

## LIMING CAI

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Department of Integrative Biology, The University of Texas at Austin

**Research Interests:** Plant biodiversity, Phylogenomics, Evolutionary genomics, Parasitic plants, Plant-insect interaction, Macroevolution, Biogeography, Herbarium and museum based sciences

### EDUCATION

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|------|--|
| 2020 | <b>Ph.D.</b> , Organismic and Evolutionary Biology, Harvard University, Cambridge, MA<br>Advisor: Charles C. Davis<br>“Phylogeny and genome evolution of an ancient and diverse plant clade, Malpighiales”               |
| 2014 | <b>B.S. with Honors</b> , Life Sciences, Fudan University, Shanghai, China<br>Advisor: Hong Ma<br>“Using nuclear genes to reconstruct angiosperm phylogeny at the species level: A case study with Brassicaceae species” |

### PROFESSIONAL APPOINTMENTS

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| 2021-     | Stengl-Wyer Postdoctoral Research Fellow, Department of Integrative Biology, The University of Texas at Austin (UT Austin) |
| 2021      | Lecturer, Department of Botany & Plant Sciences, The University of California, Riverside (UC Riverside)                    |
| 2020–2021 | Postdoctoral researcher, Department of Botany & Plant Sciences, UC Riverside   |

### PUBLICATIONS

§ Denotes undergraduate author; \* denotes corresponding author

#### Peer Reviewed Publications

- Cai, L.\***, Zhang, H., Davis, C.C.\*, 2022. PhyloHerb: A high-throughput phylogenomic pipeline for processing genome skimming data. *Applications in Plant Sciences*, p.e11475. Journal cover.
- Lyra, G.M., Iha, C., Grassa, C.J., **Cai, L.**, Zhang, H., Gurgel, F.C., Fredericq, S., Lane, C., Blouin, N., Oliveira, M.C., Castro, J.M., Davis, C.C. 2021. Phylogenomics, divergence time estimation and trait evolution provide a new look into the Gracilariales (Rhodophyta). *Molecular Phylogenetics and Evolution*, 165, p.107294.
- Cai, L.**, Arnold, B., Xi, Z., Khost, D., Patel, N., Hartmann, C., Manikam, S., Sasirat, S., Nikolov, L.A., Mathews, S., Sackton, T.B., Davis, C.C., 2021. Deeply altered genome architecture in the endoparasitic flowering plant *Sapria himalayana* Griff. (Rafflesiaceae). *Current Biology*, 31(5), pp.1002-1011. Journal cover.  
Featured by a [Current Biology commentary](#): Westwood, J.H., 2021. Plant Biology: Genome Reveals Secrets of the Alien Within. *Current Biology*, 31(5), pp.R241-R243.
- Cai, L.\***, Xi, Z., Lemmon, E., Lemmon, A., Mast, A., Buddenhagen, C., Liu, L. and Davis, C.C.\*, 2020. The perfect storm: gene tree estimation error, incomplete lineage sorting, and ancient gene flow explain the most recalcitrant ancient angiosperm clade, Malpighiales. *Systematic Biology*, syaa083.



6. Marinho, L.C., Fiaschi, P., Fernandes, M.F., **Cai, L.**, Duan, X., Amorim, A.M., Davis, C.C., 2020. Phylogenetic relationships of *Tovomita* (Clusiaceae): carpel number and geographic distribution speak louder than venation pattern. *Systematic Botany*, 46(1), pp.102-108.
5. **Cai, L.**, Xi, Z., Amorim, A.M., Sugumaran, M., Rest, J.S., Liu, L. and Davis, C.C., 2019. Widespread ancient whole genome duplications in Malpighiales coincide with Eocene global climatic upheaval. *New Phytologist*, 221(1), pp.565-576.  
Featured by a [New Phytologist commentary](#): Sessa, E., 2019. Polyploidy as a mechanism for surviving global change. *New Phytologist*, 221 (1), pp.5-6.
4. Marinho, L.C., **Cai, L.**, Duan, X., Ruhfel, B.R., Fiaschi, P., Amorim, A.M., van den Berg, C., Davis, C.C. 2019. Plastomes resolve generic limits within tribe Clusiaceae (Clusiaceae) and reveal the new genus *Arawakia*. *Molecular Phylogenetic Evolution*, 134:pp.142-151.
3. **Cai, L.** §, Xi, Z., Peterson, K., Rushworth, C., Beaulieu, J. and Davis, C.C., 2016. Phylogeny of Elatinaceae and the tropical Gondwanan origin of the Centroplacaceae (Malpighiaceae, Elatinaceae) Clade. *PLOS ONE*, 11(9), p.e0161881.
2. **Cai, L.** § and Ma, H., 2016. Using nuclear genes to reconstruct angiosperm phylogeny at the species level: A case study with Brassicaceae species. *Journal of Systematics and Evolution*, 54(4), pp.438-452.
1. Huang, C.H., Sun, R., Hu, Y., Zeng, L., Zhang, N., **Cai, L.** §, Zhang, Q., Koch, M.A., Al-Shehbaz, I., Edger, P.P. and Pires, J.C., *et al.* 2015. Resolution of Brassicaceae phylogeny using nuclear genes uncovers nested radiations and supports convergent morphological evolution. *Molecular Biology and Evolution*, 33(2), pp.394-412.

#### Manuscripts in review/revision

- Cai, L.\*** The inevitable destiny of plant parasitism through predictable gene death. *American Journal of Botany*. In review. Invited for "[AJB Synthesis Papers and Prize](#)".
- Kawahara, A., Storer, C., Carvalho, A., P., ..., **Cai, L.** (10<sup>th</sup> among 88 authors), et al., Evolution and diversification dynamics of butterflies. *Nature Ecology and Evolution*. In revision.
- Lin, P., Chan, W., **Cai, L.**, Dankowicz, E., Gilbert, K.J., Pierce, N.E., Felton, G.W., Host plant specialization and diel activity patterns of herbivores: the Aroma Hypothesis. *Nature Ecology and Evolution*. In review.
- Ma, Y., Mao, X., Wang, J., Jiang, Y., ..., **Cai, L.** (7<sup>th</sup> among 20 authors), et al., Genome evolution and extensive hybridization underlie montane species radiation in *Rhododendron*. *National Science Review*. In review.
- Zhu, S.S., Zhang, X.Y.; Ren, C.Q., ..., **Cai, L.** (8<sup>th</sup> among 13 authors), et al., Chromosome-level reference genome of *Tetrastigma hemsleyanum* (Vitaceae) provides insights into genomic evolution and the biosynthesis of phenylpropanoids and flavonoids. *The Plant Journal*. In review.

#### Manuscripts in preparation (available upon request)

- Cai, L.**, Liu, L., Davis, C.C. Between rock and a hard place: enigmatic placement of Rafflesiaceae due to incomplete lineage sorting and long branch attraction. In prep. Target journal: *Systematic Biology*.

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#### AWARDS AND FELLOWSHIPS

##### Awards

- 2021            The Chinese government award for outstanding self-financed students, China Scholarship Council, Ministry of Education of the People's Republic of China

- (\$6,000) [The highest award granted by the Chinese government to Chinese students overseas]
- 2021 W.D. Hamilton Award for Outstanding Graduate Student Presentation, Society for the Study of Evolution (\$1,000)
- 2021 Dorothy M. Skinner Award, Society for Integrative and Comparative Biology (\$500)
- 2019 Early Career Scientist Award, JF Crow Institute for the Study of Evolution, The University of Wisconsin–Madison
- 2019 Ernst Mayr Award finalist, Society of Systematic Biologists
- 2019 Rising Star in Organismal Botany Award finalist, Society for Integrative and Comparative Biology
- 2017, 2016 Bok Center Certificate for Distinction in Teaching, Harvard University
- 2012 Tung OOCL Scholarship, Fudan University (approx. \$1,000)
- 2012 Fosun Pharma Scholarship, Fudan University (approx. \$1,000)
- 2011 National Scholarship of China, Ministry of Education of the People's Republic of China (approx. \$1,200)

### **Fellowships and grants**

- 2022 Texas Ecological Laboratory Program (\$2,900). “Diversity and evolutionary genomics of Lamiales in Texas with a focus on the parasitic broomrape family (Orobanchaceae)”.
- 2021 Stengl-Wyer Scholars Program, UT Austin (\$210,000 stipend plus \$30,000 research funds over three years).
- 2021 The California Conservation Genomics Project (\$42,763). “Genomic diversity of the manzanita gall aphid across California”. Proposal intellectual input.
- 2020, 2017 Student Curatorial Fellowship, Harvard University Herbaria (\$9,882)
- 2018 Student Travel Grant, Botanical Society of America (\$300)
- 2016 Fernald Travel Grant, Harvard University Herbaria (\$5,300)
- 2014 McDonnell Academy Fellowship, Washington University in St. Louis (declined, \$142,500 over five years)
- 2013-2014 National Top Talent Undergraduate Training Fellowship, Fudan University (\$6,000)
- 2013 Junzhen Undergraduate Research Fellowship, Fudan University (approx. \$500)

### **TEACHING AND MENTORING EXPERIENCE**

**Teaching** \* denotes teaching award received

#### Instructor

- 2021 California's Cornucopia: Food from The Field to Your Table (undergraduate, solo teaching), UC Riverside

#### Guest lecture

- 2022 “Unlocking the potential of herbarium for biodiversity research” and “Keep Plants Weird”, Biodiversity: Past, Present and Future, UT Austin
- 2020 “Plant phylogenetics and horizontal gene transfer”, Molecular Ecology and Evolution, Harvard University

#### Teaching Fellow

- 2019 Animal Behavior (undergraduate), Harvard University
- 2018\* Plant Systematics (undergraduate and graduate), including a field trip to Brazil, Harvard University
- 2016\* Plants and Human Affairs (undergraduate), Harvard University
- 2015 Evolutionary Human Physiology and Anatomy (pre-med undergraduate), Harvard

#### Training

2014 Professional communication program for international teachers (3 hours per week for 15 weeks), Derek Bok Center for Teaching & Learning, Harvard University

### Mentoring

Postdoc Goia Lyra (2018–2020, Universidade Federal da Bahia, Brazil)  
 - Phylogenomic analysis of red algae (Rhodophyta)  
 - Plastid genome assembly and annotation

Graduate student Todd Farmer and Lydia Tressel (2021–Present, UT Austin)  
 - Bioinformatic training on phylogenomic analysis in Fabaceae  
 Renata Asprino (2020, Universidade Estadual de Feira de Santana)  
 - Library preparation for Next Generation Sequencing (NGS)  
 - Plastid genome assembly and annotation with NGS data  
 Lucas C. Marinho (2017, Universidade Estadual de Feira de Santana)  
 - Plastid genome assembly, annotation, and phylogenetic reconstruction

Undergraduate Alexa Morton (2022 Feb–Present, UT Austin)  
 - Society for Advancing Gender Equality in STEM Program (SAGES)  
 Saneeva George (2022 Sep–Present, UT Austin)  
 - The Texas Excellence in Jobs and Services (TEJAS) Awardee for CNS students from disadvantaged backgrounds  
 - The hydraulic architecture of leaf venation in Orobanchaceae  
 Jenni Kao (2020 Nov–2021 Jul, UC Riverside)  
 - Gut microbiome metadata analysis for the grape phylloxera  
 - Venom serine protease gene family evolution in aphids  
 - Presented a research talk in Botany 2022

Training Diversity Education Certificate (2022, UT Austin)  
 Undergraduate Research Mentoring Training Program (2019, Harvard)

### Workshop

2022 **Cai, L.**, Davis., C.C. “Herbariomics-based biodiversity research: from specimen to phylogeny.” Botany, Anchorage, AK, July 2022.

2021 **Cai, L.**, Zhang, H., Davis., C.C. “Herbariomics-based biodiversity research: from specimen to phylogeny.” Botany, online, July 2021.

2018 **Cai, L.** “Tips for success: graduate school application.” Fudan University, Shanghai, China, May 2018.

## PRESENTATIONS

### Invited Presentations

Department Seminar. Department of Plant Pathology and Microbiology at Texas A&M, College Station, TX, Nov 2022 (expected).

16th Aykut Kence Evolution Conference. “What makes a parasitic plant?” Middle East Technical University, Çankaya/Ankara, Turkey, Feb 2022 (online).

Department Seminar. “Anything but the species tree.” Department of Integrative Biology, University of Texas, Austin, Austin, TX, Oct 2021.

Chinese Genomics Meet-up Online. “Deeply altered genome architecture in the endoparasitic plant Rafflesiaceae.” July 2021.

Herbarium Botany Salon. “What makes a parasitic plant?” Rutgers University, Brunswick, NJ, April 2021.

Department Seminar. “What makes a parasitic plant?” Department of Botany and Plant Sciences, University of California, Riverside, CA, February 2021.

JF Crow Institute Early Career Seminars. “Genomic evolution of Malpighiales: duplicated, introgressed, and incompletely-sorted.” UW Madison, Madison, WI, February 2019.

Harvard University Herbaria Seminar. “Genomic evolution of Malpighiales: duplicated, introgressed, and incompletely-sorted.” Harvard University, Cambridge, MA, February 2019.  
 Career development panelist. “Enhancing graduate school experience.” School of Life Science, Fudan University, Shanghai, China, May 2018.

### Conference Presentations

Contributed paper. “PhyloHerb: A high-throughput phylogenomic pipeline for processing genome skimming data.” Evolution, Cleveland, OH, June 2022.  
 Contributed paper. “Deeply altered genome architecture in the endoparasitic plant Rafflesiaceae.” Botany, online, July 2021.  
 Hamilton Symposium. “Deeply altered genome architecture in the endoparasitic plant Rafflesiaceae.” Evolution, online, June 2021.  
 Contributed paper. “Deeply altered genome architecture in the endoparasitic plant Rafflesiaceae.” SICB annual meeting, online, Jan 2021.  
 Invited colloquium. “Dissecting the genomic evolution of Malpighiales—whole genome duplication, incomplete lineage sorting, and introgression.” Botany, online, July 2020.  
 Ernst Mayr Award Symposium. “The Perfect Storm—Gene Tree Estimation Error, Incomplete Lineage Sorting, and Ancient Gene Flow Explain the Most Recalcitrant Ancient Angiosperm Clade, Malpighiales.” Evolution, Providence, RI, July 2019.  
 Rising Star in Organismal Botany Award Symposium. “Thrive with Additional Sets of Genome: Widespread Paleopolyploidization Buffers Plants Through Eocene Climatic Upheaval.” SICB meeting, Tampa, FL, January 2019.  
 Contributed paper. “Extensive genealogical discordance in Malpighiales not explained by incomplete lineage sorting or gene tree estimation error.” Botany, Rochester, MI, July 2018.

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### SELECTED MEDIA AND SOCIETY COVERAGE

The Texas Scientist (interview article): “Q & A with Dr. Liming Cai.”  
<https://www.texasscientist.cns.utexas.edu/articles/liming-cai>  
 The Botanical Society of America Spotlight Series (profile highlight): “Liming Cai.”  
<https://botany.org/home/careers-jobs/careers-in-botany/bsa-spotlight-series/liming-cai.html>  
 Quanta Magazine (video interview): “2021's Biggest Breakthroughs in Biology.”  
<https://www.quantamagazine.org/videos/2021s-biggest-breakthroughs-in-biology>  
 Quanta Magazine (article and podcast): “DNA of Giant ‘Corpse Flower’ Parasite Surprises Biologists.” <https://www.quantamagazine.org/dna-of-giant-corpse-flower-parasite-surprises-biologists-20210421>  
 Science Editors’ Choice (article): “Moving genes through parasitism.”  
<https://www.science.org/doi/10.1126/science.2021.371.6531.twil>  
 The Harvard Gazette (article): “The most charismatic and strange of all flowering plants.”  
<https://news.harvard.edu/gazette/story/2021/01/harvard-researchers-sequence-sapria-genome>  
 Cai et al., 2021 Current Biology is also covered in [Spektrum](#) (German article), [le Scienze](#) (Italian article), [Sciencenet](#) (Chinese article), [Polit](#) (Russian article)

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### ADDITIONAL RESEARCH EXPERIENCE AND TRAININGS

#### Additional research experience

2019	Research assistant, PI: Naomi Pierce, Harvard University “Comparative analysis of butterfly life-history trait evolution”
2013	Undergraduate research intern, PI: Charles Davis, Harvard University “The Gondwana origin of the aquatic plant family Elatinaceae”

**Professional trainings**

- 2019 Science Education Partners Program, Harvard Museums of Science and Culture  
 2016 Tropical Plant Systematics, Organization for Tropical Studies, Costa Rica  
 2015 Tropical Botany Course, University of Florida, Miami, FL  
 2014 NESCent Academy summer course, Duke University, Durham, NC

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**SERVICE AND OUTREACH ACTIVITIES**


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**To the Profession**

- 2022-2025 Education and Outreach Committee, Society for the Study of Evolution  
 2022-2023 Early Career Advisory Board, Botanical Society of America  
 2021-2024 Grad Student Research Award Committee, Botanical Society of America  
 2022, 2021 Dorothy Skinner Award Committee, Society for Integrative and Comparative Biology  
 2020- Ernst Mayr Symposium Judge (presentation and abstract), Society of Systematic Biologists  
 2020- Graduate Student Research Award reviewer, Society of Systematic Biologists  
 2022 Conference affinity group organizer: Asian, Asian American, and Pacific Islander Affinity Group Mixer; Botany 2022, Anchorage, AK  
 2020-2022 Review Editorial Board, Applications in Plant Sciences  
 2019 Science Journalism Intern, Society for Integrative and Comparative Biology  
 Peer review Applications in Plant Sciences, Biological Journal of the Linnean Society, Evolution, Frontiers in Ecology and Evolution, Genome Biology and Evolution, International Journal of Plant Sciences, Molecular Ecology, Molecular Phylogeny and Evolution, Nature Plants, PeerJ, Plants, Plants People Planet, PNAS, Systematic Biology, Taxon

**To the Institution**

- 2022 Postdoc representative, SURE in CNS, graduate student recruitment program for students with identities historically marginalized, UT Austin  
 2022 Judge, The Undergraduate Research Forum, UT Austin  
 2022 Judge, The 11<sup>th</sup> National Collegiate Research Conference, Harvard University  
 2020, 2017 Curatorial Assistant, Harvard University Herbaria  
 2020 Creation and curation of the herpetology teaching collection, 3D-printed and hand-painted models at the Museum of Comparative Zoology, Harvard University  
 2019 Blog writer for Science in the News, Harvard University  
 2018 External review student representative, Harvard University Herbaria  
 2018 Poster session organizer, Harvard Annual Plant Biology Initiative Symposium

**To the Community**

- 2022 Scientific consultant, Children's book "Plants Persist", Author: Ann McCallum Staats, MIT Kids Press  
 2022 The 16<sup>th</sup> Aykut Kence Evolution Conference, Middle East Technical University (Feb 28), Ankara, Turkey  
 2021 Amphibian habitat restoration, Yegua Knobbs Preserve (Nov 6), McDade, TX  
 2021 Judge, The Riverside County Science and Engineering Fair (Feb 15-16), Riverside, CA  
 2021 Judge, Moreno Valley Unified School District Science Fair (Jan 15-21), Riverside, CA  
 2020 Participating scientist, I "Heart" Science, Harvard Museums of Science and Culture (Feb 9), Cambridge, MA  
 2019 Mentor, College and Career Pathway Program, Chelsea High School, Chelsea, MA  
 2019 Participating scientist, "Meet a Scientist" (April 18), "DayCon" (June 15), Harvard Museums of Science and Culture, Cambridge, MA

2018-present Mentor, PlantingScience Master Plant Science Team Program, Botanical Society of America; Mentees from Santaluces Community High School (Lantana, FL), Mendota High School (Mendota, IL), University Liggett School (Grosse Pointe Woods, MI), Franklin County High School (Carnesville, GA), etc.

**Society Affiliations**

Botanical Society of America (BSA, since 2018)

American Society of Plant Taxonomists (ASPT, since 2018)

Society for Integrative and Comparative Biology (SICB, since 2019)

Society of Systematic Biologists (SSB, since 2019)

Society for the Study of Evolution (SSE, since 2021)

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**REFERENCES**

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**Charles C. Davis**

Professor of Organismic and Evolutionary Biology

Curator of Vascular Plants in the Harvard University Herbaria

Harvard University

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**Robert K. Jansen**

S.F. Blake Centennial Professor in the Department of Integrative Biology

Director of the Billie L. Turner Plant Resources Center

The University of Texas at Austin

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**Naomi E. Pierce**

Sidney A. and John H. Hessel Professor of Biology

Curator of Lepidoptera in the Museum of Comparative Zoology

Senior Fellow of the Society of Fellows

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