Daniel Bojar, PhD

Curriculum Vitae

Employment

10/2024 - present **Tenured Associate Professor** (Senior Lecturer) at the Department of Chemistry and Molecular Biology & the Wallenberg Centre for Molecular and Translational Medicine of the **University of Gothenburg**.

01/2021 - 10/2024 **Tenure-track Assistant Professor** (Associate Senior Lecturer) at the Department of Chemistry and Molecular Biology & the Wallenberg Centre for Molecular and Translational Medicine of the **University of Gothenburg**.

09/2019 - 12/2020 **Postdoctoral Researcher** in the research group of Dr. James J. Collins at **MIT** and the Wyss Institute for Biologically Inspired Engineering of **Harvard University**.

05/2016 - 07/2019 **PhD in Mammalian Synthetic Biology** (defended February 14th, graduated June 3rd) in the research group of Dr. Martin Fussenegger at the D-BSSE of **ETH Zurich**.

09/2012 - 03/2016 **Research assistant** at **ETH Zurich** (Dr. M. Fussenegger), **University of Zurich** (Dr. M. Jinek, Dr. A. Plueckthun), and the **Max Planck Society** (Dr. M. Hothorn).

Education

12/2023 **Docent** in Bioinformatics at University of Gothenburg.

09/2014 - 03/2016 **Master of Science ETH** in 'Structural Biology and Biophysics' at ETH Zurich, final grade: 5.78 / 6.0 [Swiss Grades]. Graduated with Distinction.

10/2011 - 07/2014 **Bachelor of Science** 'Biochemistry' at Eberhard-Karls-University Tuebingen, final grade: 1.1 / 1.0 [German Grades]. Awarded for graduating at the top of the program.

Selected Publications (ORCID: 0000-0002-3008-7851; Full List)

10/2024 Bennett, A.R., Lundstrøm, J., Chatterjee, S., Thaysen-Andersen, M., and **Bojar, D.*** Ratios in Disguise, Truths Arise: Glycomics Meets Compositional Data Analysis. *Nat Commun*, accepted. bioRxiv

10/2024 Joeres, R. and **Bojar, D.*** Higher-Order Message Passing for Glycan Representation Learning. *Proceedings of the 'Machine Learning in Structural Biology' workshop at NeurIPS*. arXiv.

09/2024 Porat, J., Watkins, C.P., Jin, C., Xie, X., Tan, X., Lebedenko, C.G., Hemberger, H., Shin, W., Chai, P., Collins, J.J., Garcia, B.A., **Bojar, D.**, and Flynn, R.A. O-glycosylation contributes to mammalian glycoRNA biogenesis. *bioRxiv*, doi:10.1101/2024.08.28.610074 .

08/2024 Urban, J., Joeres, R., Thomès, L., Thomsson, K.A., and **Bojar, D.*** Navigating the Maze of Mass Spectra: A Machine-Learning Guide to Identifying Diagnostic Ions in *O*-Glycan Analysis. *Anal Bioanal Chem*, doi:10.1007/s00216-024-05500-9.

07/2024 Urban, J., Jin, C., Thomsson, K.A., Karlsson, N.G., Ives, C.M., Fadda, E., and **Bojar, D.*** Predicting glycan structure from tandem mass spectrometry via deep learning. *Nat Methods*, 21:1206-1215.

05/2024 Kellman, B., Mariethoz, J., Zhang, Y., Shaul, S., Jeffris, M., Sandoval, D., Armingol, E., Bao, B., Lisacek, F., **Bojar, D.***, and Lewis, N*. Decoding glycosylation potential from protein structure across human glycoproteins with a multi-view recurrent neural network. *bioRxiv*, 10.1101/2024.05.15.594334.

04/2024 Bennett, A.R. and **Bojar, D.*** Syntactic Sugars: Crafting a Regular Expression Framework for Glycan Structures. *Bioinform Adv*, 4:vbae059.

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04/2024 Lundstrøm, J., Thomès, L., and **Bojar, D.*** Protocol for constructing glycan biosynthetic networks using glycowork. *STAR Protoc*, 5:102937.

02/2024 Lundstrøm, J. and **Bojar, D.*** The Evolving World of Milk Oligosaccharides: Biochemical Diversity Understood by Computational Advances. *Carbohydr Res*, 109069.

02/2024 Lundstrøm, J., Gillon, E., Chazalet, V., Kerekes, N., Di Maio, A., Feizi, T., Liu Y., Varrot, A., and **Bojar, D.*** Elucidating the Glycan-Binding Specificity and Structure of Cucumis melo Agglutinin, a New R-Type Lectin. *Beilstein J Org Chem*, 20:306-320.

11/2023 Lundstrøm, J., Urban, J., and **Bojar, D.*** Decoding glycomics with a suite of methods for differential expression analysis. *Cell Rep Methods*, 100652.

08/2023 Jin, C., Lundstrøm, J., Korhonen, E., Luis, A.S., and **Bojar, D.*** Breast Milk Oligosaccharides Contain Immunomodulatory Glucuronic Acid and LacdiNAc. *Mol Cell Proteomics*, 100635.

07/2023 Lundstrøm, J., Urban, J., Thomès, L., and **Bojar, D.*** GlycoDraw: A Python Implementation for Generating High-Quality Glycan Figures. *Glycobiology*, cwad063.

06/2023 Thomès, L., Karlsson, V., Lundstrøm, J., and **Bojar, D.*** Mammalian Milk Glycomes: Connecting the Dots between Evolutionary Conservation and Biosynthetic Pathways. *Cell Rep*, 42:112710.

03/2023 Joeres, R., **Bojar, D.**, and Kalinina, O.V. GlyLES: Grammar-based Parsing of Glycans from IUPAC-condensed to SMILES. *J Cheminformatics*, 15:37.

09/2022 Qin, R., Mahal, L.K., and **Bojar, D.*** Deep Learning Explains the Biology of Branched Glycans from Single-Cell Sequencing Data. *iScience*, 25:105163.

08/2022 **Bojar, D.*** and Lisacek, F*. Glycoinformatics in the AI era. *Chem Rev*, 122:15971-15988.

02/2022 Lundstrøm, J. and **Bojar, D.*** Structural Insights into Host-Microbe Glycointeractions. *Curr Opin Struct Biol*, 73:102337.

01/2022 **Bojar, D.**, Meche, L., Meng, G., Eng, W., Smith, D.F., Cummings, R.D., Mahal, L.K. A Useful Guide to Lectin Binding: Machine-Learning Directed Annotation of 57 Unique Lectin Specificities. *ACS Chem Biol*, 17:2993-3012.

12/2021 Lundstrøm, J., Korhonen, E., Lisacek, F., and **Bojar, D.*** LectinOracle – A Generalizable Deep Learning Model for Lectin-Glycan Binding Prediction. *Adv Sci*, 9:2103807.

09/2021 Thomès, L., and **Bojar, D.*** The role of fucose-containing glycan motifs across taxonomic kingdoms. *Front Mol Biosci*, 8:755577.

07/2021 **Bojar, D.*** Construction of caffeine-inducible gene switches in mammalian cells. *Meth Mol Biol*, 2312:159-168.

06/2021 Thomès, L., Burkholz, R., and **Bojar, D.*** Glycowork: A Python package for glycan data science and machine learning. *Glycobiology*, 31:1240-1244.

06/2021 Burkholz, R., Quackenbush, J., and **Bojar, D.*** Using Graph Convolutional Neural Networks to Learn a Representation for Glycans. *Cell Rep*, 35:109251.

02/2021 Strittmatter, T., Egli, S., Bertschi, A., Plieninger, R., **Bojar, D.**, Xie, M., and Fussenegger, M. Gene switch for L-glucose-induced biopharmaceutical production in mammalian cells. *Biotechnol Bioeng*, 118:2220-2233.

01/2021 Uhlich, M. and **Bojar, D.*** DeepConnection: Classifying Relationship State from Images of Romantic Couples. *J Comput Soc Sci*, 4:631-653.

01/2021 **Bojar, D.**, Powers, R.K., Camacho, D.M., and Collins J.J. Deep-Learning Resources for Studying Glycan-Mediated Host-Microbe Interactions. *Cell Host Microbe*, 29:132-144.

11/2019 Saxena, P., **Bojar, D.**, Zulewski, H., and Fussenegger, M. Synthetic Biology Technologies for Beta Cell Generation. *Transplantation, Bioengineering, and Regeneration of the Endocrine Pancreas*, ISBN:9780128148310.

10/2019 **Bojar, D.** and Fussenegger, M. The Role of Protein Engineering in Biomedical Applications of Mammalian Synthetic Biology. *Small*, 16:1903093.

04/2019 Kim, H.$^{+}$, **Bojar, D.**$^{+}$, and Fussenegger, M. A CRISPR/Cas9-based central processing unit to program complex logic computation in human cells. *Proc Natl Acad Sci USA*, 9:7214-7219. Co-first authorship.

03/2019 **Bojar, D.**, Fuhrer, T., and Fussenegger, M. Purity by design: Reducing impurities in bioproduction by stimulus-controlled global translational downregulation of non-product proteins. *Metab Eng*, 52:110-123.

07/2018 **Bojar, D.** and Fussenegger, M. Programming mammalian gene expression with the antibiotic simocyclinone D8 and the flavonoid luteolin. *AIChE J*, 64:4237-4246.

06/2018 **Bojar, D.**, Scheller, L., Charpin-El Hamri, G., Xie, M., and Fussenegger, M. Caffeine-inducible gene switches controlling experimental diabetes. *Nat Commun*, 9:2318.

04/2018 Scheller, L., Strittmatter, T., Fuchs, D., **Bojar, D.**, and Fussenegger, M. Generalized extracellular molecule sensor (GEMS) platform for programming cellular behavior. *Nat Chem Biol*, 14:723-729.

04/2018 Kojima, R.$^{+}$, **Bojar, D.**$^{+}$, Rizzi, G., Charpin-El Hamri, G., El Baba, M., Saxena, P., Auslaender, S., Tan, K.R., and Fussenegger, M. Designer exosomes produced by implanted cells intracerebrally deliver therapeutic cargo for Parkinson's disease treatment. *Nat Commun*, 9:1305. Co-first authorship.

11/2017 Hansen, S., Stueber, J., Ernst, P., Koch, A., **Bojar, D.**, Batyuk, A., and Plueckthun, A. Design and applications of a clamp for green fluorescent protein with picomolar affinity. *Sci Rep*, 7:16292.

10/2017 Saxena, P., **Bojar, D.**, Zulewski, H., and Fussenegger, M. Generation of glucose-sensitive insulin-secreting beta-like cells from human embryonic stem cells by incorporating a synthetic lineage-control network. *J Biotechnol*, 259:39-45.

08/2017 Saxena, P., **Bojar, D.**, and Fussenegger, M. Design of synthetic promoters for gene circuits in mammalian cells. *Meth Mol Biol*, 1651:263-273.

06/2016 **Bojar, D.** and Fussenegger, M. The best of both worlds: Reaping the benefits from mammalian and bacterial therapeutic circuits. *Curr Opin Chem Biol*, 34:11-19.

01/2014 **Bojar, D.**, Martinez, J., Santiago, J., Rybin, V., Bayliss, R., and Hothorn, M. Crystal structures of the phosphorylated BRI1 kinase domain and implications for brassinosteroid signal initiation. *Plant J*, 78:31-43.

Patents and licenses

01/2020 Fussenegger, M., Scheller, L., Strittmatter, T., Fuchs D. and **Bojar, D.** Generalized Extracellular Molecule Sensor System. U.S. Application No. 16/737,076, filed January 8th, 2020

External Funding & Awards

01/2024 - 12/2024 Funding of **220,000 SEK** from the Program for Academic Leaders in Life Science (PALS).

12/2023 **Personal prize for successful young researchers** from the Jeansson Foundations.

11/2023 - 10/2026 Funding of **600,000 SEK** [**$55,000**] from the Jeansson Foundations.

10/2023 - 10/2026 Funding of **1,000,000 SEK** [**$95,000**] from the Hasselblad Foundation.

10/2023 - 10/2026 Funding of **4,000,000 SEK** [**$380,000**] from the IngaBritt and Arne Lundbergs Research Foundation.

01/2023 - 12/2026 VR Establishment Grant. Funding of **4,000,000 SEK** [**$380,000**] from the Swedish Research Council.

05/2022 **Forbes 30 Under 30 Europe** in the category of 'Science and Healthcare'.

12/2021 **Rising Stars** series of *Advanced Science* for especially promising early-career researchers.

12/2021 - 11/2024 VR Project Grant. Funding of **3,600,000 SEK** [**$350,000**] from the Swedish Research Council. Co-Applicant (Main applicant: Sara Lindén).

08/2021 - 06/2022 Research Leader Initiative (REAL) of the University of Gothenburg (top 20% of new group leaders).

06/2021 - 06/2022 NMMP Scientific Network Facilitation Grant. Funding of **69,500 SEK** [**$6,500**] over one year.

01/2021 - 12/2024 Wallenberg Molecular Medicine Fellowship from the Knut and Alice Wallenberg Foundation. Approximately **16,000,000 SEK** [**$1,533,000**] over four years.

06/2020 - 12/2025 Branco Weiss Fellowship – Society in Science. Funding of **500,000 CHF** [**$521,000**] over five years; success rate: 1.4%

04/2020 - 04/2021 Foresight Fellow in Health & Longevity. Foresight Institute, CA, USA.

06/2018 Selected Young Scientist at the 68th Lindau Nobel Laureate Meeting (600 most promising young physiology / medicine scientists worldwide)

11/2017 One of six finalists for the Lopez-Loreta Prize 2018 (funding of 1,000,000 €)

12/2016 ETH silver medal for outstanding Master's thesis by ETH Zurich

09/2014 - 02/2016 Fellow of the „Excellence Scholarship and Opportunity Program" of ETH Zurich (most talented 2-3% of their year)

07/2014 Award for outstanding academic achievements in the Bachelor of Science – Biochemistry by the Eberhard-Karls-University Tuebingen (best student of their year)

04/2013 - 03/2016 Fellow of the German Academic Scholarship Foundation (best 10% of their year)

03/2013 Deutschlandstipendium. Granted for one year. Gratefully declined.

05/2011 - 10/2016 Fellow of e-fellows (best 10% of their year)

Conference Activity

10/2024 Letters from the Frontier: New Advances in Glycan-Focused AI. Dutch Biochemistry NVBMB Meeting. Nijmegen, Netherlands. **Invited Speaker**.

09/2024 White Gold – Discovering and Analyzing New Milk Oligosaccharides. 16th Bratislava Symposium on Saccharides, Bratislava, Czech Republic. **Invited Speaker**.

06/2024 Sialic Symphony: Composing Function Through Sequence. SialoGlyco2024, Lille, France. **Invited Speaker**.

05/2024 Impossible Today, Obvious Tomorrow: Clarke's Laws in Glycobiology. 2024 Canadian Glycomics Symposium & 10th Warren Workshop, Edmonton, Canada. **Invited Speaker**.

04/2024 Precision Glycomics: How AI and advanced mass spectrometry are changing the game. DDLS symposium Cell and Molecular Biology, Gothenburg, Sweden. **Invited Speaker**.

08/2023 An Interface is Worth a Thousand Pictures: An Integrated Systems Approach to Glycobiology. 26th International Symposium on Glycoconjugates, Taipei, Taiwan. **Invited Keynote Speaker**.

07/2023 glAIcobiology. The 21st European Carbohydrate Symposium (Eurocarb) in Paris, France. **Invited Speaker**.

06/2023 Full-Stack Glycoinformatics: From Data to Insight. Beilstein Glyco-Bioinformatics Symposium, Limburg, Germany. **Invited Speaker**.

10/2022 It Begins in Delight and Ends in Wisdom: Milk & Mass Spectrometry. Opening symposium of the Glycomics Institute of Alberta, Canada. **Invited Speaker**.

10/2022 The Cup of Life is Not so Shallow - Milky Secrets. Annual Meeting of the Society of Glycobiology, Amelia Island, FL, USA. **Invited Keynote Speaker**.

07/2022 Mucin Glycans & Machine Learning in Infection & Inflammation. Mucins in Health & Disease, Utrecht, The Netherlands. **Invited Speaker**.

11/2021 Glycobiology & Machine Learning: There is Grandeur in This View of Life. Frontiers in Congenital Disorders of Glycosylation Symposium, San Diego, CA, USA. **Invited Speaker**.

11/2021 Endless Forms Most Beautiful – Merging Machine Learning and Glycobiology. Annual Meeting of the Society of Glycobiology, San Diego, CA, USA. **Invited Keynote Speaker**.

11/2021 Learning the Language of Pathogen-Glycan Cross-Talk. The Branco Weiss Symposium, Zurich, Switzerland. **Invited Speaker**.

07/2021 Of Language Models and Graphs - How Machine Learning can Advance Glycobiology. The 21st European Carbohydrate Symposium (Eurocarb) in Paris, France. Selected talk. Conference cancelled due to SARS-CoV-2.

06/2021 Bringing Glycobioinformatics to the Masses with the Python Package Glycowork. 3rd Australasian Glycoscience Symposium. Selected talk.

06/2020 Sequence-to-Function Models for Glycobiology Using Machine Learning (Poster). 12th International Symposium on Glycosyltransferases, Boston, MA, USA.

06/2020 Using Glycan-Focused Machine Learning for Functional Glycomics. 4th annual New England Glyco-Chemistry Meeting, Boston, MA, USA.

09/2018 Treating Diabetes with a Cup of Coffee. 3rd Bioengineering & Translational Medicine Conference, Boston, MA, USA.

09/2018 Treating Diabetes with a Cup of Coffee. Cell Therapies and Bioengineering Conference, UCSF, San Francisco, CA, USA.

11/2017 Synthetic Biology-inspired Differentiation of Human Embryonic Stem Cells into Beta-like Cells. EuroTech Winter School, Eindhoven University of Technology, Eindhoven, Netherlands.

05/2014 Mechanistic insights into brassinosteroid signalling initiation (Poster). Interdisciplinary Plant Group Symposium "Plant Protein Phosphorylation", Columbia, MO, USA.

Selected Invited Campus Talks

11/2024 TBD. Glyco@Alps Day. Université Grenoble Alpes, November 28th.

10/2024 You can't hide from glycans: Complex carbohydrates in health and disease. Department of Microbiology and Immunology, University of Gothenburg, October 17th.

09/2024 Merging Machine Learning and Glycobiology. 2nd GlycoTwinning Summer School. NOVA University Lisbon, September 6th.

09/2024 Probing the Single-Cell Glycome with AI. i3S at University of Porto, September 3rd.

05/2024 The Milky Way – Navigating Biodiversity and Function. Chemical Biology division seminar at Department of Life Sciences at Chalmers University of Technology, May 2nd.

12/2023 From Complexity to Clarity: Algorithmic Exploration of Glycans. GlyGen Webinar series, December 12th.

10/2023 Glycans Unleashed – An Algorithmic Odyssey. Max Planck Institute of Colloids and Interfaces, October 11th.

02/2023 The Immune system, AI, and the Glycome - Predicting and Modulating Immune Activity with Complex Carbohydrates. AstraZeneca. February 9th.

12/2022 Mapping Data to Sequence to Function - The Promise of Glycobioinformatics. European Glycoscience Community webinar. December 1st.

10/2022 Glycan-Mediated Pathogenesis: A Candy a Day Keeps the Doctor Away. Institute of Pharmaceutical Sciences, ETH Zurich. October 19th.

09/2022 Sugars in the Cloud: Machine Learning and Data Science for Glycobiology. APBioNET, September 21st.

03/2022 Sweet Computations: Glycans in Health. Computational Health Seminar, Institute of Computational Biology, Helmholtz Zentrum Munich. March 28th.

03/2022 Glycans in Health: The Role of Machine Learning. Yearly event of the Wallenberg Centre for Molecular and Translational Medicine, March 10th.

12/2021 Glycans & Graphs: Understanding the most complex biological sequence with machine learning. Saarland University, December 14th.

05/2021 Sugar, Sugar – Unraveling the Roles of Glycans in Biology via Machine Learning. Gothenburg Bioinformatics Network (GOTBIN), May 25th.

05/2020 SweetOrigins: Extracting Evolutionary Information from Glycans. Department of Biostatistics, Harvard University, May 18th.

03/2020 Sequence-to-Function Models for Glycobiology Using Machine Learning. Harvard School of Public Health, March 6th.

02/2020 SweetTalk: A Machine Learning-Based Language Model for Glycans. ETH Zurich, Feb. 11th.

Teaching

04/2023 - present Phylogeny lectures in the Evolutionary Genomics course (BIO442) at the University of Gothenburg.

01/2023 - present Molecular neurobiology lectures in the Neurobiology course (BIO501) at the University of Gothenburg.

12/2021 - present AI in drug development lecture in the Drug Development course (BIO524) at the University of Gothenburg.

02/2021 - present Course leader for the Bioinformatics and Functional Genomics course (BIO210) at the University of Gothenburg.

09/2021 - 2022 Glycomics/Glycoproteomics lectures in the Advanced Functional Genomics course (BIO406) at the University of Gothenburg.

03/2021 - 2022 CRISPR/Cas9 knockout screen lecture and seminar in the Experimental Systems Biology course (BIO448) at the University of Gothenburg.

06/2016 - 06/2019 Cellular Engineering Mammalian Cells course at ETH Zurich.

Mentoring

2021 - present Supervised PhD studies of Jon Lundstrøm, James Urban, and Ujala Bashir and Master's theses of Emma Korhonen, Viktoria Karlsson, Christina Grozou, Wilma Björkman, and Francesco Vacca at University of Gothenburg.

2017 - 2018 Supervised Master's thesis of Jonas Fernbach and Amgen Scholarship of Aonia Traxler at ETH Zurich.

Community Service

2021 - present **Steering committee** of the Gothenburg Bioinformatics Network (GOTBIN).

2021 - present | Organizing the yearly Wallenberg Centre for Molecular and Translational Medicine Symposium.

2021 - 2023 | **Chair** of the Glycoinformatics Consortium (GLIC).

2021 - 2022 | Organizing the Molecular and Cellular Biology division seminar series for the Department of Chemistry and Molecular Biology at the University of Gothenburg.

2019 | News & Views articles for OUP *Synthetic Biology*: 1, 2, 3, 4, 5

Reviewer for *Nature Machine Intelligence*, *Nucleic Acids Research*, *Biotechnology and Bioengineering*, *Chem*, *Analytical and Bioanalytical Chemistry*, *IEEE Open Journal of Engineering in Medicine and Biology*, *Frontiers in Bioinformatics*, *ACS Synthetic Biology*, *Current Opinion in Chemical Biology*, *Communications Chemistry*, *Beilstein Journal of Organic Chemistry*, *BBA Advances*, *Chemical Science*, *PLoS One*, OUP *Synthetic Biology*, *Comp Biochem Physiol B Biochem Mol Biol*, *Critical Reviews in Biotechnology*, *JACS Au*, *Cell Systems*, *Nature Communications*, and *Glycobiology*.

Grant reviewer for UK Research and Innovation, Academia Sinica.

Outreach & Communication

Writing in-depth and compelling science communication articles for Times Higher Education, Towards Data Science, Nautilus Magazine, Medium, Massive Science, ASBMB, PLOS Synbio, Tales of the Cocktail, Spektrum der Wissenschaft, GenoFAB, etc.

Reviewing popular science books for the Royal Society of Biology.

Communicating science to diverse audiences through invited public talks (750+ attendees) and selected talks at several international scientific conferences (100+ attendees).

01/2018 - 04/2019 | Communications Officer on the EUSynBioS (European association of synthetic biology) Steering Committee; organized an international conference in Toulouse (100+ attendees).

Further Information: LinkedIn, GitHub, Google Scholar