

CURRICULUM VITAE
University of Pittsburgh
School of Medicine

BIOGRAPHICAL

Anne-Ruxandra Carvunis
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Pittsburgh, PA 15213

EDUCATION and TRAINING

UNDERGRADUATE

1999-2001	Université Paris 6, Paris, France Classe préparatoire Lycée Sainte Geneviève, Versailles, France	“Diplôme d’Etudes Universitaires Generales”, 2001	Life Sciences
2001-2004	École Normale Supérieure and Université Paris 6, Paris, France	“Magistère” (BSc and Masters equivalent), 2004	Biology/Biochemistry

GRADUATE

2003-2004	École Normale Supérieure and Université Paris 6, Paris, France	Masters, 2004	Neurosciences
2004-2005	Université Paris 7, Paris, France	Masters, 2005	Interdisciplinary Approaches to Life Sciences
2006-2011	Université de Grenoble, Grenoble, France	Ph.D., 2011	Bioinformatics

POSTGRADUATE

2011-2012	Harvard Medical School, Boston, MA	Postdoctoral Fellow Advisor: Marc Vidal	Systems Biology
2012-2016	University of California San Diego, La Jolla, CA	Postdoctoral Fellow Advisor: Trey Ideker	Systems Biology
Summer 2013	Cold Spring Harbor Laboratory, Cold Spring Harbor, NY	Course attendee	Yeast Genetics and Genomics
March 2016	Cold Spring Harbor Laboratory, Cold Spring Harbor, NY	Course attendee	Leadership in Bioscience
Spring 2020	University of Pittsburgh, Pittsburgh, PA	Course attendee	Mentoring Academy
Spring 2022	NIH Workshops and Trainings for Extramural Faculty	Course attendee	Raising a Resilient Scientist

APPOINTMENTS and POSITIONS

Oct.- Dec. 2016	University of Pittsburgh School of Medicine	Visiting Assistant Professor
2017 – present	University of Pittsburgh School of Medicine	Assistant Professor
2022 – present	University of Pittsburgh School of Medicine	Associate Professor with Tenure

MEMBERSHIP in PROFESSIONAL and SCIENTIFIC SOCIETIES

Society for Molecular Biology and Evolution, Member	2017 – present
Center for Interdisciplinary Research, Alumni Advisory Board Member	2019 – present
Genetics Society of America, Member	2022 – present
American Society for Human Genetics, Member	2023 – present

HONORS

Most innovative Poster, Dana-Farber Cancer Institute Cancer Biology Department retreat	2009
L'Oréal France UNESCO award for Women in Science	2009
Medal of Université de Grenoble for honorable doctoral work of:	2006-2010
Postgraduate Travel Award, Society for Molecular Biology and Evolution	2014
Best Flash Talk, San Diego Center for Systems Biology retreat	2016
Trailblazer Award, Ladies Hospital Aid Society	2018
Searle Scholar	2018
NIH New Innovator	2019
Outstanding New PI, New PI Slack (November)	2019
Alfred P. Sloan Research Fellow	2021
Finalist, Allen Distinguished Investigator initiative (Micro-peptides)	2021

Nominated, NSF Alan T. Waterman Award 2021
NSF CAREER 2022

Chancellor's Distinguished Research Award, 2022
Junior category

PUBLICATIONS

* co-first author; ¶ corresponding author

1. ORIGINAL PEER REVIEWED ARTICLES

Published and accepted articles prior to joining SOM

1. **Carvunis AR**, Latapy M, Lesne A, Magnien C, Pezard L: Dynamics of three-state excitable units on Poisson versus power-law random networks. *Physica A* (2006).
2. Dupuy D, Bertin N, Hidalgo CA, Venkatesan K, Tu D, Lee D, Rosenberg J, Svrzikapa N, Blanc A, Carnec A, **Carvunis AR**, Pulak R, Shingles J, Reece-Hoyes J, Hunt-Newbury R, Viveiros R, Mohler WA, Tasan M, Roth FP, Le Peuch C, Hope IA, Johnsen R, Moerman DG, Barabási AL, Baillie D, Vidal M. Genome-scale analysis of in vivo spatiotemporal promoter activity in *Caenorhabditis elegans*. *Nat Biotechnol.* 2007 Jun;25(6):663-8. Epub 2007 May 7. PubMed PMID: 17486083.
3. Li QR*, **Carvunis AR***, Yu H*, Han JD*, Zhong Q, Simonis N, Tam S, Hao T, Klitgord NJ, Dupuy D, Mou D, Wapinski I, Regev A, Hill DE, Cusick ME, Vidal M. Revisiting the *Saccharomyces cerevisiae* predicted ORFeome. *Genome Res.* 2008 Aug;18(8):1294-303. doi: 10.1101/gr.076661.108. Epub 2008 May 23. PubMed PMID:18502943; PubMed Central PMCID: PMC2493439.
4. Cusick ME, Yu H, Smolyar A, Venkatesan K, **Carvunis AR**, Simonis N, Rual JF, Borick H, Braun P, Dreze M, Vandenhoute J, Galli M, Yazaki J, Hill DE, Ecker JR, Roth FP, Vidal M. Literature-curated protein interaction datasets. *Nat Methods.* 2009 Jan;6(1):39-46. doi: 10.1038/nmeth.1284. PubMed PMID: 19116613; PubMed Central PMCID: PMC2683745.
5. Simonis N*, Rual JF*, **Carvunis AR***, Tasan M*, Lemmens I, Hirozane-Kishikawa T, Hao T, Sahalie JM, Venkatesan K, Gebreab F, Cevik S, Klitgord N, Fan C, Braun P, Li N, Ayivi-Guedehoussou N, Dann E, Bertin N, Szeto D, Dricot A, Yildirim MA, Lin C, de Smet AS, Kao HL, Simon C, Smolyar A, Ahn JS, Tewari M, Boxem M, Milstein S, Yu H, Dreze M, Vandenhoute J, Gunsalus KC, Cusick ME, Hill DE, Tavernier J, Roth FP, Vidal M. Empirically controlled mapping of the *Caenorhabditis elegans* protein-protein interactome network. *Nat Methods.* 2009 Jan;6(1):47-54. PubMed PMID: 19123269; PubMed Central PMCID: PMC3057923.

6. Arabidopsis Interactome Mapping Consortium (**Carvunis AR*** co-first author). Evidence for network evolution in an Arabidopsis interactome map. *Science*. 2011 Jul 29;333(6042):601-7. doi:10.1126/science.1203877. PubMed PMID: 21798944; PubMed Central PMCID: PMC3170756.
7. Mukhtar MS*, **Carvunis AR***, Dreze M*, Epple P*, Steinbrenner J, Moore J, Tasan M, Galli M, Hao T, Nishimura MT, Pevzner SJ, Donovan SE, Ghamsari L, Santhanam B, Romero V, Poulin MM, Gebreab F, Gutierrez BJ, Tam S, Monachello D, Boxem M, Harbort CJ, McDonald N, Gai L, Chen H, He Y; European Union Effectoromics Consortium, Vandenhoute J, Roth FP, Hill DE, Ecker JR, Vidal M, Beynon J, Braun P, Dangl JL. Independently evolved virulence effectors converge onto hubs in a plant immune system network. *Science*. 2011 Jul 29;333(6042):596-601. doi: 10.1126/science.1203659. PubMed PMID: 21798943; PubMed Central PMCID: PMC3170753.
8. **Carvunis AR**, Rolland T, Wapinski I, Calderwood MA, Yildirim MA, Simonis N, Charloteaux B, Hidalgo CA, Barbette J, Santhanam B, Brar GA, Weissman JS, Regev A, Thierry-Mieg N, Cusick ME, Vidal M. Proto-genes and *de novo* gene birth. *Nature*. 2012 Jul 19;487(7407):370-4. doi: 10.1038/nature11184. PubMed PMID: 22722833; PubMed Central PMCID: PMC3401362.
 - Recommended F1000 (now Faculty Opinions): David Burt, Marilyn Parsons, Julin Maloof, Erich Bornberg-Bauer, Daniel Barbash, Reinhard Sterner with Rainer Merkl.
 - Press coverage including *Nature Reviews Genetics* (2012), *New York Times* (2013) and *Quanta Magazine* (2020)
9. Feinbaum RL, Urbach JM, Liberati NT, Djonovic S, Adonizio A, **Carvunis AR**, Ausubel FM. Genome-wide identification of *Pseudomonas aeruginosa* virulence-related genes using a *Caenorhabditis elegans* infection model. *PLoS Pathog*. 2012;8(7):e1002813. doi: 10.1371/journal.ppat.1002813. Epub 2012 Jul 26. PubMed PMID: 22911607; PubMed Central PMCID: PMC3406104.
10. Rozenblatt-Rosen O, Deo RC, Padi M, Adelmant G, Calderwood MA, Rolland T, Grace M, Dricot A, Askenazi M, Tavares M, Pevzner SJ, Abderazzaq F, Byrdsong D, **Carvunis AR**, Chen AA, Cheng J, Correll M, Duarte M, Fan C, Feltkamp MC, Ficarro SB, Franchi R, Garg BK, Gulbahce N, Hao T, Holthaus AM, James R, Korkhin A, Litovchick L, Mar JC, Pak TR, Rabello S, Rubio R, Shen Y, Singh S, Spangle JM, Tasan M, Wanamaker S, Webber JT, Roecklein-Canfield J, Johannsen E, Barabási AL, Beroukhim R, Kieff E, Cusick ME, Hill DE, Münger K, Marto JA, Quackenbush J, Roth FP, DeCaprio JA, Vidal M. Interpreting cancer genomes using systematic host network perturbations by tumour virus proteins. *Nature*. 2012 Jul 26;487(7408):491-5. doi: 10.1038/nature11288. PubMed PMID: 22810586; PubMed Central PMCID: PMC3408847.
11. Srivas R*, Costelloe T*, **Carvunis AR**, Sarkar S, Malta E, Sun SM, Pool M, Licon K, van Welsem T, van Leeuwen F, McHugh PJ, van Attikum H, Ideker T. A UV-induced genetic network links the RSC complex to nucleotide excision repair and shows dose-dependent

rewiring. Cell Rep. 2013 Dec 26;5(6):1714-24. doi: 10.1016/j.celrep.2013.11.035. Epub 2013 Dec 19. PubMed PMID: 24360959; PubMed Central PMCID: PMC4136507.

12. Rolland T*, Taşan M*, Charlotheaux B*, Pevzner SJ*, Zhong Q, Sahni N, Yi S, Lemmens I, Fontanillo C, Mosca R, Kamburov A, Ghiassian SD, Yang X, Ghamsari L, Balcha D, Begg BE, Braun P, Brehme M, Broly MP, **Carvunis AR**, Convery-Zupan D, Corominas R, Coulombe-Huntington J, Dann E, Dreze M, Dricot A, Fan C, Franzosa E, Gebreab F, Gutierrez BJ, Hardy MF, Jin M, Kang S, Kiros R, Lin GN, Luck K, MacWilliams A, Menche J, Murray RR, Palagi A, Poulin MM, Rambout X, Rasla J, Reichert P, Romero V, Ruysinck E, Sahalie JM, Scholz A, Shah AA, Sharma A, Shen Y, Spirohn K, Tam S, Tejada AO, Trigg SA, Twizere JC, Vega K, Walsh J, Cusick ME, Xia Y, Barabási AL, Iakoucheva LM, Aloy P, De Las Rivas J, Tavernier J, Calderwood MA, Hill DE, Hao T, Roth FP, Vidal M. A proteome-scale map of the human interactome network. Cell. 2014 Nov 20;159(5):1212-1226. doi: 10.1016/j.cell.2014.10.050. PubMed PMID: 25416956; PubMed Central PMCID: PMC4266588.
13. **Carvunis AR***, Wang T*, Skola D*, Yu A, Chen J, Kreisberg JF, Ideker T. Evidence for a common evolutionary rate in metazoan transcriptional networks. eLife. 2015 Dec 18;4. pii: e11615. doi: 10.7554/eLife.11615. PubMed PMID: 26682651; PubMed Central PMCID: PMC4764585.
 - Editorial commentary “One for all” by Duncan T. Odom
14. Yazaki J, Galli M, Kim AY, Nito K, Aleman F, Chang KN, **Carvunis AR**, Quan R, Nguyen H, Song L, Alvarez JM, Huang SS, Chen H, Ramachandran N, Altmann S, Gutiérrez RA, Hill DE, Schroeder JI, Chory J, LaBaer J, Vidal M, Braun P, Ecker JR. Mapping transcription factor interactome networks using HaloTag protein arrays. Proc Natl Acad Sci U S A. 2016 Jul 19;113(29):E4238-47. doi: 10.1073/pnas.1603229113. Epub 2016 Jun 29. PubMed PMID: 27357687; PubMed Central PMCID: PMC4961138.

Published and accepted articles since joining SOM

15. Domazet-Lošo T*, **Carvunis AR***[¶], Albà MM, Šestak MS, Bakaric R, Neme R, Tautz D[¶]. No Evidence for Phylostratigraphic Bias Impacting Inferences on Patterns of Gene Emergence and Evolution. Mol Biol Evol. 2017 Apr 1;34(4):843-856. doi: 10.1093/molbev/msw284. PubMed PMID: 28087778; PubMed Central PMCID: PMC5400388.
16. Keeling DM, Garza P, Nartey CM[¶], **Carvunis AR**[¶]. The meanings of ‘function’ in biology and the problematic case of *de novo* emergence. eLife 2019;8:e47014. doi: 10.7554/eLife.47014. Pubmed PMID: 31674305; PubMed Central PMCID: PMC6824840.
 - Recommended Faculty Opinions: Erich Bornberg-Bauer with Daniel Dowling and Jasmin Desiree Kurafeiski
17. Keeling DM, Garza P, Nartey CM[¶], **Carvunis AR**[¶]. Recalcitrance and Resilience of Scientific Function. P.O.R.O.I. 2020. doi: 10.13008/2151-2957.1299.
18. Vakirlis N, Acar O, Hsu B, Castilho Coelho N, Van Oss SB, Wacholder A, Medetgul-Ernar K, Bowman II RW, Hines CP, Iannotta J, Parikh SB, McLysaght A, Camacho CJ, O'Donnell

AF[¶], Ideker T[¶], **Carvunis AR[¶]**. *De novo* emergence of adaptive membrane proteins from thymine-rich genomic sequences. *Nature Communications* 2020. doi: 10.1038/s41467-020-14500-z. Pubmed PMID: 32034123; Pubmed Central PMCID: PMC7005711.

- Recommended Faculty Opinions: Manyuan Long, Cory Dunn
- Press: Outsize Impact, Science Features

19. Vakirlis N, **Carvunis AR[¶]**, McLysaght A[¶]. Synteny-based analyses indicate that sequence divergence is not the dominant source of orphan genes. *eLife* 2020;9: e53500. doi: 10.7554/eLife.53500. Pubmed PMID: 32066524; Pubmed Central PMCID: PMC7028367.
 - Press: Quanta Magazine (2020)
20. Wang T, Ma J, Hogan AN, Fong S, Licon K, Tsui NB, Kreisberg JF, Adams PD, **Carvunis AR**, Bannasch DL, Ostrander EA, Ideker T. Quantitative translation of dog-to-human aging by conserved remodeling of the DNA methylome. *Cell Systems* 2020. doi: 10.1016/j.cels.2020.06.006. Pubmed PMID: 32619550.
21. Parikh SB, Castilho Coelho N, **Carvunis AR[¶]**. LI Detector: a framework for sensitive colony-based screens regardless of the distribution of fitness effects. *Genes, Genomes, Genomics* 2021. doi: 10.1093/g3journal/jkaa068. Pubmed PMID: 33693606.
22. Lee J, Wacholder A, **Carvunis AR[¶]**. Evolutionary characterization of the short protein SPAAR. *Genes* 2021. doi: 10.3390/genes12121864.
 - Invited submission for Special Issue “How Do New Genes Originate and Evolve?”
23. Acar O, Zhang S, Bahar I, **Carvunis AR[¶]**. Elastic network modeling of cellular networks unveils sensor and effector genes that control information flow. *PLoS Computational Biology* 2022. doi: 10.1371/journal.pcbi.1010181
24. Guénolé A, Velilla F, Chartier A, Rich A, **Carvunis AR**, Sardet C, Simonelig M, Sobhian B. RNF219 regulates CCR4-NOT function in mRNA translation and deadenylation. *Scientific Reports* 2022. doi: 10.1038/s41598-022-13309-8
25. Mudge JM, Ruiz-Orera J, Presner JR, Brunet MA, Calvet F, Jungreis I, Gonzalez JM, Magrane M, Martinez T, Schulz JF, Yang YT, Alba MM, Aspden JL, Baranov PV, Bazzini A, Bruford E, Martin MJ, Calviello L, **Carvunis AR**, Chen J, Couso JP, Deutsch EW, Flicek P, Frankish A, Gertsein M, Hubner N, Ingolia NT, Kellis M, Menschaert G, Moritz RL, Ohler U, Roucou X, Saghatelian A, Weissman J, van Heesch S. Standardized annotation of translated open reading frames. *Nature Biotechnology* 2022. doi: 10.1038/s41587-022-01369-0
26. Van Oss SB, Parikh SB, Coelho NC, Wacholder A, Belashov I, Michaca M, Xu J, Kang YP, Ward NP, Yoon SJ, McCourt KM, McKee J, Ideker T, VanDemark AP, DeNicola GM, **Carvunis AR[¶]**. On the illusion of auxotrophy: *met15Δ* yeast cells can grow on inorganic sulfur thanks to the previously uncharacterized homocysteine synthase Yll058w. *Journal of Biological Chemistry* 2022. doi: 10.1016/j.jbc.2022.102697

Articles in revision

1. Wacholder A, Parikh SB, Castilho Coelho N, Acar O, Houghton C, Chou L, **Carvunis AR[¶]**. A vast evolutionarily transient transcriptome contributes to phenotype and fitness

2. OTHER PEER REVIEWED PUBLICATIONS

Review articles and opinion pieces

1. Mitra K*, **Carvunis AR***, Ramesh SK, Ideker T. Integrative approaches for finding modular structure in biological networks. *Nat Rev Genet.* 2013 Oct;14(10):719-32. doi: 10.1038/nrg3552. Review. PubMed PMID: 24045689; PubMed Central PMCID: PMC3940161.
2. **Carvunis AR**, Ideker T. Siri of the cell: what biology could learn from the iPhone. *Cell.* 2014 Apr 24;157(3):534-8. doi: 10.1016/j.cell.2014.03.009. Perspective. PubMed PMID: 24766803; PubMed Central PMCID: PMC4154484.
3. Ernst PB, **Carvunis AR[†]**. Of mice, men and immunity: a case for evolutionary systems biology. *Nat Immunol.* 2018 May;19(5):421-425. doi:10.1038/s41590-018-0084-4. Perspective. PubMed PMID: 29670240; PubMed Central PMCID: PMC6168288.

Invited reviews

1. Van Oss SB, **Carvunis AR[†]**. De novo gene birth. *PLoS Genet.* 2019 May 23;15(5):e1008160. doi: 10.1371/journal.pgen.1008160. eCollection 2019 May. PubMed PMID: 31120894; PubMed Central PMCID: PMC6542195.
 - This invited review became the Wikipedia article for *de novo* gene birth
2. Parikh SB, Houghton C, Van Oss SB, Wacholder A, **Carvunis AR[†]**. Origins, evolution, and physiological implications of *de novo* genes in yeast. *Yeast.* 2022. <https://doi.org/10.1002/yea.3810>

3. OTHER NON-PEER REVIEWED PUBLICATIONS

Invited lay publications

1. **Carvunis AR**, Gomez E, Thierry-Mieg N, Trilling L, Vidal M. [Systems biology: from yesterday's concepts to tomorrow's discoveries]. *Med Sci (Paris).* 2009 Jun-Jul;25(6-7):578-84. doi: 10.1051/medsci/2009256-7578. French. PubMed PMID: 19602354.
2. **Carvunis AR**, Dreze M. [Virulence effectors target key proteins of interactome networks of host plant cells]. *Med Sci (Paris).* 2012 Mar;28(3):237-9. doi: 10.1051/medsci/2012283003; Pubmed PMID: 22480639.

Invited perspective

1. Wacholder A, **Carvunis AR**. New genes from borrowed parts. *Science* 2021. 371 (6531), 779-780. doi: 10.1126/science.abf8493
2. Rich A, **Carvunis AR**. De novo gene increases brain size. *Nature Ecology Evolution* 2023. doi: 10.1038/s41559-022-01942-5

4. BOOKS, BOOK CHAPTERS AND MONOGRAPHS

1. **Carvunis AR**, Roth FP, Calderwood MA, Cusick ME, Superti-Furga G, Vidal M: Interactome networks, in *Handbook of Systems Biology* (2012).

PROFESSIONAL ACTIVITIES

TEACHING

Graduate Student Teaching:

March 2019. Molecular Evolution Graduate course. Guest lecture on Gene birth. One session.

2019 – present. Course Director, Evolutionary Biology of Human Disease, course open to graduate and medical students, 30 sessions per year every two years. MSCBIO 2074/ISB 2075.

2020 – present. Course co-director, Molecular Evolution, course open to graduate students, 30 sessions per year every two years. MSCBIO 2075/CMPBIO 2075.

Oct. 2021. Computational Biomedicine and Biotechnology Masters degree 2110. One session.

Undergraduate Student Teaching:

Nov. 2009: Simmons College, Boston, MA, USA, *De novo* gene birth in *S. cerevisiae*. Auto-biographical and scientific lecture aimed at illustrating the birth and development of a graduate research project to female seniors in Biology.

Dec. 2013 and 2014: Simmons College, Boston, MA, USA: My career path as a Network Biologist. Auto-biographical lecture aimed at introducing female freshmen to Bioinformatics. This presentation was elected best of 2013 (most informative, most relatable) by the students.

July 2017: TecBio program at the University of Pittsburgh: Example of a non-linear academic career path. Introducing a diverse group of undergraduate students to the trials and tribulations of an early academic career, including life-changing surprise discoveries.

May 2018: TecBio program at the University of Pittsburgh: Genomics and Evolutionary Biology.

2018 – present: Collaborator, Yeast ORFan Gene Project NSF RCN-UBE networking project. Design undergraduate learning modules in computational and evolutionary biology with group members and project leaders; the modules are then taught to educators at Primarily Undergraduate Institutions

July 2021: Wadsworth Center's REU program: Evolutionary origins of orphan genes.

Feb. 2022: Simmons College, Boston, MA, USA. Evolutionary origins of orphan genes.

June 2022: Adopt a Proto-gene workshop, first installment. NSF CAREER funded educational initiative where professors and students from Primarily Undergraduate Institutions and Community Colleges learn how to incorporate my research, and associated computational, evolutionary and genetics concepts, into their teachings. Worksheets and Modules provided. Weeklong event at Ohlone College, Newark, CA.

High School Student Teaching:

2001- 2005: Private Science Teacher for high students, Paris, France, all students successfully graduated high school and went to college

July 2018: DiscoBio program at the University of Pittsburgh, Genomics and Evolutionary Biology, one session.

July 2022: CompBio Academy at the University of Pittsburgh, Genomics and Evolutionary Biology, one session.

Faculty Development Teaching:

2017 - present: Member, NewPI Slack group (an international online peer-mentoring community for early-stage independent investigators)

Dec. 2018: SPRINGBOARD peer-mentoring lunch meeting, 1 session

Feb. 2022: recorded interview for the SOM NSF CAREER virtual workshop series

Public Lectures:

March 2009: Towards new models of biological network evolution: an introduction to basic molecular biology, genome annotation, and interaction mapping techniques, Center for Complex Network Research joint seminar, Boston, MA;

Oct. 2009: What biology can we learn by observing large scale experimentally generated protein interactions networks? Center for Complex Network Research joint seminar, Boston, MA, USA. Introductory biology lecture for physicists.

Jan. 2010. Interactomes et Biologie Systémique, with Drs Vidal, Charlotiaux & Dreze. Café des sciences de Boston, Boston, MA, USA. Public lecture in French language aimed at introducing the francophone community of Boston to systems biology.

Summer 2020. Passage d'informations participative et interactif. A French language online series aimed at disseminating scientific and societal information to a public mostly consisting of young professionals and graduate students spanning a broad array of backgrounds and specialties. I led the following events:

- Evolutionary Systems Biology: an introduction to molecular and evolutionary biology as they relate to the human condition
- Purpose in evolutionary biology: an introduction to the concepts of speciation and innovation in life sciences as they relate to fundamental philosophical questions

Dec. 2020. Passage d'informations participative et interactif. CRISPR, the genomic scissors.

Dec. 2022. CUDAN Open Lab Lecture. Systems Biology meets Systematic Cultural Analysis. Tallin, Estonia (*online* and on YouTube)

Feb. 2023. Club EvMed (TriCEM). Discussion on molecular innovation, *online*.

Teaching-related Service:

Service on graduate student committees:

2017 – 2020: She Zhang, Bahar laboratory, Joint Carnegie-Mellon Pitt Computational Biology (CPCB) program, University of Pittsburgh SOM

2017 – 2020: Yang Yang, Ma laboratory, CPCB program, Carnegie-Mellon University

2017 – 2020: Natalie Sauerwald, Kingsford laboratory, CPCB program, Carnegie-Mellon University

2018 – 2021: Sarah Munyoki, Orwig laboratory, Integrative Systems Biology (ISB) program, Magee Women Research Institute, University of Pittsburgh SOM

2019 – 2022: Yunye Shu, Kaplan laboratory, University of Pittsburgh Biology Department

2019 – 2021: Aidan Huene, Nicotra laboratory, ISB program, University of Pittsburgh SOM

2019 – present: Omer Acar, Carvunis laboratory, CPCB program, University of Pittsburgh SOM

2020 – 2022: Wes Phelps, Lee laboratory, University of Pittsburgh Biology Department

2020 – present: Karen Peralta Martinez, Khol laboratory, University of Pittsburgh Biology Department

2020 – present: Benjamin Patty, Hainer laboratory, University of Pittsburgh Biology Department

2019 – present: Bingbing Duan, Kaplan laboratory, University of Pittsburgh Biology Department

2020 – present: Saurin Parikh, Carvunis laboratory, ISB program, University of Pittsburgh SOM

2020: Ben Kim, Carja laboratory, CPCB program, Carnegie-Mellon University

2021 – present: Carly Houghton, Carvunis laboratory, CPCB program, University of Pittsburgh SOM

2022 – present: Manuel Michaca, Nicotra laboratory, ISB program, University of Pittsburgh SOM

2021 – present: April Rich, Carvunis laboratory, CPCB program, University of Pittsburgh SOM

2021 – present: Lin Chou, Carvunis laboratory, ISB program, University of Pittsburgh SOM

2022: Sara Andjus, Institut Curie, Paris, France

2022: Katrina Harris, Cooper laboratory, ISB program, University of Pittsburgh SOM

2022 – present: Sarah Petrosky, Rebeiz laboratory, MCDB program, University of Pittsburgh

2023 – present: Prabal Chibbar, Das laboratory, ISB program, University of Pittsburgh SOM

Other teaching-related service:

2017-2019, Member, Admissions Committee, Integrative Systems Biology graduate program

Feb. 2019, featured faculty mentoring lunch, Women in Science and Engineering Graduate Student Organization (WISE GSO)

Aug. 2019, Member, T32 Selection Committee, joint Carnegie-Mellon Pitt Computational Biology Graduate Program (CPCB)

Fall 2019 - present: Associate Director, Integrative Systems Biology (ISB) graduate program

- Liaison, Pittsburgh Center for Evolutionary Biology and Medicine
- Director, Evolutionary Medicine micro-credential

Fall 2019 – 2022: Chair, ISB program admissions

2022 – present: ISB program Director of Education

Jan. 2022 – present: Director, Adopt a Proto-gene.

- NSF CAREER funded Educational Initiative targeting undergraduate educators and students across the USA (~50 institutions, most of which Primarily Undergraduate Institutions and Community Colleges)
- Run a virtual collaborative network to facilitate exchange of course and materials
- Develop and share training modules and worksheets targeting advanced topics of computational, genetics and evolutionary biology using yeast as a model
- Promote class and lab research targeting proto-genes to synergistically develop student skills and increase knowledge about these novel genetic elements

Medical Student Mentoring:

May – July 2018: BaDoi Phan, University of Pittsburgh, MSTP program

Graduate Student Mentoring:

Prior to joining SOM:

June – Aug. 2012: Research Supervisor, Nipun Mistry, John Hopkins University, Masters Bioinformatics, now statistical analyst at MD Anderson Cancer Center

Jan. 2013 – March 2013: Co-supervisor, Dylan Skola, Graduate program in Systems Biology and Bioinformatics, UCSD, Ph.D. rotation student, graduated 2019

Jan. 2014 – March 2014: Co-supervisor, Tina Wang, Graduate Program in Biomedical Sciences, UCSC, Ph.D. rotation student, graduated 2019

2013 – 2016: Co-supervisor, Brian Hsu, UCSD, Masters Bio-engineering, now entrepreneur

Rotations supervisor:

March 2017: Haoyun Lei, University of Pittsburgh SOM, Joint Carnegie-Mellon Pitt Computational Biology (CPCB) program

Aug. 2017: Feng Shan, University of Pittsburgh SOM, Integrative Systems Biology (ISB) program

Oct. 2017: Trevor Frisby, University of Pittsburgh SOM, CPCB program

Oct. 2018: Tyler Lovelace, University of Pittsburgh SOM, CPCB program

Oct. 2019: Marissa Di, University of Pittsburgh SOM, CPCB program

Jan. – April 2020: Manuel Michaca, University of Pittsburgh SOM, Interdisciplinary Biomedical Graduate Program

Jan. – March 2021: Jiazhen Xu, University of Pittsburgh SOM, Interdisciplinary Biomedical Graduate Program

Nov. 2022: Alistair Turcan, University of Pittsburgh SOM, CPCB program

Master's thesis supervisor:

Aug. 2017 – 2018: Master's Thesis Supervisor, Saurin Parikh, Masters in Bioengineering, University of Pittsburgh SOM, Graduated 2018

Ph.D. thesis supervisor:

2018 – present: Omer Acar, University of Pittsburgh SOM, CPCB program (proposed)

2019 – present: Saurin Parikh, University of Pittsburgh SOM, ISB program (passed comprehensive exam)

2019 – present: Carly Houghton, University of Pittsburgh SOM, CPCB program (proposed)

2020 – present: April Rich, University of Pittsburgh SOM, CPCB program (proposed)

2021 – present: Jiwon Lee, University of Pittsburgh SOM, CPCB program

2021 – present: Lin Chou, University of Pittsburgh SOM, ISB program (passed comprehensive exam)

Undergraduate Student Mentoring:

June – August 2010: Justin Barbette, EPITA, Undergraduate Computer Engineering, now engineer at SNOWsat

July 2011 – August 2012: Sarah Nix, Curry College, Undergraduate Biology, now nurse practitioner at Maine Medical Center

January 2013 – June 2014: Jonathan Chen, UCSD, Undergraduate Computer Science, now at BuzzFeed

March 2013 – October 2014: Alice Yu, UCSD, Undergraduate Computer Science, now Ph.D. student at Stanford

March 2014 – December 2015: Katharine Metedgul-Ernar, UCSD, Undergraduate Biology, now working in her own start-up company

January 2015 – June 2016: Cameron Hines, UCSD, Undergraduate Biology, now in Medical School

January 2015 – June 2016: Nicholas Regent, UCSD, Undergraduate Biology, now at Golden Gate National Parks Conservancy

January – October 2016: Manuel Michaca, UCSD, Undergraduate Biochemistry, now Ph.D. student at University of Pittsburgh SOM

January – December 2016: Ailin Zhang, UCSD, Undergraduate Biochemistry, now Ph.D. student

February – March 2017: Ryan Hausler, University of Pittsburgh, Undergraduate Bioinformatics

March – September 2017: Neha Sodhi, UCSD, Undergraduate Bioengineering, graduated

May 2017: Sharif Abdelbaky, University of Pittsburgh, Undergraduate Computer Science

June – August 2017: Kate Karlovitch, Ohio University, Undergraduate Chemistry, Research Training Program in Health Sciences

July 2017 – Oct. 2019: John Iannotta, University of Pittsburgh, Undergraduate Molecular Biology, now Research Assistant at SOM

August – September 2017 & June – August 2018: Selin Sevgi, Undergraduate Molecular Biology and Genetics, Koc University (Turkey), Research Training Program in Health Sciences. Now Master's student in London

May – July 2018: Dominique Cantave, Undergraduate Mathematics, Harvard University, TecBio REU

May – July 2018: Thomas Dougherty, Undergraduate Mathematics, Harvey Mudd College, TecBio REU

May 2019 – Aug. 2022: Kate McCourt, University of Pittsburgh, Undergraduate Pre-med

May- Aug. 2019: Jake McKee, Robert Morris University, Undergraduate Biology, Research Training Program in Health Sciences

August 2019: Tanvi Yende, Yale University, Undergraduate Statistics, Research Training Program in Health Sciences

May – July 2021: Vijay Cherupally, University of Pittsburgh, Undergraduate Computational Biology, TecBio REU

June 2021 – Aug. 2022: Alexis Berger, University of Pittsburgh, Undergraduate Pre-med

May – July 2022: Sasha Manus, Undergraduate Biology, Brandeis University, TecBio REU

May – August 2022: Brandon Garcia, Undergraduate Marine Biology, Rollins College, Adopt a Proto-gene initiative

May – August 2022: Aaron Zhang, Undergraduate Biological Sciences, University of Pittsburgh, Adopt a Proto-gene initiative

Postdoctoral mentoring

Oct. 2017 – Oct. 2022: Dr Branden Van Oss, Ruth L/ Kirschstein postdoctoral fellow

Feb. 2018 – present: Dr Aaron Wacholder, postdoctoral fellow

Mentored Grant Funding:

2018 – 2021: GM129929. NIH/NIGMS Ruth L/ Kirschstein National Research Service Award (F32). Investigating mechanisms of *de novo* gene birth in *Saccharomyces cerevisiae*. Awarded to Dr. Branden Van Oss, postdoctoral fellow in Carvunis laboratory.

Aug. 2019 – 2021: NIBIB (T32) training grant to CPCB program was awarded to Carly Houghton, CPCB graduate student in Carvunis Laboratory, for the imaging of small proteins.

Sept. 2021 – present: NSF Graduate Research Fellowship Program awarded to April Rich, CPCB graduate student in Carvunis laboratory, for computational analyses of non-canonical translated elements

RESEARCH

Current Grant Support

DP2 GM137422	From non-coding to coding: uncovering the hidden coding potential of non-coding sequences and its role in de novo gene evolution	PI 65% effort 7.8 calendar	09/30/2019- 05/31/2024	\$1,500,000 DC \$2,347,500 TC
Alfred P. Sloan Foundation	2021 Sloan Research Fellowship in Computational and Evolutionary Molecular Biology.	PI 3% effort	09/15/2021- 09/14/2023	\$75,000 DC \$75,000 TC
NSF CAREER	CAREER: Investigation of how proto-gene expression impacts growth in budding yeast	PI 16.6% effort 2 calendar	01/15/2022 12/31/2026	\$1,022,531 DC \$1,491,927 TC

Pending Grant Support

HFSP	New kids on the block: how de novo emerged micropeptides rewire cellular networks	PI 0 effort	06/15/2023 06/14/2026	\$300,000 DC \$300,000 TC
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NSF	Simulating the evolution of complex functions in biological systems	Co-PI 0.5 calendar	06/15/2023 06/14/2026	\$600,000 TC
NIH	Unraveling microprotein biology with an evolutionary-immunological framework	PI 15% effort 1.8 calendar	09/01/2023 08/31/2028	\$7,636,234 TC

Prior Grant Support:

K99 GM108865	Deciphering the mechanisms and dynamics of proto-gene evolution.	PI 75% effort 9 calendar	05/01/2014- 03/31/2016	\$179,992
DARPA Biological Technologies	Streamlining and defragging the genome of a eukaryotic cell.	Project Team Member.		
R00 GM108865	Deciphering the mechanisms and dynamics of proto-gene evolution.	PI 75% effort 9 calendar	03/01/2017- 02/28/2020	\$747,000
Searle Scholar Program	The functional landscape of non-genic proteome	PI 10% effort 1.2 calendar	07/01/2018- 06/30/2021	\$300,000 DC \$300,000 TC

Journal refereeing

Prior to joining SOM

BMC Evolutionary Biology

Cell

Curr. Opt. Struct. Biol

eLife

Genome Biology and Evolution

Medicine/Sciences

Molecular Biology and Evolution: x2

Molecular Phylogenetics and Evolution
Philosophical Transactions B
PLoS Computational Biology
PLoS Genetics
PLoS One: x4
PNAS: x2
Science

Since joining SOM

Bioinformatics: x2
BMC Biology
Cell Reports
Current Opinions Structural Biology
Genome Biology: x2
Genome Biology and Evolution: x2
Genome Research: x2
Journal of Molecular Evolution: x2
Medicinal Research Reviews
Molecular Biology and Evolution: x2
Nature Communications: x2
Nature Ecology and Evolution: x3
Nature Methods
Nucleic Acids Research
Philosophical Transactions B
PLoS Biology
PLoS Computational Biology
PLoS Genetics
PLoS One: x2
Plant Science
PNAS
The Plant Journal
Trends in Cell Biology

Editorships

Member of Cell Communication and Signaling editorial board since 2012
Member of Frontiers in Bioinformatics and Computational Biology editorial board since 2017
Guest Editor for PLoS Genetics, 2018
Guest Editor for PNAS, 2022

Grant reviewing

2021 Ad-hoc reviewer for the National Science Foundation Plant Genome Research Program
2022 Ad-hoc reviewer for the National Science Foundation Molecular and Cellular Biology Program
2022 Panelist, National Science Foundation Cellular and Biochemical Engineering Program

LIST of CURRENT RESEARCH INTERESTS

My integrative research program aims at deciphering how evolution shapes the organization of genomes and molecular networks in order to improve understanding of genotype-phenotype relationships. I am particularly interested in the molecular mechanisms of change and innovation in evolution. My work is shedding light on the mechanisms and dynamics of *de novo* gene birth, a phenomenon proving increasingly important in the evolution of genomes. This research has profound biomedical implications and challenges current biological concepts such as the notion of “gene” or “function”.

INVITED SEMINARS AND LECTURESHIPS

Local Presentations

Prior to joining SOM

1. Aug. 2008: Dana-Farber Cancer Institute student retreat, Boston, MA: *De novo* appearing genes in *Saccharomyces cerevisiae*
2. Jan. 2009: Center for Cancer Systems Biology Think Tank, Boston, MA: New insights on gene birth
3. Aug. 2009: Dana-Farber Cancer Institute Cancer Biology Department retreat, Cambridge, MA: *De novo* gene birth in *Saccharomyces cerevisiae*, *Poster Presentation*
4. Sept. 2009: Boston Yeast Meeting, Cambridge, MA: *De novo* gene birth in *Saccharomyces cerevisiae*
5. June 2009: Roth Lab retreat, Gloucester, MA: *De novo* gene birth in *Saccharomyces cerevisiae*
6. July 2009: Center for Cancer Systems Biology retreat, Gloucester, MA: *De novo* gene birth in *Saccharomyces cerevisiae*
7. March 2010: Dana-Farber Cancer Institute Cancer Biology Seminar, Boston, MA: The proto-gene hypothesis
8. Sept. 2010: Center for Cancer Systems Biology retreat, Gloucester, MA: Duplication and divergence in a plant interactome
9. July 2011: Dana-Farber Cancer Institute Cancer Biology Department retreat, Boston, MA: Proto-genes, *Poster Presentation*
10. Sept. 2011: Center for Cancer Systems Biology retreat, Gloucester, MA: Proto-genes and *de novo* gene birth
11. May 2012: Dana-Farber Cancer Institute Cancer Biology Seminar, Boston, MA: Proto-genes and *de novo* gene birth
12. June 2014: Center for Cancer Systems Biology Alumni Retreat, Gloucester, MA: On the illusion of evolutionary divergence in regulatory networks
13. Feb. 2016: University of Pittsburgh Department of Computational and Systems Biology, Pittsburgh, PA: What makes us different? A systems biology perspective on evolutionary innovation
14. March 2016: University of California San Diego Department of Cellular and Developmental Biology, San Diego, CA: What makes us different? A systems biology perspective on evolutionary innovation

Since joining SOM

15. April 2017: Joint CMU-Pitt Ph.D Program in Computational Biology seminar series, Pittsburgh PA: Change and innovation in biological systems
16. May 2017: Pittsburgh Chromatin Club Mini-Symposium, Pittsburgh PA: On the illusion of evolutionary divergence in regulatory networks
17. June 2017: Joint CDSB/IMM symposium, Pittsburgh, PA: Of mice, men, network modeling and immune systems
18. Oct. 2017: Science 2017, Pittsburgh, PA: What makes us different? An evolutionary systems biology perspective
19. Oct. 2017: Magee-Womens Research Institute's Work in Progress Conference and Research Seminar Series, Pittsburgh, PA: The evolutionary impact of non-genic sequences
20. Nov. 2017: University of Pittsburgh Department of Molecular Biophysics and Structural Biology, Pittsburgh, PA: Proto-genes and *de novo* gene birth
21. June 2018: Senior Vice Chancellor 12 at 12 Seminar series, Pittsburgh PA: Proto-genes and *de novo* gene birth
22. Sept. 2018: University of Pittsburgh Department of Human Genetics, Pittsburgh, PA: Proto-genes and *de novo* gene birth
23. Nov. 2018: University of Pittsburgh Department of Biomedical Informatics, Pittsburgh, PA: Where do genes come from?
24. April 2019: Microbiome Seminar Series, Pittsburgh, PA: Proto-genes and *de novo* gene birth
25. May 2019: Life Science Week, Pittsburgh, PA: What makes us different?
26. Jan. 2020: Joint CDSB/IMM symposium, Pittsburgh, PA: Probing the dark matter of the transcriptome
27. Jan 2020: Integrative Systems Biology symposium, Pittsburgh PA: Change and innovation in Biological systems
28. May 2021: Aging institute of UPMC, Research In Progress Seminar Series
29. Sept. 2021: University of Pittsburgh Department of Biomedical Informatics, Pittsburgh, PA
30. March 2022: Starzl Transplantation Institute Biology Seminar, Pittsburgh, PA
31. Feb. 2023. Magee-Womens Research Institute's Work in Progress Conference and Research Seminar Series, Pittsburgh, PA: Molecular Mechanisms of Evolutionary Innovation.

Local Presentations by Trainees

1. Nov. 2018: Dr. Aaron Wacholder, postdoctoral fellow; Department of Computational and Systems Biology, Pittsburgh, PA
2. Feb. 2019: Dr. Branden Van Oss, postdoctoral fellow; Department of Computational and Systems Biology, Pittsburgh, PA
3. Jan 2020: Dr Saurin Parikh, PhD student; Integrative Systems Biology symposium, Pittsburgh PA, *Poster Presentation*
4. Feb. 2020: Dr. Branden Van Oss, postdoctoral fellow; Department of Computational and Systems Biology, Pittsburgh, PA
5. March 2020: Dr. Aaron Wacholder, postdoctoral fellow; Department of Computational and Systems Biology, Pittsburgh, PA

Regional Presentations

Prior to joining SOM

1. Jan. 2014: San Diego Center for Systems Biology retreat, Lake Arrowhead, CA: On the illusion of evolutionary divergence, *Poster Presentation*
2. May 2014: San Diego Center for Systems Biology: Systems-to-Synthesis Symposium, San Diego, CA: On the illusion of evolutionary divergence in regulatory networks
3. Jan. 2015: San Diego Center for Systems Biology retreat, Lake Arrowhead, CA: A molecular clock for transcription factor binding evolution? *Poster Presentation*
4. Jan. 2016: San Diego Center for Systems Biology retreat, Lake Arrowhead, CA: A molecular clock for transcriptional evolution in animals? *Poster Presentation*
5. April 2016: San Diego Center for Systems Biology Systems-to-Synthesis Symposium, San Diego, CA: Evolution of transcriptional regulation in diverse animal lineages

Since joining SOM

6. Feb. 2017: Pittsburgh Area Yeast Meeting, Pittsburgh, PA: Change and innovation in biological systems
7. Aug. 2017: Molecular Evolution Laboratory Discussion group, Pittsburgh, PA: Change and Innovation in Biological Systems
8. Sept. 2017: Three Rivers Evolution Event (TREE), Pittsburgh, PA: On the illusion of regulatory divergence
9. May 2018: Molecular Evolution Laboratory Discussion group, Pittsburgh, PA: The genome's reservoir of adaptive proto-genes
10. Feb. 2019: Pittsburgh Area Yeast Meeting, Pittsburgh, PA: The adaptive potential of transmembrane proto-genes

Regional Presentations by Trainees

1. May 2018: Dr. Branden Van Oss, postdoctoral fellow, Pittsburgh Area Yeast Meeting, Pittsburgh, PA
2. Sept. 2018: BaDoi Phan, MSTP rotation student, Three Rivers Evolution Event (TREE), Pittsburgh, PA
3. Sept. 2018: Dr. Aaron Wacholder, postdoctoral fellow, Three Rivers Evolution Event (TREE), Pittsburgh, PA
4. Nov. 2018: Dr. Aaron Wacholder, postdoctoral fellow, Molecular Evolution Laboratory Discussion group, Pittsburgh, PA
5. April 2019: Dr Branden Van Oss, postdoctoral fellow, Robert Morris University, Moon, PA
6. Sept. 2019: Saurin Parikh, graduate student, ISB program, Third Annual Evolution in Philadelphia Conference, Philadelphia, PA
7. Sept. 2019: Omer Acar, graduate student, ISB program, Third Annual Evolution in Philadelphia Conference, Philadelphia, PA, *Poster Presentation*
8. March 2020: Omer Acar, graduate student, CPCB program, Molecular Evolution Laboratory Discussion, Pittsburgh PA. *Cancelled due to covid-19.*
9. April 2020: Dr Saurin Parikh, graduate student, ISB program, Pittsburgh Area Yeast Meeting, Pittsburgh PA.

10. June 2020: Dr Aaron Wacholder, postdoctoral fellow, Pittsburgh Area Yeast Meeting, Pittsburgh PA.
11. April 2021: Dr Branden Van Oss, postdoctoral fellow, Pittsburgh Area Yeast Meeting, Pittsburgh PA
12. April 2021: Carly Houghton, graduate student, CPCB program, Molecular Evolution Laboratory Discussion, Pittsburgh PA
13. Sept. 2021: Jiwon Lee, graduate student, CPCB program, Molecular Evolution Laboratory Discussion, Pittsburgh PA
14. Nov. 2021: April Rich, graduate student, CPCB program, Pittsburgh Area Yeast Meeting, Pittsburgh PA
15. March 2022: Dr Branden Van Oss, postdoctoral fellow, Pittsburgh Area Yeast Meeting, Pittsburgh PA
16. Dec. 2022: Lin Chou, graduate student, ISB program, Molecular Evolution Laboratory Discussion, Pittsburgh PA

National Presentations (invited seminars)

Prior to joining SOM

1. June 2012: University of Michigan Department of Pathology Seminar, Ann Arbor, MI: From proteins and their interactions to evolutionary principles of biological systems
2. July 2012: University of Massachusetts Medical School, Worcester, MA: From proteins and their interactions to evolutionary principles of biological systems
3. March 2014: Northwestern University Applied Maths Colloquium, Evanston, IL: From proteins and their interactions to evolutionary principles of biological systems
4. May 2014: Gladstone Institute, San Francisco, CA: What makes us different? A systems biology perspective on evolutionary innovation
5. May 2014: Stanford School of Medicine, Palo Alto, CA: What makes us different? A systems biology perspective on evolutionary innovation
6. Aug. 2015: Workshop on Evolutionary Systems Biology and Modeling, Madison, WI: What makes us different? A systems biology perspective on evolution

Since joining SOM

7. April 2017: Iowa State University, Ames, IA: Change and innovation in biological systems
8. Nov. 2018: Dupont Experimental Station, Wilmington, DE: The adaptive potential of proto-genes.
9. April 2019: Searle Scholars annual meeting, Chicago, IL: *de novo* emergence of adaptive membrane proteins in thymine-rich intergenic regions, *Poster Presentation*
10. May 2019: University of Arizona, Tucson AZ: What makes us different? An evolutionary systems biology perspective to evolutionary innovation
11. February 2020: The College of Wooster, Wooster PA: Proto-genes and *de novo* gene birth. *Postponed due to severe weather.*
12. April 2020: Searle Scholars annual meeting, Chicago, IL: *de novo* emergence of adaptive membrane proteins in thymine-rich intergenic regions, *Poster Presentation. Cancelled due to covid-19.*

13. June 2020. NIH High Risk High Rewards Research Symposium, Bethesda, MD. *Cancelled due to covid-19.*
14. March 2021: University of Albany, Albany NY: Molecular mechanisms of evolutionary innovation. *Online due to covid-19.*
15. April 2021: The Pennsylvania State University, State College, PA: Molecular mechanisms of evolutionary innovation. *Online due to covid-19.*
16. May 2021: Searle Scholars annual meeting, Chicago, IL: The functional landscape of the proteome. *Online due to covid-19.*
17. Sept. 2021: Plasticity in Biological Organization workshop, Telluride Science Research Center, Telluride, CO.
18. June 2022: Fred Hutchinson Cancer Center, Seattle, WA: Two modes of protein evolution.
19. Dec. 2022: University of Pennsylvania, Philadelphia, PA: Molecular mechanisms of evolutionary innovation.
20. May 2023: University of Chicago, Chicago, IL: Molecular mechanisms of evolutionary innovation.
21. September 2023: Plasticity in Biological Organization workshop, Telluride Science Research Center, Telluride, CO.

International Presentations

Prior to joining SOM

1. Nov. 2007: Genome Informatics Conference, Cold Spring Harbor Laboratory, NY: Could yeast evolution itself influence our knowledge of gene functions? *Poster Presentation*
2. Sept. 2008: Genome Informatics Conference, Hinxton, UK: *De novo* appearing genes in *Saccharomyces cerevisiae*, *Poster Presentation*
3. May 2010: Network Science (NetSci) conference, Cambridge, MA: Divergence in the Arabidopsis protein interaction network
4. Feb. 2011: Epigenomics Project Genopole, Évry, France: From proteins and their interactions to evolutionary principles of biological systems, ***invited seminar***
5. Feb. 2011: European Institute of Chemistry and Biology, Bordeaux, France: From proteins and their interactions to evolutionary principles of biological systems, ***invited seminar***
6. March 2011: Systems Biology: Networks conference, Cold Spring Harbor Laboratory, NY: Proto-genes, *Poster Presentation*
7. March 2011: Systems Biology: Networks conference, Cold Spring Harbor Laboratory, NY: Independently evolved virulence effectors converge onto cellular hubs in a plant immune system network, *Poster Presentation*
8. May 2012: Integrative network biology: network medicine conference, Helsingør, Denmark: Proto-genes and *de novo* gene birth
9. June 2012: Society for Molecular Biology and Evolution conference, Dublin, Ireland: Proto-genes and *de novo* gene birth,
10. July 2012: European Molecular Biology Laboratory, Heidelberg, Germany: From proteins and their interactions to evolutionary principles of biological systems, ***invited seminar***
11. July 2013: Society for Molecular Biology and Evolution conference, Chicago, IL: The “proto-gene” model for *de novo* origination of protein-coding genes, ***invited conference speaker***

12. March 2014: Systems Biology: Global Regulation of Gene Expression conference, Cold Spring Harbor Laboratory, NY: On the illusion of evolutionary divergence in regulatory networks
13. June 2014: Society for Molecular Biology and Evolution conference, San Juan, PR: On the illusion of evolutionary divergence in regulatory networks
14. Nov. 2015: Mechanisms of Protein Evolution III 2015: Origins, Denver, CO: Proto-genes and *de novo* gene birth, **Francois Jacob keynote speaker**
15. May 2016: Cancer Research UK Cambridge Institute, Cambridge, UK: Evolution of transcriptional regulation in diverse animal lineages, **invited seminar**
16. May 2016: European Bioinformatics Institute, Hinxton, UK: What makes us different? A systems biology perspective on evolutionary innovation, **invited seminar**
17. May 2016: Molecules as documents of evolutionary history – 50 years after, Roscoff, France: A molecular clock for transcriptional evolution in animals? *Poster Presentation*

Since joining SOM

18. March 2017: Systems Biology: Networks, Cold Spring Harbor Laboratory, NY: Challenges in comparative network biology: integrating across disparate data types and organisms to model the evolution of regulatory networks
19. Feb. 2017: Q-BIO 2017, Poipu, HI: On the illusion of evolutionary divergence in regulatory networks
20. July 2017: Society for Molecular Biology and Evolution conference, Austin, TX: Proto-genes, fitness and *de novo* gene birth, **invited conference speaker**
21. April 2018: Wellcome Trust meeting on Evolutionary Systems Biology, Hinxton, UK: The adaptive potential of naturally-occurring proto-genes
22. May 2018: Biology of Genomes, Cold Spring Harbor Laboratory, NY: The genome's reservoir of adaptive proto-genes
23. June 2018: Canadian Institute For Advanced Research, Genetics Networks Program meeting, Toronto, Canada: The genome's reservoir of adaptive proto-genes, **invited conference speaker**
24. Sept. 2018: Evolutionary Biology Meeting, Marseilles, France: Predicting the evolution of novel genes
25. Oct. 2018: Experimental Approaches to Evolution and Ecology Using Yeast and Other Model Systems, EMBO workshop, Heidelberg, Germany: *De novo* gene emergence in *S. cerevisiae*, **invited conference speaker**
26. May 2019: NetSciReg, Burlington, VT: Evolutionary novelty in cellular networks, **invited conference speaker**
27. June 2019: American Society of Microbiology meeting, San Francisco, CA: Proto-genes and *de novo* gene birth, **invited conference speaker**
28. July 2019: Society for Molecular Biology and Evolution conference, Manchester, UK: The adaptive potential of proto-genes, **invited conference speaker**
29. Oct. 2019: Genetic Interactions of Proto-genes; Cold Spring Harbor Laboratories meeting on Yeast Research: Origins, Insights, Breakthroughs, NY, *Poster Presentation*
30. May 2020: Proto-genes. University of Montreal, Canada, **invited seminar**. *Postponed due to covid-19.*

31. July 2020. Evolutionary and physiological characterization of a de novo orphan protein. Society for Molecular Biology and Evolution conference, Quebec City, Canada. *Cancelled due to covid-19.*
32. Oct. 2020. University of Chicago, Chicago, IL, **invited seminar**. *Postponed due to covid-19.*
33. Dec. 2020. The Molecular Biology Society of Japan, **invited conference speaker**. *Online due to covid-19.*
34. Feb. 2021. University Laval, Quebec, Canada: Molecular mechanisms of evolutionary innovation, **invited seminar**. *Online due to covid-19.*
35. Oct. 2021. LMO meeting, University of Strasbourg, France, **Mitocross keynote speaker**
36. Nov. 2021. Viikki Lectures, University of Helsinki, Helsinki, Finland, **invited seminar**. *Postponed due to covid-19*
37. Aug. 2022. Yeast Genetics Meeting, poster presentation. *Online.*
38. Oct. 2022 Institut Curie, Paris, France, **invited seminar**.
39. Nov. 2022. ETH Zurich Institute of Molecular Systems Biology, Switzerland, **invited seminar (postponed)**.
40. Feb. 2023. University of Muenster, Muenster, Germany, **invited seminar, online.**
41. April 2023. University of Montreal, Montreal, Quebec, Canada, **invited seminar**.
42. May 2023. Great Lakes Bioinformatics Conference (GLBIO), Montreal, Canada, **conference keynote speaker**.
43. June 2023. Microproteins 2023: Unraveling the universe of microproteins - from discovery to physiology and application, Helsingor, Denmark, **invited conference speaker**.
44. July 2023: Protein Evolution Meeting, Muenster, Germany, **invited conference speaker**.
45. Nov. 2023: SMBE satellite meeting on gene emergence, College Station, Texas, **conference keynote speaker**.

International Presentations by Trainees

1. March 2019: Omer Acar, PhD student, CPCB program, Cold Spring Harbor Laboratories meeting on Network Biology, NY, *Poster Presentation*
2. Oct. 2019: Nelson Castilho Coelho; Cold Spring Harbor Laboratories meeting on Yeast Research: Origins, Insights, Breakthroughs, NY, *Poster Presentation*
3. March 2020: Carly Houghton, PhD student, CPCB program, Small Proteins in Prokaryotes, an Unexplored World, Hamburg, Germany, *Poster Presentation*. *Cancelled due to covid-19.*
4. July 2020: Dr. Aaron Wacholder, postdoctoral fellow, Society for Molecular Biology and Evolution conference, Quebec City, Canada, *Poster Presentation*. *Cancelled due to covid-19*
5. Nov. 2020: Omer Acar, graduate student, CPCB program, RECOMB/ICSB Conference on Regulatory and Systems Genomics with DREAM challenges 2020, *Online Poster Presentation*
6. March 2021: Omer Acar, graduate student, CPCB program, Cold Spring Harbor Laboratories meeting on Network Biology, NY, *selected speaker*

7. July 2021: Dr. Aaron Wacholder, postdoctoral fellow, Society for Molecular Biology and Evolution conference, *Online Poster Presentation*
8. July 2021: Carly Houghton, PhD student, CPCB program, Society for Molecular Biology and Evolution conference, *Online Poster Presentation*
9. Nov. 2021: April Rich, PhD student, CPCB program, Cold Spring Harbor Laboratories meeting on Genome Informatics, NY, *Online Poster Presentation*
10. Feb. 2022: Dr. Aaron Wacholder, postdoctoral fellow, Evolutionary Systems Biology conference, *online selected talk*
11. Oct. 2022: Carly Houghton, graduate student, CPCB program, Evolutionary Cell Biology meeting, Tuscon Arizona, *selected talk*.

Media Interviews

1. Jan. 2013: All Alone by Helen Picher, *New Scientist*
2. April 2014: The Continuing Evolution of Genes by Carl Zimmer, *New York Times*
3. Summer 2018: DNA's Dark Matter by Elaine Vitone, *PITTMED*
4. Oct. 2019: Genes from the Junkyard by Adam Levy, *Nature News Feature*
5. Oct. 2019: Outsize by Mitch Leslie, *Science News Feature*
6. Winter 2019: Faculty snapshot, *PITTMED*
7. April 2020: Where do genes come from? By Viviane Callier, *Quanta Magazine*
8. April 2021: Elizabeth Pain, *Science Careers*
9. Feb. 2022: Brian Connelly, *Pitt Research*
10. Dec. 2022: Origin stories – undergrads witness new genes arising. By Jenny Blair, *PITTMED*
11. Jan. 2023: Human gene linked to bigger brains was born from seemingly useless DNA. By Elizabeth Pennisi, *Science News*.
12. Jan. 2023: Rethinking Evolution. University of Pittsburgh 2021-2022 Research Annual Report.

SERVICE

University and Medical School Service

- Since 2017: Invited and hosted speakers for SOM seminar series:
 - Nevan Krogan (UCSF)
 - Hannah Carter (UCSD)
 - Daniel Jarosz (Stanford)
 - Sarah Slavoff (Yale)
 - Chad Myers (University of Minnesota)
 - Trey Ideker (UCSD)
 - Michael Hiller (Max Plank Institute)
 - Gisela Storz (NIH)
 - Kerry Geiler-Samerotte (Arizona State University)
 - Amy Goldberg (Duke)
 - Lucia Peixoto (Washington State University)
 - Luke Chao (Harvard University)

- Since 2017: Co-founder and Executive Committee Member, Pittsburgh Center for Evolutionary Biology and Medicine (CEBaM).
 - The mission of the Center is to advance the fields of evolutionary biology and medicine by catalyzing research at their interface. The Center serves to cultivate educational and scientific collaborations between evolutionary biologists and biomedical researchers.
 - Roles include general co-leadership, retreat organization (2018), logo design, stewarding the educational mission of the center (since summer 2019)
- 2017, Poster Judge, joint retreat of Immunology and Computational and Systems Biology Department
- Since 2018, Member, Women In Science and Engineering GSO
- 2018, Organizing Committee Member, annual retreat of the Department of Computational and Systems Biology (DCSB)
- 2018, Poster Judge, annual DCSB retreat
- 2018, set up extramural data storage solutions for DCSB
- 2019, Poster Judge, joint retreat of Immunology and Computational and Systems Biology Department
- 2019, Leader, Round Table Discussion on Evolutionary Biology and Medicine, joint retreat of Immunology and Computational and Systems Biology Department
- 2019 – 2022, Member, Dickson Prize Selection Committee
- 2019, Participant, LCME re-accreditation site visit
- 2019 – present, Chair, space and move planning for experimental laboratories DCSB
- 2019, Member, Faculty Search Committee for DCSB
- 2020, Member, Basic Science Advisory Committee
- 2020, Member, Faculty Search Committee for joint Magee-Womens Research Institute and DCSB appointment
- 2021- 2022 Member, Faculty Search Committee for DCSB
- 2021 – present: Member, UPSOM Interviewing Committee
- 2022, Reviewer, limited opportunity grant submissions
- 2022 – present, Member, DCSB Chair search committee

Local/Community Service Activities

- Oct. 2014, Public Outreach, Oct 2014, volunteered at an event organized by Fleet Science Center in San Diego aimed at educating the public

Regional Service

- 2017, Poster Judge, First Annual Three Rivers Evolution Event

National Service

- Aug 2015, Conference Symposium Organization, Investigative Workshop, Madison, Wisconsin: Modeling and Evolutionary Systems Biology
- Feb 2021: Webinar panelist: How to get into graduate school. SACNAS. Achieving true diversity in STEM.

- 2022: nominate Dr. Malik for Breakthrough prize

International Service

- June 2014, Conference Symposium Organization, Society for Molecular Biology and Evolution conference, San Juan, Puerto Rico: Examining disease through the lens of evolution with Evolutionary Systems Medicine and Phylo-medicine.
- July 2017, Conference Symposium Organization, Society for Molecular Biology and Evolution conference, Austin, Texas: Evolutionary systems biology of cells.
- Since 2017, Conference Organization, Cold Spring Harbor Laboratory international meeting on Network Biology. Organization of meetings for 2019, 2021 and upcoming 2023 including:
 - Inviting speakers
 - Selecting abstracts
 - Scientific program
 - Writing NIH grants to support the conference (PI: CSHL)
 - Organizing special emphasis panels (Women in Science in 2019; Translatability of Network Biology in 2021; Open Network Science planned for 2023)
- Since 2020, Advisor to Ensembl/GENCODE for the incorporation of non-canonical translated regions into the human genome annotations
- June 2023, invited session chair, Molecular Mechanisms in Evolution Gordon Research Conference, Stonehill College in Massachusetts, United States

Consultantship

Member of Advisory Board for a new startup derived from Flagship Pioneering, ProFound Therapeutics, aimed at mining the non-canonical translome for therapeutic and other applications.