# Joseph Swift, Ph.D.

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## Education

**PhD** - Biology, New York University, United States 2013 - 18
**MPhil** - Biotechnology, Garvan Institute of Medical Research, Australia 2011 - 12
**BSc** - Biotechnology and Biochemistry, University of New South Wales, Australia 2007 - 10

## Research Experience

**Postdoctoral Scholar** (Mentor - **Joseph Ecker**) 2019 - present
The Salk Institute of Biological Studies - Howard Hughes Medical Institute

My post-doctoral research has developed novel single-cell sequencing assays and bioinformatic approaches to reveal how different plant cell types respond to abiotic signals. My projects include:

- ***(i)*** Drawing on the 1001 *Arabidopsis* collection, I have sequenced hundreds of *Arabidopsis* accessions at single-cell resolution, creating a 1M+ transcriptional cell atlas.
- ***(ii)*** I've used single-cell RNA-seq to model how different *Arabidopsis* leaf cell-types respond to drought, revealing how water stress accelerates senescence and leaf aging.
- ***(iii)*** Using single-cell multi-omics (RNA and ATAC-seq, 500k cell atlas), I have measured how rice and sorghum leaves respond to light at the gene regulatory level. By these means, I have uncovered new molecular signatures that drive $C_4$ photosynthesis.

At present, my post-doctorate research resulted in **1** first author research publication, **1** first author review article, and has been awarded **4** fellowships.

**Doctor of Philosophy** (Mentor - **Gloria Coruzzi**) 2013 - 19
New York University - Center for Genomics and Systems Biology

My PhD thesis addressed how nutrient dose informs genome-wide responses in plants. This work drew upon transcriptomics, multivariate and kinetic modeling, and crop field trials. I discovered a new TF regulator of plant growth rate, and developed biomarker technology that can predict plant fertilizer uptake in the field. My doctorate research resulted in **2** first author research publications, **2** first author review articles, was awarded **3** fellowships and **1** patent.

**Master of Philosophy** (Mentor - **Daniel Christ**) 2011 - 12
Garvan Institute of Medical Research

## Awards

**Nucleate Golden Fellowship Prize** 2023
1-year award of laboratory space at start-up accelerator (HomeLab, La Jolla) for best scientific pitch.

**Life Sciences Research Foundation Fellowship** 2020 - 23
2nd to 4th year full post-doctoral funding at the Salk Institute to develop single-omics techniques in plants. Funding provided by Open Philanthropy.

**American-Australian Association Scholarship** 2022
3rd year full post-doctoral research fellowship at the Salk Institute to study the molecular biology of drought.

**Pioneer Fund Fellowship** 2020
2nd year full post-doctoral funding at the Salk Institute to detect early drought signalling responses in plants.

**James Arthur Fellowship** 2018 - 19
6th year full Ph.D. funding at New York University, awarded for research that concerns measurement, meaning or conceptualization of time.

**Beachell-Borlaug International Fellowship** 2016 - 18
4th and 5th full year PhD funding for rice research at New York University & IRRI Philippines.

**MacCracken Fellowship** 2013
1st year PhD funding at New York University.

**Valedictorian** 2008
Top of graduating class - American International High School Salzburg, Austria.

# Publications and Patents

Illouz-Eliaz, N., Lande, K., Yu, J., Jow, B., **Swift, J.**, Lee, T., Nobori, T., Castanon, R.G., Nery, J.R. and Ecker, J.R., 2023. Drought Recovery Induced Immunity Confers Pathogen Resistance.
***bioRxiv***, pp.2023-02.

Gonzalez, S. *, **Swift, J.***, Xu, J., Illouz-Eliaz, N., Nery, J.R. and Ecker, J.R., 2022. Mimicking genuine drought responses using a high throughput plate assay.
***eLife (posted preprint)*** (*co-first author).

Shanks, C.M., Huang, J., Cheng, C.Y., Shih, H.J., Brooks, M., Alvarez, J.M., Araus, V., **Swift, J.,** Henry, A. and Coruzzi, G.M. 2022, Validation of a high-confidence regulatory network for gene-to-NUE phenotype in field-grown rice.
***Frontiers in Plant Science***, p.4710.

Coruzzi, G.M. and **Swift, J.**, New York University, 2022. *Nutrient sensing in crop production*.
***U.S. Patent*** 16/204,558.

**Swift, J.,** Greenham, K., Ecker, J.R., Coruzzi, G.M. and McClung, C. R., 2022. The biology of time: dynamic responses of cell types to developmental, circadian and environmental cues.
***The Plant Journal***, *109*(4), p.764-778.

Secchi, C., Belli, M., Harrison T,. **Swift, J.,** Ko C., Duleba A., Stupack D., Chang J., Shimasaki S., 2021. Effect of the spatial-temporal specific theca cell Cyp17 on the reproductive phenotype of the TC17 mouse.
***Journal of Translational Medicine*** 19.1, p1-15.

Alvarez, J.M, Brooks, M.D, **Swift, J.,** Coruzzi, G.M., 2021. Time-based systems biology approaches capture and model dynamic gene regulatory networks.
***Annual Reviews of Plant Biology,*** *72.*

**Swift, J.*,** Alvarez, J.M.*, Araus, V., Gutiérrez, R.A. and Coruzzi, G.M., 2020. Nutrient dose-responsive transcriptome changes driven by Michaelis–Menten kinetics underlie plant growth rates.
***Proceedings of the National Academy of Sciences***, *117*(23), p.12531-12540 (*co-first author).

Araus, V.*, **Swift, J.*,** Alvarez, J.M*, Henry, A. and Coruzzi, G.M., 2020, A balancing act: how plants integrate nitrogen and water signals
***Journal of Experimental Botany*** *71*(15), p.442-4451 (*co-first author).

Brooks, M.D., Cirrone, J., Pasquino, A.V., Alvarez, J.M., **Swift, J.,** Mittal, S., Juang, C.L., Varala, K., Gutiérrez, R.A., Krouk, G. Shasha, D. and Coruzzi, G.M. 2019. Network Walking charts transcriptional dynamics of nitrogen signaling by integrating validated and predicted genome-wide interactions.
***Nature communications***, *10*(1), pp.1-13.

**Swift, J.**, Adame, M., Tranchina, D., Henry, A. and Coruzzi, G.M., 2019. Water impacts nutrient dose responses genome-wide to affect crop production.
***Nature Communications***, *10*(1), p.1374.

**Swift, J.** and Coruzzi, G.M., 2017. A matter of time - How transient transcription factor interactions create dynamic gene regulatory networks.
***Biochimica et Biophysica Acta (BBA) - Gene Regulatory Mechanisms***, *1860*(1), pp.75-83.

Khraiwesh, B., Jijakli, K., **Swift, J.**, Chaiboonchoe, A., Abdrabu, R., Chao, P.W., Yen, L. and Salehi-Ashtiani, K., 2015. Prospective applications of synthetic biology for algal bioproduct optimization.
***Biomass and Biofuels from Microalgae*** (pp. 137-154). Springer, Cham.

**Swift, J.**, Saing, S., Rouet, R., Dudgeon, K., Schofield, P., Sewell, W. and Christ, D., 2014. Identification of aggregation inhibitors of the human antibody light chain repertoire by phage display.
***Protein Engineering, Design & Selection***, *27*(10), pp.405-409.

**Scientific Communication Publications**

**Swift, J.**, 2022. Confronting the climate crisis. ***Science,*** *376*(6599)**,** p.1277.
**Swift, J.**, 2020. Moving beyond the paradigm. ***Science****, 370*(6518), p.771.
**Swift, J.**, 2019. Arbiters of truth, then and now. ***Science***, *366*(6469), p.1081.
**Swift, J.**, 2017. The tie that binds. ***Science***, *355*(6326), p.701.
**Swift, J.**, 2016. The social gene. ***Science***, *351*(6280), p.1403.
**Swift, J.**, 2015. Keith Veronese shines a light on world of rare metals. ***The Weekend Australian****,* p10.
**Swift, J.**, 2014. The point of it all. ***Science***, *346*(6211), p.882.

# Skills

**Genomics and Molecular Biology** (Bench Skills)

Single nuclei RNA-seq (sci-RNA-seq3, 10X), Single nuclei ATAC-seq (10X, ScaleBio), ChIP-seq, FACS, robotic platforms, crop field trials, transient expression assays, mass spectrometry.
Species expertise: Arabidopsis, rice, sorghum, maize.

**Single Cell Genomics and Statistical Modelling** (Coding Skills)

High coding competency in R and Python. High proficiency in statistical modelling. Specific expertise in single cell RNA and ATAC analysis, multivariate linear modelling, non-linear modelling, gene network construction, principle component analysis and eQTL analysis**.**

# Presentations

| | |
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| Plant Cell Atlas: Single Cell Sequencing Techniques in Plant Biology, Virtual – Invited Speaker | 2023 |
| Max Planck Institute for Plant Breeding, Germany - Invited Speaker | 2023 |
| Gordon Research Conference: Plant Molecular Biology, USA - Invited Speaker | 2022 |
| University of Cambridge, Plant Sciences Department, UK - Invited Speaker | 2021 |
| ASPB Plant Biology, Virtual - Invited Speaker | 2021 |
| Plant Biology Europe, Virtual - Invited Speaker | 2021 |
| Plant Science for Climate Emergency, Virtual - Invited Speaker | 2021 |
| EMBO International Plant Systems Biology, Virtual - Invited Speaker | 2021 |
| International Symposium on Nitrogen Nutrition of Plants, China - Invited Speaker | 2019 |
| Jacques Monod Conference: Plant Systems Biology, France - Invited Speaker | 2018 |
| International Symposium on Rice Functional Genomics, Japan - Invited Speaker | 2018 |
| Cold Spring Harbor Plant Genomes & Biotechnology Meeting, USA - Invited Speaker | 2017 |
| Carnegie Science: Stanford Round Table, USA - Invited Speaker | 2017 |
| Gordon Research Conference: Plant Molecular Biology, USA - Invited Speaker | 2016 |

# Appointments

**PNAS 'Front Matter' Editorial Advisor** 2018 - 22
Responsible for identifying research articles for PNAS promotion in their journal club

**Organizing Co-Chair** 2021
International Conference on Arabidopsis Research (ICAR): single cell 'omics mini-symposia

**Organizing Co-Chair** 2016
Gordon Research Seminar: Plant Molecular Biology

# Additional Coursework

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| 'Nucleate' Biotech Start-Up Accelerator Program | 2023 |
| University of California San Diego, Rady School of Management – Micro-MBA Program | 2022 |
| International Rice Research Institute (IRRI) – Rice Research to Production | 2017 |
| NYU Graduate School of Arts and Science – The Art and Craft of Teaching | 2016 |
| NYU Stern School of Business – Markov Models & Stochastic Processes | 2015 |

NYU Stern School of Business – Regression and Multivariate Analysis 2015
NYU Stern School of Business – Technology Innovation Strategy 2015
NYU School of Journalism - Scientific Communication 2015
Cold Spring Harbor Laboratories – Frontiers in Plant Science 2014

# Mentorship and Teaching

**Teaching Appointments**

New York University – Biostatistics 2017
New York University – Molecular Cell Biology 2017
Cold Spring Harbor Laboratories – Frontiers in Plant Science 2016
New York University – Molecular Cell Biology Laboratory 2014 - 15
New York University – Principles of Biology 2013

**Mentees & Technicians**

The Salk Institute for Biological Studies – Tanvi Jain 2023 - present
The Salk Institute for Biological Studies – Stephen Gonzalez (University of Washington) 2019 - 22
New York University – Mark Adame (CalTech) 2016 - 17
New York University – Ariel Levy (MIT) 2016
New York University – Nafisa Chowdhury (Columbia University) 2015 - 16