Daniel **Damineli**

Theoretical and Computational Biologist

danieldamineli@gmail.com

Personal

Daniel Santa Cruz Damineli
Nationality: São Paulo, Brazil
Age: 44 years old

About me

Over 850 citations; h-index 15 (Google Scholar Fev/25) • Reviewer for 13 international journals • Teaching: mathematics, programming, and statistics to over 600 undergraduate students.

Areas of specialization

Computational Biology • Time Series Analysis • Dynamical Systems & Bifurcations • Data Analysis & Visualization • Systems Biology

Interests

Chronobiology • Oscillations • Ion Dynamics • Morphogenesis • Gene Regulatory Networks • Physiology • Cell Biology • Bioelectricity • Synthetic Biology • Computation & Decision-Making in Single Cells • Complex Systems

Main Research Question

How biological functions emerge from general mathematical properties of dynamical systems — a fundamental piece of a physical theory of living systems.

Daniel Damineli
damineli
ORCID

Web of Science
ResearchGate
LinkedIn
FAPESP

Academic & Professional Experience

2023–2025 — **Professor of Biomathematics**
UFABC · Center for Mathematics, Computing and Cognition
Visiting professor at the Federal University of ABC, Brazil, in the area of Numerical Analysis, Optimization, Biomathematics, Mathematical Physics, Dynamical Systems. Research in *Quantification and Functionality of Biological Rhythms*.

2019–2023 — **Postdoctoral Researcher in Gene Expression and Clinical Data**
USP · Institute of Mathematics and Statistics & Medical School
Supervised by Prof. Carlos Alberto Moreira Filho, Medical School and Prof. Roberto Cesar Marcondes, Institute of Mathematics and Statistics, University of São Paulo, Brazil. Funding by FAPESP (2019/23343-7).

2014–2019 — **Postdoctoral Researcher in Time Series and Image Analysis**
UMD · Department of Cell Biology & Molecular Genetics
Research on pollen tube growth, ion dynamics, oscillations and guidance supervised by Prof. José Feijó at the University of Maryland, USA. Funding by NSF (MCB 1616437/2016).

2008–2014 — **PhD in Computational Biology**
IGC/ITQB · NOVA University Lisbon
Thesis "*Synchronization properties of multi-oscillator circadian systems: biological functions beyond time-keeping*" supervised by Dr. Andreas Bohn, Portugal. Funding by FCT (SFRH/BD/33857/2009).

2008 — **Researcher in Time Series Analysis and Modeling**
IGC/ITQB · Systems Biodynamics Lab
Research analyzing and modeling growth curves and sloughing events of phototrophic biofilms, supervised by Dr. Andreas Bohn, Portugal. Funding by FCT (SFRH/BI/33556/2008).

2006–2008 — **Master in Plant Biology**
UNESP · PPGCB-BV, Rio Claro
Dissertation "*Contributions of Network Connectance and Complexity of Gas Exchange Dynamics to the Stability of Light Utilization in Forest Species*" supervised by Prof. Gustavo Maia Souza, Brazil. Funding by FAPESP (05/57472-5).

2001–2006 — **Bachelor in Biology**
USP · Institute of Biosciences
Research at the Chronopharmacology lab lead by Prof. Regina Pekelmann Markus, University of São Paulo, Brazil. Funding by PIBIC, CNPq.

Reviewer/Editor roles

PLoS Computational Biology (Guest editor) • *Physica D: Nonlinear Phenomena* • *Bioinformatics* • *Journal of Theoretical Biology* • *European Biophysics Journal* • *Communicative & Integrative Biology* • *Royal Society Open Science* • *iScience (Cell Press)* • *Plant Physiology* • *The Plant Journal* • *Plant and Cell Physiology* • *PloS One* • *Theoretical and Experimental Plant Physiology*

Programming

R
Python
LaTeX
shell script
C

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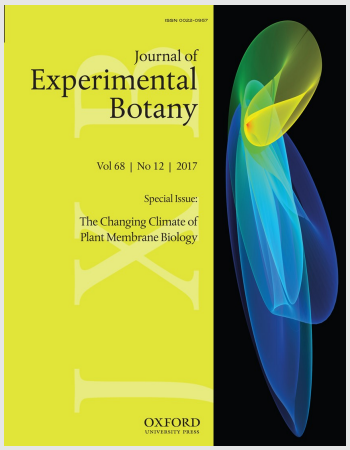
Covers



Attention score

Highest Altmetric Attention score ever recorded for *Current Opinion in Cell Biology* for Damineli et al. 2023

Media

Hundreds of news outlets picked up on Pinnotti et al. 2022 (well it was COVID times), including reports from my funding agency and university, being widely reproduced in the press, radio stations, including other universities, an interview show and additional coverage and television.

Readership

Over 500,000 accessed to Damineli & Damineli, 2007.

Fun fact

My time-series analysis pipeline developed for single cells was used to analyze a binary star system. The University of Maryland covered the story with the headline *"Discovering hidden rhythms in space with CHUKNORRIS"*

Quintuple co-authorship

Hoffmann et al. 2020 has 5 co-first authors, including me, being one of my favorite papers. It also received local and international media coverage,.

Publications in Peer-Reviewed Journals

2024 Schoenaers, S., Lee, H. K., Gonneau, M., Faucher, E., Levasseur, T., Akary, E., Claeijs, N., Moussu, S., Broyart, C., Balcerowicz, D., AbdElgawad, H., Bassi, A., **Damineli, D. S. C.**, Costa, A., Feijó, J. A., Moreau, C., Bonnin, E., Cathala, B., Santiago, J., Höfte, H., & Vissenberg, K. Rapid alkalinization factor 22 has a structural and signalling role in root hair cell wall assembly. *Nature Plants*. DOI:10.1038/s41477-024-01637-8

2023 Badain, R., **Damineli, D. S. C.**, Portes, M. T., Feijó, J., Buratti, S., Tortora, G., & Cesar Jr, R. M. AMEBaS: Automatic Midline Extraction and Background Subtraction of Ratiometric Fluorescence Time-Lapses of Polarized Single Cells. *JoVE (Journal of Visualized Experiments)*. DOI:10.3791/64857

2023 Li, K., Prada, J., Dandekar, T., **Damineli, D. S. C.**, & Konrad, K. R. pH but not Ca^{2+} Waves Propagate Membrane Potential Oscillations Throughout the Pollen Tube. *Bioelectricity*. DOI:10.1089/bioe.2023.0005

2022 **Damineli, D. S.**, Portes, M. T., & Feijó, J. A. Electrifying rhythms in plant cells. *Current Opinion in Cell Biology*. DOI:10.1016/j.ceb.2022.102113

2022 Lourenço, J., Barros, S. C., Zé-Zé, L., **Damineli, D. S.**, Giovanetti, M., Osório, H. C., & Obolski, U. West Nile virus transmission potential in Portugal. *Communications Biology*. DOI:10.1038/s42003-021-02969-3

2021 Pinotti, F., Wikramaratna, P. S., Obolski, U., Paton, R. S., **Damineli, D. S.**, Alcantara, L. C., & Lourenço, J. Potential impact of individual exposure histories to endemic human coronaviruses on age-dependent severity of COVID-19. *BMC Medicine*. DOI:10.1186/s12916-020-01887-1

2021 Portes, M., **Damineli, D.**, & Feijó, J. Spatiotemporal Quantification of Cytosolic pH in Arabidopsis Pollen Tubes. *Bio-protocol*. DOI:10.21769/BioProtoc.4084

2021 Li, K., Prada, J., **Damineli, D. S.**, Liese, A., Romeis, T., Dandekar, T., & Konrad, K. R. An optimized genetically encoded dual reporter for simultaneous ratio imaging of Ca^{2+} and H^{+} reveals new insights into ion signaling in plants. *New Phytologist*. DOI:10.1111/nph.17202

2020 **Damineli, D. S.**, Portes, M. T., & Feijó, J. A. Analyzing intracellular gradients in pollen tubes. *Pollen and Pollen Tube Biology: Methods and Protocols*. DOI:10.1007/978-1-0716-0672-8_14

2020 Hoffmann*, R. D., Portes*, M. T., Olsena*, L. I., **Damineli***, D. S. C., Hayashi*, M., Nunes, C., & Palmgren, M. Plasma membrane H^{+}-ATPases sustain pollen tube growth and fertilization. *Nature Communications*. Authors with '*' contributed equally. DOI:10.1038/s41467-020-16253-1

2019 Damineli, A., Fernández-Lajús, E., Almeida, L. A., Corcoran, M. F., **Damineli, D. S. C.**, Gull, T. R., & Weigelt, G. Distinguishing circumstellar from stellar photometric variability in Eta Carinae. *Monthly Notices of the Royal Astronomical Society*. DOI:10.1093/mnras/stz067

2018 Wudick, M. M., Portes, M. T., Michard, E., Rosas-Santiago, P., Lizzio, M. A., Nunes, C. O., **Damineli, D. S. C.**, ... & Feijó, J. A. CORNICHON sorting and regulation of GLR channels underlie pollen tube Ca^{2+} homeostasis. *Science*. DOI:10.1126/science.aar6464 **[COVER]**

2017 Ortiz-Ramírez, C., Michard, E., Simon, A. A., **Damineli, D. S. C.**, Hernández-Coronado, M., Becker, J. D., & Feijó, J. A. GLUTAMATE RECEPTOR-LIKE channels are essential for chemotaxis and reproduction in mosses. *Nature*. DOI:10.1038/nature23478

2017 **Damineli, D. S. C.**, Portes, M. T., & Feijó, J. A. Oscillatory signatures underlie growth regimes in *Arabidopsis* pollen tubes: computational methods to estimate tip location, periodicity, and synchronization in growing cells. *Journal of Experimental Botany*. DOI:10.1093/jxb/erx032 **[COVER]**

2016 Damineli, A., Almeida, L. A., Blum, R. D., **Damineli, D. S. C.**, Navarete, F., Rubinho, M. S., & Teodoro, M. Extinction law in the range 0.4 - 4.8 μm and the 8620 Å DIB towards the stellar cluster Westerlund 1. *Monthly Notices of the Royal Astronomical Society*. DOI:10.1093/mnras/stw2122

2010 Portes, M. T., **Damineli, D. S. C.**, Ribeiro, R. V., Monteiro, J. A. F., & Souza, G. M. Evidence of higher photosynthetic plasticity in the early successional *Guazuma ulmifolia* Lam. compared to the late successional *Hymenaea courbaril* L. grown in contrasting light environments. *Brazilian Journal of Biology*. DOI: 10.1590/S1519-69842010000100011

2009 Souza, G. M., Ribeiro, R. V., Prado, C. H. B. A., **Damineli, D. S. C.**, Sato, A. M., & Oliveira, M. S. Using network connectance and autonomy analyses to uncover patterns of photosynthetic responses in tropical woody species. *Ecological Complexity*. DOI:10.1016/j.ecocom.2008.10.002

2007 Damineli, A., & **Damineli, D. S. C.** Origens da vida. *Estudos Avançados*. DOI:10.1590/S0103-40142007000100022

Book Chapters and Other Publications

2017 **Damineli, D. S. C.**, Portes, M. T., & Feijó, J. A. One thousand and one oscillators at the pollen tube tip: The quest for a central pacemaker revisited. In *Pollen Tip Growth: From Biophysical Aspects to Systems Biology* (pp. 391–413). Cham: Springer International Publishing. DOI: 0.1007/978-3-319-56645-0_15

2015 Portes, M. T., **Damineli, D. S. C.**, Moreno, N., Colaço, R., Costa, S., & Feijó, J. A. The pollen tube oscillator: integrating biophysics and biochemistry into cellular growth and morphogenesis. In *Rhythms in Plants* (pp. 121-156). Cham: Springer. DOI: 10.1007/978-3-319-20517-5_6

2011 **Damineli, D. S. C.** The Daily Rhythms of Living Matter. *Champalimaud Foundation: aR Magazine* (online). https://magazine.ar.fchampalimaud.org/the-daily-rhythms-of-living-matter/

2008 **Damineli, D. S. C.**, & Souza, G. M. A Cognição como um Processo Auto-organizado e Auto-referente em Sistemas Adaptativos Complexos. "Cognition as a self-organized and self-referent process in Complex Adaptive Systems" In *AUTO-ORGANIZAÇÃO: Estudos Interdisciplinares*, Volume 52, Coleção CLE / FAPESP. Available at ResearchGate.

Teaching

2023-2025 *Calculus I*, for 450 undergraduate students (enrolled in 5 classes). UFABC, Brazil.

2023-2024 *Computational Basis of Science*, covering programming and statistics for 200 undergraduate students (enrolled in 5 classes). UFABC, Brazil.

Making Math Accessible

My *Calculus I* class had 4 times the average demand in 2024.

Main Tools & Techniques

Dynamical Systems

- Integration
- Phase Portrait
- Bifurcations

Time Series Analysis

- Detrending
- Wavelets
- Synchronization

Image Analysis

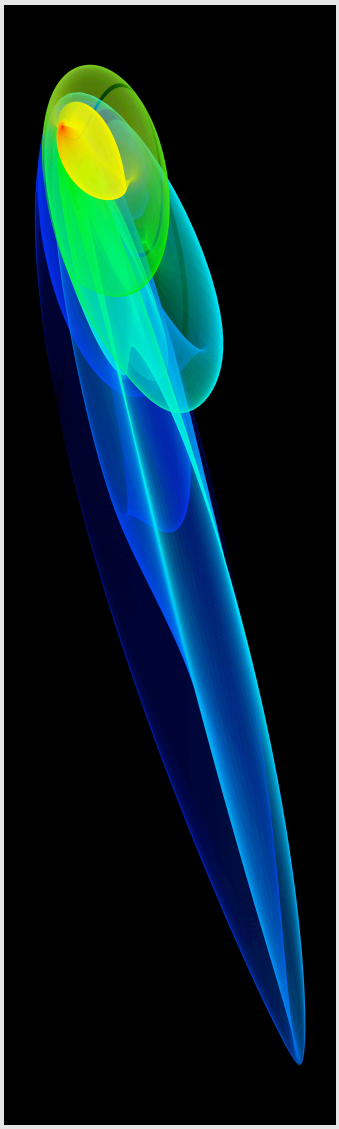
- Fluorescence
- Ratiometric images
- Subpixel detection

Favorite Packages

- XPPAUT, PyDSTool & SciPy
- SymPy & Maple
- ggplot2, tidyverse & Shiny

STEAM

Math/Data art representing synchronization as the cross-wavelet coefficients color-coded by period:



Teaching & Mentoring

2023 *An Introduction to Chronobiology: It's Not Only About Time!* and *Circadian Rhythms: From Organisms to Cells and Back*, taught within the course "From Cells to Organisms" for the PhD program in Integrative Biology and Biomedicine at the Gulbenkian Institute of Science (IGC), Oeiras, Portugal.

2017 Organized and taught a module in and international workshop. *Introducing CHUKNORRIS: Imaging and Oscillation Software Analysis* in the Pollen Network - Imaging Workshop, University of Maryland, USA.

2021-2023 Mentored Rafael Badain on fluorescence imaging analysis of individual cells with apical growth, an undergraduate research student in the Mathematics and Statistics department at the University of São Paulo, Brazil. https://github.com/badain/amebas.git

2017-2018 Mentored Francisco Neves, Electrical Engineering undergraduate at the University of São Paulo, São Carlos, Brazil, on an interactive web application of the CHUKNORRIS data analysis pipeline. UMD, USA. https://feijolab.shinyapps.io/CHUK/

2016 Mentored Urjita Daas, high school student at Montgomery Blair High School (Silver Spring, MD), on the correlation between Ca^{2+} and pollen tube growth using R. Research coordinator: Angelique Bosse. UMD, USA.

2019 Taught *Life in the Cosmic Context* for grades 6, 7, 8, and 9 at the bilingual school Pueri Domus, São Paulo, Brazil.

2010 Assisted in the course *Bayesian Brain* by Alexandre Pouget and Jeffrey Beck for the Gulbenkian-Champalimaud international PhD program in Neuroscience.

2007 Assisted in the course *Philosophy of Science* for Biology students at UNOESTE, taught by Prof. Gustavo Maia Souza.

2007 Assisted in the course *Plant Ecology and Biogeography* for Biology students at UNOESTE, taught by Prof. Gustavo Maia Souza.

2005 Assisted in the course *Life in the Cosmic Context*, offered by Prof. Augusto Damineli Neto and Prof. Denise Selivon Scheepmaker at USP.

Invited Talks

Dez. 2023 *V Symposium on Systemic Ecophysiology*, Fortaleza, Brazil. "Função e quantificação de ritmos biológicos".

Jan. 2023 *Instituto Gulbenkian de Ciência*, institutional seminar, Portugal. "Biological Functions of Oscillatory Systems: Bioelectricity in Cell Polarity, Guidance and Cell-to-Cell Communication".

Apr. 2021 *Institute for Theoretical Biology, Humboldt University*, online. "Processing conflicting signals with inter-oscillator coupling in circadian systems."

Nov. 2020 *IV Symposium on Systemic Ecophysiology*, online. "How many oscillators are here? Analysis and modeling of oscillatory systems."

Jun. 2018 *Champalimaud Neuroscience Programme*, Lisbon, Portugal. "Tau waves: circadian phase clusters affect memory formation in a minimal model of neuronal selection."

Jun. 2017 *International Conference on Biological Physics*, Rio de Janeiro. "Biological functions of oscillatory systems." http://www.if.ufrgs.br/icbp2017/program.html

Mar. 2017 *New Jersey Institute of Technology (NJIT), Center for Applied Mathematics and Statistics*. "Biological functions of oscillatory systems: specific signatures underlie distinct growth regimes in pollen tubes." https://math.njit.edu/sites/math/files/CAMS$_A R_2017.pdf$

Jun. 2011 *European Conference on Mathematical and Theoretical Biology*, Krakow, Poland. "Minimal modeling of two-oscillator circadian systems under conflicting environmental cues." https://www.impan.pl/ ecmtb11/index.php?file=peop.html

2011 *Second Workshop: Dynamical Systems applied to Biology and Natural Sciences*. "Minimal modeling and time-series analysis of circadian rhythms forced by conflicting environmental signals."

Nov. 2010 *Molecular Systems Biology Seminars of the Institute for Theoretical Biology, Humboldt University, Berlin*. "Unraveling the structure of two-oscillator circadian systems using conflicting environmental cues." http://www.sys-bio.net/msb-seminar

Feb. 2010 *Dynamical Systems applied to Biology and Natural Sciences, Center for Mathematics and Fundamental Applications, University of Lisbon, Portugal*. "Minimal modeling of biological rhythms: advantages of keeping the representation of circadian oscillators simple." http://ptmat.fc.ul.pt/ dsabn2010/program.html

Sep. 2007 *XI Brazilian Congress of Plant Physiology*, Gramado. "What can Systems Biology contribute to the understanding of sunflecks utilization by tropical tree species."

Apr. 2007 *XXIV Academic Week of Biology, Federal University of Viçosa*. "Towards a new Biology: the theory of Complex Systems promises to change the view of the phenomenon of life."

Jul. 2005 *Self-Organization Group - Center for Logic, Epistemology, and History of Science (CLE-UNICAMP)*. "The relationship between complexity and stability in biological systems."

Additional Training

2011 *Multi-level Modelling of Morphogenesis*, EMBO Practical Course, John Innes Centre, Norwich, UK.

2010 *Mathematical Modelling, Nonlinear Dynamics, Stochastic and Complex Systems*, Summer School, Danish Technical University (DTU), Lyngby, Denmark.

2009 *Biophysical Mechanisms of Development*, EMBO Workshop, Oeiras, Portugal.

2009 *Medical Bioinformatics and System Biology*, Workshop, Portugal.

The Gulbenkian Institute

The now extinct Instituto Gulbenkian de Ciência (IGC) was an indescribably vibrant scientific community. Spearheaded by Prof. António Coutinho, not only it had innovative Principal Investigators from all over the world, but also leading scientists visiting on a weekly basis. The scientific advisory board, for example, Nobel Prize laureates such as Sydney Brenner and Susumu Tonegawa.

Computational Biology PhD

The PhD Program in Computational Biology (PDBC) at IGC, directed by Dr. Jorge Carneiro, attempted to create "the best possible syllabus" by bringing leading experts from all over the globe, also sharing classes with students from the Champalimaud's International PhD in Neuroscience.

Team player

I was acknowledged in at least 12 papers.

Professional References

Click on the name to link to each profile.

- José Feijó @University of Maryland (postdoc advisor)
  jfeijo@umd.edu
- Roberto Marcondes Cesar @University of São Paulo (postdoc advisor)
  rmcesar@usp.br
- Jorge Carneiro @Instituto Gulbenkian de Ciência (PhD director)
  jorge.aka.carneiro@gmail.com
- Jordi García-Ojalvo @Universitat Pompeu Fabra (PhD jury)
  jordi.g.ojalvo@upf.edu
- Hanspeter Herzel @Humboldt-Universität (peer)
  h.herzel@biologie.hu-berlin.de
- Anja Geitmann @McGuill University (peer)
  anja.geitmann@mcgill.ca
- Veronica Grieneisen @Cardiff University (peer)
  grieneisenv@cardiff.ac.uk
- Angus Murphy @University of Maryland (peer)
  asmurphy@umd.edu
- Casey Diekman @New Jersey Institute of Technology (peer)
  diekman@njit.edu
- Luis Rocha @Binghamton University
  rocha@binghamton.edu
- Alex Costa @University of Milan (peer)
  alex.costa@unimi.it

Poster Presentations

2018 *25th International Congress on Sexual Plant Reproduction*, Gifu, Japan. "Unraveling regulatory phenotypes in pollen tube ion dynamics and growth with CHUKNORRIS2.0: chemotropism relies on plasticity."

2016 *International Workshop on Plant Membrane Biology*, Annapolis, Maryland, USA. "Oscillations at the pollen tube tip membrane: computational approaches link ion dynamics and growth modulation."

2013 *Rhythms and Oscillations (Workshop 4), Mathematical Biosciences Institute*, Ohio State University, USA. "Functions of circadian (de)synchronization in memory processes."

2011 *The Rhythm of Life: Cycles in Biology, 13th International PhD Symposium*, EMBL Heidelberg, Germany. "Minimal modeling of multiple entrainment in circadian systems."

2010 *International Symposium on Mathematical and Computational Biology (Annual Meeting of the Society for Mathematical Biology)*, Rio de Janeiro, Brazil. "Modeling two-oscillator circadian systems under the influence of conflicting zeitgebers."

2010 *European Conference on Complex Systems (ECCS'10)*, Lisbon, Portugal. "Processing of complex environmental cues in circadian systems composed of two-oscillators."

2010 *Circadian Clocks in Plants and Fungi (Workshop 2), Mathematical Biosciences Institute*, Ohio State University, USA. "When zeitgebers compete, we win! Unraveling the structure of two-oscillator systems using conflicting environmental cues."

2008 *1st Portuguese Forum on Computational Biology*, Oeiras, Portugal. "Integration and multi-level modeling of ecophysiological data from phototrophic biofilms."

2007 *3rd International Conference of the Brazilian Association for Bioinformatics and Computational Biology - X Meeting*. "Network connectance and irregularity of gas exchange dynamics as possible stability promoters in tree species."

2007 *58th National Congress of Botany*. "Inferring physiological flexibility in forest species from the perspective of Systems Biology."

2007 *Annual Meeting of the Association for Tropical Biology and Conservation - Linking Tropical Biology with Human Dimensions*, Morelia, Mexico. "Fruiting trees as biodiversity promoters in tropical forests: a case study with Cecropia spp." by DAMINELI, D.S.C., CAMARGO, M.G.G., NEVES, C.L., CASELLI, C.B., PIRES, A.S., DIRZO, R.

2006 *9th Experimental Chaos Conference, National Institute for Space Research (INPE)*, São José dos Campos. "Investigating the relationship between system complexity and stability: Time series irregularity and global network connectance as possible indicators of physiological flexibility in plant species." http://www.lac.inpe.br/ecc9/scientific$_{program/abstracts.html}$

2005 *XII Latin American Congress of Plant Physiology*. "Temporal dynamics of stomatal conductance and differences in the pattern of gas exchange network connectance in tree species from different forest succession groups."

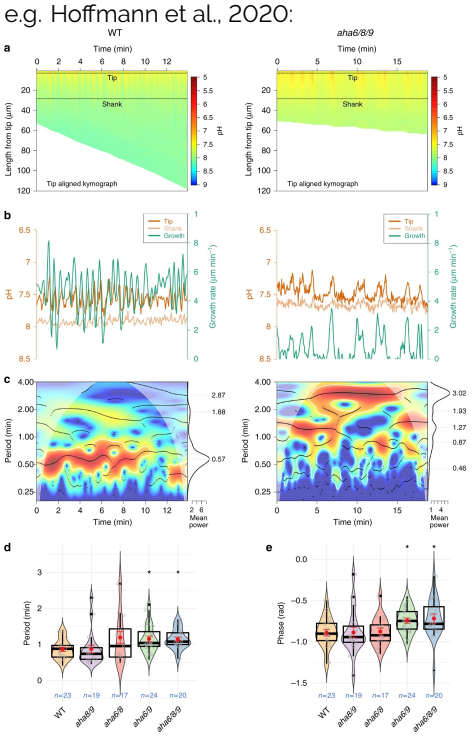
2004 *12th International Symposium on Scientific Initiation at USP*. "Melatonin prevents KCl-induced inhibition of branching formation in rat myotubes in culture."

2003 *11th International Symposium on Scientific Initiation at USP*. "Melatonin prevents KCl-induced inhibition of branching formation in rat myotubes in culture."

2003 *XXXV Brazilian Congress of Pharmacology and Experimental Therapeutics*. "Melatonin prevents KCl-induced inhibition of branching formation in rat myotubes in culture."

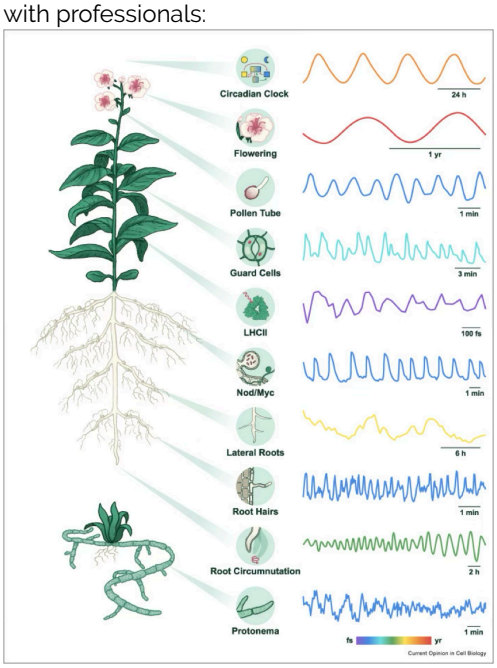
Data Viz

Data visualization for quantitative approaches, e.g. Hoffmann et al., 2020:



Scientific Illustration

Conceptualization and development of impactful illustrations in collaboration with professionals:



By Joana Carvalho Damineli et al. 2022

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