

Henning Stahlberg

Prof. of Structural Biology, C-CINA, Biozentrum,
University of Basel, Switzerland
and: Professor of Physics, IPHYS,
EPFL, Switzerland



Date of birth: November 18, 1965
Nationality: German and Swiss
Civil status: Married to Dr. med. Milena Menegola Stahlberg (FMH), from GR, Switzerland.
Three children, born 2000, 2002 and 2007.
Lab Web site: <http://c-cina.org>
ORCID: <http://orcid.org/0000-0002-1185-4592>
ResearcherID: <http://www.researcherid.com/rid/H-1868-2011>
Google Scholar: <https://scholar.google.ch/citations?user=u9D1CicAAAAJ>

EDUCATION

2002 Habilitation, Biozentrum (Prof. **Andreas Engel**), University of Basel, Switzerland
1997 PhD, Chemistry Department (Profs. **Jacques Dubochet & Horst Vogel**), EPFL Lausanne, Switzerland
1993 Solid-State Physics, Diploma, Physics Department, Technical University Berlin, Germany

CURRENT POSITION(S)

From 2021 Director, Dubochet Imaging Center, University of Lausanne and EPFL, Switzerland
2020 – pres. Full Professor (Ordinarius), Physics Institute, EPFL, Lausanne, Switzerland
2010 – 2020 Director, Center for Cellular Imaging and NanoAnalytics, University Basel, Switzerland
2009 – 2021 Full Professor (Ordinarius), Biozentrum, University of Basel, Switzerland

PREVIOUS POSITIONS

2009 – 2010 Adjunct Assoc. Professor, Molecular and Cellular Biology, UC Davis, CA, USA
2007 – 2009 Associate Professor (tenured), Molecular and Cellular Biology, UC Davis, CA, USA
2003 – 2007 Assistant Professor, Molecular and Cellular Biology, UC Davis, CA, USA
2002 – 2003 Group Leader Structural Biology, Biozentrum, Uni Basel, Switzerland
1998 – 2002 PostDoc, Biozentrum, University of Basel, Switzerland
1990 – 1991 Undergrad Researcher, Neutron Scattering, Hahn-Meitner Institute, Berlin, Germany
1989 – 1990 Software Developer, IWIS Scientific Visualization Softw., Berlin, Germany

PUBLICATIONS

As of January 2020: 181 scientific articles
6548 citations (h-index 45) [Web of Science], or
9528 citations (h-index 55) [Google Scholar].

AWARDS

2018 F. Hoffmann-La Roche Donation (CHF 3.3 Mio), Basel, Switzerland
2009 W.M.Keck Award (US\$ 1.2 Mio), Keck Foundation, TX, USA
2008 – 2013 UC Davis Chancellor's Fellow Award, UC Davis, CA, USA
2004 – 2008 NSF CAREER award (US\$ 800k), NSF, Alexandria, VA, USA

CURRENT LAB MEMBERS

PI:	1
Senior Scientists:	5
PostDocs:	3
PhD Students:	6
Technicians:	2
Master Students:	3
<u>Administrators:</u>	<u>1</u>
Total:	21

SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

2009 – 2019	PostDocs: 27, PhD Students: 33, Master Students: 21 Biozentrum, University of Basel, Switzerland
2003 – 2010	PostDocs: 7, PhD Students: 9, Master Students: 4 Molecular and Cellular Biology, UC Davis, CA, USA

ALUMNI WITH OWN ACADEMIC GROUP

- Dr. Ricardo Guerrero-Ferreira, Emory University, Atlanta, USA
- Prof. Nicholas Taylor, University of Copenhagen, Denmark
- Dr. Sarah Shahmoradian, Paul-Scherrer Institute, Villigen, Switzerland
- Prof. Mikhail Kudryashev, Max-Planck Institute for Biophysics, Frankfurt, Germany
- Dr. Christopher Bleck, NHLB, NIH, Bethesda, MD, USA
- Prof. Po-Lin Chiu, Arizona State University, Tempe, AZ, USA
- Prof. Xiangyan Zeng, Fort Valley State Univ., Georgia, USA
- Dr. James Evans, PNNL, Richland, WA, USA
- Prof. Lia Stanciu, Purdue University, West Lafayette, IN, USA

TEACHING ACTIVITIES

2009 –	Teaching “Physics of Life”, “Biophys. Chemistry”, “Struct. Biology”, “NanoSciences”, “BioEnergy”, “Electron Microscopy”, Biozentrum, University of Basel, Switzerland
2003 – 2009	Teaching “Macromolecular Structure and Function”, “Structural Biology”, “Advanced Electron Microscopy and Image Processing”, Mol. Cell. Biol., UC Davis, CA, USA
2000 – 2003	Teaching “Digital Image Processing” and “Linear Algebra”, Biozentrum, University of Basel, Switzerland

INSTITUTIONAL RESPONSIBILITIES

2016 – 2017	Member of search committee for the Director of the Biozentrum, Uni Basel, Switzerland
2009 – 2018	Member of various (>10) faculty search committees, University of Basel, Switzerland
2009 – 2013	“Fellowship for Excellence” selection committee, Biozentrum, Uni Basel, Switzerland
2007 – 2008	Roadmap planning committee, Molecular and Cellular Biology, UC Davis, CA, USA
2003 – 2007	Member of various (>4) faculty search committees, UC Davis, CA, USA
2004 – 2009	Member of various (>5) campus committees, MCB, UC Davis, CA, USA
2004	Participation in two television ads for UC Davis Health System “There’s a whole university behind every UC Davis doctor”. UC Davis, CA, USA

REVIEWING ACTIVITIES

2019 –	SAB member, nuonex.com, Basel, Switzerland
2017 –	SAB member, leadXpro.ch, Villigen, Switzerland
2019 –	Chair of SAB, Max Planck Institute for Biophysics, Frankfurt, Germany

- 2016 – SAB member, Max Planck Institute for Biophysics, Frankfurt, Germany
- 2016 – SAB member, IBS, Grenoble, France
- 2004 – Review of grant proposals from various foundations and countries, incl. Australia: Queensland Univ.; Germany: DFG, IMPRES (MPG), VolkswagenStiftung; France: FRM; Netherlands: NeCEN; Switzerland: SNF, Ambitione, Latsis Foundation; South Africa: MRC; USA: NSF, NIH, Energy Biosci. Inst. USA, US Civilian Res.&Devel. Foundation, Duke Univ., LLNL LDRD (Livermore)
- 2002 – Review of various manuscripts for journals, incl. ACS Nano, BBA, BioCell, COSB, Comp. Biophys. J., CRDF, eLife, EMBO J., EMBO R., J. Mol. Biol., JoVE, J. Pharmacy Pharmacolo., PLOS, J. Struct. Biol., J. Separation Sci., Micron, Micr. Microanal., Nature, Nature Methods, NSMB, PNAS, Science, Structure, Ultramic., and others.
- 2004 – 2008 Review panel member at various study sections, NIH, Washington, USA

ORGANISATION OF LARGER SCIENTIFIC MEETINGS

- Aug. 2018, 2016, 2014, 2012, 2010, 2008: Co-Organizer. “EMBO Cryo-EM workshop”, Biennial 10-day workshops. EMBL, Heidelberg, Germany.
- Mar. 2018, 2016, 2014: Co-Organizer. “Int. Symposium on Cryo-EM 3D Image Analysis”, Biennial 1-week Symposia, Tahoe, CA, USA
- Sept. 2018: Organizer and Chair. “Single Particle Cryo-EM”, Annual 1-week Workshop, University Basel, Switzerland
- Sept. 2018, 2017, 2016, 2015, 2014, 2013, 2012: Organizer and Chair. “International Workshop on Sub-Volume Averaging of Electron Tomography data”, Annual 1-week Workshops, University Basel, Switzerland
- June 2016 Organizer, “ICON: International Conference on Nanoscopy”, Basel, Switzerland
- June 2014 Chair, “Gordon Research Conference on 3D EM”, Barcelona, Spain.
- June 2013 Co-Chair. “Gordon Research Conference on 3D EM”, New London, NH, USA.
- June 2005 Session chair. “Gordon Research Conference on Mechanisms of Membrane Transport”, Tilton School, Tilton, NH, USA.
- Aug. 2016, 2012, 2010, 2008, 2006: Organizer and Chair. “International Workshop on 2dx Image Processing”, 1-week workshops, University Basel, Switzerland (2010,2012), UC Davis, CA, USA (2008,2006).
- Nov. 2005, Mar. 2005, Nov. 2004, Jun. 2004, Mar. 2004: Organizer or co-organizer. “Bay area cryo-EM meeting”, Quarterly 1-day workshops, Stanford, UC Davis, San Francisco, Santa Cruz, Berkeley, CA, USA.

INVITED CONFERENCE TALKS (incomplete list)

- Oct. 2019 3D SSOM Symposium, Engelberg, Switzerland
- Oct. 2019 Cryo-EM Inauguration Symposium, IST, Vienna, Austria
- Sept. 2019 Cold Spring Harbor Asia Conference on Cross-Scale Biological Structure: From Macromolecular Complexes and Organelles to Cells and Tissues, Suzhou, China
- Sept. 2018 Demystifying Alpha-Synuclein Functions in Health and Diseases, 3-day conference (Lashuel), EPFL, Lausanne, Switzerland
- Aug. 2018 EMBO Cryo-EM workshop: *Cryo-electron microscopy*, EMBL, Heidelberg, Germany
- Mar. 2018 Tahoe Cryo-EM 3D Image Analysis Symposium, Granlibakken Conference Center, Lake Tahoe, CA, USA
- Oct. 2017 SGBM and BIOS International Symposium, Freiburg, Germany
- Sept. 2017 Cryo-EM Symposium, Technical University Delft, The Netherlands
- Sept. 2016 TNT2016, Fribourg, Switzerland
- Aug. 2016 EMBO Cryo-EM workshop: *Cryo-electron microscopy*, EMBL, Heidelberg, Germany
- July 2016 SNI Nanoconvention, Conference Center Basel, Switzerland

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- June 2016 Kuo Symposium on 3D Cryo-EM Molecular Imaging, Beijing, China
- Mar. 2016 Tahoe Cryo-EM 3D Image Analysis Symposium, Granlibakken Conference Center, Lake Tahoe, CA, USA
- Jan. 2016 Gordon Research Conference on Ligand Recognition and Molecular Gating, Il Ciocco, Italy
- Oct. 2015 Janelia Conference, *Challenges in Crystallography*, Janelia Research Campus, Ashburn, VA, USA
- Sept. 2015 SNI Annual Meeting, *Keynote, Nanoscale Characterization of Parkinson's Disease*, Lenzerheide, Switzerland
- Aug. 2015 CEASAR Seminar, Bonn, Germany
- June 2015 Gordon Research Conference on Three Dimensional Electron Microscopy, Colby Sawyer, NH, USA
- Jan. 2015 LS2 Annual Meeting, University of Zürich, Switzerland
- Nov. 2014 NRAMM Workshop on Advanced topics in EM Structure Determination, Scripps Research Institute, La Jolla, CA, USA
- Sept. 2014 Int. Conference on the Crystallization of Biological Macromolecules, Hamburg, Germany
- Sept. 2014 EMBO Cryo-EM workshop: *Cryo-electron microscopy*, EMBL, Heidelberg, Germany
- Aug. 2014 Kachalski Keynote Lecture, IUPAC Bioenergetics Conference, Brisbane, Queensland, Australia
- Aug. 2014 IMB Seminar Series Lecture, Brisbane University, Queensland, Australia
- June 2014 Gordon Research Conference on Three Dimensional Electron Microscopy, *Chair*, Girona, Spain
- Mar. 2014 International Symposium on Cryo-EM 3D Image Analysis, Granlibakken Conference Center, Lake Tahoe, CA, USA
- Sept. 2013 EMBO Cryo-EM Course, London, UK
- May 2013 Swiss Nano Convention, *Structural investigations of single cells and their molecular components*, Congress Center Basel, Switzerland
- Nov. 2012 NRAMM Workshop on Advanced Topics in EM Structure Determination, Scripps Research Institute, La Jolla, CA, USA
- Sept. 2012 EMBO Cryo-EM workshop: *Cryo-electron microscopy*, EMBL, Heidelberg, Germany
- May 2012 Max Planck Symposium on the Future of Struct. Biol., Hamburg, Germany
- Mar. 2012 SSOM, *Structure Determination of Membrane Proteins*, Les Diablerets, Switzerland
- Sept. 2011 EMBO Cryo-EM Course, London, UK
- Sept. 2010 iNet NanoEvent Basel: *NanoImaging: State of the Art*, Congress Center, Basel, Switzerland
- Aug. 2010 European Crystallographic Meeting, *Projective Constraint Optimization*, Dammstadt, Germany
- June 2010 Gordon Research Conference on Three Dimensional Electron Microscopy, *Projective Constraint Optimization*, Il Ciocco, Italy
- Feb. 2010 Haider Symposium: *Development of Phase Contrast STEM for Biological Specimens*, Universität Heidelberg, Heidelberg, Germany
- Feb. 2009 Asia-Pacific Congress on Electron Tomography: *Where Electron crystallography of membrane proteins meets electron tomography and single particle cryo-EM*, Brisbane, Queensland, Australia
- Sept. 2008 EMBO Cryo-EM workshop: *Electron crystallography*, EMBL, Heidelberg, Germany
- Jun. 2008 Gordon Research Conference on Three Dimensional Electron Microscopy, Il Ciocco, Italy
- Sept. 2007 FEMMS 2007: Aberration corrected imaging of organic/biological samples, Sonoma, CA, USA

- Aug. 2007 Microscopy & Microanalysis 2007: The structure of the CNG potassium channel MloK1, Ft. Lauderdale, FL, USA
- Jul. 2007 JEOL User Meeting: Aberration corrected imaging of biological samples, Peabody, MA, USA
- Aug. 2006 International Workshop on Electron Crystallography, UC Davis, CA, USA
- Aug. 2006 EMBO Workshop "Cryo-electron microscopy and 3D image reconstruction", EMBL, Heidelberg, Germany
- Mar. 2006 3rd International Conference on Structural Analysis of Supramolecular Assemblies by Hybrid Methods, Granlibaken Center, Lake Tahoe, CA
- Mar. 2006 GPCR symposium of the American Chemical Society meeting, Atlanta, GA, USA.
- Sep. 2004 EMBO Workshop "Cryo-electron microscopy and 3D image reconstruction", EMBL, Heidelberg, Germany
- Mar. 2003 Swiss Physical Society Annual Meeting, University Basel, Pharmacenter, Switzerland
- Nov. 2002 Integration of Information about Macromolecular Structure (IIMS) Workshop, European Bioinformatics Institute, Hinxton, Cambridge, UK
- Sep. 2002 Annual Meeting of the German Biophysics Society, Dresden, Germany
- Mar. 2002 CSBMCB 45th Annual Meeting and Winternational Symposium on Membrane, Proteins in Health and Disease, Banff, Canada
- Mar. 2001 ISIR Symposium on Biological Motors and Material Sciences and CREST Mini Symposium on Acidic Organelles and V-ATPases, Osaka, Japan
- Feb. 2001 Workshop on Pumps, Channels and Transporters: Structure and Function, Instituto Juan March, Madrid, Spain
- Oct. 2000 Biozentrum Symposium "The new generation", USB Ausbildungszentrum, Basel, Switzerland
- Jul. 2000 Molecular Biology and Physiology of Water and Solute Transport, Göteborg, Sweden
- Feb. 1999 Biophysical Society, 44th Annual Meeting, Baltimore, USA
- Jun. 1997 Reaction centers of photosynthetic purple bacteria: Structure, spectroscopy, dynamics., Cadarache, France
- Sep. 1996 Molecular Recognition in Photosynthesis, European Science Foundation, Jaca, Spain

10 MOST IMPORTANT PUBLICATIONS FROM LAST 10 YEARS

- 'Two new polymorphic structures of alpha-synuclein solved by cryo-electron microscopy', Guerrero-Ferreira, R., Taylor, N., Arteni, A.-A., Kumari, P., Mona, D., Ringler, P., Britschgi, M., Lauer, M.E., Verasdock, J., Riek, R., Melki, R., Meier, B.H., Böckmann, A., Bousset, L., Stahlberg, H., *eLife* 8:e48907, (2019)
- 'Lewy pathology in Parkinson's disease consists of a crowded organellar membranous medley', Shahmoradian, S., Lewis, A., Genoud, C., Graff, A., Pérez Navarro, P., Goldie, K., Sütterlin, R., Castano-Diez, D., Ingrassia, A., Rozemuller, A.J.M., Paepe, A.D., Erny, J.Staempfli, A., Hoernschemeyer, J., Niedieker, D., El-Mashtoly, S.F., Gerwert, K., Bohrmann, B., Britschgi, M., Stahlberg, H., van de Berg, W.D.J., Lauer, M.E., *Nature Neuroscience* 22, 1099-1109, (2019) <https://doi.org/10.1038/s41593-019-0423-2>
- 'Microfluidic protein isolation and sample preparation for high resolution cryo-EM', Schmidli, C., Albiez, S., Rima, L., Righetto, R., Mohammed, I., Oliva, P., Kovacic, L., Stahlberg, H., Braun, T. *PNAS* 116(30), 15007-15012, (2019) <https://doi.org/10.1073/pnas.1907214116>
- 'Cryo-EM structures of a human ABCG2 mutant trapped in ATP-bound and substrate-bound states', Manolaridis, I., Jackson, S.M., Taylor, N.M.I., Kowal, J., Stahlberg, H., Locher, K.P., *Nature* 563(7331), 426-430 (2018) <https://doi.org/10.1038/s41586-018-0680-3>
- 'Structural basis for regulation of human acetyl-CoA carboxylase', Hunkeler, M., Hagmann, A., Stutfeld, E., Chami, M., Guri, Y., Stahlberg, H., Maier, T., *Nature* 558, 470-474 (2018)

<https://doi.org/10.1038/s41586-018-0201-4>

- ‘Structure of the human multidrug transporter ABCG2’, Taylor, N., Manolaridis, I., Jackson, S.M., Kowal, J., Stahlberg, H., Locher, K.P., *Nature* 546, 504-509 (2017)
<https://www.nature.com/articles/nature22345>
- ‘Cullin-RING ubiquitin E3 ligase regulation by the COP9 signalosome’, Cavadini, S., et al., and Stahlberg, H., and Thoma, N.H., *Nature* 531(7596), 598-603 (2016)
<https://www.nature.com/articles/nature17416>
- ‘Atomic structure of bacteriophage T4 baseplate and its function in triggering sheath contraction’, Taylor, N., Prokhorov, N.S., Guerrero-Ferreira, R.C., Shneider, M.M., Browning, C., Goldie, K., Stahlberg, H., Leiman, P.G., *Nature* 533(7603), 346-352 (2016)
<http://www.nature.com/articles/nature17971>
- ‘X-ray structure of the mouse serotonin 5-HT3 receptor’, Hassaine, G., Deluz, C., Grasso, L., Wyss, R., Tol, M. B., Hovius, R., Graff, A., Stahlberg, H., Tomizaki, T., Desmyter, A., Moreau, C., Li, X. D., Poitevin, F., Vogel, H., Nury, H., *Nature* 512(7514), 276-81 (2014)
<http://www.nature.com/articles/nature13552>
- ‘Ligand-induced structural changes in the cyclic nucleotide-modulated potassium channel MloK1’, Kowal, J., Chami, M., Baumgartner, P., Arbeit, M., Chiu, P. L., Rangl, M., Scheuring, S., Schroder, G. F., Nimigeon, C. M., Stahlberg, H., *Nature Comm.* 5, 3106 (2014)
<https://www.nature.com/articles/ncomms4106>

STARTUP COMPANIES

- Startup company “NUONEX AG” as Aktiengesellschaft (stock corporation) founded in Jan. 2019. This company produces microfluidic EM sample preparation devices, and was founded by members of C-CINA. Stahlberg is in the SAB.
<http://nuonex.com>

PATENTS

- Stefan Arnold (PhD student C-CINA), Thomas Braun (Senior Scientist C-CINA), and Henning Stahlberg. Title: Lossless cryo-grid preparation by controlled sample evaporation. Invention Disclosure, filed Oct. 10, 2017 to the European Patent Office, The Hague. PCT/EP2017/076467
- Stefan Arnold (PhD student C-CINA), Thomas Braun (Senior Scientist C-CINA), and Henning Stahlberg. Title: Lossless cryo-grid preparation stage for high-resolution electron microscopy. Invention Disclosure, filed July 6, 2015 to the European Patent Office, The Hague. 15745407.5

METHODS / SOFTWARE DEVELOPMENT

- CryoWriter – The Stahlberg group has developed microfluidics-based instrumentation to prepare cryo-EM grids from nanolitre quantities of sample. The cytosol of single, hand-picked cells can be imaged in cryo-EM.
- FOCUS – The Stahlberg group has developed a software system to accompany online cryo-EM data collection. This system performs automated quality analysis and life processing of automatically recorded cryo-EM data, and allows online monitoring of the data collection progress via a web interface. Available at <http://focus-em.org>.
- DYNAMO – The Stahlberg group has developed a software system for user-friendly sub-volume averaging of cryo-electron tomography data. Available at <http://dynamo-em.org>.

OUTREACH

- ‘Mysteries of the Unseen World’ – a National Geographic movie about the things too slow, too fast, or too small to see. Director: Louie Schwartzberg. Narrator: Forest Whitaker. This science documentary movie from 2013 screened in various iMax cinemas in the world. Available in English, Dutch, Spanish and Chinese. Rating: 100% Rotten Tomatoes, 7.6/10 IMDb. Our lab contributed about 15 minutes of electron microscopy imagery to the 39-minute long movie. This movie was accompanied by a “Making of...” movie, in which our lab and the technology behind the movie was described.
- We regularly host 1-week workshops and courses on electron microscopy in our institute. These include workshops on electron tomography and sub-volume averaging (2019, 2018, 2017, 2016, 2015, 2014, 2013, 2012) as well as cryo-EM of membrane proteins (2018, 2016, 2012, 2010, 2008, 2006).
- I have lectured in several lay-level forums about structural biology, cryo-EM, or Parkinson’s disease research, as for example, the “Senioren-Uni” lectures of the University Basel (2018, 2012).
- We develop software tools, which we distribute via web servers. We run <http://focus-em.org>, <http://dynamo-em.org>, <http://openbeb.org>, and host source codes in 29 repositories on <http://github.com/C-CINA>.
- I have lectured on various topics in electron microscopy and image processing. These lectures are available on YouTube at <https://www.youtube.com/channel/UCGDVliRoXAVhdXAc9ZVxFzQ>, and on https://www.youtube.com/channel/UCXOgcEReKdaqKW_TdS3QWeg/playlists

WEBSITES

- <http://www.c-cina.org/workshops/> (Websites for Workshops)
- <http://github.com/C-CINA> (Open-source repositories for all software packages developed by our group)
- <http://focus-em.org> (Documentation, Download, Support for *FOCUS*)
- <http://status.c-cina.unibas.ch> (Online monitoring for our own EM facility)
- <http://www.dynamo-em.org> (*DYNAMO* software system for sub-volume averaging)

LANGUAGES

German, English, French, Italian, some Portuguese, Spanish and Latin.

HOBBIES

Violoncello, symphonic orchestra (TriRhenum) and chamber music (string quartet), ski, mountaineering

ONGOING RESEARCH SUPPORT

1. **SNF, Division III: (PI: Stahlberg),** **1.10.2019 – 31.9.2023,**
CHF 1.344 Mio total funding. Funding in Year 1: CHF 356k/yr
Structural studies of human brain in neurodegeneration
2. **NCCR TransCure. (PI: Reymond / Abriel. coPI: Stahlberg and others)** **Since 2010**
CHF 200k / year, from 2020 on reduced to CHF 120k / year for Stahlberg.
3. **SNF Sinergia: (PI: Stahlberg. Co-PIs: Riek, Picotti)** **1.1.2018 – 31.12.2022,**
CHF 3.112 Mio total funding. Annual funding for Stahlberg group: CHF 182k/yr
Molecular and Cellular Modulation in Parkinson's Disease
4. **SNF, Division II: (PI: Braun, a senior scientist in Stahlberg's group),** **1.4.2016 – 31.3.2020,**
CHF 558k total funding. Funding in 2019: CHF 137k/yr
Fast protein-complex isolation, sample preparation and data processing
for high- resolution structural analysis and visual proteomics
5. **Swiss Nanosciences Institute (PhD fellowship) (PI: Braun, Stahlberg)** **2016 – 2019**
CHF 65k / year
Microfluidics to study nano-crystallization of proteins
6. **Swiss Nanosciences Institute (PhD fellowship) (PI: Braun, Stahlberg)** **2016 – 2019**
CHF 65k / year
Targeted single cell proteomics using magnetic nanoparticles to study prion-like spreading of
amyloid nanoparticles
7. **Swiss Nanosciences Institute (PhD fellowship): (PI: Braun, Meier)** **2016 – 2019**
CHF 65k / year
Nanomechanical mass and viscosity measurement-platform for cell imaging
8. **Argovia Grant: (PI: Braun):** **2017 – 2019**
CHF 147k / year
Single cell nanoanalytics
9. **CTI (PI: Stahlberg), with CovalX.ch.** **1.10.2016 – 31.1.2019**
CHF 437k total funding
Knowledge and Technology Transfer grant: New Technology for Epitope Mapping Characterization
10. **Synapsis Foundation (PI: Lewis, a PostDoc in Stahlberg's group).** **1.4.2020 – 31.3.2022**
CHF 200k total funding
Ultrastructure of Parkinson's pathology in post-mortem human brain
11. **F. Hoffmann-La Roche (PI: Stahlberg)** **1.10.2018 – 30.9.2027**
CHF 130k / year
Collaboration in structural biology

COMPLETED RESEARCH SUPPORT

1. **SNF, Section 2: (PI: Stahlberg),** **1.4.2016 – 31.3.2019,**
CHF 540k total funding. Funding in 2017: CHF 180k/yr
High-resolution membrane protein structures by cryo-EM
2. **F. Hoffmann-La Roche (PI: Stahlberg)** **2019**
CHF 2.000 Mio (Awarded in July 2018, but terminated in May 2019)
Donation for investment into electron microscopy hardware in C-CINA
3. **Synopsis Foundation: (PI: Stahlberg)** **1.1.2015 – 31.12.2018**
CHF 300k total funding. Funding in 2018: CHF 100k/yr
The structure of prionoid tau**SNF, Section 3: (PI: Braun),** **1.10.2015 – 30.9.2018**
CHF 442k total funding. Funding in 2017: CHF 137k/yr
Fast protein complex isolation
4. **CTI (PI: Stahlberg), with CovalX.ch.** **1.10.2016 – 30.9.2018**
CHF 437k total funding
Knowledge and Technology Transfer grant: New Technology for Epitope Mapping Characterization
5. **SNF Sinergia: (PI: Riek, Rajendran, Ries, and Stahlberg).** **1.4.2014 – 31.1.2018**
CHF 2.160 Mio total direct support. Funding for Stahlberg group: CHF 180k/yr
The Time- and Spatially Resolved Aggregation of α -Synuclein and its Relationship to Cell-Cell Transmissibility
6. **SNF R'Equip: (PI: Stahlberg and others).** **2015**
CHF 405k total direct support
Cryo-electron microscopy in the ZMB
7. **SystemsX.ch: (PI: Stahlberg, co-PI: several).** **2010 – 2014**
CHF 4.100 Mio total direct support for 8 groups
RTD CINA Grant
8. **Donations F. Hoffmann-La Roche (PI: Stahlberg)** **2009 – 2017**
CHF 2.016 Mio total direct support
9. **SNF, Section 2: (PI: Stahlberg),** **1.10.2013 – 31.3.2016,**
CHF 445k total direct support
Software for electron microscopy of membrane proteins
10. **SNF, Section 3: (PI: Stahlberg),** **1.4.2013 – 31.3.2016**
CHF 562k total direct support
Electron microscopy of membrane proteins
11. **SNF CoRe (PI: Rajendran & Stahlberg)** **1.4.2014 – 31.3.2016**
CHF 200k total support. Support for Stahlberg: CHF 50k / year
Structural and functional roles of exosomal nanovesicles in the formation, release and synaptotoxicity of amyloid proteins
12. **Roche PostDoctoral Fellowship (PI: Stahlberg)** **2012 – 2015**
CHF 402k total support
Structural investigations of human postmortem brain from Parkinson's disease
13. **NCCR Nano (PI: Schönenberger, coPI Stahlberg and others)** **2009 – 2013**
CHF 100k / year
14. **NCCR Structural Biology (PI: Grütter, coPI Stahlberg and others)** **2009 – 2012**
CHF 50k / year

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15. **SNF Sinergia (PI: Cornelis, coPI Stahlberg and others)** **2009 – 2012**
CHF 50k / year
Type III Secretion
 16. **SNF, Section 2: (PI: Stahlberg)** **1.10.2009 – 30.9.2012**
CHF 487k total direct support
Software for Electron Crystallography
 17. **SNF, Section 3: (PI: Stahlberg)** **1.10.2009 – 30.9.2012**
CHF 468k total direct support
Electron Microscopy of Ion Channels
 18. **NSF BIO (PI: Stahlberg)** **2/1/05 – 1/31/10**
NSF CAREER award
\$866,612 t.c.
Creation of a highly automated, user-friendly image processing system for electron crystallography
The major goal of this project was to develop a software package for automated electron crystallography image processing.
 19. **NIH-NIGMS (PI: Stroud, coPI: Stahlberg and others)** **7/1/05 – 6/30/10**
Specialized Center of the Protein Structure Initiative
\$1,271,023 t.c. Stahlberg lab. (~\$16.5m total)
Center for Structures of Membrane Proteins
The goal of this center was the determination of the structure and function of human membrane proteins.
 20. **National Nuclear Security Administration (NNSA)** **11/1/05 – 10/31/08**
(PI: Browning, coPI: Stahlberg and Spence)
Enhanced Functionality for Materials Analysis in the DTEM
\$750,000 t.c.
The goal of this project was the construction and operation of a dynamic TEM operating in the femto-second time resolution range.
 21. **NIH-NIGMS (PI: Stahlberg)** **8/1/07 – 7/31/12**
\$1,448,750 t.c.
Electron Microscopy of Membrane Proteins
The goal of this project was the determination of the structures of two ion channel membrane proteins, and the development of an enhanced protein crystallization robot.
 22. **UC Davis Chancellor's Fellow Award (PI: Stahlberg)** **8/1/08 – 7/31/13**
\$25,000 t.c.
This award is given by the Chancellor of UC Davis to ~5 PI per year. Awardees become members of the Chancellor's club UC Davis.
 23. **UC Lab Fee Research Grant (PI: Barty)** **4/1/09 – 3/31/12**
\$600,000 t.c. Stahlberg lab
The goal of this project was the application of a Free X-ray Laser to biological protein complexes.
 24. **Keck (PI: Stahlberg, coPI: Browning.)** **1/1/09 – 12/31/10**
Phase-contrast STEM for biological samples
\$1,200,000 t.c. for 2 years
The goal of this project was the design and construction of technology for high-resolution STEM imaging of beam-sensitive biological weak-phase cryo samples.
 25. **CBCRP (PI: Stahlberg, coPI: Heyer)** **7/1/05 – 6/30/07**
California Breast Cancer Research Program
\$100,000 d.c.
Structural analysis of cancer-relevant Brca2 mutations
The major goal of this project was the analysis of structural consequences of breast-cancer relevant mutations in the DNA binding protein Brca2 by cryo electron microscopy.

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26. **UC (PI: Stahlberg)** **6/1/04 – 5/31/05**
UC New Faculty Research Grant Program
\$2,000 d.c.
Structural Studies of the Tat protein transport system
This fund was intended and used for supplies for a carbon evaporator for TEM sample preparation.
27. **UC-CRCC (PI: Stahlberg)** **7/1/04 – 6/30/05**
UC Cancer Research Coordinating Committee
\$30,000 d.c.
Analysis of DNA binding by Brca2 and determination of the 3D structure of Brca2 protein-DNA complexes by cryo electron microscopy
The major goal of this project was to structurally characterize the interaction of the breast cancer related soluble protein Brca2 with DNA. This is done by high-contrast single particle cryoEM.

In addition to these grant supports to my lab, several of the students or postdocs in my group have applied for individual fellowships, with my support. Larger awarded fellowships were awarded to James Evans (NIH training grant), Lenin Dominguez (PEW fellowship), or Nicholas Taylor (Uni Basel PostDoctoral 9-months Fellowship).

Scientific Achievements

Henning Stahlberg

Automation of electron microscopy data analysis

The Stahlberg group has built a suite of programs to process cryo-electron microscopy images. The initial version of these programs was called *2dx*, and was able to fully automatically process cryo-EM images of two-dimensional membrane protein crystals, resulting in a high-resolution 3D structure of the membrane protein *while* data are being collected. *2dx* was initially based on the so-called MRC software suite (Henderson et al.), and later extended by additional programs, *e.g.*, to apply single particle and maximum likelihood algorithms to 2D crystal geometries.

FOCUS: The Stahlberg group has also developed another software suite called *FOCUS*, which has the main purpose to function as the interface between cryo-EM data collection and cryo-EM data processing. *FOCUS* typically is installed on a powerful Linux computer directly adjacent to the cryo-EM instrument, which collects data automatically via EPU or JADAS or SerialEM software systems. *FOCUS* will then monitor the harddrives of the cryo-EM instrument, and once an image or a movie is recorded, *FOCUS* will retrieve that file and submit it to a fully automated processing pipeline, during which recorded data are analyzed (defocus, drift, resolution) and processed. *FOCUS* can operate in different modi: In the single particle mode, particles are picked, classified, and submitted to 2D or 3D reconstruction. In the tomography mode, recorded tilt series are drift-corrected, re-ordered (Hagen scheme), and subjected to 3D reconstruction. In the 2D crystal mode, the entire processing capability of *2dx* is included and applied. *FOCUS* can also sort, display, and manage recorded datasets, which can become rather large (tens of TB), and *FOCUS* can maintain a website to allow online tracking of the progress of data collection and data processing. *FOCUS* is used by a large number of other labs.

Websites:

<http://focus-em.org>

(Documentation, Download, Support website for *FOCUS*)

<https://status.c-cina.unibas.ch>

(online monitoring for our own EM facility)

<https://github.com/C-CINA>

(open-source repositories for software packages from our group)

Microfluidic sample preparation for cryo-EM

Our lab has developed microfluidic methodology to harvest miniature quantities of sample with a narrow capillary. This can be used, for example, to aspire the cytosol of a single, hand-picked neuronal cell, or to aspire small volumes of cytosol into the capillary. A tool chain composed of magnetic beads coupled to FAB antibody fragments can then be used to purify small amounts of protein from the aspired sample. The affinity purification typically results in preparations of outmost purity, as judged by TEM imaging. Finally, the miniature quantities of protein can be written onto a cryo-EM grid, akin to writing ink onto a paper with a pen, whereby loss-less application of the entire sample onto the cryo-EM grid is used, without the use of filter paper blotting as conventionally done for cryo-EM grid preparation. This tool chain was developed by the team of Dr. Thomas Braun, who is a senior scientist in the Stahlberg group. The toolchain was recently used to aspire 900 nanoliters of HeLa cell cytosol, purify endogenous 20S proteasome sample out of that cytosol, and write the resulting 9 nanoliters of pure protein onto a cryo-EM grid, which allowed us to determine the atomic structure of the human 20S proteasome within few hours of data collection with the automated imaging pipeline described above (Schmidli et al., PNAS 2019). Tobacco Mosaic Virus (TMV) also present in that sample to stabilize the water layer thickness resulted in a 3D reconstruction of TMV at 1.9 Angstrom resolution.

Determination of membrane protein structures

The Stahlberg group has structurally characterized a large number of membrane protein systems. Several medium to high-resolution membrane protein structures were investigated, and insight into how the proteins function and are regulated was obtained. Studied membrane protein systems include F-ATPases, K-channels, Cl⁻ channels, citrate/sodium antiporters, sodium/potassium antiporters, ABC transporters, GPCRs, PS-I, PS-II and LHC-RC complexes, serotonin receptors, water channels, glycerol channels, and bacterial type III and type VI secretions systems.

Ultrastructural characterization of Lewy bodies in human brain

In recent years, our group has focused on Parkinson's Disease. We have studied the brain of deceased Parkinson's disease patients that was collected with a very short post-mortem delay. Our main tool is electron microscopy.

Parkinson's disease (PD) is characterized by the presence of aggregates in the human brain of 10 micrometer diameter and more, which are staining strongly for phosphorylated alpha-synuclein (aSyn) protein. These aggregates are called Lewy bodies. Initially, it was believed that Lewy bodies were composed of fibrillar aSyn protein, and that such aSyn fibrils clustered together to form the Lewy bodies.

When studying Lewy bodies from fresh human brain with correlative light and electron microscopy (CLEM) and modern sample preparation methods, to our surprise, we found that most Lewy bodies that fulfilled above criteria and that strongly stained for aSyn, were primarily composed of densely packed membranous aggregates. Only a small minority of Lewy bodies did show fibrillar material at the periphery, while most did not (Shahmoradian et al., *Nature Neurosc.* 2019). This unexpected finding offers a possible explanation why so far all attempts failed to develop PET tracer molecules for PD, or to treat PD by preventing aSyn filament formation, or to find a mouse model that recapitulates the filament bundle hypothesis. We also described other larger aggregates in human brain, such as *Corporae amyloacea* (Perez-Navarro et al., *Sci. Reports* 2018). We also described the impact of different preparation methods for human brain on their appearance in the TEM, arguing that older tissue preparation methods sometimes can produce artifacts that let membranous material resemble filamentous structures (Lewis et al., *Curr. Op. Struct. Biol.* 2019, in press). We also investigated brain tissue from patients that suffered from other diseases (ALS, AD), where we can confirm that fibrils are present on those diseases.

Ultrastructural characterization of alpha-synuclein fibrils

Our group has also studied fibrils of aSyn, which were grown in-vitro. We so far have determined the atomic structures of three different conformations (prionoid strains) of aSyn fibrils (Guerrero-Ferreira et al., *eLife* 2018). Interestingly, polymorph 1 is not compatible with PD-relevant mutations in the gene sequence of aSyn, so that one could argue that persons suffering from familial early-onset Parkinson's disease due to such mutations in aSyn cannot form polymorph-1-fibrils, but would be able to form polymorph-2 or polymorph-3 fibrils, which might then be the more pathological forms.

It is unclear, how these fibrils contribute to the development of Parkinson's disease, and why in the human brain we only occasionally find fibrils in the post-mortem brain tissue. The present research proposal aims at a better understanding of the tissue morphology in PD, and to provide the structural basis to develop models for the mechanisms of development and progression of the disease.

Workshops on cryo-EM

We regularly hosted one-week workshops on image processing for cryo-EM, for 2D crystals (bi-annually 2006-2016, using *2dx*), for single particle cryo-EM and *FOCUS* (since 2018), and for sub-volume averaging with the *DYNAMO* software tool developed by Dr. Daniel Castaño-Díez in C-CINA (annually since 2012).

Websites:

<https://www.c-cina.org/workshops/>

<https://www.dynamo-em.org>

(Websites for Workshops)

(*DYNAMO* software system for sub-volume averaging)

Publication List

ORCID: <http://orcid.org/0000-0002-1185-4592>
As of January 2020: 181 scientific articles
6548 citations (h-index 45) [Web of Science], or
9528 citations (h-index 55) [Google Scholar].

Underlined authors are members of the Stahlberg lab.

Publications in international peer-reviewed scientific journals

1. Two new polymorphic structures of alpha-synuclein solved by cryo-electron microscopy, Guerrero-Ferreira, R., Taylor, N., Arteni, A.-A., Kumari, P., Mona, D., Ringler, P., Britschgi, M., Lauer, M.E., Verasdock, J., Riek, R., Melki, R., Meier, B.H., Böckmann, A., Bousset, L., Stahlberg, H. **eLife** 8:e48907, (2019)
2. DuoMab: a novel CrossMab-based IgG-derived antibody format for enhanced antibody-dependent cell-mediated cytotoxicity, Sustmann, C., Dickopf, S., Regula, J.T., Kettenberger, H., Mølhøj, M., Gassner, C., Weininger, D., Fenn, S., Manigold, T., Kling, L., Künkele, K.P., Schwaiger, M., Bossenmaier, B., Griese, J.J., Hopfner, K.P., Graff, A., Stahlberg, H., Ringler, P., Lauer, M.E., Brinkmann, U., Schaefer, W., Klein, C. **MAbs** 11(8), 1402-1414 (2019)
3. Diverse roles of TssA-like proteins in the assembly of bacterial type VI secretion systems, Schneider, J.P., Nazarov, S., Liuzzo, M., Ringel, P.D., Stahlberg, H., Basler, M. **EMBO J.** 38: e100825, 1-17 (2019)
4. Differential visual proteomics: Enabling the proteome-wide comparison of protein structures of single-cells', Syntychaki, A., Rima, L., Schmidli, C., Stohler, T., Bieri, A., Sütterlin, R., Stahlberg, H., Castano-Diez, D., Braun, T. **J. of Proteome Research** 18(9), 3521-3531, (2019)
5. Microfluidic protein isolation and sample preparation for high resolution cryo-EM Schmidli, C., Albiez, S., Rima, L., Righetto, R., Mohammed, I., Oliva, P., Kovacic, L., Stahlberg, H., Braun, T. **PNAS** 116(30), 15007-15012, (2019)
6. Imaging of post-mortem human brain tissue using electron and X-ray microscopy Lewis, A., Genoud, C., Pont, M., van de Berg, W.D.J., Frank, S., Stahlberg, H., Shahmoradian, S., Al-Amoudi, A. **Current Opinion Structural Biology** 58, 138-148, (2019)
7. Cryo-EM structure of the rhodopsin-G-alpha-i-beta-gamma complex reveals binding of the rhodopsin C-terminal tail to the G-beta subunit Tsai, C.J., Marino, J., Adaixo, R., Pamula, F., Muehle, J., Maeda, S., Flock, T., Taylor, N., Mohammed, I., Matile, H., Dawson, R.J.P., Deupi, X., Stahlberg, H., Schertler, G.F.X. **eLife** 8:e46041, (2019)

8. Lewy pathology in Parkinson's disease consists of a crowded organellar membranous medley
Shahmoradian, S., Lewis, A., Genoud, C., Graff, A., Pérez Navarro, P., Goldie, K., Sütterlin, R.,
Castano-Diez, D., Ingrassia, A., Rozemuller, A.J.M., Paepe, A.D., Erny, J., Staempfli, A.,
Hoernschemeyer, J., Niedieker, D., El-Mashtoly, S.F., Gerwert, K., Bohrmann, B., Britschgi,
M., Stahlberg, H., van de Berg, W.D.J., Lauer, M.E.
Nature Neuroscience 22, 1099-1109, (2019)
9. Tumor-targeted 4-1BB agonists for combination with T cell bispecific antibodies as off-the-shelf
therapy
Claus, C., Ferrara, C., Xu, W., Sam, J., Lang, S., Uhlenbrock, F., Albrecht, R., Herter, S.,
Schlenker, R., Hüsser, T., Diggelmann, S., Challier, J., Mössner, E., Hosse, R.J., Hofer, T.,
Brünker, P., Joseph, C., Benz, J., Ringler, P., Stahlberg, H., Lauer, M., Perro, M., Chen, S.,
Küttel, C., Bhavani, Mohan, P.L., Nicolini, V., Birk, M.C., Ongaro, A., Prince, C., Gianotti, R.,
Dugan, G., Whitlow, C.T., Solingapuram, Sai, K.K., Caudell, D.L., Burgos-Rodriguez, A.G.,
Cline, J.M., Hettich, M., Ceppi, M., Giusti, A.M., Cramer, F., Driessen, W., Morcos, P.N.,
Freimoser-Grundschober, A., Levitsky, V., Amann, M., Grau-Richards, S., von, Hirschheydt,
T., Tournaviti, S., Mølhøj, M., Fauti, T., Heinzlmann-Schwarz, V., Teichgräber, V.,
Colombetti, S., Bacac, M., Zippelius, A., Klein, C., Umaña, P.
Science Translational Medicine 11(496), 1-12 (2019)
10. Cryo-EM structures of the pore-forming A subunit from the *Yersinia entomophaga* ABC toxin
Piper, S., Brillault, L., Rothnagel, R., Croll, T., Box, J., Chassagnon, I., Scherer, S., Goldie, K.,
Jones, S., Schepers, F., Hartley-Tassell, L., Ve, T., Busby, J., Dalziel, J., Lott, S., Hankamer, B.,
Stahlberg, H., Hurst, M., Landsberg, M
Nature Communications 10(1), 1952 (2019)
11. Retrieving high-resolution information from disordered 2D crystals by single particle cryo-EM
Righetto, R., Biyani, N., Kowal, J., Chami, M., Stahlberg, H.
Nature Communications 10(1), 1722 (2019)
12. Cryo-EM structure of phosphodiesterase 6 reveals insights into the allosteric regulation of type I
phosphodiesterases
Gulati, Palczewski, K., Engel, A., Stahlberg, H., Kovacik, L.
Science Advances 5(2), eaav4322 (2019)
13. Supramolecular architectures of molecularly thin yet robust free-standing layers
Moradi, M., Opara, N., Tulli, L.G., Wäckerlin, C., Dalgarno, S.J., Teat, S.J., Baljovic, M.,
Popova, O., van Genderen, E., Kleibert, A., Stahlberg, H., Abrahams, J., Padeste, C., Corvini,
P.F.-X., Jung, T.A., Shahgaldian, P.
Science Advances 5(2), eaav4489 (2019)
14. Molecular structure and function of myelin protein P0 in membrane stacking
Raasakka, A., Ruskamo, S., Kowal, J., Han, H., Baumann, A., Myllykoski, M., Fasano, A.,
Rossano, R., Riccio, P., Buerck, J., Ulrich, A.S., Stahlberg, H., Kursula, P.
Scientific Reports 9(462), (2019)9(462), (2019)
15. TDP-43 extracted from FTLD patient brains displays distinct aggregate assemblies and neurotoxic
effects reflecting disease progression rates
Laferrriere, F., Maniecka, Perez-Berlanga, Hruska-Plochan, Gilhespy, Hock, Wagner, Afroz,
Boersema, Barmettler, Foti, Asi, Isaacs, Al-Amoudi, A., Lewis, A., Stahlberg, H., Ravits, De
Giorgi, Ichas, Bezdard, Picotti, P., Lashley, T., Polymenidou, M.
Nature Neuroscience 22, 65-77 (2019)
16. Self-assembly of a designed nucleoprotein architecture through multimodal interactions
Subramanian, R.H., Smith, S.J., Alberstein, R.G., Bailey, J.B., Zhang, L., Cardone, G.,
Suominen, L., Chami, M., Stahlberg, H., Baker, T.S., Tezcan, F.A.
ACS Central Science 4(11), 1578-1586 (2018)

17. Cerebral Corpora amylacea are dense membranous labyrinths containing structurally preserved cell organelles
Pérez Navarro, P., Genoud, C., Castano-Diez, D., Graff-Meyer, A., Lewis, A., de Gier, Y., Lauer, M.E., Britschgi, M., Bohrmann, B., Frank, S., Hench, J., Schweighauser, G., Rozemuller, A.J.M., van de Berg, W.D.J., Stahlberg, H., Shahmoradian, S.
Scientific Reports 8(18046), (2018)
18. Cryo-EM structures of a human ABCG2 mutant trapped in ATP-bound and substrate-bound states
Manolaridis, I., Jackson, S.M., Taylor, N., Kowal, J., Stahlberg, H., Locher, K.
Nature 563(7731), 426-430 (2018)
19. Protocols for Subtomogram Averaging of Membrane Proteins in the Dynamo Software Package
Pérez Navarro, P., Stahlberg, H., Castano-Diez, D.,
Frontiers in Molecular Biosciences 5(82), 1-18 (2018)
20. Demonstration of femtosecond X-ray pump X-ray probe diffraction on protein crystals
Opara, N., Mohacsi, I., Makita, M., Castano-Diez, D., Diaz, A., Jurani, P., Marsh, M., Meents, A., Milne, C. J., Mozzanica, A., Padeste, C., Panneels, V., Sikorski, M., Song, S., Stahlberg, H., Vartiainen, I., Vera, L., Wang, M., Willmott, P. R., David, C.
Structural Dynamics 5(5), 054303 (2018)
21. An iris diaphragm mechanism to gate a cyclic nucleotide-gated ion channel
Marchesi, A., Gao, X., Adaixo, R., Rheinberger, J., Stahlberg, H., Nimigeon, C., Scheuring, S.
Nature Communications 9(1), 3978 (2018)
22. Protocols for Subtomogram Averaging of Membrane Proteins in the Dynamo Software Package
Pérez Navarro, P., Stahlberg, H., Castano-Diez, D.
Frontiers in Molecular Biosciences 5(82), 1-18 (2018)
23. Structure of a PSI-LHCI- cyt b6f supercomplex in *Chlamydomonas reinhardtii* promoting cyclic electron flow under anaerobic conditions
Steinbeck J., Ross, I. L., Rothnagel, R., Gäbelein, P., Schulze, S., Giles, N., Ali, R., Drysdale, R., Sieracki, E., Gambia, Y., Stahlberg, H., Takahashi, Y., Hippler, M., Hankamer, B.
PNAS 115(41), 10517-10522 (2018)
24. Cryo-EM structure of alpha-synuclein fibrils
Guerrero-Ferreira, R., Taylor, N., Mona, D., Ringler, P., Lauer, M. E., Riek, R., Britschgi, M., Stahlberg, H.
eLife 7(e36402), (2018)
25. Structural basis for regulation of human acetyl-CoA carboxylase
Hunkeler, M., Hagmann, A., Stutfeld, E., Chami, M., Guri, Y., Stahlberg, H., Maier, T.
Nature 558, 470-474 (2018)
26. Structural basis of small-molecule inhibition of human multidrug transporter ABCG2
Jackson, S. M., Manolaridis, I., Kowal, J., Zechner, M., Taylor, N., Bause, M., Bauer, S., Bartholomaeus, R., Bernhardt, G., Koenig, B., Buschauer, A., Stahlberg, H., Altmann, K. H., Locher, K. P.
Nature Struct. Mol. Biol. 25(4), 333-340 (2018)
27. Image processing techniques for high-resolution structure determination from badly ordered 2D crystals
Biyani, N., Scherer, S., Righetto, R., Kowal, J., Chami, M., Stahlberg, H.
Journal of Structural Biology 203(2), 120-134 (2018)
28. Femtosecond X-ray coherent diffraction of aligned amyloid fibrils on low background graphene
Seuring, C., Ayer, Filippaki, Barthelmess, Longchamp, Ringler, P., Pardini, Wojtas, Coleman, Dörner, Fuglerud, Hammarin, Habenstrein, Langkilde, Loquet, Meents, Riek, Stahlberg, H., Boutet, Hunter, Koglin, Liang, Ginn, Millane, Frank, Barty, Chapman
Nature Communications 9(1), 1836 (2018)

29. Miniaturized sample preparation for transmission electron microscopy
Schmidli, C., Rima, L., Arnold, S., Stohler, T., Syntychaki, A., Bieri, A., Albiez, S., Goldie, K., Chami, M., Stahlberg, H., Braun, T.
Journal of Visual Experiments (JOVE) (137), (2018)
30. 3D correlative electron microscopy reveals continuity of Brucella-containing vacuoles with the endoplasmic reticulum
Sedzicki, J., Tschon, T., Huey-Low, S., Willemart, K., Goldie, K., Lewtesson, J. -J., Stahlberg, H., Dehio, C.
J. of Cell Science 131(4), (2018)
31. Cryo-EM reconstruction of Type VI secretion system baseplate and sheath distal end
Nazarov, S., Schneider, J. P.O., Brackmann, M., Goldie, K., Stahlberg, H., Basler, M.
EMBO Journal 37, e97103 (2018)
32. Miniaturizing EM Sample Preparation: Opportunities, Challenges and "Visual Proteomics"
Arnold, S., Müller, S., Schmidli, C., Syntychaki, A., Rima, L., Chami, M., Stahlberg, H., Goldie, K., Braun, T.
Proteomics 18(5-6), e1700176 (2018)
33. Structure of a zosuquidar and UIC2-bound human-mouse chimeric ABCB1
Alam, A., Küng, R., Kowal, J., McLeod, R., Tremp, N., Broude, E. V., Roninson, I. B., Stahlberg, H., Locher, K. P.
PNAS 115(9), E1973-E1982 (2018)
34. MRCZ – A file format for cryo-TEM data with fast compression
McLeod, R., Righetto, R., Stewart, A., Stahlberg, H.
J. Struct. Biol. 201(3), 252-257 (2018)
35. High-resolution cryo-EM structure of the cyclic nucleotide-modulated potassium channel MloK1 in a lipid bilayer
Kowal, J., Biyani, N., Chami, M., Scherer, S., Rzepiela, A., Baumgartner, P., Upadhyay, V., Nimigean, C. N., Stahlberg, H.
Structure 26(1), 20-27 (2018)
36. Lipid Internal Dynamics Probed in Nanodiscs
Martinez, D., Decossas, M., Kowal, J., Frey, L., Stahlberg, H., Dufourc, E. -J. ., Riek, R., Habenstein, B., Bibow, S., Loquet A.
Chem. Phys. Chem. 18(19), 2651-2657 (2017)
37. Expression, Biochemistry, and Stabilization with Camel Antibodies of Membrane Proteins: Case Study of the Mouse 5-HT3 Receptor
Hassaine, G., Deluz, C., Grasso, L., Wyss, R., Hovius, R., Stahlberg, H., Tomizaki, T., Desmyter, A., Moreau, C., Peclinovska, L., Minniberger, S., Mebarki, L., Li, X. -D. ., Vogel, H., Nury, H.
Methods Mol. Biol. 1635(Chapter 8), 139-168 (2017)
38. CryoEM structure of the extended type VI secretion system sheath–tube complex
Wang, J., Brackmann, M., Castano-Diez, D., Kudryashev, M., Goldie, K., Maier, T., Stahlberg, H., Basler, M.
Nature Microbiology 2(11), 1507-1512 (2017)
39. Three-Dimensional Imaging of Biological Tissue by Cryo X-Ray Ptychography
Shahmoradian, S., Tsai, E. H. R., Diaz, A., Guizar-Sicairos, M., Spycher, L., Raabe, J., Britschgi, M., Ruf, A., Stahlberg, H., Holler, M.
Scientific Reports 7(2), 6291 (2017)
40. Structure of the human multidrug transporter ABCG2
Taylor, N., Manolaridis, I., Jackson, S. M., Kowal, J., Stahlberg, H., Locher, K. P.
Nature 546, 504-509 (2017)

41. Membrane vesicle secretion and prophage induction in multidrug-resistant *Stenotrophomonas maltophilia* in response to ciprofloxacin stress
Devos, S., Van Putte, W., Vitse, J., Van Driessche, G., Stremersch, S., Van Den Broek, W., Raemdonck, K., Braeckmans, K., Stahlberg, H., Kudryashev, M., Savvides, S., Devreese, B.
Environmental Microbiology 19(10), 3930-3937 (2017)
42. Direct protein crystallization on ultrathin membranes for diffraction measurements at X-ray free electron lasers
Opara, N., Martiel, I., Arnold, S., Braun, T., Stahlberg, H., Makita, M., David, C., Padeste, C.
J. of Applied Crystallography 50, 909-918 (2017)
43. Cryo-EM analysis of homodimeric full-length LRRK2 and LRRK1 protein complexes
Sejwal, K., Chami, M., Remigy, H., Vancraenenbroeck, R., Sibran, W., Sütterlin, R.,
Baumgartner, P., McLeod, R., Chartier-Harlin, M. -C., Baekelandt, V., Stahlberg, H., Taymans, J. -M.
Scientific Reports 7(1), 8667-8678 (2017)
44. Membrane association landscape of myelin basic protein portrays formation of the myelin major dense line
Raasakka, A., Ruskamo, S., Kowal, J., Barker, R., Baumann, A., Martel, A., Tuusa, J., Myllykoski, M., Bürck, J., Ulrich, A. S., Stahlberg, H., Kursula, P.
Scientific Reports 7(1), 4974-4991 (2017)
45. Focus: The interface between data collection and data processing in cryo-EM
Biyani, N., Righetto, R., McLeod, R., Caujolle-Bert, D., Castano-Diez, D., Goldie, K.,
Stahlberg, H.
J. Struct. Biol. 198(2), 124-133 (2017)
46. Cell-free reconstitution reveals centriole cartwheel assembly mechanisms
Guichard, P., Hamel, V., Le Quennec, M., Banterle, N., Iacovache, I., Nemcikova, V., Flückiger, I., Goldie, K., Stahlberg, H., Levy, D., Zuber, B., Gönczy, P.
Nature Communications 8:14813, (2017)
47. Amyloid Fibril Polymorphism: Almost Identical on the Atomic Level, Mesoscopically Very Different
Seuring, C., Verasdonck, J., Ringler, P., Cadalbert, R., Stahlberg, H., Böckmann, A., Meier, B. H., Riek, R.
J. Phys. Chem. 121(8), 1783-1792 (2017)
48. Blotting-free and lossless cryo-electron microscopy grid preparation from nanoliter-sized protein samples and single-cell extracts
Arnold, S., Albiez, S., Bieri, A., Syntyckaki, A., Adaixo, R., McLeod, R., Goldie, K., Stahlberg, H., Braun, T.
J. Struct. Biol. (197), 220-226 (2017)
49. Proteoliposomes - a system to study membrane proteins under buffer gradients by cryo-EM
Sejwal, K., Chami, M., Baumgartner, P., Kowal, J., Müller, S., Stahlberg, H.
Nanotechnology Reviews 6(1), 57-74 (2017)
50. Solution structure of discoidal high-density lipoprotein particles with a shortened apolipoprotein A-I
Bibow, S., Polyhach, Y., Eichmann, C., Chi, C. N., Kowal, J., Albiez, S., McLeod, R.,
Stahlberg, H., Jeschke, G., Günter, P., Riek, R.
Nature Structural and Molecular Biology 24, 187-193 (2017)
51. Two-dimensional crystallization of the mouse serotonin 5-HT_{3A} receptor
Rheinberger, J., Hassaine, G., Chami, M., Stahlberg, H., Vogel, H., Li, X.
Micron 90, 19-24 (2017)

52. Biochemical and biophysical approaches to study the structure and function of the chloride channel (ClC) family of proteins
Abeyrathne, P., Chami, M., Stahlberg, H.
Biochimie 128-129, 154-162 (2016)
53. Robust image alignment for cryogenic transmission electron microscopy
McLeod, R., Kowal, J., Ringler, P., Stahlberg, H.
J. Struct. Biol. 197(3), 279-293 (2017)
54. GSDMD membrane pore formation constitutes the mechanism of pyroptotic cell death
Sborgi, L., Rühl, S., Mulvihill, E., Pipercevic, J., Heilig, R., Stahlberg, H., Farad, C. J., Müller, D. J., Broz, P., Hiller, S.
EMBO Journal 35(16), 1766-1778 (2016)
55. Real-time visualization of conformational changes within single MloK1 cyclic nucleotide-modulated channels
Rangl, M., Miyagi, A., Kowal, J., Stahlberg, H., Nimigean, C., Scheuring, S.
Nature Communications 7, 12789 (2016)
56. Dynamo Catalogue: Geometrical tools and data management for particle picking in subtomogram averaging of cryo-electron tomograms
Castano-Diez, D., Kudryashev, M., Stahlberg, H.
J. Struct. Biol. 197(2), 135-144 (2017)
57. Total sample conditioning and preparation of nanoliter volumes for electron microscopy
Arnold, S., Albiez, S., Opara, N., Chami, M., Schmidli, C., Bieri, A., Padeste, C., Stahlberg, H., Braun, T.
ACS Nano 10, 4981-4988 (2016)
58. Characterization of mAb dimers reveals predominant dimer forms common in therapeutic mAbs
Plath, F., Ringler, P., Graff, A., Stahlberg, H., Lauer, M., Rufer, A., Graewert, M., Svergun, D., Kellermann, G., Winkler, C., Stücker, J. O., Koulov, A., Schnaible, V.
mAbs 8(5), 928-940 (2016)
59. Cullin-RING ubiquitin E3 ligase regulation by the COP9 signalosome
Cavadini, S., Fischer, E. S., Goldie, K., Boehm, K., Lingaraju, G. M., Jones, M., Bunker, R. D., Richkule, R., Pantelic, R., Mohamed, W. I., Hassiepen, U., Beckwith, R. E. J., Stahlberg, H., and Thoma, N. H.
Nature 531(7596), 598-603 (2016)
60. Atomic structure of bacteriophage T4 baseplate and its function in triggering sheath contraction
Taylor, N., Prokhorov, N. S., Guerrero-Ferreira, R. C., Shneider, M. M., Browning, C., Goldie, K., Stahlberg, H., Leiman, P. G.
Nature 533(7603), 346-352 (2016)
61. Cholesteryl ester transfer between lipoproteins does not require the formation of a ternary tunnel complex with the cholesteryl ester transfer protein
Lauer, M. E., Graff, A., Rufer, A. C., Maugeais, C., von der Mark, E., Matile, H., D'Arcy, B., Magg, C., Ringler, P., Müller, S., Scherer, S., Dernick, G., Thoma, R., Hennig, M., Niesor, E. J., Stahlberg, H.
J. Struct. Biol. 194(2), 191-198 (2016)
62. Preparation and characterization of stable alpha-synuclein lipoprotein particles
Eichmann, C., Campioni, S., Kowal, J., Maslennikov, I., Gerez, J., Liu, X., Verasdonck, J., Nespovitya, N., Choe, S., Meier, B., Picotti, P., Rizo, J., Stahlberg, H., Riek, R.
J. Biol. Chem. 291(16), 8516-8527 (2016)

63. The structure of the mouse serotonin 5-HT₃ receptor in lipid vesicles
Kudryashev, M., Castano-Diez, D., Deluz, C., Hassaine, G., Grasso, L., Graff, A., Vogel, H., Stahlberg, H.
Structure 24(1), 165-170 (2016)
64. The lipidome associated with the gamma-secretase complex is required for its integrity and activity.
Aycirieux, S., Gerber, H., Osuna, G. M., Chami, M., Stahlberg, H., Shevchenko, A., Fraering, P. C.
Biochemical Journal 473(3), 321-334 (2016)
65. 3D reconstruction of two-dimensional crystals
Stahlberg, H., Biyani, N., Engel, A.
Arch Biochem Biophys 581, 68-77 (2015)
66. Structure and assembly of the mouse ASC inflammasome by combined NMR spectroscopy and cryo-electron microscopy
Sborgi, L., Ravotti, F., Dandey, V. P., Dick, M. S., Mazur, A., Reckel, S., Chami, M., Scherer, S., Huber, M., Bockmann, A., Egelman, E. H., Stahlberg, H., Broz, P., Meier, B. H., Hiller, S.
Proc Natl Acad Sci U S A 112(43), 13237-42 (2015)
67. Structure of the type VI secretion system contractile sheath
Kudryashev, M., Wang, R. Y., Brackmann, M., Scherer, S., Maier, T., Baker, D., DiMaio, F., Stahlberg, H., Egelman, E. H., Basler, M.
Cell 160(5), 952-62 (2015)
68. CTF challenge: result summary
Marabini, R., Carragher, B., Chen, S., Chen, J., Cheng, A., Downing, K. H., Frank, J., Grassucci, R. A., Heymann, B. J., Jiang, W., Jonic, S., Liao, H. Y., Ludtke, S. J., Patwari, S., Piotrowski, A. L., Quintana, A., Sorzano, C. O., Stahlberg, H., Vargas, J., Voss, N. R., Chiu, W.
J Struct Biol 190(3), 348-59 (2015)
69. Translational arrest by a prokaryotic signal recognition particle is mediated by RNA interactions
Beckert, B., Kedrov, A., Sohmen, D., Kempf, G., Wild, K., Sinning, I., Stahlberg, H., Wilson, D. N., Beckmann, R.
Nature Struct Mol Biol 22(10), 767-73 (2015)
70. *Yersinia enterocolitica* type III secretion injectisomes form regularly spaced clusters, which incorporate new machines upon activation
Kudryashev, M., Diepold, A., Amstutz, M., Armitage, J. P., Stahlberg, H., Cornelis, G. R.
Mol Microbiol 95(5), 875-84 (2015)
71. Rendering graphene supports hydrophilic with non-covalent aromatic functionalization for transmission electron microscopy
Pantelic, R. S., Fu, W., Schönenberger, C., Stahlberg, H.
Appl Phys Lett 104(13), 134103-134107 (2014)
72. 2dx_automator: implementation of a semiautomatic high-throughput high-resolution cryo-electron crystallography pipeline
Scherer, S., Kowal, J., Chami, M., Dandey, V., Arbeit, M., Ringler, P., Stahlberg, H.
J Struct Biol 186(2), 302-7 (2014)
73. openBEB: open biological experiment browser for correlative measurements
Ramakrishnan, C., Bieri, A., Sauter, N., Roizard, S., Ringler, P., Müller, S., Goldie, K., Enimanev, K., Stahlberg, H., Rinn, B., Braun, T.
BMC Bioinformatics 15, 84 (2014)

74. A KcsA/MloK1 chimeric ion channel has lipid-dependent ligand-binding energetics
McCoy, J. G., Rusinova, R., Kim, D. M., Kowal, J., Banerjee, S., Jaramillo Cartagena, A., Thompson, A. N., Kolmakova-Partensky, L., Stahlberg, H., Andersen, O. S., Nimigean, C. M.
J Biol Chem 289(14), 9535-46 (2014)
75. Single particle 3D reconstruction for 2D crystal images of membrane proteins
Scherer, S., Arheit, M., Kowal, J., Zeng, X., Stahlberg, H.
J Struct Biol 185(3), 267-77 (2014)
76. Structural and mechanistic paradigm of leptin receptor activation revealed by complexes with wild-type and antagonist leptins
Moharana, K., Zabeau, L., Peelman, F., Ringler, P., Stahlberg, H., Tavernier, J., Savvides, S. N.
Structure 22(6), 866-77 (2014)
77. Clostridium difficile toxin CDT hijacks microtubule organization and reroutes vesicle traffic to increase pathogen adherence
Schwan, C., Kruppke, A. S., Nolke, T., Schumacher, L., Koch-Nolte, F., Kudryashev, M., Stahlberg, H., Aktories, K.
Proc Natl Acad Sci U S A 111(6), 2313-8 (2014)
78. Cryo-electron microscopy of membrane proteins
Goldie, K., Abeyrathne, P., Kebbel, F., Chami, M., Ringler, P., Stahlberg, H.
Methods Mol Biol 1117, 325-41 (2014)
79. Disease modeling and phenotypic drug screening for diabetic cardiomyopathy using human induced pluripotent stem cells
Drawnel, F. M., Boccardo, S., Prummer, M., Delobel, F., Graff, A., Weber, M., Gerard, R., Badi, L., Kam-Thong, T., Bu, L., Jiang, X., Hoflack, J. C., Kiialainen, A., Jeworutzki, E., Aoyama, N., Carlson, C., Burcin, M., Gromo, G., Boehringer, M., Stahlberg, H., Hall, B. J., Magnone, M. C., Kolaj
Cell Rep 9(3), 810-21 (2014)
80. The ultrastructure of Chlorobaculum tedium revealed by cryo-electron tomography
Kudryashev, M., Aktoudianaki, A., Dedoglou, D., Stahlberg, H., Tsiotis, G.
Biochim Biophys Acta 1837(10), 1635-42 (2014)
81. Exploring the interactome: microfluidic isolation of proteins and interacting partners for quantitative analysis by electron microscopy
Giss, D., Kemmerling, S., Dandey, V., Stahlberg, H., Braun, T.
Anal Chem 86(10), 4680-7 (2014)
82. Functional surface engineering by nucleotide-modulated potassium channel insertion into polymer membranes attached to solid supports
Kowal, J. L., Kowal, J., Wu, D., Stahlberg, H., Palivan, C. G., Meier, W. P.
Biomaterials 35(26), 7286-94 (2014)
83. X-ray structure of the mouse serotonin 5-HT₃ receptor
Hassaine, G., Deluz, C., Grasso, L., Wyss, R., Tol, M. B., Hovius, R., Graff, A., Stahlberg, H., Tomizaki, T., Desmyter, A., Moreau, C., Li, X. D., Poitevin, F., Vogel, H., Nury, H.
Nature 512(7514), 276-81 (2014)
84. Ligand-induced structural changes in the cyclic nucleotide-modulated potassium channel MloK1
Kowal, J., Chami, M., Baumgartner, P., Arheit, M., Chiu, P. L., Rangl, M., Scheuring, S., Schroder, G. F., Nimigean, C. M., Stahlberg, H.
Nature Commun 5, 3106 (2014)
85. Single-cell lysis for visual analysis by electron microscopy
Kemmerling, S., Arnold, S., Bircher, B. A., Sauter, N., Escobedo, C., Dernick, G., Hierlemann, A., Stahlberg, H., Braun, T.
J Struct Biol 183(3), 467-73 (2013)

-
86. Automation of image processing in electron crystallography
Arheit, M., Castano-Diez, D., Thierry, R., Gipson, B. R., Zeng, X., Stahlberg, H.
Methods Mol Biol 955, 313-30 (2013)
 87. Structure and substrate-induced conformational changes of the secondary citrate/sodium symporter CitS revealed by electron crystallography
Kebbel, F., Kurz, M., Arheit, M., Grütter, M. G., Stahlberg, H.
Structure 21(7), 1243-50 (2013)
 88. Structure of the dodecameric *Yersinia enterocolitica* secretin YscC and its trypsin-resistant core
Kowal, J., Chami, M., Ringler, P., Müller, S., Kudryashev, M., Castano-Diez, D., Amstutz, M., Cornelis, G. R., Stahlberg, H., Engel, A.
Structure 21(12), 2152-61 (2013)
 89. Cryo-electron tomography reveals four-membrane architecture of the *Plasmodium* apicoplast
Lemgruber, L., Kudryashev, M., Dekiwadia, C., Riglar, D. T., Baum, J., Stahlberg, H., Ralph, S. A., Frischknecht, F.
Malar J 12, 25 (2013)
 90. Thermal unfolding of a mammalian pentameric ligand-gated ion channel proceeds at consecutive, distinct steps
Tol, M. B., Deluz, C., Hassaine, G., Graff, A., Stahlberg, H., Vogel, H.
J Biol Chem 288(8), 5756-69 (2013)
 91. Image processing of 2D crystal images
Arheit, M., Castano-Diez, D., Thierry, R., Gipson, B. R., Zeng, X., Stahlberg, H.
Methods Mol Biol 955, 171-94 (2013)
 92. Vaccinia virus entry is followed by core activation and proteasome-mediated release of the immunomodulatory effector VH1 from lateral bodies
Schmidt, F. I., Bleck, C. K., Reh, L., Novy, K., Wollscheid, B., Helenius, A., Stahlberg, H., Mercer,
J. Cell Rep 4(3), 464-76 (2013)
 93. In situ structural analysis of the *Yersinia enterocolitica* injectisome
Kudryashev, M., Stenta, M., Schmelz, S., Amstutz, M., Wiesand, U., Castano-Diez, D., Degiacomi, M. T., Munnich, S., Bleck, C. K., Kowal, J., Diepold, A., Heinz, D. W., Dal Peraro, M., Cornelis, G. R., Stahlberg, H.
Elife 2, e00792 (2013)
 94. Merging of image data in electron crystallography
Arheit, M., Castano-Diez, D., Thierry, R., Abeyrathne, P., Gipson, B. R., Stahlberg, H.
Methods Mol Biol 955, 195-209 (2013)
 95. Molecular assembly of the aerolysin pore reveals a swirling membrane-insertion mechanism
Degiacomi, M. T., Iacovache, I., Pernot, L., Chami, M., Kudryashev, M., Stahlberg, H., van der Goot, F. G., Dal Peraro, M.
Nature Chem Biol 9(10), 623-9 (2013)
 96. The application of graphene as a sample support in transmission electron microscopy
Pantelic, R. S., Meyer, J. C., Kaiser, U., Stahlberg, H.
Solid State Commun 152(15), 1375-1382 (2012)
 97. Electron microscopy analysis of 2D crystals of membrane proteins
Abeyrathne, P. D., Arheit, M., Kebbel, F., Castano-Diez, D., Goldie, K., Chami, M., Renault, L., Kühlbrandt, W., Stahlberg, H.
Comprehensive Biophysics 1, 277-310 (2012)

-
98. Projection structure of the secondary citrate/sodium symporter CitS at 6 Å resolution by electron crystallography
Kebbel, F., Kurz, M., Grütter, M. G., Stahlberg, H.
J Mol Biol 418(42006), 117-26 (2012)
99. RNAi screening reveals proteasome- and Cullin3-dependent stages in vaccinia virus infection
Mercer, J., Snijder, B., Sacher, R., Burkard, C., Bleck, C. K., Stahlberg, H., Pelkmans, L., Helenius, A.
Cell Rep 2(4), 1036-47 (2012)
100. Assessing the benefits of focal pair cryo-electron tomography
Kudryashev, M., Stahlberg, H., Castano-Diez, D.
J Struct Biol 178(2), 88-97 (2012)
101. Structural basis for chirality and directional motility of Plasmodium sporozoites
Kudryashev, M., Munter, S., Lemgruber, L., Montagna, G., Stahlberg, H., Matuschewski, K., Meissner, M., Cyrklaff, M., Frischknecht, F.
Cell Microbiol 14(11), 1757-68 (2012)
102. Structure and function of purified monoclonal antibody dimers induced by different stress conditions
Paul, R., Graff, A., Stahlberg, H., Lauer, M. E., Rufer, A. C., Beck, H., Briguet, A., Schnaible, V., Buckel, T., Boeckle, S.
Pharm Res 29(8), 2047-59 (2012)
103. Characterization of the motion of membrane proteins using high-speed atomic force microscopy
Casuso, I., Khao, J., Chami, M., Paul-Gilloteaux, P., Husain, M., Duneau, J. P., Stahlberg, H., Sturgis, J. N., Scheuring, S.
Nature Nanotechnol 7(8), 525-9 (2012)
104. Connecting micro-fluidics to electron microscopy
Kemmerling, S., Ziegler, J., Schweighauser, G., Arnold, S., Giss, D., Müller, S., Ringler, P., Goldie, K., Goedecke, N., Hierlemann, A., Stahlberg, H., Engel, A., Braun, T.
J Struct Biol 177(1), 128-134 (2012)
105. Dynamo: a flexible, user-friendly development tool for subtomogram averaging of cryo-EM data in high-performance computing environments
Castano-Diez, D., Kudryashev, M., Arbeit, M., Stahlberg, H.
J Struct Biol 178(2), 139-51 (2012)
106. Ionic liquids as matrices in microfluidic sample deposition for high-mass matrix- assisted laser desorption/ionization mass spectrometry
Weidmann, S., Kemmerling, S., Madler, S., Stahlberg, H., Braun, T., Zenobi, R. Eur
J Mass Spectrom (Chichester, Eng) 18(3), 279-86 (2012)
107. Limiting factors in single particle cryo electron tomography
Kudryashev, M., Castano-Diez, D., Stahlberg, H.
Comput Struct Biotechnol J 1, e201207002 (2012)
108. Mus81-Mms4 functions as a single heterodimer to cleave nicked intermediates in recombinational DNA repair
Schwartz, E. K., Wright, W. D., Ehmsen, K. T., Evans, J. E., Stahlberg, H., Heyer, W. D.
Mol Cell Biol 32(15), 3065-80 (2012)
109. Oxidative doping renders graphene hydrophilic, facilitating its use as a support in biological TEM
Pantelic, R. S., Suk, J. W., Hao, Y., Ruoff, R. S., Stahlberg, H.
Nano Lett 11(10), 4319-23 (2011)

110. Polymer-based cell-free expression of ligand-binding family B G-protein coupled receptors without detergents
Klammt, C., Perrin, M. H., Maslennikov, I., Renault, L., Krupa, M., Kwiatkowski, W., Stahlberg, H., Vale, W., Choe, S.
Protein Sci 20(6), 1030-41 (2011)
111. Rad51 paralogues Rad55-Rad57 balance the antirecombinase Srs2 in Rad51 filament formation
Liu, J., Renault, L., Veaute, X., Fabre, F., Stahlberg, H., Heyer, W. D.
Nature 479(7372), 245-8 (2011)
112. Automatic recovery of missing amplitudes and phases in tilt-limited electron crystallography of two-dimensional crystals
Gipson, B. R., Masiel, D. J., Browning, N. D., Spence, J., Mitsuoka, K., Stahlberg, H.
Phys Rev E Stat Nonlin Soft Matter Phys 84(1 Pt 1), 11916 (2011)
113. Graphene: Substrate preparation and introduction
Pantelic, R. S., Suk, J. W., Magnuson, C. W., Meyer, J. C., Wachsmuth, P., Kaiser, U., Ruoff, R. S., Stahlberg, H.
J Struct Biol 174(1), 234-8 (2011)
114. Interaction of complexes I, III, and IV within the bovine respirasome by single particle cryo electron tomography
Dudkina, N. V., Kudryashev, M., Stahlberg, H., Boekema, E. J.
Proc Natl Acad Sci U S A 108(37), 15196-200 (2011)
115. 3D reconstruction from 2D crystal image and diffraction data
Schenk, A. D., Castano-Diez, D., Gipson, B., Arheit, M., Zeng, X., Stahlberg, H.
Methods Enzymol 482, 101-29 (2010)
116. Preparation of 2D crystals of membrane proteins for high-resolution electron crystallography data collection
Abeyrathne, P. D., Chami, M., Pantelic, R. S., Goldie, K., Stahlberg, H.
Method Enzymol 481, 25-43 (2010)
117. An optical and microPET assessment of thermally-sensitive liposome biodistribution in the Met-1 tumor model: importance of formulation
Paoli, E. E., Kruse, D. E., Seo, J. W., Zhang, H., Kheirrolomoom, A., Watson, K. D., Chiu, P., Stahlberg, H., Ferrara, K. W.
J Control Release 143(1), 13-22 (2010)
118. High-resolution low-dose scanning transmission electron microscopy
Buban, J. P., Ramasse, Q., Gipson, B., Browning, N. D., Stahlberg, H.
J Electron Microsc (Tokyo) 59(2), 103-12 (2010)
119. Structural variability of edge dislocations in a SrTiO₃ low-angle [001] tilt grain boundary
Buban, J. P., Chi, M., Masiel, D. J., Bradley, J. P., Jiang, B., Stahlberg, H., Browning, N. D.
J Mater Res 24, 2191-2199 (2009)
120. 2007 annual progress report synopsis of the Center for Structures of Membrane Proteins
Stroud, R. M., Choe, S., Holton, J., Kaback, H. R., Kwiatkowski, W., Minor, D. L., Riek, R., Sali, A., Stahlberg, H., Harries, W.
J Struct Funct Genomics 10(2), 193-208 (2009)
121. Coassembly of Mgm1 isoforms requires cardiolipin and mediates mitochondrial inner membrane fusion
DeVay, R. M., Dominguez-Ramirez, L., Lackner, L. L., Hoppins, S., Stahlberg, H., Nunnari, J.
J Cell Biol 186(6), 793-803 (2009)
122. Crystal structures of Limulus SAP-like pentraxin reveal two molecular aggregations
Shrive, A. K., Burns, I., Chou, H. T., Stahlberg, H., Armstrong, P. B., Greenhough, T. J.
J Mol Biol 386(5), 1240-54 (2009)

-
123. Membrane activity of a C-reactive protein
Harrington, J. M., Chou, H. T., Gutschmann, T., Gelhaus, C., Stahlberg, H., Leippe, M.,
Armstrong, P. B.
FEBS Lett 583(6), 1001-5 (2009)
124. Molecular electron microscopy: state of the art and current challenges
Stahlberg, H., Walz, T.
ACS Chem Biol 3(5), 268-81 (2008)
125. 2dx - Automated 3D structure reconstruction from 2D crystal data
Gipson, B., Zeng, X., Stahlberg, H.
Microscopy and Microanalysis 14(Supp 2), 1290-1291 (2008)
126. Bridging across length scales: multi-scale ordering of supported lipid bilayers via lipoprotein self-assembly and surface patterning
Vinchurkar, M. S., Bricarello, D. A., Lagerstedt, J. O., Buban, J. P., Stahlberg, H., Oda, M. N.,
Voss, J. C., Parikh, A. N.
J Am Chem Soc 130(33), 11164-9 (2008)
127. The fold of alpha-synuclein fibrils
Vilar, M., Chou, H. T., Luhrs, T., Maji, S. K., Riek-Loher, D., Verel, R., Manning, G.,
Stahlberg, H., Riek, R.
Proc Natl Acad Sci U S A 105(25), 8637-42 (2008)
128. Low-dose aberration corrected cryo-electron microscopy of organic specimens
Evans, J. E., Hetherington, C., Kirkland, A., Chang, L. Y., Stahlberg, H., Browning, N.
Ultramicroscopy 108(12), 1636-44 (2008)
129. Membrane pore formation by pentraxin proteins from *Limulus*, the American horseshoe crab
Harrington, J. M., Chou, H. T., Gutschmann, T., Gelhaus, C., Stahlberg, H., Leippe, M.,
Armstrong, P. B.
Biochem J 413(2), 305-13 (2008)
130. Editorial: Spotlight on Electron Crystallography
Hankamer, B., Glaeser, B., Stahlberg, H.
J Struct Biol 160(3), 263-264 (2007)
131. 2dx_merge: data management and merging for 2D crystal images
Gipson, B., Zeng, X., Stahlberg, H.
J. Struct. Biol. 160(3), 375-384 (2007)
132. Oocyte CD9 is enriched on the microvillar membrane and required for normal microvillar shape and distribution
Runge, K. E., Evans, J. E., He, Z. Y., Gupta, S., McDonald, K. L., Stahlberg, H., Primakoff, P.,
Myles, D. G.
Dev Biol 304(1), 317-25 (2007)
133. 2dx – User-friendly image processing for 2D crystals
Gipson, B., Zeng, X., Zhang, Z. Y., Stahlberg, H.
J Struct Biol 157(1), 64-72 (2007)
134. A maximum likelihood approach to two-dimensional crystals
Zeng, X., Stahlberg, H., Grigorieff, N.
J Struct Biol 160(3), 362-74 (2007)
135. Automatic lattice determination for two-dimensional crystal images
Zeng, X., Gipson, B., Zheng, Z. Y., Renault, L., Stahlberg, H.
J Struct Biol 160(3), 353-61 (2007)

136. Structural and kinetic studies of induced fit in xylulose kinase from *Escherichia coli*
Di Luccio, E., Petschacher, B., Voegtli, J., Chou, H. T., Stahlberg, H., Nidetzky, B., Wilson, D. K.
J Mol Biol 365(3), 783-98 (2007)
137. Electron crystallography of membrane proteins
Chou, H. T., Evans, J. E., Stahlberg, H.
Methods Mol Biol 369, 331-43 (2007)
138. The structure of the prokaryotic cyclic nucleotide-modulated potassium channel MloK1 at 16 Å resolution
Chiu, P. L., Pagel, M. D., Evans, J., Chou, H. T., Zeng, X., Gipson, B., Stahlberg, H., Nimigean, C. M.
Structure 15(9), 1053-64 (2007)
139. Avoiding charge induced drift in vitrified biological specimens through scanning transmission electron microscopy.
Nicotra, G., Chou, H. -T., Stahlberg, H., Browning, N. D.
Microscopy and Microanalysis 12(Supp. 02), 246-247 (2006)
140. Cryo-electron microscopy analysis of a 105 kDa protein particle: the xylulose kinase from *E. coli*
Chou, H. -T., di Luccio, E., Wilson, D., Stahlberg, H.
Microscopy and Microanalysis 12(Supp 2), 408-409 (2006)
141. A homotetrameric kinesin-5, KLP61F, bundles microtubules and antagonizes Ncd in motility assays
Tao, L., Mogilner, A., Civelekoglu-Scholey, G., Wollman, R., Evans, J., Stahlberg, H., Scholey, J. M.
Curr Biol 16(23), 2293-302 (2006)
142. Double hexameric ring assembly of the type III protein translocase ATPase HrcN
Müller, S., Pozidis, C., Stone, R., Meesters, C., Chami, M., Engel, A., Economou, A., Stahlberg, H.
Mol Microbiol 61(1), 119-25 (2006)
143. Functional modulation of IFT kinesins extends the sensory repertoire of ciliated neurons in *Caenorhabditis elegans*
Evans, J. E., Snow, J. J., Gunnarson, A. L., Ou, G., Stahlberg, H., McDonald, K. L., Scholey, J. M.
J Cell Biol 172(5), 663-9 (2006)
144. Milestones in electron crystallography Renault, L., Chou, H. T., Chiu, P. L., Hill, R. M., Zeng, X., Gipson, B., Zhang, Z. Y., Cheng, A., Unger, V., Stahlberg, H.
J Comput Aided Mol Des 20(42193), 519-27 (2006)
145. Applications of Atomic Scale Scanning Transmission Electron Microscopy
Browning, N. D., Erni, R., Mitterbauer, C. J., Fu, L., Chi, M., Mehraeen, S., Herrera, M., Chou, H. -T., Stahlberg, H., Ramasse, Q. M., Ziegler, A., Nicotra, G., Arslan, I., Idrobo, J. -C., Stach, E. A., Bleiloch, A.
Microscopy and Microanalysis 12(S02), 134-135 (2006)
146. Testing 3-D Reconstruction Methods for Electron Tomography
Mehraeen, S., Stahlberg, H., Evans, J. E., Meesters, C., Arslan, I., Midgley, P. A., Browning, N. D.
Microscopy and Microanalysis 11(S02), 336-337 (2005)
147. The 4.5 Å structure of human AQP2
Schenk, A. D., Werten, P. J., Scheuring, S., de Groot, B. L., Müller, S., Stahlberg, H., Philippsen, A., Engel, A.
J Mol Biol 350(2), 278-89 (2005)

148. Oligomeric structure of the Bacillus subtilise cell division protein DivIVA determined by transmission electron microscopy
Stahlberg, H., Kutejova, E., Muchova, K., Gregorini, M., Lustig, A., Müller, S., Olivieri, V., Engel, A., Wilkinson, A. J., Barak, I.
Mol Microbiol 52(5), 1281-90 (2004)
149. Type III protein translocase: HrcN is a peripheral ATPase that is activated by oligomerization
Pozidis, C., Chalkiadaki, A., Gomez-Serrano, A., Stahlberg, H., Brown, I., Tampakaki, A. P., Lustig, A., Sianidis, G., Politou, A. S., Engel, A., Panopoulos, N. J., Mansfield, J., Pugsley, A. P., Karamanou, S., Economou, A.
J Biol Chem 278(28), 25816-24 (2003)
150. IPLT: An image processing library and toolkit for the electron microscopy community
Philippsen, A., Schenk, A. D., Stahlberg, H., Engel, A.
J Struct Biol 144(42006), 42106 (2003)
151. Progress in the analysis of membrane protein structure and function
Werten, P. J., Remigy, H. W., de Groot, B. L., Fotiadis, D., Philippsen, A., Stahlberg, H., Grubmuller, H., Engel, A.
FEBS Lett 529(1), 65-72 (2002)
152. Sampling the conformational space of membrane protein surfaces with the AFM
Scheuring, S., Müller, D. J., Stahlberg, H., Engel, H. A., Engel, A.
Eur Biophys J 31(3), 172-8 (2002)
153. Assessing the structure of membrane proteins: combining different methods gives the full picture
Stahlberg, H., Engel, A., Philippsen, A.
Biochem Cell Biol 80(5), 563-8 (2002)
154. Charting and unzipping the surface layer of Corynebacterium glutamicum with the atomic force microscope
Scheuring, S., Stahlberg, H., Chami, M., Houssin, C., Rigaud, J. L., Engel, A.
Mol Microbiol 44(3), 675-84 (2002)
155. The aquaporin superfamily: structure and function
Stahlberg, H., Heymann, B., Mitsuoka, K., Fuyijoshi, Y., Engel, A.
Current Topics in Membranes 51, 39-119 (2001)
156. ATP synthase: constrained stoichiometry of the transmembrane rotor
Müller, D. J., Dencher, N. A., Meier, T., Dimroth, P., Suda, K., Stahlberg, H., Engel, A., Seelert, H., Matthey, U.
FEBS Lett 504(3), 219-22 (2001)
157. Bacterial Na(+)-ATP synthase has an undecameric rotor
Stahlberg, H., Müller, D. J., Suda, K., Fotiadis, D., Engel, A., Meier, T., Matthey, U., Dimroth, P.
EMBO Rep 2(3), 229-33 (2001)
158. Two-dimensional crystals: a powerful approach to assess structure, function and dynamics of membrane proteins
Stahlberg, H., Fotiadis, D., Scheuring, S., Remigy, H., Braun, T., Mitsuoka, K., Fujiyoshi, Y., Engel, A.
FEBS Lett 504(3), 166-72 (2001)
159. The aquaporin sidedness revisited
Scheuring, S., Tittmann, P., Stahlberg, H., Ringler, P., Borgnia, M., Agre, P., Gross, H., Engel, A.
J. Mol. Biol. 299(5), 1271-1278 (2000)

160. GlpF: A structural variant of the aquaporin tetramer
Braun, T., Philippsen, A., Wirtz, S., Borgnia, J., Agre, P., Kühlbrandt, W., Engel, A., Stahlberg, H. In **'Molecular biology and physiology of water and solute transport'**, Hohmann & S. Nielsen (Eds.) Kluwer Academic, New York. ISBN 0-306-46501-9 , 13-22 (2000)
161. Proton-powered turbine of a plant motor
Seelert, H., Poetsch, A., Dencher, N. A., Engel, A., Stahlberg, H., Müller, D. J.
Nature 405(6785), 418-9 (2000)
162. Surface tongue-and-groove contours on lens MIP facilitate cell-to-cell adherence
Fotiadis, D., Hasler, L., Muller, D. J., Stahlberg, H., Kistler, J., Engel, A.
J Mol Biol 300(4), 779-89 (2000)
163. The 3.7 Å projection map of the glycerol facilitator GlpF: a variant of the aquaporin tetramer
Braun, T., Philippsen, A., Wirtz, S., Borgnia, M. J., Agre, P., Kühlbrandt, W., Engel, A., Stahlberg, H.
EMBO Rep 1(2), 183-9 (2000)
164. The 6.9-Å structure of GlpF: a basis for homology modeling of the glycerol channel from Escherichia coli
Stahlberg, H., Braun, T., de Groot, B., Philippsen, A., Borgnia, M. J., Agre, P., Kühlbrandt, W., Engel, A.
J Struct Biol 132(2), 133-41 (2000)
165. Domain structure of secretin PulD revealed by limited proteolysis and electron microscopy
Nouwen, N., Stahlberg, H., Pugsley, A. P., Engel, A.
EMBO J 19(10), 2229-36 (2000)
166. The reaction centre from green sulphur bacteria Chlorobium tedium: a structural analysis by scanning transmission electron microscopy
Remigy, H. W., Stahlberg, H., Fotiadis, D., Müller, S., Wolpensinger, B., Engel, A., Hauska, G., Tsiotis, G.
J Mol Biol 290(4), 851-858 (1999)
167. Structure of the water channel AqpZ from Escherichia coli revealed by electron crystallography
Ringler, P., Borgnia, M. J., Stahlberg, H., Maloney, P. C., Agre, P., Engel, A.
J Mol Biol 291(5), 1181-90 (1999)
168. High resolution AFM topographs of the Escherichia coli water channel aquaporin Z
Scheuring, S., Ringler, P., Borgnia, M., Stahlberg, H., Muller, D. J., Agre, P., Engel, A.
EMBO J 18(18), 4981-7 (1999)
169. Mitochondrial Lon of Saccharomyces cerevisiae is a ring-shaped protease with seven flexible subunits
Stahlberg, H., Kutejova, E., Suda, K., Wolpensinger, B., Lustig, A., Schatz, G., Engel, A., Suzuki, C. K.
Proc Natl Acad Sci U S A 96(12), 6787-90 (1999)
170. The reaction centre of the photounit of Rhodospirillum rubrum is anchored to the light-harvesting complex with four-fold rotational disorder
Stahlberg, H., Dubochet, J., Vogel, H., Ghosh, R.
Photosynthesis Research 55, 363-368 (1998)
171. Are the light-harvesting I complexes from Rhodospirillum rubrum arranged around the reaction centre in a square geometry?
Stahlberg, H., Dubochet, J., Vogel, H., Ghosh, R.
J Mol Biol 282(4), 819-31 (1998)

172. Friction anisotropy and asymmetry of a compliant monolayer induced by a small molecular tilt
Liley, M., Gourdon, D., Stamou, D., Meseth, U., Fischer, T. M., Lautz, C., Stahlberg, H., Vogel, H., Burnham, N. A., Duschl, C.
Science 280(5361), 273-5 (1998)
173. Chloroplast F0F1 ATP synthase imaged by atomic force microscopy
Neff, D., Tripathi, S., Middendorf, K., Stahlberg, H., Butt, H. J., Bamberg, E., Dencher, N. A.
J Struct Biol 119(2), 139-48 (1997)
174. Sulphur-bearing lipids for the covalent attachment of supported lipid bilayers to gold surfaces: a detailed characterisation and analysis
Duschl, C., Liley, M., Lang, J., Ghandi, A., Zakeeruddin, S. M., Stahlberg, H., Dubochet, J., Nemetz, A., Knoll, W., Vogel, H.
Materials Science & Engineering C 4, 7-18 (1996)

Peer-reviewed books / monographs

175. Single particle analysis for high-resolution 2D electron crystallography
Righetto, R., Stahlberg, H.
Methods in Mol. Biology. (invited review, submitted), (2019)
176. Three-dimensional electron microscopy of macromolecular assemblies (J. Frank), Book Review
Renault, L., Stahlberg, H.
Scanning 29(1), 37 (2007)
177. Structure determination using electron crystallography
Evans, J. E., Renault, L., Stahlberg, H. In: 3D-Electron Microscopy in Life Sciences (a Textbook on DVD). Ed. A. Verkleij, E. V. Orlova, and A. Leis. First edition.
3DEM NETWORK of EXCELLENCE (European Union), (2008)

Peer-reviewed conference papers

178. Microfluidics to isolate untagged proteins from cell extracts for visual analysis by electron microscopy
D. Giss, S. Kemmerling, V. Dandey, Stahlberg, H., Braun, T.
17th International Conference on Miniaturized Systems for Chemistry and Life Science
Conference proceeding, (2013)

Contributions to books

179. Thylakoid ultrastructure: Visualizing the photosynthetic machinery
Steinbeck, S., O'Mara, M. L., Ross, I., Stahlberg, H., Hankamer, B.
Microbiology Monographs (Springer), Chlamydomonas Biology, Biotechnology and Biomedicine. Biotechnology and Biomedicine Pt. 2(in press), (2016)
180. Electron Cryomicroscopy
Dubochet, J., Stahlberg, H.
eLS - Encyclopaedia of Life Sciences (online library), (2001)
181. Aquaglyceroporins: channel proteins with a conserved core, multiple functions, and variable surfaces
Engel, A., Stahlberg, H.
Int Rev Cytol 215, 75-104 (2002)