Pablo Cárdenas R.

Cambridge, MA, USA (*citizen of Colombia, F1 visa status*)

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Education

Massachusetts Institute of Technology (MIT) — Cambridge, MA, USA   **Ongoing**
PhD Candidate, Department of Biological Engineering (GPA: 5.0/5.0)

Universidad de los Andes (Uniandes) — Bogotá, Colombia   **Mar, 2018**
Bachelor of Science *Summa Cum Laude* in Microbiology, minor in Bioinformatics (GPA: 4.84/5.0)

Research

Department of Biological Engineering, MIT — Cambridge, MA
Graduate Research Assistant   **Sep 2018 ++**
→ Designing molecular and computational tools for transcriptional control, functional genetics, and drug discovery in the malarial parasite *Plasmodium falciparum* (Prof. Jacquin C. Niles)
→ Helped model, construct, and test a control system for managing a shared cell resource in genetic circuits (Prof. Domitilla Del Vecchio, Mechanical Engineering)
→ Designed a mathematical model to guide *in vitro* studies of the efficacy and dynamics of a synthetic probiotic system for prevention of gut dysbiosis (Prof. James J. Collins)
→ Created an epidemiological modeling framework for pathogen population genetics and evolution.
→ Created a bioinformatic pipeline to identify cross-reactive T cell epitopes in SARS-CoV-2 (Profs. Mauricio Calvo-Calle & Lawrence Stern, University of Massachusetts Medical School)

Department of Systems Biology, Harvard Medical School — Boston, MA
Undergraduate Researcher   **Feb – Jul 2018**
→ Constructed and applied microfluidic systems to study bacterial physiology and persister cell formation
→ Helped develop computational workflows for analysis of single-cell imaging (Prof. Johan Paulsson)

Eligo Bioscience — Paris, France
Research Intern in Synthetic Biology   **Aug 2017 – Jan 2018**
→ Created DNA constructs and bacterial strains for phage production using CRISPR-Cas9 editing
→ Screened libraries of synthetic phage candidates against bacterial strains

Mathematical and Theoretical Biology Institute, Arizona State University — Tempe, AZ
Undergraduate Researcher   **Jun – Jul 2017**
→ Created a 3D, spatially explicit computational model of bacterial resistance to antibiotics in a biofilm

Department of Biological Engineering, MIT — Cambridge, MA
Undergraduate Researcher   **May – Aug 2016**
→ Assembled CRISPR-Cas9 constructs for gene editing in the malaria parasite (Prof. Jacquin Niles)

Department of Biological Sciences, Uniandes — Bogotá, Colombia
Undergraduate Researcher   **May 2015 - Aug 2017**
→ Designed and experimentally tested an ODE model of phage-host dynamics (Prof. Martha Vives)
→ Applied Hidden Markov Models to identify phages in human gut metagenomes (Prof. Alejandro Reyes)
→ Helped build DNA parts for a cholera biosensor with the 2014 Uniandes iGEM team (Prof. J.M. Pedraza)

Selected Publications

Peer-reviewed research: *These authors contributed equally to the work.*

GeneTargeter: automated, in silico *design for genome editing in the malaria parasite, P. falciparum*   **2022**
    P. Cárdenas, L.Y. Esherick, G. Chambonnier, S. Dey, C.V. Turlo, A.S. Nasamu, J.C. Niles
    The CRISPR Journal. doi: 10.1089/crispr.2021.0069

Preventing antibiotic-induced dysbiosis with an engineered live biotherapeutic   **2022**
    A. Cubillos-Ruiz, M.A. Alcantar, N.M. Donghia, **P. Cárdenas**, J. Ávila-Pacheco, J.J. Collins
    Nature Biomedical Engineering. Accepted.

dCas9 regulator to neutralize competition in CRISPRi circuits   **2021**
    H.-H. Huang*, M. Bellato*, Y. Qian, **P. Cárdenas**, L. Pasotti, P. Magni, & D. Del Vecchio
    Nature Communications; doi: 10.1038/s41467-021-21772-6.

Host resistance, genomics and population dynamics in a Salmonella *Enteritidis and phage system.*   **2019**
    A.V. Holguín, **P. Cárdenas**, C. Prada-Peñaranda, L. Rabelo Leite, C. Buitrago, V. Clavijo, ... , & M.J. Vives.
    Viruses. doi: 10.3390/v11020188

Preprints: *These authors contributed equally to the work.*

Resolving drug selection and migration in an inbred South American Plasmodium falciparum   **2022**
    population with identity-by-descent analysis
    M. Carrasquilla*, A.M. Early*, A.R. Taylor, A. Knudson, D.F. Echeverry, T.J.C. Anderson, E. Mancilla,
    S. Aponte, **P. Cárdenas**, C.O. Buckee, J.C. Rayner, F.E. Sáenz, D.E. Neafsey, V. Corredor
    Preprint doi: 10.1101/2022.02.18.480973

Genomic epidemiological models describe pathogen evolution across fitness valleys   **2021**
    P. Cárdenas, M. Santos-Vega
    Preprint doi: 10.1101/2021.12.16.473045

Selected Teaching & Mentorship

Department of Biological Engineering (BE), MIT — Cambridge, MA, USA
Coding Support Fellow, Biological Engineering Data Lab (BEDL)   **Mar 2019 ++**
Teaching Assistant, Principles of Molecular Bioengineering   **Sep – Dec 2019**
Peer Counselor, BE Resources for Easing Friction and Stress (REFS)   **Jan 2018 ++**
Depts. Biological Science, Biomedical Engineering, & Student Affairs; Uniandes — Bogotá, Colombia
Teaching Assistant, Quantitative Human Physiology I and II   **Jan – Dec 2016**
Teaching Assistant, Parasitology Laboratory   **Jan – Jun 2015**
Teaching and Coordination Assistant; high school tutor, Social Practice Program   **Jul – Dec 2015**

Selected Awards & Fellowships

S. & P. Eurnekian Biotechnology Fellowship, (Office of Graduate Education, MIT)   **Apr 2021**
    Awarded by competition. (1 semester tuition, insurance, stipend; ≈43,000 USD)
Teaching Assistant Excellence Award, (Department of Biological Engineering, MIT)   **Dec 2020**
    Best teaching assistant in MIT BE-Fall 2019, based on student and faculty feedback. (1000 USD)
Summa Cum Laude (Faculty of Sciences, Uniandes)   **Mar 2018**
    Awarded to top 1% Faculty of Sciences historic graduates who also demonstrate strong community service.
Best *Saber Pro* Graduate National Exam, Biology (Ministry of Education, Colombia)   **Nov 2017**
    Awarded to nation-wide top scores on Colombian ICFES-Saber Pro exam for university graduates.
Ramón de Zubiría Awards (4) (Uniandes)   **Nov 2015–Oct 2017**
    For the highest GPA in a program, won in Microbiology (1x) and Biomedical Engineering (3x).