

# Ana Y. Morales-Arce

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## ACADEMIC APPOINTMENTS

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- Present-2020 Postdoctoral Fellow, Instituto Gulbenkian de Ciência, Oeiras, Portugal.  
2020-2018 Postdoctoral Fellow, Center for Evolution and Medicine (CEM), Arizona State University, USA.

## EDUCATION

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- 2017-2012 Ph.D. Archaeology, University of Calgary, Canada  
Thesis: Ancient mitochondrial DNA in Mesoamerica and its borderlands. The cases of Paquimé (A.D. 1200-1450), Greater Nicoya (A.D. 800-1250) and Central Mexico (A.D. 900-1519).
- 2010-2006 M.Sc. Anthropology, University of Costa Rica  
Thesis: Genetic variation associated with lactose intolerance in Amerindians of Lower Central America and the related potential health problems.
- 2004 -2000 B.Sc. Biotechnology Engineering, Instituto Tecnológico de Costa Rica (TEC)  
Thesis: Genetic variation of squirrel monkeys (*Saimiri oerstedii*). Implications for conservation.

## RESEARCH INTERESTS

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Population genetics, pathogens evolution, molecular anthropology, ancient DNA.

## PUBLICATIONS

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- 2020 **Morales-Arce AY**, Johri P, Jensen JD. Inferring the distribution of fitness effects in influenza A virus and human cytomegalovirus. In review.
- 2020 **Morales-Arce AY**, Sabin SJ, Stone AC, Jensen JD. The population genomics of within-host *Mycobacterium tuberculosis*. *Heredity*, <https://doi.org/10.1038/s41437-020-00377-7>
- 2020 **Morales-Arce AY**, Harris RB, Stone AC, Jensen JD. Evaluating the contributions of purifying selection and progeny-skew in dictating within-host *Mycobacterium tuberculosis* evolution. *Evolution*, 74-5: 992-1001.
- 2019 **Morales-Arce AY**, McCafferty G, Hand J, Schmill N, McGrath K, Speller C. Ancient mitochondrial DNA and population dynamics in Postclassic Central Mexico: Cholula (A.D. 900-1350) and Tlatelolco (A.D. 1325-1521). *Archaeological and Anthropological Sciences*, 11: 3459-3475.
- 2017 **Morales-Arce AY**, Hofman CA, Duggan AT, Benfer AK, Katzenberg MA, McCafferty G, Warinner C. Successful reconstruction of whole mitochondrial genomes from ancient Central America and Mexico. *Scientific Reports*. 7(1):18100.
- 2017 **Morales-Arce AY**, Snow MH, Kelley JH, Katzenberg MA. Ancient mitochondrial DNA and ancestry of Paquimé inhabitants, Casas Grandes (1200-1450 A.D.). *American Journal of Physical Anthropology*, 163: 616-626.

- 2015 **Morales-Arce AY**. Ancient DNA studies in Mesoamerica: major contributions and limitations. *Proceedings of the Annual Chacmool Archaeological Conference* 47: 139-148.
- 2014 McCafferty G, Carrol G, Manion J, **Morales-Arce AY**, Smekal M. Huesos Nicaragua: Creación de un Laboratorio de Bio-Arqueología en la Universidad Nacional/ Bones Nicaragua: Creation of a Bio-Archaeology Laboratory in the National University. *Mi Museo y Vos* 29: 13-16.
- 2012 **Morales-Arce AY**, Alvarado Rojas S, Calvo Brenes M, Contreras Rojas J, Raventós Vorst. Un acercamiento al contenido cultural de los delirios de personas con esquizofrenia de Costa Rica/ Cultural content of delusions in people with schizophrenia from Costa Rica. *Cuadernos de Antropología*, 22.
- 2012 **Morales-Arce AY**. Lactose Intolerance in Indigenous Groups of Lower Central America. Genetic variation and its potential health problem. LAP LAMBERT Academic Publishing, Saarbrücken, Germany. 84p.

### SCHOLARSHIPS, GRANTS AND AWARDS

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- 2020-2018 Research Fellowship, CEM. Arizona State University. USD 140 000.
- 2012-2017 Wadsworth International Fellowship. The Wenner Gren Foundation. USD 70 000.
- 2016 Shelley Saunders PhD Research Award. The Canadian Association for Physical Anthropology. CAD 800.
- 2016 Martha Biggar Anders Memorial Award. University of Calgary. CAD 2200.
- 2016 Faculty of Graduate Studies Travel Award. University of Calgary. CAD 500.
- 2016 Professional Development Grant. GSA. University of Calgary. CAD 750.
- 2015 Dissertation Research Grant. University of Calgary. CAD 1500.
- 2015 Grants-in-Aid of Research Program. Sigma Xi. USD 600.

### TEACHING EXPERIENCE

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- 2017 **Instructor of Record**, University of Calgary  
*Introduction to Primatology and Human Evolution (ANTH 201, Winter 2017)*
- Enrollment: 200 students
- 2016-2013 **Teaching Assistant**, University of Calgary  
*Ethnographic Survey of Latin America (2013)*  
*Archaeology & Popular Culture -Frauds, Myths & Mysteries (2015)*  
*Introduction to Archaeology (2015)*
- Enrollment: 2 laboratories of 20 students each
- Head Graduate Teaching Assistant: Introduction to Physical Anthropology (2014-16)*
- Enrollment: 8 laboratories of 22 students each

- 2012-2011     **Instructor of Record**, University of Costa Rica  
*Molecular Basis of Human Phylogeny (2012)*
- Enrollment: 20 students
- Principles of Population Genetics (2011)*
- Enrollment: 30 students
- Biological Anthropology (2011)*
- Enrollment: 30 - 40 students

## RESEARCH & FIELDWORK EXPERIENCE

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### Post-doctorate Research

- July 2020-July 2018     Center for Evolution and Medicine, Arizona State University, USA
- Time sampled population genetics data analysis and Bayesian computation modeling for understanding evolutionary dynamics of within-host *Mycobacterium tuberculosis*, and distribution of fitness effects in influenza A and human cytomegalovirus.

### Primary PhD Research

- 2012-2017     Ancient DNA laboratory, University of Calgary, Canada
- Conducted research on ancient samples from Mesoamerica, Costa Rica, and Nicaragua using Sanger sequencing and contamination-controlled extractions of DNA. Dental metrics collected and casts produced prior to destructive analysis.
- 2016     McMaster Ancient DNA Centre, McMaster University, Canada
- Conducted analysis of Next Generation Sequencing data and mitogenomes from ancient Central American populations.
- 2016     Laboratories of Molecular Anthropology and Microbiome Research (LMAMR), Oklahoma State University, USA
- Applied Next Generation Sequencing methods to sequence mitogenomes from tropical archaeological dental samples.
- 2014     The National Museum of Costa Rica, Costa Rica
- Examined and collected human osteological samples from excavated archaeological sites: La Cascabel and Jícaro (1 month). Collected data for PhD project on skeletal preservation and archaeological context.

### Other fieldwork

- 2014     **Research Assistant**, UNAM, Nicaragua
- Assisted Dr. McCafferty on the successful creation of a Bio-Archaeology Laboratory in the National University.
- 2014     **Research Assistant**, Museo de las Culturas del Norte, Casas Grandes, INAH-Chihuahua, Mexico

- Assisted the study directed by Dr. Anne Katzenberg (University of Calgary), collecting archaeological human remains in the Casas Grandes, Paquimé.

2004

**Research Assistant**, School of Biology, University of Costa Rica, Costa Rica

- Assisted in fieldwork collecting primate blood samples in Manuel Antonio National Park, extraction of DNA and data analysis. Project: Genetic diversity of monkeys in Costa Rica, directed by Dr. Gustavo Gutierrez.

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## WORK EXPERIENCE

2012-2004      Research Assistant and Laboratory Technician, Genetics Laboratory, School of Biology, University of Costa Rica

- Carried out genetic techniques and protocols for multiple faculty members, coordinated research activities and grant applications, was accountable for budgets and development of new methodologies and experimental techniques

August 2011-July 2012, with Prof. Henriette Raventós-Vorst, Center for Molecular Biology, School of Biology, University of Costa Rica

- Investigated susceptibility genes for schizophrenia in Costa Rica. Screened several genetic (molecular) markers associated to OPO using the genetic analyzer ABI Prism 3130

July 2009-July 2011 with Prof. Jorge Azofeifa Navas, School of Biology, University of Costa Rica

- Genetic variation in modern groups of Lower Central America. Ancient DNA laboratory design and training on contamination issues in archaeological sites.
- Haplotypic variation around the region of the lactase gene (LCT, 2q21) in Costa Rica.

May 2004-June 2009 with Prof. Ramiro Barrantes, School of Biology, University of Costa Rica

- History and genetic structure of Costa Rica: molecular, demographic and social perspective.
- Mitochondrial DNA and Y chromosome analysis in Costa Rica.
- Haplotypic variation of TP53 locus in Amerindians of Lower Central America. Sequencing and genotyping DNA in 3130 and 310 genetic analyzers.

2004-2003      Biotechnology Department, Technological Institute of Costa Rica (TEC), Costa Rica

- Carried out sampling in the forest and DNA extraction as well as molecular analysis.

June 2003-November 2003 with Prof. Olman Murillo

- Genetic variability of Jaúl (*Alnus acuminata*) in Costa Rica.

March 2003-July 2003, Computer technician at LAIMI (Microprocessor Laboratory of the Technological Institute of Costa Rica)

## CONFERENCE PRESENTATIONS

April 2020

The population genetics of within-host *Mycobacterium tuberculosis*. American Association of Physical Anthropologists. Los Angeles, CA, USA

- July 2019 The population genetics of within-host drug resistance in *Mycobacterium tuberculosis*. Society for Molecular Biology and Evolution (SMBE). Manchester, UK.
- April 2019 The population genetics of within-host *Mycobacterium tuberculosis*. The Evolutionary Genetics of Infectious Disease, Carleton University, ON.
- April 2019 Greater Nicoya from an ancient molecular perspective. Society for American Archaeology 84th Annual Meeting (SAA), Albuquerque, NM.
- November 2017 Ancient Mesoamerican groups and their multiple faces: From Cholula and Tlatelolco to an ancient genetic landscape in Central Mexico and beyond. 50th Chacmool Conference, Calgary, AB. *Session organizer and presenter*.
- May 2016 Infant sex determination and ancient mtDNA among offerings dedicated to Ehécatl-Quetzalcóatl in Tlatelolco (1325-1521 AD). 49th Annual Meeting of the Canadian Archaeological Association (CAA), Whitehorse, Yukon.
- April 2016 Ancient mitochondrial DNA of Pre-Columbian populations inhabiting Greater Nicoya during the Sapoa period (A.D. 800-1350). Latin American Research Center, Graduate Student Symposium (LARC), Calgary, AB.
- April 2016 Ancient mitochondrial DNA and pre-Columbian inhabitants ancestry at Paquimé, Casas Grandes. SAA, Orlando, FL.
- February 2016 Ancient mitochondrial DNA of Pre-Columbian populations inhabiting Greater Nicoya during the Sapoa period (A.D. 800-1350). 6<sup>th</sup> Annual Interdisciplinary Archaeology Research Conference (UCLA), Los Angeles, CA.
- November 2015 Ancient mitochondrial DNA approach to explore pre-Columbian inhabitants' ancestry at Paquimé, Casas Grandes, 48th Chacmool Conference, Calgary, AB.
- April 2015 Exploring the ancient mitochondrial DNA of pre-Columbian populations inhabiting Central Mexico during the postclassic period (A.D. 900-1521). SAA, San Francisco, USA.
- April 2015 Ancient Mitochondrial DNA of Precolumbian Populations inhabiting Greater Nicoya during the Sapoa Period (800-1350 AD). Methods in Ecology and Evolution: Next Generation Ecology and Evolution, Calgary, AB.
- November 2014 Ancient DNA in Mesoamerica: limitations and contributions. 47th Chacmool Conference. Calgary, AB.
- April 2014 Bioarchaeological approaches to the site La Cascabel in Bahía Culebra, Costa Rica (800-1350 AD). SAA, Austin, TX.
- February 2011 Genetic variability of lactose intolerance in Amerindians of lower Central America. Central American Congress of Anthropology, Tegucigalpa, Honduras.
- November 2010 Haplotypic variation of lactose intolerance in Costa Rica. Nutrition and Health Congress. San José, Costa Rica.
- December 2009 Haplotypic variation around the region of the lactase gene (LCT, 2q21) in Amerindians of Costa Rica. Darwin200 Celebration International Symposium, Alajuela, Costa Rica.

## LANGUAGES

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Spanish: Native speaker

English: Fluent comprehension, reading, writing, and speaking

Italian: Fluent comprehension, reading, and speaking

## REFERENCES

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Prof. Jeffrey Jensen – *Postdoctoral Supervisor*

School of Life Sciences, Arizona State University. E-mail: Jeffrey.D.Jensen@asu.edu

Prof. Anne Stone – *Postdoctoral Supervisor*

School of Human Evolution and Social Change, Arizona State University. E-mail: acstone@asu.edu

Prof. Anne Katzenberg – *PhD Supervisory committee member*

Archaeology and Anthropology Department, University of Calgary. E-mail: katzenbe@ucalgary.ca

Prof. Geoffrey McCafferty - *PhD Supervisor*

Archaeology and Anthropology Department, University of Calgary. E-mail: mccafer@ucalgary.ca