

ELISE ALEXANDRA KIKIS

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EDUCATION

University of California, Berkeley, Ph.D. in Plant Biology (2007)
Dissertation: *The Role of ELF4 in Arabidopsis thaliana Circadian Clock Function and the Identification of Phytochrome B Point Mutants Affecting Binding to bHLH Transcription Factors*
Committee in Charge: Peter H. Quail (Chair), Sarah Hake, Russell Jones, Kimmen Sjolander

Cornell University, Bachelor of Arts *Summa Cum Laude* in Biological Sciences (2002)
Thesis: *Analysis of Nuclear and Chloroplast Mutations Affecting the Stability of Polyadenylated atpB Messenger RNA in the Chlamydomonas reinhardtii Chloroplast*
Committee in Charge: David B. Stern and Tom Owens

RESEARCH

Laboratory of Richard I. Morimoto
Northwestern University, Department of Biochemistry, Molecular Biology, and Cell Biology

Postdoctoral Research in the area of Protein Folding and Conformational Diseases (2007-present):

Developing transgenic *C. elegans* lines that express Huntingtin, the human protein affected in patients with Huntington's Disease (HD). By introducing an expanded polyglutamine tract, which is known to be the genetic determinant for HD, accumulation of Huntingtin aggregates form. Using this model and others, I am studying the effect of flanking protein context on the aggregation/toxicity of polyglutamine.

Laboratory of Peter H. Quail
University of California, Berkeley, Department of Plant and Microbial Biology and the Plant Gene Expression Center

Ph.D. Research in the area of phytochrome signaling (2002-2007):

Reverse Genetic Screen To Identify Factors Required for Phytochrome-Mediated Photomorphogenesis

We selected for reverse genetics a subset of previously identified light-regulated *Arabidopsis* genes which were either induced or repressed in response to red light. This analysis, published in *Plant Cell* (see below) revealed one gene, *ELF4*, which proved to be particularly interesting. *elf4* mutants displayed photomorphogenic defects in the seedling, including reduced red light-mediated inhibition of hypocotyl elongation and cotyledon expansion. These phenotypic data suggest an important role for ELF4 in controlling red light-mediated photomorphogenic growth and development, as described in *Plant Physiology* (see below).

Circadian Clock

Based on our previous findings, and those published in (Doyle *et al.* (2002) *Nature*), it became clear that ELF4 plays an important role in circadian clock function. Therefore, I established conditions under which I could monitor the red light-mediated induction of the central oscillator components CCA1, LHY, and TOC.

Ultimately, I used these conditions to describe the genetic framework of ELF4 function, as published in *Plant J* (see below).

bHLH-Phytochrome Interaction

To identify amino acid residues in the *Arabidopsis* phytochrome B molecule that are required for binding to basic helix-loop-helix (bHLH) transcription factors, I performed a reverse yeast 2-hybrid screen that allowed for the selection of loss-of-binding mutants. Through this screen, I identified ten novel missense mutations, and two that were previously identified in genetic screens for plants with long hypocotyls. I then used computational methods to predict which residues might be directly involved in binding to the bHLH PIF3 and to identify a potential PIF binding surface on phyB.

Laboratory of David B. Stern

Cornell University, Department of Plant Biology and the Boyce Thompson Institute for Plant Research

Honors Research in the area of Chloroplast RNA processing (1999-2002)

I performed a screen aimed at the identification of factors required for polyadenylation-mediated chloroplast RNA degradation in the model unicellular green alga, *chlamydomonas reinhardtii*. This screen uncovered a number of mutants acting through multiple mechanisms including altered RNA processing and heteroplasmic suppression. Ultimately we described previously unknown mechanisms by which RNA secondary structure, and anti-sense RNAs in the chloroplast, can act to protect chloroplast transcripts from degradation, as published in *Plant Cell* (see below).

TEACHING

Training Undergraduates in Laboratory Research

Trained the following students: Katherine Chadwick (University of California, Berkeley), Vincey Leung (University of California, Berkeley), Anamika Dwivedi (Northwestern University).

Guest Lecturer, Carthage College (Oct 2008)

Presented lecture on the molecular underpinnings of light signaling in plants to Dan Choffnes's Plant Physiology class.

Plant Biology 160/160L (2005)

Graduate student instructor for a course in plant molecular biology and genetics.

Biology 1A (2003-2004)

Graduate student instructor for introductory biology.

Biology Fellows Journal Club Facilitator (2004)

Assisted undergraduate students in preparing presentations for journal club, and in leading discussions.

WISER (Women in Science and Engineering Resources) Tutor for Genetics (2001-2002)

Tutored students on lecture material covered in an introductory genetics course at Cornell University (BioGD281).

Genetics Lab TA (2000)

Assistant Instructor for the laboratory portion of BioGD281 (genetics) at Cornell University.

DEPARTMENTAL SERVICE

Seminar Committee (2004-2005)

Graduate student representative to the University of California, Berkeley, Plant and Microbial Biology Department Seminar Committee.

Admissions Committee (2005-2006)

Graduate student representative to the University of California, Berkeley Plant and Microbial Biology department admissions committee.

AWARDS/HONORS/FELLOWSHIPS

- 1) Recipient of NRSA-Kirstein individual postdoctoral fellowship (2009)
- 2) Invited Seminar, Carthage College (host: Dan Choffnes) "Misbehaving proteins: When protein misfolding leads to cellular dysfunction and neurodegeneration" (2008).
- 3) Best graduate student presentation, UC Berkeley, Department of Plant and Microbial Biology, Department Retreat (2006).
- 4) Cornell Department of Biology Honors Program/Honors Graduate (2001-2002)
- 5) National Science Foundation Research Experience for Undergraduates (NSF REU) award (2001)

MEETING ABSTRACTS

- 1) **Kikis E.A.**, Komine Y., Stern D.B. (2002) *Analysis of Nuclear and Chloroplast Mutations Affecting the Stability of Polyadenylated atpB Messenger RNA in the Chlamydomonas reinhardtii Chloroplast*. Abstract for poster presentation, International Chlamydomonas Meeting, Vancouver, British Columbia, Canada.
- 2) Komine Y., **Kikis E.A.**, Schuster G., and Stern D.B. (2002) *Evidence for in vivo Modulation of Chloroplast RNA Stability by 3'-UTR Homopolymeric Tails in Chlamydomonas reinhardtii*. Abstract for poster presentation, International Chlamydomonas Meeting, Vancouver, British Columbia, Canada
- 3) Walker, N., Belcher, S., Herschberger, N., Osborne, E., Barkan, A., Stern, D., Brenchly, J., Harris, F., **Kikis, E.**, Hanson, M., Peeters, N. (2003) *Functional Genomics of Chloroplast Biogenesis: The Photosynthetic Mutant Library*. Abstract for International Maize Meeting, Lake Geneva, WI.
- 4) **Wostrikoff K., Brenchley J., Harris F., Kikis E., Belcher S., Walker N., Osbourne E., Barkan A., Stern D.** (2004) *Functional Genomics to Understand Chloroplast Gene Regulation*. Abstract for International Maize Meeting.
- 5) **Kikis, E.A.**, Morimoto, R.I. (2007) *High-Throughput Genome-Wide RNAi Screen for Sequence Context-Specific Modifiers of polyQ Protein Aggregation in C. elegans*. Abstract for poster presentation, Huntington's Disease Society of America Meeting. Boston, MA.
- 6) **Kikis, E.A.**, Morimoto, R.I. (2007) *Modifiers of Protein Misfolding in C. elegans polyglutamine Disease Models*. Abstract for poster presentation, Molecular Chaperones and Stress Response Meeting at Cold Spring Harbor Laboratory, NY.
- 7) **Kikis, E.A.**, Morimoto, R.I. (2009) *Huntingtin N-terminal Fragments Display Unique Aggregation Properties in C. elegans Models of Polyglutamine Protein Aggregation*. Abstract for oral presentation, Midwest Stress Meeting.

PUBLICATIONS

- 1) Komine, Y., **Kikis, E.**, Schuster, G., and Stern, D. (2002). Evidence for in vivo modulation of chloroplast RNA stability by 3'-UTR homopolymeric tails in Chlamydomonas reinhardtii. *Proc Natl Acad Sci U S A* **99**, 4085-4090.
- 2) Khanna, R., **Kikis, E.A.**, and Quail, P.H. (2003). EARLY FLOWERING 4 functions in phytochrome B-regulated seedling de-etiolation. *Plant Physiol* **133**, 1530-1538.
- 3) *Nishimura, Y., ***Kikis, E.A.**, Zimmer, S.L., Komine, Y., and Stern, D.B. (2004). Antisense transcript and RNA processing alterations suppress instability of polyadenylated mRNA in chlamydomonas chloroplasts. *Plant Cell* **16**, 2849-2869.
*authors contributed equally
- 4) Khanna, R., Huq, E., **Kikis, E.A.**, Al-Sady, B., Lanzatella, C., and Quail, P.H. (2004). A novel molecular recognition motif necessary for targeting photoactivated phytochrome signaling to specific basic helix-loop-helix transcription factors. *Plant Cell* **16**, 3033-3044.

- 5) **Kikis, E.A., Khanna, R., and Quail, P.H.** (2005). ELF4 is a phytochrome-regulated component of a negative-feedback loop involving the central oscillator components CCA1 and LHY. *Plant J* **44**, 300-313.
- 6) **Khanna, R., Shen, Y., Toledo-Ortiz, G., Kikis, E.A., Johannesson, H., Hwang, Y.S., and Quail, P.H.** (2006). Functional profiling reveals that only a small number of phytochrome-regulated early-response genes in Arabidopsis are necessary for optimal deetiolation. *Plant Cell* **18**, 2157-2171.
- 7) **Al-Sady B., Kikis E.A., Monte, E., and Quail P.H.** (2007) Mechanistic Duality of Transcription Factor Function in Phytochrome Signaling. *Proc Natl Acad Sci USA* **105**, 2232-2237.
- 8) ***Kikis, E.A., *Oka, Y., Hudson, M., Nagatani, A., Quail, P.H.** (2009) Residues clustered in the light-sensing knot of phytochrome B are necessary for conformer-specific binding to signaling partner PIF3 *PLoS Genetics* 5(1):e1000352. *authors contributed equally