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RALPH P. DIENSTHUBER

Ralph Diensthuber

Current Position. Postdoctoral fellow, Institute of Biology, Humboldt University Berlin. Advisor: Prof. Andreas Möglich.

Education. Ph.D. in Biochemistry, Leibniz University Hannover (2009). Advisor: Prof. Georgios Tsiavaliaris.

Nonscientific Interests. Opera, movies and soundtracks, sports.

My research focuses on the molecular and structural details of the signaling mechanism in LOV (light−oxygen−voltage)-based photoreceptors. Our crystal structure of the blue-light sensitive LOV histidine kinase YF1 is one of the first structures of a full-length sensor histidine kinase and highlights the crucial role of coiled-coils in signal transduction. This structure motivated our current study, where we analyzed the effect of mutations in vicinity of the flavin chromophore on the YF1 photocycle and signal transduction. Many mutations, which accelerate the photocycle of LOV domains, also impair the enzymatic activity of the YF1 histidine kinase. However, a few benign mutations allow us to tune the photocycle kinetics in YF1 at desire without affecting biological function, and hence, these mutations are suitable for diverse applications *in vivo* and *in vitro*. (Read Diensthuber's article; DOI: 10.1021/sb400205x)

CHRISTOPHER ENGELHARD

Christopher Engelhard

Current Position. Ph.D. candidate, Physics Department, Freie Universität Berlin, Berlin, Germany. Advisor: Prof. Robert Bittl.

Education. Physics diploma, Freie Universität Berlin, Berlin, Germany.

Nonscientific Interests. Card/board games, playing the piano, free-ride skiing, with hiking in the Alps thrown into the mix when there is no snow to ski on.

My main scientific interest is the investigation of biological photoreceptors in general, flavoproteins in particular, both in terms of their signaling mechanisms and in terms of how those mechanisms can be influenced by their in-cell environment as well as direct human intervention. The artificial protein YF1 used in this paper is an ideal test bed for this kind of work, and our results provide an important piece in the puzzle of how LOV domains can be tailored to a wide variety of effector domains and are a stepping stone for further investigation of potential environmental influences on the signaling mechanism. (Read Engelhard's article; DOI: 10.1021/sb400205x)

GOPAL P. PATHAK

Gopal Pathak

Current Position. Postdoctoral fellow, Department of Pharmacology, School of Medicine, University of Colorado. Advisor: Dr. Chandra Tucker.

Education. Ph.D. Biology, Max Planck Institute for Bioinorganic Chemistry/University of Dusseldorf, Germany (2010). Advisor: Dr. Wolfgang Gärtner; M.Sc. Water Science, University of Duisburg Essen, Germany; M.Sc. Botany, Tribhuvan University, Nepal.

Nonscientific Interests. Traveling, exploring new places and cultures, home-brewing (wine/beer).

My Ph.D. work was to identify novel photoreceptor genes from metagenomes and perform biophysical characterization. My current research focuses on developing engineered optogenetic tools to control cellular functions. Engineered photoreceptor proteins are important tools in biological application because of their spatiotemporal precision and other unique features. This paper presents a comparative study of different optical dimerizers and their activation in different light conditions. In addition, improved optogenetic tools for the regulation of yeast transcription and membrane recruitment are presented. In the future, I am interested in investigating novel genes of biotechnological

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importance and engineering them for synthetic biology applications. (Read Pathak's article; DOI: 10.1021/sb500291r)

MIN-HYUNG RYU

Min-Hyung Ryu

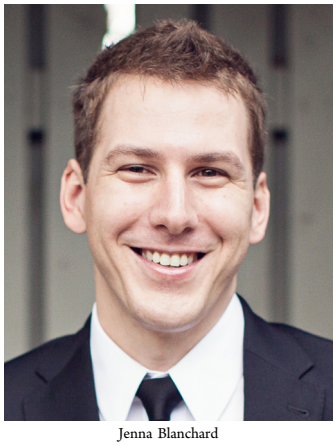
Current Position. Postdoctoral fellow, Department of Biological Engineering, MIT. Advisor: Dr. Christopher Voigt.

Education. Ph.D. Molecular Biology, University of Wyoming. Advisor: Dr. Mark Gomelsky; B.S. Life Science, Sogang University, Korea.

Nonscientific Interests. Travel, music.

My PhD work included identifying and engineering light-activated enzymes that control synthesis or degradation of small molecules for optogenetic application. Here, we employed engineered bacteriophytochrome proteins and modules to build near-infrared light-dependent gene circuits via the small molecule c-di-GMP. This work can be expanded using orthogonal small molecules in a specific organism while allowing remote control of biological processes even in deep tissues of small mammals, since near-infrared can penetrate tissues without causing harm. (Read Ryu's article; DOI: 10.1021/sb400182x)

SEBASTIAN R. SCHMIDL



Jenna Blanchard

Current Position. Postdoctoral Fellow, Department of Bioengineering, Rice University. Advisor: Assistant Professor Jeffrey J. Tabor.

Education. Dr. rer. nat. in Biology, Georg-August-University, Göttingen, Germany (2010). Advisor: Prof. Dr. Jörg Stülke. Biology Diploma, Georg-August-University, Göttingen, Germany (2007). Advisor: Prof. Dr. Jörg Stülke.

Nonscientific Interests. Sports, traveling, hiking, family, and friends.

My research interests focus on the development of engineering strategies for the construction of synthetic two-component signal transduction systems (TCSs), especially those involved in sensing complex disease biomarkers. In this work, we describe the optimization of light-switchable TCSs with transcriptional outputs by genetic refactoring and enhancing protein expression levels in the heterologous host *Escherichia coli*. The improved TCSs provide a powerful optogenetic perturbation tool that acts rapidly, reversibly, and is tunable. In addition, our approach may demonstrate a more general engineering method for constructing synthetic signaling pathways to gain customized signaling or regulatory functions. (Read Schmidl's article; DOI: 10.1021/sb500273n)

RAVI U. SHETH

Ravi Sheth

Current Position. Undergraduate Researcher, Department of Bioengineering, Rice University. Advisor: Dr. Jeffrey Tabor.

Education. Rice University, B.S. Bioengineering, 2015 (expected); Advisor: Dr. Jeffrey Tabor.

Nonscientific Interests. Cooking, eating, brewing beer.

I am interested in engineering bacterial ecosystems to accomplish useful functions. Bacteria are nearly everywhere: inside ourselves, the food we eat, our surroundings, even flies that buzz past us. The ability to precisely engineer these communities will enable many useful applications of synthetic biology. Our paper presents an important advance in our ability to systematically and precisely engineer sensors, and it will contribute toward our ability to design, perturb, and observe complex bacterial communities. (Read Sheth's article; DOI: 10.1021/sb500273n)

DEVIN STRICKLAND

Devin Strickland

Current Position. Scientist, Matrix Genetics, Seattle, WA.

Education. Ph.D. and Postdoctoral fellowship at the University of Chicago.

Nonscientific Interests. I enjoy cooking, reading, and hiking with my wife and daughter.

The idea for this paper grew out of our experience developing TULIPs alongside several optogenetic dimerization systems (including the Tucker lab's) that were published ahead of ours. Many scientists were interested in using this technology in their own laboratories but wanted to know how the performance of our system compared with that of existing systems. We could not provide a good answer because we were using different assays than the other groups. We realized that there was a need for standard benchmarking assays based on real biological applications so that prospective users could better decide which system to try. (Read Strickland's article; DOI: 10.1021/sb500291r)

JEFFREY J. TABOR

Evan J. Olson

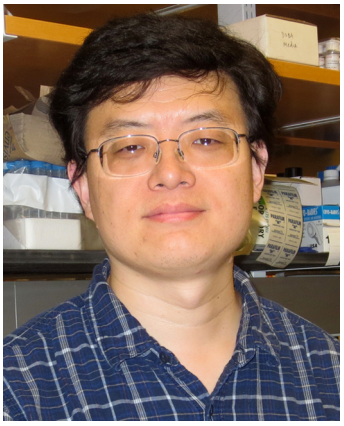
Current Position. Assistant Professor, Department of Bioengineering, Rice University, Houston, TX.

Education. Postdoctoral fellow, University of California, San Francisco. Advisor: Dr. Christopher Voigt. Ph.D. in Molecular Biology, University of Texas, Austin. Advisor: Dr. Andrew Ellington.

Nonscientific Interests. I enjoy food, traveling, art, running, cooking, reading, skiing, sunshine, college football, family and friends.

My lab has two focus areas. First, we are developing a framework for engineering living organisms in a far more predictable fashion than is currently possible. Second, we are engineering bacteria that can sense disease or physiological signatures in the body and respond by producing compounds that make you better or report on your individual state. One of our major approaches to making biology easy to engineer is to use light-switchable proteins to create "tailor-made" gene expression signals in live cells. Those gene expression signals can in turn be used as inputs to interrogate different genetic parts in live cells in space and time. We previously engineered green and red light seniors in *E. coli* that had several limitations, including leakiness and low dynamic range. Here, we systematically re-engineer these systems for much higher performance and compatibility with a wider range of biological parts, devices and systems. (Read Tabor's article; DOI: 10.1021/sb500273n)

HUI WANG



Elizabeth Clarke

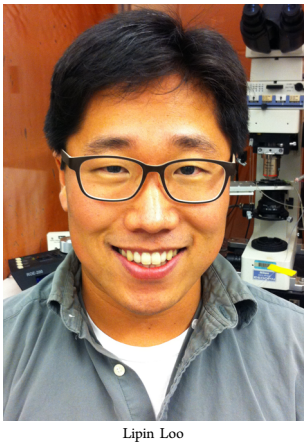
Current Position. Research Assistant Professor, Department of Pharmacology, The University of North Carolina at Chapel Hill.

Education. Ph.D. in Biophysics, University of Wisconsin at Madison, 2008. M.S. in Biophysics, Nankai University, China, 2001. B.S. in Biophysics, Nankai University, China, 1998.

Nonscientific Interests. Spending time with my wife and two girls, traveling, reading, cooking and watching movies.

I have been fascinated by both cell biology and protein biophysics. This project combines these to generate practical tools that will be valuable in our lab's study of cell motility. We produced new proteins that will be useful for their ability to control endogenous signaling proteins in living cells and animals. Perhaps most importantly, these light-controlled inhibitors of PKA and MLCK are proof of principle for an approach that can be used for many different proteins, whenever there is a biologically active peptide to control. (Read Wang's article; DOI: 10.1021/sb5001356)

JASON J. YI



Lipin Loo

Current Position. Postdoctoral fellow, Departments of Pharmacology and Cell Biology and Molecular Physiology, The University of North Carolina at Chapel Hill.

Education. Ph.D. in Pharmacology, Duke University. Advisor: Michael D. Ehlers. B.S. in Biochemistry and Molecular Biology, Dickinson College.

Nonscientific Interests. Spending time with my wife and daughter, home improvement projects, southern barbecue, local beer, cycling.

I am a neurobiologist by training, and my Ph.D. work examined signaling events that shape the developing brain.

This work made me appreciate the technical limitations that exist for studying native signaling pathways in living cells. As a postdoctoral fellow, I am exploring optogenetics approaches that can be used to interrogate endogenous signaling mechanisms in cells. Here, we use the LOV2 photoreceptor from oats to generate photoswitchable peptide inhibitors. These inhibitors remain inert in cells until the application of blue light activates their inhibitory activity toward specific kinases. This method provides a generalizable, highly specific method to isolate endogenous signaling events in living cells. (Read Yi's article; DOI: 10.1021/sb5001356)