
Andrew Santiago-Frangos, Ph.D.

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EDUCATION AND PROFESSIONAL EXPERIENCE

2024 – Present	Assistant Professor , University of Pennsylvania	
2018 – 2024	Postdoctoral Fellow , Montana State University “Mechanisms of CRISPR-mediated immunity and applications beyond editing”	Advisor: Dr. Blake Wiedenheft
2012 – 2018	Ph.D. , CMDB Program, Johns Hopkins University “Modular disordered domains autoregulate the bacterial RNA chaperone Hfq”	Advisor: Dr. Sarah A Woodson
2010 – 2011	Year In Industry Placement , GlaxoSmithKline (UK) “Strategies to select for thermostable therapeutic antibodies”	Advisor: Susannah Ford
2008 – 2012	B.Sc. , Biochemistry, University of Leicester (UK)	First Class Honors

HONORS, AWARDS & FELLOWSHIPS

2024	Nominated – The G. Harold & Leila Y. Mathers Foundation , UPenn
2024	Nominated – Sloan Research Fellowship , UPenn
2024	Nominated – Searle Scholars Program , UPenn
2024	Grant for Faculty Mentoring Undergraduate Research , UPenn
2024 – 2028	M. Jane Williams and Valerie Vargo Presidential Assistant Professor of Biology , UPenn
2022 – 2027	MOSAIC Postdoctoral Career Transition Award to Promote Diversity (K99/R00) , NIGMS
2020 – 2023	Postdoctoral Enrichment Program Award , Burroughs Wellcome Fund
2019 – 2022	Postdoctoral Fellow of the Life Sciences Research Foundation , Simons Foundation
2022	Registration Award , RNA Society, Diversity, Equity and Inclusion Committee
2020	Travel Award , International Union of Crystallography, New Mexico Consortium
2018	Nominated – Harold M. Weintraub Graduate Student Award , Johns Hopkins University
2018	Saul Roseman Award for Outstanding Biochemistry Thesis , Johns Hopkins University
2015, 2016	Poster Award for Outstanding RNA Research , Travel Award, RNA Society
2014	Victor Corces Teaching Award for Biochemistry , Johns Hopkins University

PUBLICATIONS (Citations: 790, h-index: 13, i10-index: 13) †corresponding, *direct mentee, ‡ equal contributors

- Burman N*, Belukhina S, Depardieu F, Wilkinson RA, Skutel M, **Santiago-Frangos A**, Graham AB*, et al.,. Viral proteins activate PARIS-mediated tRNA degradation and viral tRNAs rescue infection. *Nature* (2024).
- Faith DR, Kinnersley M, Brooks DM, Drecktrah D, Hall LS, Luo E, **Santiago-Frangos A**, Wachter J, Samuels DS, Secor PR. Characterization and genomic analysis of the Lyme disease spirochete bacteriophage phiBB-1. *PLOS Pathogens*. (2024).
- Santiago-Frangos A**, Henriques WS*, Wiegand T, Gauvin CC, Buyukyoruk M*, Graham AB, Wilkinson RA, Triem L*, Neselu K, Eng E, Lander GC, Wiedenheft B. Structure reveals why genome folding is necessary for site-specific integration of foreign DNA into CRISPR arrays. *Nat Struct Mol Biol* (2023).
- Wiegand T, Wilkinson R, **Santiago-Frangos A**, Lynes M, Hatzenpichler R, Wiedenheft B. Functional and Phylogenetic Diversity of Cas10 Proteins. *The CRISPR Journal* (2023).
- Nemudraia A, Nemudryi A, Buyukyoruk M*, Scherffius AM, Zahl TR*, Wiegand T, Pandey S, Nichols JE, Hall L*, McVey A, Lee HH, Wilkinson RA, Snyder LR, Jones JD, Koutmou KS, **Santiago-Frangos A**†, Wiedenheft B. Sequence-specific capture and concentration of viral RNA by type III CRISPR system enhances diagnostic. *Nature Communications* (2022).
- Roca J, **Santiago-Frangos A**, Woodson SA. Diversity of bacterial small RNAs drives competitive strategies for a mutual chaperone. *Nature Communications* (2022).
- Santiago-Frangos A**, Buyukyoruk M*, Wiegand T*, Krishna P*, Wiedenheft B. Distribution and phasing of sequence motifs that facilitate CRISPR adaptation. *Current Biology* (2021).
- Santiago-Frangos A**, Hall LN*, Nemudraia A, Nemudryi A, Krishna P*, et al.,. Intrinsic signal amplification by type III CRISPR-Cas systems provides a sequence-specific SARS-CoV-2 diagnostic. *Cell Reports Medicine* (2021).
- Hirschi M‡, Lu WT‡, **Santiago-Frangos A**, Wilkinson, R, Golden SM, et al.,. AcrIF9 tethers non-sequence specific dsDNA to the CRISPR RNA-guided surveillance complex. *Nature Communications* (2020).
- Santiago-Frangos A**‡, Fröhlich KS‡, Jeliaskov JR, Matecka EM, Marino G, et al.,. Caulobacter Crescentus Hfq Structure Reveals a Conserved Mechanism of RNA Annealing Regulation. *Proc. Natl. Acad. Sci.* (2019).
- Rollins M.F.‡, Chowdhury S.‡, Carter J., Golden S.M., Miettinen H.M., **Santiago-Frangos A.**, et al.,. Structure Reveals a Mechanism of CRISPR-RNA-Guided Nuclease Recruitment and Anti-CRISPR Viral Mimicry. *Mol. Cell* (2019).
- Santiago-Frangos A**, Jeliasko JR, Gray JJ, Woodson SA. Acidic C-terminal domains autoregulate the RNA chaperone Hfq. *Elife*, (2017).
- Santiago-Frangos A**, Kavita K, Schu DJ, Gottesman S, Woodson SA. C-terminal domain of the RNA chaperone Hfq drives sRNA competition and release of target RNA. *Proc. Natl. Acad. Sci.* (2016).
- Panja S‡, **Santiago-Frangos A**‡, Schu DJ, Gottesman S, Woodson SA. Acidic residues in the Hfq chaperone increase the selectivity of sRNA binding and annealing *J. Mol. Biol.* (2015).

REVIEWS AND INVITED PUBLICATIONS

15. **Santiago-Frangos A**, Nemudryi A, Nemudraia A, Wiegand T, Nichols JE*, Krishna P*, Scherffius AM*, Zahl TR*, Wilkinson RA, Wiedenheft B. CRISPR-Cas, Argonaute proteins and the emerging landscape of amplification-free diagnostics. *Methods* (2022).
16. Panja S, Małecka EM, **Santiago-Frangos A**, Woodson SA. Quantitative analysis of RNA chaperone activity by native gel electrophoresis and fluorescence spectroscopy. *RNA chaperones: Methods and Protocols* (2020).
17. **Santiago-Frangos A**, Wiegand T, Wiedenheft B. Cas9 slide-and-seek for phage defense and genome engineering. *EMBO J.* (2019).
18. Woodson SA, Panja S, **Santiago-Frangos A**. Proteins That Chaperone RNA Regulation. *Micrbiol. Spectr.* (2018).
19. **Santiago-Frangos A**, & Woodson, SA. Hfq chaperone brings speed dating to bacterial sRNA. *Wiley Interdisciplinary Reviews: RNA* (2018).

PATENTS

1. **Nucleic Acid Detection Using Type III CRISPR Complex.** (Patent No.: US 11,814,689 B2)
Licensed to the startup *VIRIS Detection Systems*, which has raised >\$1,250,000 in seed funding for this patent.

SERVICE, COMMUNITY, PUBLIC OUTREACH, & DIVERSITY AND INCLUSION INITIATIVES

- 2016 – **Ad hoc reviewer** for *Sci. Advances, Mol Cell, Nature Chem Bio, NAR, EMBO J.*
- 2024 – **Faculty mentor**, Penn Undergraduate Research Mentoring (PURM) Program
- 2024 – **Early Career Reviewer**, *Journal of Biological Chemistry*
- 2024 – **Steering Committee**, First Exposure to Research in the Biological Sciences, *UPenn, USA*
- 2024 **Judge**, Flash Talks and Undergraduate Poster session, *ASBMB, USA*
- 2024 **Speaker**, CRISPR demo event for Highschool students, *ASBMB, USA*
- 2023 **Panelist**, Meet the Scientist event for Highschool students, *ASBMB, USA*
- 2022 **Speaker**, Panel Discussion, *RNA Society's Diversity, Equity and Inclusion Committee*
- 2021 **Interviewee**, CRISPR-based diagnostics, *ABC FOX Montana, Cyprus Mail*
- 2019 **Summer Research Mentor**, *Leadership Alliance Program*
- 2019 **Speaker**, Meet an Expert Week, *The Grammar School in Nicosia, Cyprus*

MENTORING & TEACHING

UPenn Ph.D. Students: Briana Cruga.

UPenn Research Specialists: Pranami Patel, Vinh Dang (now: MD student at Thomas Jefferson University).

UPenn Undergraduates: Syraj Uddin, Risa Garg, Ariana Treat, Shirley Yuan, Phelps Tin, Cat Nguyen, Tiffany Chang.

MSU Ph.D. Students: Trevor Zahl, William Henriques, Nate Burman, Murat Buyukyoruk (now: MSU postdoc).

MSU Master's Students: Joey E. Nichols (now: Washington Univ. in St Louis MD/PhD student).

MSU Undergraduates: Laina N. Hall (*Goldwater Scholar*, now: UC Berkeley PhD student), Pushya Krishna (*Goldwater Scholar*, now: UC San Diego research assistant), Ava Graham (*Goldwater Scholar*).

- 2024 Rotating Faculty, Cell and Molecular Biology First-Year Seminar (CAMB 6050, UPenn)
- 2023 – 2024 Guest Speaker, Ethics Of Human Genome Editing Discussion (BIOL 3851-001, UPenn)
- 2020 Teaching Assistant, Research Methods in Microbiology (BIOM457R, MSU)
- 2018 – 2019 Teaching Assistant, Wild Virus Hunt (MSU)
- 2018 Guest Speaker, SOUL: The CRISPR Side of Science (AS.360.111, JHU)
- 2016 Teaching Assistant, Biochemistry II (AS.250.316, JHU)
- 2013, 2015 Teaching Assistant, Biochemistry Lab (AS.020.315, JHU)

SELECT TALKS (only last 5 years)

- 2024 *University of Pennsylvania, USA*: Communicating Research.
- 2023 *Montana State Uni., USA*: Mechanisms of CRISPR-mediated immunity and applications beyond editing.
- 2023 *ASBMB, USA*: Mechanisms of CRISPR-mediated immunity and applications beyond editing.
- 2022 *NIH "Lambda Lunch", USA*: Mechanisms of CRISPR-mediated immunity and applications.
- 2022 *ACA, USA*: Genomic DNA folding licenses site-specific CRISPR integration.
- 2022 *CRISPR, USA*: Genomic DNA folding licenses site-specific CRISPR integration.
- 2022 *RNA Society, USA*: DEI Panel: Diverse Voices from Rising Scientists.
- 2022 *RNA Society, USA*: Site-specific CRISPR adaptation driven by DNA folding.
- 2022 *NIH Common Fund Cryo-EM Meeting, USA*: Genomic DNA folding drives site-specific CRISPR adaptation.
- 2021 *Cyprus Institute of Neurology and Genetics, CY*: A novel CRISPR-based diagnostic for SARS-CoV-2.

FUNDING (I am the Sole PI on all the below research support)

Current Support:

1. Title: **Mechanisms of CRISPR-mediated immunity and applications beyond editing.** Source: *NIGMS, NIH*.
Start and End Date: 01/2024 – 01/2027. Total Award Amount (including Indirect Costs): **\$747,000.**

2. Title: **M. Jane Williams and Valerie Vargo Presidential Assistant Professor of Biology**. Source: *UPenn*. Start and End Date: 01/2024 – 12/2028. Total Award Amount (including Indirect Costs): **\$37,500**.
3. Title: **Regulatory mechanisms of CRISPR evolution and expression**. Source: *Burroughs Wellcome Fund*. Start and End Date: 09/2020 – 12/2024. Total Award Amount (including Indirect Costs): **\$60,000**.

Recent Support (past 3 years):

4. Title: **Mechanisms of CRISPR-mediated immunity and applications beyond editing**. Source: *NIGMS, NIH*. Start and End Date: 08/2022 – 12/2024. Total Award Amount (including Indirect Costs): **\$200,000**.
5. Title: **Interplay between innate and adaptive immune systems in bacteria**. Source: *Life Sciences Research Foundation, Simons Foundation*. Start and End Date: 08/2019 – 7/2022. Total Award Amount (including Indirect Costs): **\$186,000**.