

# CURRICULUM VITAE

Chuan Ku (顧銓)

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Birth: 1987 in Taipei County, Taiwan  
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Current address: Institute of Plant and Microbial Biology (IPMB)  
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## Education

2013-2016 Dr. rer. nat. in Biology (*summa cum laude*), Heinrich Heine University Düsseldorf, Germany (dissertation title: “On the prokaryotic origins of eukaryotic genes”)  
2009-2011 M.Sc. in Ecology and Evolutionary Biology, National Taiwan University, Taiwan (thesis title: “Identification of *Ardisia* (Myrsinaceae) leaf-nodule symbionts and cophylogenetic analyses of plant-bacteria symbiosis”)  
Certificate in Mandarin-English Translation and Interpretation, National Taiwan University, Taiwan  
2005-2009 B.Sc. in Life Science with a minor degree in Geosciences, National Taiwan University, Taiwan

## Professional experience

2019- Assistant Research Fellow, Institute of Plant and Microbial Biology, Academia Sinica, Taiwan  
2016-2018 Postdoctoral fellow, Department of Plant and Environmental Sciences, Weizmann Institute of Science, Israel  
2016 Postdoctoral fellow, Institute of Molecular Evolution, Heinrich Heine University Düsseldorf, Germany  
2012-2013 Research assistant, Institute of Plant and Microbial Biology, Academia Sinica, Taiwan  
2011-2012 Personnel officer, Reserve Command, Ministry of National Defense, Taiwan  
2010-2012 Part-time English-Mandarin translator, Linguitronics Co., Taiwan

## **Awards and scholarships**

- 2017-2018 European Molecular Biology Organization (EMBO) Long-Term Fellowship for postdoctoral fellows
- 2017 2016 Best Dissertation Award, Faculty of Mathematics and Natural Sciences, Heinrich Heine University Düsseldorf, Germany
- 2016 Koshland Prize for postdoctoral fellows, Weizmann Institute of Science, Israel
- 2016 Dean of Faculty Fellowship, Weizmann Institute of Science, Israel
- 2016 Young Investigator Travel Award, Annual Meeting of the Society for Molecular Biology & Evolution (SMBE) 2016, Gold Coast, Australia
- 2016 Funded Visit Program for PhD students, Weizmann Institute of Science, Israel
- 2015 Travel Grant for Volkswagenstiftung “Kick-off Conference: Life? – A New Funding Initiative Introduces Itself,” Hanover, Germany
- 2013-2016 Research scholarship for foreign doctorate students and young academics, German Academic Exchange Service (DAAD), Germany
- 2011 Distinguished Master’s Thesis Award, Taiwan Society of Plant Biologists, Taiwan
- 2011 Dean Award for outstanding performance in study, College of Life Science, National Taiwan University, Taiwan
- 2008 Undergraduate Research Scholarship, National Science Council, Taiwan
- 2007 Scholarship for further academic study and training in Germany, German Academic Exchange Service (DAAD), Germany
- 2005-2009 Presidential Awards for bachelor students, National Taiwan University, Taiwan

## **Teaching experience**

- 2014-2015 Teaching assistant, Perl for Biologists / Genomic Analyses, Institute of Molecular Evolution, Heinrich Heine University Düsseldorf, Germany
- 2009-2010 Teaching assistant, General Biology Laboratory, National Taiwan University, Taiwan

## **Language proficiency**

Mandarin (native speaker), English (fluent), German (near-fluent)

English:

- 2012 TOEFL iBT: Total 115/120 (Reading 30/30, Listening 30/30, Speaking 28/30, Writing 27/30)
- 2010 Certificate of Competency in Chinese and English Translation and Interpretation (examination in *English to Chinese Translation: General Topics*), Ministry of Education, Taiwan

German:

- 2012 TestDaF: Reading 5/5, Listening 4/5, Speaking 4/5, Writing: 4/5

## Workshops and courses

- 2018 EMBO Lab Leadership for Postdocs (September 3 – 5, 2018), Heidelberg, Germany
- 2017 EMBO Practical Course – Single Cell Omics (April 24 – April 30, 2017), Heidelberg, Germany (selected attendee; oral and poster presentation)
- 2016 Hjort Summer School 2016: Microbial Oceanography – Complexity vs. Simplicity in Microbial Ecology (August 29 - September 2, 2016), Bergen, Norway (selected attendee; oral and poster presentation)

## Research interests

- Microbial eukaryote evolution and ecology
- Marine microalgae
- Giant viruses
- Single-cell omics
- Microbial interactions
- Phylogenetics and systematics
- Eukaryote origin and early evolution
- Lateral gene transfer
- Organelle genomics
- Symbiosis

## Publications

- 21. **Chuan Ku**<sup>#</sup>, Tsu-Wang Sun (2020): Did giant and large dsDNA viruses originate before their eukaryotic hosts? *Proceedings of the National Academy of Sciences of the United States of America* (in press) <sup>#</sup>Corresponding author
- 20. **Chuan Ku**<sup>#</sup>, Arnau Sebé-Pedrós<sup>#</sup> (2019): Using single-cell transcriptomics to understand functional states and interactions in microbial eukaryotes. *Philosophical Transactions of the Royal Society B* 374(1786): 20190098. DOI:10.1098/rstb.2019.0098 <sup>#</sup>Corresponding authors
- 19. **Chuan Ku**<sup>\*</sup>, Uri Sheyn<sup>\*</sup>, Arnau Sebé-Pedrós, Shifra Ben-Dor, Daniella Schatz, Amos Tanay, Shilo Rosenwasser, Assaf Vardi (2019): Tracking infection dynamics at single-cell level reveals highly-resolved expression programs of a large virus infecting algal blooms. *bioRxiv*. DOI:10.1101/757542 <sup>\*</sup>equal contribution
- 18. **Chuan Ku**, Noa Barak-Gavish, Mark Maienschein-Cline, Stefan J. Green, Assaf Vardi (2018): Complete genome sequence of *Sulfitobacter* sp. strain D7, a virulent bacterium isolated from an *Emiliania huxleyi* algal bloom in the North Atlantic. *Microbiology Resource Announcements* 7(19): e01379-18. DOI:10.1128/MRA.01379-18
- 17. Noa Barak-Gavish, Miguel Frada, **Chuan Ku**, Peter A. Lee, Giacomo R. DiTullio, Sergey Malitsky, Asaph Aharoni, Stefan J. Green, Ron Rotkopf, Elena Kartvelishvily, Uri Sheyn, Daniella Schatz, Assaf Vardi (2018): Bacterial virulence against an oceanic bloom-forming phytoplankter is mediated by algal DMSP. *Science Advances* 4(10): eaau5716. DOI: 10.1126/sciadv.aau5716

16. William F. Martin, Mayo Roettger, **Chuan Ku**, Sriram G. Garg, Shijulal Nelson-Sathi, Giddy Landan (2017): Late mitochondrial origin is an artefact. *Genome Biology and Evolution* 9(2): 373-379. DOI:10.1093/gbe/evx027
15. **Chuan Ku**<sup>#</sup>, William F. Martin<sup>#</sup> (2016): A natural barrier to lateral gene transfer from prokaryotes to eukaryotes revealed from genomes: the 70% rule. *BMC Biology* 14:89. DOI:10.1186/s12915-016-0315-9 <sup>#</sup>Corresponding authors (recommended by Faculty of 1000: <http://f1000.com/prime/726862983>)
14. **Chuan Ku**, Shijulal Nelson-Sathi, Mayo Roettger, Filipa L. Sousa, Peter J. Lockhart, David Bryant, Einat Hazkani-Covo, James O. McInerney, Giddy Landan, William F. Martin (2015): Endosymbiotic origin and differential loss of eukaryotic genes. *Nature* 524:427-432. DOI:10.1038/nature14963 (recommended by Faculty of 1000: <http://f1000.com/prime/725729035>)
13. **Chuan Ku**<sup>\*</sup>, Shijulal Nelson-Sathi<sup>\*</sup>, Mayo Roettger, Sriram Garg, Einat Hazkani-Covo, William F. Martin (2015): Endosymbiotic gene transfer from prokaryotic pangenomes: Inherited chimerism in eukaryotes. *Proceedings of the National Academy of Sciences of the United States of America* 112(33): 10139-10146. DOI:10.1073/pnas.1421385112 <sup>\*</sup>equal contribution
12. **Chuan Ku**<sup>\*</sup>, Mayo Roettger<sup>\*</sup>, Verena Zimorski, Shijulal Nelson-Sathi, Filipa L. Sousa, William F. Martin (2014): Plastid origin: Who, when and why? *Acta Societatis Botanicorum Poloniae* 83(4):281-289 DOI:10.5586/asbp.2014.045 <sup>\*</sup>equal contribution
11. Verena Zimorski, **Chuan Ku**, William F. Martin, Sven B. Gould (2014): Endosymbiotic theory for organelle origins. *Current Opinion in Microbiology* 22:38-48. DOI:10.1016/j.mib.2014.09.008
10. **Chuan Ku**, Wen-Sui Lo, Chih-Horng Kuo (2014): Molecular evolution of the actin-like MreB protein gene family in wall-less bacteria. *Biochemical and Biophysical Research Communications* 446(4):927-932. DOI:10.1016/j.bbrc.2014.03.039
9. Tean-Hsu Chang, Wen-Sui Lo, **Chuan Ku**, Ling-Ling Chen, Chih-Horng Kuo (2014): Molecular evolution of the substrate utilization strategies and putative virulence factors in mosquito-associated *Spiroplasma* species. *Genome Biology and Evolution* 6(3): 500-509. DOI:10.1093/gbe/evu033
8. **Chuan Ku**, Wen-Sui Lo, Ling-Ling Chen, Chih-Horng Kuo (2014): Complete genome sequence of *Spiroplasma apis* B31T (ATCC 33834), a bacterium associated with May disease of honeybees (*Apis mellifera*). *Genome Announcements* 2(1): e01151-13. DOI:10.1128/genomeA.01151-13
7. **Chuan Ku**, Jer-Ming Hu (2014): Phylogenetic and cophylogenetic analyses of the leaf-nodule symbiosis in *Ardisia* subgenus *Crispardisia* (Myrsinaceae): Evidence from nuclear and chloroplast markers and bacterial *rrn* operons. *International Journal of Plant Sciences* 175(1):92-109. DOI:10.1086/673306
6. **Chuan Ku**, Wen-Sui Lo, Chih-Horng Kuo (2013): Horizontal transfer of potential mobile units in phytoplasmas. *Mobile Genetic Elements* 3(5):e26145. DOI:10.4161/mge.26145
5. Wen-Sui Lo, **Chuan Ku**, Ling-Ling Chen, Tean-Hsu Chang, Chih-Horng Kuo (2013): Comparison of metabolic capacities and inference of gene content evolution in mosquito-associated *Spiroplasma diminutum* and *S. taiwanense*. *Genome Biology and Evolution* 5(8):1512-1523. DOI:10.1093/gbe/evt108
4. **Chuan Ku**, Wan-Chia Chung, Ling-Ling Chen, Chih-Horng Kuo (2013): The complete plastid genome sequence of Madagascar periwinkle *Catharanthus roseus* (L.)

- G. Don: Plastid genome evolution, molecular marker identification, and phylogenetic implications in asterids. *PLoS ONE* 8(6):e68518. DOI:10.1371/journal.pone.0068518
3. **Chuan Ku**, Wen-Sui Lo, Ling-Ling Chen, Chih-Horng Kuo (2013): Complete genomes of two dipteran-associated spiroplasmas provided insights into the origin, dynamics, and impacts of viral invasion in *Spiroplasma*. *Genome Biology and Evolution* 5(6):1151-1164. DOI:10.1093/gbe/evt084
  2. **Chuan Ku**, Jer-Ming Hu, Chih-Horng Kuo (2013): Complete plastid genome sequence of the basal asterid *Ardisia polysticta* Miq. and comparative analyses of asterid plastid genomes. *PLoS ONE* 8(4):e62548. DOI:10.1371/journal.pone.0062548
  1. **Chuan Ku**, Liang-Chi Wang, Su-Hwa Chen (2012): Dispersal of airborne pollen in Chatienshan nature reserve, northern Taiwan, with emphasis on Taiwan beech. *Taiwania* 57(4):331-341.

### **Presentations at scientific meetings**

17. **Chuan Ku**. Single-cell transcriptomics: understanding viral infection at high resolution. 2019 Taiwan Society of Plant Biologists Annual Meeting (November 23-24, 2019), Taipei, Taiwan. (oral)
16. **Chuan Ku**. Single-cell RNA-seq for microbial eukaryotes: insights into infection of a cosmopolitan alga by its large DNA virus. Fourth Microbial Single Cell Genomics Workshop (September 22-26, 2019), Boothbay Harbor, USA. (oral)
15. **Chuan Ku**. Single-cell transcriptomic dynamics of a large virus infecting a cosmopolitan alga. 2019 EMBO Fellows' Meeting (June 12-16, 2019), Heidelberg, Germany. (oral)
14. **Chuan Ku**. Single-cell transcriptomic dynamics of a large virus infecting a cosmopolitan alga. 2019 Taiwan Society of Microbial Ecology Annual Meeting (May 11, 2019), Taichung, Taiwan. (oral)
13. **Chuan Ku**. Dynamics of viral infection in the ocean at the single-cell level. 17<sup>th</sup> International Symposium on Microbial Ecology (August 12-17, 2018), Leipzig, Germany. (poster)
12. **Chuan Ku**. Highly resolved transcriptomic dynamics of a large DNA virus at the single-cell level. Israel Society for Microbiology Annual Meeting (July 3-4, 2018), Be'er Sheva, Israel. (oral)
11. **Chuan Ku**. Single-cell transcriptomics of host and virus dynamics in the ocean. Single Cell Genomics 2017 (October 16-18, 2017), Rehovot, Israel. (poster)
10. **Chuan Ku**. Defining viral infection states of a bloom-forming marine alga with single-cell dual RNA sequencing. International Phycological Congress 2017 (August 13-18, 2017), Szczecin, Poland. (oral)
9. **Chuan Ku**. Endosymbiotic origin and differential loss of eukaryotic genes. Society of Molecular Biology and Evolution SBE 2016 (July 3-7, 2016), Gold Coast, Australia. (oral)
8. **Chuan Ku**. Bacterial origins of eukaryotic genes. Gordon Research Conference: Marine Microbes (June 19-24, 2016), Girona, Spain. (poster)
7. **Chuan Ku**. Endosymbiotic origin and differential loss of eukaryotic genes. Bilateral Workshop Germany-Japan (March 22-23, 2016), National Institute of Genetics, Mishima, Japan. (oral)

6. **Chuan Ku**, Shijulal Nelson-Sathi, Mayo Roettger, Filipa L. Sousa, Peter J. Lockhart, David Bryant, Einat Hazkani-Covo, James O. McInerney, Giddy Landan, William F. Martin. Endosymbiotic origin and differential loss of eukaryotic genes. Volkswagenstiftung “Kick-off Conference: Life? - A New Funding Initiative Introduces Itself” (December 17-18, 2015), Hanover, Germany. (poster)
5. **Chuan Ku**, Shijulal Nelson-Sathi, Mayo Roettger, Filipa L. Sousa, William F. Martin. Endosymbiotic gene transfer in light of prokaryotic genome evolution. SMBE 2015 (July 12-16, 2015), Vienna, Austria. (poster)
4. **Chuan Ku**, Mayo Roettger, Shijulal Nelson-Sathi, Filipa L. Sousa, William F. Martin. On the endosymbiotic origin of eukaryotic genes and apparent transfers from multiple prokaryotic sources. Sackler colloquium “Symbioses becoming permanent: The origins and evolutionary trajectories of organelles” (October 15-17, 2014), Irvine, USA. (poster)
3. **Chuan Ku**, Wen-Sui Lo, Ling-Ling Chen, Chih-Horng Kuo. Complete genome sequences of two dipteran-associated *Spiroplasma* species provided insights into the viral invasion of *Spiroplasma* genomes. SMBE 2013 (July 7-11, 2013), Chicago, USA. (poster)
2. **Chuan Ku** and Jer-Ming Hu. Identification of *Ardisia* (Myrsinaceae) leaf-nodule endosymbionts and cophylogenetic analyses of plant-bacteria symbiosis. 27<sup>th</sup> Annual Meeting of the Taiwan Society of Plant Biologists (November 13, 2010), Nantou, Taiwan. (oral)
1. **Chuan Ku** and Su-Hwa Chen. Comparison of SEM microscopic structure of *Fagus* L. (Fagaceae) pollen from extant and fossil samples in Taiwan. 28<sup>th</sup> Symposium of the Microscopy Society of Taiwan (June 21, 2008), Taichung, Taiwan. (oral)

## Invited talks

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| 11/2019 | Microbial eukaryotes: From genome evolution to viral infection. Institute of Tropical Plant Sciences and Microbiology, National Cheng Kung University, Tainan, Taiwan. Host: Dr. Chi-Chou Chiu.   |
| 06/2019 | Highly resolved expression programs revealed by single-cell RNA-seq of a large virus infecting a bloom-forming alga. Department of Plant and Environmental Sciences, Weizmann Institute of Science, Rehovot, Israel. Host: Dr. Assaf Vardi. |
| 09/2018 | Evolutionary origins of eukaryotic genes and the eukaryote-prokaryote divide. National Museum of Natural Science, Taichung, Taiwan. Host: Dr. Yu-Ling Huang.  |
| 09/2018 | Evolutionary origins of eukaryotic genes and the eukaryote-prokaryote divide. Institute of Ecology and Evolutionary Biology, Taipei, Taiwan. Host: Dr. Cheng-Ruei Lee.  |
| 04/2016 | Endosymbiotic origin and differential loss of eukaryotic genes. Department of Plant and Environmental Sciences, Weizmann Institute of Science, Rehovot, Israel. Host: Dr. Assaf Vardi.  |
| 09/2015 | Origin of eukaryotic genes. Biodiversity Research Center, Academia Sinica, Taipei, Taiwan. Host: Dr. Shu-Miaw Chaw.   |

## Institutional services

Member of Committee on IPMB Cell Biology Core (2019)

Member of Committee on IPMB Facebook Page (2019-)

Member of Committee on IPMB Genomics Core (2020-)

## **Student supervision**

IPMB summer undergraduate interns (two in 2019)

Ministry of Science and Technology Research Grant for Undergraduate Students (one in 2019-2020)

## **Organization of seminars/conferences**

10/2019      Ministry of Science and Technology Outstanding Lectureship by Prof. James Van Etten, with seminars at Academia Sinica, National Taiwan University, National Cheng Kung University and National Chung Hsing University, Taiwan

## **Referee service for scientific journals**

<https://publons.com/researcher/1500155/chuan-ku/>

*BMC Evolutionary Biology, BMC Genomics, Evolution, Genes, Genome Biology and Evolution, Genomics, Journal of Molecular Evolution, Microbial Genomics, New Phytologist, Nucleic Acids Research, PLoS One, Scientific Reports, Virology Journal*

## **Media coverage**

11/2019      PI interview, Institute of Plant and Microbial Biology ([in Mandarin](#))

01/2019      Introduction to new PI, Academia Sinica ([in Mandarin](#))

09/2016      Best Dissertation Award, Heinrich Heine University Düsseldorf (in German)

09/2015      Report by German Academic Exchange Service ([in German](#))

## **Research profiles**

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