

Timothy Stephens

Curriculum vitae

Personal summary

I am a computational biologist working on understanding the forces that govern the interactions between organisms in ecologically critical environments, such as coral reefs, and the forces that drive major evolutionary transitions, such as the one that gave rise to the first photosynthetic Eukaryotas. I am also CEO of OceanOmics, a company dedicated to developing salable tools for environmental health monitoring.

📍 Department of Biochemistry and Microbiology, Rutgers University, USA

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Education and Research Experience

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|----------------|---|
| 2019 — present | Post Doctoral Associate, Department of Biochemistry and Microbiology, Rutgers University |
| 2016 — 2019 | PhD, Institute for Molecular Bioscience, The University of Queensland |
| 2015 | Honours, Institute for Molecular Bioscience, The University of Queensland |
| 2012 — 2015 | Bachelor of Biotechnology, Institute for Molecular Bioscience, The University of Queensland |

Awards and honours

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| 2023 | Selected to attend and present at the New Phytologist Next Generation Scientists Conference 2023, National University of Singapore |
| 2021 | 2019 Dean's Award for Outstanding Higher Degree by Research Theses, University of Queensland |
| 2018 | Registration award for Society for Molecular Biology & Evolution (SMBE) 2018, SMBE |
| 2017 | Won best pitch prize at the UQ Idea Hub, University of Queensland |
| 2016 | Research Training Program (RTP) scholarship, University of Queensland |
| 2016 | Top poster prize at the IMB Research Higher Degree Student Symposium, University of Queensland |
| 2012 | Selected for the Advanced Study Program in Science (ASPinS; based on academic merit), University of Queensland |
| 2012 | Dean's Commendation for Academic Excellence (achieved a GPA over 6.6), University of Queensland |
| 2011 | Merit Scholarship for academic achievement, University of Queensland |

Publications

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| 2024 | Calatrava V.*, Stephens T. G.* , Grossman A. R., and Bhattacharya D. What has <i>Paulinella</i> taught us about endosymbiont metabolic integration?. <i>Schwartzbach, S.D., Kroth, P.G., Obornik, M. (eds) Endosymbiotic Organelle Acquisition. Springer, Cham., 2024. [URL]</i> *Co-first authorship |
| 2024 | Chille E. E., Stephens T. G. , Misri D., Strand E. L., Putnam H. M., and Bhattacharya D. Gene expression response under thermal stress in two Hawaiian corals is dominated by ploidy and genotype. <i>Ecology and Evolution</i> , 14:e70037, 2024. [URL] |

- 2024 Gabr A., **Stephens T. G.**, Reinfelder J. R., Liao P., Calatrava V., Grossman A. R., and Bhattacharya D. Evidence of a putative CO₂ delivery system to the chromatophore in the photosynthetic amoeba *Paulinella*. *Environmental Microbiology Reports*, e13304, 2024. [[URL](#)]
- 2024 Etten J. V., **Stephens T. G.**, Chille E., Lipzen A., Peterson D., Barry K., Grigoriev I. V., and Bhattacharya D. Diverse fates of ancient horizontal gene transfers in extremophilic red algae. *Environmental Microbiology*, 26(5):e16629, 2024. [[URL](#)]
- 2024 Benites L. F., **Stephens T. G.**, Etten J. V., James T., Christian W. C., Barry K., Grigoriev I. V., McDermott T. R. & Bhattacharya D. Viruses associated with extremophilic red algal mats reveal signatures of early thermal adaptation. *Communications Biology*, 2024. [[URL](#)] Featured by [Science](#)
- 2023 Bhattacharya D., **Stephens T. G.**, Chille E. E., Benites L. F., Chan C. X. Facultative lifestyle drives diversity of coral algal symbionts. *Trends in Ecology and Evolution*, 39(3):239-247, 2023. [[URL](#)]
- 2023 *Williams A., ***Stephens T. G.**, Shumaker A., and Bhattacharya D. Peeling back the layers of coral holobiont multi-omics data. *iScience*, 26(9):107623, 2023. [[URL](#)] *Co-first authorship
- 2023 **Stephens T. G.**, Strand E. L., Putnam H. M., and Bhattacharya D. Ploidy variation and its implications for reproduction and population dynamics in two sympatric Hawaiian coral species. *Genome Biology and Evolution*, ead149, 2023. [[Preprint](#)] [[URL](#)]
- 2023 Etten J. V., **Stephens T. G.**, and Bhattacharya D. A k-mer-based approach for inferring phylogenetic relatedness of environmental genomic data. *Systems Biology*, syad037, 2023. [[URL](#)] Won the [Publisher's Award for Excellence in Systematic Research](#)
- 2023 Etten J. V., Benites F. L., **Stephens T. G.**, Yoon H. S., and Bhattacharya D. Algae obscura: The potential of rare species as model systems. *Journal of Phycology*, 59(2):293-300, 2023. [[URL](#)]
- 2022 **Stephens T. G.**, Lee J., Jeong Y., Yoon H. S., Putnam H. M., Majerova E., and Bhattacharya D. High-quality genome assemblies from key Hawaiian coral species. *GigaScience*, 11:giac098, 2022. [[URL](#)]
- 2022 Benites L. F., **Stephens T. G.**, and Bhattacharya D. Multiple waves of viral invasions in Symbiodiniaceae algal genomes. *Virus Evolution*, 8:veac101, 2022. [[Preprint](#)] [[URL](#)]
- 2022 Bhattacharya D., Etten J. V., Benites L. F., and **Stephens T. G.** Endosymbiotic ratchet accelerates divergence after organelle origin. *BioEssays*, e2200165, 2022. [[URL](#)]
- 2022 *Gabr A., ***Stephens T. G.**, and Bhattacharya D. Loss of key endosymbiont genes may facilitate early host control of the chromatophore in *Paulinella*. *iScience*, 25:104974, 2022. [[URL](#)] *Co-first authorship
- 2022 Meng Z., Williams A., Liao P., **Stephens T. G.**, Drury C., Chiles E. N., Su X., Javanmard M., and Bhattacharya D. Development of a portable toolkit to diagnose coral thermal stress. *Scientific Reports*, 12:14398, 2022. [[URL](#)]
- 2022 Bhattacharya D., **Stephens T. G.**, Tinoco A., Richmond R., and Cleves P. A. Life on the edge: Hawaiian model for coral evolution. *Limnology and Oceanography*, 67:1976-1985, 2022. [[URL](#)]
- 2022 *Calatrava V., ***Stephens T. G.**, Gabr A., Grossman A. R., and Bhattacharya D. Retrotransposition facilitated the establishment of a primary plastid in the thecate amoeba *Paulinella*. *PNAS*, 119:e2121241119, 2022. [[URL](#)] *Co-first authorship
- 2022 *Gabr A., ***Stephens T. G.**, and Bhattacharya D. Hypothesis: *Trans*-splicing generates evolutionary novelty in the photosynthetic amoeba *Paulinella*. *Journal of Phycology*, 58:392-405, 2022. [[URL](#)] *Co-first authorship
- 2022 Dougan K. E., Gonzalez-Pech R. A., **Stephens T. G.**, Shah S., Chen Y., Ragan M. A., Bhattacharya D., and Chan C. X. Genome-powered classification of microbial eukaryotes: focus on coral algal symbionts. *Trends in Microbiology*, 30:831-840, 2022. [[URL](#)]
- 2022 Gabr A., Zournas A., **Stephens T. G.**, Dismukes G., and Bhattacharya D. Evidence for a robust photosystem II in the photosynthetic amoeba *Paulinella*. *New Phytologist*, 234:934-945, 2022. [[URL](#)]
- 2021 Williams A., Pathmanathan J. S., **Stephens T. G.**, Su X., Chiles E. N., Conetta D., Putnam H. M., and Bhattacharya D. Multi-omic characterization of the thermal stress phenome in the stony coral *Montipora capitata*. *PeerJ*, 9:e12335, 2021. [[Preprint](#)] [[URL](#)] Featured by PeerJ Expert Curations: Molecular Ecology: [PeerJ Expert Curations](#), [PeerJ Blog](#)

- 2021 **Stephens T. G.**, Gabr A., Calatreva V., Grossman A. R., and Bhattacharya D. Why is primary endosymbiosis so rare?. *New Phytologist*, 231:1693-1699, 2021. [[URL](#)]
- 2021 Bernard G., **Stephens T. G.**, Gonzalez-Pech R. A., and Chan C. X. Inferring phylogenomic relationship of microbes using scalable alignment-free methods. *Methods in Molecular Biology*, 2242:69-76, 2021. [[URL](#)]
- 2021 Jacobus A. P., **Stephens T. G.**, Youssef P., Gonzalez-Pech R., Ciccotosto-Camp M. M., Dougan K. E., Chen Y., Basso L. C., Frazzon J., Chan C. X., and Gross J. Comparative genomics supports that Brazilian bioethanol *Saccharomyces cerevisiae* comprise a unified group of domesticated strains related to cachaca spirit yeasts. *Frontiers in Microbiology*, 12:644089, 2021. [[Preprint](#)] [[URL](#)]
- 2021 Gonzalez-Pech, R. A., **Stephens T. G.**, Chen Y., Mohamed A. R., Cheng Y., Shah S., Dougan K. E., Fortuin M. D. A., Lagorce R., Burt D. W., Bhattacharya D., Ragan M. A., and Chan C. X. Comparison of 15 dinoflagellate genomes reveals extensive sequence and structural divergence in family Symbiodiniaceae and genus *Symbiodinium*. *BMC Biology*, 0.842361111, 2021. [[Preprint](#)] [[URL](#)]
- 2020 Lhee D., Lee J., Ettahi K., Cho C. H., Ha J., Chan Y., Zelzion U., **Stephens T. G.**, Price D. C., Gabr A., Nowack E. C. M., Bhattacharya D., and Yoon H. S. Amoeba genome reveals dominant host contribution to plastid endosymbiosis. *Molecular Biology and Evolution*, 38:344-357, 2020. [[URL](#)]
- 2020 **Stephens T. G.**, Gonzalez-Pech R. A., Cheng Y., Mohamed A. R., Burt D. W., Bhattacharya D., Ragan M. A., and Chan C. X. Genomes of the dinoflagellate *Polarella glacialis* encode tandemly repeated single-exon genes with adaptive functions. *BMC Biology*, 18:56, 2020. [[Preprint](#)] [[URL](#)] Featured by [IMB News](#)
- 2019 Chen Y., Gonzalez-Pech R. A., **Stephens T. G.**, Bhattacharya D., and Chan C. X. Evidence that inconsistent gene prediction can mislead analysis of dinoflagellate genomes. *Journal of Phycology*, 56:6-10, 2019. [[Preprint](#)] [[URL](#)]
- 2018 *Gonzalez-Pech R. A., ***Stephens T. G.**, and Chan C. X. Commonly misunderstood parameters of NCBI BLAST and important considerations for users. *Bioinformatics*, 35:2697-6998, 2018. [[URL](#)] *Co-first authorship [F1000 recommended]
- 2018 **Stephens T. G.**, Ragan M. A., Bhattacharya D., and Chan C. X. Core genes in diverse dinoflagellate lineages include a wealth of conserved dark genes with unknown functions. *Scientific Reports*, 8:17175, 2018. [[URL](#)]
- 2018 Liu H., **Stephens T. G.**, Gonzalez-Pech R. A., Beltran V. H., Lapeyre B., Bongaerts P., Cooke I., Aranda M., Bourne D. G., Foret S., Miller D. J., van Oppen M. J. H., Voolstra C. R., Ragan M.A., and Chan C.X. *Symbiodinium* genomes reveal adaptive evolution of functions related to coral-dinoflagellate symbiosis. *Communications Biology*, 0.107638889, 2018. [[Preprint](#)] [[URL](#)] Featured by multiple outlets: [IMB News](#), [GBRE](#), [Video Feature](#), [IMB 2018 year in review](#)
- 2018 Lee J., Yang E. C., Graf L., Yang J. H., Qiu H., Zelzion U., Chan C. X., **Stephens T. G.**, Weber A. P. M., Boo G. H., Boo S. M., Kim K. M., Shin Y., Jung M., Lee S. J., Yim H. S., Lee J. Y., Bhattacharya D., and Yoon H. S. Analysis of the draft genome of the red seaweed *Gracilariopsis chorda* provides insights into genome size evolution in Rhodophyta. *Molecular Biology and Evolution*, 35:1869-1886, 2018. [[URL](#)]
- 2016 **Stephens T. G.**, Bhattacharya D., Ragan M. A., and Chan C. X. PhySortR: a fast, flexible tool for sorting phylogenetic trees in R. *PeerJ*, 4:e2038, 2016. [[Preprint](#)] [[URL](#)]

Grants

- 2024 New Jersey CSIT Clean Tech R&D Voucher Pilot Program Round 3, \$40,000 USD
Funds awarded to our startup OceanOmics to utilize government facilities to aid development of our coral health monitoring toolkit, New Jersey Commission on Science, Innovation and Technology
- 2024 New Jersey CSIT Clean Tech Seed Grant Program Round 3, \$75,000 USD
Funds awarded to our startup OceanOmics to continue development of our coral health monitoring toolkit, New Jersey Commission on Science, Innovation and Technology

- 2023 Rutgers TechAdvance Fund, \$74,842 USD
Funds to continue development of our coral health monitoring toolkit.
Principal Investigators: Debashish Bhattacharya (Rutgers University), Rutgers University
- 2023 Climate Action Grant 2023, \$10,000 USD
Funds for metabolomic and transcriptomic profiling of sex hormone dysregulation in spawning corals during thermal stress.
Principal Investigators: Debashish Bhattacharya (Rutgers University), Rutgers University
- 2023 Core Facility Utilization Application 2023, \$5,000 USD
Funds for metabolomic profiling of the sex hormone cycle in spawning corals.
Principal Investigators: Debashish Bhattacharya (Rutgers University), Rutgers University
- 2022 Core Facility Utilization Application 2022, \$5,000 USD
Funds for sequencing of coral microbiome samples.
Principal Investigators: Debashish Bhattacharya (Rutgers University), Rutgers University
- 2022 Center for Nutrition, Microbiome, and Health Small Grant FY-22, \$2,000 USD
Characterizing the coral microbiome biogeography across colonies and reefs.
Principal Investigators: Debashish Bhattacharya (Rutgers University), Center for Nutrition, Rutgers University
- 2018 UQ-FAPESP Strategic Research Fund SPRINT (2018/15159-9), \$20,000 (~USD \$14,000)
Integrated genomic approaches to understand stress tolerance in bioethanol-producing yeasts and coral reef symbionts
Principal Investigators: Cheong Xin Chan (UQ) and Jeferson Gross (State University of Sao Paulo), Jointly funded by University of Queensland (UQ) and Sao Paulo State Foundation (FAPESP)

Teaching experience

- 2020 — present **Co-lecturer**
Rutgers University
Design and conducted lectures on de novo next-generation genome and transcriptome sequencing, metabolomics, proteomics, metagenomics, phylogenetics, and phylogenomics in a join undergraduate and postgraduate course titled “Fundamentals of Microbial Genomics”. Duties include designing and marking student’ exam questions and oral presentations.
- 2018 **Head Practical Tutor**
University of Queensland
Duties included designing and developing assessment material for the course and organising marking of assignments.
- 2016 — 2017 **Practical Tutor**
University of Queensland
Duties included assisting students with the completion of set questions and marking of assignments.
- 2013 **Science Mentor**
University of Queensland
Duties included organizing and running first year science student introduction and social engagement events designed to inform students about study/research opportunities available at The University of Queensland.
- 2013 — 2014 **Peer Assisted Study Session (PASS) Tutor**
University of Queensland
Duties included planning and leading multiple weekly tutorial sessions, each comprising 20-30+ students.
- 2012 — 2014 **CASPiE Tutor**
University of Queensland
Duties included guiding undergraduate chemistry students through an advanced set of research-focused practicals, with the aim of developing their critical and experimental thinking.

Professional development

- 2017 Research Commercialisation Workshop, University of Queensland
2017 UQ Idea Hub, University of Queensland

Talks

- 2024 **Stephens T. G.**, Kulczyk A. W., and Bhattacharya D. Cosmopolitan gene families with known functions are hotspots for the evolution of novel genes in stony corals. *3rd Joint Congress on Evolutionary Biology*. 26-30 July 2024, Montreal, Canada.
- 2023 **Stephens T. G.**, Etten J. V., Benites L. F., Mcdermott T., and Bhattacharya D. Cyanidiophyceae: The extremophilic red algae that underpin hot spring microbial communities in Yellowstone National Park. *UQ Marine Ecogenomics Symposium 2023*. 13-14 December 2023, University of Queensland, Australia.
- 2023 **Stephens T. G.**, Etten J. V., Benites L. F., Mcdermott T., and Bhattacharya D. Cyanidiophyceae: The extremophilic red algae that underpin hot spring microbial communities in Yellowstone National Park. *Department of Molecular Biology and Biochemistry Seminar*, Rutgers University.
- 2023 **Stephens T. G.**, Chille E., Wong K., Andrade N., Hulett R., Cleves P., Bhattacharya D., Traylor-Knowles N. Shining a light on “dark” proteins in corals. *From Postdoc to Principal Investigator: An NSF Division of Integrative Organismal Systems (IOS) Virtual Colloquium 2023*. 13-14th September 2023, Virtual.
- 2023 **Stephens T. G.**, Calatrava V., Gabr A., Grossman A., and Bhattacharya D. Exploring the origin and evolution of primary plastids using *Paulinella* as a model system. *International Society of Endocytobiology conference 2023*. 10-14th September 2023, Field Museum, Chicago.
- 2023 **Stephens T. G.**, Chille E., Strand E. L., Putnam H. M., and Bhattacharya D. Multi-omics investigation of coral resilience. *Invited talk at Carnegie Plant Biology Seminar, August 2023*. 25th August 2023, Carnegie Department of Plant Biology, Stanford University, USA.
- 2023 **Stephens T. G.**, Calatrava V., Gabr A., Grossman A., and Bhattacharya D. Exploring the origin and evolution of primary plastids using *Paulinella* as a model system. *New Phytologist Next Generation Scientists Conference 2023*. 3rd July 2023, National University of Singapore, Singapore.
- 2023 **Stephens T. G.**, Calatrava V., Gabr A., Grossman A., and Bhattacharya D. Exploring endosymbiosis and biotic interactions using niche, non-model algae. *Invited talk at SCMB GenGen/ACE Special Seminar*. 10th January 2023, The University of Queensland, Brisbane, Australia.
- 2022 **Stephens T. G.**, Williams A., Shumaker A., and Bhattacharya D. Integration of multi-omics coral data under thermal stress . *4th Institute for Food, Nutrition, and Health*. 4th November 2022, Rutgers University, New Jersey, USA.
- 2022 **Stephens T. G.**, Strand E. L., Putnam H. M., and Bhattacharya D. Differences in ploidy and the prevalence of clonal propagation between *Montipora capitata* and *Pocillopora acuta* from Kane’ohe Bay, Hawai’i. *15th International Coral Reef Symposium*. 3-8th July 2022, Bremen, Germany.
- 2022 **Stephens T. G.**, Etten J. V., McDermott T., and Bhattacharya D. Analysis of environmental meta-omics data from the extremophilic red algae Cyanidiophyceae. *Joint Aquatic Sciences Meeting*. 14-20th May, 2022, Grand Rapids, USA.
- 2021 **Stephens T. G.**, Calatrava V., Gabr A., Grossman A., and Bhattacharya D. Insights into the evolution of a primary endosymbiosis through analysis of the *Paulinella* genome. *75th Annual Meeting of the Phycological Society of America*. 13-22nd July 2021, online.
- 2021 **Stephens T. G.**, Calatrava V., Gabr A., Grossman A., and Bhattacharya D. Insights into the evolution of a primary endosymbiosis through analysis of the *Paulinella* genome. *12th International Phycological Congress*. 22-26th March 2021, Chile.

- 2019 **Stephens T. G.**, Bhattacharya D., Ragan M. A., and Chan C. X. *Polarella* genomics: understanding the evolutionary transition to algal symbiosis and cold adaptation. *Joint Academic Microbiology Seminars (JAMS)*. 9th April 2019, Brisbane, Australia.
- 2018 **Stephens T. G.**, Bhattacharya D., Ragan M. A., and Chan C. X. *Polarella* genomics: understanding the evolutionary transition to algal symbiosis and cold adaptation. *Botany Department, Biosciences Institute, University of Sao Paulo*. 14th December 2018, Sao Paulo, Brazil.
- 2018 **Stephens T. G.**, Bhattacharya D., Ragan M. A., and Chan C. X. *Polarella* genomics: understanding the evolutionary transition to algal symbiosis and cold adaptation. *2nd Bioenergy Workshop, UNESP-USP-UNICAMP Integrated Postgraduate Program in Bioenergy, Institute for Research in Bioenergy, State University of Sao Paulo (UNESP)*. 6th December 2018, Sao Paulo, Brazil.
- 2017 **Stephens T. G.**, Bhattacharya D., Ragan M. A. and Chan C. X. Insights into coral reef symbiosis from the genome of cold-adapted algae. *EMBL Australia Postgraduate Symposium 2017*, 29th November-1st December 2017, Sydney, Australia.

Poster presentations

- 2024 **Stephens T. G.**, Etten J. V., McDermott T. R., and Bhattacharya D. Cyanidiophyceae: The Extremophilic Red Algae That Underpin Hot Spring Microbial Communities In Yellowstone National Park. *Eastern Regional Photosynthesis Conference 2024*. 12-14th April 2024, Marine Biological Laboratory, Massachusetts, USA.
- 2024 **Stephens T. G.**, Calatrava V., Gabr A., Grossman A., and Bhattacharya D. Exploring the origin and evolution of primary plastids using *Paulinella* as a model system. *RUMP Annual Retreat 2024*. 16th March 2024, Rutgers University, New Jersey, USA.
- 2023 **Stephens T. G.**, Chille E., Wong K., Andrade N., Hulett R., Cleves P., Bhattacharya D., Traylor-Knowles N. Shining a light on “dark” proteins in corals. *NSF EDGE PI Meeting 2023*. 10-11th October 2023, Alexandria, Virginia, USA.
- 2023 **Stephens T. G.**, Calatrava V., Gabr A., Grossman A., and Bhattacharya D. Exploring the origin and evolution of primary plastids using *Paulinella* as a model system. *JGI Annual User Meeting 2023*. 21-24th August 2023, JGI, Berkeley, California, USA.
- 2018 **Stephens T. G.**, Bhattacharya D., Ragan M. A., and Chan C. X. *Polarella* genomics: understanding cold adaptation and evolutionary transition to symbiosis in dinoflagellates. *Society for Molecular Biology & Evolution (SMBE) annual meeting 2018*, 8-12th July 2018, Yokohama, Japan.
- 2016 **Stephens T. G.**, Chan C. X., and Ragan M. *Polarella* genomics: understanding the evolutionary transition to algal symbiosis and cold adaptation, *IMB Research Higher Degree Student Symposium*, 13th Jul 2016, The University of Queensland, Brisbane, Australia.

Media coverage

- 2024 Our paper [Viruses associated with extremophilic red algal mats reveal signatures of early thermal adaptation](#) was featured by [Science](#)
- 2023 Our paper [A k-mer-Based Approach for Phylogenetic Classification of Taxa in Environmental Genomic Data](#) won the [Publisher’s Award for Excellence in Systematic Research](#)
- 2022 Our paper [Retrotransposition facilitated the establishment of a primary plastid in the thecate amoeba Paulinella](#) covered by [Rutgers Research](#)
- 2022 Article by [Rutgers Research](#) on our short film [The Coral Holobiont Response to Climate Change](#) which won Best Trailer in the Kiez Berlin Film Festival.
- 2021 Our paper [Why is primary endosymbiosis so rare?](#) was covered by [Rutgers Newsroom](#). We also produced two animated videos: [Video 1](#), [Video 2](#)
- 2020 Our paper [Amoeba Genome Reveals Dominant Host Contribution to Plastid Endosymbiosis](#) covered by [Rutgers Today](#)

Service

2023 — present Associate Editor: Symbiotic and Parasitic Protists section, [Frontiers in Protistology](#).

Patents

2023 Provisional Patent “Protein Markers of Coral Stress” (5431.1025-000:2023-098)

Non-provisional US Patent filed 2024/03/27

2023 Provisional Patent “Coral Rapid Strip Test” (5431.1024-000:2023-097)