Jessica A. Willi, Ph.D.

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CURRENT POSITION

2024-present **Assistant Professor of Biochemistry**
University of Lethbridge, Alberta, Canada
Teaching Biochemistry and Synthetic Biology
Research on function and evolution of the ribosome, and finding new ways to unlock the ribosome's catalytic potential for green chemistry

EDUCATION

2019 **Ph.D., University of Bern**, Bern, Switzerland
Ph.D. in Biochemistry & Molecular Biology, summa cum laude
NCCR RNA and Disease PhD program in RNA Biology
Thesis adviser: Prof. Norbert Polacek, Department of Chemistry and Biochemistry
Thesis: "Rusty Ribosomes: How oxidation affects ribosomal RNA and translation"

2015 **M.Sc., University of Bern**, Bern, Switzerland
M.Sc. in Molecular Life Sciences, magna cum laude
specialization in Biochemistry and Chemical Biology
Thesis: "Atomic mutagenesis of the ribosome: oxidation of conserved bases in the peptidyl transferase center"

2014 **B.Sc., University of Bern**, Bern, Switzerland
B.Sc. in Biochemistry and Molecular Biology, magna cum laude
Thesis: "Exploring the ribosome via molecular modifications"

WORK/RESEARCH EXPERIENCE

2020-24 **Post-doctoral Researcher, Northwestern University**, Evanston, Illinois, USA
Group of Michael C. Jewett (moved to Stanford Bioengineering in 2023)
Performed research in the area of rational engineering of translational systems for synthetic biology, developing assays for the quantification of cell-free protein synthesis, and directed evolution of ribosomes.

2015-19 **Ph.D. Thesis Research, University of Bern,** Bern, Switzerland
Investigated the causes and effects of oxidative stress on the translation process, specifically the ribosomal RNA. Employed the method of atomic mutagenesis to study the consequence of a single base oxidation on the 2.5 MDa complex of the ribosome. Demonstrated how this damage may contribute to neurodegenerative diseases like Alzheimer's.

2018-19 **Visiting research scholar, University of Cincinnati,** Cincinnati, Ohio, USA
Developed two mass-spectrometry based methods to quantify and map oxidation sites on ribosomal RNA and transfer RNA. Host: Prof. Patrick Limbach

2014-15 **Research Assistant, University of Bern,** Bern, Switzerland
Studied how RNA oxidation of the ribosome's active site affects peptide bond formation and other key translation functions.

2013 **Technical Assistant, University of Bern,** Bern, Switzerland

Survey of the building's ventilation system under Martin Schuppler, Head of Safety

FELLOWSHIPS AND AWARDS

Early Postdoc.Mobility Fellowship: Swiss National Science Foundation (SNF) supported my research project P2BEP3_191771 with funding for 18 months + 3 months extension (2020)
Award for Best PhD Thesis in Chemistry and Biochemistry, awarded annually by the Faculty of Natural Sciences, University of Bern (2019)
Doc.Mobility Fellowship: Project P1BEP3_181745 funded by the Swiss National Science Foundation (SNF), providing funding for 6 months research abroad and travel (2018)
National Center of Competence in Research: RNA & Disease, Travel Grant (2018)
Poster Award for "Excellence in RNA Research" by the RNA Society (2017)
Grad School for Biochemistry & Molecular Biology Travel Grant (2017)

CONFERENCE PRESENTATIONS

Oral Presentations

EMBO Ribosome Synthesis, Engelberg, Switzerland (2022)
"Repurposing ribosomes for synthetic biology"
Ribosome Structure and Function, Bordeaux, France (2022)
"Translationally active proto-ribosomes with smaller rRNA"
Rustbelt RNA Meeting, Columbus, Ohio, USA, (2018)
"Rusty ribosomes: how oxidation damages rRNA and affects translation"
Life Sciences Switzerland LS² Annual Meeting, Lausanne, Switzerland (2016)
"Oxidized bases in the ribosome's peptidyl transferase center and their effects on translation"

Poster Presentations

24th Annual Meeting of the RNA Society, Krakow, Poland, (2019)
"Revealing where ribosomal RNA gets oxidized via Mass Spectrometry-generated maps"
Ribosome Structure and Function, Merida, Mexico (2019)
"Revealing where ribosomal RNA gets oxidized via Mass Spectrometry-generated maps"
NucMod, 1st Symposium on Nucleic Acid Modifications, Mainz, Germany (2017)
"RNA oxidation harms the ribosome and differentially affects the catalytic center"
22nd Annual Meeting of the RNA Society, Prague, Czech Republic (2017)
"How oxidation of the ribosome's active site affects translation"
LS² Annual Meeting, Zurich, Switzerland (2017)
Ribosome Structure and Function, Strasbourg, France (2016)
"Oxidized bases in the ribosome's peptidyl transferase center and their effects on translation"
LS² Annual Meeting, Lausanne, Switzerland (2016)
Swiss RNA Workshop, Bern, Switzerland (2015)
20th Annual Meeting of the RNA Society, Madison, Wisconsin, USA (2015)
"Oxidized bases in the ribosome's peptidyl transferase center and their effects on translation"

TEACHING AND MENTORING

University Teaching Experience

Assistant Instructor with Prof. Achim Stocker in leading a weekly lab-course in Biochemistry for second-year students. Co-designed curriculum, created new lab component, managed online resources, prepared and supervised experimental setups, and graded the students' reports (2015-2019)
Seminar contributor in Department Seminar chaired by Prof. André Schneider (2015, 2017, 2018)

Mentorship of Students

During Post-doc, mentored two graduate students (defended in 2021, 2023)
During Ph.D., directly supervised an undergraduate student (2018),
and trained two technical assistants (2017, 2019).
During undergrad, worked as a tutor in sciences, math, and English on university and high school (Matura) level (2009-2013)

PUBLICATIONS IN PREPARATION / PRE-PRINT

Jessica A. Willi, and Michael C. Jewett (2024) “Directed evolution of translationally active proto-ribosomes with minimized rRNA” *In preparation*

Jose L. Alejo†, Dylan Girodat†, Michael J. Hammerling, **Jessica A. Willi**, Michael C. Jewett, Aaron E. Engelhart, Katarzyna P. Adamala (2024) “Alternate conformational trajectories in protein synthesis” *Under Revision at Nature Communications, BioXriv preprint*

PEER-REVIEVED PUBLICATIONS

Google Scholar **ORCID 0000-0001-5672-3089**
† contributed equally to this work *corresponding author

Jessica A. Willi, Ashty Karim, and Michael C. Jewett (2024) “Fluorescent minihelix assay for translation quantification in high-throughput cell-free systems” *ACS Synthetic Biology* *10.1021/acssynbio.4c00266*

Camila Kofman, **Jessica A Willi**, Ashty S. Karim, and Michael C. Jewett (2024) “Ribosome pool engineering for improved and robust cell-free systems” *ACS Central Science* *10.1021/acscentsci.3c01413* *Cover*

Kanghun Lee†, **Jessica A. Willi**†, Namjin Cho, Inseon Kim, Michael C. Jewett, and Joongoo Lee (2023) "Cell-free Biosynthesis of Peptidomimetics” *Biotechnology and Bioprocess Engineering* *10.1007/s12257-022-0268-5*

Camila Kofman, Andrew M Watkins, Do Soon Kim, **Jessica A Willi**, Alexandra C Wooldredge, Ashty S Karim, Rhiju Das, and Michael C. Jewett (2022) “Computationally-guided design and selection of high performing ribosomal active site mutants” *Nucleic Acids Research* *10.1093/nar/gkac1036*

Michel Fasnacht, Stefano Gallo, Puneet Sharma, Maximilian Himmelstoß, Patrick A Limbach, **Jessica Willi*,** and Norbert Polacek (2022) “Dynamic 23S rRNA modification ho5C2501 benefits Escherichia coli under oxidative stress” *Nucleic Acids Research* *10.1093/nar/gkab1224*

Jessica Willi, Pascal Küpfer, Guillermo Fernandez, Damien Evéquoz, Assaf Katz, Christian Leumann, and Norbert Polacek (2018) “Oxidative stress damages rRNA inside the ribosome and differentially affects the catalytic center” *Nucleic Acids Research* *10.1093/nar/gkx1308*

Thomas Philipp Hoernes, Nina Clementi, Michael Andreas Juen, Xinying Shi, Klaus Faserl, **Jessica Willi**, Catherina Gasser, Christoph Kreutz, Simpson Joseph, Herbert Lindner, Alexander Hüttenhofer, and Matthias David Erlacher (2018) “Atomic mutagenesis of stop codon nucleotides reveals the chemical prerequisites for release factor-mediated peptide release”. *PNAS* *10.1073/pnas.1714554115*

Miriam Koch, **Jessica Willi**, Ugo Pradère, Jonathan Hall, and Norbert Polacek (2017) “Critical 23S rRNA interactions for macrolide-dependent ribosome stalling on the ErmCL nascent peptide chain”. *Nucleic Acids Research* *10.1093/nar/gkx195*

SERVICE ACTIVITIES

Journal Manuscript Review

Reviewed or co-reviewed manuscripts for the following journals: Nature Communications, ACS Synthetic Biology, Nucleic Acid Research, ChemBioChem, Frontiers, Archives of Microbiology

Judging

Committee member judging for Bernese Environmental Research Award (*Berner Umweltforschungspreis,* 2011-2015)

Poster judge at Undergraduate Research Expo and Creative Arts Exposition, Northwestern University (2022-2024)

Educational Outreach

Presented my research creatively at the Science Slam at GCB Symposium (2018)

Alumni presenter at Career Day of the Department of Chemistry and Biochemistry (2018)

Science presenter at University of Bern „Nacht der Forschung" (night of research) (2017)

Led science demonstration/discussion during the Open House of the Department of Chemistry and Biochemistry (2016)

Service on Boards and Committees

Professorship appointment committee for RNA biology at the Department of Chemistry and Biochemistry at the University of Bern (2017)

Senate of University of Bern, representing the Faculty of Science students (2013-2015)

Bernese Award for Environmental Research (Berner Umwelt-Forschungspreis) (2013-2015)

Faculty of Science Session, students' representative (2012-2015)

Swiss Student Union (VSS), representative for University of Bern (2012-2015)

Parliament of the Students' Union of the University of Bern (SUB) (2010-2015)

Board member of the TUX party, President for 1 year. TUX party participates in legislative branch of the Students' Union and promotes open-source policy (2010-2015)

Membership in professional organizations

RNA Society (2015-present)

LS^2 (Life Sciences Switzerland, 2016-present)

GRANT WRITING EXPERIENCE

Wrote two successful proposals to the Swiss National Science Foundation (SNF), resulting in personal research grants (funding years 2018, 2020-2021)

Contributed to collaborative annual report writing for grants from the Army Research Office's Multidisciplinary University Initiative (MURI) (2020-2023), and the Swiss National Focus in Research on RNA & Disease (2017-2018), and two SNF project grants (2014-2016, 2016-2019)

PROFESSIONAL DEVELOPMENT

Mentoring Up + Down Workshop Series, Northwestern University, Evanston, USA (2023)

Inclusive STEM Teaching Project course, Boston University, USA (2023)

Contextualizing your research workshop, Chicago, USA (2023 & 2021)

Scientific Writing and Communication Course, Bern, Switzerland (2018)

NCCR RNA and Disease: Summer School "RNA & RNP architecture: from structure to function to disease", Saas Fee, Switzerland (2017)

NCCR RNA and Disease: Summer School "RNA as target and drug", Saas Fee, Switzerland (2015)

University of Wuhan (武汉大学) Summer School, Wuhan, China (2014)

LANGUAGES

Swiss	(native speaker)
German	(highly proficient)
English	(highly proficient)
French	(Intermediary)
Chinese Mandarin 中文	(Beginner)