

BIOGRAPHICAL SKETCH

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NAME: Mitchell, Aaron P.

eRA COMMONS USER NAME (credential, e.g., agency login): MITCHELLA

POSITION TITLE: Professor & Head, Department of Microbiology

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Carnegie Mellon University, Pittsburgh, PA	BS	05/1977	Biology
MIT, Cambridge, MA	PhD	04/1984	Microbiology
UCSF, San Francisco, CA	Postdoc	06/1987	Molecular Genetics

A. Personal Statement

I have a long-standing interest in gene expression and regulation, and how we can use such information to get insight into biological questions. This interest was a constant throughout my training with Boris Magasanik and Ira Herskowitz, both of whom had thought deeply about such connections and inspired me to pursue those ideas. My group has contributed to gene discovery in *C. albicans* through construction and distribution of mutant collections, and through genetic screens for defects in biofilm formation and drug sensitivity.

I have also committed significant effort to training and mentorship of young scientists. I was PI or co-PI for three different training grants during my time at Columbia University. I served as PI for an HHMI Undergraduate Education Grant immediately upon moving to Carnegie Mellon University. I was an instructor in the Cold Spring Harbor Yeast Genetics Course, and a co-founder and co-director (through 2010) of the MBL Molecular Mycology Course. I served as an advocate for young scientists as a member of the Burroughs Wellcome Fund Advisory Board for Pathogenesis of Infectious Disease Awards. I was recognized for these efforts with the 2015 Graduate Microbiology Teaching Award from the American Society for Microbiology, with election to the American Academy of Arts and Sciences, and as the shared namesake for the Jack Edwards and Aaron Mitchell Endowed Lectureship at the Marine Biological Labs in Woods Hole, MA.

B. Positions, Scientific Appointments, and Honors**Positions and Employment**

2020- Professor & Head, Department of Microbiology, University of Georgia, Athens, GA
 2016-2019 Head, Biological Sciences, Carnegie Mellon University, Pittsburgh, PA
 2015-2016 Acting Head, Biological Sciences, Carnegie Mellon University, Pittsburgh, PA
 2008-2019 Professor of Biological Sciences, Carnegie Mellon University, Pittsburgh, PA
 2005-2008 Acting Chair, Department of Microbiology, Columbia University, New York, NY
 1995 Visiting Scientist, Department of Biochemistry, Merck Research Labs, Rahway, NJ
 Myra Kurtz, sponsor
 1987-2008 Assistant/Associate/Full Professor, Department of Microbiology,
 Columbia University, New York, NY
 1984-1987 Postdoctoral Fellow, Department of Biochemistry and Biophysics
 UCSF, San Francisco, CA; Ira Herskowitz, sponsor
 1977-1984 Graduate Student, Department of Biology, MIT, Cambridge, MA;
 Boris Magasanik, advisor

1976-1977 Undergraduate Research Assistant, Carnegie Mellon University, Pittsburgh, PA; Beth Jones, advisor

Other Experience and Professional Memberships

2022- Associate Editor, PLOS GENETICS
2016- Senior Editor, mSPHERE
2015 Reviewer, Mycology Centre Review Panel, Medical Research Council, UK
2014 Chair, Medical Mycology Division, American Society for Microbiology
2012-2018 Advisory Board, Burroughs Wellcome Fund Pathogenesis of Infectious Disease Awards
2012- Editorial Board, PLOS BIOLOGY
2009-2015 Member, NIH PTHE Study Section
2008-2012 Director, HHMI Undergraduate Research Program, Carnegie Mellon University
2008- Associate Editor/Mycology Section Editor/Reviews Section Editor, PLOS PATHOGENS
2007-2008 Co-director, TIRAR Training Program, Columbia University
2006 Chair, Cellular and Molecular Fungal Biology Gordon Conference
2006-2008 Executive Committee, ASM Candida and Candidiasis Conference
2004-2007 Member, Damon Runyon Fellowship Review Panel
2002-2005 Director, Microbiology PhD Training Program, Columbia University
2002-2015 Editor/Editor in Chief, EUKARYOTIC CELL
2000- Ad hoc Member, NIH BM-2, MBC-1, PTHE, AOIC, & Special Emphasis Panels
1997-2010 Course Director, Molecular Mycology Summer Course, Woods Hole MBL
1996- Associate Editor, GENETICS
1995-1998 Member, American Cancer Society Virology and Molecular Genetics Study Section
1995-1999 Member, NIH Microbial Physiology and Genetics-1 Study Section
1990-1994 Yeast Genetics Summer Course Instructor, Cold Spring Harbor Lab

Honors

2024 Election to American Academy of Arts and Sciences
2024 Distinguished Research Professorship, University of Georgia
2021 Shared namesake for "The Jack Edwards and Aaron Mitchell Endowed Lecture in Molecular Mycology," Marine Biological Labs, Woods Hole, MA
2020 MVP Speaker, Marine Biological Labs summer program
2019 Top 2% of Microbiologists, as per PLOS Biology 17(8): e3000384
2016-2019 Dr. Frederick A. Schwertz Distinguished Professor of Life Sciences, Carnegie Mellon University
2015 American Society for Microbiology Graduate Microbiology Teaching Award
2013 Division X Lecturer, American Society for Microbiology General Meeting
2011 Friday Night Lecturer, Marine Biological Lab, Woods Hole
2005-2008 Harold S. Ginsberg Professorship, Columbia University
2005 Fellow, American Association for the Advancement of Science
2005 Keynote Speaker, CSH Microbial Pathogenesis & Host Response Meeting
2003 Fellow, American Academy of Microbiology
1997 Molecular Mycology Scholar Award, Burroughs Wellcome Fund
1992 Faculty Research Award, American Cancer Society
1989 Searle Scholar
1984 Damon Runyon - Walter Winchell Cancer Fund Postdoctoral Fellow

C. Contributions to Science

My full bibliography is available at

<https://www.ncbi.nlm.nih.gov/myncbi/browse/collection/41198498/?sort=date&direction=ascending> ORCID 0000-0002-0868-4000

My work on *C. albicans* biofilm formation began with mutant screens to identify biofilm-defective mutants. This work was inspired by several stimulating reviews on bacterial biofilms by O'Toole and Kolter. Our studies were, to the best of my knowledge, the first broad identification of biofilm mutants in *C. albicans*.

1. Nobile CJ, Mitchell AP. Regulation of cell-surface genes and biofilm formation by the *C. albicans* transcription factor Bcr1p. *Curr Biol*. 2005;15(12):1150-5. Epub 2005/06/21. doi: S0960-9822(05)00562-2 [pii] 10.1016/j.cub.2005.05.047. PubMed PMID: 15964282.

2. Richard ML, Nobile CJ, Bruno VM, Mitchell AP. *Candida albicans* biofilm-defective mutants. *Eukaryot Cell*. 2005;4(8):1493-502. Epub 2005/08/10. doi: 4/8/1493 [pii] 10.1128/EC.4.8.1493-1502.2005. PubMed PMID: 16087754.
3. Norice CT, Smith FJ, Jr., Solis N, Filler SG, Mitchell AP. Requirement for *Candida albicans* Sun41 in biofilm formation and virulence. *Eukaryot Cell*. 2007;6(11):2046-55. Epub 2007/09/18. doi: EC.00314-07 [pii] 10.1128/EC.00314-07. PubMed PMID: 17873081.
4. Finkel JS, Xu W, Huang D, Hill EM, Desai JV, Woolford CA, Nett JE, Taff H, Norice CT, Andes DR, Lanni F, Mitchell AP. Portrait of *Candida albicans* Adherence Regulators. *PLoS Pathog*. 2012;8(2):e1002525. Epub 2012/02/24. doi: 10.1371/journal.ppat.1002525 PPATHOGENS-D-11-02358 [pii]. PubMed PMID: 22359502.

We characterized the regulatory circuitry that controls biofilm-related genes in multiple different contexts. These studies have included collaborations with the Andes lab (University of Wisconsin).

1. Desai JV, Bruno VM, Ganguly S, Stamper RJ, Mitchell KF, Solis N, Hill EM, Xu W, Filler SG, Andes DR, Fanning S, Lanni F, Mitchell AP. Regulatory role of glycerol in *Candida albicans* biofilm formation. *MBio*. 2013;4(2):e00637-12. Epub 2013/04/11. doi: mBio.00637-12 [pii] 10.1128/mBio.00637-12. PubMed PMID: 23572557; PMCID: 3622937.
2. Woolford CA, Lagree K, Xu W, Aleynikov T, Adhikari H, Sanchez H, Cullen PJ, Lanni F, Andes DR, Mitchell AP. Bypass of *Candida albicans* Filamentation/Biofilm Regulators through Diminished Expression of Protein Kinase Cak1. *PLoS Genet*. 2016;12(12):e1006487. Epub 2016/12/10. doi: 10.1371/journal.pgen.1006487 PGENETICS-D-16-01930 [pii]. PubMed PMID: 27935965; PMCID: 5147786
3. Sharma A, Solis NV, Huang MY, Lanni F, Filler SG, Mitchell AP. 2023. Hgc1 Independence of Biofilm Hyphae in *Candida albicans*. *mBio* doi:10.1128/mbio.03498-22:e0349822. PMID: 36779720 PMCID: 10128054
4. Xiong L, Pereira De Sa N, Zarnowski R, Huang MY, Mota Fernandes C, Lanni F, Andes DR, Del Poeta M, Mitchell AP. 2024. Biofilm-associated metabolism via ERG251 in *Candida albicans*. *PLoS Pathog* 20:e1012225. PubMed PMID: 38739655; PMCID: 11115363.

We have collaborated extensively with the Andes lab in studies of the mechanism of biofilm extracellular matrix biogenesis and the roles of extracellular vesicles in the process.

1. Mitchell KF, Zarnowski R, Sanchez H, Edward JA, Reinicke EL, Nett JE, Mitchell AP, Andes DR. Community participation in biofilm matrix assembly and function. *Proc Natl Acad Sci U S A*. 2015;112(13):4092-7. Epub 2015/03/15. doi: 1421437112 [pii] 10.1073/pnas.1421437112. PubMed PMID: 25770218.
2. Zarnowski R, Sanchez H, Covelli AS, Dominguez E, Jaromin A, Bernhardt J, Mitchell KF, Heiss C, Azadi P, Mitchell A, Andes DR. *Candida albicans* biofilm-induced vesicles confer drug resistance through matrix biogenesis. *PLoS Biol*. 2018;16(10):e2006872. Epub 2018/10/09. doi: 10.1371/journal.pbio.2006872 pbio.2006872 [pii]. PubMed PMID: 30296253; PMCID: 6209495.
3. Zarnowski R, Noll A, Chevrette MG, Sanchez H, Jones R, Anhalt H, Fossen J, Jaromin A, Currie C, Nett JE, Mitchell A, Andes DR. Coordination of fungal biofilm development by extracellular vesicle cargo. *Nat Commun*. 2021;12(1):6235. Epub 2021/10/31. doi: 10.1038/s41467-021-26525-z. PubMed PMID: 34716343.
4. Zarnowski R, Sanchez H, Jaromin A, Zarnowska UJ, Nett JE, Mitchell AP, Andes D. A common vesicle proteome drives fungal biofilm development. *Proc Natl Acad Sci U S A*. 2022;119(38):e2211424119. Epub 2022/09/13. doi: 10.1073/pnas.2211424119. PubMed PMID: 36095193; PMCID: PMC9501958.

We have collaborated extensively with the Filler lab (Lundquist Institute) in studies on *C. albicans* hypha formation, pathogenesis, and associated gene regulation.

1. Xu W, Solis NV, Ehrlich RL, Woolford CA, Filler SG, Mitchell AP. Activation and Alliance of Regulatory Pathways in *C. albicans* during Mammalian Infection. *PLoS Biol*. 2015;13(2):e1002076. Epub 2015/02/19. doi: 10.1371/journal.pbio.1002076 PBIولوجY-D-14-02153 [pii]. PubMed PMID: 25693184.
2. Swidergall M, Solis NV, Millet N, Huang MY, Lin J, Phan QT, Lazarus MD, Wang Z, Yeaman MR, Mitchell AP, Filler SG. Activation of EphA2-EGFR signaling in oral epithelial cells by *Candida albicans* virulence factors. *PLoS Pathog*. 2021;17(1):e1009221. Epub 2021/01/21. doi: 10.1371/journal.ppat.1009221. PubMed PMID: 33471869; PMCID: PMC7850503.
3. Phan QT, Solis NV, Lin J, Swidergall M, Singh S, Liu H, Sheppard DC, Ibrahim AS, Mitchell AP, Filler SG. Serum bridging molecules drive candidal invasion of human but not mouse endothelial cells. *PLoS Pathog*. 2022;18(7):e1010681. Epub 2022/07/08. doi: 10.1371/journal.ppat.1010681. PubMed PMID:

35797411; PMCID: PMC9295963.

4. Kim MJ, Cravener M, Solis N, Filler SG, Mitchell AP. A Brg1-Rme1 circuit in *Candida albicans* hyphal gene regulation. *mBio*. 2024:e0187224. Epub 20240730. doi: 10.1128/mbio.01872-24. PubMed PMID: 39078139.

We have worked to develop methods to streamline and simplify *C. albicans* genetic manipulation. We also made large mutant collections freely available to the community, in 2008, via

<http://www.fgsc.net/candida/FGSCcandidaresources.htm>

1. Wilson RB, Davis D, Mitchell AP. Rapid hypothesis testing with *Candida albicans* through gene disruption with short homology regions. *J Bacteriol*. 1999;181(6):1868-74. Epub 1999/03/12. PubMed PMID: 10074081.

2. Davis DA, Bruno VM, Loza L, Filler SG, Mitchell AP. *Candida albicans* Mds3p, a conserved regulator of pH responses and virulence identified through insertional mutagenesis. *Genetics*. 2002;162(4):1573-81. Epub 2003/01/14. PubMed PMID: 12524333.

3. Min K, Ichikawa Y, Woolford CA, Mitchell AP. *Candida albicans* Gene Deletion with a Transient CRISPR-Cas9 System. *mSphere*. 2016;1(3):00130-16. PubMed PMID: 27340698.

4. Huang MY, Mitchell AP. Marker Recycling in *Candida albicans* through CRISPR-Cas9-Induced Marker Excision. *mSphere*. 2017;2(2):e00050-17. Epub 2017/03/21. doi: 10.1128/mSphere.00050-17 mSphere00050-17 [pii]. PubMed PMID: 28317025; PMCID: 5352831.

Most recently we have been the first group to my knowledge to document extensive regulatory network variation among *C. albicans* isolates, and to use this variation for gene discovery. These studies have included collaborations with the Andes and Filler labs.

1. Huang MY, Woolford CA, May G, McManus CJ, Mitchell AP. Circuit diversification in a biofilm regulatory network. *PLoS Pathog*. 2019;15(5):e1007787. Epub 2019/05/23. doi: 10.1371/journal.ppat.1007787 PPATHOGENS-D-19-00221 [pii]. PubMed PMID: 31116789; PMCID: 6530872.

2. Do E, Cravener MV, Huang MY, May G, McManus CJ, Mitchell AP. Collaboration between Antagonistic Cell Type Regulators Governs Natural Variation in the *Candida albicans* Biofilm and Hyphal Gene Expression Network. *mBio*. 2022;13(5):e0193722. Epub 2022/08/23. doi: 10.1128/mbio.01937-22. PubMed PMID: 35993746; PMCID: PMC9600859.

3. Cravener MV, Do E, May G, Zarnowski R, Andes DR, McManus CJ, Mitchell AP. Reinforcement amid genetic diversity in the *Candida albicans* biofilm regulatory network. *PLoS Pathog*. 2023;19(1):e1011109. Epub 2023/01/26. doi: 10.1371/journal.ppat.1011109. PubMed PMID: 36696432; PMCID: PMC9901766.

4. Mao Y, Solis NV, Filler SG, Mitchell AP. Functional Dichotomy for a Hyphal Repressor in *Candida albicans*. *mBio*. 2023:e0013423. Epub 2023/03/09. doi: 10.1128/mbio.00134-23. PubMed PMID: 36883818.

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5R01AI146103 (PI: Mitchell) NIH/NIAID 07/01/2019 – 06/30/2025
Functional Analysis of Natural Variation in the Pathogen *Candida albicans*

R21AI185250 (PI: Mitchell) NIH/NIAID 06/11/2024 – 04/30/2026
NIH/NIAID
Roles of *C. albicans* white-opaque regulators in biofilm and virulence

No proposal number (PI: Cornish) DARPA 01/01/2024 – 06/30/2026
Modular engineered biosensors for environmental sensing

5R01AI073289 (MPI: Andes, Mitchell) NIH/NIAID 06/15/2024 – 5/31/2029
NIH/NIAID
Biofilm Induced Extracellular Vesicle Pathogenesis