

Fay-Wei Li

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Education and Appointments

- 2017- Assistant professor, Boyce Thompson Institute
2016-17 Forschungskredit postdoc, University of Zurich
2015-16 Postdoctoral researcher, UC-Berkeley and Duke University
2010-15 Ph.D., Department of Biology, Duke University
2005-09 B.S., Department of Life Science, National Taiwan University

Publications

As first/co-first author:

- Li, F.-W., J.C. Villarreal, P. Szovenyi. Hornworts, an overlooked window into carbon-concentrating mechanism. **Trends in Plant Science** (in review).
- Li, F.-W., C.A. Rushworth, J.B. Beck, M.D. Windham. 2017. *Boechea* (Brassicaceae) Microsatellite Database: an online portal for species identification and hybrid relationship resolution. **Database** (in press).
- Li, F.-W., L.-Y. Kuo, K.M. Pryer, C.J. Rothfels. 2016. Genes translocated into the plastid inverted repeat show marked deceleration in substitution rates and an elevated GC content. **Genome Biology and Evolution** 8: 2452-2458.
- Li, F.-W., S. Mathews. 2016. Evolutionary aspects of plant photoreceptors [invited review]. **Journal of Plant Research** 129: 115-122.
- Li, F.-W., L.Y. Kuo, Y.H. Chang, T.C. Hsu, H.C. Hung, W.L. Chiou, C.J. Rothfels, Y.M. Huang. 2016. *Asplenium pifongiae* (Aspleniaceae: Polypodiales), a new species from Taiwan. **Systematic Botany** 41: 24-31.
- Li, F.-W., M. Melkonian, C.J. Rothfels, J.C. Villareal, D. Stevenson, S.W. Graham, G.K.-S. Wong, K.M. Pryer, S. Mathews. 2015. Phytochrome diversity in green plants and the origin of canonical plant phytochromes. **Nature Communications** 6: 7852.
*Featured in: [Duke Today](#), [Science Daily](#), [Phys.org](#), [Faculty of 1000](#)
- Li, F.-W., C.J. Rothfels, M. Melkonian, J.C. Villareal, D. Stevenson, S.W. Graham, G.K.-S. Wong, S. Mathews, K.M. Pryer. 2015. The origin and evolution of phototropins. **Frontiers in Plant Science** 6: 637.
- Li, F.-W., K.M. Pryer. 2014. Crowdfunding the *Azolla* fern genome project: a grassroots approach. **GigaScience** 3: 16.
*Featured in: Editor's pick
- Li, F.-W., J.C. Villarreal, S. Kelly, C.J. Rothfels, M. Melkonian, E. Frangedakis, M. Ruhsam, E. M. Sigel, J.P. Der, J. Pittermann, D.O. Burge, L. Pokorný, A. Larsson, T. Chen, S. Weststrand, P. Thomas, E. Carpenter, Y. Zhang, Z. Tian, L. Chen, Z. Yan, Y. Zhu, X. Sun, J. Wang, D.W. Stevenson, B.J. Crandall-Stotler, A.J. Shaw, M.K. Deyholos, D.E. Soltis, S.W. Graham, M.D. Windham, J.A. Langdale, G.K.S. Wong, S. Mathews & K.M. Pryer. 2014. Horizontal transfer of an adaptive chimeric photoreceptor from bryophytes to ferns. **Proceedings of the National Academy of Sciences USA**, 111: 6672-6677.
*Featured in: [The Economist](#), [New York Times](#), [National Geographic](#), [Scientific American](#), [Aeon](#), [Faculty of 1000](#), [Current Biology](#), and [Nature Reviews Genetics](#)
- Li, F.-W., K.M. Pryer & M.D. Windham. 2012. *Gaga*, a new fern genus segregated from *Cheilanthes* (Pteridaceae). **Systematic Botany** 37: 845-860.
*Featured in: [Rolling Stone](#), [New York Times](#), [Huffington Post](#), [The Guardian](#), [Wired](#) and [National Geographic](#)
- Li, F.-W., L.Y. Kuo, C.J. Rothfels, A. Ebihara, W.L. Chiou, M.D. Windham & K.M. Pryer. 2011. *rbcL* and *matK* earn two thumbs up as the core DNA barcode for ferns. **PLoS ONE** 6: e26597.

- Li, F.-W. 2011. Book review: Knapp, Ralf. 2011. Ferns and Fern Allies of Taiwan. **Taxon** 60: 1233-1234.
- Kuo, L.Y.*, F.-W. Li*, W.L. Chiou & C.N. Wang. 2011. The first insight into fern *matK* phylogeny. **Molecular Phylogenetics and Evolution** 59: 556-566. *Equal contributions
- Li, F.-W., L.Y. Kuo, Y.M. Huang, W.L. Chiou & C.N. Wang. 2010. Tissue-Direct PCR, a rapid and extraction-free method for barcoding of ferns. **Molecular Ecology Resources** 10: 92-95.
- Li, F.-W., B.C. Tan, V. Buchbender, R.C. Moran, G. Rouhan, C.N. Wang & D. Quandt. 2009. Identifying a mysterious aquatic fern gametophyte. **Plant Systematics and Evolution** 281: 77-86.

As co-author:

- Rockwell, N.C., S.S. Martin, F.-W. Li, S. Mathews, J.C. Lagarias. 2017. The phycocyanobilin chromophore of streptophyte algal phytochromes is synthesized by HY2. **New Phytologist** (in press).
- Rothfels, C.J., K.M. Pryer, F.-W. Li. 2017. Next-generation polyploid phylogenetics: Rapid resolution of hybrid polyploid complexes using PacBio single-molecule sequencing. **New Phytologist** 213:413-429.
- Hsu, P.Y., L. Calviello, H.-Y. L. Wu*, F.-W. Li*, C.J. Rothfels, U. Ohler, P.N. Benfey. 2016. Super-resolution ribosome profiling reveals unannotated translation events in Arabidopsis. **Proceedings of the National Academy of Sciences USA** 113: E7126-E7135.
*Equal contributions
- Jia, Q., G. Li, T.G. Köllner, J. Fu, X. Chen, W. Xiong, A. Norris, B. Crandall-Stotler, J.L. Bowman, D.J. Weston, Y. Zhang, L. Chen, Y. Xie, F.-W. Li, C.J. Rothfels, A. Larsson, S.W. Graham, D.W. Stevenson, G.K.-S. Wong, J. Gershenzon, F. Chen. 2016. Microbial type terpene synthase genes occur specifically in non-seed land plants. **Proceedings of the National Academy of Sciences, USA** 113: 12328-12333.
- Stevenson, S.R., Y. Kamisugi, J. Schmutz, J.W. Jenkins, J. Grimwood, W. Muchero, G.A. Tuskan, S. Rensing, D. Lang, R. Reski, C. Trinh, M. Melkonian, C.J. Rothfels, F.-W. Li, A. Larsson, G.K.S. Wong, T. Edwards, A.C. Cuming. 2016. Genetic analysis of *Physcomitrella patens* identifies ABCISIC ACID NON-RESPONSIVE (ANR): a regulator of ABA responses unique to basal land plants, required for desiccation tolerance. **Plant Cell** 28: 1310-1327..
- Pryer, K.M., L. Huiet, F.-W. Li, C.J. Rothfels, E. Schuettpelz. Maidenhair ferns—*Adiantum*—are indeed monophyletic, and sister to the shoestring ferns—vittaroids (Pteridaceae). **Systematic Botany** 41: 14-23.
- Windham, M.D., J.B. Beck, F.-W. Li, A. Allphin, J.G. Carman, C.A. Rushworth, E.M. Sigel, P.J. Alexander, C.D. Bailey, I.A. Al-Shehbaz. 2015. Searching for diamonds in the apomictic rough. I: A case study involving *Boechera lignifera* (Brassicaceae). **Systematic Botany** 40: 1031-1044.
- Wolf, P.G., E.B. Sessa, D.B. Marchant, F.-W. Li, C.J. Rothfels, E.M. Sigel, M.A. Gitzendanner, C.J. Visger, J.A. Banks, D.E. Soltis, P.S. Soltis, K.M. Pryer, and J.P. Der. 2015. An exploration into fern genome space. **Genome Biology and Evolution** 7: 2533-2544.
- Rothfels C.J., F.-W. Li, E.M. Sigel., L. Huiet, A. Larsson, D.O. Burge, M. Ruhsam, M. Deyholos, D. Soltis, N. Stewart, S. Shaw, L.M. Pokorny, T. Chen, C. dePamphilis, L. DeGironimo, D.W. Stevenson, S.W. Graham, G.K.-S. Wong, and K.M. Pryer. 2015. The evolutionary history of ferns inferred from 25 single-copy nuclear genes. **American Journal of Botany** 10: 1089-1107.
- Sessa, E.B., J.A. Banks, M.S. Barker, J.P. Der, A.M. Duffy, S.W. Graham, M. Hasebe, J. Langdale, F.-W. Li, D.B. Marchant, K.M. Pryer, C.J. Rothfels, S.J. Roux, M.L. Salmi, E.M. Sigel, D.E. Soltis, P.S. Soltis, D.W. Stevenson, P.G. Wolf. 2014. Between two fern genomes. **GigaScience** 3: 15.
- Zhang, W.Y., L.Y. Kuo, F.-W. Li, C.N. Wang & W.L. Chiou. 2014. The hybrid origin of *Adiantum meishanianum* (Pteridaceae): a rare and endemic species in Taiwan. **Systematic Botany**, 39: 1034-1041.
- Rothfels, C.J., A. Larsson, F.-W. Li, E.M. Sigel, L. Huiet, D.O. Burge, M. Ruhsam, S. Graham, D. Stevenson, G.K.S. Wong, P. Korall & K.M. Pryer. 2013. Transcriptome-mining for fern single-copy nuclear regions. **PLoS ONE** 8: e76957.

Awards and Grants

- 2016 **Forschungskredit postdoc**, University of Zurich
- 2015 **Perry Price**, Best thesis in plant science, Duke University
- 2014 **Edgar T. Wherry Award**, Botanical Society of America
- 2014 **Graduate Student Research Fellowship**, Torrey Botanical Society (US \$2,500)
- 2014 **NSF Doctoral Dissertation Improvement Grant**, National Science Foundation (US \$20,410)
- 2014 **Duke Biology Grant-in-Aid**, Department of Biology, Duke University (US \$1,000)
- 2013 **Shirley and Alan Graham Graduate Student Research Grant**, American Society of Plant Taxonomists (US \$1,000)
- 2013 **Duke Biology Grant-in-Aid**, Department of Biology, Duke University (US \$1,000)
- 2012 **NSF Graduate Research Fellowship**, National Science Foundation (US \$30,000/year for 3 years)
- 2012 **Duke Biology Grant-in-Aid**, Department of Biology, Duke University (US \$1,000)
- 2012 **Sigma Xi Matching Grant**, Duke Graduate School (US \$1,000)
- 2012 **Sigma Xi Grant-in-Aid of Research**, Sigma Xi (US \$1,000)
- 2011 **Awards for Graduate Student Research**, Society of Systematic Biologists (US \$1,700)
- 2009 **Dr. AT Chen Research Scholarship**, National Taiwan University (US \$2,400)
- 2009 **Dean Award**, College of Life Science, National Taiwan University
- 2009 **Scientific Research Award**, College of Life Science, National Taiwan University
- 2008 **Conference Travel Grant**, College of Life Science, National Taiwan University
- 2008 **Undergraduate Research Grant**, National Science Council, Taiwan (US \$1,400)
- 2007 **Undergraduate Research Grant**, National Science Council, Taiwan (US \$1,400)

Computer Programs

***Boechera* Microsatellite Database (<http://biology.duke.edu/windhamlab>)**

The database houses collection metadata and microsatellite genotypes from >3,000 *Boechera* specimens (including many types). The web portal has various search algorithms for species identification, and can automatically deduce the genomic makeup of hybrid individuals. It also has the capacity to link high-resolution images to each specimen. I generated the majority of the microsatellite data and wrote all the codes (Python and HTML). Publication: Li et al., Database (2017).

PURC: Pipeline for Untangling Reticulate Complexes

A pipeline for extracting alleles from amplicon sequencing data (PacBio, Illumina, ... etc), and is geared toward analyzing polyploid species complexes. The input is raw sequencing reads and the output are clustered allele sequences. I am the main program developer. Publication: Rothfels et al., New Phytologist (2017).

Teaching Experience

- 2014 Instructor of Record, **Practical Phylogenetics**, Duke University
I organized the course, gave lectures, led discussions and demonstrated phylogenetic programs and wet lab techniques. I also closely mentored students on their independent projects. Co-teach with D. Swofford and K.M. Pryer.
- 2012 Teaching assistant, **Genetics and Evolution**, Duke University

Invited Talks

- 2016 Institute of Environmental Biology, Utrecht University, Netherlands
- 2016 Department of Systematic and Evolutionary Botany, University of Zurich, Switzerland
- 2016 Institute for Integrative Systems Biology, Laval University, Canada
- 2015 International Conference on Genomics (ICG-10), Shenzhen, China
- 2015 Plant & Microbial Biology Seminar, North Carolina State University

Professional Activities

Journal Reviewer

American Fern Journal (x2), Annals of Botany, BMC Evolutionary Biology, BMC Research Notes, Current Genetics, Journal of Molecular Evolution, Molecular Ecology Resources, Molecular Phylogenetics and Evolution (x2), Phytotaxa, PeerJ, Plant Systematics and Evolution (x2), PNAS, Scientific Reports, Taxon

Fieldwork

>1,500 accessions of plant specimens (mostly ferns) collected from Taiwan, USA, Costa Rica, Guatemala, Belize, Lanyu, Ryukyus, and Luzon islands.

Seminar coordinator, Duke Systematics Discussion Group

I organize Duke's Systematics Discussion Group, a weekly seminar that includes research presentation and paper discussion. I am also in charge of contacting and hosting invited speakers.

Science crowdfunding and outreach

My PhD advisor, Kathleen Pryer, and I initiated a crowdfunding campaign to sequence the genome of *Azolla* (<https://experiment.com/projects/azolla-a-little-fern-with-massive-green-potential>). We together participated in [Reddit Science AMA](#), answering over a hundred questions and earning 6,349 upvotes. Our project has received media attention from [The Economist](#), [Scientific American](#), and [USA Today](#). We wrote an invited commentary on GigaScience sharing our experiences (Li and Pryer 2014).

Conference Papers (presenting author underlined)

Li, F.-W. 2016. Fern genomes on the horizon. Botany 2016, Savannah, GA, USA.

Rothfels, C.J., K.M. Pryer, F.-W. Li. 2016. Next-generation polyploid phylogenetics: Low-cost, high-throughput resolution of hybrid polyploid complexes using PacBio and PURC. Botany 2016, Savannah, GA, USA.

Der, J.P., N. Koppers, M. Simenc, S. Cheng, X. Liu, G.K.S. Wong, A. Brautigam, H. Schluepmann, K.M. Pryer, F.-W. Li. 2016. The genome and annotation of *Azolla filiculoides*. Botany 2016, Savannah, GA, USA.

Eily, A., F.-W. Li, G. Gillian, K.M. Pryer. 2016. Insider trading: Understanding nutrient exchange in the *Azolla*-*Nostoc* symbiosis. Botany 2016, Savannah, GA, USA.

Li, F.-W., L.Y. Kuo, M. Simenc, J.P. Der, C.J. Rothfels, K.M. Pryer. 2016. *Salvinia cucullata*: The smallest fern genome known. Plant and Animal Genome XXV, San Diego, CA, USA.

Brautigam, A., N. Koppers, M. Simenc, F.-W. Li, L. Dijhuizen, P. Brouwer, S. Cheng, X. Liu, B. Song, G.K.S. Wong, A. Webber, K.M. Pryer, J.P. Der, H. Schluepmann. 2016. The *Azolla* genome Project. Plant and Animal Genome XXV, San Diego, CA, USA.

Schluepmann, H., L. Dijhuizen, P. Brouwer, H. Bolhuis, G.-J. Reuchert, N. Koppers, B. Huettel, F.-W. Li, X. Liu, G.K.S. Wong, K.M. Pryer, A. Weber, A. Brautigam. 2016. The *Azolla* Metagenome: Foul play in the pocket? Annotating the nuclear genome of *Azolla filiculoides*. Plant and Animal Genome XXV, San Diego, CA, USA.

Simenc, M., F.-W. Li, N. Koppers, S. Cheng, B. Song, X. Liu, S. Xu, L. Dijhuizen, B. Huettel, A. Brautigam, G.K.S. Wong, H. Schluepmann, K.M. Pryer, J.P. Der. 2016. Annotating the nuclear genome of *Azolla filiculoides*. Plant and Animal Genome XXV, San Diego, CA, USA.

Li, F.-W., S. Cheng, J.C. Villarreal, J.P. Der, S. Mathews, X. Liu, C.J. Rothfels, G.K.S. Wong, J. Palmer, K.M. Pryer. 2015. Evolutionary genomics of plant-cyanobacteria symbiosis and its role in nitrogen fixation. Plant Genome Evolution, Amsterdam, Netherlands.

Rothfels, C.J., F.-W. Li, E.M. Sigel, L. Huiet, A. Larsson, S. Graham, G.K.S. Wong, K.M. Pryer. 2015. Curated phylogenomics and the first single-copy nuclear phylogeny of the ferns. Botany 2015, Edmonton, AB, Canada.

Brouwer, P., L.W. Dijhuizen, B. Huettel, J.P. Der, F.-W. Li, K.M. Pryer, S.B. Gould, A.P.M. Weber, A. Brautigam, H. Schluepmann. 2015. Transcriptome, genome and microbiome of the water fern *Azolla filiculoides*. Next Generation Pteridology, Washington DC, USA.

- Zhan, S.H., C.J. Rothfels, A. Larsson, S. Westrand, D.O. Burge, M. Ruhsam, **F.-W. Li**, E.M. Sigel, S. Ellis, S. Shaw, A. Calcedo, T. Chen, L. DiGironomo, E. Sessa, J.P. Der, M. Barker, J. Leebens-Mack, M. Deyholos, G.K.S. Wong, D. Stevenson, **S.W. Graham**. 2015. Phylotranscriptomics of the seed-free vascular plants. Next Generation Pteridology, Washington DC, USA.
- Wolf, P.G.**, E.B. Sessa, D.B. Marchant, **F.-W. Li**, C.J. Rothfels, E.M. Sigel, M.A. Gitzendanner, C.J. Visger, J.A. Banks, D.E. Soltis, P.S. Soltis, K.M. Pryer, and J.P. Der. 2015. Skimming the surface of fern nuclear genomes. Next Generation Pteridology, Washington DC, USA.
- Li, F.-W.**, S. Cheng, J.P. Der, B. Song, X. Liu, X. Xu, A. Bräutigam, C.J. Rothfels, E.M. Sigel, P. Wolf, Y. Kato, H. Schluepmann, G.K.S. Wong, K.M. Pryer. 2015. The *Azolla* genome and the metagenomes of its obligate endosymbionts: unlocking the massive green potential of a little fern. Next Generation Pteridology, Washington DC, USA.
- Rothfels, C.J.**, K.M. Pryer, **F.-W. Li**. 2015. Utilizing the PacBio next-generation sequencing platform to unravel hybrid polyploid complexes. Next Generation Pteridology, Washington DC, USA.
- Li, F.-W.**, S. Cheng, J.P. Der, B. Song, X. Liu, X. Xu, A. Bräutigam, C.J. Rothfels, E.M. Sigel, P. Wolf, Y. Kato, H. Schluepmann, G.K.S. Wong, K.M. Pryer. 2015. The *Azolla* genome and the metagenomes of its obligate endosymbionts: unlocking the massive green potential of a little fern. Plant and Animal Genome XXIII, San Diego, CA, USA.
- Li, F.-W.**, K.M. Pryer. 2014. Massive horizontal gene transfer of a chimeric photoreceptor within ferns. Botany 2014, Boise, ID, USA.
- Wolf, P.G.**, J.P. Der, **F.-W. Li**, C.J. Rothfels, M.A. Gitzendanner, C.J. Visger, D.E. Soltis, P.S. Soltis, K.M. Pryer. 2014. An exploration of fern genome space. Botany 2014, Boise, ID, USA.
- Windham, M.D.**, J.B. Beck, P.J. Alexander, **F.-W. Li**, C. Rushworth, C.D. Bailey, L. Allphin, I. Al-Shehbaz. 2014. Newly documented hybrids in the tribe Boechereae (Brassicaceae) challenge current generic circumscriptions in the group. Botany 2014, Boise, ID, USA.
- Allphin, L.**, J.B. Beck, P.J. Alexander, **F.-W. Li**, C. Rushworth, C.D. Bailey, I. Al-Shehbaz, M.D. Windham. 2014. New insights into the taxonomy of the rare Park rockcress (Brassicaceae) from Dinosaur National Park. Botany 2014, Boise, ID, USA.
- Morin, D., P.J. Alexander, J.B. Beck, M.D. Windham, **F.-W. Li**, C. Rushworth, I. Al-Shehbaz, L. Allphin, **C.D. Bailey**. 2014. Identifying the sexual diploid members of the *Boechera suffrutescens* (Brassicaceae) complex. Botany 2014, Boise, ID, USA.
- Li, F.-W.**, K.M. Pryer. 2014. Massive horizontal gene transfer of a chimeric photoreceptor in ferns. Evolution 2014, Raleigh, NC, USA.
- Li, F.-W.**, C.J. Rothfels, A. Larsson, E.M. Sigel, L. Huiet, P. Korall, M. Ruhsam, D. Stevenson, S. Graham, G.K.S. Wong, K.M. Pryer. 2013. Mining fern transcriptome data for low-copy nuclear markers. Botany 2013, New Orleans, LA, USA.
- Call, C., **L. Allphin**, M.D. Windham, J.B. Beck, **F.-W. Li**, P.J. Alexander, C.D. Bailey, I. Al-Shehbaz. 2013. Ecological and genetic diversity across two divergent species of *Boechera* (Brassicaceae) in biogeographic space. Botany 2013, New Orleans, LA, USA.
- Schuettpelz, E.**, **F.-W. Li**, A.N. Davila, A. Cochran. 2012. Streamlining plastid data acquisition in ferns through the use of short, rapidly evolving, coding segments. Botany 2012, Columbus, OH, USA.
- Windham, M.D.**, J.B. Beck, **F.-W. Li**, C. Rushworth, P.J. Alexander, L. Allphin, C.D. Bailey, I. Al-Shehbaz. 2012. Easy come, easy go: Diversification and extinction via hybridization in the genus *Boechera* (Brassicaceae). Botany 2012, Columbus, OH, USA.
- Alexander, P.J., J.B. Beck, **F.-W. Li**, M.D. Windham, L. Allphin, I. Al-Shehbaz, **C.D. Bailey**. 2012. Patterns of evolutionary divergence and homoploid hybridization in *Boechera* (Brassicaceae). Botany 2012, Columbus, OH, USA.
- Windham, M.D.**, J.B. Beck, P.J. Alexander, L. Allphin, C.D. Bailey, C. Call, **F.-W. Li**, C. Rushworth, I. Al-Shehbaz. 2011. Is the glass half-empty or half-full?: the current state of *Boechera* (Brassicaceae) systematics. Botany 2011, St. Louis, MO, USA.

- Li, F.-W.**, C.J. Rothfels, M.D. Windham, K.M. Pryer. 2011. The global two-locus plant barcode: a first evaluation of its utility across ferns. XVIII International Botanical Congress, Melbourne, Australia.
- Li, F.-W.**, L.Y. Kuo, C.J. Rothfels, A. Ebihara, W.L. Chiou, M.D. Windham, **K.M. Pryer**. 2011. *rbcL* and *matK* earn a thumbs up as the core DNA barcode for ferns. Botany 2011, St. Louis, MO, USA.
- Li, F.-W.**, L.Y. Kuo, W.L. Chiou, C.N. Wang. 2008. Tissue-Direct PCR, a rapid and extraction-free method for barcoding of ferns. Botany 2008, Vancouver, Canada.
- Kuo, L.Y.***, **F.-W. Li***, C.N. Wang 2008. The first insight into the *matK* phylogeny of ferns. Botany 2008, Vancouver, Canada. *Equal contributions
- Li, F.-W.**, B.C. Tan, R.C. Moran, G. Rouhan, C.N. Wang 2007. Identifying a mysterious aquatic fern gametophyte. Plant Biology and Botany 2007, Chicago, IL, USA.