

Bruno G Beltran

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PERMANENT ADDRESS

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OBJECTIVE

Apply my computational and mathematical expertise to research problems requiring bottom-up, analytical models

EDUCATION

STANFORD UNIVERSITY, BIOPHYSICS PROGRAM, STANFORD, CA
NSF (GRFP) Research Fellow
Doctor of Philosophy, Biophysics (Ph.D.), September 2015-May 2020

LOUISIANA STATE UNIVERSITY, HONORS COLLEGE, BATON ROUGE, LA
Bachelor of Science, Mathematics (B.S.), GPA: 3.97, August 2011-May 2015
GRE: 164V/168Q/5A (93%/95%/93%)

RESEARCH EXPERIENCE

Papers:

- Beltran B**, MacPherson Q, Spakowitz AJ. *Waiting Times from Finite Trajectories*. (in preparation)
- Newman T*, **Beltran B***, McGehee J, Elnatan D, Cahoon C, Chua D, Spakowitz AJ, Burgess S. *Homologous chromosomes undergo sequential, quasi-stable, interactions during meiotic prophase*. (in preparation)
- Sandholtz S, **Beltran B**, Spakowitz AJ. *Physical Modeling of the Spreading of Epigenetic Modifications Through Transient DNA Looping*. Physical Review E. (in review)
- Beltran B***, Kannan D*, MacPherson Q, Spakowitz AJ. *Heterogeneity in Nucleosome Spacing Governs Chromatin Elasticity*. PRL. (in review)
- Kim S, **Beltran B**, Imov I, Jacobs-Wagner C. *Transcription-induced DNA supercoiling mediates long-distance collaborative and antagonistic RNA polymerase dynamics*. Cell. (2019)
- Ghosh RP, Franklin JM, Draper WE, Shi Q, **Beltran B**, Spakowitz AJ, Liphardt J. *A fluorogenic array for temporally unlimited single-molecule tracking*. Nature Chemical Biology. (2019)
- MacPherson Q, **Beltran B**, Spakowitz AJ. *Bottom-up modeling of chromatin segregation due to epigenetic modifications*. PNAS. (2018)
- Campos M, Surovtsev I, Kato S, Paintdakhi A, **Beltran B**, Ebmeier S, Jacobs-Wagner C. *A Constant Size Extension Drives Bacterial Cell Size Homeostasis*. Cell. (2014)
- Hoong C, Surovtsev I, **Beltran B**, Huang F, Bewersdorf J, Jacobs-Wagner C. *Evidence for a DNA-relay mechanism in ParABS-mediated chromosome segregation*. eLife. (2014)

Research Experiences:

Stanford University: Biophysics PhD under Dr. Andrew Spakowitz
– Effects of Nucleosome Spacing Noise on Chromatin Organization (manuscript, poster)

Presentations:

- Non-specific Chromatin Remodelers Can Facilitate Enhancer Looping – Colloquium for Stanford's Chromatin Club
- Heterogeneity in Nucleosome Spacing Governs Chromatin Elasticity – Poster presented at the 2019 BPS Thematic Meeting in Les Houches and at the 2019 "Genome Architecture and Dynamics Workshop" in Varna, Bulgaria

RESEARCH EXPERIENCE (cont.)

Research Experiences:

Stanford University: Biophysics PhD under Dr. Andrew Spakowitz

- Lifetime Distributions of Polymer Loops: Applications to Homolog Pairing in Prophase I (manuscript, poster) and H3K9me3 Spreading (manuscript)
- Generalized Meier-Kaplan Methods (manuscript)
- Stoichiometric Lotka-Volterra Equations

Louisiana State University: Undergraduate Honors Thesis under Dr. Frank Neubrandner

Louisiana State University: Hardware Specialist and Lead Coder under Dr. Robert Kooima

- Erebus: An Arcade-Style Experiment in Modern Graphics and Human Interaction

Yale University and the Howard Hughes Medical

Institute: EXROP Scholar under Dr. Christine Jacobs-Wagner

- Chromosome Segregation in *C. crescentus* (paper, poster)
- Cell Size Control Mechanisms in *C. crescentus* (paper)

Louisiana State University: Global Leaders in Research Program under Dr. Frank Neubrandner

- Numerical Laplace Inversion Using Rational Padé Approximants (technical report)

Arizona State University: Mathematical and Theoretical Biology Institute NSF Summer Program under Dr. Carlos Castillo-Chavez

- Secondary Aneurysm Formation Due to the Effects of a Primary Aneurysm (technical report, poster)

Louisiana State University: Undergraduate Mathematics Research Seminar under Dr. Frank Neubrandner

- Numerical Methods for Approximating the Matrix Exponential (poster)

Presentations:

- Increased Dynamics in Meiotic Nuclei Allows for Passive Homolog Search – Talk at BPS 2018 and poster for 2019 BioX Symposium
- Exploring the Effects of Cooperation in Bacterial Communities Using Stoichiometrically-Explicit Lotka-Volterra Models – Talk at Lake Como School of Advanced Studies "Quantitative Laws II"
- Sharp Growth Estimates for Sub-diagonal Rational Padé Approximants – Undergraduate Honors Thesis
- Unveiled at LSU's *enOvation* showcase – May 2014
- A mathematical model for ParABS-mediated chromosome segregation in *C. crescentus* – Poster presented at LSU's 2014 Undergraduate Honors Colloquium and HHMI's 2014 EXROP Meetings
- Approximating Operator Semigroups: The Real Story of the Complex Exponential – Invited Talk for the Spring 2013 Colloquium Series at Humboldt State University, and a presentation award at LSU's 2013 Undergraduate Research Conference
- Secondary Intracranial Aneurysm Formation Due to the Effects of a Primary Aneurysm – Talks given at the 2013 Mid-Atlantic SIAM Meeting (as chair of the session), Brown's 2013 SUMS Research Conference, the 2013 Joint Mathematics Meetings, and LSU's 2012 Undergraduate Research Conference
- Secondary Aneurysm Formation – Poster presented at SACNAS 2012 and LSU's 2013 Undergraduate Honors Colloquium
- A New Twist on Computing the Matrix Exponential - Poster presentation at LSU's 2012 Undergraduate Research Conference and the 2013 SIAM/MAA Mid-Atlantic Student Conference

COMPUTATIONAL SKILLS

Proficiencies: Python, C, C++, Git, Linux System Administration, Cl, LaTeX, Mathematica, Matlab, Unity3D

Experienced with: 32-bit MIPS assembly, Bash, Blender, C#, Haskell, Java, OCaml, computational fluid dynamics using OpenFOAM and ANSYS Fluent/Workbench, Perl, PHP, Puppet, HTML5, CSS3, Javascript

WORK EXPERIENCE

RESEARCH TECH I, ORANGE, CT

HHMI: Jacobs-Wagner Lab, Yale University, January 2015 – August 2015

EXROP CAPSTONE RESEARCH FELLOW, NEW HAVEN, CT

Yale: MC&D Biology Department, June 2014 – August 2014

STUDENT RESEARCHER & LINUX ADMIN, BATON ROUGE, LA

LSU: Chemical Engineering Department, August 2013 – August 2014

EXROP RESEARCH FELLOW, NEW HAVEN, CT

Yale: MC&D Biology Department, May 2013 – August 2013

SUMMER UNDERGRADUATE RESEARCH FELLOW, TEMPE, AZ

ASU: Mathematical and Theoretical Biology Institute, May 2012 – August 2012

FOUNDER & MANAGER, BATON ROUGE, LA

Cain Center Tutoring, August 2012 – May 2013

STUDENT WORKER & RESEARCHER, BATON ROUGE, LA

LSU: Cain Center, August 2011 – May 2013

VOLUNTEER WORK

~15 Hours

VOLUNTEER LSU STAFF, BATON ROUGE, LA

LSU Honors College, September 2011

- Manned a voter registration drive in celebration of Mississippi's "Freedom Summer" of 1964
- Repaired and repainted local schools

300+ Hours

VOLUNTEER CAMP COUNSELOR, LAKE CHARLES, LA

ETC, March 2011 – June 2011 & March 2012 – June 2012

- Monitored high-risk children at camp, mediating between them and the psychiatrist in charge of their cases

70+ Hours

STUDENT VOLUNTEER, LAKE CHARLES, LA

Memorial Hospital, Summer 2009 and Summer 2010

- Assisted with paperwork and running miscellaneous errands in the ICU, PT/OT, and Orthopedics departments

RELATED COURSEWORK

(STANFORD):

- CS 229 – Machine Learning
- MATH 236 – Introduction to Stochastic Differential Equations
- BIOE 300a – Molecular and Cellular Bioengineering
- CSB 260 – Concepts and Applications in Chemical Biology
- BIOPHYS 242 – Methods in Molecular Biophysics
- BIOS 232 – Two-Photon Imaging of Neural Circuits
- BIO 214 – Advanced Cell Biology
- MATH 7380 – Tempered Distributions and Integral Transforms of Generalized Functions
- MATH 7350 – Complex Analysis
- MATH 7330 – Functional Analysis
- MATH 7320 – Differential Equations
- MATH 7210 – Algebra I
- HNRS 3999 – Thesis Research II
- MATH 4999 – Thesis Research I
- MATH 4997 – Theory of Distributions
- MATH 4066 – Numerical Differential Equations
- MATH 4200 – HONORS: Abstract Algebra
- MATH 4036 – Complex Variables

(LSU):

- MATH 7325 – Finite Element Methods
- MATH 7360 – Probability Theory
- MATH 7390 – Calculus of Variations and Optimal Control
- MATH 7710 – Advanced Numerical Linear Algebra
- MATH 7510 – Topology I
- MATH 4031 – HONORS: Advanced Calculus I
- MATH 3903 – Methods of Problem Solving
- MATH 3355 – Probability
- MATH 2085 – Linear Algebra
- CSC 3501 – Computer Organization and Design (MIPS 32-bit assembly, circuit design)
- CSC 3102 – Advanced Data Structures and Algorithm Analysis (using the C language)

HONORS

NSF GRFP Fellow, Goldwater Scholar, LSU Discover Scholar 2014-15, Honors College Outstanding Junior 2013-14, College of Science Dean's Honor Award 2013-14, Phi Kappa Phi's 2014 Outstanding Junior Award, Demarcus D. Smith III Undergraduate Mathematics Scholarship, LA-STEM Scholarship, 2nd place in the 2013 MAA Louisiana/Mississippi Sectional Meeting's Mathematics Contest, National Hispanic Scholar, National Merit Scholar, LSU Flagship Scholarship, LSU Alumni Association Global Leaders Scholarship, LSU Distinguished Freshman Award, Southwest Louisiana Alumni Chapter Endowed Scholarship, TOPS HONORS Award, SWLA Health Services Scholarship.