

# VITALY V. GANUSOV

## Curriculum vitae

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### General information

**Current position:** Professor. Host-Pathogen Interactions (HPI) program.  
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### Academic history

- 2023- Professor (Texas Biomedical Research Institute, San Antonio, USA).
- 2023-24 Professor (University of Tennessee, Knoxville, USA, on the leave of absence).
- 2016-23 Associate Professor (University of Tennessee, Knoxville, USA).
- 2010-16: Assistant Professor (University of Tennessee, Knoxville, USA).
- 2008-10: Post-doctoral fellow with Dr. Alan S. Perelson (Los Alamos National Laboratory, Los Alamos, USA).
- 2005-08: Post-doctoral fellow with Prof. Dr. Rob J. De Boer (Theoretical Biology, Utrecht University, Utrecht, The Netherlands).
- 2003-04: Post-doctoral fellow with Dr. Rustom Antia (Emory University, Atlanta, GA, USA).
- 2003: Ph. D. degree (Emory University, Atlanta, GA, USA; thesis adviser: Rustom Antia, Ph.D)
- 2001: Candidate of Physical and Mathematical sciences (Russian equivalent of Ph.D. degree; Institute of Biophysics, Krasnoyarsk, Russia; thesis adviser: Anatoly V. Brilkov, Doctor of Biology).
- 2000: Master of Science (Krasnoyarsk State University, Krasnoyarsk, Russia; major: physics/biophysics; thesis adviser: Anatoly V. Brilkov, Doctor of Science)
- 1997: Bachelor of Science (Krasnoyarsk State University, Krasnoyarsk, Russia; major: physics/biophysics; thesis adviser: Anatoly Brilkov, Ph.D.)

## Selected three publications best representing the work and modeling philosophy

1. Rajakaruna, H., O'Connor, J. H., Cockburn, I. A. & **Ganusov, V. V.** 2022 Liver environment-imposed constraints diversify movement strategies of liver-localized CD8 T cells. *J Immunol*, 208, 1292–1304. doi:10.4049/jimmunol.2100842.

*What regulates specific movement patterns of T cells in tissues remains poorly understood. Detection of some exotic movements such as Levy walks has been attributed to existence of cell-intrinsic programs of search for infection, thought to be evolutionary optimal. In this paper we showed that for CD8 T cells in the liver the observed movement patterns of cells (Levy walks or Brownian walks) can be easily explained by environmental details of the liver such as straightness of the liver sinusoids and blood flow. With this paper we provide a strong argument that experimental data on T cell movement in tissues must be understood by taking the tissue details into account.*

2. Kelemen, R. K., Rajakaruna, H., Cockburn, I.A., and **Ganusov, V. V.** (2019) Clustering of activated CD8 T cells around malaria-infected hepatocytes is rapid and is driven by antigen-specific cells. *Front Immunol*, 10:2153. doi: 10.3389/fimmu.2019.02153

*In this paper we developed quantitative framework to understand how activated CD8 T cells form clusters around Plasmodium liver stages. We showed that several alternative mathematical models are fully compatible with experimental data, and that additionally designed experiments were needed to discriminate between alternatives (e.g., reject fixed environment model and support density-dependent recruitment model). This paper represents my personal example of using strong inference in mathematical modeling.*

3. **Ganusov, V. V.** (2016) Strong Inference in Mathematical Modeling: A Method for Robust Science in the Twenty-First Century. *Front Microbiol*, 7, 1131

*In this paper I outline the basic philosophy behind mathematical modeling and how modeling can help us understand biological processes. I highlight several pitfalls in mathematical modeling nowadays (e.g., focus on single hypothesis/mechanism, confirmation and not falsification of models), and how the use of strong inference may improve inference of biological mechanisms from experimental data.*

## Publications under review/preprints/preparation

1. Ganusov, V. V., Srinivasula, S., and Di Mascio, M. (2023) Mathematical framework to quantify migration kinetics of adoptive transferred lymphocytes in monkeys using SPECT-CT scanning technology (in preparation)
2. Ganusov, V. V. and Subbian, S. (2023) Deposition of Mycobacterium tuberculosis bacteria in lungs of rabbits is primarily determined by the weights of individual lobes (in preparation)
3. Ganusov, V.V., and Urdahl, K. (2023) Latent Mycobacterium tuberculosis infection is associated with lower probability of developing tuberculosis: analysis of cohort data on 745 nurses in TB wards (in preparation)
4. Summers, J., Leone W., Barber, D. L., and Ganusov, V. V. (2023) Mycobacterium tuberculosis dynamics in different granulomas of monkeys are not independent (in preparation)
5. Zenkov, V., O'Connor, J., Cockburn, I. A. , and Ganusov, V. V. (2023) Limited role of IFN $\gamma$  and CXCR3/CCR5 receptors in mediating CD8 T cell-dependent protection against Plasmodium liver stages (in preparation)

6. Zenkov, V., Lin, R. Cockburn, I. A., and Ganusov, V. V. (2023) Detecting attraction of Plasmodium-specific CD8 T cells towards infection using graph theory (in preparation)
7. Majumber, B. and Ganusov, V. V. (2023) Comparing two alternative frameworks to simulate persistent random walks (in preparation)
8. Trowse, M. and Ganusov, V. V. (2023) Rapid replication and death of Mycobacterium tuberculosis in spleens of mice (in preparation)
9. Trowse, M. and Ganusov, V. V. (2023) Kinetics of cell size growth improves prediction of division time of individual E. coli bacteria (in preparation)
10. Maddox, J. and Ganusov, V. V. (2023) Cytolytic immunity controls duration of influenza A virus shedding in humans (in preparation)
11. Ganusov, V. V., Kolloli, A., and Subbian, S. (2023) Mathematical modeling suggests heterogeneous replication of Mycobacterium tuberculosis in rabbits (in preparation)

## Peer-reviewed publications

1. Bera, S., Amino, R., Cockburn, I. A. & **Ganusov, V. V.** 2023 Heterogeneity of in efficacy of individual CD8 T cells at killing Plasmodium liver stages. *Proc Roy Soc Lond B*, pp. 1–44. doi:doi.org/10.1101/2022.05.18.492520. In press.
2. Majumder, B., Budhu, S. & **Ganusov, V. V.** 2023 Cytotoxic T lymphocytes control growth of B16 tumor cells in collagen-fibrin gels by cytolytic and non-lytic mechanisms. *Viruses*, **15**, 1454. doi:https://doi.org/10.3390/v15071454.
3. Gross, L. J., McCord, R. P., LoRe, S., **Ganusov, V. V.**, Hong, T., Strickland, W. C., Talmy, D., von Arnim, A. G. & Wiggins, G. 2023 Prioritization of the concepts and skills in quantitative education for graduate students in biomedical science. *PloS one*, **18**, e0284982. doi:10.1371/journal.pone.0284982.
4. Patel, D., Lin, R., Majumder, B. & **Ganusov, V. V.** 2023 Brain-localized CD4 and CD8 T cells perform correlated random walks and not Levy walks. *F1000Research*, pp. 1–18. doi:https://doi.org/10.12688/f1000research.129923.1.
5. **Ganusov, V. V.**, Zenkov, V. S. & Majumder, B. 2023 Correlation between speed and turning naturally arises for sparsely sampled cell movements. *Physical Biology*, **20**, 1–13. doi:10.1088/1478-3975/acb18c.
6. Rajakaruna, H. & **Ganusov, V. V.** 2022 Mathematical modeling to guide experimental design: T cell clustering as a case study. *Bulletin of mathematical biology*, **84**, 103. doi:10.1007/s11538-022-01063-x.
7. O'Connor, J. H., McNamara, H. A., Cai, Y., Coupland, L. A., Gardiner, E. E., Parish, C. R., McMorran, B. J., **Ganusov, V. V.** & Cockburn, I. A. 2022 Interactions with asialo-glycoprotein receptors and platelets are dispensable for CD8 T cell localization in the murine liver. *Journal of immunology (Baltimore, Md. : 1950)*. doi:10.4049/jimmunol.2101037.
8. Miller, J., Burch-Smith, T. M. & **Ganusov, V. V.** 2022 Mathematical modeling suggests cooperation of plant-infecting viruses. *Viruses*, **14**(4). doi:10.3390/v14040741.
9. Rajakaruna, H., O'Connor, J. H., Cockburn, I. A. & **Ganusov, V. V.** 2022 Liver environment-imposed constraints diversify movement strategies of liver-localized CD8 T cells. *J Immunol*, **208**, 1292–1304. doi:10.4049/jimmunol.2100842. Top choice read.

10. Zenkov, V. S., O'Connor, J., Cockburn, I. A. & **Ganusov, V. V.** 2022 A new method based on the von Mises-Fisher distribution shows that a minority of liver-localized CD8 T cells display hard-to-detect attraction to Plasmodium-infected hepatocytes. *Frontiers in Bioinformatics*, pp. 1–15. doi:10.3389/fbinf.2021.770448.
11. Hooker, K. L. & **Ganusov, V. V.** 2021 Impact of oseltamivir treatment on influenza A and B virus dynamics in human volunteers. *Frontiers in microbiology*, **12**, 631 211. doi:10.3389/fmicb.2021.631211.
12. Plumlee, C. R., Duffy, F. J., Gern, B. H., Delahaye, J. L., Cohen, S. B., Stoltzfus, C. R., Rustad, T. R., Hansen, S. G., Axthelm, M. K. *et al.* 2021 Ultra-low dose aerosol infection of mice with Mycobacterium tuberculosis more closely models human tuberculosis. *Cell Host Microbe*, **29**, 68–82.e5. doi:10.1016/j.chom.2020.10.003.
13. **Ganusov, V. V.** & Tomura, M. 2021 Experimental and mathematical approaches to quantify recirculation kinetics of lymphocytes. In *Mathematical, Computational and Experimental T Cell Immunology* (eds. C. MOLINA-PARIS & G. Lythe), chap. 10, pp. 151–169. Springer Nature Switzerland. doi:https://doi.org/10.1007/978-3-030-57204-4\10.
14. Gjini, E., Paupério, F. F. S. & **Ganusov, V. V.** 2020 Treatment timing shifts the benefits of short and long antibiotic treatment over infection. *Evolution, medicine, and public health*, **2020**, 249–263. doi:10.1093/emph/eoaa033.
15. Aleshnick, M., **Ganusov, V. V.**, Nasir, G., Yenokyan, G. & Sinnis, P. 2020 Experimental determination of the force of malaria infection reveals a non-linear relationship to mosquito sporozoite loads. *PLoS pathogens*, **16**, e1008 181. doi:10.1371/journal.ppat.1008181.
16. Kelemen, R. K., Rajakaruna, H., Cockburn, I. A. & **Ganusov, V. V.** 2019 Clustering of activated CD8 T cells around malaria-infected hepatocytes is rapid and is driven by antigen-specific cells. *Frontiers in immunology*, **10**, 2153. doi:10.3389/fimmu.2019.02153.
17. Vella, L. A., Buggert, M., Manne, S., Herati, R. S., Sayin, I., Kuri-Cervantes, L., Bukh Brody, I., O'Boyle, K. C., Kaprielian, H. *et al.* 2019 T follicular helper cells in human efferent lymph retain lymphoid characteristics. *J Clin Invest*, **129**, 3185–3200. doi:10.1172/JCI125628.
18. McDaniel, M. M. & **Ganusov, V. V.** 2019 Estimating residence times of lymphocytes in ovine lymph nodes. *Front Immunol*, **10**, 1492. doi:10.3389/fimmu.2019.01492.
19. Hoft, S. G., Sallin, M. A., Kauffman, K. D., Sakai, S., **Ganusov, V. V.** & Barber, D. L. 2019 The rate of CD4 T cell entry into the lungs during Mycobacterium tuberculosis infection is determined by partial and opposing effects of multiple chemokine receptors. *Infection and immunity*, **87**, e00 841–18. doi:10.1128/IAI.00841-18.
20. Yang, Y. & **Ganusov, V. V.** 2019 Defining kinetic properties of HIV-specific CD8+ T-cell responses in acute infection. *Microorganisms*, **7**(3), 69–94. doi:doi:10.3390/microorganisms7030069.
21. Kaderali, L., Theis, F., **Ganusov, V. V.**, Ciupe, S. M., Mehr, R., Ribeiro, R. M. & Hernandez-Vargas, E. A. 2019 Editorial: Integrative computational systems biology approaches in immunology and medicine. *Frontiers in microbiology*, **9**, 3338. doi:10.3389/fmicb.2018.03338.
22. Bohrer, A. C., Tocheny, C., Assmann, M., **Ganusov, V. V.** & Mayer-Barber, K. D. 2018 Cutting edge: IL-1R1 mediates host resistance to Mycobacterium tuberculosis by trans-protection of infected cells. *J Immunol*, **201**, 1645–1650. doi:10.4049/jimmunol.1800438.

23. Song, H., Giorgi, E. E., **Ganusov, V. V.**, Cai, F., Athreya, G., Yoon, H., Carja, O., Hora, B., Hraber, P. *et al.* 2018 Tracking HIV-1 recombination to resolve its contribution to HIV-1 evolution in natural infection. *Nat Commun*, **9**, 1928. doi:10.1038/s41467-018-04217-5.
24. Yang, Y. & **Ganusov, V. V.** 2018 Kinetics of HIV-specific CTL responses plays a minimal role in determining HIV escape dynamics. *Front Immunol*, **9**(140), 1–15. doi:10.3389/fimmu.2018.00140.
25. **Ganusov, V. V.** 2018 Time intervals in sequence sampling, not data modifications, have a major impact on estimates of HIV escape rates. *Viruses*, **10**. doi:10.3390/v10030099.
26. Panteleev, A. V., Nikitina, I. Y., Burmistrova, I. A., Kosmiadi, G. A., Radaeva, T. V., Amansahedov, R. B., Sadikov, P. V., Serdyuk, Y. V., Larionova, E. E. *et al.* 2017 Severe tuberculosis in humans correlates best with neutrophil abundance and lymphocyte deficiency and does not correlate with antigen-specific CD4 T-cell response. *Frontiers in immunology*, **8**, 963. doi:10.3389/fimmu.2017.00963.
27. Wang, C., Jiang, C., Gao, N., Zhang, K., Liu, D., Wang, W., Cong, Z., Qin, C., **Ganusov, V. V.** *et al.* 2017 Immunologic and virologic mechanisms for partial protection from intravenous challenge by an integration-defective siv vaccine. *Viruses*, **9**. doi:10.3390/v9060135.
28. McNamara, H. A., Cai, Y., Wagle, M. V., Sontani, Y., Roots, C. M., Miosge, L. A., O'Connor, J. H., Sutton, H. J., **Ganusov, V. V.** *et al.* 2017 Up-regulation of LFA-1 allows liver-resident memory T cells to patrol and remain in the hepatic sinusoids. *Science Immunology*, pp. 1–10.
29. **Ganusov, V. V.** 2016 Strong Inference in Mathematical Modeling: A Method for Robust Science in the Twenty-First Century. *Front Microbiol*, **7**, 1131. doi:10.3389/fmicb.2016.01131.
30. McDaniel, M. M., Krishna, N., Handagama, W. G., Eda, S. & **Ganusov, V. V.** 2016 Quantifying limits on replication, death, and quiescence of Mycobacterium tuberculosis in mice. *Front Microbiol*, **7**, 862. doi:10.3389/fmicb.2016.00862.
31. Sakai, S., Kauffman, K. D., Sallin, M. A., Sharpe, A. H., Young, H. A., **Ganusov, V. V.** & Barber, D. L. 2016 CD4 T Cell-Derived IFN- $\gamma$  Plays a Minimal Role in Control of Pulmonary Mycobacterium tuberculosis Infection and Must Be Actively Repressed by PD-1 to Prevent Lethal Disease. *PLoS Pathog*, **12**(5), e1005667. doi:10.1371/journal.ppat.1005667.
32. Leviyang, S. & **Ganusov, V. V.** 2015 Broad CTL response in early HIV infection drives multiple concurrent CTL escapes. *PLoS Comput Biol*, **11**(10), e1004492. doi:10.1371/journal.pcbi.1004492.
33. **Ganusov, V. V.**, Klinkenberg, D., Bakker, D. & Koets, A. P. 2015 Evaluating contribution of the cellular and humoral immune responses to the control of shedding of Mycobacterium avium spp. paratuberculosis in cattle. *Vet Res*, **46**(1), 62. doi:10.1186/s13567-015-0204-1.
34. Noecker, C., Schaefer, K., Zacheo, K., Yang, Y., Day, J. & **Ganusov, V. V.** 2015 Simple mathematical models do not accurately predict early SIV dynamics. *Viruses*, **7**, 1189–1217.
35. White, C. E., Villarino, N. F., Sloan, S. S., **Ganusov, V. V.** & Schmidt, N. W. 2015 Plasmodium suppresses expansion of T cell responses to heterologous infections. *J Immunol*, **194**(2), 697–708. doi:10.4049/jimmunol.1401745.
36. Le, D., Miller, J. D. & **Ganusov, V. V.** 2015 Mathematical modeling provides kinetic details of the human immune response to vaccination. *Front Cell Infect Microbiol*, **4**, 177. doi:10.3389/fcimb.2014.00177.

37. **Ganusov, V. V.** & Auerbach, J. 2014 Mathematical modeling reveals kinetics of lymphocyte recirculation in the whole organism. *PLoS Comp Biol*, **10**, e1003586.
38. Magombedze, G., Eda, S. & **Ganusov, V. V.** 2014 Competition for antigen between Th1 and Th2 responses determines the timing of the immune response switch during *mycobacterium avium* subspecies *paratuberculosis* infection in ruminants. *PLoS Comput Biol*, **10**, e1003414.
39. Kelemen, R., He, G., Woo, H., Lane, T., Rempe, C., Wang, J., Cockburn, I. A., **Ganusov, V. V.** & Berry, M. W. 2014 Classification of T cell movement tracks allows for prediction of cell function. *Int. J. Comput. Biol Drug Desig*, **7**, 113–129.
40. Magombedze, G., Reddy, P. B. J., Eda, S. & **Ganusov, V. V.** 2013 Cellular and population plasticity of helper CD4<sup>+</sup> T cell responses. *Front Physiol*, **4**, 1–9.
41. Cockburn, I. A., Amino, R., Kelemen, R. K., Kuo, S. C., Tse, S.-W., Radtke, A., Mac-Daniel, L., **Ganusov, V. V.**, Zavala, F. *et al.* 2013 In vivo imaging of CD8<sup>+</sup> T cell-mediated elimination of malaria liver stages. *Proc Natl Acad Sci USA*, **110**(22), 9090–9095. doi:10.1073/pnas.1303858110.
42. Liu, M. K. P., Hawkins, N., Ritchie, A. J., **Ganusov, V. V.**, Whale, V., Brackenridge, S., Li, H., Pavlicek, J. W., Cai, F. *et al.* 2013 Vertical T cell immunodominance and epitope entropy determine HIV-1 escape. *J Clin Invest*, **123**(1), 380–393. doi:10.1172/JCI65330.
43. **Ganusov, V. V.**, Neher, R. A. & Perelson, A. S. 2013 Modeling HIV escape from cytotoxic T lymphocyte responses. *J Stat Mech*, **2013**(01), P01010.
44. **Ganusov, V. V.** & Boer, R. J. D. 2012 A mechanistic model for bromodeoxyuridine dilution naturally explains labelling data of self-renewing T cell populations. *J R Soc Interface*, **10**(78), 1–12. doi:10.1098/rsif.2012.0617.
45. Nikitina, I. Y., Kondratuk, N. A., Kosmiadi, G. A., Amansahedov, R. B., Vasilyeva, I. A., **Ganusov, V. V.** & Lyadova, I. V. 2012 Mtb-Specific CD27(low) CD4 T Cells as Markers of Lung Tissue Destruction during Pulmonary Tuberculosis in Humans. *PLoS One*, **7**(8), e43733. doi:10.1371/journal.pone.0043733.
46. Louzoun, Y. & **Ganusov, V. V.** 2012 Evolution of viral life-cycle in response to cytotoxic T lymphocyte-mediated immunity. *J Theor Biol*, **310C**, 3–13. doi:10.1016/j.jtbi.2012.06.020.
47. Bar, K. J., Tsao, C.-Y., Iyer, S. S., Decker, J. M., Yang, Y., Bonsignori, M., Chen, X., Hwang, K.-K., Montefiori, D. C. *et al.* 2012 Early Low-Titer Neutralizing Antibodies Impede HIV-1 Replication and Select for Virus Escape. *PLoS Pathog*, **8**(5), e1002721. doi:10.1371/journal.ppat.1002721.
48. Riou, C., **Ganusov, V. V.**, Champion, S., Mlotshwa, M., Liu, M. K. P., Whale, V. E., Goonetilleke, N., Borrow, P., Ferrari, G. *et al.* 2012 Distinct kinetics of Gag-specific CD4(+) and CD8(+) T cell responses during acute HIV-1 infection. *J Immunol*, **188**(5), 2198–2206. doi:10.4049/jimmunol.1102813.
49. **Ganusov, V. V.**, Goonetilleke, N., Liu, M. K. P., Ferrari, G., Shaw, G. M., McMichael, A. J., Borrow, P., Korber, B. T. & Perelson, A. S. 2011 Fitness Costs and Diversity of the Cytotoxic T Lymphocyte (CTL) Response Determine the Rate of CTL Escape during Acute and Chronic Phases of HIV Infection. *J Virol*, **85**(20), 10518–10528. doi:10.1128/JVI.00655-11.
50. **Ganusov, V. V.**, Barber, D. L. & De Boer, R. J. 2011 Killing of targets by CD8 T cells in the mouse spleen follows the law of mass action. *PLoS One*, **6**(1), e15959.

51. Fischer, W., **Ganusov, V. V.**, Giorgi, E. E., Hraber, P. T., Keele, B. F., Leitner, T., Han, C. S., Gleasner, C. D., Green, L. *et al.* 2010 Transmission of single HIV-1 genomes and dynamics of early immune escape revealed by ultra-deep sequencing. *PLoS One*, **5**(8), e12303.
52. Zilman, A., **Ganusov, V. V.** & Perelson, A. S. 2010 Stochastic models of lymphocyte proliferation and death. *PLoS One*, **5**(9), e12775. doi:10.1371/journal.pone.0012775.
53. **Ganusov, V. V.**, Lukacher, A. E. & Byers, A. M. 2010 Persistence of viral infection despite similar killing efficacy of antiviral CD8(+) T cells during acute and chronic phases of infection. *Virology*, **405**(1), 193–200.
54. Lyadova, I. V., Tsiganov, E. N., Kapina, M. A., Shepelkova, G. S., Sosunov, V. V., Radaeva, T. V., Majorov, K. B., Shmitova, N. S., van den Ham, H. J. *et al.* 2010 In mice, tuberculosis progression is associated with intensive inflammatory response and the accumulation of Gr-1 cells in the lungs. *PLoS One*, **5**(5), e10469.
55. **Ganusov, V. V.**, Borghans, J. & De Boer, R. J. 2010 Explicit kinetic heterogeneity: mechanistic models for interpretation of labeling data of heterogeneous cell populations. *PLoS Comp Biol*, **6**(2), e1000666.
56. Goonetilleke, N., Liu, M. K., Salazar-Gonzalez, J. F., Ferrari, G., Giorgi, E., **Ganusov, V. V.**, Keele, B. F., Learn, G. H., Turnbull, E. L. *et al.* 2009 The first T cell response to transmitted/founder virus contributes to the control of acute viremia in HIV-1 infection. *J Exp Med*, **206**(6), 1253–72.
57. Asquith, B., Borghans, J. A., **Ganusov, V. V.** & Macallan, D. C. 2009 Lymphocyte kinetics in health and disease. *Trends Immunol*, **30**(4), 182–9.
58. **Ganusov, V. V.** & De Boer, R. J. 2008 Estimating in vivo death rates of targets due to CD8 T-cell-mediated killing. *J Virol*, **82**(23), 11749–11757.
59. **Ganusov, V. V.** & De Boer, R. J. 2008 Tissue distribution of lymphocytes and plasma cells and the role of the gut: response to Pabst *et al.* *Trends Immunol*, **29**(5), 209–10.
60. Althaus, C. L., **Ganusov, V. V.** & De Boer, R. J. 2007 Dynamics of CD8+ T cell responses during acute and chronic lymphocytic choriomeningitis virus infection. *J Immunol*, **179**(5), 2944–2951.
61. **Ganusov, V. V.** & De Boer, R. J. 2007 Do most lymphocytes in humans really reside in the gut? *Trends Immunol*, **28**(12), 514–8.
62. **Ganusov, V. V.**, Milutinovic, D. & De Boer, R. J. 2007 IL-2 regulates expansion of CD4+ T cell populations by affecting cell death: insights from modeling CFSE data. *J Immunol*, **179**(2), 950–957.
63. **Ganusov, V. V.** 2007 Discriminating between Different Pathways of Memory CD8+ T Cell Differentiation. *J Immunol*, **179**(8), 5006–5013.
64. De Boer, R. J., **Ganusov, V. V.**, Milutinovic, D., Hodgkin, P. D. & Perelson, A. S. 2006 Estimating Lymphocyte Division and Death Rates from CFSE Data. *Bull Math Biol*, **68**(5), 1011–1031.
65. **Ganusov, V. V.** & Antia, R. 2006 Imperfect vaccines and the evolution of pathogens causing acute infections in vertebrates. *Evolution*, **60**(5), 957–69.
66. **Ganusov, V. V.** & De Boer, R. J. 2006 Estimating costs and benefits of CTL escape mutations in SIV/HIV Infection. *PLoS Comput Biol*, **2**(3), e24.
67. **Ganusov, V. V.**, Pilyugin, S. S., Ahmed, R. & Antia, R. 2006 How does cross-reactive stimulation affect the longevity of CD8+ T cell memory? *PLoS Comput Biol*, **2**(6), e55.

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69. **Ganusov, V. V.** & Antia, R. 2005 Pathology during acute infections: contributions of intracellular pathogens and the CTL response. *Biol Lett*, **1**(2), 239 – 242.
70. Antia, R., **Ganusov, V. V.** & Ahmed, R. 2005 The role of models in understanding CD8+ T-cell memory. *Nat Rev Immunol*, **5**(2), 101–111.
71. Pilyugin, S. S., **Ganusov, V. V.**, Murali-Krishna, K., Ahmed, R. & Antia, R. 2003 The rescaling method for quantifying the turnover of cell populations. *J Theor Biol*, **225**(2), 275–283.
72. **Ganusov, V. V.** 2003 The role of the cytotoxic T-lymphocyte response and virus cytopathogenicity in the virus decline during antiviral therapy. *Proc R Soc Lond B Biol Sci*, **270**(1523), 1513–8.
73. **Ganusov, V. V.** & Antia, R. 2003 Trade-offs and the evolution of virulence of microparasites: do details matter? *Theor Popul Biol*, **64**(2), 211–20.
74. **Ganusov, V. V.** 2003 Evolution of virulence: adaptive or not? *Trends Microbiol*, **11**(3), 112–3; author reply 113–4.
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79. **Ganusov, V. V.**, Bril'kov, A. V. & Pechurkin, N. S. 2000 Mathematical modeling of the population dynamics of unstable plasmid-bearing bacterial strains during continuous cultivation in the chemostat. *Biofizika*, **45**(5), 881–887.
80. Pechurkin, N. S., Brilkov, A. V., **Ganusov, V. V.**, Kargatova, T. V., Maksimova, E. E. & Popova, L. Y. 1999 Modelling of genetically engineered micro-organisms introduction in closed artificial microcosms. *Adv Space Res*, **24**(3), 335–41.
81. **Ganusov, V. V.**, Bril'kov, A. V. & Pechurkin, N. S. 1999 Structural approach to simulating the population dynamics of unstable recombinant strains of bacteria containing multicopy plasmids. *Dokl Akad Nauk*, **369**(2), 267–70.

## Grants: pending/in preparation

- 2024-29: NIH/NAID. R01: “Quantitative understanding of early events of Mycobacterium tuberculosis aerosol infection of rhesus monkeys” (MPI: Smriti Mehra and Vitaly V. Ganusov, total: \$5.6M).
- 2024-27: NSF. “Collaborative Research: Building rigorous, quantitative understanding of how plant viruses manipulate their hosts for systemic dissemination” (MPI: Tessa M. Burch-Smith, Jesse D. Woodson, and Vitaly V. Ganusov, total: \$2M).



- 2024-29 : NIH/NIAID. R01: "Using mouse models to elucidate the mechanisms of chikungunya virus neuropathogenesis" (PI: Torri Baxter, my role: Co-I, total: \$4.8M).
- 2024-29: NIH/NIAID. R01: "Mathematical modeling of immune response to malaria" (PI: Vitaly Ganusov, renewal of the previous award; grant was transferred from NIGMS to NIAID). Score 14%, waiting for funding decision.

## Grants: active

- 2022-27: NIH/NIAID. R01AI158963: "Mathematical modeling of Mycobacterium tuberculosis dissemination" (PI: Vitaly Ganusov, \$2.85M/\$2.2 (direct)).

## Grants: past

- 2017-23: NIH/NIGMS. R01GM118553: "Mathematical modeling of immune response to malaria" (PI: Vitaly Ganusov, total/direct amount \$1.5M/\$1.15M (direct)).
- 2018-20: Burroughs Wellcome Fund "Enhancing Quantitative and Data Science Education for Graduate Students in Biomedical Science at the University of Tennessee, Knoxville" (PI: Lou Gross; VG: key personnel; total/direct amount: \$150k/\$150k).
- 2018-19: Burroughs Wellcome Fund "Mathematical modeling of Mycobacterium tuberculosis dynamics" (travel grant for sabbatical; PI: Vitaly Ganusov, total/direct amount: \$7.5k/\$7.5k).
- 2013-17: Scientist Development Grant: "Modeling escape of HIV from CD8 T cell responses" (American Heart Association, PI: Vitaly Ganusov, total amount/direct cost: \$301k/\$274k).
- 2014-15: Center for Wildlife Health Research grant (Institute of Agriculture/UTK, PI: S. Eda, Co-PI: Vitaly Ganusov, total amount \$10k).
- 2014-15: Center of Excellence in Livestock Diseases and Human Health (COE) Research Award (Institute of Agriculture/UTK, PI: S. Eda, Co-PI: Vitaly Ganusov, total amount \$5k).
- 2013-14: AgResearch Innovation Grant: "Mathematical modeling of immune response to Mycobacterium avium subsp. paratuberculosis in Johne's disease". Ag Campus, UTK (PI: Shige Eda, Co-PI: Vitaly Ganusov, total amount: \$25k).
- 2013: Support for the Third Bi-annual workshop on "Systems approaches in Immunology". Army Research Office (PI: Vitaly Ganusov, total amount: \$10k).
- 2012: Support for the Annual meeting of the Society for Mathematical Biology. Army Research Office (PI: Vitaly Ganusov, total amount: \$9k).

## Awards and Fellowships

- 2023 Success in Multidisciplinary Research Award from Chancellor's office of the University of Tennessee (May 2023).
- 2020 Best contributed talk (award at the annual meeting of the Society for mathematical biology, Aug 20, 2020).

- 2017 Undergraduate faculty travel award from the American Association of Immunologists (Washington, DC, May 12-16, 2017).
- 2016 Junior faculty travel award from the American Association of Immunologists (Seattle, WA, May 13-17, 2016).
- 2015 Undergraduate faculty travel award from the American Association of Immunologists (New Orleans, LA, May 8-12, 2015).
- 2015 Quest scholar of the week (University of Tennessee, Knoxville, TN, October 2015).
- 2014 Undergraduate faculty travel award from the American Association of Immunologists (Pittsburgh, PA, May 2-6, 2014).
- 2014 Quest scholar of the week (University of Tennessee, Knoxville, TN, March 2014).
- 2013 Junior faculty travel award from the American Association of Immunologists (Honolulu, HI, May 5-8, 2013).
- 2012 Junior faculty travel award from the American Association of Immunologists (Boston, MA, May 8-12, 2012).
- 2011 Junior faculty travel award from the American Association of Immunologists (San Francisco, CA, May 13-17, 2011).
- 2010 New Investigator Award during the "AIDS vaccine" meeting (Atlanta, GA, September 28 - October 1st, 2010).
- 2010 Travel grant to participate in the work of the Keystone meeting "HIV biology and pathogenesis" (Santa Fe, NM, January 12-16, 2010).
- 2009 Travel grant to participate in the work of the workshop "Multi-Scale Modeling of Host/Pathogen Interactions" (Pittsburgh, PA, USA, June 23-25, 2009)
- 2009 Travel grant to participate in the work of the Keystone meeting "HIV Immunobiology: From Infection to Immune Control" (Keystone, CO, March 22-27, 2009).
- 2008-10 Director's Postdoctoral Research Fellowship, Los Alamos National Laboratory, United States Department of Energy (Los Alamos, NM, USA; total amount ~ \$170k for 2 years)
- 2007 Travel grant to participate in the work of the Keystone meeting "Immunologic memory" (Santa Fe, NM, 2007).
- 2006 First place in the contest of oral presentations of young immunologists during the conference "Immunology days", St. Petersburg, 2006
- 2005-07 Marie Curie Incoming International Fellowship (# 019735, title: "Developing quantitative methods for estimating birth and death rates of immune cells using CFSE label"; total amount ~ €130k for 2 years)
- 2002 Krasnoyarsk Region Science Foundation personal grant for young scientists (KRSF #13G094)
- 2002 Krasnoyarsk Region Science Foundation grant (KRSF #11F0007M)
- 1998-99 Scholarship of the President of Russia for outstanding students for studying abroad (Emory University, Atlanta, GA, USA; total award ~ \$50k for 1 year).

1996-99 Scholarships of the President of Russia for outstanding students.

1997 Award of the Mayor of Krasnoyarsk City to young talents.

1996-99 Fellowship grants of the International Soros Science Education Program (ISSEP) (s96-1710, s97-188, s98-963, s99-407).

1995 Fellowship of the Krasnoyarsk Region Science Foundation for outstanding students.

## Presentations (invited talks, selected talks, posters)

1. **Selected oral presentation.** Annual meeting of the Society for Mathematical Biology. Columbus, OH (July 16-20, 2023)
2. **Selected oral presentation.** 6th workshop on virus dynamics. Nagoya, Japan (July 4-6, 2023)
3. **Invited participation.** Annual symposium on mathematical modeling of infectious diseases dynamics. Institute for Disease modeling. Bill and Melinda Gates foundation. Seattle, WA (May 22-24, 2023)
4. **Selected poster presentation.** Annual meeting of American Association of Immunologists (AAI). Washington, DC (May 11-15, 2023)
5. **Selected oral presentation.** 30th International Dynamics & Evolution of Human Viruses Meeting. Heidelberg, Germany (April 19-22, 2023)
6. **Invited presentation.** Molecular and Biomedical Sciences, University of Montana, Missoula, MT (April 7, 2023)
7. **Selected poster presentation.** Gordon Research conference "Directed cell migration". Galveston, TX (Jan 8-13, 2023)
8. **Invited presentation.** Texas Biomedical Research Institute, San Antonio, Texas (Oct 28, 2022).
9. **Selected poster presentation.** 15th Q-bio conference. Colorado State University, Fort Collins, CO (June 15-17, 2022). q-bio.org
10. **Invited presentation.** Junior colloquium, Mathematics Department, University of Tennessee, Knoxville (May 5, 2022).
11. **Invited presentation.** Emory University, Department of Biology (Feb 23/24, 2022)
12. **Invited presentation.** Siberian Federal University, Department of Biophysics/Department of Natural Sciences (June 24/June 31, 2021)
13. **Invited presentation.** Department of medicine, Laboratory of Medicine, University of Florida (via Zoom, April 1, 2021)
14. **Selected oral presentation.** Models in Population Dynamics, Ecology, and Evolution (MPDEE) conference (via Zoom, April 26-30, 2021, University of Leicester, UK)
15. **Selected oral presentation.** Annual (e-version) meeting of the Society for Mathematical Biology (eSMB, Aug 17-20, 2020). Award for best oral presentation in Immunology and Infection subgroup.

16. **Selected oral and poster presentations.** Annual American Association of Immunologists (AAI) meeting (Honolulu, HI, May 8-12, 2020).
17. **Invited presentation.** Webinar at the National Institute for Mathematical and Biological Synthesis (NIMBioS) (Knoxville, TN, April 22, 2020)
18. **Invited presentation.** Public Health Research Institute, Rutgers University Medical School (Newark, NJ, Feb 11, 2020).
19. **Selected oral presentation.** Fourth international workshop “Virus dynamics” (Paris, France, Oct 21-23, 2019).
20. **Selected oral presentation.** Third international conference “Physics for Life Sciences” (St. Petersburg, Russia, Oct 14-18, 2019).
21. **Invited talk.** University of Washington Medical School (Jim Mullins laboratory, Department of Microbiology, Seattle, WA, June 11, 2019).
22. **Invited talk.** Conference “Many Hosts of Mycobacteria VIII” (Bronx, NY, March 4-6, 2019).
23. **Selected oral and poster presentations.** Annual American Association of Immunologists (AAI) meeting (San Diego, CA, May 9-13, 2019).
24. **Selected poster presentation.** European congress on immunology (Amsterdam, the Netherlands, Sep 2-5, 2018).
25. **Selected talk.** Annual meeting of the Society for Mathematical Biology (Sydney, Australia, July 8-12, 2018).
26. **Selected poster presentation.** Gordon research conference “Host-parasite interactions” (Newport, RI, June 10-15, 2018).
27. **Selected poster presentation.** Annual American Association of Immunologists (AAI) meeting (Austin, TX, May 4-8, 2018).
28. **Selected oral presentation.** Second international symposium “Models in Population Dynamics, Ecology, and Evolution (MPDEE’18)” (Leicester, UK, April 9-13, 2018).
29. **Selected poster presentation.** Keystone meeting “HIV and Co-Infections: Pathogenesis, Inflammation and Persistence (X8)” (Whistler, BC, Canada, April 15-19, 2018).
30. **Invited talk.** University of Tennessee Institute of Agriculture (UTIA); College of Veterinary Medicine (Knoxville, TN, March 26, 2018).
31. **Invited talk.** University of Tennessee Medical Center (Knoxville, TN, February 27, 2018).
32. **Selected oral presentation.** International symposium “Measuring and modeling cell migration” (Vienna, Austria, February 22-23, 2018).
33. **Invited talk.** University of Tennessee Health Science Center (Amber Smith and Colleen Jonsson labs) (Memphis, TN, Nov 29, 2017)
34. **Invited talk.** Second international meeting “Physics for life sciences” (St. Petersburg, Russia, Sept 16-20, 2017)
35. **Invited talk.** Center for Infectious Disease Research (Seattle, WA, Aug 1-4, 2017)

36. **Invited talk.** Department of Biophysics, Siberian Federal University (Krasnoyarsk, Russia, July 3, 2017)
37. **Invited talk.** Central Institute for Tuberculosis (Moscow, Russia, June 17, 2017)
38. **Participation.** Second Biology and Medicine through Mathematics (BAMM) meeting (Virginia Commonwealth University, Richmond, VA, May 18-20, 2017).
39. **Selected poster presentation.** Annual American Association of Immunologists (AAI) meeting (Washington, DC, May 12-16, 2017).
40. **Participation.** Workshop “Viral Dynamics: Past, Present & Future” (Santa Fe, NM, May 5-7, 2017). Workshop in honor of Alan S. Perelson (70th birthday).
41. **Selected poster presentation and workshop chair.** Keystone meeting “Modeling virus infections and immunity” (Estes Park, CO, May 1-5, 2017).
42. **Invited talk.** Mathematics Junior Colloquium (Department of Mathematics, University of Tennessee, Knoxville, TN, Oct 12, 2016).
43. **Selected talk.** 4th workshop on Systems Approaches in immunology (Santa Fe, NM, September 27-28, 2016).
44. **Invited talk.** Workshop to Explore the Creation of an ORNL/UT Computational Viral Genomics Center (Oak Ridge, TN, July 28-29, 2016).
45. **Selected talk.** Biology and Medicine through Mathematics (BAMM) meeting (Virginia Commonwealth University, Richmond, VA, May 20-22, 2016).
46. **Selected poster presentation.** Annual meeting of the American Association of Immunologists (Seattle, WA, May 13-17, 2016).
47. **Invited talk.** NIMBioS casual seminar (National Institute for Mathematical and Biological Synthesis, April 29, 2016).
48. **Plenary talk.** 7th Annual Undergraduate Research Symposium (URSA) at the University of Tennessee (Knoxville, TN, April 2, 2016).
49. **Invited talk.** University of Tennessee Medical School (Knoxville, TN, Jan 26, 2016).
50. **Invited talk.** Haslam Scholars. University of Tennessee (Knoxville, TN, Jan 29, 2016).
51. **Invited talk.** Department of Biology, Faculty of Science (Kyushu University, Fukuoka, Japan, Nov 2, 2015).
52. **Keynote talk.** International Conference “Innovative Mathematical Modeling for the Analysis of Infectious Disease Data” (Sapporo, Hokkaido, Japan, Oct 29-30, 2015).
53. **Invited talk.** Theoretical Biology and Bioinformatics, Utrecht University (Utrecht, The Netherlands, Oct 18-22, 2015).
54. **Invited (plenary) talk.** Second international workshop “Virus dynamics” (Toronto, ON, Canada, May 17-18, 2015).
55. **Selected oral presentation.** Annual meeting of the Society for Mathematical Biology (Atlanta, GA, June 30-July 3, 2015).

56. **Invited talks.** Department of Biophysics, Siberian Federal University (Krasnoyarsk, Russia, May 25-29, 2015).
57. **Selected poster presentation.** Annual meeting of the American Association of Immunologists (New Orleans, LA, May 5-11, 2015).
58. **Invited talk.** 19th Annual Woods Hole Immunoparasitology (WHIP) meeting: Immune Selection on Protozoan & Metazoan Parasites Workshop. (Woods Hole, MA, April 19-22, 2015).
59. **Invited talk.** Mathematics Department, Case Western Reserve University (Cleveland, OH, March 19, 2015).
60. **Invited talk.** World Health Interest Group, Center for Global Health & Diseases, Case Western Reserve University (Cleveland, OH, March 19, 2015).
61. **Invited talk.** SIAM regional meeting (Georgetown University, Washington, DC, March 7-8, 2015).
62. **Invited talk.** Johns Hopkins University School of Public Health (Baltimore, MD, 19 February, 2015).
63. **Invited talk.** AIDS and Cancer Virus Program, Frederick National Laboratory for Cancer Research (NIH/NCI, Frederick, MD, Dec 5, 2014).
64. **Invited talk.** Annual meeting of the Society for Mathematical Biology (Osaka, Japan, July 28 - Aug 1, 2014).
65. **Poster presentations.** Annual meeting "HIV dynamics and evolution" (Tucson, AZ, May 7-10, 2014).
66. **Selected oral and poster presentations.** Annual meeting of the American Association of Immunologists (Pittsburgh, PA, May 2-6, 2014).
67. **Invited talk.** Southeastern Spring Sectional Meeting of the American Mathematical Society (Knoxville, TN, 21-23 March, 2014).
68. **Poster presentation.** Keystone meeting "Tissue-resident memory T cells" (Snowbird, UT, Jan 12-16, 2014).
69. **Selected oral presentation.** Third international workshop "Systems approaches in immunology" (Santa Fe, NM, Jan 10-11, 2014).
70. **Invited talk.** Theoretical Biology and Bioinformatics, Utrecht University (Utrecht, The Netherlands, Dec 18, 2013).
71. **Invited talk.** Virolab (Ab Osterhaus) Erasmus Medical Center, (Rotterdam, The Netherlands, 16-17 December, 2013).
72. **Invited talk.** Kyoto University, Michio Tomura laboratory (Kyoto, Japan, May 27 - June 2, 2013).
73. **Selected oral presentation.** Annual meeting of the American Association of Immunologists (Honolulu, HI, May 5-8, 2013).
74. **Invited talk.** University of Pennsylvania Veterinary School, Gudrun Debes laboratory (Philadelphia, PA, 27-29 March, 2013).
75. **Invited talk.** NIAID/NIH, Ron Germain laboratory for systems biology (Washington, DC, Nov 30, 2012).

76. **Invited talk.** Miniprogram “Quantitative Immunology: Experiments Meet Modeling” (UCSB/Kavli Institute for Theoretical Physics, Santa Barbara, CA, Nov 26 - Dec 20, 2012).
77. **Poster presentation.** Annual meeting of the American Association of Immunologists (Boston, MA, May 4-8, 2012).
78. **Selected oral presentation.** Annual meeting “HIV dynamics and Evolution” (Ashville, NC, April 27-30, 2012).
79. **Invited talk.** Second International workshop “Lymphocyte repertoire” (Jerusalem, Israel, February 19-23, 2012).
80. **Poster presentation.** Annual meeting of the American Association of Immunologists (San Francisco, CA, May 13-17, 2011).
81. **Invited talk.** Physics of Immunity: Complexity Approach (Dresden, Germany, April 04 - 08, 2011).
82. **Poster presentation.** Annual Meeting “AIDS vaccine” (Atlanta, GA, 28 September - 1 October, 2010).
83. **Invited talk.** UT Medical Center, Graduate School of Medicine (Knoxville, TN, Sept 14, 2010)
84. **Poster presentation.** Keystone meeting “HIV biology and pathogenesis” (Santa Fe, NM, USA, 12-16 January, 2010).
85. **Invited talk.** Theoretical Biology and Biophysics group (T-6). Los Alamos National Laboratory, Los Alamos, NM, July 24-Aug 7, 2010)
86. Workshop on Mathematical Immunology at the annual Life Sciences meeting of the Society for Industrial and Applied Mathematics (Pittsburgh, PA, July 12-15, 2010).
87. **Invited talk.** Lectures at the Fields Institute for research in mathematical sciences (Toronto, Canada, July 19-30, 2010; *was unable to attend*).
88. **Invited plenary lecture.** The annual meeting of the Society for Mathematical Biology (Rio De Janeiro, Brazil, July 26-29, 2010; *was unable to attend*).
89. **Invited talk.** University of Luebeck (Luebeck, Germany, November 25-28, 2009)
90. **Participation.** An annual Center for HIV/AIDS vaccine immunology (CHAVI) meeting (Raleigh, NC, USA, October 4 - 7, 2009).
91. **Poster presentation.** The CMPI Symposium on “Multi-Scale Modeling of Host/Pathogen Interactions” (Pittsburgh, PA, USA, June 23 - 25, 2009).
92. **Invited talk.** Fred Hutchinson Cancer Research Center (Seattle, WA, June 3-5, 2009).
93. **Poster presentation.** Keystone meeting “HIV Immunobiology: From Infection to Immune Control” (Keystone, CO, USA, 22-27 April, 2009).
94. **Invited talk.** University of Massachusetts Medical School (Worcester, MA, April 18, 2009).
95. **Invited talk.** National Institutes of Health (Bethesda, MD, April 10-13, 2009).
96. **Invited talk.** Center for Mathematics and Informatics (CWI, Amsterdam, Netherlands, April 3, 2009).

97. **Invited talk.** An international conference "Antigenic variation and immune evasion" (Annecy, France, March 30 - April 2, 2009).
98. **Invited talk.** University of Tennessee, Department of Microbiology (Knoxville, TN, USA, March 11-13, 2009).
99. **Poster presentation.** Keystone meeting "Immune memory and host defense" (Keystone, CO, USA, 8-13 February, 2009).
100. **Poster presentation.** Conference "Frontiers in Immunological Memory" (Newport Beach, CA, USA, 26-27 September, 2008).
101. **Invited talk.** An international workshop "Lymphocyte kinetics in health and disease" (London, UK, May 19-20, 2008).
102. **Poster presentation.** Annual conference "HIV dynamics and Evolution" (Santa Fe, NM, USA, 27-30 April, 2008).
103. **Invited talk.** Wistar Institute, University of Pennsylvania (Philadelphia, USA, April 25, 2008).
104. **Invited talk.** University of Bordeaux 2 (Victor Segalen), Institute for Public Health, Epidemiology and Development (ISPED) (Bordeaux, France, April 8-10, 2008).
105. **Invited talk.** International workshop "Modeling and identification of distributed parameter systems for cell population dynamics" (Leuven, Belgium, March 12-14, 2008).
106. **Invited talk.** University of Bath, Department of Mathematics (Bath, UK, January 23-25, 2008).
107. **Poster presentation.** Annual meeting of the Dutch Immunology Society (NVVI) (Congress Hotel NH "De Leeuwenhorst", Noordwijkerhout, the Netherlands, December 20-21, 2007).
108. **Invited talk.** Mount Sinai Medical School (New York, NY, USA, December 4, 2007).
109. **Invited talk.** Yale University (New Haven, CT, USA, December 3, 2007).
110. **Invited talk.** Instituto Gulbenkian de Ciencia (Lisbon, Portugal, November 11-14, 2007).
111. **Invited talk.** Institute for Numerical Mathematics (Moscow, Russia, October 23-24, 2007).
112. **Invited talk.** Central Institute for Tuberculosis (Moscow, Russia, October 23-24, 2007).
113. **Invited talk.** Los Alamos National Laboratory (Los Alamos, New Mexico, USA, July 16-20, 2007).
114. **Selected oral presentation.** 1st International Symposium on Genetic and Immune Correlates of HIV Infection and Vaccine-Induced Immunity (Budapest, Hungary, June 10-13, 2007).
115. **Invited talk.** Annual meeting of the Canadian Mathematical Society-MIDAS (Winnipeg, Canada, June 3-4, 2007).
116. **Selected oral Presentation.** 14th international meeting "HIV Dynamics and Evolution" (Segovia, Spain, April 17-20, 2007).
117. **Poster presentation.** Keystone meeting "Immunologic memory" (Santa Fe, New Mexico, March 3-8, 2007).
118. **Invited talk.** DIMACS workshop "Immuno-epidemiology", Rutgers University (New Brunswick, NJ, USA, December 10-14, 2006).



119. **Invited talk.** Department of Mathematics, University of Glasgow (Glasgow, UK, October 23, 2006).
120. **Invited talk.** Department of Biology, GA Tech (Atlanta, USA, August 7, 2006).
121. **Selected oral presentation.** Annual Meeting of the Society for Mathematical Biology, joint with SIAM (North Carolina State University, Raleigh, July 31-August 4, 2006).
122. **Selected oral presentation.** International Forum “Immunology days” (St. Petersburg, Russia, May 29 – June 1, 2006).
123. **Invited talk.** Annual meeting of the Dutch Society for Medical Microbiology (Arnhem, The Netherlands, April 2006).
124. **Poster presentation.** Annual meeting of the Swiss Immunology Society (ETH, Zurich, Switzerland, March 30-31, 2006).
125. **Poster presentation.** 34st Annual Autumn Immunology conference (Chicago Marriott Downtown, Chicago, Illinois, November 19-21, 2005).
126. **Invited talk.** Laboratory of Ecology, Pierre and Marie Curie University (Paris, France, November 2005).
127. **Invited talk.** Theoretical Biology department, Utrecht University (Utrecht, the Netherlands, July 2004).
128. **Selected oral presentation.** Annual meeting of the Society for the Study of Evolution (Colorado State University, Fort Collins, Colorado, June 26-30, 2004).
129. **Invited talk.** Mathematical Biosciences Institute, Ohio State University (Columbus, Ohio, June 2004).
130. **Selected oral presentation.** “Immunology Models: Cell Signaling and Immune Dynamics”: workshop on mathematical modeling in immunology (Mathematical Biosciences Institute, Ohio State University, Columbus, Ohio, May 10-14, 2004).
131. **Poster presentation.** Annual meeting of the Dutch Immunology Society (NVVI) (Congress Hotel NH “De Leeuwenhorst”, Noordwijkerhout, the Netherlands, December 8-9, 2005).
132. **Selected oral presentation.** Annual meeting of the Society for the Study of Evolution (California State University, Chico, California, June 20-24, 2003).
133. **Selected oral presentation.** Workshop on Theoretical Immunology (Florida State University, Gainesville, Florida, May 27-29, 2002).
134. **Poster presentation.** 31st Annual Autumn Immunology conference (Chicago Marriott Downtown, Chicago, Illinois, November 22-25, 2002).
135. **Poster presentation.** Annual meeting of the Society for the Study of Evolution (University of Tennessee, Knoxville, Tennessee, June 26-30, 2001).
136. **Selected oral presentation.** 1st annual Duke University’s conference on Mathematical immunology (Duke University, Durham, North Carolina, April 23-26, 2000).
137. **Poster presentation.** International Conference on Mathematics Applied to Biology and Annual Meeting of the Society for Mathematical Biology (University of Utah, Salt Lake City, Utah, April 3-5, 2000).

138. **Selected oral presentation.** 3rd Siberian Congress on industrial and applied mathematics (INPRIM-98) (Novosibirsk State University, Novosibirsk, Russia, June 22-27, 1998).
139. **Selected oral presentation.** 8th International Symposium “Reconstruction of homeostasis” (Krasnoyarsk Scientific Center, Krasnoyarsk, Russia, March 15-20, 1998).

## Outreach activities

1. **Expertise in immunology for news agencies.** Expert opinion on articles on COVID19 by Russian news agency TASS in 2021-22 (<https://tass.com/>)
2. **Novel advances in immunology.** TV interview on novel achievements in immunology (July 18, 2017. TV Center, local TV station in Krasnoyarsk, Russia).
3. **Undergraduate supervision.** Summer Research Experience for Undergraduates (SRE) at NIM-BIoS, the National Institute for Mathematical and Biological Synthesis (Knoxville, TN, summer 2015).
4. **Undergraduate supervision.** Summer Research Experience for Undergraduates (SRE) at NIM-BIoS, the National Institute for Mathematical and Biological Synthesis (Knoxville, TN, summer 2014).
5. **Invited talk.** Oak Ridge League of Women Voters (Oak Ridge, TN, March 4, 2014)
6. **Undergraduate supervision.** Summer Research Experience for Undergraduates (SRE) at NIM-BIoS, the National Institute for Mathematical and Biological Synthesis (Knoxville, TN, summer 2012).
7. **Undergraduate supervision.** Summer Research Experience for Undergraduates (SRE) at NIM-BIoS, the National Institute for Mathematical and Biological Synthesis (Knoxville, TN, summer 2011).

## Organized conferences/workshops/etc

1. Forth international workshop “Systems approaches in immunology” (27-28 of September, 2016, Santa Fe, NM). Co-organized with Steven Kleinstein (Yale), Ruy M. Ribeiro (LANL), and Alan S. Perelson (LANL).
2. Southeastern Spring Sectional Meeting of the American Mathematical Society (21-23 of March 2014, Knoxville, TN). Co-organized with Megan Powell (University of St. Francis) and Judy Day (UTK).
3. Third international workshop “Systems approaches in immunology” (10-11 of January 2014, Santa Fe, NM). Co-organized with Steven Kleinstein (Yale), Ruy M. Ribeiro (LANL), and Alan S. Perelson (LANL).
4. Annual meeting of the Society for Mathematical Biology, SMB (Co-organized with Lou Gross, Suzanne Lenhard, Sergey Gavrillets, Judy Day, Yetta Jager; 27-30 of July, 2012, Knoxville, TN)
5. Second international workshop “Systems approaches in immunology” (6-7 of January 2012, Santa Fe, NM). Co-organized with Steven Kleinstein (Yale), Ruy M. Ribeiro (LANL), and Alan S. Perelson (LANL).

6. An International workshop “T cell kinetics in viral infections” (24-25 of January 2011, Regent’s College Conference Center, London, UK). Co-organized with Derek Macallan (St. George’s University of London), Becca Asquith (Imperial college) and Jose Borghans (University Medical Center Utrecht).
7. An international workshop “Systems approaches in immunology” (10-11 of January 2010, Santa Fe, NM). Co-organized with Steven Kleinstein (Yale), Ruy M. Ribeiro (LANL), and Alan S. Perelson (LANL).
8. A Minisymposium “Systems approaches in immunology” during the Society for Mathematical Biology annual meeting (27-30 July 2009, Vancouver, Canada).
9. An International workshop “Lymphocyte kinetics in health and disease” (19-20 May 2008, Regent’s College Conference Center, London, UK). Co-organized with Derek Macallan (St. George’s University of London), Becca Asquith (Imperial college) and Jose Borghans (University Medical Center Utrecht).

## Editor/Guest Editor for journals

Associate Editor for *Frontiers in Immunology* (section “Viral Immunology”)

Associate Editor for *Frontiers in Microbiology* (section “Infectious diseases”)

Associate Editor for *Microorganisms*

Guest Editor for *PLoS Computational Biology* (selected papers)

## Refereed/co-refereed for journals

American Naturalist, BMC Bioinformatics, BMC Theoretical Biology and Medical Modelling, Bulletin of Mathematical Biology, Epidemics, eLife, Evolution, Evolutionary Applications, Evolutionary Ecology, Frontiers in Cellular and Infection Microbiology, Frontiers in Immunology, Frontiers in Microbiology, Genetics, IEEE/ACM Transactions on Computational Biology and Bioinformatics, Immunology and Cell Biology, Journal of Biological Dynamics, Journal of Mathematical Biology, Journal of Mathematical Analysis and Applications, Journal of the Royal Society Interface, Journal of Theoretical Biology, Journal of Immunology, Mathematical Analysis and Applications, Mathematical Biosciences, Mathematical Biosciences and Engineering, Nature, Nature Medicine, PLoS Biology, PLoS Computational Biology, PLoS One, PLoS Pathogens, Proceedings of the National Academy of Science of USA, Proceedings of the Royal Society of London: series B, Proceedings of the Royal Society Interface, Theoretical Biology and Medical Modelling, Trends in Microbiology, Viruses

## Refereed for grant agencies

Reviewer for the NSF (GRFP)

Reviewer for the NIH (ACE study section, U01 and P01 applications, MIRA for early investigators, COVID19-related research study sections, MABS study section)

Reviewer for the NIH study to determine impact of PI’s identity on scoring applications (2018)

Austrian Science Foundation

Germany Science Foundation (DFG)

Wellcome Trust (UK)

Army Research Office (reviewer of grants. 2013, 2018)

US-Israel Binational Funding

ANR (French analogue of NIH)

Swiss Science Foundation

## Teaching experience

1. **Course “Immunology” (MICRO 330: 2014-2022, UTK, Knoxville, TN).**

The course introduces basics of immunology to juniors majoring in biology. In this introductory course I use various active learning techniques such as online quizzes before the lecture, in class clicker quizzes, case study discussions and online blogging. The major change in the course was the development of a series of case studies where students, via group discussion, need to determine the underlying causes of illness of a patient.

2. **Course “Data-driven mathematical modeling” (MATH 681: Fall 2021, UTK, Knoxville, TN).**

In this course I teach basics of data analysis including statistics, programming (using R), data visualization, and mathematical modeling. Groups of students in the course were assigned sets of experimental data which they groups had to analyze and generate appropriate mathematical models to explain the data.

3. **Course “Overview of data science” (MATH 499: Fall 2019, UTK, Knoxville, TN).**

In this course I teach basics of data analysis including statistics, programming (using R), data visualization, and mathematical modeling. In the course we reproduce results from one of my unpublished research, and groups of students reproduce results (statistical analyses, graphs) from previously published papers.

4. **Course “Grant writing” (MICR 594: Fall 2017, UTK, Knoxville, TN).**

In this course I teach basics of scientific writing, the basics of critical thinkings, scientific method and experimental design. The ultimate goal for the course is for students to be able to write NIH- or NSF-style grant proposals, be able to present their work, and to critique other grant proposals.

5. **Course “Mathematics for the Life Sciences” (MATH 152: Spring 2017, UTK, Knoxville, TN).**

This is the second part of the series of mathematics for biology course. Topics included limits, derivatives, and integration with strong emphasis on solving biological problems. Many problems are formulated as word problems requiring to “convert” the word problem into mathematical problem.

6. **Course “Mathematics for the Life Sciences” (MATH 151: Spring 2013; 2015, UTK, Knoxville, TN).**

The goal of the course is to expose biology students to the wealth of mathematical methods for the analysis of experimental data and for the dynamical modeling of biological systems. The students also learn basics of programming using Matlab. I use a number of different active learning techniques, active learning room environment and flipped format of the course to promote group discussions/problem solving.

7. **Course “Immunology” (MICRO 430: Fall 2010-2013, UTK, Knoxville, TN).**

The course is similar to Micro 330.

8. **Course “Pathogenesis of infectious diseases” (MICRO 620, Spring 2012, UTK, Knoxville, TN).**  
In this course we analyzed and critiqued recent publications in the area of infectious diseases and immunology.
9. **Course “Data-driven mathematical modeling in immunology” (MATH 682, Spring 2011, UTK, Knoxville, TN).**  
In this course I taught the students basics of the mathematical modeling in immunology and data analysis. Groups of Students then analyzed specific sets of immunological data and development mathematical models to explain these data. Results of the work of one group have been submitted for publication.
10. **Course “Bioinformatica” (100-level, Fall 2006, Utrecht University, the Netherlands)..**  
Teaching assistant for a group of 25 biology students during recitation sessions.
11. **Course “Theoretical Biology” (100-level, Fall 2005, Utrecht University, the Netherlands)..**  
Teaching assistant for a group of 25 biology students during recitation sessions.
12. **Course “Immunology and Epidemiology” (Fall 2001, Emory University, Atlanta, GA).** Teaching assistant (grading exams, performing preparation sessions).

## Learning experiences

1. 2023 Faculty mentoring program (Spring 2023, UTK, Knoxville). This was the pilot program designed to teach how to be a better mentor – I was selected to be one of about 25 faculty participated in this program.
2. Grant writing institute (Spring 2012, UTK, Knoxville). This program was designed to teach how to write grants (NSF/NIH).

## Supervising experience

### Post-docs

1. Saikat Batabyal (2023-current). Topic: “Mathematical modeling of Mycobacterium tuberculosis dissemination”.
2. Dipanjan Chakraborty (2023-current). Topic: “Mathematical modeling of Mtb dynamics at ultra-low doses”.
3. Barun Majumder (2020-23). Topic: “Modeling CD8 T cell-mediated killing of cancers in collagen-fibrin gels”.
4. Soumen Bera (2020-21). Topic: “Mathematical modeling of T cell response to malaria”. Placement: Yu lab (St Jude’s Children’s hospital)
5. Harshana Rajakaruna (2017-2020). Topic: “Mathematical modeling of T cell response to malaria”. Future placement: Talmy lab (UTK), Das lab (Ohio State), Meharry Medical College (program coordinator).
6. Yiding Yang (2014-16). Topic: “Impact of CTL escape of HIV on disease progression”. Placement: home.
7. Clemente Aguilar (NIMBioS post-doc, 2013-14). Topic: “Development of novel tools for predicting CD4 T cell epitopes”.

8. Gesham Magombedze (NIMBioS post-doc, 2012-14). Topic: “Mathematical modeling of the dynamics of MAP infection in cattle”. Placement: post-doc, Imperial College, London, UK.
9. Calistus Ngonghala (NIMBioS post-doc, 2013). Topic: “Mathematical modeling of the lymphocyte migration via spleen”. Placement: Post-doc, Harvard University, Cambridge, MA, USA.
10. Yiding Yang (2010-11). Topic: “Mathematical modeling of CD8 T cell response to HIV”.

#### PhD students

1. Viktor Zenkov (2020-current, EECS). Topic: “Mathematical modeling of T cell search for the malaria parasites in the liver”.
2. Elizabeth Johnson (2011-2017, Microbiology). Topic: “Mathematical models of early HIV evolution”.

#### MS students

1. Hanlin Wang (2022, Mathematics). Topic: “Mathematical modeling of Plasmodium sporozoite movement in skin”.
2. Guilherme Silva (2022, Mathematics). Topic: “Mathematical modeling of naive T cell migration in mice”.
3. Viktor Zenkov (2019-20, EECS). Topic: “Mathematical modeling of T cell search for malaria parasites in the liver”.
4. David A. Foutch (2017-19, GST). Topic: “Mathematical modeling of lymphocyte migration”.
5. Reka Kelemen (2014, UTK). Topic: “Discriminating between alternative hypotheses of T cell clustering using computational and mathematical modeling”. Placement: Vienna Graduate School of Population Genetics, Vienna, Austria).
6. Jorg Calis (2008, Utrecht University). Topic: “Mathematical modeling of the impact of vaccination on SHIV dynamics”. Placement: PhD program (Theoretical Biology and Bioinformatics, Utrecht, Netherlands)
7. Tjibbe Donken (2006, Utrecht University). Topic: “Mathematical modeling of the immune response to influenza”. Placement: researcher (University of Groningen, Netherlands).

#### Undergraduate students supervised (selected list from over 80)

1. Kailynn Deck (2022-24, UTK, BME).
2. Jacob Looney (2023-24, UTK, Math).
3. John Maddox (2020-23, UTK, Math).
4. Raymond Lin (2020-23, UTK, BCMB).
5. Dhruv Patel (2020-23, UTK, BCMB).
6. Will Leone (2019-2022, UTK, Psychology): Placement: medical school (UT Memphis)
7. Joshua Miller (2019-2022, UTK, Math). Placement: Fire department, Oregon State parks.
8. Jacob Summers (2017-21, BCMB). Placement: graduate school at Stanford U; recipient of NSF GRFP.
9. Lucas Fiet (2018-19, Math).
10. Viktor Zenkov (2017-19, EECS). Placement: graduate school at UT
11. Kyla Linn (2016-18, Math). Placement: graduate school (GST program at UTK)

12. Aram Bejnood (2016-18, Math). Placement: medical school (UT Memphis)
13. Dustin Le (2011-14, college scholars). Placement: University of Texas Southwestern School of Medicine.
14. Margaret McDaniel (2013-15, BCMB/Math). Placement: University of Texas Southwestern Graduate School (NSF GRFP recipient).

### Other programs

1. Multiple rotation PhD/MS students.
2. Research Experience for Undergraduates (REU) at NIMBioS, the National Institute for Mathematical and Biological Synthesis (Summer 2011, Summer 2012, Summer 2014)

## Scientific expertise

- Mathematical biology
- Mathematical modeling of cellular immune responses to viral infections
- Data-driven modeling of immune responses
- Ecology and evolution of infectious diseases

## Programming skills

- *Mathematica, R*
- *python, matlab, C*

## List of potential referees

### Referees for competence in mathematical modelling

Alan S. Perelson, ph.D. (Los Alamos National Laboratory, USA; expertise: *population biology, theoretical immunology*, [asp@lanl.gov](mailto:asp@lanl.gov)): post-doctoral adviser

Rob J. De Boer, Prof. Dr. (Utrecht University, The Netherlands; expertise: *population biology, theoretical immunology*, [r.j.deboer@uu.nl](mailto:r.j.deboer@uu.nl)): post-doctoral adviser

Rustom Antia, ph.D. (Emory University, USA; expertise: *population biology, theoretical immunology*, [rustom.antia@emory.edu](mailto:rustom.antia@emory.edu)): PhD adviser

Daniel Coombs, ph.D. (University of British Columbia, Canada; expertise: *population biology, theoretical immunology*, [coombs@math.ubc.ca](mailto:coombs@math.ubc.ca))

Sergei S. Pilyugin, ph.D. (University of Florida, USA; expertise: *dynamical systems, theoretical immunology*, [pilyugin@math.ufl.edu](mailto:pilyugin@math.ufl.edu))

### Referees for competence in experimental immunology

Ian Cockburn, PhD (Australian National University, Canberra, Australia) expertise: *Immunology*, [ian.cockburn@anu.edu.au](mailto:ian.cockburn@anu.edu.au))

Dan Barber, PhD (NIH/NIAID, expertise: *Mtb infection*, barberd@niaid.nih.gov).

Photini Sinnis, PhD (Johns Hopkins University, Baltimore, MD, USA; expertise: *Malaria infection*, psinnis1@jhu.edu)

Kevin Urdahl, MD (Seattle Children's Research Institute/University of Washington, expertise: *Mtb infection*, Kevin.Urdahl@seattlechildrens.org).

Barry T. Rouse, VMD, PhD (University of Tennessee, Knoxville, TN, USA; expertise: *T cell response to herpes simplex virus*, btr@utk.edu)

**Referees for competence in microbiology**

Anatoly V. Brilkov, Doctor of Science (Federal Siberian University, Krasnoyarsk, Russia; expertise: *experimental and theoretical microbiology*, abrilkov@lan.krasu.ru): undergraduate adviser