JOHN H ABEL
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EDUCATION

2018	**Harvard University**
	PhD in Systems Biology

2015	**UC Santa Barbara**
	MS in Chemical Engineering

2013	**Tufts University**
	BS in Chemical Engineering *magna cum laude*

RESEARCH POSITIONS

Postdoctoral fellow	**Harvard Medical School** Department of Anesthesia, Critical Care and Pain Medicine Massachusetts General Hospital *with Emery N. Brown*	2018 -
Research affiliate	**Massachuetts Institute of Technology** Picower Institute for Learning and Memory	2018 -
Graduate researcher	**Harvard University** Department of Systems Biology *with Francis J. Doyle III*	2015 - 2018
Graduate researcher	**UC Santa Barbara** Department of Chemical Engineering *with Francis J. Doyle III, Linda R. Petzold*	2013 - 2015
Undergraduate researcher	**Tufts University** Department of Chemical Engineering *with Hyunmin Yi*	2011 - 2013

HONORS, AWARDS, AND FELLOWSHIPS

2018	Postdoctoral NIH T32 Traineeship (Harvard Medical School)
2016	Predoctoral NIH T32 Traineeship (Harvard Medical School)
2016	Research Excellence Award, Society for Research of Biological Rhythms
2014	Mellichamp Fellowship in Systems Biology (UC Santa Barbara)
2014	Honorable Mention, NSF Graduate Research Fellowship Program
2013	High Thesis Honors (Tufts University)
2012	Meritorious Winner, COMAP Mathematical Contest in Modeling
2011	Meritorious Winner, COMAP Mathematical Contest in Modeling
2009	ExxonMobil Teagle Foundation Scholarship

JOURNAL ARTICLES

1. Y Shan, **JH Abel**, Y Li, M Izumo, DP Olson, S-H Yoo, FJ Doyle III, and JS Takahashi, "AVP neurons are essential for circadian synchrony within the suprachiasmatic nucleus," submitted.

2. **JH Abel**, A Chakrabarty, EB Klerman, and FJ Doyle III, "Pharmaceutical-based entrainment of circadian phase via nonlinear model predictive control," *Automatica* 100, 2019.
doi: 10.1016/j.automatica.2018.11.012

3. C Mazuski, **JH Abel**, S Chen, T Hermanstyne, FJ Doyle III, and ED Herzog, "Entrainment of circadian rhythms depends on firing rates and neuropeptide release of VIP SCN neurons," *Neuron* 99 (3), 2018.
doi: 10.1016/j.neuron.2018.06.029

4. V Carmona-Alcocer, **JH Abel**, TC Sun, LR Petzold, FJ Doyle III, CL Simms, and ED Herzog, "Ontogeny of circadian rhythms and synchrony in the suprachiasmatic nucleus," *Journal of Neuroscience* 38 (6), 2018. doi: 10.1523/jneurosci.2006-17.2017

5. **JH Abel**[†], B Drawert[†], A Hellander, and LR Petzold, "GillesPy: a Python package for stochastic model building and simulation," *IEEE Life Sciences Letters* 2 (3), 2017. doi: 10.1109/lls.2017.2652448

6. **JH Abel** and FJ Doyle III, "A systems theoretic approach to analysis and control of mammalian circadian dynamics," *Chemical Engineering Research and Design* 116, 2016.
doi: 10.1016/j.cherd.2016.09.033

7. S Jung, **JH Abel**, J Starger, and H Yi, "Porosity-tuned chitosan-polyacrylamide hydrogel microspheres for improved protein conjugation," *Biomacromolecules* 17 (7), 2016.
doi:10.1021/acs.biomac.6b00582

8. **JH Abel**[†], K Meeker[†], D Granados-Fuentes, PC St. John, T Wang, BB Bales, FJ Doyle III, ED Herzog, and LR Petzold, "Functional network inference of the suprachiasmatic nucleus," *Proceedings of the National Academy of Sciences* 113 (16), 2016. doi: 10.1073/pnas.1521178113

9. E Kang, S Jung, **JH Abel**, A Pine, and H Yi, "Shape-encoded chitosan-polyacrylamide hybrid hydrogel microparticles with controlled macroporous structures via replica molding for programmable biomacromolecular conjugation," *Langmuir* 32 (21), 2016. doi: 10.1021/acs.langmuir.5b04653

10. **JH Abel**, LA Widmer, PC St. John, J Stelling, and FJ Doyle III, "A coupled stochastic model explains differences in Cry knockout behavior," *IEEE Life Sciences Letters* 1 (1), 2015.
doi: 10.1109/lls.2015.2439498

11. PC St. John, SR Taylor, **JH Abel**, and FJ Doyle III, "Amplitude metrics for cellular circadian bioluminescence reporters," *Biophysical Journal* 107 (11), 2014. doi: j.bpj.2014.10.026

PEER-REVIEWED CONFERENCE PROCEEDINGS

1. **JH Abel**, A Chakrabarty, and FJ Doyle III, "Nonlinear model predictive control for circadian entrainment using small-molecule pharmaceuticals," *Proceedings of the 20th IFAC World Congress*, July 2017. doi: 10.1016/j.ifacol.2017.08.1596

BOOK CHAPTERS

1. **JH Abel**, A Chakrabarty, and FJ Doyle III, "Controlling time: nonlinear model predictive control for populations of circadian oscillators," in *Emerging Applications of Control and System Theory*, R Tempo, S Yurkovich, P Misra Eds. New York, NY: Springer Publishing, 2018. ISBN: 978-3-319-67068-3

2. B Drawert, K Sanft, **JH Abel**, S Hellander, A Pourzanjani, A Hellander, and LR Petzold, "Simulation of well-mixed and spatially inhomogeneous biochemical systems," in *Quantitative Biology: Theory, Computational Methods, and Models*, B Munsky, W Hlavacek, L Tsimring, Eds. Cambridge, MA: The MIT Press, 2018. ISBN: 978-0-262-03808-9

PATENTS AND APPLICATIONS

1. H Yi, S Jung, and **JH Abel** "Macroporous chitosan-polyacrylamide hydrogel microspheres and preparation thereof," filed 2017. U.S. Patent Application No. 62/353,273, Application WO2017223315A1.

2. H Yi, E Kang, S Jung, and **JH Abel**, "Fabrication of macroporous polymeric hydrogel microparticles," filed 2017. U.S. Patent Application No. 62/315,349, Application WO2017172437A1.

CONFERENCE TALKS

1. **JH Abel**, A Asgari-Targhi, EB Klerman, and FJ Doyle III, "Designing a critical resetting protocol for achieving large phase shifts in humans," presented at Meeting of the Society for Research on Biological Rhythms (SRBR 2018), Amelia Island, Florida, USA, May 2018. (contributed talk)

2. **JH Abel**, A Chakrabarty, and FJ Doyle III, "Nonlinear model predictive control for circadian entrainment using small-molecule pharmaceuticals," presented at IFAC World Congress 2017, Toulouse, France, July 2017. (contributed talk, proceedings listed above)

3. **JH Abel**, "Control of the Mammalian Circadian Oscillator," presented at International School and Conference on Network Science (NetSci) 2017, Indianapolis, Indiana, USA, June 2017. (invited talk)

4. **JH Abel** and FJ Doyle III, "Identifying circadian drug targets for maintained oscillatory precision," presented at 2016 Meeting of the American Institute of Chemical Engineers (AIChE 2016), San Francisco, California, USA, November 2016. (contributed talk)

5. **JH Abel**, K Meeker, D Granados-Fuentes, PC St. John, T Wang, BB Bales, ED Herzog, LR Petzold, and FJ Doyle III, "Inferring the functional resynchronization network in the suprachiasmatic nucleus," presented at Meeting of the Society for Research on Biological Rhythms (SRBR 2016), Palm Harbor, Florida, USA, May 2016. (contributed talk)

6. **JH Abel** and LR Petzold (jointly given). "The effects of stochasticity on circadian rhythms," presented at Lorentz Center Workshop on Human Circadian Rhythms, Leiden, Netherlands, July 2015. (invited talk)

TEACHING

Introduction to Physiological Closed-Loop Control (HST S56), Instructor, MIT   January 2019
Taught 20-hour, 3-credit MIT course in control theory and its medical applications (in collaboration with other members of MIT NSRL). Approximately 20 graduate and undergraduate students.

Sleep and Circadian Clocks: Biology to Public Health (MCB 186), Teaching Fellow, Harvard   Spring 2017
Instructor: Charles A. Czeisler
Lectured regarding the suprachiasmatic nucleus and system-wide circadian coordination, led weekly discussion and review section, graded and wrote portions of problem sets and exams.

Analytical Methods in Chemical Engineering (CHE 132A), Teaching Assistant, UCSB   Fall 2014
Instructor: Baron Peters
Taught six lectures on topics in analytical solutions to ordinary and partial differential equations, held office hours and individual review sessions, assisted in teaching a computer lab section and grading exams.

STUDENTS MENTORED

Kimaya Lecamwasam, MIT/Wellesley Undergraduate Researcher	2018-
Lindsey Brown, Harvard University Ph.D. Student	2016-2017
Shikha Sharma, Harvard University Summer Researcher	2016
David McBride, UC Santa Barbara Undergraduate	2015
Dustin Oakes, UC Santa Barbara HSAP	2015
Amanda N. Luan, UC Santa Barbara Undergraduate (co- with P.C. St. John)	2014
Jesse Starger, Tufts University Undergraduate	2013

PROFESSIONAL ACTIVITIES

Peer review

International Federation of Automatic Control (IFAC) World Congress, IEEE International Conference on Biomedical and Health Informatics, PeerJ Computer Science

Organizing and leadership

Organizer, chair of invited session "Optimal Control and Optimization of Biological Systems" at International Federation of Automatic Control (IFAC) World Congress 2017 (with Steffen Waldherr)

Professional societies

American Institute of Chemical Engineers (AIChE), Member
Society for Research on Biological Rhythms (SRBR), Member

Computing skills

- Languages: Python (including numpy, scipy, scikit-learn, pandas, cython), Matlab, some use of C++, R, and Unix shell scripts.
- Algorithms: Experience in methods for numerical solutions to ordinary and partial differential equations, stochastic simulation algorithms, linear/nonlinear programming, evolutionary algorithms, and artificial neural networks.
- Applications: Vim, Wolfram Mathematica, LaTeX, Stata, common Microsoft database, spreadsheet, and presentation software.
- Operating Systems: Unix/Linux, OSX.

Current as of: March 18, 2019.