CURRICULUM VITAE

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WORK EXPERIENCE

Postdoctoral Research Fellow Bioengineering & Neuroscience	Stanford University, USA	[2018 – 2023]
Postdoctoral Research Fellow Structural Biology	University of Oxford, UK	[2017 – 2018]

FORMAL EDUCATION

Doctor of Philosophy Structural Biology	University of Oxford, UK	[2013 – 2017]
Bachelor of Science (Honours) Medical Biology	WEHI, University of Melbourne, AUS	[2012]
Bachelor of Science Biochemistry & Chemistry	University of Melbourne, AUS	[2007 – 2011]
Bachelor of Arts History & Chinese Language	University of Melbourne, AUS	[2007 – 2011]

EXPERTISE & TECHNICAL PROFICIENCIES

PROTEIN PRODUCTION & STRUCTURAL BIOLOGY:

- For expression screening: Fluorescence-detection size exclusion chromatography (FSEC) (e.g. Shimadzu iProminence & HPLC systems)
- Bacterial cell culture (e.g. DH5a, BL21(DE), Rosetta cells)
- Insect cell culture (e.g. Sf9 cells with baculovirus infection)
- Mammalian cell culture (e.g. HEK293T, HEK293S cells; adherent & suspension formats; various transfection/infection methods, including lentivirus preparation)
- Membrane protein expression & purification (2-10 L of mammalian cell culture per prep)
- Nanobody protein expression & purification (1-2 L of bacterial cell culture per prep)
- Affinity purification of proteins (e.g. His, FLAG, Rho1D4)
- Preparative chromatography for protein purification (e.g. size exclusion & ion exchange columns of various sizes; with AKTA Pure, AKTA Purifier machines) & diafiltration (e.g. QuixStand)
- Purification-tag cleavage (HRV 3C protease, TEV protease)
- Crystallography set-up & screening (e.g. lipidic cubic phase & vapor diffusion methods; ARI Gryphon, Mosquito & Hydra robots)
- Fishing, cryo-cooling and shooting protein crystals (Diamond Light Source, UK; Advanced Photon Source, USA)
- Structure solution data processing for crystallography (software packages: CCP4 Suite, Phenix, Coot, PyMOL)
- Small-Angle X-ray Scattering (SAXS) (Diamond Light Source, UK)
- Transmission electron microscopy (TEM) (e.g. of microbial samples for large protein assemblies)

BIOCHEMISTRY:

- Western blotting and polyacrylamide gel electrophoresis (SDS-PAGE) analyses
- Protein thermostability analysis (FSEC: Shimadzu systems; Unchained Labs UNCLE machine)

- Protein-protein binding affinity analysis (surface plasmon resonance (SPR) with Biacore systems; bio-layer interferometry (BLI) with Sartorius Octet systems)
- High throughput Forster Resonance Energy Transfer (FRET) analysis (e.g. Cisbio homogenous time-resolved fluorescence (HTRF) system)
- Molecular mass analysis with Multi-Angle Light Scattering (MALS) (Wyatt Technologies)

MOLECULAR BIOLOGY:

- Plasmid/Construct design
- Cloning techniques (e.g. PCR, overlapping PCR, restriction enzyme digestion, ligation, Gibson Assembly, bacterial cell transformation)
- Virus vector design (e.g. AAVs, Lentivirus)
- Confocal microscopy (e.g. Leica microscopes, FIJI software)

CELL-BASED ASSAYS:

- Primary mammalian cell culturing (e.g. rat hippocampal neurons)
- Electrophysiology (whole-cell patch-clamping) of HEK cells and primary neurons (e.g. Scientifica systems) for functional screening of ion channels
- Culturing of anaerobic microbes (e.g. *Geobacter sulfurreducens*)
- Flow cytometry (e.g. for membrane protein binding assay in HEK cells)

COMPUTATIONAL:

- Languages: proficient in Bash, Python
- Computing: clusters (SLURM), cloud (Google Colabs)
- Version control (GitHub), containerization (Docker)
- Data analysis: arrays, data frames, graphing (Jupyter Notebooks, Numpy, Pandas, Matplotlib, Seaborn, Biopandas, pyABF, fpocket, skimage, SimpleITK)
- Machine learning: Scikit-learn, TensorFlow2/Keras, PyTorch
- Prediction tools: structure prediction (AlphaFold2), protein-nucleic acid prediction (RoseTTAFold2NA), sequence prediction (ProteinMPNN)
- Rosetta Suite: comparative modelling (CMRosetta), active site design (Match, EnzymeDesign)
- Crystallography: CCP4 Suite, Coot, PyMOL, XDS, XScale, Phenix
- Visualization: PyMOL, Chimera
- Bioinformatics: MPI Bioinformatics Toolkit, BLAST

MANAGERIAL SKILLS:

- Developing agendas
- Leading meetings
- Project management
- Delegating action items
- Setting goals and deadlines
- Inclusive mentoring and management practices
- Dialogue facilitation

COMMUNICATION SKILLS:

- Constructing figures (Adobe Illustrator, GraphPad PRISM, PyMOL, Microsoft Excel, Biorender)
- Presenting plans & data (Microsoft Powerpoint, Google Sheets, Apple Keynote)
- Drafting & editing manuscripts (Microsoft Word, Latex, Google Docs, Quarto Markdown)

RESEARCH EXPERIENCE

POSTDOCTORAL research work with:

Prof. Karl Deisseroth, Bioengineering Department & Psychiatry and Behavioral Sciences, Stanford University. [Aug 2018 –Jul 2023]

Collaboration with **Prof. Alfred Spormann**, Chemical Engineering & Civil and Environmental Engineering, Stanford University. [May 2021 –Jul 2023]

Collaboration with **Prof. Zhenan Bao**, Chemistry, Stanford University. [Jun 2020 –Jul 2023]

Prof. Christian Siebold, Division of Structural Biology, Nuffield Department of Medicine, University of Oxford. [Oct 2017 – Jul 2018]

DOCTORAL research work with:

Prof. Christian Siebold, Division of Structural Biology, Nuffield Department of Medicine, University of Oxford. [Oct 2013 – Sep 2017]

Close collaboration with **Assoc. Prof. Rajat Rohatgi**, Depts of Biochemistry and Medicine, Stanford University. [2014 – 2017]

UNDERGRADUATE research work with:

Drs Matthew Call and Melissa Call, Structural Biology, Walter & Eliza Hall Institute (WEHI), University of Melbourne. [Jan – Nov 2012]

Prof. Amanda Fosang, Murdoch Childrens Research Institute (MCRI), Royal Melbourne Children's Hospital. [Feb – Dec 2011]

Dr Ron Zuckermann, Molecular Foundry, Lawrence Berkeley National Laboratories (LBNL). [May – July 2010]

LEADERSHIP & COMMUNITY WORK

Certificate in Critical Consciousness and Anti-Oppressive Praxis (CCC&AOP) program, School of Medicine, Stanford University Co-Facilitator [2020 – 2023]

Long-Range Planning Committee, Stanford Postdoc Association (SURPAS)
Co-Chair [2020 – 2023]
Final Report: https://surpasstanfordpostdocs.github.io/long-range-planning-report2023/

Postdoc Justice, Equity, Diversity and Inclusion (JEDI) Committee, Bioengineering Department, Stanford University Committee Member [2020 – present]

Justice, Equity, Diversity and Inclusion (JEDI) Committee, Stanford Postdoc Association (SURPAS)
Committee Member [2019 – 2023]

SURPAS Council, Stanford Postdoc Association (SURPAS)
Council Member [2019 – 2023]

Stanford Summer Research Program (SSRP), School of Medicine, Stanford University
Panel Judge [2021]

Leadership Team, Stanford Postdoc Association (SURPAS)
Community Engagement Liaison [2020]

Voluntary Student Organisations Working Group, Stanford University
Postdoc Representative [2019]

Faculty Senate Committee on Academic Computing and Information Systems (C-ACIS), Stanford University Academic Council Postdoc Representative [2019/20]

Certificate in Critical Consciousness and Anti-Oppressive Praxis (CCC&AOP) program, School of Medicine, Stanford University Participant [2019/20]

Stanford Ignite program, Graduate School of Business, Stanford University
Participant [2019]

Bio-X Science Day
Volunteer [2019]
Health & Safety Committee, Wellcome Centre for Human Genetics, University of Oxford
Graduate Student Representative [2014 – 2017]
STRUBI Student Sessions, Division of Structural Biology, University of Oxford
Founder, Convener [2014 – 2016]
Synthetic Biology Society, University of Oxford
President [2015]
Titjimbat (formerly, Teachabout Inc.), Melbourne
Co-Founder, Managing Director, Activity Leader [2010 – 2013]
Trinity College, University of Melbourne
President of the Junior Common Room ("Senior Student") [2009]

PUBLICATIONS & PREPRINTS

Google Scholar page: https://scholar.google.com/citations?user=E49YJmcAAAAJ&hl=en

- Tajima, S., Kim, Y.S., Fukuda, M., **Byrne, E.F.X.**, Wang P.Y., Paggi, J.M., Kishi, K.E., Ramakrishnan, C., Takaramoto, S., Nagata, T., Konno, M., Sugiura, M., Katayama, K., Matsui, T.E.,Yamashita, K., Ikeda, H., Inoue, M., Kandori, H., Dror, R.O., Inoue, K., Deisseroth, K., Kato, H.E. (2022) Structural basis for ion selectivity in potassium-selective channelrhodopsins. ***bioRxiv***, 2022.10.30.514430; doi: 10.1101/2022.10.30.514430
- Kishi, K.E., Kim, Y.S., Fukuda, M., Inoue, M., Kusakizako, T., Wang, P.Y., Ramakrishnan, C., **Byrne, E.F.X.**, Thadhani, E., Paggi, J.M., Matsui, T.E., Yamashita, K., Nagata, T., Konno, M., Quirin, S., Lo, M., Benster, T., Uemura, T., Liu, K., Shibata, M., Nomura, N., Iwata, S., Nureki, O., Dror, R.O., Inoue, K., Deisseroth, K., Kato, H.E. (2022) Structural basis for channel conduction in the pump-like channelrhodopsin ChRmine. ***Cell***, 185, 1-18. doi:10.1016/j.cell.2022.01.007.
- Kinnebrew, M., Wooley, R., Ansell, T.B., **Byrne, E.F.X.**, Frigui, S., Luchetti, G., Sircar, R., Nachtergaele, S., Mydock-McGrane., L., Krishnan, K., Sansom, M., Covey, D., Siebold, C., Rohatgi, R. (2022) Patched 1 regulates Smoothened by controlling sterol binding to its extracellular cysteine-rich domain. ***Science Advances***, (8), 22. doi:10.1126/sciadv.abm5563.
- Coupland, C.E., Andrei, S.A., Ansell, T.B., Carrique, L., Kumar, P., Sefer, L., Schwab, R.A., **Byrne, E.F.X.**, Pardon, E., Steyaert, J., Magee, A.I., Lanyon-Hogg, T., Sansom, M.S.P., Tate, E.W., Siebold, C. (2021) Structure, Mechanism, and Inhibition of Hedgehog Acyl Transferase. ***Molecular Cell***, doi:10.1016/j.molcel.2021.11.018.
- Karhson, D., Kotadia, S., Jones, T., Isaacman-Beck, J., **Byrne, E.**, Flores, B. (2021) Decolonizing STEMM Training for a Just Biomedical Research Future. ***PLOS Blogs***. https://yoursay.plos.org/2021/08/09/decolonizing-stemm-training-for-a-just-biomedical-research-future/
- Tan, C., **Byrne, E.F.X.**, Ah-Cann, C., Call, M.J., Call, M.E. (2018) A serine in the transmembrane domain of the human ubiquitin ligase MARCH9 is critical for down-regulation of its protein substrates. ***J. Biol. Chem.*** doi: 10.1074/jbc.RA118.004836.
- Elegheert, J., Behiels, E., Bishop, B., Scott, S., Woolley, R.E., Griffiths, S.C., **Byrne, E.F.X.**, Chang, V.T., Stuart, D.I., Jones, E.Y., Siebold, C., Aricescu, A.R. (2018) Lentiviral transduction of mammalian cells for fast, scalable and high-level production of soluble and membrane proteins. ***Nature Protocols***. doi: 10.1038/s41596-018-0075-9.
- Raleigh, D.R., Sever, N., Choksi, P.K., Sigg, M.A., Hines, K.M., Thompson, B.M., Elnatan, D., Jaishankar, P., Bisignano, P., Garcia-Gonzalo, F.R., Krup, A.L., Eberl, M., **Byrne, E.F.X.**, Siebold,

C., Wong, S.Y., Renslo, A.R., Grabe, M., McDonald, J.G., Xu, L., Beachy, P.A., Reiter, J.F. (2018) Cilia-associated oxysterols activate Smoothened. ***Molecular Cell***, (72), 316-327.e5. doi: 10.1016/j.molcel.2018.08.034.

- **Byrne, E.F.X.**, Luchetti, G., Rohatgi, R., Siebold, C. (2018) Multiple ligand binding sites regulate the Hedgehog signal transducer Smoothened in vertebrates. ***Curr. Opin. Cell Biol***., (51), 81-88. doi: 10.1016/j.ceb.2017.10.004.
- **Byrne, E.F.X.**, Sircar, R., Miller, P.S., Hedger, G., Luchetti, G., Nachtergaele, S., Tully, M.D., Mydock-McGrane, L., Covey, D.F., Rambo, R.P., Sansom, M.S.P., Newstead, S., Rohatgi, R., Siebold, C. (2016) Structural basis of Smoothened regulation by its extracellular domains. ***Nature***, (535), 517-522. doi: 10.1038/nature18934.
- Luchetti, G., Sircar, R., Kong, J.H., Nachtergaele, S., Sagner, A., **Byrne, E.F.X.**, Covey, D.F., Siebold, C., Rohatgi, R. (2016) Cholesterol activates the G-protein coupled receptor Smoothened to promote morphogenetic signaling. ***eLife***, 5:e20304. doi: 10.7554/eLife.20304.
- Sharma, P., Kaywan-Lufti, M., Krshnan, L., **Byrne, E.F.X.**, Call, M.J., Call, M.E. (2013) Production of disulfide-stabilized transmembrane peptide complexes for structural studies. ***Journal of visualized experiments: JoVE***, (73), p.e50141.

GRANTS, FELLOWSHIPS & SCHOLARSHIPS

National Health & Medical Research Council (NHMRC), Australian Government
Investigator Grant – Emerging Leadership [2020]
For proposal titled: "Engineering a light-activated potassium channel for rapid optogenetic silencing of neuronal circuits in vivo"

Stanford University
School of Medicine Dean's Fellowship [2019 – 2020]
For proposal titled: "Structural characterization of a novel channelrhodopsin for next-generation optogenetics"

University of Oxford
Clarendon Fund Scholarship [2013 – 2017]

University College, University of Oxford
Oxford-Radcliffe Graduate Scholarship [2013 – 2017]

Nuffield Department of Medicine, University of Oxford
NDM Prize Studentship [2013 – 2017]

University College, University of Oxford
GA Paul Scholarship [2017]

Walter & Eliza Hall Institute (WEHI), University of Melbourne
Alan W. Harris Honours Scholarship [2012]

University of Melbourne
Norma Hilda Schuster Scholarship – Biochemistry [2012]

University of Melbourne
University of Melbourne National Scholarship [2007 – 2011]

PRIZES & AWARDS

Office for Postdoctoral Affairs (OPA), Stanford University
Postdoc Justice, Equity, Diversity, Inclusion (JEDI) Champion Award [2021]

Office of Faculty Development, Diversity and Engagement (OFDD), Stanford University
President's Award for Excellence Through Diversity for the CCC&AOP program [2021]

Health Research Alliance & PLOS
"Reimagine Biomedical Research for a Healthier Future" Essay Challenge – Honorable Mention for the essay: "Decolonizing STEMM Training for a Just Biomedical Research Future" [2021]
Office of the Vice Provost for Graduate Education (VPGE), Stanford University
Diversity and Inclusion Innovation Funds (DIF) Award for the CCC&AOP program [2021]
Nuffield Department of Medicine, University of Oxford
Graduate Student Prize – Highly Commended in Overall Category [2018]
Division of Structural Biology, University of Oxford
STRUBI Away-Day Poster Prize [2016]
Nuffield Department of Medicine, University of Oxford
Medical Sciences DPhil-Day Poster Prize [2016]
Walter & Eliza Hall Institute (WEHI), University of Melbourne
Colman Speed Honours Award for the best Honours thesis [2012]
Walter & Eliza Hall Institute (WEHI), University of Melbourne
First Class Honours in Medical Biology [2012]
Trinity College, University of Melbourne
Kevin Westfold Medal for Leadership and Service [2009]