

Curriculum Vitae

Valérie Panneels

Name : Valérie Panneels, Dr. sc. Biomed.
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ACTIVITIES AT PSI:

I am leading structural biology projects on 1/. the dynamics of retinal binding proteins using time-resolved serial crystallography; 2/. the neuronal networks of the retina tissue using hard X-ray cryotomography and electron microscopy.

EXPERIENCE:

- Scientist** (2011 to date) – Laboratory of Biomolecular Research (LBR), Research Department Biology and Chemistry (BIO), Paul Scherrer Institut (PSI), department Prof. Dr. Gebhard Schertler. *Structure of G Protein-coupled Receptors.*
- Scientist** (2001 to 2011) – Structural Biology Department, Heidelberg University Biochemistry Center (BZH), University of Heidelberg, Germany, group of Prof. Dr. Irmgard Sinning. *Structure of Eukaryotic Membrane Proteins.*
- Scientist** (1997-2001) – Structure and Biocomputing Department, European Molecular Biology Laboratory (EMBL), Heidelberg, Germany, group of Dr. Irmgard Sinning. *Structure of Eukaryotic Membrane Proteins.* Personal Grants: EMBO and TMR-Marie Curie grant.
- Postdoc** (1996-1997) – Institute of Interdisciplinary Research in human and molecular Biology (IRIBHM), Université Libre de Bruxelles (ULB), Brussels, Belgium, group of Prof. Dr. med. Jacques Emile Dumont. *Metabolism and Role of Iodolipids in Human.*

EDUCATION:

- Ph.D. Thesis** – **Biomedical Sciences**, Faculty of Medicine, Université Libre de Bruxelles (ULB), Brussels, Belgium. Supervisor Prof. Dr. med. Jean-Marie Boeynaems, Institute of Interdisciplinary Research in human and molecular Biology (IRIBHM). On the *Metabolism and Role of Iodolipids in Human*. Highest grade.
(1991-1996)
- Master Thesis** – **"Biologie Médicale Appliquée"**, Faculty of Medicine, Université Libre de Bruxelles (ULB), Brussels, Belgium. Supervisor Prof. Dr. med. Jean-Marie Boeynaems, Institute of Interdisciplinary Research in human and molecular Biology (IRIBHM). On the *Metabolism and Role of Iodolipids in Human*. Highest grade.
(1987-1991)

PUBLICATIONS as a first or last author:

- *Ultrafast structural changes direct the first molecular events of vision*. Gruhl T, Weinert T, Rodrigues MJ, Milne CJ, Ortolani G, Nass K, Nango E, Sen S, Johnson PJM, Cirelli C, Furrer A, Mous S, Skopintsev P, James D, Dworkowski F, Båth P, Kekilli D, Ozerov D, Tanaka R, Glover H, Bacellar C, Brünle S, Casadei CM, Diethelm AD, Gashi D, Gotthard G, Guixà-González R, Joti Y, Kabanova V, Knopp G, Lesca E, Ma P, Martiel I, Mühle J, Owada S, Pamula F, Sarabi D, Tejero O, Tsai CJ, Varma N, Wach A, Boutet S, Tono K, Nogly P, Deupi X, Iwata S, Neutze R, Standfuss J, Schertler G, Panneels V. **Nature (2023)** 615(7954):939-944. doi: 10.1038/s41586-023-05863-6.
- ULTRAFAST STRUCTURAL CHANGES DIRECT THE FIRST MOLECULAR EVENTS OF VISION. Thomas Gruhl, Tobias Weinert, Matthew Rodrigues, Christopher J Milne, ... , Przemyslaw Nogly, Xavier Deupi, So Iwata, Richard Neutze, Jörg Standfuss, Gebhard FX Schertler, Valerie Panneels. **bioRxiv (2022)**.10.14.511948; doi: <https://doi.org/10.1101/2022.10.14.51194>.
- Imaging of retina cellular and subcellular structures using ptychographic hard X-ray tomography. Panneels V, Diaz A, Imsand C, Guizar-Sicairos M, Müller E, Bittermann AG, Ishikawa T, Menzel A, Kaech A, Holler M, Grimm C, Schertler G. **J Cell Sci. (2021)** 134(19):jcs258561. doi: 10.1242/jcs.258561.
- *Batch crystallization of rhodopsin for structural dynamics using a X-ray free electron laser (X-FEL)*. W. Wu, P. Nogly, J. Rheinberger, L.M. Kick, C. Gati, G. Nelson, X. Deupi, J. Standfuss, G. Schertler and V. Panneels. **Acta Crystallographica section F (2015)** (Pt 7):856-60.
- *Time-resolved structural studies with serial crystallography: A new light on retinal proteins*. V. Panneels, W. Wu, C.-J. Tsai, P. Nogly, J. Rheinberger, K. Jaeger, G. Cicchetti, C. Gati, L. Kick, G. Capitani, C. Milne, C. Padeste, B. Pedrini, X.-D. Li, J. Standfuss, R. Abela, G. Schertler. **Structural Dynamics (2015)** 2, 041718 (2015); <http://dx.doi.org/10.1063/1.4922774>.
- *Drosophila Photoreceptor Cells exploited for the Production of Eukaryotic Membrane Proteins: Receptors, Transporters and Channels*. Panneels V, Kock I., Krijnse-Locker J., Rezgaoui M. and Sinning I. **PLoS One (2011)** **8;6(4):e18478**.
- *Targeting of Drosophila rhodopsin requires helix 8 but not the distal C-terminus*. Kock I, Bulgakova NA, Knust E, Sinning I and Panneels V. **PLoS One (2009)** **4(7):e6101**.

- *Pharmacological characterization and immunoaffinity purification of metabotropic glutamate receptor from Drosophila overexpressed in Sf9 cells.* V. Panneels, Ç. Eroglu, P. Cronet and I. Sinning. **Prot. Exp. and Purif.** (2003) 30, 275-282.
- *Choline head groups stabilize the matrix loop regions of the ATP/ADP carrier ScAAC2.* Panneels V., Schüssler U, Costagliola S, Sinning I. **Biochem Biophys Res Commun** (2003) 300 (1), 65-74.
- *Biosynthesis and metabolism of 2-iodohexadecanal in cultured dog thyroid cells.* Panneels V., Macours P., Van Den Bergen H., Braekman J-C., Van Sande J. and Boeynaems J.M. **J. Biol. Chem.** (1996) 271 (38) 23006-23014
- *Inhibition of human thyroid adenylyl cyclase by 2-iodoaldehydes.* Panneels V., Van Sande J., Van Den Bergen H., Jacoby C., Braekman J.C., Dumont J.E. and Boeynaems J.M. **Mol. Cell. Endocrinol.** (1994) 106, 41-50.
- *Inhibition of H₂O₂ production by iodoaldehydes in cultured dog thyroid cells.* Panneels V., Van Den Bergen H., Jacoby C., Braekman J., Van Sande J., Dumont J.E. and Boeynaems J.M. **Mol. Cell. Endocrinol.** (1994) 102, 167

PUBLICATIONS through collaborations:

- Correction of rhodopsin serial crystallography diffraction intensities for a lattice-translocation defect. Rodrigues MJ, Casadei CM, Weinert T, **Panneels V**, Schertler GFX. **Acta Cryst D Struct Biol** (2023) 79(Pt 3):224-233. doi: 10.1107/S2059798323000931.
- Dynamics and mechanism of a light-driven chloride pump. Mous S, Gotthard G, Ehrenberg D, Sen S, Weinert T, Johnson PJM, James D, Nass K, Furrer A, Kekilli D, Ma P, Brünle S, Casadei CM, Martiel I, Dworkowski F, Gashi D, Skopintsev P, Wranik M, Knopp G, Panepucci E, Panneels V, Cirelli C, Ozerov D, Schertler GFX, Wang M, Milne C, Standfuss J, Schapiro I, Heberle J, Nogly P. **Science** (2022) 375(6583):845-851. doi: 10.1126/science.abj6663.
- Femtosecond-to-millisecond structural changes in a light-driven sodium pump. Skopintsev P, Ehrenberg D, Weinert T, James D, Kar RK, Johnson PJM, Ozerov D, Furrer A, Martiel I, Dworkowski F, Nass K, Knopp G, Cirelli C, Arrell C, Gashi D, Mous S, Wranik M, Gruhl T, Kekilli D, Brünle S, Deupi X, Schertler GFX, Benoit RM, Panneels V, Nogly P, Schapiro I, Milne C, Heberle J, Standfuss J. **Nature** (2020) Jul;583(7815):314-318. doi: 10.1038/s41586-020-2307-8.
- Jumping spider rhodopsin-1: crystal structure of a light-sensitive GPCR. Varma N., Mutt E., Muehle J., Panneels V., Terakita A., Deupi X., Nogly P., Schertler G., Lesca E. **PNAS** (2019) 16;116(29):14547-14556. doi: 10.1073/pnas.1902192116.
- Femtosecond phase-transition in hard x-ray excited bismuth. Makita M, Vartiainen I, Mohacsi I, Caleman C, Diaz A, Jönsson HO, Juranić P, Medvedev N, Meents A, Mozzanica A, Opara NL, Padeste C, Panneels V, Saxena V, Sikorski M, Song S, Vera L, Willmott PR, Beaud P, Milne CJ, Ziaja-Motyka B, David C. **Sci Rep.** (2019) Jan 24;9(1):602. doi: 10.1038/s41598-018-36216-3.
- The role of water molecules in phototransduction of retinal proteins and G protein-coupled receptors. Lesca E., Panneels V. and Schertler G. **Faraday Discussions** (2018)17;207:27-37.
- Demonstration of femtosecond X-ray pump X-ray probe diffraction on protein crystals. Opara NL, Mohacsi I, Makita M, Castano-Diez D, Diaz A, Juranić P, Marsh M, Meents A, Milne CJ, Mozzanica A, Padeste C, Panneels V, Sikorski M, Song S, Stahlberg H, Vartiainen I, Vera L, Wang M, Willmott PR, David C. **Struct Dyn.** (2018) Oct 1;5(5):054303.
- Retinal isomerization in bacteriorhodopsin captured by a femtosecond x-ray laser. Nogly P, Weinert T, James D, Carbajo S, Ozerov D, Furrer A, Gashi D, Borin V, Skopintsev P, Jaeger K, Nass K, Båth P, Bosman R, Koglin J, Seaberg M, Lane T, Kekilli D, Brünle S, Tanaka T, Wu W, Milne C, White T, Barty A, Weierstall U, Panneels V, Nango E, Iwata S, Hunter M, Schapiro I, Schertler G, Neutze R, Standfuss J. **Science.** (2018) Jul 13;361(6398).

- OMNY-A tOMography Nano crYo stage. Holler M, Raabe J, Diaz A, Guizar-Sicairos M, Wepf R, Odstrcil M, Shaik FR, Panneels V, Menzel A, Sarafimov B, Maag S, Wang X, Thominet V, Walther H, Lachat T, Vitins M, Bunk O. **Rev Sci Instrum.** (2018) Apr;89(4):043706.
- *Serial millisecond crystallography for routine room-temperature structure determination at synchrotrons.* Weinert T, Olieric N, Cheng R, Brünle S, James D, Ozerov D, Gashi D, Vera L, Marsh M, Jaeger K, Dworkowski F, Panepucci E, Basu S, Skopintsev P, Doré AS, Geng T, Cooke RM, Liang M, Prota AE, Panneels V, Nogly P, Ermler U, Schertler G, Hennig M, Steinmetz MO, Wang M, Standfuss J. **Nat Commun.** (2017) 8(1):542.
- *Lipidic cubic phase injector is a viable crystal delivery system for time-resolved serial crystallography.* Nogly P, Panneels V, et al. **Nat Commun.** (2016) 7:12314. My contribution: beamtime coordination.
- *Three-dimensional mass density mapping of cellular ultrastructure by ptychographic X-ray nanotomography.* Diaz A, Malkova B, Holler M, Guizar-Sicairos M, Lima E, Panneels V, Pigino G, Bittermann AG, Wettstein L, Tomizaki T, Bunk O, Schertler G, Ishikawa T, Wepf R, Menzel A. **J Struct Biol.** (2015) 192(3):461-9. My contribution: beamtime participation.
- *Lipidic cubic phase serial millisecond crystallography using synchrotron radiation.* P Nogly, D James, D Wang, TA White, N Zatsepin, A Shilova, G Nelson, H Liu, L Johansson, M Heymann, K Jaeger, M Metz, C Wickstrand, W Wu, P Bath, P Berntsen, D Oberthuer, V Panneels, V Cherezov, H Chapman, G Schertler, R Neutze, J Spence, I Moraes, M Burghammer, J Standfuss and U Weierstall **IUCrJ** (2015) 2(Pt 2):168-76. My contribution: writing ESRF proposal for the ITN-NanoMem consortium and protein sample purification.
- *Constitutively active rhodopsin mutants causing night blindness are effectively phosphorylated by GRKs but differ in arrestin-1 binding.* Vishnivetskiy SA, Ostermaier MK, Singhal A, Panneels V, Homan KT, Glukhova A, Sligar SG, Tesmer JJ, Schertler GF, Standfuss J, Gurevich VV. **Cell Signal.** (2013) Nov;25(11):2155-62. My contribution: rhodopsin nanodiscs preparation.
- *Insights into congenital stationary night blindness based on the structure of G90D rhodopsin.* Singhal A, Ostermaier MK, Vishnivetskiy SA, Panneels V, Homan KT, Tesmer JJ, Veprintsev D, Deupi X, Gurevich VV, Schertler GF, Standfuss J. **EMBO Rep.** (2013) Jun;14(6):520-6. My contribution: rhodopsin nanodiscs preparation.
- *Delineation of the discontinuous-conformational epitope of a monoclonal antibody displaying full in vitro and in vivo thyrotropin activity.* Costagliola S., Bonomi M., Morgenthaler MG., Van Durme J., Panneels V., Refetoff S. and Vassart G. **Mol Endocrinol** (2004) 18(12):3020-34. My contribution: purification, crystallisation and structural determination of 1H7-Fab monoclonal antibody.
- *Reconstituted TOM core complex and Tim9/Tim10 complex of mitochondria are sufficient for translocation of the ADP/ATP carrier across membranes.* Vasiljev, Ahting, Nargang, Go, Habib, Kozany, Panneels V., Sinning I., Prokisch, Neupert, Nussberger, Rapaport. **Mol Biol Cell.** (2004) 15(3):1445-58.
My contribution: purification of the native endogenous *S.cerevisiae* ATP/ADP carrier in detergent.
- *Functional reconstitution of purified metabotropic glutamate receptor expressed in the fly eye.* Eroglu C, Cronet P, Panneels V, Beaufile P, Sinning I. **EMBO rep.** (2002) 3 (5), 491-6.
My contribution: monoclonal antibodies against the glutamate receptor by genetic immunisation, discussions.
- *Tyrosine sulfation is required for agonist recognition by glycoprotein hormone receptors.* Costagliola S., Panneels V., Bonomi M., Koch J., Many M., Smits G. and Vassart G. **The EMBO Journal** (2002) 21 (4), 1-10. My contribution: ultimate identification of which aminoacid is sulfated by thin layer chromatography, discussions.
- *Purification and characterization of a soluble bioactive amino-terminal extracellular domain of the human thyrotropin receptor* Cornelis S., Uttenweiler-Joseph S., Panneels V., Vassart G. and Costagliola S.
Contribution: advices for the purification and O¹⁸-MS-analysis of the N-glycosylation of the receptor, discussions.
Biochemistry (2001) 40 (33), 9860-9.
- *Human thyroperoxidase in its alternatively spliced form (TPO2) is enzymatically inactive and exhibits changes in intracellular processing and trafficking.* Niccoli-Sire P., Fayadat L., Panneels V., Lanet J. and Franc J.L.
Contribution: Cloning of the thyroperoxidase and establishment of the Guaiacol-Oxidation Assay.
J. Biol. Chem. (1997) 272 (47), 29487-29492
- *The thyroperoxidase doublet is not produced by alternative splicing.*

Cetani F., Costagliola S., Tonacchera M., Panneels V., Vassart G. and Ludgate M. **Mol. Cell. Endocrinol. (1995) 115**, 125-132 My contribution: generation of antibodies specific to different thyroperoxidase isotypes.

BOOK CHAPTER PUBLICATIONS:

- *Membrane protein preparation for serial crystallography using high viscosity injectors: rhodopsin as an example.* Weinert T. and Panneels V. **Methods Mol Biol. (2020) 2127:321-338. doi: 10.1007/978-1-0716-0373-4_21.**
- *Expression of membrane proteins in the eyes of transgenic *Drosophila melanogaster*.* Y. Hackmann, L. Joedicke, V. Panneels, I. Sinning. **Methods in Enzymology (2015) 556:219-39.**
- *Membrane protein expression in the eyes of transgenic flies.* Panneels V and Sinning I. **Methods in Mol Biol (2010) 601, 135-147.**
- *Iodide effects on the thyroid : biochemical, physiological, pharmacological and clinical effects of iodide in the thyroid.* Panneels V., Boeynaems JM, Dumont JE and Van Sande J. **Comprehensive Handbook of Iodine (2009) Academic Pr Inc 303-312.**

SUPERVISION of Master thesis & PhD Students:

- "Rhodopsin dynamics using a FEL" Azeglio Diethelm, **PhD**, 2020-2021.
- "Biomolecular Techniques of Purification and Crystallization of Rhodopsin for High Resolution Crystallography and Spectroscopy" Seraina Abele, **Master**, 2020 [before and after the Covid19 lockdown]
- "Towards the structural studies of the rhodopsin photoactivation process using serial femtosecond crystallography" Thomas Gruhl, **PhD**, 2016-2020
- "Nanocrystallisation of rhodopsin for structural studies with the XFEL" Thomas Gruhl, **Master thesis**, 2015.
- "Nanocrystallisation of rhodopsin for time-resolved SFX at X-FELs" Wenting Wu, **PhD**, 2016.
- "Crystallisation of dark-state rhodopsin for serial femtosecond crystallography at X-FELs" Leonhard Kick, **3-months practical**, PSI, 2013.
- "Preparation of rhodopsin nanocrystals for kinetic studies using X-FELs" Cornelius Gati, **Master thesis**, PSI, 2012.
- "Expression of a signal peptide peptidase in the eyes of transgenic *Drosophila melanogaster*" Lisa Jödicke, **Master Thesis**, BZH, 2010.
- "Targeting of Rhodopsin in the *Drosophila* Retina" Ines Kock, **Ph.D.**, BZH, 2008-2009.
- "Allosteric regulation of mGluRs by cholesterol" Badri Konkimalla, **Ph.D.**, BZH, 2001-2005.
- "Crystallisation of the extracellular domain of a GPCR in complex with a catalytic antibody" Sami Caner, **Master Thesis**, BZH, 2005.
- "Structural and functional characterization of the Metabotropic Glutamate Receptor A overexpressed in the photoreceptor cells of transgenic *Drosophila*", Çağla Eroglu, **Ph.D.**, EMBL, 1999-2003.
- "Crystallisation of a catalytic antibody for a GPCR" Sami Caner, **practical**, BZH, 2003.
- "Oligomeric state of the ATP/ADP carrier: native gels and gel filtration of the protein in complex with a Fab fragment" Henrik Bringmann, **Master thesis**, BZH, 2001.
- "Engineering of a monoclonal antibody epitope tag for purification of membrane proteins" Corinne von Arx, **Master Thesis** in the Faculty of Biotechnology, EMBL Heidelberg, 2000.