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ACADEMIC APPOINTMENTS:

2014- Group Leader, Swiss Institute of Bioinformatics
2011- Assistant Professor, ETH Zurich
2006-2010 Assistant Professor, National University of Singapore
2008-2010 Singapore-MIT Alliance Fellow, Chemical & Pharmaceutical Engineering
2007-2008 Singapore-MIT Alliance Visiting Professor
2003-2006 Postdoctoral Fellow, University of California Santa Barbara
1998-2003 Research Assistant, University of Illinois Urbana-Champaign
2000 Lecturer, University of Illinois Urbana-Champaign
1999-2000 Teaching Assistant, University of Illinois Urbana-Champaign

HONORS AND AWARDS

- Best Theory/Methodology Paper 2005-2008, Journal of Process Control, Elsevier (2008)
- Best Paper of 2006, Computers and Chemical Engineering (2008)
- UIUC Graduate Student Travel Grant (2002)
- University of Wisconsin Dean's List (1994-1998)
- University of Wisconsin Honoring Scholarship (1997)

EDUCATION:

2003 Ph.D. Chemical Engineering, University of Illinois Urbana-Champaign
2000 M.S. Chemical Engineering, University of Illinois Urbana-Champaign
1998 B.S. Chemical Engineering and Mathematics, University of Wisconsin – Madison

RESEARCH INTERESTS

- Areas: systems biology, computational biology, mathematical modeling, systems analysis, design of experiments, network inference, bioinformatics, process optimization
- Applications: biogerontology, mitochondrial DNA, drug discovery, systems pharmacology, stem cell differentiation, influenza viral infection, monoclonal antibody, glycosylation, circadian rhythms, programmed cell death, pharmaceutical crystallization

PUBLICATIONS

Peer-Reviewed Articles: (* as corresponding author)

1. A. Richard, L. Boullu, U. Herbach, A. Bonnafoux, V. Morin, E. Vallin, A. Guillemin, N. Papili Gao, R. Gunawan, J. Cosette, O Arnaud, J. Kupiec, T. Espinasse, S. Gonin-Giraud and O. Gandrillon. A surge in cell-to-cell molecular variability precedes the commitment in a differentiation process. *PLoS Biology*, 2016. in press
2. H. Noh, Z. Hua and R. Gunawan*, Inferring causal gene targets from time course expression data, In *Proc. of Foundations of Systems Biology in Engineering*, 2016. in press
3. N. Papili-Gao, S.M.M. Ud-Dean and R. Gunawan*, Gene regulatory network inference using time-stamped cross-sectional single cell expression data, In *Proc. of Foundations of Systems Biology in Engineering*, 2016. in press

4. S.M.M Ud-Dean, S. Heise, S. Klamt and R. Gunawan*. TRaCE+: Ensemble inference of gene regulatory networks from gene knock-out experiments, *BMC Bioinformatics*, 17:252, 2016.
5. H. Noh and R. Gunawan*. Inferring gene targets of drugs and chemical compounds from gene expression profiles, *Bioinformatics*, doi: 10.1093/bioinformatics/btw148, 2016.
6. S.M.M Ud-Dean and R. Gunawan*. Optimal design of gene knock-out experiment for gene regulatory network inference, *Bioinformatics*, 32:875-883, 2016.
7. K. Sriyudthsak, H. Uno, R. Gunawan and F. Shiraishi. Using dynamic sensitivities to characterize metabolic reaction systems. *Mathematical Biosciences*, 269:153-163, 2015.
8. Y. Liu, E. Manesso and R. Gunawan*. REDEMPTION: Reduced dimension ensemble modeling and parameter estimation, *Bioinformatics*, 31:3387-3389, 2015.
9. L. N. Lakshmanan, J. Gruber, B. Halliwell, and R. Gunawan*. Are mutagenic non D-loop direct repeat motifs in mitochondrial DNA under a negative selection pressure? *Nucleic Acids Research*, 43:4098-4108, 2015.
10. Z. Tam, J. Gruber, B. Halliwell, and R. Gunawan*. Context-dependent role of mitochondrial fusion-fission in clonal expansion of mitochondrial DNA mutations. *PLoS Computational Biology*, 8:e76230, 2015.
11. Y. Liu and R. Gunawan*. Parameter Estimation of Dynamic Biological Network Models using Integrated Fluxes, *BMC Systems Biology*, 8:127, 2014.
12. S.M.M. Ud-Dean and R. Gunawan*. Ensemble Inference and Inferability of Gene Regulatory Networks, *PLoS One*, 9(8): e103812, 2014.
13. C. Siegenthaler and R. Gunawan*. Assessment of Network Inference Methods: How to cope with an underdetermined problem, *PLoS One*, 9(3):e90481, 2014.
14. T. M. Perumal and R. Gunawan*. PathPSA: a dynamical pathway-based sensitivity analysis. *Ind. Eng. Chem. Res.*, 53:9149-9157, 2014.
15. Z. Tam, J. Gruber, L. F. Ng, B. Halliwell, and R. Gunawan*. Effects of lithium on age-related decline in mitochondrial turnover and function in *Caenorhabditis elegans*. *J. Gerontol. A Biol. Med. Sci.*, 69:810-820, 2014.
16. Z. Tam, J. Gruber, B. Halliwell, and R. Gunawan*. Mathematical modeling of the role of mitochondrial fusion-fission in mtDNA maintenance. *PLoS One*, 8:e76230, 2013.
17. T. M. Perumal and R. Gunawan*. Reduction of kinetic models using dynamic sensitivities. *Comp. Chem. Eng.*, 56:37-45, 2013.
18. G. Jia, G. N. Stephanopoulos and R. Gunawan*. Incremental parameter estimation of kinetic metabolic network models. *BMC Syst. Biol.*, 6:142, 2012.
19. G. Jia, G. N. Stephanopoulos and R. Gunawan*. Ensemble kinetic modeling of metabolic networks from dynamic metabolic profiles. *Metabolites*, 2(4):891-912, 2012.
20. S. K. Poovathingal, J. Gruber, L. N. Lakshmanan, B. Halliwell, and R. Gunawan*. Is mitochondrial DNA turnover slower than commonly assumed? *Biogerontology*, 13:557-564, 2012.
21. A. I. Toldy, A. Z. M. Badruddoza, Z. Lu, T. A. Hatton, R. Gunawan, R. Rajagopalan, and S. A. Khan. Spherical crystallization of glycine from monodisperse microfluidic emulsions. *Cryst. Growth Des.*, 12:3977-3982, 2012.
22. L. N. Lakshmanan, J. Gruber, B. Halliwell, and R. Gunawan*. Role of direct repeat and stem-loop motifs in mtDNA deletions: cause or coincidence? *PLoS One*, 7:e35271, 2012.
23. G. Jia and R. Gunawan*, Construction of Kinetic Model Library of Metabolic Networks, In *Proc. of the 8th IFAC International Symposium on Advanced Control of Chemical Process*, pp. 952-957, 2012.
24. S. Poovathingal, J. Gruber, L. F. Ng, B. Halliwell, and R. Gunawan*. Maximizing signal to noise ratio in the random mutation capture assay. *Nucl. Acids Res.*, doi:10.1093/nar/gkr1221, 2011.

25. G. Jia, G. N. Stephanopoulos and R. Gunawan*. Parameter estimation of kinetic models from metabolic profiles: Two-phase dynamic decoupling method. *Bioinformatics*, 27:1964-1970, 2011.
26. T. M. Perumal and R. Gunawan*. Understanding dynamics using sensitivity analysis: caveat and solution. *BMC Syst. Biol.*, 5:41, 2011
27. T.M. Perumal and R. Gunawan*. Impulse parametric sensitivity analysis. In *Proc. of the 18th IFAC World Congress*, pp. 9896-9890, 2011.
28. G. Jia and R. Gunawan*, Construction of Kinetic Model Library of Metabolic Networks from Dynamic Profiles, In the 8th International Workshop on Computational Systems Biology, TICSP series #57, pp. 85-88, 2011.
29. Z. Y. Tam and R. Gunawan*, On the Roles of Mitochondrial Fusion-Fission in Mitochondrial Genome Integrity, In *Proc of the 8th International Workshop on Computational System Biology*, TICSP series #57, pp. 177-180, 2011.
30. Z. Y. Tam, Y. H. Cai and R. Gunawan*. Elucidating cytochrome C release from mitochondria: insights from an *in silico* three-dimensional model. *Biophys. J.*, 99:3155-3163, 2010. (cover article)
31. S. K. Poovathingal and R. Gunawan*. Global parameter estimation of stochastic biochemical systems. *BMC Bioinformatics*, 11:414, 2010.
32. J. Gruber, S. K. Poovathingal, N. L. Fang, R. Gunawan and B. Halliwell. *Caenorhabditis elegans* lifespan studies: the challenge of maintaining synchronous cohorts, *Rejuvenation Res.*, 13:347-349, 2010.
33. S. Srinath and R. Gunawan*. Parameter identifiability of power-law biochemical system models. *J. Biotechnol.*, 2010. 149:132-140, 2010.
34. S. K. Poovathingal, J. Gruber, B. Halliwell, and R. Gunawan*. Stochastic drift in mitochondrial DNA point mutations: a novel perspective ex silico. *PLoS Comput Biol*, 5:e1000572, 2009. (featured research Nov 2009, listed in Faculty 1000 Biology)
35. T. M. Perumal, Y. Wu, and R. Gunawan*. Dynamical analysis of cellular networks based on the Green's function matrix. *J. theor Biol*, 261:248-259, 2009.
36. R. Gunawan*, I. Fusman, and R. D. Braatz. Parallel high-resolution finite volume simulation of particulate processes. *AIChE J.*, 54:1449-1458, 2008.
37. S. Taylor, R. Gunawan, L. R. Petzold, and F. J. Doyle III. Sensitivity measures for oscillating systems: application to mammalian circadian gene network. *IEEE Trans. Automatic Control*, 153:177-188, 2008.
38. T.M. Perumal, Y. Wu, and R. Gunawan. Robustness analysis of cellular systems for *in silico* drug discovery. In *Proc. of the 17th IFAC World Congress*, pp. 1607-12612, 2008.
39. R. Gunawan and F. J. Doyle III. Phase sensitivity analysis of circadian rhythm entrainment. *J. Biol. Rhythms.*, 22:180-194, 2007.
40. R. Gunawan and F. J. Doyle III. Isochron-based phase response analysis of circadian rhythms. *Biophys. J.*, 91:2131-2141, 2006.
41. F. J. Doyle III, R. Gunawan, N. Bagheri, H. Mirsky, and T.-L. To. Circadian rhythm: A natural, robust, multi-scale control system. *Comp. & Chem. Eng.*, 30:1700-1711, 2006.
42. R. D. Braatz, R. C. Alkire, E. G. Seebauer, T. O. Drews, E. Rusli, M. Karulkar, F. Xue, Y. Qin, M. Y. L. Jung and R. Gunawan. A multiscale systems approach to microelectronics processes. *Comp. & Chem. Eng.*, 30:1643-1656, 2006.
43. R. D. Braatz, R. C. Alkire, E. G. Seebauer, E. Rusli, R. Gunawan, T. O. Drews, X. Li, and Y. He. Perspectives on the dynamics and control of multiscale systems. *J. Process Control*, 16:193-204, 2006.

44. F. J. Doyle III, R. Gunawan, N. Bagheri, H. Mirsky, and T.-L. To. Circadian rhythm: A natural, robust, multi-scale control system. In *Proc. of Chem. Process Control*, Alberta, Canada, January 2006.
45. K. Gadkar, R. Gunawan, and F. J. Doyle III. Iterative approach to model identification of biological networks. *BMC Bioinformatics*, 6:155-174, 2005.
46. R. Gunawan, Y. Cao, L. Petzold, and F. J. Doyle III. Sensitivity analysis of discrete stochastic system. *Biophys. J.*, 88:2530-2540, 2005.
47. R. Gunawan and F. J. Doyle III. Phase sensitivity analysis of a circadian gene network. In *Proc. of the 44th IEEE Conf. on Decision & Control and European Control Conf.*, pp. 3687-3692, 2005.
48. M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Pair diffusion and kick-out: Contributions to diffusion of boron in silicon. *AIChE J.*, 50:3248-3256, 2004.
49. R. Gunawan, I. Fusman, and R. D. Braatz. High resolution algorithms for multidimensional population balance equations. *AIChE J.*, 50:2738-2749, 2004.
50. M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Effect of near-surface band bending on dopant profiles in ion-implanted silicon. *J. Appl. Phys.*, 95:1134-1140, 2004.
51. M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. A simplified picture for transient enhanced diffusion of boron in silicon. *J. Electrochem. Soc.*, 151:G1-G7, 2004.
52. R. Gunawan, M. Y. L. Jung, E. G. Seebauer, and R. D. Braatz. Optimal control of rapid thermal annealing in a semiconductor process. *J. Process Control*, 14:423-430, 2004.
53. K. Dev, M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Mechanism for coupling between properties of interfaces and bulk semiconductors. *Phys. Rev. B.*, 68:195311-195316, 2003.
54. M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Ramp-rate effects on transient enhanced diffusion and dopant activation. *J. Electrochem. Soc.*, 150:G838-G842, 2003.
55. R. Gunawan, M. Y. L. Jung, R. D. Braatz, and E. G. Seebauer. Parameter sensitivity analysis applied to modeling transient enhanced diffusion and activation of boron in silicon. *J. Electrochem. Soc.*, 150:G758-G765, 2003.
56. R. Gunawan, M. Y. L. Jung, E. G. Seebauer, and R. D. Braatz. Maximum *a posteriori* estimation of transient enhanced diffusion kinetics. *AIChE J.*, 49:2114-2123, 2003.
57. R. Gunawan, M. Y. L. Jung, E. G. Seebauer, and R. D. Braatz. Optimal control of transient enhanced diffusion. In *Proc. of the IFAC Symp. on Advanced Control of Chemical Processes*, pp. 603-608, 2003.
58. R. Gunawan, D. L. Ma, M. Fujiwara, and R. D. Braatz. Identification of kinetic parameters in a multidimensional crystallization process. *Int. J. Modern Phys. B*, 16:367-374, 2002.
59. R. Gunawan, M. Y. L. Jung, R. D. Braatz and E. G. Seebauer. Systems analysis applied to modeling dopant activation and TED in rapid thermal annealing. In *Proc. of the 10th IEEE Intl. Conf. on Advanced Thermal Processing of Semiconductors*, pp. 107-110, 2002.
60. M. Fujiwara, J. C. Pirkle Jr., T. Togkalidou, D. L. Ma, R. Gunawan, and R. D. Braatz. A holistic approach to materials process design. *J. Materials Edu.*, 24:65-70, 2002.
61. R. Gunawan, E. L. Russell, and R. D. Braatz. Comparison of theoretical and computational characteristics of dimensionality reduction methods for large scale uncertain systems. *J. Process Control*, 11:543-552, 2001.
62. R. Gunawan, E. L. Russell, and R. D. Braatz. Robustness analysis of multivariable systems with time delays. In *Proc. of European Control Conf.*, pp. 1882-1887, 2001.
63. M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. New physics for modeling transient enhanced diffusion in RTP. In *Rapid Thermal & Other Short-Time Processing Technologies*, vol. 2000-9, pp. 15-20, 2000.

Patent:

1. “Methods for controlling dopant concentration and activation in semiconductor structures” with E. G. Seebauer, R. D. Braatz and M. Y. L. Jung, US Patent 7,846,822, 2010.

Book Chapters:

1. H. Mirsky, J. Stelling, R. Gunawan, N. Bagheri, S. R. Taylor, E. Kwei, J. E. Shoemaker, and F. J. Doyle III. Automatic Control in Systems Biology. In S. Y. Nof (Ed.), Handbook of Automation, Springer-Verlag, 2009.
2. S. Hildebrandt, N. Bagheri, R. Gunawan, H. Mirsky, J. Shoemaker, S. Taylor, L. R. Petzold and F. J. Doyle III. Systems Analysis in Biological Networks. In E. T. Liu, G. P. Noland, and D. A. Lauffenburger (Eds.), Systems Biomedicine: Concepts and Perspectives, Academic Press, 2009.
3. R. Gunawan, K. Gadkar, and F. J. Doyle III. Methods to identify cellular architecture and dynamics from experimental data. In Z. Szallasi, V. Periwal, and J. Stelling (Eds.), System Modeling in Cellular Biology, MIT Press, 2006.

PRESENTATIONSLectures and Oral Presentations:

1. Y. Liu and R. Gunawan. Bioprocess optimization under uncertainty using ensemble modeling, presented at *AICHE Annual Meeting*, San Francisco, CA, 16 November 2016.
2. S. Hutter, D. Karst, T. Schweigler, M. Morbidelli and R. Gunawan. Analyzing protein glycosylation in mammalian perfusion cell culture using glycosylation flux analysis, presented at *AICHE Annual Meeting*, San Francisco, CA, 16 November 2016.
3. N. Papili-Gao, S.M.M. Ud-Dean and R. Gunawan. Inferring gene regulatory networks from single cell expression data, presented at *AICHE Annual Meeting*, San Francisco, CA, 15 November 2016.
4. H. Noh, Z. Hua and R. Gunawan. Inferring molecular targets and mechanism of action from time course expression data, presented at *9th RECOMB/ISCB Conference on Regulatory and Systems Genomics*, Phoenix, AZ, 7 November 2016.
5. H. Noh, Z. Hua and R. Gunawan. Inferring causal gene targets from time course expression data, presented at *6th IFAC Conference on Foundations of Systems Biology in Engineering*, Magdeburg, Germany, 12 October 2016.
6. R. Gunawan. Gene regulatory network inference using single cell expression data, presented at *6th IFAC Conference on Foundations of Systems Biology in Engineering*, Magdeburg, Germany, 10 October 2016. (keynote lecture)
7. R. Gunawan. Tackling uncertainty in bioprocess modeling and optimization, presented at *Department of Biotechnology, Delft University*, Delft, Netherlands, 5 October 2016. (invited lecture)
8. R. Gunawan. Elucidating mechanism of action by network inference and analysis, presented at *Biomedical Institute for Global Health Research and Technology (BIGHEART)*, National University of Singapore, Singapore, 23 September 2016. (invited lecture)
9. N. Vertti-Quintero, X. Casadevall i Solvas, O. Dressler, S. Stavakis, J. Gruber, R. Gunawan and A. deMello. A microfluidic platform for the study and characterization of intrinsic stochastic variability in the stress response system of *C. elegans*, presented at *Microfluidics – EMBL Conference*, Heidelberg, Germany, 24 June 2016.
10. R. Gunawan, Mitochondrial DNA mutations and ageing, presented at *CSIC Instituto de Investigaciones Marinas*, Vigo, Spain, 13 June 2016. (invited lecture)

11. R. Gunawan, Coping with underdetermined biological network inference. In *Platform for Advanced Scientific Computing*, 9 June 2016. (invited talk)
12. S. Hutter, T. K. Villiger, D. Brühlmann, M. Stettler, H. Broly, M. Morbidelli, and R. Gunawan, Dynamic glycosylation flux analysis, presented at *6th Conference on Systems Biology of Mammalian Cells*, Helmholtz Zentrum, Munich, Germany, 6-8 April 2016.
13. R. Gunawan, Inferring causal targets and influence in systems biology, presented at *Control Theory and Systems Biology Laboratory, Department of Biosystems Science and Engineering*, ETH Zurich, Basel, Switzerland, 4 April 2016. (invited lecture)
14. H. Noh and R. Gunawan, Inference targets of compounds from gene transcriptional profiles. In *Systems Toxicology*, Les Diablerets, Switzerland, 27-29 January 2016.
15. R. Gunawan, Ensemble-based design of experiments for biological network inference, *Virtual Swiss Institute of Bioinformatics Computational Biology Seminar Series*, Lausanne, Switzerland, 14 October 2015. (invited lecture)
16. H. Noh and R. Gunawan, Inferring gene regulatory network perturbations from expression data, presented at *Biochemical Systems Theory Conference*, Fukuoka, Japan, 16-17 September 2015.
17. R. Gunawan, REDEMPTION: Reduced dimension ensemble modeling and parameter estimation, presented at *Department of Bioscience and Biotechnology, Kyushu University*, Fukuoka, Japan, 14 September 2015. (invited lecture)
18. R. Gunawan, Mitochondrial DNA Mutations and Ageing: Insights from *in silico* modeling and analysis, presented at *RIKEN*, Yokohama, Japan, 11 September 2015. (invited lecture)
19. R. Gunawan, Ensemble-based optimal design of experiments for biological network identification, presented at *Process Systems Engineering Laboratory, Department of Chemical Engineering, MIT*, Boston, MA, USA, 14 August 2015. (invited lecture)
20. R. Gunawan, Causal inference in systems biology, presented at *Foundation of Systems Biology in Engineering*, Boston, MA, USA, 9-12 August 2015. (invited talk)
21. R. Gunawan, REDEMPTION: Reduced dimension ensemble modeling and parameter estimation, presented at *Foundation of Systems Biology in Engineering, Training Workshop*, Boston, MA, USA 8 August 2015.
22. R. Gunawan, Ageing *in silico*: Using computational chemistry to understand the biology of ageing, Tag der offenen Laboratorien, DCHAB, ETH Zurich, 9 June 2015. (public lecture)
23. R. Gunawan, Ensemble Modeling based Strategies for Biological Network Inference, presented at *Institute for Automation Engineering (IFAT), Otto-von-Guericke University Magdeburg*, Magdeburg, Germany, 13 January 2015. (invited lecture)
24. R. Gunawan, Inferring Biological Network Structure and Parameters: How to cope with an underdetermined problem, Laboratory of Biological Systems Analysis, Georgia Tech, Atlanta GA, USA, 17 November 2014. (invited lecture)
25. E. Manesso and R. Gunawan, A Bayesian Design of Experiments for Ensemble Modelling of Gene Regulatory Networks, RECOMB/Regulatory Systems Genomics, San Diego, CA, USA, 10-14 November 2014.
26. R. Gunawan, Mitochondrial DNA Mutations and Ageing: Mutagenesis and Clonal Expansion, Northwestern Institute on Complex Systems (NICO), Northwestern University, Evanston, IL, USA, 6 November 2014. (invited lecture)
27. R. Gunawan, Direct Repeats and Deletions in Mitochondrial DNA: Causal and Evolutionary Aspects, SwissMito Meeting 2014, Kandersteg, Switzerland, 3 September 2014. (invited talk)
28. R. Gunawan, Inference of Biological Network Structure and Parameters: How to Cope with an Underdetermined Problem, Laboratory of Chemical Technology, Universitaet Gent, Ghent, Belgium, 18 July 2014. (invited lecture)

29. R. Gunawan, Inference of Biological Network Structure and Parameters: How to Cope with an Underdetermined Problem, Process Systems Engineering Seminar, MIT, Cambridge, MA, USA, 10 July 2014. (invited lecture)
30. R. Gunawan, Methods for Constructing Biological Network Models, Biochemtex, Tortona, Italy, 25 March 2014. (invited lecture)
31. S. M. Minhaz Ud-Dean and R. Gunawan, Ensemble Inference and Inferability of Gene Regulatory Networks, In the 6th Annual RECOMB/ISCB Conference on Regulatory and Systems Genomics, Toronto, Canada, 8 – 12 November 2013.
32. R. Gunawan, Ageing *in silico*, Maturadentage, DCHAB, ETH Zurich, 5 September 2013. (public lecture)
33. R. Gunawan, Ageing *in silico*, Tag der offenen Laboratorien, DCHAB, ETH Zurich, 14 June 2013. (public lecture)
34. G. Jia, G. Stephanopoulos and R. Gunawan, Please mind the DOF, In *Frontiers in Systems and Synthetic Biology*, Atlanta, GA, 20-24 March 2013. (invited talk)
35. G. Jia, G. Stephanopoulos and R. Gunawan, Incremental Parameter Estimation and Ensemble Kinetic Modeling of Metabolic Networks, In the 12th AIChE Annual Meeting, Pittsburgh, PA, 28 October – 2 November, 2012.
36. G. Jia and R. Gunawan, Construction of Kinetic Model Library of Metabolic Networks, In the 8th IFAC International Symposium on Advanced Control of Chemical Processes, Singapore, 10-13 July 2012.
37. R. Gunawan, Mitochondrial DNA Mutations and Aging: When and How? ETH Zurich Introductory Lecture, 23 April 2012. (public lecture)
38. J. Gengjie, G. N. Stephanopoulos and R. Gunawan, Estimating Kinetic Parameters of Large Scale Metabolic Models, In the 14th Asia Pacific Confederation of Chemical Engineering Congress, Singapore, 21-24 February, 2012.
39. R. Gunawan, Mitochondrial DNA and Ageing: When and How. Institute for Systems Theory and Automatic Control, University of Stuttgart, 19 January 2012. (invited lecture)
40. T. M. Perumal and R. Gunawan, Dynamical Pathway Sensitivity Analysis for Biological Systems, In *AIChE Annual Meeting*, Minneapolis, Minnesota, October 2011.
41. T. M. Perumal and R. Gunawan, Impulse Parametric Sensitivity Analysis, In the 18th World Congress of the International Federation of Automatic Control (IFAC), Milano, Italy, August 28 – September 2. 2011.
42. S. Srinath and R. Gunawan, Model-based Design of Experiment for Kinetic Parameter Identification: Beyond the Fisher Information Matrix. In the 13th International Conference on Molecular Systems Biology, Lleida, Spain, May 2011. (invited talk)
43. R. Gunawan, Mitochondrial Ageing: New insights *ex silico*, ETH Zurich, D-ITET, 2011. (invited lecture)
44. S. K. Poovathingal, J. Gruber, B. Halliwell and R. Gunawan, Sarcopenia *in silico*. In *AIChE Annual Meeting*, Salt Lake City, UT, USA, November 2010.
45. T. M. Perumal and R. Gunawan, Dynamical Model Reduction of Large Reaction Mechanisms: A Green's Function Matrix (GFM) Based Approach. In *AIChE Annual Meeting*, Salt Lake City, UT, USA, November 2010.
46. T. M. Perumal and R. Gunawan, Caveats of Parametric Sensitivity Analysis (PSA): In analyzing the dynamics of biological systems. In *AIChE Annual Meeting*, Salt Lake City, UT, USA, November 2010.
47. T. M. Perumal and R. Gunawan, Dynamical Analysis and Model Reduction of Complex Systems, In *13th Asia Pacific Confederation of Chemical Engineering Congress (APCCHE)*, Taipei, October 5-8, 2010. (keynote lecture)

48. S. Srinath and R. Gunawan, Parameter Identifiability of Metabolic Network Models, In *Satellite Conference of the International Congress of Mathematics*, Hyderabad, India, August 2010.
49. T. M. Perumal and R. Gunawan, In Analyzing the Complex Dynamics of Biochemical Pathways. In the satellite conference on *Application of Control Theory and Optimization Techniques in Biochemical Pathways*, HICC, Hyderabad, India, August 16-18, 2010.
50. S. Srinath, Y. Zu and R. Gunawan, Identifiability Analysis of Decoupled Power-Law Models, In the *5th International Symposium on Design, Operation and Control of Chemical Processes (PSE Asia)*, Singapore, July 2010.
51. R. Gunawan, Systems Modeling and Analysis of Mitochondria Physiology: Cell Death and Aging, Institute for Chemical and Bioengineering, ETH Zurich, 2010. (invited lecture)
52. J. Gruber, S. K. Poovathingal, N. L. Fang, R. Gunawan and B. Halliwell, Deceptively simple – considerations regarding *Caenorhabditis elegans* lifespan, ageing and antioxidant studies. *Strategies for Engineered Negligible Senescence (SENS-4)*, Cambridge, England, September 2009.
53. S. Srinath and R. Gunawan. Identifiability analysis of metabolic networks. In *Intl. Conf. of Molecular Systems Biology*, Shanghai, PR China, July 2009. (invited talk)
54. S. Poovathingal, J. Gruber, B. Halliwell, R. Gunawan. Aging Studies: A Stochastic Approach in point mutation dynamics in mouse model. In *AICHE Annual Meeting*, Philadelphia, PA, November 2008.
55. T. M. Perumal, Y. Wu, and R. Gunawan. Robustness analysis of cellular systems for *in silico* drug discovery. In *IFAC World Congress*, Seoul, South Korea, July 2008.
56. R. Gunawan, The Yin and Yang of Systems Biology, Department of Chemical and Biomolecular Engineering, National University of Singapore, Singapore, 2006. (invited lecture)
57. R. Gunawan, Systems Biology: New Frontiers for Systems Engineering, Department of Chemical Engineering, Purdue University, USA, 2006. (invited lecture)
58. R. Gunawan, Systems Biology: New Frontiers for Systems Engineering, Department of Chemical Engineering, University of Florida-Gainesville, USA, 2006. (invited lecture)
59. R. Gunawan, Systems Biology: New Frontiers for Systems Engineering, Department of Chemical Engineering, Massachusetts Institute of Technology, USA, 2006. (invited lecture)
60. R. Gunawan, Systems Biology: New Frontiers for Systems Engineering, Graduate Program in Bioinformatics, Boston University, USA, 2006. (invited lecture)
61. R. Gunawan, Systems Biology: New Frontiers for Systems Engineering, Department of Chemical Engineering, University of Texas at Austin, USA, 2006. (invited lecture)
62. R. Gunawan, The Yin and Yang of Systems Biology, Division of Chemical and Biomolecular Engineering, Nanyang Technological University, Singapore, 2005. (invited lecture)
63. R. Gunawan and F. J. Doyle III. Isochron-based phase sensitivity analysis of biological oscillatory systems. In *AICHE Annual Meeting*, Cincinnati, OH, October 2005.
64. R. Gunawan, S. R. Taylor, and F. J. Doyle III. Sensitivity analysis in biological modeling: an application in the model development of staphylococcal enterotoxin B response. In *AICHE Annual Meeting*, Cincinnati, OH, October 2005.
65. R. Gunawan, Y. Cao, L. Petzold, and F. J. Doyle III. Stochastic sensitivity analysis of discrete stochastic biological systems. In *AICHE Annual Meeting*, Austin, TX, November 2004.
66. R. Gunawan, Y. Cao, L. Petzold, and F. J. Doyle III. Stochastic sensitivity analysis of cellular processes. In *Intl. Conf. of Molecular Systems Biology*, Lake Tahoe, CA, August 2004.
67. R. Gunawan, I. Fusman, and R. D. Braatz. High resolution algorithms for multidimensional population balance equations with nucleation and size-dependent growth. In *AICHE Annual Meeting*, San Francisco, CA, November 2003.
68. R. Gunawan, Modeling and Control of Transient Enhanced Diffusion of Boron in Silicon, Department of Chemical Engineering, Auburn University, USA, 2003. (invited lecture)

69. R. Gunawan, Modeling and Control of Transient Enhanced Diffusion of Boron in Silicon, Department of Chemical Engineering, Lehigh University, USA, 2003. (invited lecture)
70. R. Gunawan, M. Y. L. Jung, E. G. Seebauer, and R. D. Braatz. Maximum *a posteriori* estimation of transient enhanced diffusion kinetics. *AIChE Annual Meeting*, Indianapolis, IN, November 2002.
71. R. Gunawan, M. Y. L. Jung, E. G. Seebauer, and R. D. Braatz. Optimal control of transient enhanced diffusion. *AIChE Annual Meeting*, Indianapolis, IN, November 2002.
72. R. Gunawan, M. Y. L. Jung, R. D. Braatz, and E. G. Seebauer. Systems analysis applied to modeling transient enhanced diffusion. *AIChE Annual Meeting*, Indianapolis, IN, November 2002.

Poster Presentations:

1. L.N. Lakshmanan, J. Gruber, B. Halliwell and R. Gunawan. Deletion mutagenesis of mitochondrial DNA, presented at *Cell Fate Diversity in Aging*, Dubrovnik, Croatia, 25-28 September 2016.
2. H. Noh, Z. Hua and R. Gunawan. Elucidating mechanism of drug action and diseases using network perturbations, presented at *15th International Conference on Bioinformatics (InCOB)*, Biopolis (Matrix), Singapore, 21-23 September 2016.
3. N. Vertti-Quintero, X. Casadevall i Solvas, O. Dressler, S. Stavakis, J. Gruber, R. Gunawan and A. deMello, A microfluidic platform for the study and characterization of intrinsic stochastic variability in the stress response system of *C. elegans*, presented at *Microfluidics – EMBL Conference*, Heidelberg, Germany, 24-26 June 2016.
4. H. Noh and R. Gunawan, Inferring causal gene targets from time course expression data. In *SIB Days*, Biel, Switzerland, 7-8 June 2016.
5. N. Papili-Gao and R. Gunawan, Gene regulatory network inference using cross-sectional single cell data. In *SIB Days*, Biel, Switzerland, 7-8 June 2016.
6. S. Hutter and R. Gunawan, Dynamic glycosylation flux analysis. In *SIB Days*, Biel, Switzerland, 7-8 June 2016.
7. H. Noh and R. Gunawan, Inference targets of compounds from gene transcriptional profiles. In *Systems Toxicology*, Les Diablerets, Switzerland, 27-29 January 2016.
8. H. Noh and R. Gunawan, Inference of causal gene targets from expression data using Δ Net, In *Drug Discovery Network Zurich Symposium*, Zurich, Switzerland, 10 September 2015.
9. H. Noh and R. Gunawan, Inference of causal gene targets from expression data, In *Foundation of Systems Biology in Engineering*, Boston, MA, USA, 9 – 12 August 2015
10. N. Vertti-Quintero, O. Dreaser, X. Casadevall I Solvas, S. Stavakis, J. Gruber, R. Gunawan and A. deMello, Microfluidic high-throughput fluorescence-based sorter for studying stochastic expression of heat shock proteins in *C. elegans*. In the *20th International C. elegans Conference*, Los Angeles, CA, USA, 24-28 June 2015.
11. H. Noh and R. Gunawan, Inference of causal gene targets from expression data, In *Ascona Workshop*, Ascona, Switzerland, 31 May – 5 June 2015.
12. S.M.M. Ud-Dean and R. Gunawan, How to break a network to infer it, In *Ascona Workshop*, Ascona, Switzerland, 31 May – 5 June 2015.
13. S.M.M. Ud-Dean and R. Gunawan, Ensemble Inference and Inferability of Gene Regulatory Networks, In the *22nd Annual International Conference on Intelligent Systems for Molecular Biology*, Boston, MA, USA, 13 – 15 July 2014.
14. E. Manesso and R. Gunawan, A Bayesian Design of Experiments for Ensemble Modeling of Metabolic Networks, In *Metabolic Engineering X Conference*, Vancouver, Canada, 15 – 19 July 2014.
15. Y. Liu, E. Manesso and R. Gunawan, REDEMPTION: Reduced Dimension Ensemble Modeling and Parameter Estimation, In *Metabolic Engineering X, Conference*, Vancouver, Canada, 15 – 19 July 2014.

16. S.M.M. Ud-Dean and R. Gunawan, Ensemble Inference and Inferability of Gene Regulatory Networks, In the 6th Annual RECOMB/ISCB Conference on Regulatory and Systems Genomics, Toronto, Canada, 8 – 12 November 2013.
17. C. Siegenthaler and R. Gunawan, Assessment of Network Inference Methods: How to cope with and underdetermined problem, In *sbv IMPROVER Symposium*, Athens, Greece, 29-31 October 2013.
18. S. M. Minhaz Ud-Dean and R. Gunawan, Gene Regulatory Network Inference through Transitive Reduction and Closure Estimation, In *Frontiers in Systems and Synthetic Biology*, Atlanta, GA, 20-24 March 2013.
19. S. M. Minhaz Ud-Dean and R. Gunawan, TRACE: Transitive Reduction and Closure Estimate of a Genetic Network, In the 11th *European Conference on Computational Biology*, Basel, Switzerland, 9-12 September 2012.
20. S. M. Minhaz Ud-Dean and R. Gunawan, TRACE: Transitive Reduction and Closure Estimate of a Genetic Network, In the 6th *International Workshop on Machine Learning in Systems Biology*, Basel, Switzerland, 8-9 September 2012.
21. L. N. Lakshmanan, J. Gruber, and R. Gunawan, Mitochondrial DNA Deletion Mutagenesis in Aging. In *International Conference of Systems Biology*, Toronto, Canada, 19-23 August 2012.
22. Z. Y. Tam, L. F. Ng, R. Gunawan and J. Gruber, Lithium Preserves Mitochondrial Function and Extend Healthspan in *C. elegans*, In the *British Society for Research on Ageing Annual Meeting*, Aston, UK, 3 July 2012.
23. L. N. Lakshmanan, J. Gruber, B. Halliwell and R. Gunawan, Role of Direct Repeats and DNA Misalignments in mtDNA Deletions: Cause or Coincidence? In *Gordon Research Conference on Biology of Aging*, Ventura, California, USA, 12-17 February 2012.
24. G. Jia and R. Gunawan, Construction of Kinetic Model Library of Metabolic Networks from Dynamic Profiles, In the 12th *International Conference on Systems Biology*, Heidelberg/Mannheim, Germany, August 28 - September 1, 2011.
25. Z. Y. Tam, J. Gruber, B. Halliwell and R. Gunawan, On the Roles of Mitochondrial Fusion-Fission in Mitochondrial Genome Integrity, In the 12th *International Conference on Systems Biology*, Mannheim, Germany, August 28 - September 1, 2011.
26. Z. Y. Tam, J. Gruber, B. Halliwell and R. Gunawan, On the Roles of Mitochondrial Fusion-Fission in Mitochondrial Genome Integrity, In the *Conference on Stochastic Systems Biology*, Monte Verità, Switzerland, July 2011.
27. L. N. Lakshmanan, S. K. Poovathingal, and R. Gunawan, Modeling of Age-associated Mitochondrial DNA Deletions in Mouse Cardiac Tissue. In the *Conference on Stochastic Systems Biology*, Monte Verità, Switzerland, July 2011.
28. L. Lakshmanan, S. K. Poovathingal, and R. Gunawan *, Mouse cardiac tissue modeling of age-associated deletions in mitochondrial genome, In the 8th *International Workshop on Computational System Biology*, Zurich, Switzerland, June 2011.
29. G. Jia and R. Gunawan, Parameter Estimation of Kinetic Models from Metabolic Profiles: Two-phase Dynamic Decoupling Method, In the 13th *International Conference on Molecular Systems Biology*, Lleida, Spain, May 2011.
30. S. K. Poovathingal, J. Gruber, B. Halliwell and R. Gunawan, Random Drift of Mitochondrial DNA Deletions in Sarcopenia, In 11th *International Conference on Systems Biology*, Edinburgh, UK, October 2010.
31. L. N. Lakshmanan, S. K. Poovathingal, J. Gruber, B. Halliwell and R. Gunawan, Elucidating Mechanisms of Age-dependent Accumulation of Mitochondrial DNA Deletions – An *in silico* Approach. In *Gordon Research Conference on Biology of Aging*, Les Diablerets, Switzerland, August 2010.
32. S. Srinath and R. Gunawan, Parameter Identifiability in Kinetic Modeling of Metabolic Pathways, In *Metabolic Engineering Conference VIII*, Jeju Island, South Korea, June 2010.

33. S. K. Poovathingal, J. Gruber, B. Halliwell and R. Gunawan, Stochasticity in mitochondrial DNA point mutations and its relevance in *Caenorhabditis elegans* aging. In *10th International Conference on Systems Biology*, Stanford, CA, September 2009.
34. T.M. Perumal and R. Gunawan, Information transfer in biological network motifs. In *10th International Conference on Systems Biology*, Stanford, CA, September 2009.
35. S. K. Poovathingal and R. Gunawan. A Global Approach for Estimating the Kinetic Parameters of Stochastic Biological Systems. In *Foundations of Systems Biology and Engineering (FOSBE)*, Denver, CO, August 2009.
36. T.M. Perumal and R. Gunawan, Information theoretic global robustness analysis of cellular systems: a molecular perturbation approach. In *Foundations of Systems Biology and Engineering (FOSBE)*, Denver, CO, August 2009.
37. K. S. Ang and R. Gunawan. Parameter estimation of oscillatory biological systems. In *AICHE Annual Meeting*, Philadelphia, PA, November 2008.
38. T. M. Perumal, Y. Wu, and R. Gunawan. *In silico* dynamical analysis of cellular systems: a molecular perturbation approach. In *Annual International Conference on Research in Computational Molecular Biology (RECOMB)*, Singapore, March 2008.
39. S. Poovathingal, J. Gruber, B. Halliwell, R. Gunawan. Aging studies: a stochastic approach. In *Annual International Conference on Research in Computational Molecular Biology (RECOMB)*, Singapore, March 2008.
40. K. S. Ang and R. Gunawan. Parameter estimation for oscillatory biological systems. In *Annual International Conference on Research in Computational Molecular Biology (RECOMB)*, Singapore, March 2008.
41. T. M. Perumal, Y. Wu, and R. Gunawan. *In silico* dynamical analysis of cellular systems: a molecular perturbation approach. In *10th International Conference on Molecular Systems Biology*, UP Dilliman, Quezon City, Philippines, February 2008.
42. T. M. Perumal, Y. Wu, and R. Gunawan. New *in silico* robustness analysis of cellular systems: a molecular perturbation approach. In *8th International Conference on Systems Biology*, Long Beach, CA, October 2007.
43. R. Gunawan, D. L. Ma, M. Fujiwara, and R. D. Braatz. Identification of kinetic parameters in a multidimensional crystallization process. *Int. Conf. on Materials for Advanced Technologies*, Symposium D: Crystallization and Interfacial Processes, Singapore, July 2001.

STUDENTS SUPERVISION

Postdoctoral Students

1. Lakshminarayanan Lakshmanan, PhD (NUS)

Graduate Students

1. Sandro Hutter
2. Heeju Noh
3. Nadia Vertti Quintero (with Prof. Dr. Andrew de Mello)
4. Nan Papili Gao
5. Ravi Sudharshan

Alumni

1. Y. Liu, PhD 2016. Thesis title: "Ensemble Modeling and Optimization of Bioprocesses under Uncertainty"
2. S. M. M. Ud-Dean, PhD 2016. Thesis title: "Inferability and Inference of Gene Regulatory Networks" (currently post-doc at University of Tubingen, Germany)

3. Manuel Alberto Garcia Albornoz, Postdoc 11/2014-12/2015 (currently post-doc at Manchester Univ., UK)
4. Erica Manesso, Postdoc 10/2013-10/2015 (currently Lab Head at Bayer Crop Sciences, Germany)
5. Lakshminarayanan Lakshmanan, PhD 2014. Thesis title: “Direct Repeats and Deletions in Mitochondrial DNA: Causal and Evolutionary Aspects”. (currently post-doc at ETH Zurich)
6. Zhi Yang Tam, PhD 2013. Thesis title: “Mitochondrial Dynamics and Quality Control in Ageing” (currently post-doc at Singapore Phenome Centre, Singapore)
7. Gengjie Jia, PhD 2012. Thesis title: “Metabolic Network Model Identification – Parameter Estimation and Ensemble Modeling” (currently postdoc at University of Chicago, Chicago, IL, USA).
8. Thanneer Malai Perumal, PhD 2012. Thesis title: “Dynamical Sensitivity Analysis of Kinetic Models in Biology” (currently at Sage Bionetworks, Seattle, WA, USA).
9. Sridharan Srinath, PhD 2012. Thesis title: “Model Identification in the Biochemical Systems Theory” (currently at Institute for Infocomm Research, Singapore).
10. Suresh Kumar Poovathingal, PhD 2011. Thesis title: “Systems Biology of Aging: Modeling and Analysis of Mitochondrial Genome Integrity” (currently post-doc at University of Luxembourg).
11. Ang Kok Siong, M.Eng, 2010. Thesis title: “Parameter Estimation of Oscillatory Biological Systems” (currently PhD student at National University of Singapore).

COLLABORATORS

- Prof. Jan Gruber, NUS-Yale, Singapore
- Prof. Barry Halliwell, National University of Singapore
- Prof. Andrew de Mello and Dr. Xavier Casadevall i Solvas, ETH Zurich
- Prof. Massimo Morbidelli and Dr. Thomas K. Villiger, ETH Zurich
- Prof. Lawrence Rajendran, University of Zurich
- Prof. Olivier Gandrillon, University of Lyon, France
- Prof. Jason Shoemaker, University of Pittsburgh, Pittsburgh, PA, USA
- Prof. Bernhard O. Boehm and Dr. Zhi Yang Tam, Singapore Phenome Center, Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore
- Prof. Fumihide Shiraishi and Dr. Kansuporn Sriyudthsak, Kyushu University, Japan
- Profs. Saif A. K. Khan and R. Rajagopalan, National University of Singapore

PROFESSIONAL ACTIVITIES AND SERVICES

Committee

- International Programming Committee, Foundations of Systems Biology in Engineering (FOSBE), Chicago, USA, 2018.
- Co-chair, Biochemical Systems Theory Conference, Munich, Germany, 2017.
- Area chair International Programming Committee, Foundations of Systems Biology in Engineering (FOSBE), Magdeburg, Germany, 2016.
- Scoring review panel, *sbvImprover Systems Toxicology Challenge*, Philip-Morris International, starting May 2015.
- Scoring review panel, *sbvImprover Species Translational Challenge*, Philip-Morris International, March-December 2013.
- *International Symposium on Advanced Control of Chemical Processes (ADCHEM)*, Singapore, July 2012
- *5th International Symposium on Design, Operation and Control of Chemical Processes*, Singapore, July 2010
- *3rd International Conference on Bioinformatics and Systems Biology (BSB)*, Chongqing, China, July 2010
- *International Conference on Molecular Systems Biology (ICMSB)*, UP Diliman, Philippines, February 2008.

Editorial Board Memberships

- Member of Editorial Board: *Processes, ScienceMatters*
- Member of Editorial Advisory Board: *Industrial & Engineering Chemistry Research*

Professional Societies

- Member, American Institute of Chemical Engineers (AIChE)
- Member, Institute Society for Computational Biology
- Member, Society for Biological Engineering
- Member, IEEE

GRANTS

Active

- PI: “MetAge: Metabolic network analysis for understanding the biology of ageing”, 2016-2018, SNSF, CHF211,060.
- PI: “Ensemble inference of gene regulatory networks”, 2015 – 2017, SNSF, CHF 194,550.
- PI: “Network perturbation discovery under uncertainty”, 2014 – 2016, ETH Grants, CHF 183,400.
- co-PI: “Large-scale single organism studies in *Caenorhabditis elegans*”, 2013 – 2016, Swiss National Science Foundation, CHF600,000.

Past

- PI: “Benchmarking, assessment and development of methods for biological network inference”, 2012 – 2014, Swiss National Science Foundation, CHF317,094.
- PI: “Understanding, screening and optimizing single-step crystallization and granulation of API by emulsion-based processing - a combined microfluidics and multi-scale modeling approach”, GSK-Singapore, 2010-2014, S\$744,000.
- PI: “Mathematical models for the study of sarcopenia”, 2010-2013, MOE NUS-FRC, S\$112,286.
- PI: “Global robustness analysis of cellular networks: a molecular perspective”, 2009-2010, MOE NUS-FRC, S\$39,000.
- PI: “Elucidating the role of cristae junction remodeling in cell death: an *in silico* approach”, 2007-2008, NUS Cross Faculty Grant, S\$35,000.
- PI: “Reverse engineering of robust stochastic biological systems”, 2007-2009, S\$122,890.