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EDUCATION

Ph.D. Department of Chemistry and Chemical Engineering, EPFL, Switzerland, 2013

M.A. Department of Chemistry, Ecole Normale Supérieure, Lyon, France, 2008

B.A. Department of Biochemistry, University of Michigan, Ann Arbor, 2003

PROFESSIONAL EXPERIENCE

2018-2020 T32 Cancer Therapeutics Training Fellow, Moore's Cancer Center, UC San Diego

2016-2018 Scientific Consultant, Celgene, San Diego

2014-2015 Scientific Consultant, Novo Nordisk Center for Biosustainability, Denmark

2014-2016 SNSF Postdoctoral Fellow, Department of Bioengineering, UC San Diego

2013-2014 Visiting Scholar, Department of Bioengineering, UC Berkeley / JBEI

PUBLICATIONS

(* denotes shared first authorship, † denotes shared corresponding author)

Peer Reviewed Journal Articles

2019 Chowdhry, S; Zanca, C; Rajkumar, U.; Koga, T.; Diao, Y.; Raviram, R.; Liu, F.; Turner, K.; Yang, H.; **Brunk, E.**; Bi, J.; Furnari, F.; Bafna, V.; Ren, B.; Mischel, P. NAD metabolic dependency in cancer is shaped by gene amplification and enhancer remodelling. *Nature*. 569, 570

2018 **Brunk, E.**; Chang, RL; Xia, J; Hefzi, H; et al. Characterizing post-translational modifications in prokaryote metabolism using a multi-scale workflow. *PNAS*. 115

2018 **Brunk, E.**; Sahoo, S; et. al. Recon 3D enables a three-dimensional view of gene variation in human metabolism. *Nature Biotechnology*. 36, 272–281

2018 Mih, N; **Brunk, E.**; Chen, K; Catoiu, E; Sastry, A; Kavvas, E; Monk, JMM; Zhang, Z; Palsson, BO. ssbio: A Python Framework for Structural Systems Biology. *Bioinformatics*. 34(12), 2155-2157

2018 McCloskey D; Xu S; Sandberg TE; **Brunk E.**; Hefner Y; Szubin R; Feist AM; Palsson BO. Adaptive laboratory evolution resolves energy depletion to maintain high aromatic metabolite phenotypes in Escherichia coli strains lacking the Phosphotransferase System. *Metabolic Engineering*. 48, 233-242

- 2018 McCloskey D; Xu S; Sandberg TE; **Brunk E**; Hefner Y; Szubin R; Feist AM; Palsson BO. Adaptation to the coupling of glycolysis to toxic methylglyoxal production in tpiA deletion strains of Escherichia coli requires synchronized and counterintuitive genetic changes. *Metabolic Engineering*. 48, 82-93
- 2018 McCloskey D; Xu S; Sandberg TE; **Brunk E**; Hefner Y; Szubin R; Feist AM; Palsson BO. Evolution of gene knockout strains of E. coli reveal regulatory architectures governed by metabolism. *Nature Communications*. 9, 3796
- 2017 Monk, J.*; Llyod, C*; **Brunk, E***; Mih, N., Sastry, A; King, Z; Takeuchi, R; Nomura, W; Mori, H; Feist, AM; Palsson, BO. iML1515; a computable knowledgebase for E coli. *Nature Biotechnology*. 5(10), 904-908
- 2017 Glusman G.; Rose PW.; Prlić A.; Dougherty J.; Duarte JM.; Hoffman AS.; Barton GJ.; Bendixen E.; Bergquist T.; Bock C.; **Brunk E**; et al.. Mapping genetic variations to three-dimensional protein structures to enhance variant interpretation. *Genome Medicine*. (2017) 9:113
- 2017 Sastry, A; Monk, J; Tegel, H; Uhlen, M; Rockberg, J†; Palsson, BO, **Brunk, E†**. Machine Learning in Computational Biology to Accelerate High-throughput protein expression. *Bioinformatics*. 33(16), 2487-2495
- 2016 **Brunk, E**; Perez, M; Athri, P; Rothlisberger, U. Genetic Algorithm Based Optimization of a Peptidic Scaffold for Sequestration and Hydration of CO2 *chemphyschem*. 17, 23, 3831-3835
- 2016 Mih, N*; **Brunk, E*†**; Bordbar, A; Palsson, BO†. The Effect of Single Nucleotide Polymorphisms on Native Metabolite and Drug Responses in Human Erythrocyte Metabolism. *Plos. Comp. Bio*. 12(7), e1005039
- 2016 Ebrahim, A*; **Brunk, E***; Tan, J*; O'Brien, EJ; Donghyuk, K; Lerman, J; Lechner, A; Sastry, A; Bordbar, A; Feist, A; Palsson BO. Multi-omic data integration enables discovery of hidden biological regularities. *Nature Communications*. 7, 13091
- 2016 **Brunk, E***; George, KJ*; Alonso-Gutierrez, J; Thompson, M; Baidoo, E; ... Adams, P; Keasling, JD; Palsson, BO; Lee, TS. Characterizing Strain Variation in Engineered E. coli Using a Multi-omics Based Workflow. *Cell Systems*. 2 (5), 335
- 2016 **Brunk, E***; Mih, N*, Monk, J; Chen, K; Zhang, Z; Bliven, S; O'Brien, E; Chang, RL; Bourne, PE; Palsson, BO. Systems Biology of the Structural Proteome. *BMC systems biology*. 10, 1, 26
- 2015 Guzman, G*; Utrilla, J*; Nurk, S; **Brunk, E**; Monk, JM; Ebrahim, A; Palsson, B; Feist, AM. Model-driven discovery of underground metabolic functions in Escherichia coli. *PNAS*. 112,3, 929-934
- 2015 Aziz, RK; Khaw, V; Monk, JM; **Brunk, E**; et al. Model-driven discovery of synergistic inhibitors against E. coli and S. enterica serovar Typhimurium targeting a novel synthetic lethal pair, aldA and prpC. *Frontiers in Microbiology*. 6, 958
- 2015 Latif, H; Szubin, R; Tan, J; **Brunk, E**; Lechner, A; Zengler, K; Palsson, BO. A streamlined ribosome profiling protocol for the characterization of microorganisms. *Biotechniques*. 58, 329.

- 2015 Menten, A; Florescu, AM; **Brunk, E**; Wereszczynski, J; Joyeux, M; Andricioaei I. Free energy landscape and characteristic forces for the initiation of DNA unzipping. *Biophysical Journal*. 108
- 2014 **Brunk, E**; Kellett, WF; Richards, NGJ; Rothlisberger, U. A Mechano-Chemical Switch to Control Reactive Intermediates. *Biochemistry*. 53, 23, 3830-3838
- 2014 Bozkurt, E; Ashari, N; Browning, N; **Brunk, E**; Campomanesa, P; Perez, MAS; Rothlisberger, U. Lessons from Nature: Computational Design of Biomimetic Compounds and Processes. *CHIMIA* 68, 9, 642.
- 2013 **Brunk, E**; Mollwitz, B; Rothlisberger, U. Mechanism for Triggering Unfolding in O6-Alkylguanine DNA Alkyltransferase. *ChemBioChem*. 14, 6, 703-10
- 2013 Kellett, WF; **Brunk, E**; et al.. Computational, Structural and Kinetic Evidence that *Vibrio vulnificus* FrsA is not a Cofactor- Independent Pyruvate Decarboxylase. *Biochemistry*. 2, 11, 1842-1844
- 2012 **Brunk, E**; Arey, JS; Rothlisberger, U. The Role of Environment in the Catalysis of the MutY DNA Repair Enzyme. *JACS*. 134, 8608.
- 2012 Mollwitz, B; **Brunk, E**; et al.. Directed Evolution of the Suicide Protein O-6-Alkylguanine-DNA Alkyltransferase for Increased Reactivity Results in an Alkylated Protein with Exceptional Stability. *Biochemistry*. 51, 986.
- 2011 **Brunk, E**; Neri, M; Tavernelli, I; Hatzimanikatis, V; Rothlisberger, U. Integrating computational methods to retrofit enzymes to synthetic pathways. *Biotechnology and Bioengineering*. 109, 572.
- 2011 **Brunk, E**; et al.. Pushing the Frontiers of First-Principles Based Computer Simulations of Chemical and Biological Systems. *CHIMIA*. 65, 667.

Peer Reviewed Review Articles

- 2016 Lechner, A.; **Brunk, E.**; Keasling, JD. The Need For Integrated Approaches in Metabolic Engineering. *Cold Springs Harbor Perspectives*. 8 (11)
- 2015 **Brunk, E**; Rothlisberger, U. Mixed Quantum Mechanical/Molecular Mechanical Molecular Dynamics Simulations of Biological Systems in Ground and Electronically Excited States. *Chemical Reviews*. 115 (12): 6217-6263

FELLOWSHIPS & AWARDS

- 2018 National Cancer Institute Cancer Therapeutics Training Fellowship, Moores Cancer Center
- 2013 Swiss National Science Foundation Postdoc Fellowship, UC Berkeley / UCSD
- 2013 Swiss Academy of Sciences (SCNAT), Platform Chemistry Travel Award, EPFL
- 2013 Global Young Scientist Summit, National Research Foundation Singapore
- 2007 Erasmus Mundus AtoSim Fellowship, Ecole Normale Supérieure-Lyon
- 2005 Undergraduate Research Opportunities Program Physical Sciences and Engineering Fellowship, University of Michigan

INVITED TALKS

- 2020 TBD, Protein Engineering Global Summit, Boston
- 2020 TBD, 6th Conference on Constraint-Based Reconstruction and Analysis, Tel Aviv
- 2020 TBD, Festival of Biologics USA, San Diego, CA
- 2019 Tacking Multi-omic data integration with Machine Learning, MLxBio4 Machine Learning and Biology Conference, San Francisco
- 2019 Advanced Analytics, Big Omics Data and Visualization, Northwestern University, Bioengineering Grad Student Practicum
- 2019 Machine learning to leverage Omics data integration and Systems Biology approaches, Protein Engineering Global Summit (PEGS), Boston
- 2019 Integrating omics data using systems biology, machine learning and constraint based modeling, Integrative Omics, NCRG & NM-INBRE
- 2018 Computational chemistry and machine learning to leverage systems biology, SAGIM & Vertex Pharmaceuticals, San Diego
- 2017 Modeling at the intersection of structural and systems biology, Gene Variation in 3D Workshop, Seattle
- 2016 Modeling at the intersection of molecular and systems biology in the era of big data, Celgene, San Diego
- 2015 Elucidating functions of bacterial post-translational modifications through genome editing, pathway modeling, and molecular dynamics, Zing Conference on Computational Chemical Biology, Cairns, Australia

CONFERENCE ACTIVITY

Presentations

- 2018 Expanding Metabolic Models to 3 Dimensions, 5th Conference on Constraint-Based Reconstruction and Analysis, Seattle
- 2016 Characterizing strain variation in E. coli using a multi-omics based workflow, American Chemical Society Meeting, San Diego
- 2015 Systems Biology of the Structural Proteome, 4rth Conference on Constraint-Based Reconstruction and Analysis, Heidelberg
- 2013 Computational Design of biomimetic strategies for the production of chemical compounds, American Chemical Society Meeting, New Orleans
- 2013 A Mechanism to Trigger Unfolding in O6-Alkylguanine DNA Alkyltransferase, American Chemical Society Meeting, New Orleans
- 2013 The Role of Environment on the Catalysis of the MutY Enzyme, American Chemical Society Meeting, New Orleans

- 2013 A Mechano-Chemical Switch to Control Reactive Intermediates, American Chemical Society Meeting, New Orleans
- 2012 The Role of Environment on the Catalysis of the MutY Enzyme, CECAM, Lausanne, Switzerland
- 2011 Integrating Comp. Methods To Retrot Enzymes to Biosynthetic Pathways, American Chemical Society Meeting, Irvine
- 2010 Integrating Comp. Methods To Retrot Enzymes to Biosynthetic Pathways, Swiss Chemical Society, Zurich

Posters

- 2015 The Effect of Single Nucleotide Polymorphisms on Native Metabolite and Drug Responses in Human Erythrocyte Metabolism, CECAM Lausanne
- 2014 Characterization of Heterologous Pathways for Advanced Biofuel Production, 3rd Conference on Constraint-Based Reconstruction and Analysis, Virginia
- 2014 A Mechano-Chemical Switch to Control Reactive Intermediates by Negative Enzyme Catalysis, Biophysical Society, San Francisco
- 2010 Integrating Computational Methods To Retrofit Enzymes to Biosynthetic Pathways, Understanding Molecular Simulation Workshop, Amsterdam

Departmental Seminars

- 2019 *Big Data in 3 Dimensions: Integrating omics data with systems and structural biology*, Department of Biological Sciences, University of Southern California
- 2019 *A Structural Systems Biology approach to determine the downstream effects of gene variation*, Department of Developmental and Cell Biology, UC, Irvine
- 2019 *A Multi-Omic Data Integration Approach to Link Gene Variation to Phenotype*, School of Life Sciences & School of Engineering, EPFL

TEACHING EXPERIENCE

UCSD, Guest Lecturer / Teaching Faculty

Advanced Systems Biology (Winter 2015)

Translational Research Fundamentals (Winter 2020)

EPFL, Teaching Assistant

General Chemistry Lab (Fall 2009, Winter 2010)

Bioinorganic Chemistry Lab (Fall 2010)

Advanced Organic Chemistry (Winter 2011)

Introduction to Electronic Structure Theory (Fall 2011, Fall 2012)

Molecular Dynamics and Monte Carlo Simulations (Winter 2012)

Master Thesis Project Mentor (Winter 2012)

University of Michigan, Teaching Assistant

Organic Chemistry Lab (Fall 2006, Winter 2006)

PROFESSIONAL SERVICE

To Profession

Advisor to the Program Director of the Translational Science Certificate, ATCRI UCSD (2019)

Journal Reviewer, Science (2019), Nature Comm (2019), Bioinformatics (2019), Biotechnology and Bioengineering (2018-19), Plos Comp Bio (2017-18), Antibody Therap. (2019)

Discussion Panelist, Overcoming bottlenecks in using the microbiome to improve health, Festival of Genomics, San Diego, June 2018

Session Chair, American Chemical Society, Irvine, 2011

To Community / Outreach

Volunteer, Lego Therapy Workshop, Autism Tree Project Foundation, San Diego, 2019

Volunteer, Tap Dance Fever Class, Autism Tree Project Foundation, San Diego, 2019

Volunteer, Ready, Set, Go! College Applications, Autism Tree Project Foundation, San Diego, 2019

REFERENCES

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UC Berkeley and JBEI
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