

# ALEXANDER G. LUCACI

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## EDUCATION

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<b>Temple University</b> Ph.D. in Bioinformatics Department of Biology Dissertation mentored by Dr. Sergei L Kosakovsky Pond	2018-2023
<b>New York University</b> Masters of Science in Biology Department of Biology	2016 - 2018
<b>SUNY Stony Brook University</b> Bachelors of Science in Biochemistry Department of Biochemistry and Cell Biology	2011

## RESEARCH POSITIONS HELD

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<b>Temple University</b> <i>Graduate Research Assistant</i> <ul style="list-style-type: none"><li>· Conducting research in molecular evolution evaluating the effect of multinucleotide mutational events on the inference of parameters of gene adaptation.</li><li>· This work involves the use and development of statistical models and computational software. Our current implementation is available as an extension in the Hypothesis testing in Phylogenies (HyPhy) suite of analyses.</li></ul>	Spring 2022-Present
<b>Temple University</b> <i>Graduate Research Assistant</i> <ul style="list-style-type: none"><li>· Conducting research in molecular evolution evaluating the effect of multinucleotide mutational events on the inference of parameters of gene adaptation.</li><li>· This work involves the use and development of statistical models and computational software. Our current implementation is available as an extension in the Hypothesis testing in Phylogenies (HyPhy) suite of analyses.</li></ul>	Spring 2021
<b>Temple University</b> <i>Graduate Research Assistant</i> <ul style="list-style-type: none"><li>· Conducting research in molecular evolution evaluating the effect of multinucleotide mutational events on the inference of parameters of gene adaptation. This work involves the use and development of statistical models and computational software. Our current implementation is available as an extension in the Hypothesis testing in Phylogenies (HyPhy) suite of analyses.</li></ul>	Spring 2020
<b>ROTH Capital Partners</b> <i>Intern - Healthcare Investment Banking</i> <ul style="list-style-type: none"><li>· Participated in the process for the Initial Public Offering (IPO) of a NASDAQ listed company.</li><li>· Responsible for current healthcare IPO market data, preparing pitch decks for senior managers and materials for mergers and acquisition (M&amp;A) deals.</li></ul>	Spring 2018
<b>Albert Einstein College of Medicine</b> <i>Lab Manager - Dominick P. Purpura Department of Neuroscience</i>	2012 - 2017

## PREPRINTS

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1. **Lucaci AG**, Zehr JD, Pond SLK. Evolutionary shortcuts via multi-nucleotide substitutions and their impact on natural selection analyses [Internet]. bioRxiv; 2022 [cited 2022 Dec 14]. p. 2022.12.02.518889. Available from: <https://www.biorxiv.org/content/10.1101/2022.12.02.518889v1>

## PUBLICATIONS

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1. Jordan D Zehr, Sergei L Kosakovsky Pond, Jean K Millet, Ximena A Olarte-Castillo, **Alexander G Lucaci**, Stephen D Shank, Kristina M Ceres, Annette Choi, Gary R Whittaker, Laura B Goodman, Michael J Stanhope, Natural selection differences detected in key protein domains between non-pathogenic and pathogenic Feline Coronavirus phenotypes, *Virus Evolution*, 2023;; vead019, <https://doi.org/10.1093/ve/vead019>
2. Silva SR, F O Miranda V, Michael TP, Pachno BJ, Matos RG, Adamec L, L K Pond S, **Lucaci AG**, Pinheiro DG, Varani AM. The phylogenomics and evolutionary dynamics of the organellar genomes in carnivorous Utricularia and Genlisea species (Lentibulariaceae). *Mol Phylogenet Evol*. 2023 Jan 21:107711. doi: 10.1016/j.ympev.2023.107711. Epub ahead of print. PMID: 36693533.
3. Tegally H, Moir M, Everatt J, Giovanetti M, Scheepers C, Wilkinson E, Subramoney K, Makatini Z, Moyo S, Amoako DG, Baxter C, Althaus CL, Anyaneji UJ, Kekana D, Viana R, Giandhari J, Lessells RJ, Maponga T, Maruapula D, Choga W, Matshaba M, Mbulawa MB, Msomi N; **NGS-SA consortium**, Naidoo Y, Pillay S, Sanko TJ, San JE, Scott L, Singh L, Magini NA, Smith-Lawrence P, Stevens W, Dor G, Tshiabuila D, Wolter N, Preiser W, Treurnicht FK, Venter M, Chiloane G, McIntyre C, O'Toole A, Ruis C, Peacock TP, Roemer C, Kosakovsky Pond SL, Williamson C, Pybus OG, Bhiman JN, Glass A, Martin DP, Jackson B, Rambaut A, Laguda-Akingba O, Gaseitsiwe S, von Gottberg A, de Oliveira T. Emergence of SARS-CoV-2 Omicron lineages BA.4 and BA.5 in South Africa. *Nat Med*. 2022 Sep;28(9):1785-1790. doi: 10.1038/s41591-022-01911-2. Epub 2022 Jun 27. PMID: 35760080; PMCID: PMC9499863.
4. **Lucaci AG**, Notaras MJ, Kosakovsky Pond SL, Colak D. The evolution of BDNF is defined by strict purifying selection and prodomain spatial coevolution, but what does it mean for human brain disease? *Transl Psychiatry*. 2022 Jun 22;12(1):258. doi: 10.1038/s41398-022-02021-w. PMID: 35732627; PMCID: PMC9217794.
5. Benndorf R, Velazquez R, Zehr JD, Pond SLK, Martin JL, **Lucaci AG**. Human HspB1, HspB3, HspB5 and HspB8: Shaping these disease factors during vertebrate evolution. *Cell Stress Chaperones*. 2022 Jul;27(4):309-323. doi: 10.1007/s12192-022-01268-y. Epub 2022 Jun 9. PMID: 35678958; PMCID: PMC9346038.
6. Viana R, Moyo S, Amoako DG, Tegally H, Scheepers C, Althaus CL, Anyaneji UJ, Bester PA, Boni MF, Chand M, Choga WT, Colquhoun R, Davids M, Deforche K, Doolabh D, du Plessis L, Engelbrecht S, Everatt J, Giandhari J, Giovanetti M, Hardie D, Hill V, Hsiao NY, Iranzadeh A, Ismail A, Joseph C, Joseph R, Koopile L, Kosakovsky Pond SL, Kraemer MUG, Kuate-Lere L, Laguda-Akingba O, Lesetedi-Mafoko O, Lessells RJ, Lockman S, **Lucaci AG**, Maharaj A, Mahlangu B, Maponga T, Mahlakwane K, Makatini Z, Marais G, Maruapula D, Masupu K, Matshaba M, Mayaphi S, Mbhele N, Mbulawa MB, Mendes A, Mlisana K, Mnguni A, Mohale T, Moir M, Moruise K, Mosepele M, Motsatsi G, Motswaledi MS, Mphoyakgosi T, Msomi N, Mwangi PN, Naidoo Y, Ntuli N, Nyaga M, Olubayo L, Pillay S, Radibe B, Ramphal Y, Ramphal U, San JE, Scott L, Shapiro R, Singh L, Smith-Lawrence P, Stevens W, Strydom A, Subramoney K, Tebeila N, Tshiabuila D, Tsui J, van Wyk S, Weaver S, Wibmer CK, Wilkinson E, Wolter N, Zarebski AE, Zuze B, Goedhals D, Preiser W, Treurnicht F, Venter M, Williamson C, Pybus OG, Bhiman J, Glass A, Martin DP, Rambaut A, Gaseitsiwe S, von Gottberg A, de Oliveira T. Rapid epidemic expansion of the SARS-CoV-2 Omicron variant in southern Africa. *Nature*. 2022 Mar;603(7902):679-686. doi: 10.1038/s41586-022-04411-y. Epub 2022 Jan 7. PMID: 35042229; PMCID: PMC8942855.

7. **Lucaci AG**, Zehr JD, Shank SD, Bouvier D, Ostrovsky A, Mei H, Nekrutenko A, Martin DP, Kosakovsky Pond SL. RASCL: Rapid Assessment of Selection in CLades through molecular sequence analysis. PLoS One. 2022 Nov 2;17(11):e0275623. doi: 10.1371/journal.pone.0275623. PMID: 36322581; PMCID: PMC9629619.
8. Martin DP, Lytras S, **Lucaci AG**, Maier W, Grning B, Shank SD, Weaver S, MacLean OA, Orton RJ, Lemey P, Boni MF, Tegally H, Harkins GW, Scheepers C, Bhiman JN, Everatt J, Amoako DG, San JE, Giandhari J, Sigal A; NGS-SA, Williamson C, Hsiao NY, von Gottberg A, De Klerk A, Shafer RW, Robertson DL, Wilkinson RJ, Sewell BT, Lessells R, Nekrutenko A, Greaney AJ, Starr TN, Bloom JD, Murrell B, Wilkinson E, Gupta RK, de Oliveira T, Kosakovsky Pond SL. Selection Analysis Identifies Clusters of Unusual Mutational Changes in Omicron Lineage BA.1 That Likely Impact Spike Function. Mol Biol Evol. 2022 Apr 11;39(4):msac061. doi: 10.1093/molbev/msac061. PMID: 35325204; PMCID: PMC9037384.
9. Martin DP, Weaver S, Tegally H, San JE, Shank SD, Wilkinson E, **Lucaci AG**, Giandhari J, Naidoo S, Pillay Y, Singh L, Lessells RJ; NGS-SA; COVID-19 Genomics UK (COG-UK), Gupta RK, Wertheim JO, Nekrutenko A, Murrell B, Harkins GW, Lemey P, MacLean OA, Robertson DL, de Oliveira T, Kosakovsky Pond SL. The emergence and ongoing convergent evolution of the SARS-CoV-2 N501Y lineages. Cell. 2021 Sep 30;184(20):5189-5200.e7. doi: 10.1016/j.cell.2021.09.003. Epub 2021 Sep 7. PMID: 34537136; PMCID: PMC8421097.
10. **Lucaci AG**, Wisotsky SR, Shank SD, Weaver S, Kosakovsky Pond SL. Extra base hits: Widespread empirical support for instantaneous multiple-nucleotide changes. PLoS One. 2021 Mar 12;16(3):e0248337. doi: 10.1371/journal.pone.0248337. PMID: 33711070; PMCID: PMC7954308.
11. Yao C, Vanderpool KG, Delfiner M, Eddy V, **Lucaci AG**, Soto-Riveros C, Yasumura T, Rash JE, Pereda AE. Electrical synaptic transmission in developing zebrafish: properties and molecular composition of gap junctions at a central auditory synapse. J Neurophysiol. 2014 Nov 1;112(9):2102-13. doi: 10.1152/jn.00397.2014. Epub 2014 Jul 30. PMID: 25080573; PMCID: PMC4274921.

## FELLOWSHIPS AND AWARDS

2023	Metascience Conference Travel Award	Center for Open Science	300 USD
2023	Young Investigators Travel Award	SMBE	3,500 USD
2023	Opening Influenza Research Fellowship	Center for Open Science	2,000 USD
2022	CST Outstanding Research Award	Temple University	500 USD
2020	Young Investigators Travel Award	SMBE	1,500 USD

## MENTORING

<b>Bioinformatics Studio at Temple University</b> <i>Co-Founder</i>	Spring 2018 - Present
<ul style="list-style-type: none"> <li>· The Bioinformatics Studio is an inclusive and hands-on environment for learning, training, sharing, and most importantly doing bioinformatics at Temple University.</li> <li>· A student run organization that provides guided hands-on training at every level of research and computational expertise in an open studio format.</li> </ul>	

## TEACHING EXPERIENCE

**Temple University***Graduate Teaching Assistant*

Fall 2021

*Genomics in Medicine*

- Directed over one hundred and fifty students in a cross-listed (Graduate and Undergraduate) course.
- Responsible for holding office hours and communicating with students.
- Provide guidance on assignments, help with interpreting primary research articles and offered guidance on classroom projects.

**Temple University***Graduate Teaching Assistant*

Fall 2020

*Genomics in Medicine*

- Directed over one hundred and sixty students in a cross-listed (Graduate and Undergraduate) course in a virtual format.
- Responsible for holding office hours and communicating with students.
- Provide guidance on assignments, help with interpreting primary research articles and offered guidance on classroom projects.

**Temple University***Graduate Teaching Assistant*

Fall 2019

*Genomics in Medicine*

- Directed over one hundred students in a cross-listed (Graduate and Undergraduate) course.
- Responsible for holding office hours and communicating with students. Additionally, provided guidance on assignments, helped with interpreting primary research articles and offered guidance on classroom projects.

**Temple University***Graduate Teaching Assistant*

Spring 2019

*Introduction to Organismal Biology*

- Directed forty students over two sections of the Introduction to Organismal Biology Laboratory course.
- Instructed students on laboratory exercises, provided feedback, and demonstrated proper techniques.

**Temple University***Graduate Teaching Assistant*

Fall 2018

*General Biology*

- Directed forty students over two sections of the "General Biology I" Laboratory course
- Instructed students on laboratory exercises, provided feedback, and demonstrated proper techniques.

**New York University***Adjunct Professor*

Spring 2018

*Fundamentals of Bioinformatics*

- Directed twenty students in a weekly recitation section.
- Reviewed theory and topics discussed in lecture and provided guidance and hands-on support in the use of bioinformatics software and analysis.

**New York University***Adjunct Professor*

Fall 2017

*Molecules of Life*

- Directed forty students over two sections in a weekly laboratory course.
- Reviewed theory and topics discussed in lecture and provided guidance and hands-on support in the use of standard laboratory techniques.

**New York University***Adjunct Professor*

Spring 2017

*Principles of Biology Laboratory*

- Directed forty students over two sections in a weekly laboratory course.
- Reviewed theory and topics discussed in lecture and provided guidance and hands-on support in the use of standard laboratory techniques.

## PRESENTATIONS

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2023	Temple University	The role of complex evolutionary dynamics in molecular sequence analysis.
2022	Weill Cornell Medical College	Advances in quantifying Natural Selection in coding sequences.
2022	Dynamics and Evolution of Human Viruses	RASCL: Rapid Assessment of Selection in CLades through molecular sequence analysis
2021	EMBO	Widespread empirical support for instantaneous multiple-nucleotide changes
2021	Mid-Atlantic Bioinformatics	Rapid assessment of selection in SARS-CoV-2 variants
2021	Dynamics and Evolution of Human Viruses	Rapid assessment of selection in SARS-CoV-2 variants
2020	CSHL	Widespread empirical support for instantaneous multiple-nucleotide changes
2020	Human Genetics in NYC	Widespread empirical support for instantaneous multiple-nucleotide changes
2020	SMBE	Evaluating the impact of multiple simultaneous mutations on evolutionary rate inference.
2020	Binghamton University	Evaluating the impact of multiple simultaneous mutations on evolutionary rate inference.
2019	Temple University BGSS Retreat	Evaluating the impact of multiple simultaneous mutations on evolutionary rate inference.
2019	MABC	Evaluating the impact of multiple simultaneous mutations on evolutionary rate inference.
2019	EPiC	Evaluating the impact of multiple simultaneous mutations on evolutionary rate inference.

## MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

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Center for Viral Evolution (CVE) at Temple University

Institute for Genomics and Evolutionary Medicine (iGEM) at Temple University

Acme Computational Molecular Evolution Group (ACME) at Temple University

The National COVID Cohort Collaborative (N3C)

American Physiological Society (APS)

Vertebrate Genomes Project (VGP)

Vertebrate Genomes Project - Genome Assembly Group

Models of Infectious Disease Agent Study (MIDAS)  
CDC-MIDAS COVID-19 working group  
Co-Founder: The Bioinformatics Studio at Temple University  
Society for Molecular Biology and Evolution (SMBE)  
Biology Graduate Student Society at Temple University (BGSS)  
New York Academy of Sciences (NYAS)

## WORKSHOPS

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2022	Marine Biological Laboratory (MBL)	Workshop on Molecular Evolution
2020	American Society of Tropical Medicine and Hygiene (ASTMH)	Modeling for Disease Outbreaks
2019	Temple University College of Science and Technology (CST)	Summer workshop on Scientific Computing and Statistical Reasoning

## PROFESSIONAL SERVICE

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2023	Journal reviewer for Virus Evolution
2021	Journal reviewer for Genomics

## CONFERENCES

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2022	UCSD	Dynamics and Evolution of Human Viruses
2021	Rockefeller University	9th Human Genetics in NYC Conference
2021	Virtual	Society for Molecular Biology and Evolution (SMBE)
2020	UPenn	Mid-Atlantic Bioinformatics Conference (MABC)
2020	UCSD	COVID-19 Dynamics and Evolution Conference Series
2020	ETH Zurich	Department of Biosystems Science and Engineering
2020	UPenn	Institute for Translational Medicine and Therapeutics (ITMAT)
2020	Virtual	Biodiversity Genomics Conference
2020	Virtual	24th International Conference on Research in Computational Molecular Biology (RECOMB)
2020	Virtual	The Allied Genetics Conference (TAGC)
2019	Temple University	The State of Pre-College Education 12 years after "The Gathering Storm"
2019	UPenn	Artificial Intelligence for Improvements of Biomarkers Imaging and TMA Multiplexing Analysis
2019	Wistar Institute	Epigenetics in Cancer Scientific Symposium
2019	American Museum of Natural History	8th Human Genetics in NYC Conference
2019	Philadelphia	BIO International Convention
2019	Mount Sinai	Fifth Annual New York Area Population Genomics Workshop
2018	Rockefeller University	7th Annual Human Genetics in NYC Conference
2018	Boston	BIO International Convention
2017	Columbia University	NYC EDC SBIR Impact: Bio and Health Tech NYC
2017	NYU Tandon	Future Labs AI Summit
2017	NYU	10th Annual NYU Developmental Genetics Symposium Tissue Homeostasis and Regeneration