BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Akash Vaidya

eRA COMMONS USER NAME (credential, e.g., agency login): A_VAIDYA

POSITION TITLE: Ph.D. Candidate

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
Cornell University Ithaca, NY Undergraduate Research Advisor: Dr. Christopher Akinleye Alabi	B.S	09/2018	05/2018	Chemical Engineering
University of Delaware Newark, DE Research Advisor: Dr. LaShanda Korely	M.Ch.E	08/2018	05/2020	Chemical Engineering
University of Delaware Newark, DE Research Advisor: Dr. Kevin Solomon	Ph.D.	01/2021	N/A	Chemical Engineering

A. Personal Statement

My professional vision is to advance human health and knowledge as a professor and independent cancer researcher. I was fortunate to gain extensive and diverse experiences in both teaching and research. As an undergraduate researcher in the Alabi Lab at Cornell University, I learned about precision material synthesis and characterization in the context of sequence-defined oligomer synthesis. As an NIH-supported Short-Term Educational Program Fellow in the Lyssiotis Lab at Michigan Medicine, I developed a keen interest in pancreatic cancer and immunometabolism. I seek to integrate these experiences in my future career as a cancer researcher. Unfortunately, my productivity in the early years of my graduate career was significantly hindered by full-time and daily caregiving responsibility for my Mom, who had early-onset and rapidly progressive dementia. She moved to stay with me in Delaware in 2019, which led to me leaving the University with a M.Ch.E. degree. Once my caregiving responsibilities became more stable and predictable, in 2021, I joined the lab of my current Ph.D. advisor. Prof. Kevin Solomon was incredibly supportive of my goals and ongoing familial responsibility, which continued until 2022 when my Mom passed away. During this time, Prof. Solomon and I worked together to launch a new research thrust in his lab towards the development of barley stripe mosaic virus-like particles as cancer vaccines. We wrote and were awarded an NIH INBRE grant to support this work, which was primarily based on my own ideas. My success despite personal challenges built my confidence to continue pursuing my goal of developing precision materials for cancer therapy as an independent researcher. Furthermore, my own family's struggles deeply reinforced my drive to make meaningful contributions towards improving human health. This NCCAT award will further our efforts to advance nanomedicine through the development of barley stripe mosaic virus as a platform immunotherapy. Ultimately, this project will encourage and support me to continue climbing up my challenging career trajectory. Thank you for your time and consideration.

B. Positions, Scientific Appointments and Honors

Positions and Appointments:

RESEARCH

Graduate Research Assistant in Solomon Research Group
Department of Chemical and Biomolecular Engineering, University of Delaware
Jan 2021 – Present
Graduate Research Assistant in Korley Research Group
Department of Chemical and Biomolecular Engineering, University of Delaware
Jan 2019 – Feb 2020
Undergraduate Research Assistant in Lyssiotis Research Group
Department of Molecular and Integrative Physiology, University of Michigan Medical School
May 2016 – Aug 2016 and May 2017 – Aug 2017
Undergraduate Research Assistant Alabi Research Group
Robert Frederick Smith School of Chemical and Biomolecular Engineering, Cornell University
May 2015 – May 2018

TEACHING

University of Delaware, Chemical and Biomolecular Engineering

Listed Co-Instructor, Heat and Mass Transfer (taught ~1/3 of course)
Jan 2023 – May 2023
Guest Lecturer, Reactor Design and Chemical Engineering Kinetics (3 lectures)
Aug 2022 – Dec 2022
Teaching assistant for Chemical Engineering Kinetics
Aug 2021 – Dec 2021
Teaching assistant for Chemical Engineering Thermodynamics II
Jan 2020 – May 2020

Cornell University, College of Engineering

Teaching assistant for Chemical Engineering Thermodynamics
July 2018 – Aug 2018
Engineering Learning Initiatives Peer Tutor
Jan 2016 – May 2018
Course Assistant for Calculus II for Engineers
Jan 2018 – May 2018
Course Assistant for Multivariable Calculus for Engineers
Aug 2017 – Dec 2017
Teaching Assistant for Mass and Energy Balances
Aug 2017 – Dec 2017
Teaching Assistant for Introduction to Chemical Engineering freshman course
Aug 2016 – Dec 2016

INCLUSIVE OUTREACH
Bootcamp for Synthetic Biology Training (BooST) Leader
Course Designer and Outreach Leader
June 2023 – Present
Solar Power Experiments and Engineering Design (SPEED) Instructor
NSF-Funded Employee at the University of Delaware
May 2020 – Aug 2020
UD K-12 Engineering Education
Outreach Leader and Graduate Coordinator for Korley and Solomon Groups
Feb 2019 – Present
Cornell Chemical Engineering Crash Course (Four-C)
Founder and President
Sep 2017 – May 2018

Cornell University Inspiring Chemical Engineers (ICE)
Founder and President
Feb 2016 – May 2018

Honors and Awards:

2023	Frasier and Shirley Russel Teaching Fellowship
2022	University of Delaware CBE Department GAANN Teaching Fellowship
2021	John M. Witheford Graduate Student Fellowship
2018	Award for Outstanding Service to Cornell Chemical and Biomolecular Engineering
2017	Short-Term Educational Program Research Fellowship
2016	Short-Term Educational Program Research Fellowship
2015	Cornell Learning Initiatives Undergraduate Research Fellowship

C. Contributions to Science

Alabi Lab (undergraduate research)
The Alabi group devised a method of assembling thioetheramides (TEAs) into diverse sequence-defined macromolecules with potential as antibacterial agents, linkers for drug conjugates, and probes for intracellular activity. I experimentally and theoretically evaluated the kinetics of the thiol-Michael addition, which is rate-limiting to oligoTEA synthesis. My kinetic studies promote advanced synthesis techniques for oligoTEA libraries, which can be screened for desirable physicochemical properties and bioactivity. This will ultimately provide valuable insight into how oligomer sequence affects function, which can be used to engineer therapeutics with targeted biological outcomes. My work in the Alabi Lab led to a peer-reviewed publication and sparked my interest in precision materials for biomedical research and applications.

Brown, J. S.; Ruttinger, A. W.; **Vaidya, A. J.**; Alabi, C. A.; Clancy, P. Decomplexation as a Rate Limitation in the Thiol-Michael Addition of N-Acrylamides. *Org. Biomol. Chem.* **2020**, *18* (32), 6364–6377. https://doi.org/10.1039/D0OB00726A.

Lyssiotis Lab (undergraduate research)
Oncogenic Kras mouse model tumors regress upon oncogene inactivation, but often relapse. Transcriptomic analysis showed that relapsed tumor cells without oncogenic Kras have low Nrf2, an important transcription factor for the antioxidant response. I independently quantified protein levels and found that relapsed tumor cells have low Keap1 relative to cancer cells with oncogenic Kras. Low protein levels of Keap1, a post-translational regulator of Nrf2, can explain how the relapsed tumor cells maintain a strong antioxidant program despite low Nrf2 gene expression. Our findings offer crucial insight into redox regulation in the context of pancreatic cancer relapse**.** My work with the Lyssiotis Lab also contributed to a co-authored publication and will facilitate the development of more effective therapies against pancreatic cancer.

Purohit, V.; Wang, L.; Yang, H.; Li, J.; Ney, G. M.; Gumkowski, E. R.; **Vaidya, A. J.**; Wang, A.; Bhardwaj, A.; Zhao, E.; Dolgalev, I.; Zamperone, A.; Abel, E. V.; Magliano, M. P. D.; Crawford, H. C.; Diolaiti, D.; Papagiannakopoulos, T. Y.; Lyssiotis, C. A.; Simeone, D. M. ATDC Binds to KEAP1 to Drive NRF2-Mediated Tumorigenesis and Chemoresistance in Pancreatic Cancer. *Genes Dev.* **2021**, *35* (3–4), 218–233. https://doi.org/10.1101/gad.344184.120.

Vinee Purohit, Lidong Wang, Huibin Yang, Gina M. Ney, **Akash J. Vaidya**, Erica R. Gumkowski, Brian R Magnuson, Ethan V Abel,Andrea Zamperone, Marina Pasca Di Magliano, Howard C. Crawford, Costas A. Lyssiotis, Diane M. Simeone. ATDC is a Novel Regulator of NRF2-Mediated Antioxidant Response in Pancreatic Cancer. **American Association for Cancer Research Conference. September 2018.**

Solomon Lab (graduate research)
Barley-stripe mosaic virus-like particles has tremendous potential for cancer vaccines development. In my thesis work so far, I enabled VLP engineering via length control and chemical/biological surface functionalization with antigens, transport signals, adjuvants, and small chemicals. I already demonstrated their

capacity to enter and activate antigen presenting cells, and I aim to further develop this system for cancer immunotherapy.

Rammohan, M., **Vaidya, A**., Grissom, S., Silvestri, R. Pirner, C., Solomon, K., Blenner, Mark., Synthetic Biology's Impact on Biopharmaceutical Manufacturing, *National Academy of Engineering, The Bridge* (**2025**) 55-2.

Vaidya, A. J.; Rammohan, M.; Lee, Y.-H.; Lee, K. Z.; Chou, C.; Hartley, Z.; Scott, C. A.; Susler, R. G.; Wang, L.; Loesch-Fries, L. S.; Harris, M. T.; Solomon, K. V. Engineering Alkaline-Stable Barley Stripe Mosaic Virus-like Particles for Efficient Surface Modification. *Biochem. Eng. J.* **2023**, *199*, 109062. https://doi.org/10.1016/j.bej.2023.109062.

Vaidya, A. J.; Solomon, K.V. Surface Functionalization of Rod-Shaped Viral Particles for Biomedical Applications. *ACS Appl. Bio Mater.* **2022**. 16;5(5):1980-1989. https://doi.org/10.1021/acsabm.1c01204.

Solomon, K.; Lee, K. Z.; **Vaidya, A**.; Rammohan, M. Nanoparticles and Biotemplates with Tunable Length and Methods of Manufacturing the Same. US20240209382A1, June 27, **2024**. https://patents.google.com/patent/US20240209382A1/en (patent pending)

Chou, C.; Liebrata, J.; Khansa, J.; Huang, S.; **Vaidya, A**.; Rammohan, M.; Huang, W.; Miller, J.; Solomon, K.; Loesch-Fries.; L, Harris.; M. Enhanced Gold Decoration on Palladium Barley Stripe Mosaic Virus Biotemplate. *ACS Appl. Nano Mater. (under review)*

Akash J. Vaidya, Mruthula Rammohan, Jesal Patel, Nadia Harricharan, Evan Gillen, Robyn Logue, Kevin V. Solomon. Developing Barley Stripe Mosaic Virus-Like Particles as Modular Nanovaccines.
Invited speaker for talk at 5th Annual Mid-Atlantic Synthetic Biology Network (MASBN) Symposium, January 2025.

Akash J. Vaidya, Mruthula Rammohan, Jesal Patel, Evan Gillen, Robyn Logue, Kevin V. Solomon. Repurposing Barley-Stripe Mosaic Virus as a Nanoparticle Vaccine Platform.
Presenting author for talk at American Institute of Chemical Engineers (AIChE) Annual Meeting. October 2024.

Akash J. Vaidya, Mruthula Rammohan, Jesal Patel, Evan Gillen, Robyn Logue, Kevin V. Solomon. Repurposing Barley-Stripe Mosaic Virus for Cancer immunotherapy.
Invited speaker for talk at 9th NIH NIGMS National IDeA Symposium of Biomedical Research Excellence (NISBRE). June 2024.

Akash J. Vaidya, Mruthula Rammohan, Che-yu Chou, Julia Donlevie, Jesal Patel, Evan Gillen, Kevin V. Solomon. Tuning the immunogenicity of Barley Stripe Mosaic Virus-like Particles By Surface Engineering.
Invited speaker for talk at Engineering Biology Research Consortium (EBRC) Annual Meeting. June 2023.

D. Scholastic Performance (Note: SX means “Satisfactory”, passing grade for class without letter grades)

YEAR	COURSE TITLE	GRADE
	Cornell University	
2014	Intro Bio: Comparative Physiology	B+
2014	Honors General and Inorganic Chemistry	A-
2014	Intro to Chemical Engineering	A
2014	Multivariable Calculus for Engineers	A-
2014	Philosophical Problems, Puzzles, Paradoxes & Stares	A
2015	Honors Organic Chemistry I	B
2015	Introduction to Computing Using MATLAB	B+
2015	Differential Equations for Engineers	A
2015	Physics II: Electromagnetism	B+
2015	Introduction to Sociology	A+

YEAR	COURSE TITLE	GRADE
2015	Investigative Biology Lab	A-
2015	Special Topics in Civil and Environmental Engineering	A
2015	Honors Physical Chemistry I	A-
2015	Biomolecular Engineering	A
2015	Undergraduate Project in Chemical Engineering	A
2015	Mass and Energy Balances	A
2015	Linear Algebra for Engineers	B+
2016	Special Topics in Civil and Environmental Engineering	A
2016	Intro to Physical Chemistry Lab	B
2016	Organic Chemistry for the Life Sciences	A-
2016	Honors Physical Chemistry II	B
2016	Fluid Mechanics	B+
2016	Undergraduate Project in Chemical Engineering	A
2016	Principles of Biochemistry	B+
2016	Special Topics in Civil and Environmental Engineering	A
2016	Chemical Engineering Thermodynamics	A
2016	Heat and Mass Transfer	B+
2016	Undergraduate Project in Chemical Engineering	A
2016	The Art of Teaching	A
2017	Intro Bio: Cell and Development	B+
2017	Molecular Principles of Biomedical Engineering	A-
2017	Special Topics in Civil and Environmental Engineering	A
2017	Career Perspectives	SX
2017	Analysis of Separation Processes	A
2017	Intro to Process Dynamics and Control	A
2017	Chemical Kinetics and Reactor Design	A
2017	Undergraduate Project in Chemical Engineering	A
2017	Developmental Psychology	A
2017	Biomedical Engineering Analysis of Metabolic and Structural Systems	B+
2017	Chemical Engineering Lab	A-
2017	Undergraduate Project in Chemical Engineering	A
2017	Bioprocess Engineering	A-
2017	Engineering Principles for Drug Delivery	B+
2018	Electrical and Chemical Physiology	B+
2018	Chemical Engineering Product Design	B-
2018	Polymeric Materials	A
2018	Introduction to Acting	B-
	University of Delaware	
2018	Particle Properties	B+
2018	Chemical Engineering Thermodynamics	A
2018	Chemical Engineering Principles I	B+
2018	Applied Chemical Kinetics	B
2019	Chemical Engineering Principles II	B-
2019	Advanced Transport Phenomena	B
2019	Advanced Molecular Modeling and Simulation of Soft Materials	B-
2020	Advanced Biochemical Engineering	A
2020	Practical NMR Spectroscopy	A
2020	Vibrational Spectroscopy	A

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Solomon, Kevin

eRA COMMONS USER NAME (credential, e.g., agency login): kvsolomon

POSITION TITLE: Associate Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
McMaster University, Hamilton, ON	BENG	05/2006	Chemical Engineering & Bioengineering
Massachusetts Institute of Technology, Cambridge, MA	MS	05/2008	Chemical Engineering Practice
Massachusetts Institute of Technology, Cambridge, MA	PHD	08/2012	Chemical Engineering (Synthetic Biology)
University of California, Santa Barbara, CA	Postdoc	12/2015	Systems Biology/Fungal Genomics

A. Personal Statement

My role in this NCCAT proposal is Principal Investigator. I am experienced, committed, and well-prepared to support Akash in this project. I lead a growing research group which studies cutting-edge systems and synthetic biology approaches for sustainable solutions to (bio)materials and medicine. I have almost 2 decades of experience in this field and my lab has pioneered the engineering and recombinant expression of the Barley Stripe Mosaic Viral-like particles (BSMV VLPs) proposed in this study. I have encouraged and fostered the independence of Akash's research, which culminated in a co-developed seed award ($60,000 in annual direct costs) that was funded by the NIH Delaware IDeA Network of Biomedical Research Excellence (DE-INBRE) and completed in Spring 2024. This award represented a new biomedical direction that aligned strongly with Akash's interests and built on our established platform of BSMV VLPs for nanoparticle synthesis. Over my 6-year independent career, I have supervised 14 PhD students, 3 MS students and 4 postdoctoral associates. To date, I have conferred 3 PhDs and completed training of 1 postdoc; these graduates have gone on to pursue biomedical research postdocs (Michigan Medicine; WUSTL Energy, Environmental, & Chemical Engineering) and industrial research positions. Students are strongly encouraged to be active within the research community, publishing at least 5 papers before graduation of which 3 are first author. To professionalize trainees and build strong professional networks, I support and encourage their participation in national meetings annually beginning in their 2nd year of training.

As a Black man, I have a strong commitment to trainee mentorship and provide a unique perspective to mentor students from less privileged backgrounds. This commitment has been recognized with a Purdue University Residences' Most Outstanding Faculty award, an honor I was nominated for by an undergraduate trainee in my lab. My lab is multiethnic and inclusive including religious minorities, underrepresented populations (e.g. 50% of undergrad trainees are African women) and members of the LGBTQ+ community. The training environment within my lab supports rich collaborative and interdisciplinary interactions with academic, industrial and national lab partners (e.g. the Joint Genome Institute, Phase Genomics, Oklahoma State University) to facilitate student training and development that transcends molecular scales and tackles important biological and biomedically-relevant problems. This environment also served as the basis of my testimony before Congress on the future of the US bioeconomy and the training of practitioners in synthetic biology.

1. Engineering Our Way to a Sustainable Bioeconomy: Hearings before the House Science, Space, and Technology Subcommittee on Research and Technology, US House of Representatives, 116th Congress (2019) (Testimony of **Kevin Solomon**). https://www.congress.gov/event/116th-congress/house-event/109051

B. Positions, Scientific Appointments, and Honors

Positions and Employment

2023 –	Associate Professor of Chemical & Biomolecular Engineering, University of Delaware, Newark, DE
2022 –	Trainer, Computational Biology, Bioinformatics, and Biomedical Data Science (i3-CBB) T32 Program
2022 –	Director, NIIMBL Workforce Development Training Center for Biopharma Manufacturing
2021 – 2023	Assistant Professor of Chemical & Biomolecular Engineering, University of Delaware, Newark, DE
2021 –	Trainer, Chemistry-Biology Interface T32 Program
2021 –	Trainer, Microbiology Graduate Program
2021 –	Faculty Affiliate, Center for Plastics Innovation
2021 –	Affiliated Faculty, Delaware Biotechnology Institute
2019 –	Adjunct Professor, Agricultural & Biological Engineering, Purdue University
2016 – 2020	Assistant Professor of Agricultural & Biological Engineering, Purdue University, West Lafayette, IN
2016 – 2020	Trainer for Purdue University Interdisciplinary Life Sciences (PULSe) Microbiology & Biotechnology Training Groups
2017 – 2020	Member of the Laboratory of Renewable Resources Engineering (LORRE), Purdue University, West Lafayette, IN
2018 – 2020	Member of the Purdue Institute of Inflammation, Immunology and Infectious Disease
2012 – 2015	Postdoctoral Scholar, Chemical Engineering, University of California, Santa Barbara, CA
2006 – 2012	Graduate Research Assistant, Julie Payette Post Graduate Scholar (2006), NSERC Postgraduate Research Scholar (2008 – 2011), Massachusetts Institute of Technology, Cambridge, MA

Professional Memberships and Appointments

2020 –	Council Member, Engineering Biology Research Consortium
2020 –	Associate Editor, Frontiers in Fungal Biology – Fungal Biotechnology Section
2019 –	Academic Member, Engineering Biology Research Consortium
2014 –	Member, International Metabolic Engineering Society
2013 –	Member, Society of Biological Engineers
2011 –	Member, American Chemical Society – Biochemical Tech Division (ACS-BIOT)
2010 –	Member, American Institute of Chemical Engineers (AIChE)

Honors

2022	NSF Faculty Early Career Development (CAREER) Award
2022	Society for Industrial Microbiology & Biotechnology (SIMB) Early Career Award
2022	Invited Speaker at National Academy of Engineering (NAE) 2022 US Frontiers of Engineering Symposium, Seattle, WA
2021	Invited participant to NAE 2021 German – American Frontiers of Engineering Symposium, Oak Ridge, TN
2020	Named as one of the 1000 Inspiring Black Scientists in America by Cell Mentor

2019	Congressional testimony before the 116th US Congress House Science, Space, and Technology Subcommittee on Research and Technology
2019	US Department of Energy (DOE) Early Career Award
2018	Most Outstanding Faculty, Purdue University Residences
2017	Genewiz Empower New Faculty Award
2014	Distinguished Young Scholar, UW-Seattle
2013	Nucleic Acids Research Travel Award, Intl. Conf. on Biomolecular Eng., Ft. Lauderdale, FL
2011	Invited Webinar, Best of BIOT, American Chemical Society
2010	Science Education Leadership Award, Synthetic Biology Engineering Research Center
2010	Genopole Travel Grant, International Conference on Synthetic Biology, Paris, France
2009 – 2011	PGS D Scholar, Natural Sciences & Engineering Research Council of Canada (NSERC)
2008	PGS M Scholar, Natural Sciences & Engineering Research Council of Canada (NSERC)
2006	Julie Payette PGS M Scholar, Natural Sciences & Engineering Research Council of Canada
2006	Merit Award, Society of Chemical Industry
2006	Lemelson Presidential Fellow, Lemelson Foundation (MIT)
2004	Undergraduate Student Research Award, Natural Sciences & Engineering Research Council of Canada (NSERC)

C. Contributions to Science

1. **Engineering Anaerobic Fungi for Biotechnology:** Since the start of my independent career, I've begun to integrate my training in synthetic biology and systems biology to develop tools to manipulate anaerobic fungi and control their properties for biotech. Our initial studies have characterized the baseline properties of these fungal systems and described approaches for ongoing development. Future work will interrogate newly acquired -omics data sets (HiC sequencing, long read NGS, MS-acquired proteomes, RNAseq, histone PTM analysis, etc) with bioinformatic approaches to tease out the genetic potential of anaerobic fungi, including potential natural products with biomedical applications, and create tools to manipulate this.
    a. ET Hillman, LR Readnour, KV Solomon*, Exploiting the natural product potential of fungi with integrated -omics and synthetic biology approaches, ***Current Opinion in Systems Biology***, 5: 50-56 (2017). doi: 10.1016/j.coisb.2017.07.010
    b. C Hooker, KZ Lee*,* KV Solomon*, Leveraging the biotechnology potential of anaerobic fungi*, Current* ***Opinion in Biotechnology***, 59, 103-110 (2019). PMID: 31005803.
    c. ET Hillman, M Li, CA Hooker, J Englaender, IR Wheeldon, KV Solomon*, Hydrolysis of lignocellulose by anaerobic fungi produces free sugars and organic acids for two-stage fine chemical production with *Kluyveromyces marxianus*, ***Biotechnology Progress***, 37 (5): e3172 (2021). PMID: 33960738
    d. CL Swift, KB Louie, BP. Bowen, CA Hooker, KV Solomon, V Singan, C Daum, CP Pennacchio, K Barry. V Shutthanandan, JE Evans, IV Grigoriev, TR Northen, MA O'Malley*, Co-cultivation of anaerobic fungi with rumen bacteria establishes an antagonistic relationship, ***mBio***, 12(4):01442-21 (2021). PMID: 34399620
    e. ET Hillman*, E Frazier, E Shank, A Ortiz-Velez*, J Englaender, KV Solomon*, Anaerobic fungal mevalonate pathway genomic biases lead to heterologous toxicity underpredicted by codon adaptation indices, ***Microorganisms****,* 9(9):1986 (2021). PMID: 34576881
2. **Fungal Genomics & Systems Biology:** Microbial systems possess a wealth of uncharacterized proteins with attractive properties for biotechnology. One such system is anaerobic fungi that efficiently degrade untreated plant material, a property needed for economical biofuels. In this work, I characterized an understudied early diverging line of fungi resident in the digestive tracts of large herbivores that had eluded scientists for many years. I leveraged high-throughput next generation sequencing, bioinformatics, and traditional biochemical analyses to rapidly identify novel protein candidates and evaluate their function. These rich datasets provide data that were critical to forming testable hypotheses, which were then confirmed biochemically. Among these discoveries was the first direct evidence of a fungal cellulosome, which had

been proposed a decade earlier. This work revealed the complete composition of the cellulosome as well as provided insights as to the function of its components.

a. KV Solomon, CH Haitjema, JK Henske, SP Gilmore, D Borges-Rivera, A Lipzen, H Brewer, S Purvine, AT Wright, MK Theodorou, IV Grigoriev, A Regev, DA Thompson D, MA O'Malley*. Early-branching gut fungi possess a large, comprehensive array of biomass-degrading enzymes. ***Science***. 2016 February 18; 351(6278):1192-1195. PMID: 26912365.
b. S Seppälä, KV Solomon, SP Gilmore, JK Henske, MA O'Malley*. Mapping the membrane proteome of anaerobic gut fungi identifies a wealth of carbohydrate binding proteins and transporters. ***Microbial Cell Factories***. 2016; 15(1):212. PMID: 27998268.
c. CH Haitjema, SP Gilmore, JK Henske , KV Solomon, R de Groot, A Kuo, S Mondo, AA Salamov , K LaButti, Z Zhao, J Chiniquy, K Barry, HM Brewer, S Purvine, AT Wright, M Hainaut, B Boxma, T van Alen, JHP Hackstein, B Henrissat, S Baker, IV Grigoriev, MA O'Malley*. A parts list for fungal cellulosomes revealed by comparative genomics. ***Nature Microbiology***. 2017; 2:17087. PMID: 28555641.
d. C Hooker, E Hillman, J Overton, A Ortiz-Velez, M Schacht, A Hunnicutt, N Mosier, KV Solomon*, Hydrolysis of untreated lignocellulosic feedstock is independent of S-lignin composition in newly classified anaerobic fungal isolate, *Piromyces* sp. UH3-1, ***Biotechnology for Biofuels***, 11:293 (2018). PMID: 30386430.

3. **Synthetic Biology/Dynamic Gene Regulation**: Biological components may be characterized and repurposed in non-native contexts to create complex new functionality. My early work focused on the design rules for expressing these components in a non-native host. Through these studies, I created a synthetic gene circuit incorporating antisense RNA and regulatory proteins that were able to dynamically regulate central metabolism to enable production of a non-natural product in *E. coli*. In so doing, I produced product at >90% of the theoretical yield and established a new paradigm of dynamic flux regulation or metabolite valves for the optimization of biosynthetic production pathways.

a. KV Solomon, KL Prather*. The zero-sum game of pathway optimization: Emerging paradigms for tuning gene expression. ***Biotechnology Journal***. 2011 September; 6(9):1064-1070. PMID: 21695787.
b. KV Solomon, T Sanders, KL Prather*. A dynamic metabolite valve for the control of central carbon metabolism. ***Metabolic Engineering***. 2012 November; 14(6):661-671. PMID: 23026120.
c. KV Solomon, T Moon, B Ma, T Sanders, KL Prather*. Tuning Primary Metabolism for Heterologous Pathway Productivity. ***ACS Synthetic Biology***. 2013 March 15; 2(3):126-135. PMID: 23656436.
d. KV Solomon, E Ovadia, F Yu, W Mizunashi, MA O'Malley*. Mitochondrial targeting increases specific activity of a heterologous valine assimilation pathway in Saccharomyces cerevisiae***.*** ***Metabolic Engineering Communications***. 2016 December 31; 3:68-75. PMID: 29468114.

4. **Engineering Viral-Like Particles:** As part of my independent career, I've begun to apply my training in synthetic biology and systems biology to novel systems such as barley stripe mosaic virus. Here, I've led a multidisciplinary team engineering viral nanoparticles with diverse morphology and surface characteristics. We have established novel viral-like particles derived from barley-stripe mosaic virus that we are currently developing as a vector for drug delivery and vaccine development. Prior to our work, barley-stripe mosaic virus could only be produced *in planta* via infection, limiting opportunities for engineering. This platform has a tunable size allowing for increased cargo carrying capacity and is more surface active permitting richer, programmed interactions with the immune system for successful stimulation of an appropriate response. We are currently developing technologies to control this surface functionality.

a. KZ Lee,V Basnayake Pussepitiya ‡,YH Lee ‡,S Loesch-Fries,M Harris,S Hemmati, KV Solomon*, Engineering Tobacco Mosaic Virus and its Virus-Like-Particles for Synthesis of Biotemplated Nanomaterials, ***Biotechnology Journal***, 16 (4): 200311 (2021). PMID: 33135368

b. YH Lee‡, KZ Lee‡, RG. Susler, CA. Scott, L Wang, LS Loesch-Fries, MT Harris , KV Solomon*, Bacterial production of Barley Stripe Mosaic Virus Biotemplates for Palladium Nanoparticle Growth, ***Applied Nano Materials***, 3 (12): 12080 - 12086 (2020). https://doi.org/10.1021/acsanm.0c02570

Complete List of Published Work in My Bibliography:
https://www.ncbi.nlm.nih.gov/myncbi/1pmWT1wpU8qA4/bibliography/public/