ACS SyntheticBiology
Introducing Our Authors
pubs.acs.org/synthbio

## JEFFREY DIETRICH

Image courtesy of Jeffrey Dietrich

**Current position:** Chief Technology Officer, Lygos, Inc.

**Education:** Graduate Institution and Advisor: University of California, Berkeley, Dr. Jay Keasling. Undergraduate Institution and Advisor: Rice University, Dr. Kyriacos Athanasiou.

**Nonscientific interests:** I enjoy spending as much time exploring nature as possible, and two of my favorite recreational activities include backpacking and camping.

The predominant challenge in metabolic engineering is rapidly shifting from proof-of-principle demonstration of metabolic pathways to directed evolution of microbial strains for improved product yield, titer, and productivity. Strain optimization is hindered by the complexity of the microbial host, and high-throughput screens or selections are necessary to address this hurdle. Furthermore, it is currently difficult to screen for the majority of small molecules being produced today, and overproduction of only a select few molecules results in improved host fitness. Our paper begins to address this challenge by demonstrating application of transcription factor-based biosensors as a means to couple small-molecule production to either a detectable phenotype (fluorescent protein formation) or host fitness, termed here "synthetic selections". These biosensors can be used as either screens or selections to rapidly detect desirable phenotypes and evolve microbial strains. (Read Dietrich's article; DOI: 10.1021/sb300091d).

## NIMISH GERA

Image courtesy of Nimish Gera

**Current position:** Senior Scientist I, Discovery Sciences, Oncobiologics Inc., Cranbury, NJ

**Education:** Ph.D. in Chemical and Biomolecular Engineering, North Carolina State University (2012); Advisor, Dr. Balaji M. Rao. B. Tech in Chemical Engineering, Indian Institute of Technology Guwahati (2006)

**Nonscientific interests:** Music, movies, cooking and theater

My research is focused on protein engineering to design proteins with a novel binding function. In my Ph.D. work I engineered a novel hyperthermophilic scaffold, Sso7d, from *Sulfolobus Solfataricus* to bind a wide spectrum of target proteins. Highly stable and specific binding proteins were obtained. The Sso7d scaffold was also used to generate pH-sensitive binding proteins using yeast surface display. Currently, as a Senior Scientist at Oncobiologics, I am building the Antibody Discovery and Engineering group where we are using a modular antibody scaffold to address a variety of targets to generate safe and effective cancer therapeutics. In the current study, a mixture of several hyperthermophilic scaffolds called the "super-library" was used to screen for binding proteins. This "super-library" is a powerful alternate strategy for combinatorial library construction. (Read Gera's article; DOI: 10.1021/sb300029m).

## MATTHEW HARGER

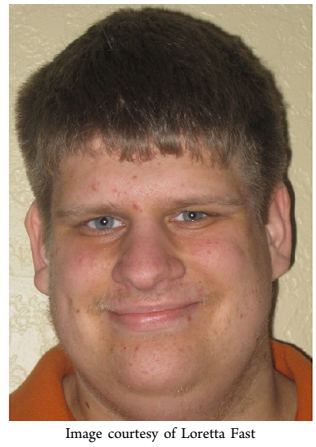

Image courtesy of Loretta Fast

**Current position:** Undergraduate student (Biochemistry) at the University of Washington, Seattle, Washington

**Education:** Juanita High School, Kirkland, WA

**Nonscientific interests:** Videogames and movies.

Through my three years of participation in the undergraduate synthetic biology competition iGEM, I have realized that current abilities to effectively engineer organisms are not fundamentally limited by ability to synthesize and assemble DNA constructs, but by the ability to design genetic systems with desired functions. Improvement in the capability to engineer biological systems will require the ability to predictively tune systems toward exact behavior. My principle research interests are in these efforts to engineer organisms in a more precise manner. I am particularly interested in the application of synthetic biology

**Received:** December 20, 2012
**Published:** January 18, 2013

for the improvement of engineered biosynthetic pathways. (Read Harger's article; DOI: 10.1021/sb300061x).

## MAHMUD HUSSAIN

Image courtesy of Mahmud Hussain

**Current position:** Postdoctoral Researcher, Department of Biochemistry and Biophysics, University of North Carolina at Chapel Hill; Advisor, Professor Brian Kuhlman.

**Education:** Ph.D. (2011) and M.S. (2008) in Chemical and Biomolecular Engineering, North Carolina State University; Advisor, Professor Balaji M. Rao.

**Nonscientific interests:** Playing guitar, cricket, and traveling.

The holy grail of my research is to be able to engineer *de novo* proteins or protein−protein interaction via common display technologies together with computational modeling. In particular, I am interested in generating highly stable affinity reagents by mutagenizing naturally occurring proteins with little or no binding interaction for a given target. In my paper featured in this issue, a "library-of-libraries" or the so-called "super library" was generated from seven hyperthermophilic scaffolds with a modest diversity ($\sim 4 \times 10^8$) and is able to produce binders to five widely divergent model targets. The super library also outperforms a single scaffold derived 1000-fold higher sequence-diversity library (Sso7d) in terms of binding affinities for two of the model targets tested. This counterintuitive finding that a library with lower sequence-diversity (super library) performs better than a single-scaffold higher sequence-diversity library underscores the benefits of scaffold diversification. Our work involving multiple highly thermostable, mutable protein scaffolds validates yet another set of proteins for engineering molecular recognition. (Read Hussain's article; DOI: 10.1021/sb300029m).

## INGRID SWANSON PULTZ

Image courtesy of Scott Pultz

**Current position:** Senior Fellow, Department of Biochemistry, University of Washington, lab of David Baker

**Education:** Ph.D. in Microbiology, University of Washington Department of Microbiology; Advisor, Samuel I. Miller. BA in Biology, Wellesley College.

**Nonscientific interests:** Traveling, music, gardening

My scientific interests involve the application of engineering principles to molecular biology, in order to generate novel molecules or systems with desired characteristics. I advised the University of Washington (UW) team that participates in iGEM, which is an annual synthetic biology competition, from 2008 to 2011. Work done by UW iGEM undergraduates has led to several publications including the work featured here, which I believe demonstrates the potential for undergraduate research to make significant contributions to the field of synthetic biology and highlights the need for rigorous training programs at the undergraduate level. Currently, my work involves the engineering and optimization of a gliadin-degrading enzyme for use as an oral therapeutic for celiac disease. (Read Pultz's article; DOI: 10.1021/sb300061x).

## JUSTIN SIEGEL

Image courtesy of Justin Siegel

**Current position:** Assistant Professor, Biochemistry and Chemistry, University of California, Davis

**Education:** Graduate school (2005−2012), University of Washington, Seattle, WA; Advisors, Dr. David Baker and Dr. Michael Gelb. Undergraduate (2001−2005), University of California, Davis; Advisors, Dr. Vladimir Filkov, Dr. Michael Toney, and Dr. Kenneth Burtis.

**Nonscientific interests:** Outside of the lab I am enjoying life with my wife (Juliet), dog (JJ), and new baby girl, Josefina! We recently have moved back to Northern California where both my wife and I are from, and we have been enjoying being close to family and being able to attend all our family events. Recreationally I enjoy skiing, scuba diving, and casual games of racket ball!

This work demonstrates two exciting scientific advancements. First, it highlights how modification of a single upstream gene in a recently discovered biofuel pathways can be used to modulate the product spectrum. In addition, this work was conceived and completed as part of the 2011 iGEM competition by a group of undergraduates over the course of a summer. This truly highlights how rewiring metabolic pathways is moving toward the engineering discipline, and these types of experiments no longer requires years of training to accomplish. (Read Siegel's article; DOI: 10.1021/sb300061x).

## ELIZABETH SPECHT

Image courtesy of Steven Specht

**Current position:** Ph.D. Candidate, Division of Biological Sciences, University of California San Diego, La Jolla, CA; Advisor, Dr. Stephen P. Mayfield.

**Education:** B.S. in Chemical and Biomolecular Engineering, Johns Hopkins University, Baltimore, MD.

**Nonscientific interests:** Horseback riding, running, teaching, traveling, international development, and global health.

My research seeks a better understanding of the complex regulatory mechanisms governing transgene expression in green algae. Algae have proven their utility for synthesizing functional complex mammalian proteins, and their low cost and growth requirements facilitate protein production at large scale. However, this potential is currently hampered by relatively low levels of transgene product accumulation. Our recent work applies the power of synthetic biology to obtain a nonbiased map of functional regulatory elements within algal chloroplast gene leader sequences. I used this information to construct a novel synthetic leader sequence that allows expression higher than that of the parental strain. This is among the first demonstrations of high-throughput strategies that I anticipate will soon make algae a feasible production platform for sustainable and inexpensive therapeutics, nutritional supplements, and more. (Read Specht's article; DOI: 10.1021/sb300069k).

## SHEN-LONG TSAI

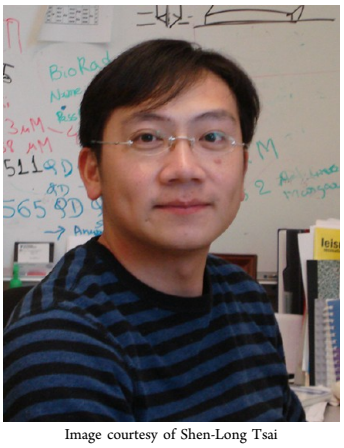

Image courtesy of Shen-Long Tsai

**Current position:** Assistant Professor, Department of Chemical Engineering, National Taiwan University of Science and Technology, Taiwan.

**Education:** Postdoctoral fellow in Chemical and Biomolecular Engineering, University of Delaware (2012); Advisor, Prof. Wilfred Chen. Ph.D. in Chemical and Environmental Engineering, University of California, Riverside (2011); Advisor, Prof. Wilfred Chen. M.S. in Chemical Engineering, National Tsing Hua University, Taiwan (2003). B.S. in Environmental Engineering, Da-Yeh University, Taiwan (2001).

**Nonscientific interests:** Music, drama, toys, and cooking.

My Ph.D. thesis focused on the assembly of artificial cellulosomes on the *Saccharomyces cerevisiae* cell surface for simultaneous cellulose hydrolysis and ethanol production. In this paper, we develop a new adaptive strategy for the *ex vivo* assembly of a functional tetravalent designer cellulosome on the yeast cell surface, which is the first report that exploits the natural adaptive assembly strategy in creating artificial cellulosome structures. The unique feature of the anchoring and the adaptor scaffoldin strategy to amplify the number of enzymatic subunits can be easily extended to not only more complex cellulosomal structures but more quantitative and site specific metabolons to achieve an even higher level of enzyme synergy. My current research is focused on the design and development of artificial cell systems and functional biomolecules to address challenges like the energy crisis, environmental pollution, and infectious diseases. (Read Tsai's article; DOI: 10.1021/sb300047u).


dx.doi.org/10.1021/sb300134j | *ACS Synth. Biol.* 2013, 2, 3−5