

Pablo Cárdenas R.

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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. Jacquín 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

- Helped develop computational workflows for analysis of single-cell imaging (Prof. Johan Paulsson)
- Constructed and applied microfluidic systems to study bacterial physiology and persister cell formation

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. Jacquín Niles)
- Carried out a computational genome-wide scan and analysis of Cas9 and Cas12a sites in *P. falciparum*

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)

Teaching & Mentorship

Department of Biological Engineering (BE), MIT — Cambridge, MA, USA

Coding Fellow, Biological Engineering Data Lab

Mar 2019 ++

- Providing 1-on-1 coaching for programming and biological data analysis to undergraduates, graduate students, and postdocs at MIT as an inaugural fellow at the [BE Data Lab](#)
- Mentored an undergraduate student in a semester-long individual project in genomics and epidemiology as an Experiential Learning Opportunity class

Teaching Assistant, Principles of Molecular Bioengineering

Sep – Dec 2019

- Assignment and exam design and grading, review lecture sessions, one-on-one tutoring for 40 students (Profs. Ernest Fraenkel and Alan Jasanoff)
- Awarded best Fall 2019 teaching assistant at the MIT Department of Biological Engineering

Peer Counsellor, BE Resources for Easing Friction and Stress (REFS)

Jan 2018 ++

- Providing 1-on-1 confidential counselling for graduate students at MIT BE as a member of the [BE REFS](#)
- Underwent a week-long training course on conflict coaching and support resources for grad students
- Working with the MIT BE Department leadership and Grad Student Board to improve graduate experience

Department of Biomedical Engineering, Uniandes — Bogotá, Colombia

Teaching Assistant, Quantitative Human Physiology I and II

Jan – Dec 2016

- Assignment design and grading, review sessions, and teaching main lectures during professor absences for 100 students (Prof. Juan Manuel Cordovez)

Department of Student Affairs, Uniandes — Bogotá, Colombia

Teaching Assistant, Social Practice Program

Jul – Dec 2015

- Trained, guided, and evaluated 60 Uniandes students serving as tutors for low-income high school students (Instructors David Parga and María del Pilar Pérez)

Volunteer Tutor, Social Practice Program

Jan – Jun 2015

- Provided academic tutoring and review sessions three hours a week for a group of 10 low-income high school students in Bogotá
- Designed a semester-long tutoring curriculum to reinforce high school classes and prepare students for the ICFES-Saber 11 state exam

Department of Biological Sciences, Uniandes — Bogotá, Colombia

Teaching Assistant, Parasitology Laboratory

Jan – Jun 2015

- Provided review sessions and tutoring, helped develop and grade assignments, and prepared microscope slides (Instructor Laura Tamayo and Prof. Camila González)

Association of Students with Financial Aid (ANDAR), Uniandes — Bogotá, Colombia

Co-leader, First Year Mentorship Program

Jul 2016 – May 2017

- Provided individual tutoring and calculus review sessions for Uniandes students receiving financial aid
- Designed integration and counseling activities, helped develop student housing networks
- Coordinated up to eight teams of Uniandes students mentoring 20 incoming students receiving financial aid through their first semester

First Year Mentor & Academic tutor

Jul – Dec 2015

- Trained, guided, and evaluated 60 Uniandes students serving as tutors for low-income high school students (Instructors David Parga and María del Pilar Pérez)

Publications

Peer-reviewed research:

**These authors contributed equally to the work.*

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](https://doi.org/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](https://doi.org/10.3390/v11020188)

Research submitted for publication:

Preventing antibiotic-induced dysbiosis with an engineered probiotic

A. Cubillos-Ruiz, M.A. Alcantar, N.M. Donghia, **P. Cárdenas**, J. Avila-Pacheco, J. J. Collins

An essential, multifunctional lipocalin from Plasmodium falciparum with heme-related and antioxidant functions

M. Nakashima, K.T. Osman, A.S. Nasamu, A.M. Goren, S.J. Saha, **P. Cárdenas**, C.L. Drennan, J.C. Niles.

Manuscripts in preparation:

GeneTargeter: automated, in silico design for genome editing in the malaria parasite, Plasmodium falciparum

P. Cárdenas, L.Y. Esherick, G. Chambonnier, S. Dey, C.V. Turlo, A.S. Nasamu, J.C. Niles

Using Big Data to inform decision-making on COVID-19 in Colombia: a micro-territorial experimental design framework for urban interventions and policy evaluation

F. González-Casabianca, M. Santos-Vega, F. Andrade-Rivas, A. Parra, J. Cascante, **P. Cárdenas**, ... & A. Feged-Rivadeneira

Technical reports:

**These authors contributed equally to the work.*

Cheating the cheaters: spatial dynamics in the evolutionary stability of antibiotic resistance. **2018**

D. Akman*, L. Callaway III*, **P. Cárdenas***, J. Nieve-Silva*, ..., L. Arreola, C. Castillo-Garsow
Technical report available from MTBI, Arizona State University.

Reviews and commentary:

Starting from scratch: a workflow for building truly novel proteins **2021**

P. Cárdenas. *Synthetic Biology* (accepted), ysab005, doi: [10.1093/synbio/ysab005](https://doi.org/10.1093/synbio/ysab005)

Designing for durability: new tools to build stable, non-repetitive DNA **2020**

P. Cárdenas. *Synthetic Biology*, 5(1), ysaa016, doi: [10.1093/synbio/ysaa016](https://doi.org/10.1093/synbio/ysaa016)

Awards & Fellowships

- Surpina and Panos Eurnekian Biotechnology Fellowship**, (Office of Graduate Education, MIT) **Apr 2021**
*Awarded by competition to an MIT student pursuing research in biotechnology.
(1 semester tuition, insurance, stipend; ≈43,000 USD)*
- Teaching Assistant Excellence Award**, (Department of Biological Engineering, MIT) **Dec 2020**
*Best teaching assistant in the department during the 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 the Colombian ICFES-Saber Pro exam for university graduates.
- Ramón de Zubiría Awards** (4) (Uniandes) **Nov 2015–Oct 2017**
For the highest cumulative GPA in a program, won in Microbiology (1x) and Biomedical Engineering (3x).
- Alberto Magno Award** (Uniandes) **Oct 2013**
Given to the top ten application scores among admitted students university-wide in a semester.