Kyungyong Seong

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Genome and Biomedical Sciences Facility
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EDUCATION

Ph.D. Microbiology with Designated Emphasis in Computational & Genomic Biology
University of California, Berkeley (UCB) | 2020-2025

Dissertation: Beyond Primary Sequences: Leveraging Predicted Structures to Decode Fungal Effector Evolution and Engineer Plant Immune Receptors

B.S. Bioengineering
University of California, Berkeley | 2015-2017
Diablo Valley College (DVC) | 2012-2015

RESEARCH IMPACT & EXPERIENCE

Research impact: 7 (co-)first author | 16 publications | 2 preprints | > 1,200 citations | H-index: 11

Postdoctoral Fellow | University of California, Davis | January 2026 – Present
Advisor: Dr. Richard Michelmore

- **Effector–NLR Interface Mapping**: Building genome-scale receptor–ligand interaction maps across host-pathogen systems to decode immune recognition logic.
- **Population Genomics of Pathogen Adaptation**: Integrating pan-genomics and transcriptomics to identify evolutionary drivers of virulence diversification and host specialization.
- **Goal**: Building a unified, AI-powered framework for decoding and engineering pathogen-host interactions, bridging protein structure, sequence semantics, and crop immunity design.

Postdoctoral Fellow | UCB | June 2025 – December 2025
Advisor: Dr. Ksenia Krasileva

- **Genomics for Precision Agriculture**: Creating and releasing community-adopted genomic resources to accelerate targeted resistance breeding in wheat.
- **Language Models for Pathogen Biology**: Developing applications of large language models to fungal effector characterization, extending machine learning-driven structure-function discovery beyond AlphaFold.

Graduate Student Researcher | UCB | June 2021 – May 2025
Berkeley Fellow | Bakar Fellow | Advisor: Dr. Ksenia Krasileva

- **AlphaFold-Powered Effector Discovery:** Pioneered large-scale structure prediction in plant pathology; discovered new fungal effector families and linked structures to immune receptor design (*MPMI*, 2021; *Nature Microbiology* 2023).
- **Rational Receptor Design:** Reprogrammed the defeated wheat receptor *Sr50* to recognize invisible effector variants, introducing changes not found in natural variations (in revision at *Nature Biotechnology*).
- **Cross-Kingdom Evolutionary Insights:** Conducted multi-omic analyses across plant and fungal genomes to elucidate co-evolutionary signatures at both sequence and structural levels.
- **Mentorship and Teaching**: Designed and taught modules for high school, undergraduate, and graduate students; all mentees became co-authors on high-impact publications.
- **Collaborative Leadership**: Co-authored papers with nearly every lab member and served as a key bridge to international collaborators, contributing structural and functional analyses across projects.

Research Assistant | Innovative Genomics Institute | January 2017 – August 2020
Advisor: Dr. Brian Staskawicz

- **Engineered Crop Immunity**: Contributed to pioneering studies on broad-spectrum disease resistance, including *DMR6* knockout lines validated in both lab and field condition.
- **Genomic & Evolutionary Analyses**: Led comparative genomic, transcriptomic, and evolutionary analyses across multiple projects, laying the computational foundation for later structure-guided NLR work.
- Developed expertise in **plant-pathogen genomics**, preparing for subsequent innovations in structure-driven receptor design.

** Closely worked with Dr. Igor Grigoriev (Joint Genome Institute; fungal biology), Dr. Thomas Bruns (UCB; fungal biology), and Dr. Mary Wildermuth (UCB; plant pathology) prior to Ph.D.*

ENTREPRENEURSHIP TRAINING

5050 Entrepreneurship trainee | Fifty Years (VC for science-based startups) | Fall 2024

- Selected for a competitive program at a venture firm backing scientist-founders addressing global challenges through deep tech.
- Completed workshops on translating cutting-edge research into societal impact and scalable solutions.

PUBLICATIONS

Selected publications

Seong K, Kumar R, Prigozhin D, Lunde C, Cherubino Ribeiro CH, Bélanger H, Hsieh JWA, Tang M, Meyers BC, Krasileva KV. (2026) The Annotated Blueprint: Integrated Functional Genomic Resources for a Model Tetraploid Wheat *Triticum turgidum* cv. Kronos. ***New Phytologist***.

Seong K, Wei W, Sent SC, Vega B, Dee A, Ramirez-Bernardino G, Kumar R, Parra L, Saur IM, Krasileva KV. (2025) Resurrection of the Plant Immune Receptor Sr50 to Overcome Pathogen Immune Evasion. ***bioRxiv***.

Seong K, Krasileva KV. (2023) Prediction of effector protein structures from fungal phytopathogens enables evolutionary analyses. ***Nature Microbiology***.

Seong K, Shaw CL, Seo E, Li M, Krasileva KV, Staskawicz B. (2022) A draft genome assembly for the heterozygous wild tomato *Solanum habrochaites* highlights haplotypic structural variations of intracellular immune receptors. ***bioRxiv***.

Seong K, Krasileva KV. (2021) Computational structural genomics unravels common folds and novel families in the secretome of fungal phytopathogen *Magnaporthe oryzae*. ***MPMI***.

Liu B*, **Seong K***, Pang S*, Song J*, Gao H, Wang C, Zhai J, Zhang Y, Gao S, Li X, Qi T, Song S. (2021) Functional specificity, diversity, and redundancy of *Arabidopsis* JAZ family repressors in jasmonate and COI1-regulated growth, development, and defense. ***New Phytologist***.

Seong K*, Seo E*, Witek K, Li M, Staskawicz B. (2020) Evolution of NLR resistance genes with noncanonical N-terminal domains in wild tomato species. ***New Phytologist***.

Other peer-reviewed publications

Lunde C, **Seong K**, Kumar R, Deatker A, Chhabra B, Wang M, Kaur S, Raats D, Schudoma C, Schultink A, Song S, Palayur A, Davies C, Cumberlich W, Gill U, Rawat N, Chen X, Aoun M, Mundt C, Krasileva KV. (2025) Durum wheat mutants with enhanced disease resistance to stripe rust show differential responses to other fungal diseases. ***Molecular Breeding***.

Sutherland CA, Danielle SM, **Seong K**, Wei W, Krasileva KV. The Resistance Awakens: Diversity at the DNA, RNA, and protein levels informs engineering of plant immune receptors from Arabidopsis to crops. (2025) ***The Plant Cell***.

Thynne E, Ali H, **Seong K**, Abukhalaf M, Guerreiro MA, Flores-Nunez VM, Hansen R, Bergues A, Salman MJ, Rudd JJ, Kanyuka K, Tholey A, Krasileva KV, Kettles GJ, Stukenbrock EH. An array of *Zymoseptoria tritici* effectors suppress plant immune responses. (2024) ***Molecular Plant Pathology***.

Ortega A, **Seong K**, Schultink A, Thomazella DPDT, Seo E, Zhang E, Pham J, Cho MJ, Dahlbeck D, Warren J and Minsavage GV, Jones JB, Sierra-Orozco E, Hutton SF, Staskawicz B. (2024) CRISPR/Cas9-mediated editing of *Bs5* and *Bs5L* in tomato leads to resistance against *Xanthomonas*. ***Plant Biotechnology Journal***.

Tang Y, Yang X, Huang A, **Seong K**, Ye M, Li M, Zhao Q, Krasileva K, Gu Y. (2024) Proxiome assembly of the plant nuclear pore reveals an essential hub for gene expression regulation. ***Nature Plants***.

Schuster M, Schweizer G, Reissmann S, Happel P, Aßmann D, Rössel N, ... , **Seong K**, Krasileva K, Kahmann R. (2024) Novel secreted effectors conserved among smut fungi contribute to the virulence of *Ustilago maydis*. ***MPMI***.

Karavolias NG, Patel-Tupper D, **Seong K**, Tjahjadi M, Gueorguieva GA, Tanaka J, Gallegos Cruz A, Lieberman S, Litvak L, Dahlbeck D, Cho MJ, Niyogi KK, Staskawicz BJ. (2023) Paralog editing tunes rice stomatal density to maintain photosynthesis and improve drought tolerance. ***Plant Physiology***.

Tamborski J, **Seong K**, Liu F, Staskawicz B, Krasileva K. Altering specificity and auto activity of plant immune receptors Sr33 and Sr50 via a rational engineering approach. (2023) ***MPMI.***

Steindorff AS, **Seong K**, Carver A, Calhoun S, Fischer MS, Stillman K, Liu H, Drula E, Henrissat B, Simpson HJ, Schilling JS, Lipzen A, He G, Yan M, Andreopoulos B, Pangilinan J, LaButti K, Ng V, Traxler M, Bruns TD, Grigoriev IG. (2023) Diversity of genomic adaptations to the post-fire environment in Pezizales fungi points to crosstalk between charcoal tolerance and sexual development. ***New Phytologist.***

Thomazella DPDT, **Seong K**, Mackelprang R, Dahlbeck D, Geng Y, Gill US, Qi T, Pham J, Giuseppe P, Lee CY and Ortega A, Cho MJ, Samuel HF, Staskawicz B. (2021) Loss of function of a *DMR6* ortholog in tomato confers broad-spectrum disease resistance. ***PNAS***.

Qi T, **Seong K**, Thomazella DP, Kim JR, Pham J, Seo E, Cho MJ, Schultink A, Staskawicz BJ. (2018) NRG1 functions downstream of EDS1 to regulate TIR-NLR-mediated plant immunity in *Nicotiana benthamiana*. ***PNAS***.

***Equal contribution**

INVITED TALKS & PRESENTATIONS

Leveraging Predicted Structures to Decode Fungal Effector Evolution and Engineer Plant Immune Receptors.
Seoul National University, Seoul, South Korea | April 2025 | Inviter: Dr. Doil Choi

Structures predicted by AlphaFold elucidate fungal effector evolution.
The 19th Congress of IS-MPMI, Providence, Rhode Island | July 2023 | Inviter: Dr. Josephine Maidment

Elucidating effector evolution through predicted structures.
What's New in MPMI with Kyungyong Seong | Link | November 2022 | Inviter: MPMI journal

Computational structural genomics unravels common folds and novel families in *Magnaporthe oryzae.*
Center for Structural Biology, University of California, Berkeley | May 2021 | Inviter: Dr. Daniil Prigozhin

Presentations

2025.12	Talk	Plant Genomes, Systems Biology & Engineering, Cold Spring Harbor, USA.
2025.07	Poster	The 20th Congress of IS-MPMI, Cologne, Germany.
2023.07	Poster	The 19th Congress of IS-MPMI, Providence, Rhode Island, USA.
2022.09	Oral	Plant and Microbial Biology department, University of California, Berkeley, USA.
2021.11	Oral	Center for Computational Biology, University of California, Berkeley, USA.
2018.03	Poster	13th Annual DOE Joint Genome Institute Genomics Meeting, San Francisco, California, USA.

AWARDS AND FELLOWSHIPS

Total Competitive Funding Secured: $193,275

2026 Life Sciences Research Foundation (LSRF) Fellowship — Finalist
Highly selective national postdoctoral fellowship

2026 Stanford Science Fellows — Finalist
Interdisciplinary postdoctoral fellowship program

2026 AGBT Next Gen Leadership Award
Emerging leaders in genomics and biotechnology

2025 Berkeley conference Travel Grant $1,500

2024 **Bakar BioEnginuity Fellowship — UC Berkeley** $80,000
Top campus-wide translational research award

2022 **Best Graduate Student-authored Paper Award** $500

2020 **Berkeley Fellowship for Graduate Study — UC Berkeley** $107,000
Highly competitive entry fellowship

2017 NSF Research Experience for Undergraduates (REU) $3,975

2016 Quantedge Award for Academic Excellence — UC Berkeley $300

TEACHING, MENTORSHIP & OUTREACH

Teaching Experience

Guest Lecturer | *Graduate module for Computational Biology (PMB 200B)* | UCB | Fall 2023/2024/2025
- Designed and delivered graduate-level module on evolutionary genomics with AlphaFold integration.
- Mentored 15-25 graduate students in project development and presentation.

Graduate Student Instructor | *General Microbiology Lab (PMB C112L)* | UCB | Fall 2024
- Supervised 70-80 students across three laboratory sections in advanced molecular biology techniques.

Graduate Student Instructor | *Secret Life of Plants (PMB40)* | UCB | Spring 2024
- Designed and led two discussion sections of 20-30 students and review sessions for 220-240 undergraduates.

Undergraduate Tutor | *Biology and Chemistry* | DVC | Spring/Fall 2014, Spring 2015
- Helped bridge equity gaps in STEM through one-on-one and small group tutoring at a community college serving first-generation, ESL, and historically underrepresented students.

** Recognized for highly supportive and compassionate instruction; course evaluations consistently demonstrate strong student satisfaction (available upon request).*

Mentorship

Graduate Student | Amanda Dee (2023)
Undergraduate Students | McCree Tang (2024-2025), Brandon Vega (2024-2025), Griselda Ramirez-Bernardino (2023)

** All mentees contributed directly to computational and molecular work and became co-authors in my publications.*

Outreach

Instructor | *Genomes and Plant Health Summer Program* | UCB | July 2023/2024

- Developed and taught hands-on modules on computational biology and plant immunity to ~50 high school and university students from underrepresented backgrounds.

PROFESSIONAL SERVICE

Reviews: Microbial Genomics (1), Molecular Ecology (1), PLOS Pathogens (1), The Plant Journal (4), The Plant Cell (1).

Departmental Services: Co-led graduate student recruitment activity (2024); peer mentor for incoming Ph.D. students (2024).