

# Jackson Champer

jc3248@cornell.edu  
<https://champerlab.weebly.com>

## EDUCATION

Ph.D. in Biology, City of Hope Beckman Research Institute	6/2015
M.S. in Physics, University of California, Los Angeles	12/2006
B.S. in Physics and Mathematics, University of Oregon	6/2004

## SIGNIFICANT ACADEMIC POSITIONS

**Assistant Professor**, Peking University position to be started in early 2021  
 • School of Life Sciences and joint Peking-Tsinghua Center for Life Sciences.

**Postdoctoral Fellow**, Cornell University 5/2016-Present  
 • Labs of Philipp Messer and Andrew Clark in the Department of Molecular Biology and Genetics and the Department of Computational Biology.  
 • Improved gene drive systems, designs and experiments.  
 • Computational modeling and genetic analysis of gene drives in realistic environments.  
 • Collaboration with Harrington lab on mosquito gene drive.

**Graduate Researcher**, City of Hope Beckman Research Institute 6/2011-6/2015  
 • Lab of Markus Kalkum in the Department of Immunology.  
 • Mass spectrometry and proteomics for antifungal vaccine development.  
 • Projects on detection assay for botulinum and anthrax.  
 • Rotation on the immunological and proteomic analysis of breast cancer extracellular matrix with S. Emily Wang.

**Researcher**, University of California, Los Angeles 6/2008-7/2009, 8/2013-9/2014  
 • Lab of Jenny Kim in the Department of Dermatology.  
 • Immunological and proteomic analysis of *Propionibacterium acnes* phylotypes.  
 • Analysis of antimicrobial treatments for acne and *Staphylococcus aureus* infection.

**Graduate Researcher**, University of California, Los Angeles 6/2004-9/2004  
 • Lab of David Cline in the physics department.  
 • Simulations, design, and construction of a dark matter detector. in the physics lab of David Cline.

**Undergraduate Researcher**, University of Oregon 8/2003-6/2004  
 • Lab of Russell Donnelley in the physics department.  
 • Propagation of vortex rings in fluid and diffusion of a marker dye.

## **PUBLICATIONS**

\*Equal Contribution, <sup>+</sup>Mentored Student First Author

### **Preprints**

30. Champer SE\*, Oakes N\*, Sharma R, Garcia-Diaz P, **Champer J**, Messer PW. Modeling CRISPR gene drives for suppression of invasive rodents. *bioRxiv*, November 2020.

29. **Champer J\***, Champer SE\*<sup>+</sup>, Kim IK, Clark AG, Messer PW. Design and analysis of CRISPR-based underdominance toxin-antidote gene drives. *bioRxiv*, December 2019. (accepted at *Evolutionary Applications*)

28. **Champer J\***, Kim IK\*<sup>+</sup>, Champer SE, Clark AG, Messer PW. Suppression gene drive in continuous space can result in unstable persistence of both drive and wild-type alleles. *bioRxiv*, September 2019. (under revision at *Molecular Ecology*)

### **Peer-Reviewed Postdoctoral Publications**

27. **Champer J\***, Yang E\*<sup>+</sup>, Lee E, Liu J, Clark AG, Messer PW. A CRISPR homing gene drive targeting a haplolethal gene removes resistance alleles and successfully spreads through a cage population. *Proc Natl Acad Sci U S A*, 117(39), 24377-24383, 2020.

26. **Champer J**, Kim IK, Champer SE, Clark AG, Messer PW. Performance analysis of novel toxin-antidote CRISPR gene drive systems. *BMC Biol*, 8(1), 27, 2020.

25. **Champer J**, Zhao J, Champer SE, Liu J, Messer PW. Population dynamics of underdominance gene drive systems in continuous space. *ACS Synth Biol*, 9(4), 779-792, 2020.

24. Champer SE<sup>+</sup>, Liu C, Oh SY, Wen Z, Clark AG, Messer PW, **Champer J**. Computational and experimental performance of CRISPR homing gene drive strategies with multiplexed gRNAs. *Sci Adv*, 6(10), eaaz0525, 2020.

23. **Champer J**, Lee E, Yang E, Liu C, Clark AG, Messer PW. A toxin-antidote CRISPR gene drive system for regional population modification. *Nat Commun*, 11(1), 1082, 2020.

22. **Champer J\***, Wen Z\*<sup>+</sup>, Luthra A, Reeves R, Chung J, Liu C, Lee YL, Liu J, Yang E, Messer PW, Clark AG. CRISPR Gene drive efficiency and resistance rate is highly heritable with no common genetic loci of large effect. *Genetics*, 212(1), 334-341, 2019.

21. **Champer J**, Chung J, Lee YL, Liu C, Yang E, Wen Z, Clark AG, Messer PW. Molecular safeguarding of CRISPR gene drive experiments. *Elife*, 8, e41439, 2019.

20. Liu J\*<sup>+</sup>, **Champer J\***, Liu C, Chung J, Reeves R, Lee YL, Luthra L, Clark AG, Messer PW. Maximum likelihood estimation of fitness components in experimental evolution. *Genetics*, 211(3), 1005-1017, 2019.

19. **Champer J\***, Liu J<sup>+</sup>, Oh SY, Reeves R, Luthra L, Oakes N, Clark AG, Messer PW. Reducing resistance allele formation in CRISPR/Cas9 gene drive. *Proc Natl Acad Sci U S A*, 115(21), 5522-5527, 2018.

18. **Champer J**, Reeves R, Oh SY, Liu C, Liu J, Clark AG, Messer PW. Novel CRISPR/Cas9 gene drive constructs reveal insights into mechanisms of resistance allele formation and drive efficiency in genetically diverse populations. *PLoS Genetics*, 13(7), e1006796, 2017.

17. **Champer J**, Buchman A, Akbari OS. Cheating evolution: Engineering gene drives to manipulate the fate of wild populations. *Nat Rev Genet*, 17, 146-159, 2016.

### Other Peer-Reviewed Publications

16. Yu Y<sup>+</sup>, Dunway S, **Champer J**, Kim J, Alikhan A. Changing our microbiome: Probiotics in dermatology. *Br J Dermatol*, 2019.

15. Champer M, Wong AM, **Champer J**<sup>+</sup>, Brito IL, Messer PW, Hou JY, Wright JD. The role of the vaginal microbiome in gynaecological cancer. *BJOG*, 125(3), 309-315, 2018.

14. **Champer J**, Ito JI, Clemons KV, Stevens DA, Kalkum M. Proteomic analysis of pathogenic fungi reveals highly expressed conserved cell wall proteins. *J. Fungi*, 2(1), 6, 2016.

13. Yu Y<sup>+</sup>, **Champer J\***, Agak GW, Kao S, Modlin RL, Kim J. Different *Propionibacterium acnes* phylotypes induce distinct immune responses and express unique surface and secreted proteomes. *J Invest Dermatol*, 136(11), 2221-2228, 2016.

12. Yu Y<sup>+</sup>, **Champer J**, Kim J. Analysis of the surface, secreted, and intracellular proteome of *Propionibacterium acnes*. *EuPA Open Proteom*, 9, 1-7, 2015.

11. Yu Y<sup>+</sup>, **Champer J**, Beynet DP, Kim J, Friedman AJ. The role of the cutaneous microbiome in skin cancer: Lessons learned from the gut. *J Drugs Dermatol*, 14(5), 461-465, 2015.

10. Yu Y<sup>+</sup>, **Champer J**, Garbán H, Kim J. Typing of *Propionibacterium acnes*: A review of methods and comparative analysis. *Br J Dermatol*, 172(5), 1204-1209, 2015.

9. Schmidt NW, Agak GW, Deshayes S, Yu Y, Blacker A, **Champer J**, Xian W, Kasko AM, Kim J, Wong GC. PenTobra: An aminoglycoside with robust antimicrobial & membrane activity against *Propionibacterium acnes*. *J Invest Dermatol*, 135(6), 1581-1589, 2015.

8. Taylor EJM<sup>+</sup>, Yu Y, **Champer J**, Kim J. Resveratrol demonstrates antimicrobial effects against *Propionibacterium acnes*. *Dermatol Ther*, 4, 249-257, 2014.

7. Chow A, Zhou W, Liu L, Fong MY, **Champer J**, Van Haute D, Chin AR, Ren X, Gugiu BG, Meng Z, Huang W, Ngo V, Kortylewski M, Wang SE. Macrophage immunomodulation by breast cancer-derived exosomes requires Toll-like receptor 2-mediated activation of NF-κB. *Sci Rep* 4, 5750, 2014.

6. Lehrnbecher T, Kalkum M, **Champer J**, Tramsen L, Schmidt S, Klingebiel T. Immunotherapy in invasive fungal infection-focus on invasive aspergillosis. *Curr Pharm Des*, 19(20), 3689-3712, 2013.
5. **Champer J**, Diaz-Arevalo D, Champer M, Hong TB, Wong M, Shannahoff M, Ito JI, Clemons KV, Stevens DA, Kalkum M. Protein targets for broad-spectrum mycosis vaccines: quantitative proteomic analysis of *Aspergillus* and *Coccidioides* and comparisons with other fungal pathogens. *Ann N Y Acad Sci*, 1273, 44-51, 2012.
4. **Champer J**, Patel J, Fernando N, Salehi E, Wong V, Kim J. Chitosan against cutaneous pathogens. *AMB Express*, 3(1), 37, 2013.
3. Friedman AJ, Phan J, Schairer DO, **Champer J**, Qin M, Pirouz A, Blecher-Paz K, Oren A, Liu PT, Modlin RL, Kim J. Antimicrobial and anti-inflammatory activity of chitosan-alginate nanoparticles: a targeted therapy for cutaneous pathogens. *J Invest Dermatol*, 133(5), 1231-1239, 2013.
2. Chandra M, Zang S, Li H, Zimmerman L, **Champer J**, Chow A, Zhou W, Tsuyada A, Yu Y, Gao H, Ren X, Lin RJ, Wang SE. Nuclear translocation of type I TGF- $\beta$  receptor confers a novel function in RNA splicing. *Mol Cell Biol*, 32(12), 2183-2195, 2012.
1. Bungau C, Camanzi B, **Champer J**, Chen Y, Cline DB, Luscher R, Lewin JD, Smith PF, Smith NJT, Wang H. Monte Carlo studies of combined shielding and veto techniques for neutron background reduction in underground dark matter experiments based on liquid noble gas targets. *Astroparticle Physics*, 23, 97-115, 2005.

## **RESEARCH SUPPORT**

### **Previous Support**

NIH/NIAID K22AI146276	~\$250,000	Champer (PI)	award declined
Engineering and modeling improved CRISPR gene drive systems			
NIH/NIAID F32AI138476	~\$200,000	Champer (PI)	4/2018 - 3/2021
Dynamics of gene drives in natural populations			
NIH/NIAID R21AI130635	~\$250,000	Messer, Clark (PIs), Champer	9/2017 - 9/2020
Improved CRISPR gene drive systems with reduced resistance allele formation			

## **TEACHING EXPERIENCE**

### **Research Students Mentored**

**Cornell University:** Anisha Luthra, Anna Langmuller, Chen Liu, Emily Yang, Isabel Kim, Jingxian Liu, Joan Chung, Joanna Zhao, Lin Xie, Matt Metzloff, Nathan Oakes, Phoebe Conley, Riona Reeves, Sam Champer, Sandra Lapinska, Suh Yeon Oh, Yineng Xu, Esther (formerly Yoo Lim) Lee, Zhaoxin Wen.

**University of California, Riverside:** Jennifer Shyong, Kenneth Truong.

**University of California, Los Angeles:** Elaheh Salehi, Julie Patel, Nathalie Fernando, Sam Ngo, Victoria Wong, Yang Yu.

**City of Hope:** Jason Yu, Mayyen Wong, Miriam Champer, Molly Shannahoff.

### **Courses**

**Guest Lecturer**, Population Genetics and CRISPR classes, Cornell University 9/2017-3/2020

**Teaching Fellow**, Current Topics in Biology graduate class, City of Hope 3/2014-4/2014

**Physics Teaching Assistant**, University of California, Los Angeles 9/2004-12/2006

## **OTHER EXPERIENCE**

### **Patents**

Yu Y<sup>+</sup>, **Champer J**, Kim J. Compositions and Methods for Treating Skin and Mucus Membrane Diseases. US 20170065647. Published November 2015.

Taylor E<sup>+</sup>, **Champer J**, Kim J. Treatment of inflammatory and infectious skin disorders. US 20140018437 A1. Published January 2014.

### **Conference Seminars**

Entomological Society of America, Conference, 2019.

Sea Lamprey International Symposium, 2019. (invited)

EMBO Vector Conference, 2019.

Society for the Study of Evolution Annual Meeting, 2019. (invited)

Entomological Society of America, Joint Annual Meeting, 2018. (invited)

Genetics Society of America, Drosophila Research Conference, 2018.

Cold Spring Harbor, Genome Engineering: The CRISPR-Cas Revolution, 2017.

**Workshops:** FNIH Data Needs and Assay Design for Decision Making on Gene Drive-Modified Mosquitoes (2019), ILSI Gene Drive Modeling Conference (2019)

**Journal Referee:** Bioscience, Ecological Modelling, Ecological Psychology, eLife, European Journal of Dermatology, Evolutionary Applications, Infection Genetics and Evolution, Journal of Functional Foods, Journal of Great Lakes Research, Journal of Theoretical Biology, Molecular Ecology, NAR Genomics and Bioinformatics, Nature Communications, PeerJ, PLOS Genetics, Proceedings of the Royal Society B, Scientific Reports

**Other Referee:** National Carp Control Plan for Australia “Synergistic genetic biocontrol options for common carp (*Cyprinus carpio*)”, United Nations Environment Programme: Frontiers, Emerging Issues of Environmental Concern, Synthetic Biology