ACS SyntheticBiology

Introducing Our Authors

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TIMOTHY HARVEY-SAMUEL

Image courtesy of Timothy Harvey-Samuel

Current position: Ph.D. student, Department of Zoology, University of Oxford in conjunction with OXITEC Ltd.

Education: Master's in Applied Ecology, Imperial College, Silwood Park. B.Sc. Biology, Imperial College, London.

Nonscientific interests: Hiking, diving, cycling, fishing and generally exploring new places.

My academic interest focuses on developing more environmentally sustainable ways to control the pest insects that plague us. In this paper we were able to develop a synthetic genetic pest management system for two globally important pest lepidopterans based on engineered female-specific lethality. The primary significance of this work is due to its application in controlling economically important pests for which management techniques are currently failing. However, in addition to this, the translation of our construct across a significant phylogenetic range highlights one of the great advantages in developing solutions to real world problems using standardized parts and designs. (Read Harvey-Samuel's article; DOI: 10.1021/sb300123m)

HEATHER JENSEN

Image courtesy of Heather Jensen

Current position: Ph.D. candidate, Department of Chemistry, UC Berkeley; Advisers: Dr. Caroline Ajo-Franklin and Dr. Jay Groves.

Education: B.S. in Biochemistry at California Polytechnic State University, San Luis Obsipo, 2007.

Nonscientific interests: In my time away from the lab, I enjoy baking and playing the ukulele.

Currently I am nearing the completion of my dissertation on using synthetic biology to engineer an extracellular electron conduit in live microbes for enabling bidirectional electronic communication with inorganic materials. By building direct cellular-electrical connections in a cell, we can exploit the vast capabilities of microbes, including chemical synthesis, energy conversion, and self-assembly and repair. This paper highlights how synthetic biology may be used to carefully balance the expression of complex transmembrane pathways while minimizing perturbations on cell health. It also represents the first time our strains deliver a measurable current to an anode. In the future, I look forward to continuing to work on engineering biological systems for sophisticated functions. (Read Jensen's article; DOI: 10.1021/sb300119v)

LI JIN

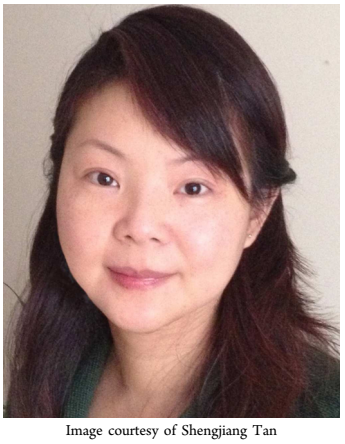

Image courtesy of Shengjiang Tan

Current position: Postdoctoral Research Associate, Department of Haematology, University of Cambridge; Advisor: Professor Alan Warren

Education: Ph.D., University of Oxford; Supervisor: Dr. Luke Alphey, Dr. Helen White-Cooper and Professor Peter Holland. B.S. from College of Life Sciences, Shaanxi Normal University, China.

Nonscientific interests: Reading novels, traveling, and watching movies.

My Ph.D. work focused on the development of conditional germ-line expression systems for genetic control of pests using an improved version of the classical sterile insect technique (SIT) called RIDL (Release of Insects carrying a Dominant Lethal). During my Ph.D. study, I focused on analyzing some of pest's native genes and the function of their promoters' function designing plasmid constructs and testing them *in vivo*, aiming to find new molecular tools for directing gene expression in particular tissues and times of development. *In vivo* testing

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depended on insect transgenesis using microinjection in early embryos of the pest. We also aimed to control gene expression by alternative splicing, to provide complementary methods to the use of promoters and so, via combinatorial control, give more precise and sophisticated control options. The ultimate aim of this research is to find a new, environmentally friendly and cost-effective pest control system. This paper shows that it is possible to develop the necessary genetic control elements and strains in moths, a taxonomic group of huge agricultural importance but with little precedent for synthetic biology. The strains themselves are complete systems, albeit in prototype form, and have all the genetics necessary for field use.

My current research is focused on investigating the fundamental conserved molecular mechanisms that control ribosome maturation and understanding how defects in this process result in human disease. (Read Jin's article; DOI: 10.1021/sb300123m)

TAE SEOK MOON

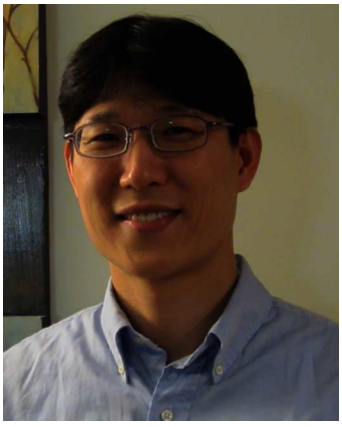

Image courtesy of Tae Seok Moon

Current position: Assistant Professor, Department of Energy, Environmental and Chemical Engineering, Washington University in St. Louis.

Education: Postdoctoral Scholar, Pharmaceutical Chemistry, UCSF, and Postdoctoral Associate, Biological Engineering, MIT; Advisor: Christopher Voigt, Chemical Engineering, MIT; Advisor: Kristala Prather.

Nonscientific interests: Watching movies and traveling with my family; poetry, music, and education.

Many applications require cells to integrate multiple environmental signals and to implement synthetic control over biological processes. Genetic circuits enable cells to perform computational operations, interfacing biosensors and actuators. Despite advances in the rational construction of genetic circuits, practical applications of genetic circuits have yet to be realized. Engineering cells on a lab scale is entirely different from creating microbial cell factories and environmental janitors that face various changing signals. For such real-world applications, systems must be robust and resistant to mutations for an extended use. In addition, orthogonal genetic parts are needed to build complex circuits. My long-term goal is to construct programmable cells that are able to process multiple input signals and produce desirable outputs to solve energy, environment, and health problems. (Read Moon's article; DOI: 10.1021/sb300055e)

KEVIN SOLOMON

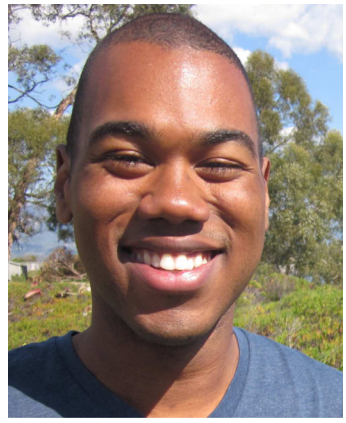

Image courtesy of Charles Haitjema

Current position: Postdoctoral Scholar, Department of Chemical Engineering, UC Santa Barbara; Advisor: Prof. Michelle A. O'Malley

Education: Ph.D. in Chemical Engineering, Massachusetts Institute of Technology, 2012; Advisor: Prof. Kristala Jones Prather; M.S. in Chemical Engineering, MIT, 2008. B. Eng. Biosci. in Chemical Engineering and Bioengineering, McMaster University, Canada, 2006.

Nonscientific interests: Trying new cuisines, wine tasting, dancing, and traveling

I seek to develop new tools that immediately address global challenges. In the work described within this issue, we use community sourced and curated tools to create a platform that more efficiently utilizes glucose for engineered production pathways. While we were able to reroute glucose away from central metabolism and into our pathway of interest, there are trade-offs in the ability of the cell to express heterologous enzymes and maintain necessary cofactor levels. These challenges were addressed somewhat with a more dynamic strategy in subsequent work (DOI: 10.1016/j.ymben.2012.08.006). Currently, I work with anaerobic gut fungi, proficient fibrolytic organisms, to isolate new tools for biological engineering and to develop them as novel platforms for lignocellulosic biofuel production. (Read Solomon's article; DOI: 10.1021/sb300055e)

CLAUDIA VICKERS

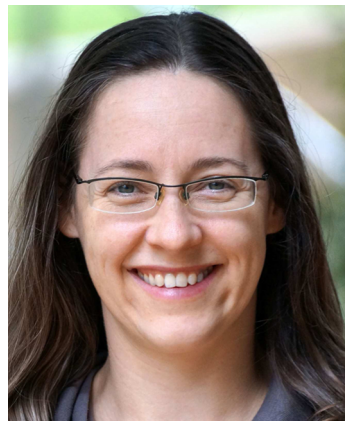

Image courtesy of Erik de Wit

Current position: Senior Research Fellow, Australian Institute for Bioengineering and Nanotechnology, The University of Queensland, Australia. Group head: Professor Lars Nielsen

Education: Ph.D. in Molecular Biology, The University of Queensland, Australia.

Nonscientific interests: Mum to a 1.5-year old (which could technically count as a scientific interest). Between two full time jobs (research and parenting) there is not much time for other hobbies, but I do fit in a bit of lap swimming and yoga. Having grown up in New Zealand, I'm also very keen on hiking (and being in the mountains in general).

I'm fascinated by isoprenoids, a very large and diverse group of natural products with many different biological functions as well as many industrial applications. We are using a systems and synthetic biology approach both to understand production/regulation of isoprenoids and to improve production using metabolic engineering. However, when we try to overproduce some industrially useful isoprenoids in microbes, they cause growth defects through toxicity or metabolic burden. Therefore, to improve production, it is desirable to get cells up to a reasonably high biomass before you get them to start producing. In the current paper, we developed a yeast quorum sensing system enabling late onset of production without addition of an inducer. The native pheromone signaling system was hijacked to provide the parts for the circuits, and gene expression (in this case, a GFP reporter) is initiated based on cell density. The engineered circuits are highly tunable and will be applied for production of industrially useful compounds. (Read Vicker's article; DOI: 10.1021/sb300110b)

ADAM S. WALKER

Image courtesy of Adam S. Walker

Current position: Research Scientist at Oxitec Ltd., U.K.; Advisor: Prof. Luke Alphey

Education: B.Sc. in Zoology, University of Wales, Swansea, U.K.

Nonscientific interests: Skateboarding, surfing, swimming, tennis, painting, and music production.

I have always been interested in insects, which is the main reason that I chose to study Zoology as an undergraduate. During this time, I was fascinated to learn about transgenic insects and their potential application in pest control. I currently work in Oxitec's agricultural research department, developing transgenic strains of lepidopteran pests engineered to express a conditional lethal gene system called Release of Insects carrying a Dominant Lethal (RIDL). RIDL works in the same way as the Sterile Insect Technique, but without the need for irradiation, among other innovations. The focus of my research so far has been in the development of engineered repressible female-specific lethality in moth pests, the fruits of which are described in our paper. In the future, I'm keen to be involved in this kind of work, at the interface between insect biology and real-world application of synthetic biology principles. (Read Walker's article; DOI: 10.1021/sb300123m)

THOMAS C. WILLIAMS

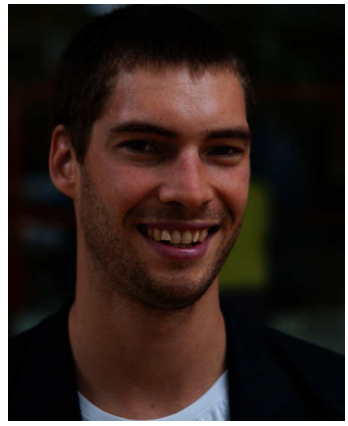

Image courtesy of Erik de Wit

Current position: Ph.D. candidate, Australian Institute for Bioengineering and Nanotechnology, University of Queensland, St Lucia, Australia; Advisors: Dr. Claudia Vickers and Professor Lars Nielsen.

Education: B.Sc. in Biochemistry and M.Sc. in Microbiology, University of Waikato, New Zealand; M.Sc. advisor: Professor Hugh Morgan.

Nonscientific interests: I enjoy rowing regularly on the Brisbane River and competing at regattas in double and quadruple sculls. Other interests include watching Rugby Union and home beer brewing.

My Ph.D. is focused on developing and applying the tools of synthetic biology to metabolic engineering problems in *Saccharomyces cerevisiae*. Specifically, I have engineered quorum sensing as a mechanism for the dynamic regulation of gene expression. Our synthetic quorum sensing circuits will be used to separate growth and biochemical production phases in *S. cerevisiae* so that metabolic burden and product toxicity do not limit population growth and therefore product titer. My broad scientific interests include understanding the engineering principles of metabolic productivity, the potential existence and modularity of archetypal regulatory network motifs, and the features of the transition between chemistry and biochemistry (the origin of life). (Read Williams' article; DOI: 10.1021/sb300110b)