CURRICULUM VITAE

Kang-Ling Liao

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E-mail: kangling325@gmail.com

https://kangling325.wixsite.com/mysite

https://www.researchgate.net/profile/Kang-Ling_Liao

Research Interests

- Mathematical Biology: Cancer Immunoediting, G Protein Complex, Modeling on Biological Process, Pattern Formation in Somitogenesis, Gene Regulation, Data Fitting, Machine Learning, Ecology
- Dynamical Systems: Differential Equations, Delay Differential Equations, Bifurcation Theory

Important Academic Positions

- Postdoctoral Research Associate   July 2015 –May 2017

  Department of Biology, The University of North Carolina at Chapel Hill, U.S.A.

  Mentors: Prof. Alan M. Jones (Department of Biology),

         Prof. Timothy C. Elston (Department of Pharmacology)

- Postdoctoral Fellow   June 2012 – July 2015

  Mathematical Biosciences Institute, The Ohio State University, U.S.A.

  Mathematical Mentors: Prof. Avner Friedman and Prof. Yuan Lou

  Biological Mentor: Prof. Xue-Feng Bai

Education

- National Chiao Tung University, Taiwan   March 2012

  Ph. D., in Applied Mathematics (Advisor: Prof. Chih-Wen Shih)

  Thesis: *Analysis on mathematical models of somitogenesis in zebrafish*

- National Taiwan University, Taiwan   June 2005

  M.S., in Mathematics (Advisor: Prof. Chiun-Chuan Chen)

  Thesis: *Traveling Wavefronts in Cooperative Lotka-Volterra System with Time Delays*

- Fu Jen Catholic University, Taiwan   June 2003

  B.S., in Applied Mathematics

Publications

Journal Publications

1. Meral Tunc-Ozdemir, **Kang-Ling Liao**, Timothy Ross-Elliot, Timothy Elston, and Alan M. Jones, 2018, Long-distance communication in Arabidopsis involving a self-activating G protein, ***Plant Direct***, No. **2**, e00037.

2. **Kang-Ling Liao**, Charles E. Melvin, Rosangela Sozzani, Roger D. Jones, Timothy C. Elston, and Alan M. Jones, 2017, Dose-duration reciprocity for G protein activation: modulation of kinase to substrate ratio alters cell signaling, ***PLoS ONE***, No. **12(12)**, e0190000.

3. Kuan-Wei Chen, **Kang-Ling Liao** and Chih-Wen Shih, 2017, The kinetics in mathematical models on segmentation clock genes in zebrafish, *Journal of Mathematical Biology*, No. **25**, 1-54.

4. Liang Ying, Daisuke Urano, **Kang-Ling Liao**, Tyson L Hedrick, Yajun Gao, Alan M Jones, 2017, A nondestructive method to estimate the chlorophyll content of Arabidopsis seedlings, *Plant Methods*, No. **13: 26**.

5. **Kang-Ling Liao**, Roger D. Jones, Patrick McCarter, Meral Tunc-Ozdemir, James A. Draper, Timothy C. Elston, David Kramer, and Alan M. Jones, 2017, A shadow detector for photosynthesis efficiency, *Journal of Theoretical Biology*, No. **414**, 231-244.

6. Avner Friedman and **Kang-Ling Liao**, 2015, The role of the cytokines IL-27 and IL-35 in cancer, *Mathematical Biosciences and Engineering*, No. **12(6)**, 1203-1217.

7. **Kang-Ling Liao**, Xue-Feng Bai, and Avner Friedman, 2014, Mathematical modeling of Interleukin 35 promoting tumor growth and angiogenesis, *PLoS ONE*, No. **9(10)**, e110126.

8. **Kang-Ling Liao**, Xue-Feng Bai, and Avner Friedman, 2014, Mathematical modeling of Interleukin-27 induction of anti-tumor T cells response, *PLoS ONE*, No. **9(3),** e91844.

9. **Kang-Ling Liao** and Yuan Lou, 2013, The effect of time delay in a two-patch model with random dispersal, *Bulletin of Mathematical Biology*, No. **76**, 335-376.

10. **Kang-Ling Liao**, Xue-Feng Bai, and Avner Friedman, 2013, The role of CD200-CD200R in tumor immune evasion, *Journal of Theoretical Biology*, No. **328**, 65-76.

11. **Kang-Ling Liao** and Chih-Wen Shih, 2012, A lattice model on somitogenesis of zebrafish*, Discrete and Continuous Dynamical Systems - Series B*, No. **17**, 2789-2814.

12. **Kang-Ling Liao**, Chih-Wen Shih, and Jui-Pin Tseng, 2012, Synchronized oscillations for a mathematical model of segmentation in zebrafish, *Nonlinearity*, No. **25**, 869-904.

    [**Nonlinearity highly downloaded collection** 2012, selected and certified by the Nonlinearity]

13. **Kang-Ling Liao** and Chih-Wen Shih, 2012, Snapback repellers and homoclinic orbits for multi-dimensional maps, *Journal of Mathematical Analysis and Applications*, No. **386**, 387-400.

Book chapter

14. **Kang-Ling Liao**, Chih-Wen Shih, and Jui-Pin Tseng, Multidimensional dynamics: From simple to complicated, in Discrete Time Systems, Editor: Mario Alberto $Jord\,a'n$, Publisher: InTech, April 2011.

Works in Revision

15. **Kang-Ling Liao**, Xue-Feng Bai, and Avner Friedman, 2018, Mathematical modeling of anti-PD-1 and IL-27 synergy in inhibiting tumor growth, in revision.

16. **Kang-Ling Liao**, Chih-Wen Shih, and Chi-Jer Yu, 2018, The snapback repellers for chaos in multi-dimensional maps, in revision.

Works in Progress

17. **Kang-Ling Liao**, Tim Ross-Elliot, Roger D. Jones, Alan M. Jones, and Timothy C. Elston, 2018, Dose-duration reciprocity: complex epistatic relationship between three WITH NO LYSINE KINASES in G protein activation in *Arabidopsis*, ready for submission.

18. **Kang-Ling Liao** and Avner Friedman, 2018, Mathematical modeling and analysis of anti-PD-1 and anti-CTLA-4 synergy in cancer immunotherapy, in preparation.

19. **Kang-Ling Liao** and Chih-Wen Shih, 2018, Regulation of segmentation clock through intercellular connection between autonomous oscillators, in preparation.

Award

- Best Poster Award, SIAM Conference on the Life Sciences 2014. 2014
- Postdoctoral Research Fellowship, 2014
  Mathematical Biosciences Institute, The Ohio State University.
- Postdoctoral Research Abroad Award, National Science Council of Taiwan. 2012

Grant Submission

- Ministry of Science and Technology Grant, Taiwan December 2017 – July 2018
  Mathematical modeling and analysis of anti-PD-1 combination therapy in cancer immunotherapy
- Ministry of Science and Technology Grant, Taiwan (not successful) 2018
  Mathematical modeling and analysis of Interleukin-27 combination therapy in cancer immunotherapy
- Pelotonia Postdoctoral Fellowship Grant, The Ohio State University (not successful) 2014
  AAV-IL-27 co-treatment with PD-L1 inhibitor in cancer: a mathematical model

Mentoring Experience

- Department of Biology, The University of North Carolina at Chapel Hill, U.S.A.
  (i) Mentoring new lab members in fluorescence microscope experiment Fall 2016
  (ii) Mentoring undergraduates in mathematical modeling and data analysis
  - ➤ YeonJin Kang (Major in Biology) August 2016 –May 2017
  - ➤ James A. Draper (Major in Engineering) July 2015 –June 2016
- Mathematical Biosciences Institute, The Ohio State University, U.S.A.
  Project supervisor, Joint 2014 MBI-CAMBAM-NIMBioS Summer graduate program July 2014

Teaching Experience

- Numerical Analysis, Tamkang University, Taiwan. Fall 2017, Spring 2017
- Computer Programming, Tamkang University, Taiwan. Fall 2017, Spring 2017
- Numerical Method, Tamkang University, Taiwan. Fall 2017
- Calculus, Tamkang University, Taiwan. Fall 2017, Spring 2017
- Linear Algebra (in English), The Ohio State University, U.S.A. Fall 2013
- Precalculus (in English), National Chiao Tung University, Taiwan. Fall 2008

Other Teaching Experience - Teaching Assistant

- Ordinary Differential Equations (I), National Chiao Tung University, Taiwan. Fall 2009
- Linear Algebra, National Chiao Tung University, Taiwan. August 2006 – June 2008, Spring 2008
- Linear Algebra, National Taiwan University, Taiwan. August 2004 – June 2005
- Calculus, National Taiwan University, Taiwan. August 2003 – June 2004
- Calculus, Fu Jen Catholic University, Taiwan. Spring 2002

Presentations

Invited Talks

- 12th AIMS Conference on Dynamical Systems, Differential Equations and Application July 2018
  NCTS Mathematics Division, Taiwan.

Mathematical modeling of Interleukin-35 promoting tumor growth and angiogenesis

- Department of Mathematics,   February 2018
  The Ohio State University, U.S.A.
  Applications of mathematics in biology

- Department of Applied Mathematics,   January 2018
  National Chung Hsing University, Taiwan
  Applications of mathematics in biology

- Department of Mathematics,   December 2017
  National Chung Cheng University, Taiwan
  Applications of mathematics in biology

- Department of Mathematics,   December 2017
  National Taiwan University, Taiwan
  Applications of mathematics in biology

- ReaDiNet 2017: International Conference on Mathematical Biology   October 2017
  National Center for Theoretical Sciences Mathematics Division, Taiwan.
  Mathematical modeling in cancer immunotherapy

- Department of Mathematics,   March 2017
  Tamkang University, Taiwan
  Mathematical modeling in cancer immunotherapy

- Department of Mathematical Sciences,   February 2017
  University of Arkansas, U.S.A.
  Mathematical Models for cancer immunotherapy

- AMS 2017 Joint Mathematics Meeting, Atlanta, U.S.A.   January 2017
  Mathematical modeling of anti-PD-1 and IL-27 synergy in inhibiting tumor growth

- Department of Biology,   April 2015
  The University of North Carolina at Chapel Hill, U.S.A.
  Mathematical models for somitogenesis and cancer immunotherapy

- Renimin University of China, China   April 2015
  How time delays affect the dynamics of mathematical models in ecology and somitogenesis?

- Institute of Mathematics, Academia Sinica, Taiwan   February 2015
  Mathematical modeling for cancer immunotherapy

- Department of Applied Mathematics,   February 2015
  National University of Kaohsiung, Taiwan
  Mathematical modeling of anti-PD-1 and IL-27 synergy in inhibiting tumor growth

- Department of Engineering Sciences and Applied Mathematics,   January 2015
  Northwestern University, U.S.A.
  A Mathematical model for anti-PD-1 and IL-27 drugs in cancer treatment

- H. Lee Moffitt Cancer Center, Tampa, U.S.A.   January 2015
  To what degree anti-PD-1 improves the efficacy of immunotherapeutic drugs?

- Workshop 3: Cancer and the Immune System   November 2014

  Mathematical Biosciences Institute, The Ohio State University, U.S.A.

  Mathematical modeling of Interleukin-35 promoting tumor growth and angiogenesis
- The 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications

  Madrid, Spain   July 2014

  (i) *The role of CD200-CD200R in cancer immunoediting*

  (ii) *Mathematical modeling of Interleukin-27 induction of anti-tumor T cells response*
- The 6th International Symposium on Biomathematics and Ecology: Education and Research

  Marymount University, U.S.A.   October 2013

  The role of CD200-CD200R in tumor immune evasion

Contributed Talks

- AMS 2017 Joint Mathematics Meeting, Atlanta, U.S.A.   January 2017

  A shadow detector for photosynthesis efficiency
- AMS 2015 Joint Mathematics Meeting, San Antonio, U.S.A.   January 2015

  The contradictory experimental results of CD200-CD200R in cancer proliferation
- NCTS International Conference of Nonlinear Dynamics with Application to Biology   May 2014

  NCTS Mathematics Division, Taiwan.

  The effect of time delay in a two-patch model with random dispersal
- Taida Institute for Mathematical Sciences, Taiwan   May 2014

  The roles of CD200-CD200R and Interleukin-27 in cancer immunoediting
- The 6th International Congress of Chinese Mathematicians   July 2013

  Taida Institute of Mathematical Sciences, Taiwan

  The dynamics for kinetic model of segmentation clock genes in zebrafish
- SIAM Conference on Applications of Dynamical Systems, Snowbird, U.S.A.   May 2013

  The relation between two-cell model and N-Cell model on somitogenesis of zebrafish
- Mathematical Conference and Annual Meeting of the Taiwan Mathematical Society   December 2011

  Chung Yuan Christian University, Taiwan

  Synchronized oscillations in a mathematical model of segmentation in zebrafish
- NCTS Workshop on Dynamical Systems   May 2011

  National Center for Theoretical Sciences Mathematics Division, Taiwan.

  The dynamics for segmentation clock gene of zebrafish.
- 2nd Japan-Taiwan Joint Workshop for Graduate Students, Meiji University, Japan   February 2011

  Synchronized oscillation for segmentation clock gene of zebrafish

Departmental Talks

- Postdoc Seminar, Mathematical Biosciences Institute, The Ohio State University, U.S.A.

  (i) The functions of Interleukins in tumor microenvironment   November 2014

  (ii) The roles of CD200-CD200R and IL-12 cytokine family in cancer immunoediting   February 2014

  (iii) Analysis on mathematical models of somitogenesis in zebrafish   February 2013

Posters

- 30th Annual Plant Molecular Biology Retreat, Wrightsville, U.S.A.   September 2016

  How AtRGS1 expression level affects endocytosis in plant cells?

- Phosphorylation & G-protein mediated signaling networks (Gordon Research Conference) June 2016

  University of New England. U.S.A.

  Fluctuation detection by a receptor-like regulator of G signaling complex

- 29th Annual Plant Molecular Biology Retreat, Asheville, U.S.A.   September 2015

  How plant cells sort through noise to detect signal: dynamics of photosynthate sensing by the heterotrimeric G protein pathway?

- SIAM Conference on the Life Sciences 2014, Charlotte, USA   August 2014

  The role of CD200-CD200R in cancer suppression and promotion

  [Poster Award by SIAM Conference on the Life Sciences 2014]

- Math Biology: Looking at the Future (MBI's 10th Anniversary Meeting)   September 2012

  Mathematical Biosciences Institute, The Ohio State University, U.S.A.

  From two-cell model to N-cell model of somitogenesis in zebrafish

- NCTS Workshop on Dynamical Systems   May 2012

  National Center for Theoretical Sciences Mathematics Division, Taiwan.

  The dynamics for two-cell model and N-cell model of somitogenesis in zebrafish

- SIAM Conference on Applications of Dynamical Systems, Snowbird, U.S.A.   May 2011

  From synchronous oscillations to oscillation-arrested for segmentation clock gene of zebrafish

Journal Reviewer

- The Scientific Pages of Cell and Developmental Biology
- Journal of Mathematical Biology
- Discrete and Continuous Dynamical Systems - Series B (DCDS-B)
- Taiwanese Journal of Mathematics
- Tamkang Journal of Mathematics

Conference Organizing

- Organizer of the International Conference on Nonlinear Analysis and its Applications

  Department of Mathematics, Tamkang University, Taiwan   March 2018

- Co-organizer of Workshop for young researchers in mathematical biology

  Mathematical Biosciences Institute, The Ohio State University, U.S.A.   August 2012 - August 2014

Skills in Programming and Software

- Mathematical and Programming Software

  C, C++, Matlab, Mathematica, Maple, Fortran, XPP, Auto

- Data and Image Analysis

  SAS, ImageJ, GraphPad Prism

- 3D printing design

  Tinkercad

- Graphics Editor

  Adobe Photoshop, Adobe illustrator

Skills in Experiment

- Fluorescence microscopy
- Basic molecular biology skills

Other Research Experience

- Mathematical Biosciences Institute, The Ohio State University, U.S.A.
  Mentor: Prof. Avner Friedman (on cancer immunoediting modeling)
        Prof. Yuan Lou (on mathematical models in spatial ecology)   September - October 2012
- The University of Kansas, U.S.A
  Mentor: Prof. Weishi Liu (on geometric singular perturbation theorem)   July 2009