

郭立園 Li-Yaung Kuo

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Research interests/contributions

Plant evolutionary biology with special foci on phylogenetics, systematics, and genomics. More recent updates can be found in my ResearchGate webpage:

https://www.researchgate.net/profile/Li-Yaung_Kuo

High-level fern phylogenetics:

- Resolved several difficult nodes on the family-level backbone (Kuo & Li et al. 2011 in *Molecular Phylogenetics and Evolution*; Rothfels, Larsson & Kuo et al. 2012 in *Systematic Biology*).
- Phylogenomics at the order and family levels (Kuo et al. 2018 in *American Journal of Botany*; Qi et al. 2018 in *Molecular Phylogenetics and Evolution*).

Fern species diversity in Asia:

- New *Asplenium* and *Haplopteris* species (Chen et al. 2013, Li & Kuo et al. 2016 in *Systematic Botany*; Chen et al. 2018 in *Gardens' Bulletin Singapore*).
- Newly recoded *Adiantum* fern in Taiwan (Kuo et al. 2016 in *Phytotaxa*).
- Recorded the first sporophyte-less ferns in Taiwan (Kuo & Chen et al. 2017 in *Journal of Plant Research*).
- Confirmation of a new record of *Acystopteris taiwaniana* in Japan and its allopolyploid origin (Ebihara et al. 2019 in *Acta Phytotaxonomica et Geobotanica*).

Fern morphology & systematics:

- Taxonomic revision of the fern genus *Deparia*, *Monachosorum*, *Dryopteris* subg. *Nothoperanema* (Ebihara et al. 2016, Kuo et al. 2016, 2018 in *Systematic Botany*).
- Organized genus and family system of suborder Aspleniineae (Rothfels et al. 2012 in *Taxon*), particular for Athyriaceae (PPG I 2016 in *Journal of Systematics and Evolution*).
- New addition of fern genus in Lomariopsidaceae (Chen et al. 2017 in *PhytoKey*).

Fern biogeography:

- Reviewed the geographic distribution of independent gametophyte ferns (Pinson et al. 2017 in *International Journal of Plant Sciences*), and confirmed the first case in subtropical regions (Kuo & Chen et al. 2016 in *Journal of Plant Research*).
- Investigated the dispersal rates/abilities in polyploid and diploid *Deparia* ferns, and also their historical biogeography (Kuo et al. 2016 in *Molecular Phylogenetics and Evolution*).

Genomic diversity in ferns:

- Discovered a fern species with the smallest genome size known to date, helped sequencing the first fern genomes, found a new horizontal gene transfer in ferns (Li et al. 2018 in *Nature Plants*).
- Plastome structural evolution at the order level (Kuo et al. 2018 in *American Journal of Botany*).
- Finding candidate taxa for whole genome sequencing across seed-free vascular plant orders (Kuo & Li 2019 in *American Fern Journal*).
- Identified a novel protein-coding gene in plastomes of seed-free vascular plant lineages (Song & Kuo et al. 2018 in *American Journal of Botany*).
- Provided the second case study of mitogenome maternal inheritance in ferns (Kuo et al. 2018 in *Frontiers in Plant Science*).
- Investigated gene evolution rate heterogeneity in fern plastomes (Li et al. 2016 in *Genome Biology and Evolution*).
- Surveyed microRNA diversity among fern transcriptomics (You & Cui et al. 2017 in *Genome Biology*).

Reproductive biology of ferns:

- Developed flow cytometry method to evaluate spore genome sizes of ferns and lycophytes, and facilitated examination of their reproductive modes (Kuo et al. 2017 in *New Phytologist*).
- Formulated hypotheses of the origins of independent gametophytes in ferns (species that lack sporophyte generation in their life cycle) (Pinson et al. 2017 in *International Journal of Plant Sciences*; Kuo & Chen et al. 2016 in *Journal of Plant Research*).
- Polyploidy and reproduction in *Deparia* ferns (Kuo 2015 Ph.D. thesis).

DNA barcoding in ferns:

- Provided the first sets of sequences and primers of plant DNA barcode region *matK* for all fern families (Kuo & Li et al. 2011 in *Molecular Phylogenetics and Evolution*).

- Developed “Tissue-Direct PCR” technique for DNA-barcoding fern gametophytes (Li & Kuo et al. 2010 in *Molecular Ecology Recourse*).
- Verified the power of barcoding regions on fern species (Li et al. 2011 in *PLoS ONE*; Chen et al. 2013 in *Annals of Botany*).
- Reviewed research progress of fern DNA barcode in Asia (Ebihara & Kuo 2012, book chapter in *The Biodiversity Observation Network in the Asia-Pacific Region*).

Education/Postdoctoral fellow

2017-2019 Postdoctoral Researcher. Boyce Thompson Institute and Cornell University, USA.

2009-2015 Ph.D. Institute of Ecology and Evolutionary Biology, National Taiwan University.

2004-2008 BS. Department of Life Science, National Taiwan University.

Teaching experience

2015 台北植物園志工解說培訓課程

2011, 2012 “國際珍古德教育及保育協會” “根與芽福山生物多樣性種子教師研習工作坊”
「從蕨類認識福山」課程講師

2010 2nd semester “植物分子發育技術” of Department of Life Science, National Taiwan University.

2008 2nd semester “臺灣維管束植物與植被實習” of Institute of Ecology and Evolutionary Biology,
National Taiwan University.

International fellowship

2015 May, USA. Scholar fellowship of Next Generation Pteridology. US herbarium work.

2010 September-October, China. Ph.D. student fellowship of Mainland Affairs Council. (陸委會
中華發展基金)

July-August, Japan. Ph.D. student fellowship of Japan-Taiwan Exchange Association. (台日
交流協會, 博士生暑期赴日研究計畫)

International field and herbarium work

2018 September, Vietnam. Field collection in Bidoup Nui Ba National Park.

2018 July, Japan. TNS herbarium, and field collection in Mt. Fuji.

2017 July, China. Field collection in Guangxi.

July, China. PE herbarium.

- June, USA.** Field collection in Wichita Mountain Wildlife Refuge.
- March, Japan.** TNS herbarium.
- 2014 February, the Philippines.** Field collection in Negros.
- 2013 March, Japan.** Field collection in Hachijo Island and southern Kyushu. TNS herbarium.
- 2012 December, the Philippines.** Field collection in Mt. Kitanglad, Mindanao.
- November, Japan.** Field collection in Okinawa and Amami Islands.
- September, China.** Field collection in Yunnan.
- May, the Philippines.** Field collection in Mt. Apo, Mindanao.
- 2011 October, Indonesia.** Field collection in Java and BO herbarium.
- August, China.** Field collection in Sichuan.
- May-June, the Philippines.** Field collection in southern Luzon and PNH herbarium work.
- 2010 December, Vietnam.** Field collection in Hoang Lien National Park.
- November, China.** Field collection in Hainan.
- September-October, China.** Field collection in Guangdong, Yunnan, Jiangsu, Jiangxi, and Anhui. PYU and IBSC herbarium.
- July-August, Japan.** Field collection in Tsukuba, Tokyo, northern Honshu, and Yakushima.
- KYO, TI, MAK, and TNS herbaria.
- June, China.** PE herbarium work.
- 2009 November, Japan.** TNS herbarium.
- July-August, China.** Field collection in Hainan.
- May-June, the Philippines.** Field collection in central Luzon and PNH herbarium work.
- 2008 October, Japan.** Field collection in Okinawa, Iriomote, and Ishigaki.
- October, China.** Field collection in Yunnan and PYU herbarium work.
- 2007 February, Japan.** TNS herbarium.

Other work experiences

- 2016** 大愛電視台發現專題錄製科普節目“蕨代風華”
(<https://www.youtube.com/watch?v=VwhpzFCr61U&t=89s>)
- 2015** Organization of fern and lycophyte classification system for TAIF herbarium (Herbarium of Taiwan Forestry Research Institute, 林試所標本館)

Publication list (*equally contributed)

2020

- Kuo L-Y, Chang Y-H, Huang Y-H, Testo W, Ebihara A, Rouhan G, Quintanilla LG, Watkins JEJ, Huang Y-M, Li F-W. 2020.** A global phylogeny of *Stegnogramma* ferns (Thelypteridaceae): generic and sectional revision, historical biogeography and leaf architecture. *Cladistics*, **26**: 164–183.
- Chang Z-X***, **Kuo L-Y***, P-F Lu, Y-M Huang. New addition to the *Asplenium normale* complex (Aspleniaceae): an endemic form in Taiwan. *Taiwania*, in press.

2019

- Kuo L-Y, Li F-W. 2019.** A roadmap for fern genome sequencing. *American Fern Journal* **109**: 212–223.
- TPG. 2019.** Updating Taiwanese pteridophyte checklist: a new phylogenetic classification. *Taiwania* **64**: 367–395.
- Ebihara A, Nakato N, Kuo L-Y, Miyazaki H, Serizawa S. 2019.** Allopolyploid origin and distribution range of *Acystopteris taiwaniana* (Cystopteridaceae: Polypodiales). *Acta Phytotaxonomica et Geobotanica* **70**: 19–28.

2018

- Kuo L-Y, Ebihara A, Kato M, Rouhan G, Ranker TA, Wang C-N, Chiou W-L. 2018.** Morphological characterization of infra-generic lineages in *Deparia* (Athyriaceae; Polypodiales). *Cladistics* **34**: 78–92. (2017 5-year-IF: 5.594, 14.3% ranked in Evolutionary Biology)
- Kuo L-Y, Tang T-Y, Li F-W, Su H-J, Chiou W-L, Huang Y-M, Wang C-N. 2018.** Organelle genome inheritance in *Deparia* ferns (Athyriaceae, Aspleniaceae, Polypodiales). *Frontiers in Plant Science* **9**: Article 486. (2017 5-year-IF: 3.678, 10.8% ranked in Plant Sciences)
- Kuo L-Y, Qi X, Huang Y-M, H. Ma, Li F-W. 2018.** Order-level fern plastome phylogenomics: new insights from Hymenophyllales. *American Journal of Botany* **105**: 1545–1555. (2017 5-year-IF: 2.788, 22% ranked in Plant Sciences)
- Kuo L-Y, Ebihara A, Hsu T-C, Rouhan G, Huang Y-M, Wang C-N, Chiou W-L, Kato M. 2018.** Infrageneric revision of the fern genus *Deparia* (Athyriaceae, Aspleniaceae, Polypodiales). *Systematic Botany* **43**: 645–655. (2017 5-year-IF: 1.515, 45% ranked in Plant Sciences)
- Song M***, **Kuo L-Y***, Huiet L, Pryer KM, Rothfels CJ, Li F-W. 2018. A novel chloroplast gene reported for flagellate plants. *American Journal of Botany* **105**: 117–121. (2017 5-year-IF: 2.788, 22% ranked in Plant Sciences)
- Li F-W, Carretero-Paulet L, Cheng S, Vries J de, Delaux P-M, Eily A, Koppers N, Kuo L-Y, Li Z, Simenc M, et al. 2018.** Fern genomes elucidate land plant evolution and cyanobacterial symbioses. *Nature Plants* **4**: 460–472. (2017 5-year-IF: 11.471, 1.3% ranked in Plant Sciences)
- Qi X, Kuo L-Y, Guo C, Li H, Li Z, Qi J, Wang L, Hu Y, Zhang C, Guo J, et al. 2018.** A well-resolved fern nuclear phylogeny and expansion of numerous transcription factor families.

Molecular Phylogenetics and Evolution **127**: 961–977. (2017 5-year-IF: 4.294, 19.9% ranked in Genetics & Heredity)

Chen C-W, Lindsay S, Mynssen CM, Kuo L-Y, Amoroso VB, Huang Y-M. 2018. A new *Haplopteris* species from the Philippines and clarification of the status of *H. amboinensis* in China and Indochina. *Gardens' Bulletin Singapore* **70**: 177–190.

2017

Kuo L-Y, Huang Y-J, Chang J, Chiou W-L, Huang, Y-M. 2017. Evaluating the spore genome sizes of ferns and lycophytes: a flow cytometry approach. *New Phytologist* **213**: 407–416. (2017 5-year-IF: 7.433, 3.1% ranked in Plant Sciences)

Kuo L-Y*, Chen C-W*, Shinohara W, Ebihara A, Kudoh H, Sato H, Huang Y-M, Chiou W-L. 2017. Not only in the temperate zone: independent gametophytes of two vittarioid ferns (Pteridaceae, Polypodiales) in East Asian subtropics. *Journal of Plant Research* **130**: 255–262. (2017 5-year-IF: 2.000, 35.6% ranked in Plant Sciences)

Kuo L-Y, Huang Y-M. 2017. Determining genome size from spores of seedless vascular plants. *Bioprotocol* **7**: e2322.

Chen C-W, Lindsay S, Kuo L-Y, Fraser-Jenkins CR, Ebihara A, Luu HT, Park CW, Chao YS, Huang Y-M, Chiou W-L. 2017. A systematic study of East Asian vittarioid ferns (Pteridaceae, Vittarioideae). *Botanical Journal of the Linnean Society* **187**: 545–560. (2017 5-year-IF: 3.124, 16.7% ranked in Plant Sciences)

Chen C-W*, Sundue M*, Kuo L-Y, Huang Y-M. 2017. Phylogenetic analyses place the monotypic *Dryopolystichum* within Lomariopsidaceae. *PhytoKeys* **78**: 83–107. (2017 IF: 1.393, 52% ranked in Plant Sciences)

Hori K, Kuo L-Y, Chiou W-L, Ebihara A, Murakami, N. 2017. Geographical distribution of sexual and apogamous types of *Dryopteris formosana* and *Dryopteris varia* (Dryopteridaceae) in Taiwan. *Acta Phytotaxonomica et Geobotanica* **68**: 23–32.

Pinson JB, Chambers SM, Nitta JH, Kuo L-Y, Sessa EB. 2017. The separation of generations: biology and biogeography of long-lived sporophyteless fern gametophytes. *International Journal of Plant Sciences* **178**: 1–18. (2017 5-year-IF: 1.450, 48% ranked in Plant Sciences)

You C*, Cui J*, Wang H, Qi X, Kuo L-Y, Ma H, Gao L, Mo B, Chen X. 2017. Conservation and divergence of small RNA pathways and microRNAs in land plants. *Genome Biology* **18**: 158. (2017 5-year-IF 16.497, 2.3% ranked in Genetics & Heredity).

Tseng M-H, Lin K-H, Huang Y-J, Chang Y-L, Huang S-C, Kuo L-Y, Huang Y-M. 2017. Detection of chlorophylls in spores of seven ferns. *Journal of Plant Research* **130**: 407–416. (2017 5-year-IF: 2.000, 35.6% ranked in Plant Sciences)

2016

Kuo L-Y, Ebihara A, Shinohara W, Rouhan G, Wood KR, Wang C-N, Chiou W-L. 2016. Historical biogeography of the fern genus *Deparia* (Athyriaceae) and its relation with polyploidy.

Molecular Phylogenetics and Evolution **104**: 123–134. (2017 5-year-IF: 4.294, 19.9% ranked in Genetics & Heredity)

Kuo L-Y, Chang Y-H, Glowienka JMO, Amoroso VB, Dong S-Y, Kao T-T, Wang C-N, Chiou W-L. 2016. A revised framework of *Dryopteris* subg. *Nothoperanema* (Dryopteridaceae) inferred from phylogenetic evidence, with descriptions of two new sections. *Systematic Botany* **41**: 596–605. (2017 5-year-IF: 1.515, 45% ranked in Plant Sciences)

Kuo L-Y, Hsu T-C, Chang Y-H, Huang Y-M, Chiou W-L. 2016. Systematics of the *Adiantum philippense* complex (Pteridaceae, Polypodiales) in Taiwan. *Phytotaxa* **263**: 113–121. (2017 5-year-IF: 1.185, 58% ranked in Plant Sciences)

Li F-W*, Kuo L-Y*, Chang Y-H, Hsu T-C, Hung H-C, Chiou W-L, Rothfels CJ, Huang Y-M. 2016. *Asplenium pifongiae* (Aspleniaceae: Polypodiales), a new species from Taiwan. *Systematic Botany* **41**: 24–31. (2017 5-year-IF: 1.515, 45% ranked in Plant Sciences)

Ebihara A, Nakato N, Amoroso VB, Hidayat A, Kuo L-Y. 2016. The Japanese endemic *Monachosorum arakii* Tagawa (Dennstaedtiaceae) is a relict ‘inter-national’ hybrid: a reassessment of the *Monachosorum* species. *Systematic Botany* **41**: 586–595. (2017 5-year-IF: 1.515, 45% ranked in Plant Sciences)

Li F-W, Kuo L-Y, Pryer KM, Rothfels CJ. 2016. Genes translocated into the plastid inverted repeat show decelerated substitution rates and elevated GC content. *Genome Biology and Evolution* **8**: 2452–2458. (2017 5-year-IF: 4.171, 24.6% ranked in Genetics & Heredity)

Pteridophyte Phylogeny Group I. 2016. A community-derived classification for extant lycophytes and ferns. *Journal of Systematics and Evolution* **54**: 563–603. (2017 5-year-IF: 3.657, 11.7% ranked in Plant Sciences)

2014

Zhang W-Y*, Kuo L-Y*, Li F-W, Wang C-N, Chiou W-L. 2014. The hybrid origin of *Adiantum meishanianum* (Pteridaceae): a rare and endemic species in Taiwan. *Systematic Botany* **39**: 1034–1041. (2017 5-year-IF: 1.515, 45% ranked in Plant Sciences)

Ebihara A, Nakato N, Matsumoto S, Chao Y-S, Kuo L-Y. 2014. Cytotaxonomic studies on thirteen ferns of Taiwan. *Bulletin of the National Museum of Nature and Science. Series B, Botany* **40**: 19–28.

2013

Chang Y-H, Kuo L-Y, Chiou W-L, Chen C-W, Chang H-M, Amoroso VB. 2013. *Stenolepia Alderw.* (Dryopteridaceae), a fern genus new to the Philippines. *Philippine Journal of Science* **142**: 83–88.

Chen C-W, Huang Y-M, Kuo L-Y, Chang Y-H, Liu Y-C, Chiou W-L. 2013. A new vittarioid fern species, *Haplopteris heterophylla* (Pteridaceae). *Systematic Botany* **38**: 901–909. (2017 5-year-IF: 3.657, 11.7% ranked in Plant Sciences)

Chen C-W, Huang Y-M, Kuo L-Y, Nguyen QD, Luu HT, Callado JR, Farrar DR, Chiou W-L. 2013. *TrnL-F* is a powerful marker for DNA identification of field vittarioid gametophytes

(Pteridaceae). *Annals of Botany* **111**: 663–673. (2017 5-year-IF: 3.646, 12.2% ranked in Plant Sciences)

2012

Rothfels CJ*, **Larsson A***, **Kuo L-Y***, **Korall P**, **Chiou W-L**, **Pryer KM**. 2012. Overcoming deep roots, fast rates, and short internodes to resolve the ancient rapid radiation of eupolypod II ferns. *Systematic Biology* **61**: 490–509. (2017 5-year-IF: 14.501, 8.1% ranked in Evolutionary Biology)

Chen C-W, **Kuo L-Y**, **Wang C-N**, **Chiou W-L**. 2012. Development of PCR primer sets for intron 1 of the low-copy gene *LEAFY* in Davalliaceae. *American Journal of Botany* **99**: e223–225. (2017 5-year-IF: 2.788, 22% ranked in Plant Sciences)

Rothfels CJ*, **Sundue MA***, **Kuo L-Y**, **Larsson A**, **Kato M**, **Schuettpelz E**, **Pryer KM**. 2012. A revised family-level classification for eupolypod II ferns (Polypodiidae: Polypodiales). *Taxon* **61**: 515–533. (2017 5-year-IF: 2.680, 23.9% ranked in Plant Sciences)

2011

Kuo L-Y*, **Li F-W***, **Chiou W-L**, **Wang C-N**. 2011. First insights into fern *matK* phylogeny. *Molecular Phylogenetics and Evolution* **59**: 556–566. (2017 5-year-IF: 4.294, 19.9% ranked in Genetics & Heredity)

Li F-W, **Kuo L-Y**, **Rothfels CJ**, **Ebihara A**, **Chiou W-L**, **Windham MD**, **Pryer KM**. 2011. *RbcL* and *matK* earn two thumbs up as the core DNA barcode for ferns. *PLoS ONE* **6**: e26597. (2017 5-year-IF: 3.352, 23.4% ranked in Multidisciplinary Sciences)

2010

Li F-W*, **Kuo L-Y***, **Huang Y-M**, **Chiou W-L**, **Wang C-N**. 2010. Tissue-direct PCR, a rapid and extraction-free method for barcoding of ferns. *Molecular Ecology Resources* **10**: 92–95. (2017 5-year-IF: 6.073, 5.06% ranked in Ecology)

Book chapter

Ebihara A, **Kuo L-Y**. 2012. East and Southeast Asian pteridophyte flora and DNA barcoding. In: Nakano S, Yahara T, Nakashizuka T, eds. Ecological Research Monographs. The Biodiversity Observation Network in the Asia-Pacific Region: Toward Further Development of Monitoring, Ecological Research Monographs. Tokyo: Springer Japan, 321–327.

Thesis

Kuo L-Y. 2015. Polyploidy and biogeography in genus *Deparia* and phylogeography in *Deparia lancea*. Ph.D. thesis, National Taiwan University.

Presentations at international conferences

- Kuo L-Y, Ebihara A, Chen C-W, Li F-W, Huang Y-M, Rouhan G. 2018.** Phylogeny of Lomariopsidaceae: evolution of epiphytism and multiple origins of independent gametophytes. *7th Asian Symposium of Ferns & Lycophytes*. Taipei, Taiwan.
- Kuo L-Y, Chen C-W, Hung Y-L, Ko C-W, Li F-W, Chiou W-L, Wang C-N, Huang Y-M. 2018.** Heterochronic response to antheridiogen could explain the mating behavior shifts in polyploid ferns. *Botany 2018*. Rochester, USA.
- Kuo L-Y, Tang T-Y, Chiou W-L, Li F-W, Huang Y-M, Wang C-N. 2017.** Organelle genome inheritance in *Deparia* ferns (Athyraceae, Aspleniaceae, Polypodiales). *Botany 2017*. Fort Worth, USA.
- Kuo L-Y, Ebihara A, Kato M, Wang C-N, Chiou W-L. 2015.** Phylogeny of *Deparia* (Athyraceae) and characterization of its infrageneric lineages. *Next Generation Pteridology*. Washington DC, USA.
- Kuo L-Y, Tang D-Y, Huang Y-M, Chen C-W, Fan S-W, Wang C-N, Chiou W-L. 2014.** Cryptic species diversity on field fern gametophyte flora in Fushan (Taiwan). *The 6th Asian Fern Symposium*. Bali, Indonesia.
- Kuo L-Y, Ebihara A, Shinohara W, Kato M, Wood K, Ranker T, Wang C-N, Chiou W-L. 2011.** Phylogeography of genus *Deparia* (Woodsiaceae). *XVIII International Botanical Congress*. Melbourne, Australia.

Popular article & scientific education TV program

- 郭立園。2016。愛蕨人慧眼揭身世—碧鳳鐵角蕨。科學人 174 期 98 頁。
- 郭立園、邱文良。2015。梅山口鐵線蕨：珍稀蕨類的過去與未來。科學人 163 期 98 頁。
- 大愛電視台發現專題-蕨色風華 (<https://www.youtube.com/watch?v=VwhpzFCr61U&t=89s>)