

Asher Williams, Ph.D.

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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

Presidential Postdoctoral Fellow with Prof. Matthew DeLisa

- Developing a platform for cell-free biosynthesis of conjugate vaccines against emerging pathogens.
- Characterizing the immunogenicity and protective efficacy of vaccine candidates in laboratory animals.

Rensselaer Polytechnic Institute, Troy NY

Sep 2015 – Dec 2019

Graduate Research Fellow with Profs. Mattheos Koffas & Robert 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. aurescens*.
- 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.
- Manuscript Reviewer: Bioprocess and Biosystems Engineering, Biotechnology and Bioengineering, Glycobiology, Metabolic Engineering, Current Opinion in Biotechnology, ACS Synthetic Biology, Scientific Reports.

NASA Ames Research Center, Moffett Field CA

Jun - Aug 2015

Research Intern, Bioengineering Branch

Advisor: Dr. John Hogan

- Developed and troubleshot 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: Prof. 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.

Fellowships, Honors & Awards

- **Cornell Postdoc Spotlight**, Cornell University 2021
- **G7 Summit Vaccine Luminary**, G7 Global Vaccine Confidence Summit 2021
- **1000 Inspiring Black Scientists in America**, Cell Press 2020
- **Next Generation Faculty Symposium Honorable Mention**, UC Berkeley/Stanford/UCSF 2020
- **MIT Rising Star in Chemical Engineering**, Massachusetts Institute of Technology 2020
- **Presidential Postdoctoral Research Fellow**, Cornell University 2020
- **William N. Gill Prize for Excellence in Dissertation Research Nominee**, Rensselaer Polytechnic Institute 2020
- **RPI Class of 2020 Changemaker**, Rensselaer Polytechnic Institute 2020
- **Best Oral Research Pitch (1st place award)**, NOBCChE 45th Annual Meeting 2018
- **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
- **Honors Scholar and Dean's List Member**, 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

Publications in Peer-Reviewed Journals

1. **A. Williams**, M. P. DeLisa "Microbial glycoengineering for therapeutic applications: the past, present, and future" *Biotechnology Advances* (manuscript in preparation).
 2. K. F. Warfel, **A. Williams**, D. A. Wong, S. E. Sobol, A. S. Karim, M. P. DeLisa, M. C. Jewett "A low-cost, thermostable, cell-free protein synthesis platform for on-demand production of glycoconjugate vaccines" (under review).
 3. X. Fu, **A. Williams**, J. Pieracci, M. Bakhshayeshi "Leveraging High-Throughput Purification to Accelerate Viral Vector Process Development" *Journal of Chromatography A* (2022). [\[Link\]](#)
 4. 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* (2021). [\[Link\]](#)
 5. Z. Olmsted, C. Stigliano, A. Badri, F. Zhang, **A. Williams**, M. A. G. Koffas, Y. Xie, R. J. Linhardt, J. Cibelli, P. Horner "Fabrication of homotypic neural ribbons as a multiplex platform optimized for spinal cord delivery" *Nature Scientific Reports* (2020) [\[Link\]](#).
 6. 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). [\[Link\]](#)
 7. **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). [\[Link\]](#)
 8. 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* [\[Link\]](#)
9. 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). [\[Link\]](#)

10. 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). [\[Link\]](#)
11. 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). [\[Link\]](#)
12. **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* [\[Link\]](#)
13. 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). [\[Link\]](#)
14. **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). [\[Link\]](#)
15. D. Vaidyanathan, **A. Williams**, J. S. Dordick, M. A.G. Koffas, R. J. Linhardt "Engineered heparins as new anticoagulant drugs", *Bioengineering & Translational Medicine* (2016). [\[Link\]](#)
16. 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

"Recombinant microorganisms for in vivo production of sulfated glycosaminoglycans" WO2021050634A1 WIPO (PCT) (2021).

Conference Presentations

Oral

1. *Synthetic glycobiology: designing and engineering glycomolecules inside and outside of living cells*. Society for Industrial Microbiology and Biotechnology Annual Meeting. San Francisco CA, Aug 2022.
2. *Cell-Free Biosynthesis of Conjugate Vaccines*. Black in Immunology Week – Immunology Technology Panelist & Featured Speaker. Virtual Presentation, Nov 2020.
3. *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]**
4. *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. **[*2018 NOBCChE Advancing Science Conference Grant]**
5. *Animal-Free Chondroitin Sulfate Production Through Protein Engineering and Metabolic Engineering Strategies*. American Institute of Chemical Engineers (AIChE) Annual Meeting. Pittsburgh PA, Oct 2018.
6. *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]**

Invited Seminars

- **Invited Speaker**, [2022 Simons Society of Fellows Alumni Symposium](#). Sept 2022.
- **Keynote Speaker**, Columbia's Annual Women in Science & Engineering (WISE) Conference. Oct 2022.
- **Featured Speaker**, [Genome BC Annual Genomics Forum](#). Covid-19: Ask Me Anything. May 2021.

- **Invited Speaker**, NIH-SANAS Chapter. *Cultural Competency in Science Communication*. March 2021.
- **Invited Speaker**, [NYU Women in STEM Summit](#). March 2021.
- **Invited Speaker**, University of the West Indies, Department of Life Sciences. *Cell-Free Biosynthesis of Conjugate Vaccines Against Bacterial infections*. Sept 2021.
- **Invited Speaker**, [SUNY Cortland CNYLA](#). *Vaccine Biosynthesis at the Point of Care & My Journey in STEM*. Nov 2021.
- **Featured Speaker**, Thoracic Society of Trinidad & Tobago. *Vaccine Updates & Vaccine Hesitancy Insights*. Nov 2021.
- **Invited Speaker**, Columbia University Department of Chemical Engineering Spring Seminar Series. Feb 2022.
- **Invited Speaker**, [University of Notre Dame Edison Lecture Series](#). April 2022.

Skills

Experimental

- Spectroscopy analysis (CD, UV-Vis, fluorescence), molecular biology techniques (PCR, molecular cloning, site-directed mutagenesis, Gibson assembly, plasmid construct design, gene validation, quantitative polymerase chain reaction - qPCR), bacterial cell culture fermentation and cell harvesting, mammalian cell-based assays (Caco-2), 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), ELISA, depth filtration, microscopy (bright field, phase contrast, fluorescence), DNA extraction, DNA agarose gels, transfection (electroporation), animal (mouse) handling, immunization & blood draws.

Computational

- Microsoft Office Suite (Word, Excel, PowerPoint), MS OSX environment, Pymol, LIMS, PRISM, 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. **[Certificates & Badges: [Lean Green](#); [Six Sigma](#)]**

Science Communication & Public Engagement (*AAAS Center for Public Engagement*)

Aug 2021

- AAAS Science Communication and Public Engagement Fundamentals Workshop **[Certificate]**

Work, Service & Leadership Experience

Team Halo Guide & CDC Foundation Campaign Member

Jan 2021 – Present

Team Halo is a collaboration between the United Nations Verified initiative, Gavi, the Vaccine Alliance, and the University of London Vaccine Confidence Project aimed at promoting confidence around COVID-19 vaccines.

- Communicating complex scientific concepts in a simple and relatable format to a broad audience.
- Developing, producing and editing video content, fielding questions, and doing informational interviews across various platforms to increase public confidence in COVID-19 vaccines.
- Contributed video content to the [COVID-19 Vaccine Communication Handbook & Wiki](#).
- Member of the CDC Foundation's social media campaign to combat vaccine misinformation.

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).

Paper published based on this work: [\[Link\]](#)

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.

Vice President - RPI Black Graduate Students Association**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***Resident Assistant and Summer Assistant - NYU Residential Life & Housing Services*****Aug 2013 – May 2015**

- Conducted Health and Safety inspections to ensure abidance to policies.
- Supported university staff to manage the transition of incoming students to NYU.
- 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.

Membership Chairperson - National Society of Black Engineers**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.

Media & Press

- **Vice**, *Doctors and Scientists Are Fighting Vaccine Misinformation on TikTok* [\[Link\]](#) **2021**
- **Mashable**, *8 TikTok Accounts to Follow if You're Tired of Covid Misinformation* [\[Link\]](#) **2021**
- **The Optimist**, *Rise of the "TikDocs"* [\[Link\]](#) **2021**
- **The Cornell Daily Sun**, *Cornell Scientist Uses TikTok to Battle "Infodemic"* [\[Link\]](#) **2021**
- **Trinidad & Tobago Newsday Newspaper**, *Business Insider – Women in Science* [\[Link\]](#) **2021**
- **Insider**, *Meet the Scientists on TikTok Challenging Conspiracy Theories and Misinformation* [\[Link\]](#) **2021**
- **Cornell University Graduate School**, *Postdoc Spotlight* [\[Link\]](#) **2021**
- **The New York Times**, *Sanofi Accelerates Its Timeline for Coronavirus Vaccine Development* [\[Link\]](#) **2020**
- **The New York Times**, *Antibodies Good. Machine-Made Molecules Better?* [\[Link\]](#) **2020**
- **One Million Women in STEM**, *Feature* [\[Link\]](#) **2020**
- **RPI Class of 2020 Changemakers**, *Microbial Drug Factories* [\[Link\]](#) **2020**
- **Discover PhDs**, *Advice for Current and Future PhDs* [\[Link\]](#) **2020**
- **Represent 365**, *Feature* [\[Link\]](#) **2020**
- **Cell Press**, *1000 Inspiring Black Scientists in America* [\[Link\]](#) **2020**

Professional Societies

National Black Postdoctoral Association, Society of Cornell Fellows, 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.