

Curriculum Vitae

Prof. Gebhard F. X. Schertler



Personal Info

Citizenship	Austria
Date of birth	1.2.1957
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Address line 2	Paul Scherrer Institute
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Prof. Gebhard Schertler is investigating the structure and function of membrane proteins with a strong focus on G protein coupled receptors (GPCRs). He did his Master at the University of Innsbruck in Chemistry and received his PhD at the University of Munich where he built his expertise in structural biology of membrane proteins and molecular pharmacology. He then moved to the U.K. where his group was located at the MRC Laboratory for Molecular Biology (Cambridge, UK), it focused on 3D structural analysis by X-ray and electron crystallography and solved the atomic structures of several GPCRs (rhodopsins, beta adrenergic receptors). With this expertise, Schertler successfully revealed the mechanisms of light-induced rhodopsin activation and agonist binding to a GPCR. With his move to the Paul Scherrer Institute (PSI) in Villigen, Switzerland in 2010, Schertler became the head of the division of Biology and Chemistry (BIO) at PSI and Professor for Structural Biology at ETH Zürich. He established an interdisciplinary research group on GPCRs in the Laboratory for Biomolecular Research (LBR). With his group, he built up strong expertise in crystallography, electron microscopy, NMR, biophysics, bioinformatics, and membrane protein expression/purification/crystallization. His group has applied single-particle cryo-EM to the target of the visual cascade, the cyclic nucleotide gated (CNG) channel that transforms the chemical information into a hyper polarization that reduces nucleotide release in the photoreceptor cell. His group applied x-ray imaging to visualize synapsis in the retina. With the free electron laser and room temperature femtosecond crystallography he obtained the first direct visualization of the retinal isomerization.

Schertler is advising PSI on biological applications using the Swiss Free Electron Laser (SwissFEL) and is involved in the experimental setup and design of biology beamlines for optimization of both, biomolecular nano-crystallography and biological X-FEL imaging. He also successfully developed the PSI Electron Microscopy Facility (EMF) at BIO. In the BIO division, he strengthened structural informatics and the extended it to structural dynamics. In addition, he is involved in the development of the innovation area at PSI, the Park innovAARE and he has founded two spin-out companies, leadXpro and InterAx, in this context. LeadXpro is a membrane protein structure based drug discovery company. InterAx applies a combination of systems biology of GPCR signaling with artificial intelligence driven drug design. Besides leading the BIO division at PSI, Schertler is a member of the Board of Directors at the PSI and he is full Professor for Structural Biology in the Biology Department at the ETH in Zürich.

Major Achievements Major contributions to the structure of visual pigments and GPCRs using electron microscopy and high brilliance X-ray micro-diffraction methods

Structure of GPCR signaling complexes of rhodopsin and pharmacologically important GPCRs

Structure of the cyclic nucleotide gated vision channel

Implementing room temperature crystallography at FELs for retinal proteins

Visualization with femtosecond crystallography of the retinal isomerization

Keywords Structure of the cyclic nucleotide gated cation vision channel

Active structure of the CCR5 HIV co-receptor, signaling complex

Active structure of μ -opioid receptor–Gi protein signaling complex

Active structure of rhodopsin signaling complex with Gi and Fab

Development of Fab fragments for cryo-EM of signaling complexes

X-ray structure of rhodopsin signaling complex with mini Gi protein

Structure of invertebrate rhodopsin JSR1

Molecular signatures of G-protein-coupled receptors

First X-ray structure of agonist bound to adrenergic receptor

Structures of beta 1-adrenergic receptor with agonists and antagonists

Structure of human beta 2-adrenergic receptor

Active and inactive rhodopsin by X-ray crystallography

Structure of rhodopsin by cryo-EM (2D and 3D)

Development of micro crystallography

First visualization of a GPCR projection of rhodopsin

Education University of Munich, PhD, 1989, Biochemistry (Hartmut Michel and Dieter Oesterhelt)

University of Innsbruck, Diploma, 1984, Chemistry (Manfred Schweiger)

Positions held Member of Directorial Board, Paul Scherrer Institute (PSI), 2011 –

Full Professor of Structural Biology, ETH Zürich, 2010 -

Head of Division of Biology and Chemistry, PSI, 2010 -

Head of Laboratory of Biomolecular Research, PSI, 2010 -2012

Group Leader, MRC-LMB Cambridge, 1998 - 2010 Staff Scientist, MRC-LMB Cambridge, 1991 - 1998

Research fellowship, Clare Hall, 1996

EMBO long-term fellowship, MRC-LMB Cambridge (Richard Henderson), 1989 -1991

Organizational Activities

Main organizer and Chair, LEAPS Conference, Biology at large facilities, (2023)

Main organizer and Chair, 4th ERNEST Conference, virtual conference (2021)

Co-organizer, Drug Discovery at SwissFEL Conference, Paul Scherrer Institute, Switzerland (2019)

Co-organizer, Hybrid Methods Workshop, Paul Scherrer Institute, Switzerland (2016)

Main organizer and Chair, International Retinal Protein Conference, Ascona, Switzerland (2012)

Main Organizer and Chair, Gordon Conference, Ligand Recognition and Molecular Gating, Lucca, Italy (2002)

About 30 Session chairs related to GPCR and membrane structure research

Advisory Boards

Member of Directorial Board, Paul Scherrer Institute, Villigen (2011 -)

SIB Foundation Council Member, Switzerland (2022 -)

Scientific Advisory Board, LeadXpro AG, Switzerland (2015 -)

Scientific Advisory Board, InterAx Biotech, Switzerland (2015 -)

Scientific advisory committee of MAX IV Laboratory, Sweden (2010 - 2018)

Scientific Advisory Board, Heptares Pharmaceuticals, UK (2007 - 2014)

International advisory board of the organizing committee of the International Retinal Protein Conference (1998 -)

Invited presentations

More than hundred conference, workshop or invited presentations since 1989.

More than ten oral presentations per year during the last 15 years.

Approved research projects (last 5 years)

2022 - 2028	ERC Synergia Grant: Switchable rhodOpsins in Life Sciences (SOL) (Corresponding PI)
2020 - 2023	Swiss National Science Foundation: Structure based engineering of photo-catalysis using Free Electron Lasers (PI)
2019 - 2023	Swiss National Science Foundation, Sinergia Grant (leading house): PrP and its receptor GPR126: guardians of axomyelinic integrity and druggable targets against demyelinating diseases (Responsible PI)
2019 - 2022	Deutsche Forschungsgemeinschaft, G-Protein Signalkaskaden, Teilprojekt 12 Strukturelle, molekulare Pharmakologie von G-Protein-Inhibitor Komplexen (Co-PI)
2019 – 2022	Synapsis Foundation: Mechanisms of adhesion GPCR signalling in sustaining neuronal tissue: implications for physiology and pathology (PI)
2019 - 2023	European research network on signal transduction: COST ACTION CA18133 (Main Swiss PI)
2018 – 2019	Swiss Nanoscience Institute: NanoGhip (Co-PI)

2017 - 2020 Swiss National Science Foundation "Bonus of Excellence": Serial femtosecond crystallography of GPCR signaling systems (PI)
2017 Swiss National Science Foundation R'EQUIP: Direct electron detector for cryo-EM single particle analysis, electron tomography and protein nanocrystallography (Co-PI)

Total funding 2017 – 2021: 14'395'695 CHF

Supervision of junior researchers

Supervision of over 30 PhD students over the last 15 years

Postdoctoral scholars and junior researchers mentored (out of 40+ alumni, current position in brackets): Angelika Krebs (Professor, University of Graz, AT); Vincent Unger (Professor, Department of Molecular Biosciences, Northwestern University USA); Steffen Brünle (Assistant Professor, University Leiden, NL), Matthew Higgins (Professor, Department of Biochemistry, University of Oxford, UK); Dmitry Veprintsev (Professor of Molecular and Cellular Pharmacology, Faculty of Medicine & Health Sciences, Nottingham, UK); Volodymyr Korkhov (SNF-Professorship at ETH Zürich and PSI, CH); Shoji Maeda (Assistant Professor, Department of Pharmacology, University of Michigan Medical School, USA); Sarah Shahmoradian (Assistant Professor, UT Southw., TX, USA); Przemyslaw Nogly (Ambizione Fellow ETH Zurich, CH); Eshita Mutt (bioinformatics specialist, Sophia genetics), Elena Lesca (staff scientist ETH Zürich, CH), Tilmann Flock (deployment strategist, Palantir Technologies, UK), PikYee Ma (scientist PSI, CH), Aurelien Rizk (CTO at InterAx Biotech AG, CH) Martin Ostermaier (product manager Bachem, CH), Ching- Ju Tsai (staff scientist PSI, CH), Chayne Piscitelli (scientist Zymeworks Inc., USA), Antoine Gautier (scientist Biozentrum Basel, CH), Florian Brückner (regulatory affairs manager Formycon AG, AT), Jörg Standfuss (group leader PSI, CH).

Teaching activities

2015 - Membrane Biology. ETH Zürich, Switzerland
2010 - X-Ray Crystallographic Structure Determination and Biophysics. ETH Zürich
2010 - Fundamentals of Biology IIA: Cell Biology. ETH Zürich, Switzerland
2010 - Multigene Expression in Mammalian Cells. ETH Zürich, Switzerland

Publications Total publications = 118; Total citations = **18074**; **34** publications ≥ **100** citations. I10 index = **93**; H-index = **53**; Average Citations per Item = **112.25** (Source data: Google Scholar)

10 key publications from the last 5 years

Barret, D. C. A., **Schertler, G. F. X.**, Benjamin Kaupp, U., & Marino, J. (2022). The structure of the native CNGA1/CNGB1 CNG channel from bovine retinal rods. *Nat Struct Mol Biol*, 29(1), 32-39. <https://doi.org/10.1038/s41594-021-00700-8>

Barret, D. C. A., **Schertler, G. F. X.**, Kaupp, U. B., & Marino, J. (2021). Structural basis of the partially open central gate in the human CNGA1/CNGB1 channel explained by additional density for calmodulin in cryo-EM map. *J Struct Biol*, 214(1), 107828. <https://doi.org/10.1016/j.jsb.2021.107828>

Henzi, A., Senatore, A., Lakkaraju, A. K. K., Scheckel, C., Muhle, J., Reimann, R., Sorce, S., **Schertler, G.**, Toyka, K. V., & Aguzzi, A. (2020). Soluble dimeric prion protein ligand activates Adgrg6 receptor but does not rescue early signs of demyelination in PrP-deficient mice. *PLoS One*, 15(11), e0242137. <https://doi.org/10.1371/journal.pone.0242137>

Isaikina, P., Tsai, C. J., Dietz, N., Pamula, F., Grahl, A., Goldie, K. N., Guixa-Gonzalez, R., Branco, C., Paolini-Bertrand, M., Calo, N., Cerini, F., **Schertler, G. F. X.**, Hartley, O., Stahlberg, H., Maier, T., Deupi, X., & Grzesiek, S. (2021). Structural basis of the activation of the CC chemokine receptor 5 by a chemokine agonist. *Sci Adv*, 7(25). <https://doi.org/10.1126/sciadv.abg8685>

Koehl, A., Hu, H., Maeda, S., Zhang, Y., Qu, Q., Paggi, J. M., Latorraca, N. R., Hilger, D., Dawson, R., Matile, H., **Schertler, G. F. X.**, Granier, S., Weis, W. I., Dror, R. O., Manglik, A., Skiniotis, G., & Kobilka, B. K. (2018). Structure of the micro-opioid receptor-Gi protein complex. *Nature*, 558(7711), 547-552. <https://doi.org/10.1038/s41586-018-0219-7>

Maeda, S., Koehl, A., Matile, H., Hu, H., Hilger, D., **Schertler, G. F. X.**, Manglik, A., Skiniotis, G., Dawson, R. J. P., & Kobilka, B. K. (2018). Development of an antibody fragment that stabilizes GPCR/G-protein complexes. *Nat Commun*, 9(1), 3712. <https://doi.org/10.1038/s41467-018-06002-w>

Panneels, V., Diaz, A., Imsand, C., Guizar-Sicairos, M., Muller, E., Bittermann, A. G., Ishikawa, T., Menzel, A., Kaech, A., Holler, M., Grimm, C., & **Schertler, G.** (2021). Imaging of retina cellular and subcellular structures using ptychographic hard X-ray tomography. *J Cell Sci*, 134(19). <https://doi.org/10.1242/jcs.258561>

Tsai, C. J., Marino, J., Adaixo, R., Pamula, F., Muehle, J., Maeda, S., Flock, T., Taylor, N. M., Mohammed, I., Matile, H., Dawson, R. J., Deupi, X., Stahlberg, H., & **Schertler, G.** (2019). Cryo-EM structure of the rhodopsin-Galphai-beta-gamma complex reveals binding of the rhodopsin C-terminal tail to the gbeta subunit. *Elife*, 8. <https://doi.org/10.7554/eLife.46041>

Tsai, C. J., Pamula, F., Nehme, R., Muhle, J., Weinert, T., Flock, T., Nogly, P., Edwards, P. C., Carpenter, B., Gruhl, T., Ma, P., Deupi, X., Standfuss, J., Tate, C. G., & **Schertler, G. F. X.** (2018). Crystal structure of rhodopsin in complex with a mini-Go sheds light on the principles of G protein selectivity. *Sci Adv*, 4(9), eaat7052. <https://doi.org/10.1126/sciadv.aat7052>

Varma, N., Mutt, E., Muhle, J., Panneels, V., Terakita, A., Deupi, X., Nogly, P., **Schertler, G. F. X.**, & Lesca, E. (2019). Crystal structure of jumping spider rhodopsin-1 as a light sensitive GPCR. *Proc Natl Acad Sci U S A*, 116(29), 14547-14556. <https://doi.org/10.1073/pnas.1902192116>

for the full publication list please go to <https://www.psi.ch/en/bio/schertler-group-research#publications> or <https://scholar.google.ch/citations?user=dgQINnYAAAAJ&hl=en>