



Dr. Luis U. Aguilera

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POSTDOCTORAL EXPERIENCE

April 2017 – present

W.M. Keck Postdoctoral Scholar

Department of Chemical and Biological Engineering. School of Biomedical Engineering. Colorado State University, Fort Collins, Colorado. Supervisor: Dr. Brian Munsky.

- Stochastic modeling of gene expression.
- Development of scientific software in Python and Matlab.
- Molecular biology techniques and microscopy.

May 2015 – April 2017

Postdoctoral Researcher

Department of Modeling of Biological Processes. Bioquant. Heidelberg University, Germany. Supervisor: Dr. Ursula Kummer.

- Computational techniques to fit stochastic models to high-throughput data.
- Stochastic modeling of the interferon immune response.

EDUCATION

2011 – 2015

Doctor of Philosophy in Biomedical Engineering and Physics

Center for Research and Advanced Studies of the National Polytechnic Institute. CINVESTAV-IPN, Campus Monterrey, Mexico. Systems Biology Lab.

- Thesis: Study of the molecular mechanisms involved in HIV latency.
- Supervisor: Dr. Jesús G. Rodríguez.
- Honors: Fellowship for the "National Short Course in Systems Biology Morphogenesis & Spatial Dynamics" at the Center for Complex Biological Systems, University of California Irvine.
- Transcripts summary: 9.95/10.

2009 – 2011

Master of Science in Biomedical Engineering and Physics

CINVESTAV-Monterrey, Mexico. Systems Biology Lab.

- Thesis: Mathematical model of the signal pathway induced by the speract in the sperm's flagellum from the sea urchin (*Strongylocentrotus purpuratus*).
- Supervisor: Dr. Moisés Santillán Zerón.
- Transcripts summary: 9.3/10.

2004 – 2009

Bachelors of Science in Biotechnology and Genetics

School of Biology at the Autonomous University of Nuevo Leon (UANL), Mexico. Department of Microbiology. Laboratory for Genomics and Bioinformatics.

- Thesis: *Gorilla gorilla gorilla* growth hormone gene family: molecular cloning, sequencing and characterization.
- Supervisors: Dra. Elva T. Arechiga and Dr. Hugo Alberto Barrera Saldaña.
- Honors: Best Bachelors thesis at UANL in the category of natural sciences 2009.
- Transcripts summary: 91.89/100.

SKILLS

Languages

- Spanish – Native Speaker.
- English – Advanced.

Computational Skills

- Biostatistics and bioinformatics.
- Deterministic and stochastic modeling of biological systems.
- Parallel computing and use of computational clusters.
- Optimization.
- Software design and development.
- Version control software, Git/Github.
- Functional programming and object oriented programming.
- Advanced proficiency in the following programming languages and OS: Matlab, Python, Copasi, GNU-Octave, Linux.

Molecular Biology Skills

- Microbiological techniques.
- Serology testing, design and analysis.
- Experimental and statistical design.
- Nucleic acid manipulation techniques.
- Molecular diagnostic tests (use, design, and interpretation).

ACADEMIC INFORMATION

Current Distinctions

- 2018-present. Member of the Mexican National System of Researchers (Sistema Nacional de Investigadores). SNI-Level 1.

Teaching Experience

- 2011-2012. Teacher at the School of Physics and Mathematics at UANL, Mexico. Subjects: Introduction to Genomics and Bioinformatics.

Laboratory Experience

- 2007 - 2009. Thesis. Laboratory for Genomics and Bioinformatics. 2 years. School of Medicine at the UANL, Mexico. Cloning, sequencing, and homology analysis of primate DNA. Supervisor: Dr. Hugo A. Barrera Saldaña.
- 2004. Summer Science Research. Molecular Diagnostics Unit. 10 weeks. School of Medicine at the UANL, Mexico. PCR diagnosis of human papilloma virus. Sample processing and DNA manipulation. Supervisor: Dr. Rocío Ortiz López.

List of Publications

- **Aguilera LU**, Galindo BE, Sánchez D, Santillán M (2012) What is the core oscillator in the speract-activated pathway of the *Strongylocentrotus purpuratus* sperm flagellum? *Biophysical Journal* 102: 2481–2488.
- **Aguilera LU**, Rodríguez-González J (2014) Studying HIV latency by modeling the interaction between HIV proteins and the innate immune response. *Journal of Theoretical Biology* 360: 67–77.
- **Aguilera LU**, Zimmer C, Kummer U (2017). A New Efficient Approach to Fit Stochastic Models on the Basis of High-throughput Experimental Data Using a Model of IRF7 Gene Expression as Case Study. *BMC Systems Biology*. 11:26.
- **Aguilera, LU**, Rodríguez-González, J. (2019). Modeling the effect of tat inhibitors on HIV latency. *Journal of theoretical biology*, 473, 20-27.
- Lyon, K., **Aguilera, LU**, Morisaki, T., Munsky, B., Stasevich, T. J. (2019). Live-cell single RNA imaging reveals bursts of translational frameshifting. *Molecular cell*.
- **Aguilera, LU**, Bergmann, F. T., Dalmasso, G., Elmas, S., Elsässer, T., Großholz, R., ..., Veith, N. (2019). Robustness of frequency vs. amplitude coding of calcium oscillations during changing temperatures. *Biophysical chemistry*, 245, 17-24.
- **Aguilera, L.**, Raymond, W., Fox, Z. R., May, M. P., Djokic, E., Morisaki, T., Stasevich T.J., Munsky, B. (2019). Computational design and interpretation of live-cell, single-RNA translation experiments. *PLoS Computational Biology* 15 (10).
- Koch A., **Aguilera L.**, Morisaki T., Munsky B., Stasevich T.J. (2020). Quantifying the dynamics of IRES and cap translation with single-molecule resolution in live cells. *Nature Structural and Molecular Biology*.
- Castaño-Arcila, Mauricio, **Luis U. Aguilera**, and Jesús Rodríguez-González. (2021). Modeling the intracellular dynamics of the dengue viral infection and the innate immune response. *Journal of Theoretical Biology*. 509:110529.

Scientific Software Projects

- 2017-present. **rSNAPsim** a new open-source software package, RNA Sequence to NAscent Protein Simulator. Active developer. Language: Python and Matlab. https://github.com/MunskyGroup/Aguilera_PLoS_CompBio_2019 <https://github.com/MunskyGroup/rSNAPsim.git>
- 2020. Code to simulate IRES-CAP translation. Language: Matlab. https://github.com/MunskyGroup/Koch_Aguilera_etal_2020
- 2019. Code to simulate Ribosomal frameshifting. Language: Matlab. https://github.com/MunskyGroup/bursty_frameshift_source_code
- 2020-present. A pipeline for single-molecule resolution microscopy. Language: Python. Active developer.

Conferences, Seminars, and Meetings

- III International Congress of Biotechnology and Genomics Genobiotec. Oral presentation. *Gorilla gorilla gorilla* growth hormone gene family. Monterrey, Mexico. 2011.
- Epidemics3. Third International Conference on Infectious Disease Dynamics. Boston, USA. 2011.
- 2nd Annual SoCal System Biology Conference, UCI, Irvine California, USA. Oral presentation. 2012.
- 15th International EMBL PhD symposium. Competence in Biology. The race for survival from molecules to Systems, Heidelberg, Germany. Poster presentation. 2013.
- Immunoquant meeting at Bioquant, Heidelberg University. Oral presentation. Heidelberg, Germany. 2014.
- Challenge Workshop Parameter and State Estimation, Methods, Software, Applications. Heidelberg Collaboratory for industrial Optimization. Heidelberg, Germany. 2015.
- Immunoquant meeting at Bioquant, Heidelberg University. Oral presentation. Heidelberg, Germany. 2016.
- Conference on Computational Modeling with COPASI. Poster and Oral Presentation. Manchester, UK. 2016.
- 17th International Conference on Systems Biology - ICSB. Oral Presentation. Barcelona, Spain. 2016.
- 62nd annual meeting of the Biophysical Society. Poster Presentation. San Francisco California, USA. 2018.
- Gordon Research Conference. Stochastic Physics in Biology. Oral Presentation. California, USA 2019.
- Colorado Single Molecules and Membranes Meeting. University of Colorado Denver. Oral Presentation. Colorado, USA. 2020.
- 64nd annual meeting of the Biophysical Society. Poster Presentation. San Diego California, USA. 2020.
- APS March Meeting 2020. Oral Presentation. Presentation posted online.
- APS March Meeting 2021. Oral Presentation. Accepted.

Supervisors

- **Postdoc supervisor.** Dr. Brian Munsky. Colorado State University. Brian.Munsky@colostate.edu
- **PhD supervisor.** Dr. Jesús Rodríguez González. Cinvestav-IPN, Monterrey, Mexico. jrodriguez@cinvestav.mx
- **MS supervisor.** Dr. Moisés Santillán-Zeron. Cinvestav-IPN, Monterrey, Mexico. moises.santillan@me.com
- **Bachelor's supervisor.** Dr. Hugo A. Barrera Saldaña. Tecnológico de Monterrey, Mexico. habarrera@gmail.com