

Contact Information

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Education

Postdoctorate, Molecular and Cell Biology, 2001 – 2003

University of California at Berkeley, Berkeley, CA
Topic: Role of Export in Nonsense-Mediated Decay in *Saccharomyces cerevisiae*
Mentor: Karsten Weis

Ph.D., Chemical Engineering, 2001

University of California at Berkeley, Berkeley, CA
Thesis Topic: Engineering the Stabilities of Polycistronic mRNA
Advisor: Jay D. Keasling

B.S., Chemical Engineering with Emphasis in Biology, 1997

University of Southern California, Los Angeles, CA

Professional Experience

2003-present Assistant Professor (Dept. Chemical Engineering, Caltech)
2001-2003 NIH Postdoctoral Research Fellow (Dept. Molecular and Cell Biology, UCB)
1998-2000 Graduate Student Instructor (Dept. Chemical Engineering, UCB)
1997-2001 Graduate Research Assistant (Dept. Chemical Engineering, UCB)
1997 Process Engineer (Mobil Oil, Torrance, CA)
1996 Undergraduate Research Assistant (Dept. Chemical Engineering, UCLA)
1995 Facilities Engineer (Mobil Oil, Bakersfield, CA)
1994-1997 Laboratory Instructor (Information Technology Dept., USC)
1993-1997 Undergraduate Research Assistant (Dept. Chemical Engineering, USC)

Teaching Experience

2004-present Instructor, graduate thermodynamics course and undergraduate biomolecular engineering laboratory (Caltech)
2000-2003 University GSI Teaching and Orientation Workshop Leader (UCB)
1998-2000 Graduate Student Instructor, graduate engineering mathematics course and undergraduate separations course (Dept. Chemical Engineering, UCB)
1994-1997 Laboratory Instructor (Information Technology Programming Dept., USC)

Membership / Services

2006-present Member, Institute of Biological Engineers
2006 Session Chair, “Synthetic Systems Biology”, American Institute of Chemical Engineers Annual Meeting
2006 Session Chair, “Microbial Metabolic Engineering”, 232nd American Chemical Society National Meeting
2006 Session Chair, “Molecular Tools for the Metabolic Engineering”, Society of Industrial Microbiology Annual Meeting

- 2006 Technical Chair, “Synthetic Biology”, Computational Systems Bioinformatics Conference
- 2005-present Scientific Advisory Board, Codon Devices
- 2005-present Scientific Chair, Synthetic Biology, Life Sciences Society
- 2005-present Member, Biodefense Council
- 2005-present Member, Kavli Nanoscience Institute (Caltech)
- 2005 Session Chair, “Synthetic Systems Biology”, American Institute of Chemical Engineers Annual Meeting
- 2004-present Steering Committee, Synthetic Biology Conference
- 2004 Co-organizer/Mentor, NSF-sponsored multi-school “Synthetic Biology Competition” (Caltech, MIT, Princeton, Boston University, UT Austin)
- 2004-present Member, American Chemical Society
- 2004-present Member, RNA Society
- 2004-present Member, Center for Biological Circuit Design (Caltech)
- 2003 Participant, DARPA-sponsored ISAT study group on “Synthetic Biology”
- 2001-present Ad Hoc Reviewer, Nature Chemical Biology, Bioinformatics, Biotechnological Progress, Biotechnology and Bioengineering, and Applied Biochemistry and Biotechnology
- 2000 Co-organizer/Mentor, NSF-sponsored MarBEC summer undergraduate research program (UCB)
- 1997-present Member, American Institute of Chemical Engineers

Selected Honors

- 2005 Beckman Young Investigator Award
- 2004 TR100, Technology Review’s Top 100 Young Innovators of the World
- 2001-2003 National Institute of Health Postdoctoral Fellowship
- 2001 Graduated Summa Cum Laude
- 2000-2001 UC Dissertation Year Fellowship
- 2000-2001 Shell Doctoral Fellowship
- 1999-2000 Chemical Engineering Departmental Citation for Outstanding Teaching
- 1998 DOW Prize for Excellence in Teaching
- 1998-1999 University Award for Outstanding Graduate Student Instructor
- 1997-2000 National Science Foundation Fellowship
- 1997 Tau Beta Pi Fellowship (Declined)
- 1997 Eugene Cota-Robles Fellowship (Declined)
- 1997 Graduated Summa Cum Laude
- 1997 Salutatorian
- 1997 Emma Josephine Bradely Bovard Student Award
- 1997 School of Engineering’s Outstanding Service Award
- 1997 School of Engineering’s Outstanding Student Award
- 1996 Golden Key Peat Marwick Junior Scholarship
- 1996 Unocal Scholarship
- 1996 Excellence Award in Biochemistry
- 1995 Southern California Section AIChE Outstanding Junior Award
- 1994 Outstanding Achievement Award in General Chemistry
- 1993-1997 Trustee Scholar Award
- 1993-1997 Merit Research Award

Patents

- 2005 Filed “Engineered yeast strains for the linear, tunable response of protein expression for a GAL promoter in response to galactose concentrations”
- 2005 Filed “Ampliswitch technology for an amplification-based, digital sensor device”

- 2004 Filed “Ligand controlled RNA-based regulators of gene expression”
2004 Filed “Temperature controlled RNA-based regulators of gene expression”

Peer-Reviewed Publications

1. Win MN, Klein JS, Smolke CD. 2006. RNA aptamers to the benzyloquinoline alkaloid codeine and the rapid characterization of their binding properties using surface plasmon resonance. *In submission*.
2. Pflieger BF, Pitera DJ, Smolke CD, Keasling JD. 2006. Combinatorial engineering of intergenic regions to tune expression of multiple genes in operons. *In submission*.
3. Hawkins KH, Smolke CD. 2006. The regulatory roles of the galactose permease and kinase in the induction response of the GAL network in *Saccharomyces cerevisiae*. *In press. Journal of Biological Chemistry*.
4. Bayer TS, Smolke CD. 2005. Programmable, ligand-controlled riboregulators of eukaryotic gene expression. *Nat. Biotech.* 23:337-343. *News and Views: Plug and play with RNA.* 306-307.
5. Smolke CD, Keasling JD. 2002. Effect of gene location, mRNA secondary structures, and RNase sites on expression of two genes in an engineered operon. *Biotech. Bioeng.* 80: 762-776.
6. Smolke CD, Keasling JD. 2002. Effect of copy number and mRNA processing and stabilization on transcript and protein levels from an engineered dual-gene operon. *Biotech. Bioeng.* 78: 412-424.
7. Smolke CD, Khlebnikov A, Keasling JD. 2001. Effects of transcription induction homogeneity and transcript stability on expression of two genes in a constructed operon. *Appl. Micro. Biotech.* 57: 689-696.
8. Smolke CD, Martin VJJ, Keasling JD. 2001. Controlling the metabolic flux through the carotenoid pathway using directed mRNA processing and stabilization. *Met. Eng.* 3: 313-321.
9. Smolke CD, Carrier TA, Keasling JD. 2000. Coordinated, differential expression of two genes through directed mRNA cleavage and stabilization by secondary structures. *Appl. Environ. Microbiol.* 66: 5399-5405.

Non-Peer-Reviewed Publications

1. Smolke CD, editor. 2007. Metabolic Engineering Protocols, Vol 1. & 2. In Walker J, series ed., Methods in Molecular Biology. Totowa: Humana Press. *In preparation*.
2. Smolke CD, editor. 2006. Handbook for Metabolic Pathway Engineering. San Diego: CRC Press. *In preparation*.
3. Bayer TS, Smolke CD. 2006. Design of nucleic acid switches. *Nature Protocols*. *In preparation*.
4. Bayer TS, Smolke CD. 2006. Nucleic acid switches as cellular biosensors. *Biotechnology and Genetic Engineering Reviews, Vol. 24*. *In preparation*.
5. Smolke CD, Martin VJJ, Keasling JD. 2004. Tools for metabolic engineering in *Escherichia coli*. In: Baneyx F., editor. Protein Expression Technologies: Current Status and Future Trends. U.K.: Horizon Scientific Press.
6. Martin VJJ, Smolke CD, Keasling JD. 2002. Redesigning cells for the production of complex organic molecules. *ASM News* 68: 336-343.

Selected Invited Presentations

- Smolke CD. 2006. Molecular sensors for optimizing production of alkaloid molecules in *Saccharomyces cerevisiae*. *Metabolic Engineering VI*, NH Leeuwenhorst, Noordwijkerhout, Netherlands. (Invited Speaker)
- Smolke CD. 2006. Engineering new molecules for studying and programming cellular systems. *Japan-America Frontiers of Engineering Symposium*, Tsukuba, Japan. (Invited Speaker)
- Smolke CD. 2006. Programmable nucleic acid sensors as general tools for optimizing flux through synthetic metabolic networks. *SIM Annual Meeting*, Baltimore, MD. (Invited Speaker)
- Smolke CD. 2006. Engineering new molecules for programming complex cellular systems. *Computational Systems Bioinformatics Conference*, Stanford, CA.
- Smolke CD. 2006. Engineering new molecules for programming complex cellular systems. *International Workshop on Logic and Synthesis*, Vail, CO. (Invited Speaker)

- Smolke CD. 2006. Engineering new molecules for studying and programming cellular systems. *Northwestern University Chemical and Biological Engineering Departmental Seminar*, Evanston, IL. (Invited Speaker)
- Smolke CD. 2006. Programmable molecular switches and sensors: applications in metabolic engineering and intelligent therapeutics. *Synthetic Biology 2.0*, Berkeley, CA. (Invited Speaker)
- Smolke CD. 2006. Engineering new molecules for programming cellular systems. *Design Principles for Biological Systems, Banbury Center Meeting*, Cold Springs Harbor Laboratory, NY. (Invited Speaker)
- Smolke CD. 2006. Programmable molecular switches and sensors: applications in metabolic engineering and intelligent therapeutics. *Massachusetts Institute of Technology Chemical Engineering Departmental Seminar*, Cambridge, MA. (Invited Speaker)
- Smolke CD. 2006. Ligand-regulated nucleic acid switches as programmable biosensors. *Regenerate World Congress on Tissue Engineering and Regenerative Medicine*, Philadelphia, PA. (Invited Speaker)
- Smolke CD. 2006. Ligand-regulated nucleic acid switches as programmable molecular sensors. *Workshop on Biological Large Scale Integration (BioLSI-2)*, Pasadena, CA. (Invited Speaker)
- Smolke CD. 2006. Engineering new molecules for studying and programming cellular systems. *Caltech Discovery Day*, Pasadena, CA. (Invited Speaker)
- Bayer TS, Hawkins KH, Kimura Y, Lee H, Lee J, Win M-N, Smolke CD. 2006. Spatial patterning and hardwired memory: engineering biomolecules as cellular input/output devices. *Institute of Biological Engineering Annual Meeting*, Tuscon, AZ. (Invited Speaker)
- Smolke CD. 2006. The National Academies Keck Futures Initiative: Genomics and Life Engineering Conferences. *Board of Directors and Beckman Center Advisory Board Meeting*, Irvine, CA. (Invited Speaker)
- Smolke CD. 2006. Expanding the frontiers of molecular medicine through programmable nucleic acid sensors. *Caltech Division of Chemistry Visiting Committee Presentation*, Pasadena, CA. (Invited Speaker)
- Smolke CD. 2006. Strategies for programming cellular behavior through molecular sensors and switches. *Caltech Bioengineering Retreat*, Warner Springs, CA. (Invited Speaker)
- Smolke CD. 2005. Programmable molecular sensors and switches: applications in intelligent therapeutics, biosensors, and metabolic engineering. *Rensselaer Polytechnic Institute Chemical and Biological Engineering Departmental Seminar*, Troy, NY. (Invited Speaker)
- Smolke CD. 2005. Programmable molecular sensors and switches: applications in intelligent therapeutics, biosensors, and metabolic engineering. *Cargill Incorporated Seminar*, Minneapolis, MN. (Invited Speaker)
- Smolke CD. 2005. Smart nucleic acid devices for converting diverse biochemical inputs into programmed cell behavior. *National Academies Keck Futures Initiative Genomics Conference*, Irvine, CA. (Invited Participant and Poster)
- Smolke CD. 2005. From programmable nucleic acid devices to intelligent cells. *National Academy of Science Frontiers of Science Symposium*, Irvine, CA. (Invited Participant and Poster)
- Smolke CD. 2005. Programmable nucleic acid molecules. *National Academy of Engineering Frontiers of Engineering Symposium*, Albany, NY. (Invited Participant)
- Smolke CD. 2005. Programmable molecular sensors and switches: applications in metabolic engineering, intelligent therapeutics, and biosensors. *Lawrence Berkeley National Laboratory Synthetic Biology Seminar*, Berkeley, CA. (Invited Speaker)
- Smolke CD. 2005. Programmable molecular sensors and switches: devices for converting biochemical information into biological function. *Caltech Kavli Nanoscience Inaugural Symposium*, Pasadena, CA. (Invited Speaker)

- Smolke CD. 2005. Programmable molecular sensors and switches: applications in metabolic engineering, intelligent therapeutics, and biosensors. *Caltech Bioengineering Departmental Seminar*, Pasadena, CA. (Invited Speaker)
- Smolke CD. 2005. Programmable molecular sensors and switches: applications in metabolic engineering, intelligent therapeutics, and biosensors. *University of Southern California Chemical Engineering Departmental Seminar*, Los Angeles, CA. (Invited Speaker)
- Smolke CD. 2005. Engineering alkaloid biosynthesis in *Saccharomyces cerevisiae*: the application of programmable molecular switches to pathway optimization. *SIM Annual Meeting*, Chicago, IL. (Invited Speaker)
- Smolke CD. 2005. Programming dynamic cellular response with engineered molecular sensors. *NAKFI Life Engineering Symposium*, San Francisco, CA. (Invited Speaker)
- Smolke CD. 2005. Programmable molecular sensors and switches: applications in ‘intelligent’ therapeutics and biosensors. *Caltech Alumni College*, Pasadena, CA. (Invited Speaker)
- Smolke CD. 2005. Programmable molecular sensors and switches: applications in ‘intelligent’ therapeutics and biosensors. *DARPA: Biological Input-Output Systems Program Meeting*, Arlington, VA. (Invited Speaker)
- Smolke CD. 2005. Programmable molecular sensors and switches: applications in intelligent therapeutics, biosensors, and metabolic engineering. *Stanford Chemical Engineering Departmental Colloquium*, Palo Alto, CA. (Invited Speaker)
- Smolke CD. 2005. Programming dynamic cellular response with molecular sensors. *Caltech Alumni Seminar Day*, Pasadena, CA. (Invited Speaker)
- Smolke CD. 2004. Programmable RNA regulators of gene expression: applications in cellular sensors, therapeutics, and metabolic circuits. *Caltech Biology Division Retreat*, Redondo Beach, CA. (Invited Speaker)

Selected Presentations

- Bayer TS, Hawkins KH, Kimura Y, Lee H, Lee J, Win M-N, Smolke CD. 2005. Engineering hardwired DNA memory. *iGEM Jamboree*, Cambridge, MA. (Oral Presentation)
- Bayer TS, Smolke CD. 2005. Understanding signal processing with engineered nucleic acids. *International Conference Systems Biology*, Cambridge, MA. (Poster)
- Bayer TS, Smolke CD. 2005. From smart molecules to intelligent cells. *Life Engineering Symposium*, San Francisco, CA. (Poster)
- Smolke CD. 2005. Programmable ligand-controlled riboregulators of gene expression. *AICHE Annual Meeting*, Cincinnati, OH. (Oral Presentation)
- Smolke CD. 2005. Digital devices for the quantification and identification of large sets of biomolecules using engineered nucleic acid sensors. *AICHE Annual Meeting*, Cincinnati, OH. (Oral Presentation)
- Bayer TS, Smolke CD. 2005. Programmable nucleic acid regulators of gene expression. *DNA World Workshop*, Pasadena, CA. (Poster)
- Bayer TS, Lee J, Win M-N, Smolke CD. 2004. Programmable RNA-based cellular sensors. *Synthetic Biology Jamboree*, Cambridge, MA. (Oral Presentation)