

Asher Williams

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Education

Ph.D. Chemical Engineering

May 2020

Rensselaer Polytechnic Institute, Troy NY

B.S. Chemical & Biomolecular Engineering

May 2015

New York University Polytechnic School of Engineering, Brooklyn NY

Research Experience

Cornell University, Ithaca NY

Feb 2020 - Present

Cornell Presidential Postdoctoral Fellow, School of Chemical & Biomolecular Engineering

- Cell-free biosynthesis of conjugate vaccines against enteric infections.
- Engineering ex vivo immune organoids for modeling immune responses and generating antibodies.

Rensselaer Polytechnic Institute, Troy NY

Sep 2015 – Dec 2019

Graduate Research Associate, Center for Biotechnology & Interdisciplinary Studies

Advisors: Dr. Mattheos A. G. Koffas and Dr. Robert J. Linhardt

Research focused on engineering metabolism of microbes to biosynthesize target products (particularly polysaccharides and glycosaminoglycans) and express enzymes for biomedical and analytical applications.

- Designed and cloned genetic pathways for polysaccharide biosynthesis and recombinant protein production in *E. coli* and *Bacillus megaterium*.
 - ⇒ Collaboration with G3 Pharmaceuticals, Boston MA, for recombinant production and characterization of endotoxin-free human galectin-3 protein in *B. megaterium*.
 - ⇒ Collaboration with Aspen Pharma Group, Oss Netherlands, for recombinant production and characterization of various forms of chondroitinase AC II lyase enzyme, in *E. coli* and *A. aureus*.
- Optimized expression and improved activity of chondroitin sulfotransferase enzymes in *E. coli* and *Pichia pastoris*.
- Shake flask to bench-top fermenter bioprocess scale-up for high-value pharmaceutical compound production.
- Optimized the biosynthesis of deuterated glycosaminoglycan therapeutics in engineered microorganisms.
- ÄKTA/FPLC and gravity flow column protein purification using affinity and AEX chromatography.
- LC-MS, nuclear magnetic resonance (NMR) and GPC analysis of bioengineered glycosaminoglycans; HPLC-based detection of sugar uptake and metabolism.
- Mentored 5 undergraduate students and 3 graduate students.
- Reviewer: Bioprocess and Biosystems Engineering, Biotechnology and Bioengineering, Glycobiology, Metabolic Engineering, Current Opinion in Biotechnology.

NASA Ames Research Center, Moffett Field CA

Jun - Aug 2015

Research Intern, Bioengineering Branch

Advisor: Dr. John Hogan

- Developed and troubleshoot the design of a rehydratable single-use bioreactor prototype for *in situ* production of the carotenoids lutein and zeaxanthin in space.
- Helped to secure federal funding for this project by conducting preliminary experimental tests on the bioreactor model using an engineered strain of the yeast *Saccharomyces cerevisiae*.

New York University Polytechnic School of Engineering, Brooklyn, NY

Jun 2014 - Jan 2015

Undergraduate Research Assistant

Advisor: Dr. Jin R. Kim

- Helped to develop a new and potentially general method of protein stabilization via insertional fusion of a relatively unstable “guest” enzyme into a highly stable “host” thermophilic protein; preventing the restriction of available sequence spaces or compromising other intrinsic properties.

Awards & Recognition

- **Cornell Presidential Postdoctoral Fellow**, Cornell University 2020
- **Class of 2020 Changemaker**, Rensselaer Polytechnic Institute 2020
- **RPI Presidential Graduate Research Fellow**, Rensselaer Polytechnic Institute 2016 - 2018
- **Howard P. Isermann Fellow**, Rensselaer Polytechnic Institute 2015 - 2016
- **Founders' Day Award**, New York University 2015
- **Women in Science Scholar**, New York University College of Arts & Science 2014 - 2015
- **Dean's List Member and Honors Scholar**, New York University 2011 - 2015
- **Trinidad & Tobago National Open Science Scholar** (awarded to top 1% of students taking the Caribbean Advanced Proficiency Examination) 2011 - 2015

Skills

Experimental

- Spectroscopy analysis (CD, UV-Vis, fluorescence), molecular biology techniques (PCR, molecular cloning, site-directed mutagenesis, Gibson assembly, plasmid construct design and gene validation), bacterial cell culture fermentation and cell harvesting, sterile culture technique, bench-top bioreactor operation, recombinant protein expression in both bacteria and yeast, protein extraction (sonication, French press), purification, quantification using colorimetric assays and characterization (SDS PAGE, Western blotting, BCA assay), enzyme activity assays, enzyme kinetics, chromatography separation techniques (FPLC, liquid chromatography-mass spectrometry (LCMS), ÄKTA pure, size exclusion chromatography (SEC), gel permeation chromatography (GPC-HPLC), affinity chromatography), tangential flow filtration (TFF), depth filtration, microscopy (bright field, phase contrast, fluorescence), DNA extraction, DNA agarose gels, transfection (electroporation).

Computational

- Microsoft Office Suite (Word, Excel, PowerPoint), MS OSX environment, Pymol, LIMS, Design Expert.

Certifications

- Lean Green Belt & Six Sigma Green Belt (*Institute of Industrial & Systems Engineering (IISE)*) Mar 2019
Statistical and data analysis for continuous process improvement (Kaizen, Root Cause Analysis, Pareto Charts), Failure Mode and Effects Analysis (FMEA), DFSS principles to design new processes, Value Stream Mapping, 5S System.

Work and Leadership Experience

Biogen, Cambridge MA

Jul – Dec 2019

Gene Therapy Downstream Process Development (Co-Op)

- Developed and characterized a platform affinity column capture step for AAV gene therapy products.
- Built a high-throughput tool kit for gene therapy process development, using TECAN robot for rapid screening of recombinant clones for viral vector production.
- Supported development activities and material generation across various line functions (e.g. harvesting and clarification).

Manuscript in Preparation: Leveraging High-Throughput Strategies to Accelerate AAV Purification Process Development

NSF BIO I-Corps, Philadelphia PA

Jun 2019

Bio-entrepreneurship Workshop Student Mentor

- Served as the embedded student mentor for a cohort of 36 early-career life science researchers, learning about biotechnology commercialization, federal regulation, and how to identify outstanding problems that lead to entrepreneurial opportunities in gene/cell therapy technologies.
- Led facilitated exercises to explore the commercial potential of academic research as taught by NSF I-Corps™ nationwide.
- Supported participants' development of ideas and hypotheses to test with experts at the 2019 BIO exhibition.

Rensselaer Polytechnic Institute, Troy, NY

Graduate Teaching Assistant - Introduction to Cell and Molecular Biology

Jan – May 2019

- Taught and oversaw weekly laboratory sessions to guide undergraduate students in gaining technical proficiency in cell and molecular biology techniques.
- Directed and evaluated students on the effective presentation and documentation of scientific data.

Graduate Teaching Assistant - Material, Energy, and Entropy Balances**Aug – Dec 2018**

- Developed review material and led exam review classes and problem-solving sessions.
- Conducted office hours to assist students with homework assignments and course material.
- Graded quizzes, exams, and homework assignments for a class of 95 students.

RPI Black Graduate Students Association - Vice President**May 2018 – Jun 2019**

- Oversaw and managed Executive Board members to ensure effective and timely fulfillment of duties.
- Spearheaded the launch of recruitment/retention initiatives to increase minorities in graduate education at RPI.
- Presided Executive Board meetings in the absence of the President.

New York University, Brooklyn NY**NYU Residential Life & Housing Services - Resident Assistant and Summer Assistant****Aug 2013 – May 2015**

- Conducted Health and Safety inspections to ensure abidance to policies.
- Created and implemented programs to encourage student engagement and educational support.
- Served as a mentor and advisor for 70 upperclassman and graduate students.
- Served as overnight responder to manage crises, conflicts, and policy related incidents within residence hall.

The National Society of Black Engineers (NSBE) - Membership Chairperson**Sep 2012 - May 2013**

- Increased NYU's NSBE chapter membership by more than 20% over a period of 9 months.
- Cultivated interest in NSBE by hosting informational workshops and programs and facilitating new student mixers.
- Organized membership data and produced monthly reports to the Vice-President and executive board.

NYU Orientation and Welcome Week Leader**Aug - Sept 2012**

- Managed the transition of incoming students to New York University.
- Mentored first year students and supported university staff in the planning phase of NYU's Welcome Week.

Publications in Peer-Reviewed Journals

1. X. Fu, **A. Williams**, C. Argento, K. Soni, M. Bakhshayeshi, J. Pieracci "Leveraging High-Throughput Strategies to Accelerate AAV Purification Process Development" (Manuscript in Preparation).
2. A. Badri, **A. Williams**, W. He, K. Fraser, J. S. Dordick, R. J. Linhardt, M. A. G. Koffas "Complete biosynthesis of a sulfated glycosaminoglycan in Escherichia coli" *Nature Communications* (Under Review).
3. Z. Olmsted, C. Stigliano, A. Badri, F. Zhang, **A. Williams**, M. A. G. Koffas, Y. Xie, R. J. Linhardt, J. Cibelli, P. Horner "Low-dose homotypic neural stem cell survival and retention in the spinal cord injury cavity" *Nature Scientific Reports* (In Press).
4. D. G. Shastri, F. J. Irudayanathan, **A. Williams**, M. A. G. Koffas, R. J. Linhardt, S. Nangia, P. Karande "Rational identification and characterization of peptide ligands for targeting polysialic acid" *Nature Scientific Reports* (2020). [\[Link\]](#)
5. **A. Williams**, K. S. Gedeon, D. Vaidyanathan, Y. Yu, C. Collins, J. S. Dordick, R. J. Linhardt, M. A.G. Koffas "Metabolic Engineering of Bacillus megaterium for Heparosan Biosynthesis using Pasteurella multocida Heparosan Synthase, PmHS2", *Microbial Cell Factories* (2019). [\[Link\]](#)
6. A. Badri, **A. Williams**, K. Xia, R. J. Linhardt, M. A. G. Koffas "Increased 3'phosphoadenosine-5'-phosphosulfate levels in engineered Escherichia coli facilitates in vitro synthesis of Chondroitin Sulfate A", *Biotechnology Journal* (2019). [\[Link\]](#)
**Cover image design for this issue on Systems Metabolic Engineering [\[Link\]](#)
7. Y. Yu, **A. Williams**, X. Zhang L. Fu, K. Xia, Y. Xu, F. Zhang, J.Liu, M. A. G. Koffas, R. J. Linhardt "Specificity and action pattern of heparanase Bp, a β -glucuronidase from Burkholderia pseudomallei", *Glycobiology* (2019). [\[Link\]](#)
8. S. Kim, J. Kundu, **A. Williams**, A. S. Yandulskaya, J. R. Monaghan, R. L. Carrier, R. J. Linhardt "Glycosaminoglycans compositional analysis of urodele axolotl (Ambystoma mexicanum) and porcine retina", *Glycoconjugate Journal* (2019). [\[Link\]](#)

9. B. F. Cress, U. Bhaskar, D. Vaidyanathan, **A. Williams**, C. Cai, X. Liu, L. Fu, V. M-Chari, F. Zhang, S. A. Mousa, J. S. Dordick, M. A. G. Koffas, R. J. Linhardt "Heavy heparin, a stable isotope-enriched, chemoenzymatically-synthesized poly-component drug", *Angewandte Chemie* (2019). [\[Link\]](#)
10. **A. Williams**, R. J. Linhardt, M. A.G. Koffas "Metabolic Engineering of Capsular Polysaccharides", *Emerging Topics in Life Sciences* (2018). [\[Link\]](#)
****Designed the cover image of this special issue - Metabolic Bioengineering: Glycans and Glycoconjugates [\[Link\]](#)**
11. A. Badri, **A. Williams**, R. J. Linhardt, M. A.G. Koffas "The Road to Animal-Free Glycosaminoglycan Production: Current Efforts and Bottlenecks", *Current Opinion in Biotechnology* (2018). [\[Link\]](#)
12. **A. Williams**, W. He, B. F. Cress, X. Liu, J. Alexandria, H. Yoshizawa, K. Nishimura, T. Toida, M. A. G. Koffas, R. J. Linhardt "Cloning and expression of recombinant chondroitinase AC II and its comparison to the *Arthrobacter aurescens* enzyme", *Biotechnology Journal* (2017). [\[Link\]](#)
13. D. Vaidyanathan, **A. Williams**, J. S. Dordick, M. A.G. Koffas, R. J. Linhardt "Engineered heparins as new anticoagulant drugs", *Bioengineering & Translational Medicine* (2016). [\[Link\]](#)
14. B. Pierre, J. W. Labonte, T. Xiong, E. Aoraha, **A. Williams**, V. Shah, E. Chau, K. Y. Helal, J. Gray, J. R. Kim "Molecular determinants for protein stabilization by insertional-fusion to a thermophilic host protein", *ChemBioChem* (2015). [\[Link\]](#)

Patents

"Microbial Synthesis of Sulfated Glycosaminoglycans," Abinaya Badri, **Asher Williams**, Robert J. Linhardt, Mattheos A.G. Koffas; U.S. PATENT PENDING (2019).

Conference Presentations

Oral

1. *Protein Engineering and Metabolic Engineering Strategies for Animal-Free Chondroitin Sulfate Production*. American Chemical Society (ACS) National Meeting, Orlando FL, April 2019.
****2019 ACS-BIOT Travel Grant**
2. *Cloning and Expression of Recombinant Chondroitinase AC II and its Comparison to the *Arthrobacter aurescens* Enzyme*. The National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE) 45th Annual Meeting. Orlando, FL, Sept 2018.
****First place award for the best oral research pitch**
****2018 NOBCChE Advancing Science Conference Grant**
3. *Animal-Free Chondroitin Sulfate Production Through Protein Engineering and Metabolic Engineering Strategies*. American Institute of Chemical Engineers (AIChE) Annual Meeting. Pittsburgh, PA, Oct 2018.
4. *Engineering Microorganisms for the Efficient Synthesis of Polysaccharides*. American Institute of Chemical Engineers (AIChE) Annual Meeting. Minneapolis, MN, Nov 2017.

Posters

1. *Metabolic Engineering of Microorganisms for the Efficient Synthesis of Capsular Polysaccharides*. BASF North America Research Forum. Iselin, NJ, August 2018.
2. *Metabolic Engineering of Microorganisms for the Efficient Synthesis of Capsular Polysaccharides*. The National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE) 44th Annual Meeting. Minneapolis, MN, Nov 2017.
****2017 NOBCChE Advancing Science Conference Grant**

Professional Societies

American Institute of Chemical Engineers (AIChE), Tau Beta Pi Engineering Honor Society, Omega Chi Epsilon National Honor Society for Chemical Engineering, The National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE), National Society of Black Engineers (NSBE), American Chemical Society (ACS), Order of the Engineer.