Paul Jaschke, Ph.D.

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KEY QUALIFICATIONS

- Research project management in academic and startup environments
- Laboratory management including training, biosafety (BSL-2), biosecurity, occupational health and safety, and hazardous chemical safety and disposal
- Experienced educator at university-level
- Technical writing across scientific research, education, permits, biosafety applications, and manuals
- Diverse set of laboratory skills in biochemistry, bioinformatics, genomics, and synthetic biology

RESEARCH EXPERIENCE

Macquarie University, Sydney, Australia **2015 – Present**

Associate Professor of Synthetic Biology (2023 - Present)
Assistant Professor of Synthetic Biology (2015 - 2022)

Collaborative research group leader focused on creating new synthetic biology tools and developing the next generation of scientists through conscientious mentorship and training

Projects: (1) Creating a suite of initiator tRNA mutants to expand the number of orthogonal start codons 20-fold, (2) Engineering phage receptor binding proteins to understand and modify host-range, (3) Developing a new phage display platform for membrane proteins to rapidly identify new drug targets

Key Accomplishments:

- Nine PhD/MRes student completions with published papers, travel and paper awards, and subsequent positions at top universities and companies
- Associate Investigator of ARC Centre of Excellence in Synthetic Biology
- Co-supervised iGEM team that resulted in Gold medals in 2016/17/19 and Best Energy Prize 2017 & 2019.
- Published research and reviews in leading journals including *Nucleic Acids Research*, *PNAS*, *Nature Reviews Genetics*, and *ACS Synthetic Biology*
- Won competitive research and commercialization grants from NHMRC, CSIRO, and NSW State Gov't

Hyperdrive Science, Sydney, Australia **2019 – 2022**

CSO and Co-Founder

Managed delivery of drug target ID service (BindFind™) to a global pharmaceutical client and led company research program

Key Accomplishments:

- Winner of CSIRO science entrepreneurship Demo Night People's Choice Award
- Led development of new phage display intellectual property (BindFind v2)
- Developed custom next-generation sequencing analysis pipeline
- Awarded NSW Minimum Viable Product grant with pharmaceutical company

Autodesk, San Francisco, CA **2015**

Scientist in Residence

Led implementation of automated virus design, build, test cycle in collaboration with biotech company partners

Key Accomplishments:

- Published *ACS Synthetic Biology* article on Wet Lab Accelerator software
- Developed automated virus construction and testing protocols for Transcriptic (Strateos) cloud lab and BioXP (SGI-DNA)

Stanford University, Department of Bioengineering, Stanford, CA **2010 – 2015**

Postdoctoral Scholar

Advisor: Drew Endy

Projects: (1) Understanding and engineering gene overlaps in viruses, (2) Discovering alternative start codons in *E. coli*

Key Accomplishments:

- Managed diverse research subgroup of high-school students and undergraduates resulting in publications in high-impact journals *PNAS* and *NAR*
- Won NSERC postdoctoral fellowship and travel awards
- Created, promoted, and taught synthetic biology courses at community-biolab Biocurious

The University of British Columbia, Vancouver, Canada **2004 – 2010**

Ph.D. Student

Advisor: J. T. Beatty (Microbiology and Immunology Department)

Dissertation: Discovery and characterization of a new zinc chlorophyll biosynthetic pathway and photosystem in a magnesium-chelatase mutant

Key Accomplishments:

- Published seven papers, presented findings, and won awards at local and international conferences
- Won PhD fellowships (5), presentation awards (2), travel awards (2), and leadership award
- Discovered and characterized a novel chlorophyll biosynthesis pathway

The University of Alberta, Edmonton, Canada **1999 – 2003**

Undergraduate Research Assistant

Advisors: Marek Michalak and Joe Casey (Biochemistry Department)

Projects: (1) Determining the role of calcium signaling and calreticulin on murine embryonic stem cell differentiation; (2) Characterization of the human NBC3 sodium/bicarbonate co-transporter carboxyl-terminal cytoplasmic domain

Honors Thesis: Understanding the role of calreticulin in cardiomyocyte differentiation

Key Accomplishments:

- Published peer-reviewed article
- Won Canadian Institutes of Health Research (CIHR) Presentation Award and Alberta Heritage Foundation for Medical Summer Research Assistant Awards

EDUCATION

University of British Columbia, Vancouver, Canada **2004 – 2010**

Ph.D. Microbiology and Immunology
Selected Awards: NSERC Scholarship, John Richard Turner Fellowship, Pacific Century Scholarship, and UBC Graduate Fellowships

University of Alberta, Edmonton, Canada **1999 – 2003**

B.Sc. Biochemistry, First Class Honors
Selected Awards: Jason Lang Scholarship, Canadian Institutes of Health Research Presentation Award

HONORS, AWARDS, AND GRANTS

MQRIS-L: Nano-flow Cytometry Facility	2023
MQRIS-L: Rapid high-throughput ligand screening fluorimeter	2022
MQRIS-S: High-throughput Phenotyping Platform for PC2 organisms	2022
MQ COVID Recovery Postdoctoral Fellowship	2021
NHMRC Ideas Grant - Treatment of multi-drug resistant infections using a novel, rapid and customized synthetic phage therapy platform	2020 – 2023

MRQIS-S Galleria Research Facility: Bringing a Flexible & Ethical Animal Model to MQ	2020
Minimum Viable Product (MVP) Grant, Jobs for NSW (Hyperdrive Science)	2019
CSIRO FSP Synthetic Biology Topup award	2018 – 2021
CSIRO FSP Synthetic Biology Topup award	2018 – 2020
NSW Dept. Industry - iGEM Team Award	2018
CSIRO ON Accelerate 4 Demo Night People's Choice Award - Hyperdrive Science	2018
CSIRO ON Accelerate 4 Finalist - Hyperdrive Science	2018
CSIRO ON Prime 3 Topup - Hyperdrive Science	2017
NSW Dept. Industry Skills and Regional Development - iGEM Team Award	2017
Biomolecular Discovery and Design Research Centre	2016 – 2019
BioMolecular Frontiers Research Centre	2015
SB5.0 International Conference Travel Award	2011
Natural Sciences & Engineering Research Council Postdoctoral Fellowship	2010 – 2012
UBC Student Leader Award	2010
Sigma-Aldrich Award for Top Presentation at Life Sciences Institute Conference	2009
The Pacific Century Graduate Scholarship	2008
Beverley Green Award for Outstanding Research in the Field of Photosynthesis	2008
John Richard Turner Fellowship in Microbiology	2007
University of BC Graduate Fellowship	2006/08
Natural Sciences & Engineering Research Council Postgraduate Scholarship	2005
Canadian Institutes of Health Research Presentation Award	2003
Alberta Heritage Foundation for Medical Research Summer Studentship	2002/03
Jason Lang Scholarship	2000/02

KEY SKILLS

Research Project Management

Experienced manager of scientific research projects in both academic and startup environments.

Laboratory Management

Developed training and laboratory induction protocols for PC2 lab with >20 personnel; PC2 biosafety protocol development; bacterial and phage sample import; application for permit to import conditionally non-prohibited goods (plant pathogen), and handling of quarantine materials; OGTR Exempt and NLRD project administration; GHS hazardous chemical compliance procedures; chemical inventory management and disposal procedures; experience operating within AS/NZS 2243.3:2010 standard procedures.

Wet Lab

Synthetic Biology/Molecular Biology: Plasmid design, assembly, preparation and sequencing; PCR, Gibson and Golden Gate Assembly, gel electrophoresis; CRISPR gRNA design; cell-free/*in vitro* transcription and translation; T7 phage display library construction and biopanning

Microbiology: bacterial and yeast transformation and culture; bacteriophage (bacterial virus) propagation

Genomics: Illumina next-generation sequencing (NGS) DNA and RNA library preparation

Proteins: ELISA assay development; mass spectrometry/proteomics; soluble and membrane protein purification; SDS/Blue-Native/and 2D-PAGE; Western blotting

Chemistry: isolation and identification of chlorophyll biosynthetic pathway intermediates; HPLC; mass spectrometry; absorption and fluorescence spectrophotometry

Computational
Bioinformatics: NGS RNA- and DNA-seq analysis; phage and bacterial sequence analysis; genome assembly, BLAST, MSAs, phylogenetic trees, homology modeling, and AlphaFold; Python (Biopython); R (Bioconductor)

Software: Geneious, Artemis, and Benchling; MS Office suite; Adobe Photoshop and Illustrator; Moodle; VirtualBox

Programming: R, Python, bash, sed

Teaching and Training
Over eight years teaching experience in higher education environment: designing and delivering undergraduate, Masters of Research, coursework Masters, and career development training; complying with changing assessment and legislative polices; promoting sustainability and indigenous content within courses and research

Community Engagement
Leading university outreach activities across synthetic biology and microbiology domains; developing lectures and teaching materials for community science projects and classes

PUBLICATIONS

# indicates first author(s). Underlined indicates authors under my direct supervision. Asterix (*) indicates corresponding author.

1. Trofimova E#, Asgharzadeh KS, Weynberg KD, Willows RD, **Jaschke PR***. (2023). A bacterial genome assembly and annotation laboratory using a virtual machine. *Biochemistry and Molecular Biology Education.* https://doi.org/10.1002/bmb.21720
2. Logel DY#, Trofimova E, and **Jaschke PR*.** (2022). A Codon Restrained Method for Both Eliminating and Creating Intragenic Bacterial Promoters. *ACS Synthetic Biology*. 11: 689-699. DOI: 10.1021/acssynbio.1c00359
   - **Selected as an ACS Editors' Choice® - a collection of articles of broad public interest.**
3. Wright BW#, Molloy MP, and **Jaschke PR***. (2022). Overlapping genes in natural and engineered genomes. *Nature Reviews Genetics*. 23: 154–168. DOI: 10.1038/s41576-021-00417-w
4. Trofimova E# and **Jaschke PR***. (2021). Plaque Size Tool: an automated plaque analysis tool for simplifying and standardising bacteriophage plaque morphology measurements. *Virology*. 561: 1-5. DOI: 10.1016/j.virol.2021.05.011
5. Wright BW#, Logel DY, Mirzai M, Pascovici D, Molloy MP, and **Jaschke PR***. (2021). Proteomic and transcriptomic analysis of *Microviridae* φXI74 infection reveals broad up-regulation of host membrane damage and heat shock responses. *mSystems*. 6, 3, e00046-21. DOI: 10.1128/mSystems.00046-21
6. Wright BW#, Ruan J, Molloy MP, **Jaschke PR***. (2020). Genome modularization reveals overlapped gene topology is necessary for efficient viral reproduction. *ACS Synthetic Biology*. 9, 11, 3079–3090. DOI: 10.1021/acssynbio.0c00323
7. Logel DY# and **Jaschke PR***. (2020). A high-resolution map of bacteriophage ϕX174 transcription. *Virology*. 547:47-56. DOI: 10.1016/j.virol.2020.05.008
8. Weynberg K#* & **Jaschke PR**. (2020). Building Better Bacteriophage with Biofoundries to Combat Antibiotic Resistant Bacteria. *PHAGE: Therapy, Applications, and Research*. 1, 1, 23-26. DOI: 10.1089/phage.2019.0005
9. **Jaschke PR#***. (2020). Simulated sandwich enzyme-linked immunosorbent assay (ELISA) for a cost-effective investigation of natural and engineered cellular signaling pathways. *Biochemistry and Molecular Biology Education*. 18 September. DOI: 10.1002/bmb.21304
10. **Jaschke PR#***, Dotson GA, Hung K, Liu D, Endy E*. (2019). Definitive demonstration by synthesis of genome annotation completeness. *Proceedings of the National Academy of Sciences of the USA*. 116 (48) 24206-24213. DOI: 10.1073/pnas.1905990116
11. Vincent RM#, Yiasemides PF, **Jaschke PR***. (2019). An orthogonal amber initiator tRNA functions similarly across diverse *Escherichia coli* laboratory strains. *ScienceMatters*. 1 May 2019. DOI: 10.19185/matters.201904000009

12. Vincent RM#, Wright BW, **Jaschke PR***. (2019). Measuring amber initiator tRNA orthogonality in a genomically recoded organism. *ACS Synthetic Biology*. Apr 19;8(4):675-685. DOI: 10.1021/acssynbio.9b00021

13. Hecht A#, Glasgow J#, **Jaschke PR#**, Bawazer L, Munson MS, Cochran J, Endy D, Salit M*. (2017). Measurements of translation initiation from all 64 codons in *E. coli*. Apr 20;45(7):3615-3626. DOI: 10.1093/nar/gkx070
    - **Designated 'Breakthrough Article' by journal reviewers and editors (less than 1% of articles)**
    - **Featured in the American Society for Microbiology's "Small Things Considered"**

14. Bates M#, Berliner A, Lachoff J, **Jaschke PR**, Groban E* (2016). Wet Lab Accelerator: A Web-Based Application Democratizing Laboratory Automation for Synthetic Biology. *ACS Synthetic Biology*. 6 (1): 167–171. DOI: 10.1021/acssynbio.6b00108

15. **Jaschke PR#**, Lieberman EK, Rodriguez J, Sierra A, Endy D*. (2012). A fully decompressed synthetic bacteriophage øX174 genome assembled and archived in yeast. *Virology*. DOI: 10.1016/j.virol.2012.09.020
    - **Selected for journal cover**
    - **Featured in Scitable by Nature Education blog Bio 2.0**

16. Neupane B#, **Jaschke P**, Saer R, Beatty JT, Reppert M, Jankowiak R. (2012). Electron Transfer in Rhodobacter sphaeroides Reaction Centers Containing Zn-Bacteriochlorophylls: A Hole Burning Study. *The Journal of Physical Chemistry B*. Mar 15; 116(10): 3457-3466. DOI: 10.1021/jp300304r

17. **Jaschke PR#**, Hardjasa A, Digby EL, Hunter CN, Beatty JT. (2011). A *bchD* (Mg-chelatase) mutant of *Rhodobacter sphaeroides* synthesizes zinc bacteriochlorophyll through a novel zinc-containing pathway. *Journal of Biological Chemistry*. 286(23):20313-22. DOI: 10.1074/jbc.M110.212605

18. **Jaschke PR#**, Drake I, Beatty JT. (2009). Modification of a French pressure cell to improve microbial cell disruption. *Photosynthesis Research*. 102(1): 95-7. DOI: 10.1007/s11120-009-9493-4

19. Lin S, J**aschke PR**, Wang H, Paddock M, Tufts A, Allen JP, Rosell FI, Mauk GA, Woodbury NW, Beatty JT. (2009). Electron transfer in the *Rhodobacter sphaeroides* reaction center assembled with zinc bacteriochlorophyll. *Proceedings of the National Academy of Sciences of the USA*. 106(21): 8537-42. DOI: 10.1073/pnas.0812719106

20. **Jaschke PR#**, LeBlanc HN, Lang AS, Beatty JT. (2008). The PucC protein of *Rhodobacter capsulatus* mitigates an inhibitory effect of light-harvesting 2 alpha and beta proteins on light-harvesting complex 1. *Photosynthesis Research*. 95(2-3): 279-84. DOI: 10.1007/s11120-007-9258-x

21. **Jaschke PR#**, Beatty JT. (2007). The photosystem of *Rhodobacter sphaeroides* assembles with zinc bacteriochlorophyll in a *bchD* (magnesium chelatase) mutant. *Biochemistry*. 46(43): 12491-500. DOI: 10.1021/bi701407k

22. Loiselle FB, **Jaschke P**, Casey JR. (2003). Structural and functional characterization of the human NBC3 sodium/bicarbonate co-transporter carboxyl-terminal cytoplasmic domain. *Molecular Membrane Biology*. 20(4): 307-17. DOI: 10.1080/0968768031000122520

BOOK CHAPTERS

23. Trofimova E#, Logel DY, and **Jaschke PR***. (2023). An Improved Method for Eliminating or Creating Intragenic Bacterial Promoters. In: Braman J. (eds) *Synthetic Biology - Methods and Protocols, 2nd Edition. Methods in Molecular Biology. (In Press).*

24. Logel DY# and **Jaschke PR***. (2023). Creating De Novo Overlapped Genes. In: Selvarajoo, K. (eds) *Computational Biology and Machine Learning for Metabolic Engineering and Synthetic Biology. Methods in Molecular Biology*, vol 2553. Humana, New York, NY. https://doi.org/10.1007/978-1-0716-2617-7_6

25. **Jaschke PR#**, Saer RG, Noll S, Beatty JT*. (2011). Modification of the genome of *Rhodobacter sphaeroides* and construction of synthetic operons. *Methods in Enzymology*. Vol 497: *Synthetic Biology*. Ch 23. 519-38. DOI: 10.1016/B978-0-12-385075-1.00023-8

NON-PEER REVIEWED PUBLICATIONS

26. Zhu HX#, Wright BW, Logel DY, Molloy MP, **Jaschke PR***. (2022). IbpAB small heat shock proteins are not host factors for bacteriophage ϕX174 replication. *bioRxiv*. 2022:2022.10.13.511849. DOI: 10.1101/2022.10.13.511849

27. Hutvagner A#, Scopelliti D#, Whelan F, and **Jaschke PR***. (2021). Orthogonal translation using the non-canonical initiator-tRNA(AAC) alters protein sequence and stability *in vivo*. *bioRxiv*. DOI: 10.1101/2021.05.25.445580

28. **Jaschke PR**. (2016). A Magnetic Collaboration between CBMS and the Learning Innovation Hub. *Teche Blog*

29. **Jaschke P**, Lu J, Mulyasasmita W, Lee LJ. (2013). Incyte Pharmaceuticals Is Primed For A Run. *Seeking Alpha*. Article ID: 1156061. https://seekingalpha.com/article/1156061-incyte-pharmaceuticals-is-primed-for-a-run

SELECTED TALKS

Jaschke PR. Using multi-omics approaches to understand the *Microviridae* infection cycle on the way to next-generation antimicrobials. *2nd International Symposium on Bacteriophage*. Naresuan University, Thailand. Online. (Invited) 5/2022

Jaschke PR. Learning How to Engineer Genomes by Building Viruses. *PHAVES: Phage Directory Virtual Event Series*. (Invited) https://www.youtube.com/watch?v=qSVOKhwZzdI&t 11/2020

Jaschke PR. Remodeling the genetic code: defining new start codons in *E. coli*. *Synthetic Biology Australasia 2019 Conference*. Brisbane, Australia (Invited) 10/2019

Jaschke PR. The future of DNA technology. *Future Scoping the Anthropocene, Genes to Geosciences Outlook Meeting*. Macquarie University, Sydney, Australia (Plenary) 7/2016

PROFESSIONAL ACTIVITIES

Head of School of Natural Sciences Recruitment and Engagement Working Group	2022 – Present
International Society for Viruses of Microorganisms (ISVM) 2024 Conference Organizer	2020 – Present
Peer review for journals including *NAR*, *Nature Communications*, *Nature Microbiology*, *Nature Biomedical Engineering*, *iScience* (Cell Press), *PLOS Biology*, *Virology*, and *ACS Synthetic Biology*	Present
Grant reviewer for agencies including: Human Frontier Science Program, Natural Sciences and Engineering Research Council of Canada, Biotechnology and Biological Sciences Research Council (UK), GENESOLVE (Genome BC), and Academy of Medical Sciences (UK)	Present
ASM Bacteriophage Biology & Therapeutics Special Interest Group (founding member)	2018 – Present
Synthetic Biology Australasia Society Member	2016 – Present
Synthetic Biology Australasia 2017 Conference Organizer	2016 – 2017
Stanford University Scientific Management Series	2015
Advisor, Mendeley Reference Manager Software	2011 – 2017
Stanford Biotechnology Group Member	2011 – 2015

TEACHING EXPERIENCE

MOLS8411: Molecular Genomics Analysis and Design (Macquarie University) 2020 – Present
Course creator and main course instructor and manager (Masters of Biotechnology degree)

BMOL3201: Adv. Biochemistry & Cell Biology (Macquarie University) 2016 – Present
Main course instructor (B.Sc. and B. Med. Sci degrees)

MOLS7012: Research Topic: Synthetic Biology (Macquarie University) 2016 – Present
Course creator and main course instructor and manager (Masters of Research degree)

BMOL3401: Applied and Medical Microbiology (Macquarie University) 2019 – Present
Guest lecture on viruses and virus transmission (B.Sc. and B. Med. Sci degrees)

BMOL2401: Microbiology & Molecular Biology (Macquarie University) 2016 – Present
Guest lecture on viruses (B.Sc. and B. Med. Sci degrees)

Making a Bacterial Copper Biosensor (Zamorano Agricultural School, Honduras) 2013
Creator and instructor for a 4-day synthetic biology workshop

GFP in E. coli: Make Cells Glow! (BioCurious Community Lab, Sunnyvale, CA) 2011 – 2012
Created and taught an introductory synthetic biology class for non-scientists