2012-2017.
Mentor for the Society for Mathematical Biology, 2017-2020.
Blacksburg Math Circle (volunteer) 2018-2020.