

Curriculum Vitae

Roger M. Benoit

Personal Information

Surname / Name / Middle Name:

Benoit / Roger / Marc

Researcher ID (OrcID):

orcid.org/0000-0001-9420-7739

Lab Webpage:

<https://www.psi.ch/lnb/roger-benoit>

Department:

Department of Biology and Chemistry

Institute:

Paul Scherrer Institute,
Laboratory of Nanoscale Biology (LNB)

Address:

OFLC/101, Forschungsstrasse 111,
5232 Villigen PSI, Switzerland

Education

2006 – 2010

Project: *Novel approaches for the identification and quantification of biologics and protein-protein interactions*

Ph.D. Thesis

Dr. rer. nat. Biophysics

University of Salzburg, Novartis Institutes for BioMedical Research Basel and Vienna

Ph.D. supervisor: Prof. Dr. Manfred Auer (now at University of Edinburgh)

2004 – 2005

Project: *Universal, seamless and directional integration of DNA fragments into plasmids by RecA-independent homologous recombination in E. coli*

Master Thesis

Master of Science in Molecular Biology

University of Basel, Biozentrum, and Novartis Basel, Switzerland

2001 – 2006

Gene-to-structure research

Research Associate

(overlapping with Master Thesis)

Novartis Pharma AG and Novartis Institutes for BioMedical Research Basel, Protein Structure Unit

1997 – 2000

Project: *Characterization of the membrane faces of z-membranes in transgenic Saccharomyces cerevisiae cells overexpressing the IBV M-GUS fusion protein by freeze-fracture electron microscopy*

Bachelor of Arts Degree in Molecular, Cellular and Developmental Biology (MCDB)

University of Colorado at Boulder, USA

Employment History

June 2017 – present

Structure-based protein engineering, structural biology, pathogen-receptor interactions, membrane proteins

Scientist / Project Leader / Principal Investigator

Paul Scherrer Institute, Villigen, Switzerland
Laboratory of Nanoscale Biology (LNB)
Department of Biology and Chemistry (BIO)

May 2015 – December 2016

Biophysical and structural characterization of Botulinum toxin - receptor complexes.

Scientist / Project Leader

Paul Scherrer Institute, Villigen, Switzerland
Laboratory of Biomolecular Research (LBR)
Department of Biology and Chemistry (BIO)

2011 – April 2015

Project: *Membrane protein gene-to-structure project. Collaboration with UCB Pharma.*

Postdoctoral Researcher

Paul Scherrer Institute, Villigen, Switzerland
Laboratory of Biomolecular Research (LBR)
Department of Biology and Chemistry (BIO)

2001 – 2006

Gene-to-structure research

Research Associate

(overlapping with Master Thesis)
Novartis Pharma AG and Novartis Institutes for
BioMedical Research Basel, Protein Structure Unit

Approved research projects

- Molecular biomimetic scaffolds for the structure elucidation of receptor-drug complexes by cryo-EM (SNF SPARK CRSK-3_190414) 2020 - 2022
- Scaffolds for cryo-EM of GPCRs (Promedica Foundation, Chur) 2018 - 2021
- Scaffolds for the structure elucidation of GPCR-drug complexes by cryo-EM (Novartis FreeNovation, Winner 2017, category "Drug Discovery" 2018 - 2019

Teaching activities

I am teaching a part of the Biochemistry Blockcourse lectures and a part of the Biochemistry - Molecular Principles of Life lectures at the Biozentrum, University of Basel.

Together with Prof. Dr. Philipp Christen (University of Zürich) and Dr. Rolf Jaussi (Paul Scherrer Institute), I have written a textbook about Biochemistry and Molecular Biology that was published in the Springer Spektrum Verlag in 2016. We have submitted a second, updated edition of this book to the publisher in March 2022.

Memberships in Scientific Societies

- Principal Investigator at the Life Science Zürich Graduate School (LSZGS)
- International Neurotoxin Association (INA)

Publications

Articles

Collu G., Bierig T., Krebs A.S., Engilberge S., Varma N., Guixà-González R., Sharpe T., Deupi X., Olieric V., Poghosyan E., **Benoit R.M. (2022)** *Chimeric single α -helical domains as rigid fusion protein connections for protein nanotechnology and structural biology.* **Structure**, 30, 95-106.e7., <https://doi.org/10.1016/j.str.2021.09.002>.
Press release: <https://www.psi.ch/en/media/our-research/protein-distancing>

Collu G., Mohammed I., Lafita A., Bierig T., Poghosyan E., Bliven S., **Benoit R.M. (2021)** *Cryo-EM structure of a single-chain β 1-adrenoceptor – AmpC β -lactamase fusion protein.* **bioRxiv**. doi: <https://doi.org/10.1101/2021.09.25.461805>.

Bierig T., Collu G., Blanc A., Poghosyan E., **Benoit R.M. (2020)** *Design, Expression, Purification, and Characterization of a YFP-tagged 2019-nCoV spike receptor-binding domain construct.* **Front. Bioeng. Biotechnol.**, 21, 618615. doi: 10.3389/fbioe.2020.618615. Mentioned in press release: <https://www.psi.ch/en/media/our-research/psi-advancing-in-the-fight-against-covid-19>

Skopintsev P., Ehrenberg D., Weinert T., James D., Kar. R.K., Johnson Ph., Ozerov D., Furrer A., Mous S., Martiel I., Dworkowski F., Nass K., Knopp G., Cirelli C., Gashi D., Wranik M., Gruhl T., Kekilli, D., Brünle S., Deupi X., Schertler G.F.X., **Benoit R.M.**, Panneels V., Nogly P., Schapiro I., Milne Ch., Heberle J., Standfuss J. (2020) *Femtosecond to millisecond structural changes in a light-driven sodium pump*. **Nature**, 583, 314-318, doi: 10.1038/s41586-020-2307-8. Press release: <https://www.psi.ch/en/media/our-research/elucidating-the-mechanism-of-a-light-driven-sodium-pump>

Krebs A.S.K., Bierig T., Collu G., **Benoit R.M.** (2019) *Seamless insert-plasmid assembly at sub-terminal homology regions*. **Plasmid** 106:102445. doi: 10.1016/j.plasmid.2019.102445

Benoit, R.M. (2018) *Botulinum neurotoxin diversity from a gene-centered view*. **Toxins** (Basel). 10, E310, doi: 10.3390/toxins10080310

Heydenreich F.M., Milius T, Jaussi R., **Benoit R.**, Milic D., Veprintsev, D.B. (2017) *High-throughput mutagenesis using a two-fragment PCR approach*. **Sci Rep**. doi: 10.1038/s41598-017-07010-4

Benoit R.M.*, Schärer M., Wieser M.M., Frey D. and Kammerer R.* (2017) *Crystal structure of the BoNT/A2 receptor-binding domain in complex with the luminal domain of its neuronal receptor SV2C*. **Sci Rep**. doi: 10.1038/srep43588

***= co-corresponding authors**

Benoit R.M.*, Ostermeier C., Geiser M., Li J.S.Z., Widmer H., Auer M.* (2016) *Seamless insert-plasmid assembly at high efficiency and low cost*. **PLoS One**. 11, e0153158, doi: 10.1371/journal.pone.0153158

***= co-corresponding authors**

Bianchi S., Riel W., Kraatz S., Olieric N., Frey D., Katrukha E.A., Jaussi R., Missimer J., Grigoriev I., Olieric V., **Benoit R.M.**, Steinmetz M.O., Akhmanova A., Kammerer R.A. (2016) *Structural basis for misregulation of kinesin KIF21A autoinhibition by CFEOM1 disease mutations*. **Sci Rep**. 6, 30668, doi: 10.1038/srep30668

Benoit R.M., Frey D., Wieser, M.M., Thieltges K.M., Jaussi R., Capitani G., Kammerer R.A. (2015) *Structure of the BoNT/A1 receptor complex*. **Toxicon**. 107, 25-31, doi: 10.1016/j.toxicon.2015.08.002

Kammerer R.A. and **Benoit R.M.** (2014) *Botulinum neurotoxins: new questions arising from structural biology*. **Trends Biochem Sci**. 39, 517-526, doi: 10.1016/j.tibs.2014.08.009

Benoit R.M., Frey D., Hilbert M. Kevenaar J.T., Wieser M.M., Stirnimann C.U., McMillan D., Ceska, T., Lebon, F., Jaussi R., Steinmetz M.O., Schertler F.X., Hoogenraad C.C., Capitani G. and Kammerer R.A. (2014) *Structural basis for recognition of synaptic vesicle protein 2C by botulinum neurotoxin A*. **Nature** 505, 108-11, doi: 10.1038/nature12732

Benoit R.M. and Auer M., (2011) *A direct way of redox sensing*. **RNA Biol**. 8, 18-23

Benoit R.M., Meisner N.C., Kallen J., Graff P., Hemmig R., Cèbe R., Ostermeier C., Widmer H., Auer M. (2010) *The x-ray crystal structure of the first RNA recognition motif and site-directed mutagenesis suggest a possible HuR redox sensing mechanism*. **J Mol Biol.**, 397, 1231-1244, doi: 10.1016/j.jmb.2010.02.043

Meisner N.C., Hintersteiner M., Seifert J.M., Bauer R., **Benoit R.M.**, Widmer A., Schindler T., Uhl V., Lang M., Gstach H., Auer M. (2009) *Terminal adenosyl transferase activity of posttranscriptional regulator HuR revealed by confocal on-bead screening*. **J Mol Biol.**, 386, 435-450, doi: 10.1016/j.jmb.2008.12.020

Benoit, R.M., Wilhelm, R.N., Scherer-Becker, D., Ostermeier, C. (2006) *An improved method for fast, robust, and seamless integration of DNA fragments into multiple plasmids*. **Protein Expr Purif.**, 45, 66-71

Books

Christen P., Jaussi, R. and **Benoit R.M.** (2016) *Biochemie und Molekularbiologie – Eine Einführung in 40 Lerneinheiten*. Springer-Verlag Berlin-Heidelberg-New York, Springer Spektrum, p. 1-560, ISBN 978-3-662-46430-4 - Manuscript for 2nd, updated edition submitted to publisher in March 2022

Technical notes

Ramage P, Mathis B., Fendrich G., and **Benoit R.M.** (2007) *Purification of phosphorylated protein kinases using MonoBeads ion exchange media*. **GE Healthcare Discovery Matters**, 5, 22-23

Benoit, R.M., Wilhelm, R.N., Scherer-Becker, D., Ostermeier, C. (2006) *Universal, Seamless, and Directional Integration of DNA Fragments into PCR-Linearized Plasmids using the In-Fusion™ Dry-Down PCR Cloning Kit*. Clontech Laboratories, Inc. **Clontechiques**, XXI(2), 23-24

Conferences

- Python Scripting for Biochemistry & Molecular Biology online course, Rutgers Institute for Quantitative Biomedicine, 22 February 2022
- AlphaFold v2.0 and RoseTTAFold workshop, Norwegian Artificial Intelligence Research Consortium (NORA) - online conference, 31 August - 1 September 2021
- Poster prize for our GPCR cryo-EM project (G. Collu et al.) at the 4th European Research Network on Signal Transduction (ERNEST) conference, online, 12-14 April 2021
- Chair at the Drug Discovery @SwissFEL Conference, Villigen-PSI, Switzerland 25-27 June 2019
- Poster and summary presentation at GPCR Workshop 2017, Big Island, Hawaii, 5-9 December 2017
- Toxins Conference, Basic Science and Clinical Aspects of Botulinum and other Neurotoxins, Lisbon, Portugal, 14-17 January 2015