

## CURRICULUM VITAE ET STUDIORUM

Surname	Name	Organization and Current Position
SWUEC	Paolo	<u>Human Technopole</u> Head of National Facility for Structural Biology

### Research and Professional experience

Jul 2023 – present	<b>Head of National Facility for Structural Biology</b> Human Technopole (Italy)
Jul 2020 – Jun 2023	<b>Head of Cryo-Electron Microscopy Core Facility</b> Human Technopole (Italy)
Feb 2017 - Jun 2020	<b>Cryo-EM Lab Facility Manager</b> Dept. of BioSciences, University of Milan; “Romeo ed Erica Invernizzi” Paediatric Research Centre, Milan (Italy)
Apr 2018 - Jun 2020	<b>Research Assistant (Ricercatore Tempo Determinato di tipo A)</b> Dept. of BioSciences, University of Milan; “Romeo ed Erica Invernizzi” Paediatric Research Centre, Milan (Italy)
Feb 2017 - Mar 2018	<b>Postdoctoral Research Fellow</b> Dept. of BioSciences, University of Milan; “Romeo ed Erica Invernizzi” Paediatric Research Centre, Milan (Italy)

### Education and training

2012 - 2016	<b>Ph.D. in Structural Biology</b> ( <u>date awarded: 28<sup>th</sup> December 2016</u> ) The Francis Crick Institute (London Research Institute) - University College London London (UK) Research activity: I combined single-particle electron microscopy and biochemistry to dissect the function and mechanism of macromolecular machines involved in DNA repair and genome stability. Supervised by: Dr. Alessandro Costa
2015	<b>Visiting Scientist at Genome Stability Unit</b> St. Vincent's Institute of Medical Research, Melbourne (Australia) Research activity: Preparation of baculoviral vectors for the recombinant production and purification of Fanconi anemia core complex proteins. Supervised by: Dr. Andrew Deans
2013	<b>“Communicating your Research” Workshop by Science Connect</b> Science communication and media skills training covering: key principles of effective communication, technical writing, how to give effective scientific talks and poster presentations, how to explain science to non-specialists, and how to use blogs and social media to share their research with non-specialists.
2011 – 2012	<b>Research Studentship</b> Crystallography and Inorganic Applied Chemistry School, University of Parma (Italy) Research activity: Optimisation of crystalline and molecular forms of drugs, pesticides and biologically active compounds. Supervised by: Dr. Alessia Bacchi
2006 – 2011	<b>M.Sc. in Pharmaceutical Chemistry and Technology</b> University of Padua (Italy) Final mark: 110/110 <i>summa cum laude</i>
2011	<b>Erasmus Studentship</b> Pharmaceutical Biophysics, King's College of London, London (UK) Research activity: Prediction of inhibitory activities of Hsp90 inhibitors, a computational approach. Supervised by: Dr. David Barlow

## Scientific Publications (peer-reviewed)

\* authors equally contributed; ^ co-corresponding authors;

1. Jaciuk M\*, **Swuec P.**\*, Gaur V \*, Kasprzak J, Renault L, Dobrychłó M, Bujnicki J, Costa A, Nowotny M. "A combined structural and biochemical approach reveals translocation and stalling of UvrB on the DNA lesion as a mechanism of damage verification in bacterial nucleotide excision repair", *DNA Repair* (2020), doi: 10.1016/j.dnarep.2019.102746
2. Fuchsbaauer O.\*, **Swuec P.**\*, Zimberger C., Amigues B., Levesque S., Agudelo D., Düringer A., Chaves-Sanjuan A., Spinelli S., Rousseau GM, Bolognesi M., Roussel A., Cambillau C., Moineau S., Doyon Y., Goulet A. "Cas9 Allosteric Inhibition by the Anti-CRISPR Protein AcrIIA6", *Molecular Cell* (2019) doi: 10.1016/j.molcel.2019.09.012.
3. **Swuec P.**^, Chaves-Sanjuan A., Camilloni C., Vanoni M.A., Bolognesi M.^ "Cryo-EM Structures of Azospirillum brasilense Glutamate Synthase in Its Oligomeric Assemblies", *Journal of Molecular Biology* (2019) doi: 10.1016/j.jmb.2019.08.011.
4. Elia CA, Tamborini M, Rasile M, Desiato G, Marchetti S, **Swuec P.**, Mazzitelli S, Clemente F, Anselmo A, Matteoli M, Malosio ML, Coco S. "Intracerebral Injection of Extracellular Vesicles from Mesenchymal Stem Cells Exerts Reduced A $\beta$  Plaque Burden in Early Stages of a Preclinical Model of Alzheimer's Disease", *Cells* (2019) doi: 10.3390/cells8091059.
5. **Swuec, P.**, Lavatelli, F., Tasaki, M., Paissoni, C., Rognoni, P., Maritan, M., Brambilla, F., Milani, P., Mauri, P., Camilloni, C., Palladini, G., Merlini, G., Ricagno, S. & Bolognesi, M. "Cryo-EM structure of cardiac amyloid fibrils from an immunoglobulin light chain AL amyloidosis patient", *Nature Communications* (2019) doi: 10.1038/s41467-019-09133-w.
6. Eichwald, C., De Lorenzo, G., Schraner, E. M., Papa, G., Bollati, M., **Swuec, P.**, De Rosa, M., Milani, M., Mastrangelo, E., Ackermann, M., Burrone, O. R. & Arnoldi, F. "Identification of a Small Molecule That Compromises the Structural Integrity of Viroplasms and Rotavirus Double-Layered Particles", *Journal of Virology* (2018) doi: 10.1128/JVI.01943-17
7. **Swuec, P.**, Renault, L., Borg, A., Shah, F., Murphy, V. J., Van Twest, S., Snijders, A. P., Deans, A. J. & Costa, A. "The FA Core Complex Contains a Homo-dimeric Catalytic Module for the Symmetric Mono-ubiquitination of FANCI-FANCD2", *Cell Reports* (2017) doi: 10.1016/j.celrep.2016.11.013
8. Van Twest, S., Murphy, V. J., Hodson, C., Tan, W., **Swuec, P.**, O'rourke, J. J., Heierhorst, J., Crismani, W. & Deans, A. "Mechanism of Ubiquitination and Deubiquitination in the Fanconi Anemia Pathway", *Molecular Cell* (2017) doi: 10.1016/j.molcel.2016.11.005
9. Ballandras-Colas, A., Maskell, D. P., Serrao, E., Locke, J., **Swuec, P.**, Jonsson, S. R., Kotecha, A., Cook, N. J., Pye, V. E., Taylor, I. A., Andresdottir, V., Engelman, A. N., Costa, A. & Cherepanov, P. "A supramolecular assembly mediates lentiviral DNA integration", *Science* (2017) doi: 10.1126/science.aah7002
10. **Swuec, P.** & Costa, A. "DNA replication and inter-strand crosslink repair: Symmetric activation of dimeric nanomachines?", *Biophys Chem*, (2017) doi: 10.1016/j.bpc.2016.11.001
11. Pike A.C.\*, Gomathinayagam\* S., **Swuec P.**\*, Berti, M., Zhang, Y., Schnecke, C., Marino, F., Von Delft, F., Renault, L., Costa, A., Gileadi, O. & Vindigni, A. "Human RECQ1 helicase-driven DNA unwinding, annealing, and branch migration: insights from DNA complex structures", *Proc Natl Acad Sci USA* (2015) doi: 10.1073/pnas.1417594112
12. **Swuec, P.** & Costa, A. "Molecular mechanism of double Holliday junction dissolution", *Cell Biosci* (2014) doi: 10.1186/2045-3701-4-36
13. Costa, A., Renault, L., **Swuec, P.**, Petojevic, T., Pesavento, J. J., Ilves, I., MacLellan-Gibson, K., Fleck, R. A., Botchan, M. R. & Berger, J. M. "DNA binding polarity, dimerization, and ATPase ring remodeling in the CMG helicase of the eukaryotic replisome", *Elife* (2014) doi: 10.7554/eLife.03273
14. Coulthard, R., Deans, A. J., **Swuec, P.**, Bowles, M., Costa, A., West, S. C. & McDonald, N. Q. "Architecture and DNA recognition elements of the Fanconi anemia FANCM-FAAP24 complex", *Structure* (2013) doi: 10.1016/j.str.2013.07.006
15. **Swuec, P.** & Barlow, D. J. "Prediction of inhibitory activities of Hsp90 inhibitors", *Bioorg Med Chem* (2012) doi: 10.1016/j.bmc.2011.10.069

## Other Scientific Publications

\* authors equally contributed;

- D'Arrigo G, Gabrielli M, Scaroni M, **Swuec P.**, Amin L, Cojoc D, Legname G, Verderio C. "Astrocytes-Derived Extracellular Vesicles In Motion At The Neuron Surface: Involvement Of The Prion Protein" (*manuscript submitted to Nat Comm; under review*)

- Saponaro A\*, **Swuec P**\*, Giese H\*, Porro A, Gasparri F, Sharifzadeh AS, Chaves-Sanjuan A, Their G, Mancina F, Bolognesi M, Santoro B, Moroni A. "Cryo-EM structures of HCN4 reveal conformational transitions in cardiac and neuronal pacemaker channels" (*manuscript under review at Nature*)
- Grinzato A, Swuec P, Albanese P, Marotta R, Saracco G, Zanotti G, Bolognesi M, Pagliano C. "High-light vs. low-light: effects on paired Photosystem II supercomplex structural arrangement" (*manuscript in review at EMBO J*)

### Other Publications

- Swuec, P., Bolognesi, M., Santo, N., 2018, "Crio-microscopia elettronica di bio-macromolecole. Il Nobel per la chimica 2017", La Chimica e l'industria - ISSN 2283-544X
- Bolognesi, M., Musco, G. e Swuec P. 2019, "Capitolo 23 - Biologia Strutturale" in "Metodologie biochimiche e biomolecolari - Strumenti e tecniche per il laboratorio del nuovo millennio" 2019, Zanichelli Ed. - ISBN: 9788808520555
- Video interview and blog post for Thermo Fisher Scientific: "Getting to Know Paolo Swuec of the University of Milan" (link: <https://tinyurl.com/y4hu6rtk>)

### Electron Microscopy Data Bank Depositions

- **EMD-4904:** Cryo-EM structure of St1Cas9-sgRNA-AcrIIA6-tDNA59-ntPAM complex (Swuec P). Method: single-particle cryo-EM. Resolution: 3.2 Å. Atomic model PDB: 6rjg.
- **EMD-4902:** Cryo-EM structure of St1Cas9-sgRNA-tDNA59-ntPAM complex (Swuec P). Method: single-particle cryo-EM. Resolution: 3.3 Å. Atomic model PDB: 6rjd.
- **EMD-4901:** Cryo-EM structure of St1Cas9-sgRNA-tDNA20-AcrIIA6 dimeric assembly (Swuec P). Method: single-particle cryo-EM. Resolution: 3 Å. Atomic model PDB: 6rja.
- **EMD-4900:** Cryo-EM structure of St1Cas9-sgRNA-tDNA20-AcrIIA6 monomeric assembly (Swuec P). Method: single-particle cryo-EM. Resolution: 3.2 Å. Atomic model PDB: 6rj9.
- **EMD-4958:** Negative stain EM 3D reconstruction of the UvrA-UvrB-DNA complex (Swuec P, Renault L, Costa A). Method: single-particle neg. stain EM. Resolution: 25 Å.
- **EMD-4139:** Cryo-EM reconstruction of the maedi-visna virus (MVV) strand transfer complex (Pye VE, Ballandras-Colas A, Maskell D, Locke J, Kotecha A, Costa A, Cherepanov P). Method: single-particle cryo-EM. Resolution: 8.2 Å. Atomic model PDB: 5m0r.
- **EMD-4138:** Cryo-EM reconstruction of the maedi-visna virus (MVV) intasome (Ballandras-Colas A, Maskell D, Pye VE, Locke J, Swuec S, Kotecha A, Costa A, Cherepanov P). Method: single-particle cryo-EM. Resolution: 4.94 Å. Atomic model PDB: 5m0q.
- **EMD-3476:** Structure of FANCI-FANCD2 hetero-dimer co-expressed with FANCC-FANCE-FANCF proteins (Swuec P, Costa A). Method: single-particle neg. stain EM. Resolution: 18.3 Å.
- **EMD-2772:** CMG helicase bound to DNA and ATPγS (Costa A, Renault L, Swuec P, Petojevic T, Pesavento JJ, Ilves I, MacLellan-Gibson K, Fleck RA, Botchan MR, Berger JM). Method: single-particle neg. stain EM. Resolution: 17.8 Å.
- **EMD-10108:** Structure of *Azospirillum brasilense* Glutamate Synthase in a6b6 oligomeric state (Swuec P). Method: single-particle cryo-EM. Resolution: 3.5 Å. Atomic model PDB: 6s6x.
- **EMD-10106:** Structure of *Azospirillum brasilense* Glutamate Synthase in a6b4 oligomeric state (Swuec P). Method: single-particle cryo-EM. Resolution: 3.5 Å. Atomic model PDB: 6s6u.
- **EMD-10105:** Structure of *Azospirillum brasilense* Glutamate Synthase in a4b3 oligomeric state (Swuec P). Method: single-particle cryo-EM. Resolution: 4.1 Å. Atomic model PDB: 6s6t.
- **EMD-10104:** Structure of *Azospirillum brasilense* Glutamate Synthase in a4b4 oligomeric state (Swuec P). Method: single-particle cryo-EM. Resolution: 3.9 Å. Atomic model PDB: 6s6s.
- **EMD-0274:** Cryo-EM structure of cardiac amyloid fibrils from an immunoglobulin light chain (AL) amyloidosis patient (Swuec P). Method: helical reconstruction cryo-EM. Resolution: 4 Å. Atomic model PDB: 6hud.

### Technical and Software skills

- **Electron microscopy sample preparation:** carbon evaporation and coating, negative stain EM (uranyl acetate, uranyl formate, Nano-W), manual and automated cryo-EM grid plunge freezing (FEI Vitrobot Mark III and IV, Gatan CP3), sample stabilization by GraFix (ultracentrifugation in glycerol and glutaraldehyde gradient), EM grid functionalization with streptavidin 2D-crystals, Immunolabelling.
- **Electron microscopy data collection:** FEI TALOS Arctica equipped with Falcon 3EC DED and Volta Phase Plate; FEI Tecnai Spirit Bio-Twin; FEI Tecnai Twin; FEI Tecnai F20; FEI Tecnai F30; JEOL JEM-2100.
- **Protein Expression and Purification:** SDS-PAGE, western blotting, bioinformatics-based construct design, high-throughput cloning techniques (Gateway, In-Fusion, LIC, traditional), bacterial protein expression, baculovirus protein expression, AKTA HPLC Systems (Pure, Ettan, Micro), chromatographic methods (IMAC/SEC/IEX), affinity tag purification (FLAG, StrepII, MBP, SUMO).

- **Protein-Protein\Protein-DNA Interactions:** Multi-Angle Light Scattering, Fluorescence Polarization, Octet Red 96, ITC, MST, Yeast-2-Hybrid, Peptide Array.
- **Electron microscopy imaging and analyses software:** EPU, TIA, Digital Micrograph, RELION (1.2-3.0), EMAN (1.9/2.0/2.1), CryoSPARC, IMAGIC, Tigris, IMOD, Xmipp, SPARX, SIMPLE.
- **Others:** Scaffold 4, Serial Cloner, SeqMan Pro, SeqBuilder, PyMOL, UCSF Chimera and ChimeraX, ImageJ, Windows, Linux, OS X, Microsoft Office, Adobe Illustrator, Adobe Photoshop, Adobe Lightroom, EndNote, Papers.

### **Congress and Oral Communications**

- Organizer and tutor at Lake Como School of Advanced Studies “Unravelling The Complexity Of Biological Systems By Transmission Electron Microscopy”, Como (Italy) – (20-24/04/19)
- Poster presentation and chair of Cryo-EM Symposium at “Società Italiana di Biochimica e Biologia Molecolare (SIB) 60<sup>th</sup> National Congress” – Lecce (Italy) – (17-20/09/19)
- Invited speaker at Institute for Research in Biomedicine, Università della Svizzera Italiana, Seminar title: “Architecture of macromolecular machines revealed by single-particle EM” – (25/05/19)
- Organizer and Speaker at “PhD Program in Experimental Medicine: Basic and advanced techniques for electron microscopy application in biological and preclinical research” - Dept. BIOMETRA - Università degli Studi di Milano (Italy) – (15-16/04/19)
- Tutor at “Joint PhD course: Integrated structural biology” - Università degli Studi di Milano and Istituto Europeo di Oncologia (Italy) – (8-10/04/19)
- Organizer, tutor and speaker at “2<sup>nd</sup> Workshop on Single Particle Electron Microscopy: from Theory to Practice” - Università degli Studi di Milano (Italy) – (27/02/2019 – 01/03/19)
- Organizing committee member and poster presentation at “Dept. BioSciences Excellence Program Kick-off Meeting 2019” - Università degli Studi di Milano (Italy) – (17-18/01/19)
- Invited speaker at Dept. Biology, Seminar title: “A primer to High Resolution Cryo-Electron Microscopy” - University of Padova (Italy) – (28/11/18)
- Invited speaker at Ph.D. meeting 2018 at Villa Breme Forno - Università Degli Studi Di Milano-Bicocca (Italy) – (2-4/10/18)
- Principal organizer, tutor and speaker at “1<sup>st</sup> Workshop on Single Particle Electron Microscopy: from Theory to Practice” - Università degli Studi di Milano (Italy) – (12-14/09/18)
- Invited speaker at Dep. of Physics, University of Genova, Seminar title: “A primer to High-resolution Cryo-Electron Microscopy” - Università degli Studi di Genova (Italy) – (31/10/17)
- Invited speaker at Workshop “Experimental methods applied to biological systems. Biology and Physics working together” - Università degli Studi di Milano (Italy) – (12-14/09/17)
- Invited speaker and tutor at “AIC International School 2017 – Bridging the gap between Cryo-EM and Crystallography” - Pavia (Italy) – (3-7/09/17)
- Invited speaker at “3<sup>o</sup> Riunione dei Giovani Biochimici dell'Area milanese” - Gargnano (BS - Italy) – (25-27/06/17)
- Invited speaker at “Riunione Nazionale “A. Castellani” dei Dottorandi di Ricerca in Discipline Biochimiche” - Brallo di Pregola (PV - Italy) – (08/06/17)
- Invited speaker at “Cryo-Electron Microscopy Lab opening ceremony” - Milano (Italy) – (05/06/17)
- Invited speaker, Seminar title: “The architecture and dynamics of macromolecular machines revealed by single-particle electron microscopy” - Università degli Studi di Milano (Italy) – (21/10/16)
- Selected speaker at ICGEB conference “At the Intersection of DNA Replication and Genome Maintenance: from Mechanisms to Therapy” - Trieste (Italy) – (26/06/16 – 01/07/16)
- Poster presentation at “11<sup>th</sup> National Cancer Research Institute (NCRI) Conference” - Liverpool (UK) – (1-5/11/15)
- Poster presentation at “Insubria International Summer School (IISS) Crystallography in Health and Biosciences” - Università dell'Insubria, Como (Italy) – (18-25/06/12)
- Selected Speaker at “5<sup>th</sup> Crystal Forms@BO Polycrystalline Workshop” - Bologna (Italy) – (19-21/01/12)

### **Outreach and Science Communication**

- Science communicator at European Research Night “Notte europea dei ricercatori”, Project: “Health League”, MeetMeTonight 2017 – Milano (Italy)
- Science communicator at “Il giardino della scienza - weekend di apertura straordinaria dell'Orto Botanico Città Studi”, F.A.I. - Milano (Italy)
- Science communicator at European Research Night “Notte europea dei ricercatori”, Project: “La Health League ad Atlantide: immersi tra scienza e divertimento”, MeetMeTonight 2018 – Milano (Italy)

- Science communicator at European Research Night “Notte europea dei ricercatori”, Project: “La Health League e il mondo dei replicanti”, MeetMeTonight 2019 – Milano (Italy)

### **Career breaks**

*No career breaks to declare*

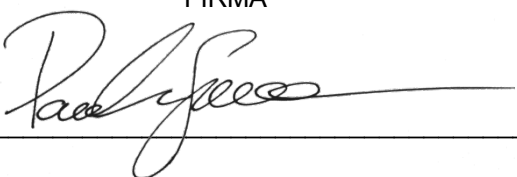
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Le dichiarazioni rese nel presente curriculum sono da ritenersi rilasciate ai sensi degli artt. 46 e 47 del DPR n. 445/2000.

Il presente curriculum, non contiene dati sensibili e dati giudiziari di cui all'art. 4, comma 1, lettere d) ed e) del D.Lgs. 30.6.2003 n. 196.

Milano, 24<sup>th</sup> October 2024

FIRMA



A handwritten signature in black ink, written over a horizontal line. The signature is stylized and cursive, appearing to read 'Paolo' followed by a long horizontal stroke.