JUAN C. SANTOS

NSF- Macrosystems Postdoctoral Fellow

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PROFESSIONAL EXPERIENCE

2014 – 2017 Macrosystems Postdoctoral Fellow. Brigham Young University
Advisor: Dr. Jack Sites (BYU), Dr. Barry Sinervo (UCSC)

2012 – 2014 Biodiversity Postdoctoral Fellow (Independent position). University of British Columbia

2009 – 2012 National Evolutionary Synthesis Center (NESCent). Duke University
Postdoctoral Fellow Independent Project:
Multivariate evolutionary analysis: integrating structural equation modeling and phylogenetics
Mentor: Dr. David W. Pfennig (UNC-Chapel Hill, USA)

EDUCATION

2009 Ph.D. Ecology, Evolution and Behavior, University of Texas at Austin
Advisor: Dr. David C. Cannatella (UT-Austin)

2009 M.S. Statistics, University of Texas at Austin
Advisor: Dr. Claus O. Wilke (UT-Austin)

2002 B.A. Biology (Honors), Pontificia Universidad Católica del Ecuador
Advisor: Dr. Luis A. Coloma (PUCE)

CURATORIAL EXPERIENCE IN MUSEUMS

2002 – 2009 *Research assistant*. Texas Memorial Museum, University of Texas at Austin.
1999 – 2002 *Curatorial assistant*. Museo de Zoologia-QCAZ, Pontificia Universidad Católica del Ecuador

GRANTS AND FINANCIAL SUPPORT

2016-2018 **DEB - 1556967**, Collaborative Research: Phylogenetics of autoresistance in poison frogs as revealed by phylogenomics, neurophysiology, and comparative ecology (PI: David Cannatella, **Senior Personnel*: Juan C. Santos;** US$ **727,758**)-- * NSF does not allow non-tenure track Co-PIs.

2014-2016 Macrosystems postdoctoral fellow. Brigham Young University (2 year contract: US$ 85,000 + benefits). With extension for a 3rd year (i.e., 2017)

2012-2014 Postdoctoral Fellowship at the Biodiversity Research Centre. Independent research fellowship. University of British Columbia (CAD $86,000 + CAD $14,000 for research)

2009-2012 NESCent Postdoctoral Fellowship (US$120,000 + $15,000 for research). Duke University

2009 Carl Gottfried Hartman Graduate Fellowship, University of Texas at Austin ($2,500)

2008 Travel Award for the Amphibian Tree of Life ($900)

2008 David Bruton, Jr. Graduate Fellowship, UT Austin. ($1,000)
2007 NSF- Doctoral Dissertation Improvement Grant (#0710033): *CoPI*. ($11,995)
2007 Frank and Fern Blair Graduate Research Fellowship, UT Austin. ($1,200)
2006 Frank and Fern Blair Graduate Research Fellowship, UT Austin. ($1,100)
2005 Frank and Fern Blair Graduate Research Fellowship, UT Austin. ($800)
2003 Frank and Fern Blair Graduate Research Fellowship, UT Austin. ($950)
2002 College of Natural Sciences, UT Austin, Computer Initiative Award ($1,500)
2001 Pontificia Universidad Católica del Ecuador, Quito-Ecuador ($2,000)

PUBLICATIONS (PEER-REVIEWED)

Tarvin, R.D.*, **Santos, J.C.,** O'Connell L.A., Zakon H.H.**,** Cannatella D.C. (2016) Multiple convergent amino acid replacements in the muscle voltage-gated sodium channel suggest a high genetic lability conferring alkaloid resistance in poison frogs. ***Molecular Biology and Evolution.*** * Graduate mentee
http://mbe.oxfordjournals.org/content/early/2016/01/18/molbev.msv350.full.pdf+html

Santos, J.C., Tarvin, R. D.*, O'Connell, L. A. 2015. A review of chemical defense in poison frogs (Dendrobatidae): Ecology, pharmacokinetics and autoresistance. Invited review Chemical Signals in Vertebrates (CSiV) Volume 13. ISBN 978-3319220253
* Graduate mentee

Santos, J.C., Baquero, M.*, Barrio-Amorós, C.L., Coloma, L.A., Erdtmann, L.K., Lima, A.P., Cannatella, D.C. 2014. Aposematism increases acoustic diversification and speciation in poison frogs. Proceedings of the Royal Society B-Biological Sciences 281:9. DOI: 10.1098/rspb.2014.1761Published 15 October 2014
* Graduate mentee

Shik, J.Z., **Santos, J.C.**, Seal, J.N., Adam Kay, A., Mueller, U.G., Kaspari, M. 2014 Metabolism and the rise of fungus cultivation by ant societies. American Naturalist 184 (3): 364-373

Santos, J.C. 2012. Fast molecular evolution associated with high active metabolic rates in poison frogs. Molecular Biology and Evolution. 29(8): 2001-2018.

Barrio-Amorós, C.L., **Santos, J.C**. 2012. Three new cloud frogs (*Aromobates*: Dendrobatidae) from the Andes of Venezuela, with notes on *Aromobates saltuensis* and *A.* i*nflexus*, and the conservation status and phyogeny of *Aromobates*). Zootaxa 3422: 1-31

Santos, J.C., Cannatella, D.C. 2011. Phenotypic integration emerges from aposematism and scale in poison frogs. Proceedings of the National Academy of Sciences USA 108: 6175-6180

Barrio-Amorós, C.L., Rivero, R., **Santos, J.C.** 2011. New striking dendrobatid frog (Dendrobatidae: Aromobatinae, Aromobates) from the Venezuelan Andes. Zootaxa 3063: 39–52

Barrio-Amorós, C.L., **Santos, J.C.** 2011. Redescription and generic assignation of *Dendrobates rufulus* Gorzula (Anura, Dendrobatidae) from Chimantá tepui, Venezuela. Salamandra 47(3): 155-160

Páez-Vacas, M.I.*, Coloma, L.A., **Santos, J.C.** 2010. Systematics of the *Hyloxalus bocagei* complex (Anura: Dendrobatidae): description of two new species and recognition of *H. maculosus*. Zootaxa Monographs (2711): 1-149
* Undergraduate mentee

Barrio-Amorós, C.L., **Santos, J.C.**, Jovanovic, O. 2010. A new dendrobatid frog (Anura: Dendrobatidae: *Anomaloglossus*) from the Orinoquian rainforest,

southern Venezuela. Zootaxa 2413: 37-50

Barrio-Amorós, C.L., **Santos, J.C.**, Molina, C.R. 2010. Diversity of dendrobatid frogs in Venezuela underestimated: Description of three new *Mannophryne* (Anura: Dendrobatidae: Aromobatinae). Phyllomedusa 9(1): 3-35

Barrio-Amorós, C.L., **Santos, J.C.** 2010. Amphibia, Anura, Dendrobatidae, *Allobates femoralis* (Boulenger, 1884): First confirmed country records, Venezuela. CheckList 6 (2): 208-209

Barrio-Amorós, C.L., Rivas, G.A., Molina, C.R., **Santos, J.C.**, Kaiser, H. 2010. Intraspecific variation in the endangered frog *Mannophryne riveroi* (Anura, Dendrobatidae, Aromobatinae), with comments on coloration and natural history. Herpetological Notes 3: 151-160

Santos, J.C., Coloma, L.A., Caldwell, J.P., Summers, K., Ree, R., Cannatella, D.C. 2009 Amazonian amphibian diversity is primarily derived from late Miocene Andean lineages. PLoS-Biology 7:3 (March 10, 2009)

Barrio-Amorós, C.L., **Santos, J.C.** 2009. Description of a new *Allobates* (Anura, Dendrobatidae) from the eastern Andean piedmont, Venezuela. Phyllomedusa 8(2): 89-104

Ron, S.R., **Santos, J.C.**, Cannatella, D.C 2006. Phylogeny of the túngara frog genus *Engystomops* (= *Physalaemus pustulosus* species group; Anura: Leptodactylidae). Molecular Phylogenetics and Evolution 39:392–403

Graham, C.H., Ron, S.R., **Santos, J.C.**, Schneider, C.J., Moritz, C. 2004. Integrating phylogenetics and environmental niche models to explore speciation mechanisms in dendrobatid frogs. Evolution 58 (8): 1781-1793

Santos, J.C., Coloma, L.A., Cannatella D.C. 2003. Multiple recurring origins of aposematism and diet specialization in poison frogs. Proceedings of the National Academy of Sciences USA 100(22): 12792–12797

Paz-y-Mino, C., Burgos, R., Morillo, S.A., **Santos**, **J.C.,** Fiallo, B.F., Leone, P.E. 2002. BCR-ABL rearrangement frequencies in chronic myeloid leukemia and acute lymphoblastic leukemia in Ecuador, South America. Cancer Genetics and Cytogenetics 132:65-67

PUBLICATIONS IN PREPARATION

Sinvero, B. *et al.* Santos one of 15 authors (2015) Desert tortoises race against climate change: past, present and future

Santos, J.C., O'Connell LA, Coloma, L.A.**,** Tarvin, R. Comparative skin transcriptomics in aposematic poison frogs

Santos, J.C. Phylogenetic structural equation modeling as a multivariate comparative method for estimating the evolution of complex traits

Tarvin, R**, Santos, J.C.,** O'Connell LA, Comparative skin transcriptomics on the evolution of ion channels in the alkaloid sequestering poison frogs of the genus *Epipedobates*

O'Connell LA, **Santos, J.C.,** Coloma, L.A, *et al.* The evolution of color vision in amphibians

INVITED PRESENTATIONS AT SCIENTIFIC MEETINGS AND SEMINARS

Santos J.C. Macroecology, Complex Phenotypes and Comparative Transcriptomics using 'Big Data' for Assessing the Biodiversity of Lizards and Amphibians. University of Rhode

Island. March 2016

Santos J.C. Macroecology, Complex Phenotypes and Comparative Transcriptomics for Assessing the Biodiversity of Lizards and Amphibians. University of Missouri-Columbia. February 2016

Santos J.C. Macroecology, Complex Phenotypes and Comparative Transcriptomics for Assessing the Biodiversity of Lizards and Amphibians. Imperial College London. January 2016

Santos J.C. Macroecology, Complex Phenotypes and Comparative Transcriptomics for Assessing the Biodiversity of Lizards and Amphibians. University of Bath. December 2015

Sites J.W.Jr., **Santos J.C.** NSF Macrosystems PI meeting: MSB session on scaling individuals to regions. NSF Headquarters. Alexandria VA, August 2015

Sinervo B., Pittermann J., **Santos J.C.**, Miles D.B., Sites J.W.Jr., Bauer A., Corl A., Huey R.B. Plant mortality and beyond: quantifying climate-forced extinction risks for lizards, amphibians, and plants. Invited Symposium on Climate Change. Botanical Society of America Meeting. Edmonton (Canada), July 2015

Taylor G.W.*, **Santos J.C.**, Perrault, B. J.*, Sites J.W.Jr. Sexual dimorphism in head and body structures in *Basiliscus* and *Corytophanes* species. Society for the Study of Amphibians and Reptiles meeting, University of Kansas, Lawrence, July 2015. * Undergraduate mentee

Santos J.C., Caetano G., Colli G.R., Tucker D., Sites J.W.Jr., Sinervo B. Species distribution models of Brazilian *Tropidurus* and *Mabuya* lizards based on eco-physiological and climatological predictors. ASN/SSB/SSE Meetings, Guarujá (Brazil), June 2015

Santos J.C., McGhie M.*, Wagstaff J.*, Pope A.J.* , Sites J.W.Jr., Stephen C. Characterization of genes with detoxifying function in desert iguanas derived from de novo transcriptome assemblies. ASN/SSB/SSE Meetings, Guarujá (Brazil), June 2015. * Undergraduate mentee

Tarvin R., **Santos J.C.**, O´Connell L.A., Zakon H.H., Cannatella D.C. La base genética de la resistencia contra los alcaloides en *Atelopus* y Dendrobatidae. X Congreso de Herpetologia Neotropical, Cartagena (Colombia), Diciembre 2014

Santos, J.C. Tarvin, R., O'Connell, L. Chemical Ecology of Poison Frogs: Evolution of Alkaloid Sequestration and Autoimmunity. Invited symposium at the Chemical Ecology Society Meeting, University of Illinois-Urbana, July 2014.

Tarvin, R., **Santos, J.C.,** O'Connell, L., Zakon, H., Cannatella, D.C. Genetic basis of alkaloid resistance in harlequin toads and poison frogs. ASN/SSB/SSE Meetings, Raleigh, NC, June 2014.

Santos, J.C. Sistemática, Fenómica and Genómica: Un estudio integrativo de las ranas venenosas. Invited presentation, University of Puerto Rico-Rio Piedras. San Juan, Puerto Rico, April 2014.

Santos, J.C. Emergent properties: Aposematism, Phenomics and Biogeography. Invited seminar. Imperial College London, November 2013.

Santos, J.C. Emergent properties: Aposematic and Systematics. Biodiversity Lunchtime Internal Seminar Series (BLISS). University of British Columbia, BC April 2013

Santos, J.C. Emergent Properties in Poison Frogs: Aposematism, Bioacoustics and Systematics. Biodiversity Research Seminar Series. University of Oklahoma, OK, February 2013

Santos, J.C. Emergent properties: Aposematic calls. Biodiversity Research Seminar Series. University of British Columbia, BC September 2012

Santos, J.C. Emergent properties in the light of evolution: Aposematism, physiology, and bioacoustics. University of Missouri-St. Louis, MO September 2012

Santos, J.C. Faster rates of molecular evolution and metabolic features in poison frogs.

Duke University, Durham, NC, May 2012

Santos, J.C. The evolution of complex phenotypes in poison frogs: Aposematism, acoustic signals and metabolic rates. East Carolina University, Greenville NC, September 2011

Santos, J.C. Phenotypic integration in poison frogs. ASN/SSB/SSE Meetings, Norman OK, June 2011

Santos, J.C. Phenotypic diversity, phylogeny, and natural history of poison frogs College of Charleston SC, February 2011

Santos, J.C. Rates of molecular evolution and life history traits in poison frogs. ASN/SSB/SSE Meetings, Portland OR, June 2010

Santos, J.C. Metabolic rates and molecular evolution in the poison frogs. Duke Systematics Group, May 2010

Santos, J.C. Evolution of complex traits in poison frogs: scale, metabolic rates, aposematism, and diet specialization. NESCent BBL Seminars, January 2010

Santos, J.C. Phylogeography and evolution of correlated traits under multiple origins of aposematism in the poison frog family. UT-EEB Population Biology Seminars, August 2009

Santos, J.C. Evolution of alkaloid profiles in poison frogs. ASN/SSB/SSE meetings 2008. Minneapolis/St. Paul, Minnesota. June, 2008

Santos, J.C. Poison frog diversity explained by repeated dispersals during the Miocene-Pliocene boundary. UT-EEB Population Biology Seminars, March 2008

Santos, J.C., Cannatella, D.C. 2006. Evolution of physiological adaptations associated with aposematism in poison frogs (Dendrobatidae). Joint Meetings of The Herpetologist's League and The Society for the Study of Amphibians and Reptiles. New Orleans, USA; July 2006

Ron, S.R., Cannatella, D.C., **Santos, J.C.** Filogenia y evolución del canto de *Physalaemus* del grupo de especies *pustulosus* (Anura:Leptodactylidae): Variaciones sobre un mismo tema. VII Congreso Latinoamericano de Herpetología. Cuernavaca, México 2005

Santos, J.C., Coloma, L.A., Caldwell, J.P., Summers, K., Cannatella, D.C. Biogeography of the Poison Frogs. Joint Meetings of The Herpetologist's League and The Society for the Study of Amphibians and Reptiles. Tampa, USA; June 2005

Coloma, L.A., Cannatella, D.C., **Santos, J.C.** Evolution of behavior in poison frogs (Anura:Dendrobatidae) reconsidered. Animal Behavior Society XLI Meeting, Oaxaca, México, 2004

Cannatella, D.C., Ron, S.R., **Santos, J.C.** Phylogenetic relationships in *Physalaemus*: how comparative analysis provides a framework for studies of behavioral evolution. Animal Behavior Society XLI Meeting, Oaxaca, México, 2004

Santos, J.C., Coloma, L.A., Caldwell, J.P., Summers, K., Cannatella, D.C. Phylogeny and diversification of poison frogs (Dendrobatidae). Joint Meetings of The Herpetologist's League and The Society for the Study of Amphibians and Reptiles. Oklahoma, USA; May 2004

Santos, J.C. Evolution of aposematism and other traits in poison frogs: A phylogenetic approach. UT-EEB Population Biology Seminars, October 2003

Santos, J.C., Coloma, L.A., Cannatella, D.C. Evolution of aposematism in dendrobatid frogs. Joint Meetings of The Herpetologist's League and The Society for the Study of Amphibians and Reptiles. Kansas, USA; July 2002

AWARDS

2012 Departmental Postdoctoral Fellow, Department of Ecology and Genetics, Evolutionary Biology Centre, Uppsala University-Sweden (*declined*)

2012 Science without Borders program: Young post-doctoral researchers (Atração de Jovens Talentos-Brazil) (*declined*)

2012 Smithsonian Postdoctoral Fellow (2012 Competition). Smithsonian Institution, Washington DC (2nd position, *alternative*)

2011 Smithsonian Postdoctoral Fellow (2011 Competition). Smithsonian Institution, Washington DC (2nd position, *alternative*)

TEACHING EXPERIENCE

2015 Principal Instructor. Biology 559R: Introduction to Phylogenetic Comparative Methods. Brigham Young University
Course website: http://www.jcsantosresearch.org/
This link contains all the course materials.

2013 - 2014 *Guest Lecturer on Multivariate Statistics*. University of British Columbia

2008 – 2009 *Biostatistics*. Graduate Instructor, University of Texas at Austin. Developed, organized, taught laboratories and experimental designs for senior undergraduates with a Biology major

2007 – 2008 *Physiology and Functional Anatomy*. Graduate Instructor, University of Texas at Austin. Organized and taught laboratories for pre-med/pre-nurse undergraduates

2005 – 2006 *Laboratory Experience in Genetics*. Graduate Instructor, University of Texas at Austin. Developed, organized, taught laboratories and experimental designs for undergraduates with a Biology major

2003 *Genetics.* Undergraduate Instructor, University of Texas at Austin. Organized and directed discussion sections for undergraduates

UNDERGRADUATE MENTORING

2015 – 2016 Benjamin Bay. Brigham Young University

2015 – 2016 Benjamin J. Perrault. Brigham Young University

2014 – 2016 Megan McGhie. Brigham Young University

2014 – 2016 Gregory Taylor. Brigham Young University

2015 Shayla Draper. Brigham Young University

2015 Jadon Wagstaff. Utah Valley University

2013 Karen Castillo. Universidad de Nariño (Colombia)

2012 N. Lily Negash and Johnny Kim. Duke University

2011 Adeeb Minhaj and Barbara Blachut. Duke University

2011 Pramodh Ganapathy and Will Hyung. Duke University

2010 – 2011 Maria Nayfa. Duke University. Work-study student

2010 Undergraduate Diversity at Evolution program with two mentees at the 2010 ASN/SSB/SSE meetings. Portland, OR

2009 – 2010 Mónica Páez-Vacas, Pontificia Universidad Católica del Ecuador. Honors Thesis (Co-Advisor). Currently: Graduate student at Colorado State University

2008 Elaine Klein. University of Texas at Austin. Lab assistant. Currently:

Graduate student at San Diego State University.
2008 Italo Tapia. Pontificia Universidad Católica del Ecuador
2007 – 2008 Margarita Baquero. Pontificia Universidad Católica del Ecuador. Honors Thesis (Co-Advisor). Currently: Instituto Interamericano de Cooperación para la Agricultura (Ecuador)
2007 Daniel Scantlebury. University of Texas at Austin. Currently: Graduate student at University of Rochester
2006 Rafael Guerrero. Universidad de los Andes, Colombia Currently: Graduate student at University of Texas at Austin
2006 Juliana Gómez. Universidad de los Andes, Colombia

GRADUATE MENTORING

2014 – 2016 Sebastian Kirchhof. PhD Gradute Research. MFN-Berlin (Germany)
2015 – 2016 Emerson Pontes da Silva. MS Ecology. Instituto Nacional de Pesquisas da Amazonia (INPA) - Brazil
2014 – 2016 Gabriel Caetano. PhD Gradute Research. University of California, Santa Cruz
2013 – 2016 Rebecca Tarvin. PhD Gradute Research. University of Texas at Austin
2012 – 2013 Ailin Blasco. MS Gradute Research. Pontificia Universidad Catolica del Ecuador
2010 – 2011 Margarita Baquero. Master's Thesis Co-Advisor. Universidad San Francisco de Quito (Ecuador). Currently: Graduate student at Mississippi State University

PROFESSIONAL SERVICE

Reviewer for *The American Naturalist, Biological Conservation, BMC Evolutionary Biology, Biological Journal of the Linnean Society, Biotropica, Journal of Biogeography, Journal of Ecology, Biodiversity and Conservation, Current Zoology, Caldasia, Copeia, Functional Ecology, Ecology Letters, Frontiers in Zoology, Molecular Biology and Evolution, Proceedings of the Royal Society-B Series*, *Revista de Biologia Tropical, Herpetologica, Tropical Zoology*, *Zootaxa*

Master in Sciences (2016): Biology – Research Proposal Reviewer: *Universidad de Quidio* (Colombia)
Master in Sciences (2015): Biology – Research Proposal Reviewer: *Universidad de Costa Rica* (Costa Rica)
Master in Sciences (2012-2014): Biology – Final Report Reviewer: *Universidad de los Andes* (Colombia)
Ad hoc reviewer (2014) for Natural Sciences and Engineering Research Council of Canada (NSERC)

PROFESSIONAL SOCIETIES

Society for Molecular Biology & Evolution
Society for the Study of Evolution
Society for the Study of Amphibians and Reptiles
American Society of Naturalists
Society of Systematic Biologists

COMMUNITY SERVICE AND OUTREACH

2012 2nd USA Science & Engineering Festival. Washington, DC, USA
2011 Seeing and Learning Science Afterschool (SALSA). NESCent outreach activities and workshops for minority children at Chapel Hill, NC, USA
2011 NESCent Ambassador Program. Darwin, Evolution, and the Importance of the Galápagos Islands. Ecuador
2010 North Carolina School of Science and Mathematics. Invited class for 9th graders. Title: The poison frogs evolution and natural history. Durham, NC, USA

LANGUAGES

English (Fluent) and Spanish (Native)

REFERENCES

Dr. Jack W. Sites, Jr. (Postdoctoral Advisor)
Department of Biology
Brigham Young University
E-mail: jack_sites@byu.edu
Phone: (801) 422-2582

Dr. David Cannatella (PhD Advisor)
Section of Integrative Biology
University of Texas at Austin
E-mail: catfish@utexas.edu
Phone: (512) 471-5302

Dr. Barry Sinervo (Postdoctoral Advisor)
University of California, Santa Cruz
Department of Ecology & Evolutionary Biology
Earth & Marine Sciences Building
E-mail: lizardrps@gmail.com