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Curriculum Vitae

**Luisa A. Marcelino**

Research Assistant Professor

Department of Civil and Environmental Engineering
McCormick School of Engineering and Applied Sciences
Northwestern University
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#### 0Beducation

6B**University of Lisbon, Portugal - Massachusetts Institute of Technology,** Cambridge, MA

Ph.D. in Molecular Biology/Genetics

University of Lisbon Portugal, degree *in absentia* through Massachusetts Institute of Technology

7B

**University of Lisbon, Portugal -** BS./MS. in Plant Biotechnology and Molecular Biology

#### 1Professional Experience

**Northwestern University**, Evanston, IL.

*Lecturer,* Department of Civil and Environmental Engineering

**Northwestern University**, Evanston, IL.

*Research Assistant Professor,* Department of Civil and Environmental Engineering

**Field Museum of Natural History**, Chicago, IL.

*Research Associate,* Department of Zoology, Fishes

**Northwestern University**, Evanston, IL.

*Research Associate,* Biomedical Engineering Department*.*

**Massachusetts Institute of Technology**, Cambridge, MA.

*Postdoctoral Associate and later Research Scientist,* Department of Civil and Environmental Engineering

*Postdoctoral Associate,* Center for Environmental Health Sciences

*Ph.D. candidate and Research Assistant,* Center for Environmental Health Sciences

 **Perkin Elmer (Applied Biosystems),** Foster City, CA

*Visiting Research Scientist,* Research and Development Department

**University of Lisbon,** Lisbon, Portugal

*Ph.D. candidate and Research Assistant,* Department of Genetics, Medical School

*Research Assistant,* Department of Plant Biology, School of Sciences

#### Teaching AND UNDERGRADUATE RESEARCH SUPERVISING

**CEE 361-2:** Public and Environmental Health since 2010 - present

**CEE 361-1:** Environmental Microbiology Winter since 2010 - present

CEE 399: undergraduate research Project (10 undergraduates)

**POST-DOCTORAL FELLOW AND RESEARCH SCIENTIST SUPERVISION**

Tim Swain, 2010- 2019 Ph.D. Biology, Florida State University currently an Assistant Professor at Nova Southeastern University with the Department of Marine and Environmental Sciences

**GRADUATE STUDENT RESEARCH SUPERVISION**

Co-supervisor along with Prof. Vadim Backman of Valentina Stoyneva, MS Biomedical Engineering, graduated 2011, BME PhD student Graham Spicer, graduated in 2019 and BME PhD student Aya Eid graduated in 2020. Currently, co-supervisor of BME Master student Aditi Sharma.

**UNDERGRADUATE STUDENT RESEARCH SUPERVISION**

Supervision of 30+ undergraduate students, with 13 students included as co-authors in peer-reviewed publications due to their significant contributions to the ongoing research projects, 5 students completed their Honor Thesis, 3 students received awards for best Honor thesis.

**RESEARCH OVERVIEW**

The research program I have established aims to understand the fundamental cellular and organismal underpinnings that lead to a successful response to heat stress using reef-forming corals as the model organisms, which are facing extinction due to climate change induced ocean warming. We are developing and applying genetic, epigenetic, phylogenetic, optical, and computational methods in three main areas of research.

The evolving symbiotic coral-algal partnership

- Uncover biological factors in both partners that promote a successful response to heat stress

- Identify the most heat-tolerant genetic combination of algal-coral partners to build more heat resistant coral stocks (adaptation through “assisted evolution”)

Light drives coral growth and calcification

- Measure light absorption and scattering in coral tissue and skeleton

- Develop a coral light model to predict coral growth

- Uncover the mechanism by which coral modulate light to their photosynthetic algae

Gene expression plasticity leads to physiological plasticity and increased survival

- Measure changes in gene expression under heat stress

- Characterize key regulators of gene expression in corals (e.g., chromatin modifications and overall structure)

- Reprogram gene transcription to increase coral’s survival to heat stress (acclimatization)

**PUBLICATIONS**

<https://scholar.google.com/citations?user=rSwpJWYAAAAJ&hl=en&oi=ao>

<https://www.scholars.northwestern.edu/en/persons/luisa-a-marcelino>

**Peer-reviewed Journal Publications (\*Student coauthors)**

1. Swain, T. D., Lax, S., Gilbert, J., Backman, V. and Marcelino, L. A., 2021, A phylogeny-informed analysis of the global coral-Symbiodiniaceae interaction network reveals that traits correlated with thermal bleaching are specific to symbiont transmission mode. mSystems. 6, 3, e00266. PMCID: [PMC8269218](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8269218/)
2. Swain, T. D., Lax, S., Backman, V., and Marcelino, L. A. 2020, Uncovering the role of Symbiodiniaceae assemblage composition and abundance in coral bleaching response by minimizing sampling and evolutionary biases, BMC Microbiology 20, 1, 124, PMCID: [PMC7236918](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7236918/)
3. Spicer G.L.C.\*, Eid A.\*, Wangpraseurt D., Swain T.D., Winkelmann J.A.\*, Yi J., Kühl, Marcelino L.A., Backman V., 2019, Measuring light scattering and absorption in corals with Inverse Spectroscopic Optical Coherence Tomography (ISOCT): a new tool for non-invasive monitoring, Scientific Reports 9:14148 PMCID: [PMC6775107](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6775107/)
4. Swain T.D., Lax S., Lake N.\*, Grooms H.\*, Backman V., Marcelino L.A., 2019, Relating coral skeletal structures at different length scales to growth, light availability to Symbiodinium, and thermal bleaching, Frontiers in Marine Science 586 1-10 PMCID: [PMC4800776](https://pubmed.ncbi.nlm.nih.gov/26996922/)
5. Swain T.D., Bold E.C.\*, Osborn P.C.\*, Baird. A.H., Westneat M.W., Backman V., Marcelino L.A. 2018, Physiological integration of coral colonies is correlated with bleaching resistance, Mar Ecol Prog Ser, 586: 1–10, [Feature Article] [DOI](https://doi.org/10.3354/meps12445)
6. Swain TD, Westneat WM, Backman V, Marcelino L.A. 2018, Phylogenetic analysis of symbiont transmission mechanisms reveal evolutionary patterns in thermotolerance and host specificity that enhance bleaching resistance among vertically transmitted Symbiodinium. European Journal of Phycology 53, 1-17. [DOI](https://doi.org/10.1080/09670262.2018.1466200)
7. Swain, T.D., DuBois, E.\*, Goldberg, S.J. \*, Backman V., Marcelino, L.A., 2017, Bleaching response of coral species in the context of assemblage response, Coral Reefs 36: 395–400. PMCID: [PMC5679474](https://pubmed.ncbi.nlm.nih.gov/29129968/)
8. Swain T.D, Vega-Perkins J.B. \*, Oestreich W. \*, Triebold C. \*, DuBois E.\*, Henss J., Baird A, Siple M., Backman V., Marcelino L.A. 2016, Coral bleaching response index: a new tool to standardize and compare susceptibility to thermal bleaching, Glob Chang Biol. PMCID: [PMC5433437](https://pubmed.ncbi.nlm.nih.gov/27074334/)
9. Swain T.D., DuBois E.\*, Gomes, A.\*, Stoyneva V.P.\*, Radosevich A.J.\*, Henss J., Wagner M.E.\*, Velazquez E.\*, Traub J., Kennedy B.J.\*, Janczak C.M., Grigorescu A.A., Westneat M.W., Sanborn K., Levine S., Schick M., Parsons G., Rogers J.D., Backman V., Marcelino L.A. 2016, Skeletal light scattering decreases bleaching susceptibility of reef-building corals, BMC Ecol. 16(1):10. PMCID: [PMC4800776](https://pubmed.ncbi.nlm.nih.gov/26996922/)
10. Swain T.D, Chandler J.\*, Backman V., Marcelino L.A., 2016, Consensus thermotolerance ranking for 110 Symbiodinium phylotypes: an exemplar utilization of a novel iterative partial rank aggregation tool with broad application potential. Functional Ecology, [DOI](https://doi.org/10.1111/1365-2435.12694)
11. Marcelino L.A., Westneat M., Stoyneva V.\*, Henss J., Rogers J.D., Radosevich A.\*, Turzhitsky V.\*, Siple M.\*, Fang A.\*, Swain T.D., Fung J.\* and Backman V. U 2013, Light scattering in coral skeleton - evolutionary trends in coral bleaching and in light amplification, PLoS One, 8 :e61492. PMCID: [PMC3632607](https://pubmed.ncbi.nlm.nih.gov/23630594/)
12. Eid A., Wangpraseurt D., Spicer G.L.C., Winkelmann J.A., Swain T.D., Yi J., Kühl M., V. Backman and L. A. Marcelino, Light scattering, absorption properties of tissue and coral skeleton and photophysiology of 4 scleractinian corals using Inverse Spectroscopic Optical Coherence Tomography (ISOCT) and Pulse amplitude modulated (PAM) fluorometry, *in preparation*
13. Worsfold, F., Swain T.D., Wallace A., Backman V., and Marcelino L.A., Accessing Bleaching susceptibility of 24 coral species and 160 sites in the Florida Reef Tract over 11 years of repeated thermal stress, *in preparation*
14. Sudo H., Li-Sucholeiki X.-C.; UMarcelino L.A.;U Gruhl A.N.; Herrero-Jimenez P.; Thilly W.G., et al., Fetal-juvenile origins of point mutations in the adult human tracheal bronchial epithelium: absence of detectable effects of age, gender or smoking status. Mutation Res., 2008; 646:25-40
15. UMarcelino L.AU., Backman V., Donaldson A., Steadman C., Thompson J, Pacocha S., Lien C., Veneziano D., Lim E., and Polz M.F., Accurate identification of low abundant targets in pools of similar sequences by revealing hidden correlations in oligonucleotide microarray data, Proc Natl Acad Sci USA. 2006; 103(37):13629-34.
16. Sudo H., Li-Sucholeiki X.-C., UMarcelino L.AU., Thilly W.G., *et al.*, Distributions of five common point mutants in the human tracheal-bronchial epithelium, Mutation Res, 2006; 596(1-2):113-1127.
17. Thompson J.R., Randa M.A., UL.A MarcelinoU, Tomita-Mitchell A., Lim E., Polz M.F., Diversity and dynamics of a North Atlantic coastal Vibrio community, Applied and Environmental Microbiology 2004; 70(7):4103-10.
18. Acinas S.G., UMarcelino L.A.,U Klepac-Ceraj V., Polz M.F., Divergence and redundancy of 16s rRNA sequences in genomes with multiple rrn operons J. Bacteriology, 2004; 186 (9): 2629-2635.
19. Thompson JR, UMarcelino L.A.U, Polz MF. Heteroduplexes in mixed-template amplifications: formation, consequence and elimination by 'reconditioning PCR". Nucleic Acids Res. 2002; 30(9):2083-8.
20. Zheng W, Marcelino L.A., Thilly WG. Scanning low-frequency point mutants in the mitochondrial genome using constant denaturant capillary electrophoresis. Methods Mol Biol. 2002;197:93-106, PMID:12013815
21. Tomita-Mitchell A., Kat A.G., UMarcelino L.AU., Li-Sucholeiki X.-C., Griffith J., and Thilly W.G., Mismatch repair deficient human cells: spontaneous and MMNG-induced mutational spectra in the HPRT gene, Mutation Res, 2000; 450:125-38.
22. Monteiro C, UMarcelino LAU, Armour JA *et al.,*. Molecular methods for the detection of mutations. Teratog Carcinog Mutagen, 2000; 20(6): 357-86.
23. UMarcelino L.AU., Galvin M., Mayrand E., Proenca M.J., Martins G., Rueff J., and Monteiro C., Fast and reliable method for the routine detection of mutations in human tumors: Multiple fluorescence-based long linker arm nucleotides assay (mf- LLA), BioTechniques, 1999; 26, 1134-1148.
24. UMarcelino L.AU., and Thilly W.G., Mitochondrial mutagenesis in Human cells and tissues, Mutat Res, 1999; 434,177- 203.
25. Li-Sucholeiki X.-C., Khrapko K., Andre P.C., UMarcelino L.A.U, Karger B.L., and Thilly W.G., Applications of constant denaturant capillary electrophoresis/high fidelity polymerase chain reaction to human genetic analysis, Electrophoresis, 1999; 20, 1224-1232.
26. UMarcelino L.A.,U Andre P., Krapko K., Coller H.A, Griffith J. and Thilly W.G., Chemically induced mutations in mitochondrial DNA of human cells: mutational spectrum of N-methyl-N'-nitro-N-nitrosoguanidine, Cancer Res, 1998; 58, 2857-2862.
27. Glaser P, Kunst F, Arnaud M, Coudart MP, Gonzales W, Hullo MF, Ionescu M, Lubochinsky B, UMarcelino LU, Moszer I, *et al.*, *Bacillus subtilis* genome project: cloning and sequencing of the 97 kb region from 325 degrees to 333 degrees, Mol. Microbiol, 1993; 10 (2): 371-84.

**Book Chapters**

1. Thompson J.R., UMarcelino L.A.U, Polz M.F., Diversity, sources and detection of human bacterial pathogens in the environment. Oceans and Health: Pathogens in the marine environment (eds. Shimshon S. and Colwell R.). 29- 68 (Springer New York, 2005).
2. UMarcelino L.A.U, and Monteiro C.J., Update to: Multiple fluorescence-based long linker arm nucleotides assay (mf- LLA): a fast and reliable method for the routine detection of mutations in human tumors, polymorphisms- detection and analysis. BioTechniques series, (eds. Burczak JD and Mardis E). 378-383 (Eaton Publishing/ Natick, 2000).

**PRESENTATIONS**

1. Swain TD, Lax S, Gilbert J., Backman V. Marcelino LA. 2022. Heightened frequency of association with thermotolerant Symbiodiniaceae correlates with bleaching-susceptibility only among vertically transmitting coral species. 10th International Symbiosis Society Congress, Lyon, France.
2. Swain TD, Lax S, Gilbert J., Backman V. Marcelino LA. 2022. Phylogeny-informed analysis of coral-Symbiodiniaceae interaction networks to assess bleaching-susceptibility and symbiont thermotolerance. 15th International Coral Reef Symposium, Bremen, Germany.
3. Swain TD, Backman VB, Marcelino LA, Phylogenetic analysis of Symbiodinium transmission modes reveal evolutionary patterns in thermotolerance and host specificity that may contribute to coral bleaching resistance, 2018, 9th International Symbiosis Society Congress, July 15-20, 2018, Oregon USA
4. Swain TD, Backman VB, Marcelino LA. Symbiodinium thermotolerance and coral susceptibility to bleaching. 13th International Coral Reef Symposium, Honolulu, Hawaii, June 2016.
5. Marcelino LA, Swain TD, Backman VB. Coral skeletal light scattering and susceptibility to thermal bleaching. 13th International Coral Reef Symposium, Honolulu, Hawaii. June 2016.
6. Swain TD, DuBois E, Gomes A, Stoyneva VP, Radosevich AJ, Henss J, Wagner ME, Derbas J, Grooms HW, Velazquez EM, Traub J, Kennedy BJ, Janczak CM, Grigorescu AA, Westneat MW, Sanborn K, Levine S, Schick M, Parsons G, Rogers JD, Backman VB, Marcelino LA. Efficient light transport through coral skeletons precipitates bleaching response. 44th Annual Benthic Ecology Meeting, Québec, Canada, 4-7 March 2015
7. Williams K\*, Swain TD, Wagner M\*, Marcelino L. 2013. (presented by first author) Does symbiont phylotype determine host susceptibility to stress? 3rd NU Bioscientist Symposium. Evanston, Illinois.
8. Swain T.D., Gomes A., Lake N., Radosevich A., Pickard K.,Kennedy B., Humecki P., Westneat M.W., Backman V., Luisa A. Marcelino, Coral skeletal fractality modulates light-backscattering to symbionts and bleaching susceptibility, (presented by first author) International Coral Reef Symposium, Cairns, Queensland, Australia, 9-13 July 2012
9. Swain T.D., Pickard K,Lake N,Henss J., Radosevich A, Gomes A., Westneat M.W., Backman V., Luisa A. Marcelino(presented by first author) “Light-scattering properties of coral skeletons at multiple morphological length-scales increase the risk of Coral Bleaching” Benthic Ecology Meetings, Mobil, Alabama, March 16-20, 2011
10. Turzhitsky, V.; Fang, A.; Fung, J.; Henss, J.; Siple, M.; Stoyneva, V.; Rogers, J. D; Wolfman, H.; Radosevich, A.; Backman, V.; Marcelino, L. A. “Optical characterization of coral skeleton with low-coherence enhanced backscattering spectroscopy.” *Optical Society of America: Biomedical Optics*, Miami, FL, USA, April 11-14, 2010.
11. A. Fang, J. Fung, E. Daly, J. Henss, M. Siple, V. Stoyneva, V. Turzhitsky, J. Rogers, M. Westneat, V. Backman, L. Marcelino (November, 2008), Characterization of optical properties of reef-building corals and its implications on bleaching susceptibility, 19th. Annual Argonne Symposium for Undergraduates in Science, Engineering and Mathematics, Argonne, IL
12. Backman V., Siple M., Daly E., Fang A., Fung J., Stoyneva V., Henss J., Westneat M., Turzhitsky V., Rogers J., Marcelino L.A. 2008. (presented by first author) Novel Optical Technique for characterization of light absorption and distribution in reef-building corals, 11th International Coral Reef Symposium. Fort-Lauderdale, Florida
13. Marcelino L.A Siple M., Daly E., Fang A., Fung J., Stoyneva V., Henss J., Westneat M., Turzhitsky V., Rogers J., Backman V. 2008. Characterization of optical properties of reef-building coral skeletons, 11th International Coral Reef Symposium. Fort-Lauderdale, Florida

**INVITED TALKS AND SEMINARS**

The Future of Coral Reefs”, Master of Science in Project Management (MPM), Expand Your Horizons dinner, April 2, 2019, Winnetka, IL

“Impacts of climate change on the rainforests of the ocean – coral reefs” Institute for Plant Science and Microbiology, University of Hamburg, Hamburg, Germany, April 2018

“Coral in the Coal Mine: What are the Oceans Telling Us?” Northwestern Climate Change Symposium, November 9-10, 2017, Evanston, IL

“Why do corals bleach differently? Two versions of the story told by the coral and its symbiotic algal partner.” National Coral Reef Institute, Nova Southeastern University, Fort Lauderdale, Fl, April 9-12, 2017

“A Novel Framework of Analysis to Identify and Evaluate Key Determinants of Bleaching”, University of Copenhagen, Helsingør, Denmark, May 29- June 2, 2017

“The role of coral skeletal scattering in bleaching response”, Brown Bag Seminars, Shedd Aquarium, Chicago, IL, May 29, 2016

“The impact of global climate change- induced thermal stress on coral reef ecosystems”, Northwestern Civil and Environmental Engineering Environmental Seminar, Evanston, IL, September 2016

“Coral skeletal light-scattering accelerates bleaching”, Coral Climate Forum, Field Museum of Natural History, Chicago, IL, June 2015

“Why do corals bleach and die differently?” Environmental Engineering and Science Seminars, Northwestern University, November 2014 and April 2015

 “Effects of global climate change on coral reefs as marine ecosystems”, Searle Center Research Roundtable on Natural Preservation In A Rapidly Changing Climate, October 4-5 and July 17- 18, 2014 and 2015, Chicago IL

“Coral Bleaching: The role of two partners” Coral Climate Forum, Field Museum of Natural History, Chicago, IL, April 2012

“The role of the algal symbiont and animal coral in the health of coral reefs”, Brown Bag Seminars, Shedd Aquarium, May 2011

“Standardization of bleaching and mortality records to identify key determinants of bleaching, Coral Histology workshop, Mote Marine Laboratory, August 23-27, 2010

“Tools to access bleaching response in corals”, Meeting at the International Registry of Coral Pathology Center for Coastal Environmental Health & Biomol. Research, National Oceanic Atmospheric Administration, Oxford, MD, September 7-11, 2009

“Use of novel optics technology to establish susceptibility, resistance, and recovery indicators of stony corals to bleaching”, Chemistry of Life Processes Institute, Northwestern, January 2008

#### Honors and Awards

Fletcher Undergraduate Research Awards for Adviser of best UGR, Northwestern, 2012

Chemistry of Life Processes Chairman's Innovation Award, 2009 Chemistry of Life Processes, Northwestern University

Takeda Entrepreneurship Award, Finalist, 2002

European foundation E.R.A.S.M.U.S (March to August, 1990)

Portuguese Engineering and Biotechnology Foundation (September, 1990)

Scholarship of the Science Program conceded by the Portuguese National Technological and Scientific Organization (1991-1994)

Scholarship of the Portuguese PRAXIS XXI Program (1995)

Scholarship of the Portuguese-American Foundation (January to June, 1996)

European Community (Environment Contract EV5V-CT920197, 1994-1995)

#### 5ProFESSIONAL SERVICE

Membership in Professional Societies: American Society for Microbiology, American Association for the Advancement of Science, International Society for Reef Studies (ISRS), American Society of Limnology and Oceanography

Journal Peer-reviewer: Nature Communications, Scientific Reports, Limnology and Oceanography, PLoS One, Proc Royal Academy of Sciences London B, Elsevier Journals, J of Experimental Marine Biology and Ecology, Journal of Applied Microbiology, Biotechniques, Journal of Medical Genetics,

**COLLABORATORS:**

* Vadim Backman, Professor of Biomedical Engineering at McCormick School of Engineering, Northwestern University
* Michael Kühl, Professor, Department of Environmental Ecology, University of Copenhagen
* Ross Cunning, Researcher at the Fishes Department, Shedd Aquarium
* Igal Szleifer, Professor of Biomedical Engineering at McCormick School of Engineering, Northwestern University
* Andrew Baird, Professorial Research Fellow, James Cook University, Australia
* Jack Gilbert, Professor of pediatrics at Vc-health Sciences-schools, UC San Diego
* Mark Westneat, Professor, Department of Organismal Biology & Anatomy, U of Chicago
* Bernhard Riegl, Associate Director, National Coral Reef Institute, NOVA Southeastern University