

Fu-Chyun Chu, PhD

Curriculum Vitae

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Highlights

- 4 publications, including 3 first-author
- 13 years of experience with molecular biology and genetic engineering
- Southern SARE Graduate Student Grant Award, 2014
- 5 invited talks in international conferences
- 20 scientific presentations including national and international conferences

Education

North Carolina State University, Raleigh, North Carolina

PhD in Department of Entomology and Plant Pathology

Minor: Biotechnology program

Thesis: *Developing Transposon Helper Strains for Two Agriculture Pests; Western Corn Rootworm and Spotted Wing Drosophila*

Graduated:
May 2017

Major Advisor: Dr. Marcé Lorenzen & Dr. Fred Gould

Committee Members: Dr. Max Scott & Jim Mahaffey

National Ilan University, Ilan, Taiwan

Bachelors of Science in Animal Science

Senior Thesis: *Effect of polymorphism of prolactin receptor (PRLR) and Porcine stress syndrome (PSS) on in vitro maturation and fertilization of pig oocytes and in vitro culture of pig zygotes.*

Graduated: July
2007

Thesis Advisor: Dr. Ming-Cheng Chen

Grants & Awards

Southern SARE Graduate Student Grant Award	2014	\$11,000
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Experiences

All Things Bugs LLC, Oklahoma City, Oklahoma

Senior Scientist

Developing, engineering, breeding, and evaluating the nutrient enhanced transgenic mealworm and house cricket strains.

- Set up a new molecular lab and starter insect colonies with special requirement for the company Jul 2018-present
- Design the transgenesis work including: DNA construct design, microinjection and breeding protocols
- Performed RNA-Seq, genomic sequencing, bioinformatics for both insect species.
- Published paper and presented research result in conferences

North Carolina State University, Raleigh, North Carolina

Post-doc and Graduate Research Assistant

Engineering, breeding, and evaluating multiple transgenic insect species and developing genetic pest control strategies.

- Published paper and presented research result in conferences Aug 2011-Sep 2018
- Developed transgenic insect strains using transposable elements and CRISPR in five species.
- Performed RNA-Seq, genomic sequencing, genome editing, and RNA interference for functional genomics.

National Taiwan University, Taipei, Taiwan

Research Assistant

Examined the feeding behaviors of predatory mite, *Phytoseiulus persimilis*; and larvae competition of two pea weevil species.

- Developed and analyzed data of feeding test assays for different insect species analysis. Oct 2009-Aug 2010
 - Maintained all experimental insect colonies, including five species.
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National Ilan University, Ilan, Taiwan

Undergraduate Student Worker

Provided critical support to senior laboratory personal by conducting cell culturing, tissue fixation, and sample staining.

May 2006-Jul 2007

- Molecular Biology: genotyping, PCR-RFLP, and primer design.
- Embryology: *In vitro* maturation (IVM), *in vitro* fertilization (IVF) and *in vitro* culturing (IVC) of pig zygotes.

Publications

Oppert, B., **Chu, F.C.**, Reyna, S., Pinzi, S., Adrianos, S., Perkin, L. and Lorenzen, M., 2019. Effects of targeting eye color in *Tenebrio molitor* through RNA interference of tryptophan 2, 3-dioxygenase (vermillion): Implications for insect farming. *Archives of insect biochemistry and physiology*, 101(1), p.e21546.

Chu, F.C., Klobasa, W., Wu, P., Pinzi, S., Grubbs, N., Gorski, S., Cardoza, Y. and Lorenzen, M.D., 2017. Germline transformation of the western corn rootworm, *Diabrotica virgifera virgifera*. *Insect molecular biology*, 26(4), pp.440-452.

Chu, F.C., Klobasa, W., Grubbs, N. and Lorenzen, M.D., 2018. Development and use of a piggyBac-based jumpstarter system in *Drosophila suzukii*. *Archives of insect biochemistry and physiology*, 97(3), p.e21439

Chu, F.C., Wu, P.S., Pinzi, S., Grubbs, N. and Lorenzen, M.D., 2018. Microinjection of Western Corn Rootworm, *Diabrotica virgifera virgifera*, Embryos for Germline Transformation, or CRISPR/Cas9 Genome Editing. *JoVE (Journal of Visualized Experiments)*, (134), p.e57497.

Manuscripts In Preparation or Review

Dossey, A. T., **Chu, F.C.**, and Oppert, B., (In Prep). Sustainable Nutrition and a Tale of 2 Cricket Genome

Chu, F.C., Wu, P.S., Pinzi, S., Grubbs, N., Cohen, A. C., and Lorenzen, M.D., (In Prep). An optimized small-scale rearing system to support embryonic microinjection protocol for western corn rootworm, *Diabrotica virgifera virgifera*

Grubbs, N., **Chu, F.C.**, and Lorenzen, M.D., (In Prep). Window to the Fluorescence: The White Eye-Color Gene of Western Corn Rootworm, *Diabrotica virgifera virgifera*

Areas of Expertise

Molecular Biology	DNA construction	Microinjection of Embryos
Genetic Engineering	DNA/RNA Sequencing	Insect rearing
CRISPR/Cas9 Genome Editing	RNA interference	Insect dissection
Software: Microsoft Office, BlastStation, Vector NTI	PCR, RT-PCR, digital-droplet PCR	Phenotype screening

Current Research Interests

- Genetic engineering in insects using CRISPR/Cas9 system to change phenotype, behavior, or nutrient content.
 - Insect genome/RNA sequencing and functional genomics.
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Broader Impacts and Academic Volunteering

Invertebrate Studies Institute, Oklahoma City, Oklahoma

Vice President

Feb 2019-
present

- Manage the insect zoo for the company
 - Helping company developing and decision making
 - Grant proposal writing
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Entomology Outreach Program, Raleigh, North Carolina

Bug Keeper

Aug 2016-Jul
2017

- Rearing exotic insects for outreach program
 - Select and bring in new insect species to program
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Bug Fest, Raleigh, North Carolina

Volunteer in NCSU Entomology booth

2017 and
2012

- Showing alive and dead insects.
 - Showing dead transgenic insects and explain the technology
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Student voice in NABC, Cornell University, Ithaca, New York

Student voice attender

- Discuss the impact of current biotechnology to world 2014
 - Communicate with professors with how young generation think of transgenic technologies.
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Invited Presentations

Developing Insects for Food, Feed and Bioproduction: White-Eye Marker for CRISPR/Cas9 in Crickets and Mealworms	F. Chu	Plant & Animal Genome Conference XXVIII, San Diego, CA	2020
The ABCs of Using CRISPR in Non-Model Organisms	F. Chu	Plant & Animal Genome Conference XXVIII, San Diego, CA	2020
CRISPR/Cas9 in the mealworm, <i>Tenebrio molitor</i> , toward improvement as a crop	F. Chu	Plant & Animal Genome Conference XXVII, San Diego, CA	2019
Emerging technologies for genetic manipulation of western corn rootworm	F. Chu	26 th IWGO Conference, Beijing, China	2017
New Western corn rootworm strains for use in genome-wide mutagenesis	F. Chu, M.D. Lorenzen	Corn Academic Summit. St. Charles. MO	2016
Development of transgenic helper/donor <i>Diabrotica virgifera virgifera</i> strains for use in genome-wide mutagenesis	F. Chu, M.D. Lorenzen	Corn Academic Summit. St. Louis. MO	2015

Targeted <i>piggyBac</i> insertion in a pest genome	F. Chu	Biolunch. Raleigh, NC	2015
Genetics and genomics of <i>Tribolium Medea</i> elements	F. Chu, M.D. Lorenzen	11th International Working Conference on Stored Product Protection. Chiang Mai, Thailand	2014
Development of a germline transformation system for the western corn rootworm, <i>Diabrotica virgifera virgifera</i>	F. Chu, S. Gorski, Y. J. Cardoza M.D. Lorenzen	Corn Academic Summit, St. Louis. MO	2014
Development of RNAi-based Dominant Markers for use in Genetic Pest Management	F. Chu, M.D. Lorenzen	Entomology Graduate Student Symposium, Raleigh, NC Scientific 3 rd Friday, Raleigh, NC	2012
Poster Presentations			
Reference Quality Insect Genomes: Applications for Sustainable Protein and Biodiversity	A. T. Dossey, F. Chu, B. Oppert	Annual G10K-VGP/EBP 2019, New York city, NY	2019
Transgenic strains for genome-wide mutagenesis of two serious agricultural pests, <i>Drosophila suzukii</i> and <i>Diabrotica virgifera virgifera</i>	F. Chu, W. A. Klobasa, M.D. Lorenzen	Research Symposium at Bayer CropScience, Raleigh, NC.	2016

The best of two worlds: the use of CRISPR/Cas9 and transposable elements to generate a genome-wide mutagenesis system for the Western corn rootworm, <i>Diabrotica virgifera virgifera</i>	<p>F. Chu, S. Gorski, Y. J. Cardoza M.D. Lorenzen</p>	<p>Ninth Annual Arthropod Genomics Symposium. Manhattan, KS</p> <hr/> <p>Insect Genetic Technology Research Coordination Network. Manhattan, KS.</p> <hr/> <p>Genetic Engineering Research at NC State. Raleigh, NC.</p>	2015
Development of a germline transformation system for the western corn rootworm, <i>Diabrotica virgifera virgifera</i>	<p>F. Chu, S. Gorski, Y. J. Cardoza M.D. Lorenzen</p>	<p>National Agricultural Biotechnology Council, Ithaca, NY</p> <hr/> <p>2014 Graduate Student Research Symposium, Raleigh, NC</p> <hr/> <p>Plant and Animal Genome XXII Conference, San Diego, CA</p>	2014
Development of RNAi-based Dominant Markers for use in Genetic Pest Management	<p>F. Chu, M.D. Lorenzen</p>	<p>6th Annual Arthropod Genomics Symposium, Kansas City, MO</p>	2012

References:

Dr. Marce Lorenzen 785-313-0712 mdlorenz@ncsu.edu
Associate Professor North Carolina State University, Raleigh, NC, 27695
PhD major advisor

Dr. Allen Cohen 919-513-0567 accohen@ncsu.edu
Research Professor North Carolina State University, Raleigh, NC, 27695
A close professor in the Entomology department in NCSU

Dr. Fred Gould 919-515-1647 fred_gould@ncsu.edu
William Neal Reynolds Professor of Agriculture
PhD major advisor North Carolina State University, Raleigh, NC, 27695

Dr. Brenda Oppert 785-776-2780 brenda.oppert@usda.gov
Research Molecular Biologist USDA-ARS Manhattan, KS, 66502
Research collaborator