Samuel Barnett

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Employment

Oct 2021 **MPI Postdoctoral Fellow Max Planck Institute for Medical Research, Heidelberg**

2018-2021 **Research Fellow at the National University of Singapore, Kanchanawong group**
Optogenetic control of mammalian mechanobiology, cell motility, and focal adhesion formation and signalling.

Education and Qualifications

2013-2018 **University of Sheffield PhD, supervisor - Professor C. Neil Hunter, FRS**
Thesis title: Advances in super-resolution microscopy and their application to photosynthesis.

2012-2013 **University of Sheffield Mechanistic Biology MSc Pass with Merit**
Project: Image processing with Python to study the growth of fungal hyphal tips.

2009-2012 **University of Sheffield Biochemistry and Microbiology BSc Class 2 Division 1 Hons**
Project: Crystallographic studies of the Sugar Fermentation Stimulation protein SfsA.

Publications

*** Co-first authorship**

1. Yu, M.*, Le, S.*, **Barnett, S.F.H.***, Guo, Z., Zhong, X., Kanchanawong, P., Yan. J. (2020). Implementing Optogenetic Modulation in Mechanotransduction. *Physical Review X.* 10, 021001.
2. Wang Y.*, **Barnett, S.F.H.***, Le, S., Guo, Z., Zhong, X., Kanchanawong, P., Yan., J. (2019). Label-free single-molecule quantification of rapamycin FKBP-FRB dimerization. *Nano Letters*.19, 7514-7525.
3. Wood, W.H.J.*, **Barnett, S.F.H.***, Flannery S., Hunter, C.N.H., Johnson, M.P. (2019). Dynamic thylakoid stacking is dependent on LHCII phosphorylation but independent of state transitions. *Plant Physiology*. 180, 2152-2166.
4. **Barnett, S.F.H.** and Kanchanawong, P. (2018). Visualising the 'backbone' of focal adhesions. *Emerging Topics In Life Sciences*. 2 (5), 677-680.
5. Wood W.H.J., Macgregor-Chatwin, C., **Barnett S.F.H.**, Mayneord G.E., Huang, X., Hobbs J.K., Hunter, C.N., Johnson, M.P. (2018). Dynamic thylakoid stacking regulates the balance between linear and cyclic photosynthetic electron transfer. *Nature Plants*. 4 (2), 116.
6. Chen, G.E., Canniffe, D.P., **Barnett, S.F.H.**, Hollingshead, S., Brindley, A.A., Vasilev, C., Hunter, C.N. (2018). Complete enzyme set for chlorophyll biosynthesis in *Escherichia coli*. *Science Advances*. 4 (1) eaaq1407.
7. **Barnett, S.F.H.**, Snape, M., Juarez, M., Hunter, C.N., Cadby, A.J. (2017). A novel application of non-destructive readout technology to localisation microscopy. *Scientific Reports* **7.** DOI: 10.1038/srep42313.
8. **Barnett, S.F.H.**, Hitchcock, A., Vasilev, C., Yuen, J.M., Mandal, A.K., Morby, J., Brindley, A.A., Niedzwiedzki, D.M., Holten, D., Bryant, D.A., Cadby, A.J., Hunter, C.N. (2017). Repurposing a photosynthetic antenna protein as a super-resolution microscopy label. *Scientific Reports*. 7, 16807.
9. MacGregor-Chatwin, C., Sener, M., **Barnett, S.F.H.**, Hitchcock, A., Barnhart-Dailey, M.C., Maghlaoui, K., Barber, J., Timlin, J.A., Schulten, K., Hunter, C.N. (2017). Lateral segregation of photosystem I in cyanobacterial thylakoids. *The Plant Cell*. 29, 1119-1136.

Articles in Preparation/Submitted

1. Tee, Y. H., Goh, W. J., Yong, X., Ong, H. T., Hu, J., Tay, I. Y. Y., Shi, S., **Barnett**, **S. F. H.,** Huang, W., Kanchanawong, P., Thiagarajan, V., Bershadsky. A. D. Actin polymerization and crosslinking drive individual and collective cell left-right asymmetry. *BioRxiv*. **Submitted to Nature Materials.**
2. Bai, J., Ouyang, B., Sing, M., Leterrier, C., Barthelemy, P., **Barnett, S.F.H**., Klein, S., Sauer, M., Kanchanawong, P., Bourg N., Cohen, M., Lelandais B., Zimmer, C., ShareLoc – an open platform for sharing localization microscopy data. *BioRxiv.* **Under review at Nature Methods.**
3. **Barnett, S.F.H.,** Huang, W., Varela L., Jain, K., Goult, B., Yan, J., Kanchanawong P. Optogenetic control shows the C-terminal dimerization domain of talin is essential for focal adhesion formation.
4. **Barnett, S.F.H.,** Kanchanawong, P. Optomechanics – Applying optogenetics to study and control biological forces.
5. Krynická V., **Barnett, S.F.H.,** Qian, P., Jackson, P.J., Skotnicová, P., Dickman, M., Hunter C.N. Komenda, J. FtsH4 protease controls biogenesis of photosynthetic complexes by modulating the levels of Hlips.
6. Zhong, X. Wang, W., **Barnett., S.F.H.,** Kanchanawong P. GPU accelerated live-cell scanning angle microscopy.
7. Wang, W., **Barnett, S.F.H.,** Wang, Y., Kanchanawong P. SG-iSTORM – surface generated interferometric 3D super resolution microscopy.

Conference Presentations

Oral Presentations

1. Remote control cells – using optogenetics to control cell motility and explore talin function. University of Kent Bioscience Seminar Series 2021 **(Invited).**
2. S.F.H Barnett Y. Wang, M. Yu, S. Le, J. Yan, P. Kanchanawong. (2021). Optogenetic control of talin-based adhesion. Cell Biology of Interfaces DGZ international meeting, Germany (Virtual).
3. **S.F.H. Barnett,** Y. Wang, M. Yu, S. Le, J. Yan, P. Kanchanawong. (2021). Spatiotemporal control of talin-mediated mechanotransduction by inducible dimerization. MMM Singapore 2021.
4. **S.F.H. Barnett,** Y. Wang, M. Yu, S. Le, J. Yan, P. Kanchanawong. (2021). Spatiotemporal control of talin-mediated mechanotransduction by inducible dimerization. MMM Singapore 2021.
5. **S.F.H. Barnett**, Y. Wang, M. Yu, S. Le, J. Yan, P. Kanchanawong. (2020). Spatiotemporal control of talin-mediated mechanotransduction by inducible dimerization. Cell Bio Virtual 2020, Virtual.
6. **S.F.H. Barnett**, P. Kanchanawong. (2020). Spatiotemporal control of talin-mediated mechanotransduction by inducible dimerization. From Molecules to Organs, The Mechanobiology of Morphogenesis 2020, Virtual.
7. **S.F.H. Barnett**, P. Kanchanawong. (2020). Controllable cell motility. Frontiers in Mechanobiology 2019, Singapore.
8. **S.F.H. Barnett**, P. Kanchanawong. (2020). Spatiotemporal control of talin-mediated mechanotransduction by inducible dimerization. Crick Cell Motility Club, London.
9. **S.F.H. Barnett**, A.J. Cadby, X. Huang, C. Vasilev, C.N. Hunter. (2017). Spectral, spatial and time-resolved imaging of intact unicellular photosynthetic organisms. Focus on Microscopy 2017, Bordeaux.
10. Multicolour STORM and imaging at high speeds. (2016). Sandia National Laboratories, New Mexico US.
11. Super resolution imaging of photosynthetic organisms. (2016). University of California San Diego, US.
12. Perfect Exposure of Single Molecules. (2016). Yorkshire Super Resolution Meeting, University of Leeds.
13. Perfect Exposure for Single Molecules. (2016). University of Sheffield Biophysics Seminar Series, University of Sheffield**.**
14. Spectral, spatial and time-resolved imaging of intact unicellular photosynthetic organisms. (2016). University of Sheffield Biophysics Seminar Series, Sheffield.
15. STORM microscopy and multicolour imaging. (2015). PhD Café, Sheffield.

Poster Presentations

1. **Barnett S. F. H.**, Wang Y., Yu, M., Le, S., Yan, J., Kanchanawong, P. (2021). Spatiotemporal control of talin-mediated mechanotransduction by inducible dimerization. MMM Singapore 2021.
2. **Barnett S. F. H.**, Wang Y., Yu, M., Le, S., Yan, J., Kanchanawong, P. (2020). Spatiotemporal control of talin-mediated mechanotransduction by inducible dimerization. Cell Bio Virtual 2021.
3. **Barnett S.F.H.,** Snape, M., Hunter, C.N., Juárez, M.A., Cadby, A.J. (2016). Non-destructive readout sensors and localisation microscopy. Single Molecule Localisation Microscopy (SMLMS) 2016, Lausanne.
4. **Barnett S.F.H.,** Snape, M., Hunter, C.N., Juárez, M.A., Cadby, A.J. (2016). Non-destructive readout sensors and localisation microscopy. Imaging Life Postgraduate Symposium 2015, Sheffield.
5. **Barnett S.F.H.,** Morby, J., Vasilev C., Johnson, M., Hunter, C.N., Cadby, A. (2015). Novel fluorescent proteins characterised for super-resolution imaging. Focus on Microscopy 2015, Göttingen.
6. **Barnett S.F.H.,** Morby, J., Vasilev, C., Johnson, M., Holten, D., Bryant, D.A., Cadby, A., Hunter C.N. (2015). Super-resolution imaging of CpcA nanoarrays. Gordon Photosynthesis Research Conference 2015, Boston.
7. **Barnett S.F.H.,** Vasilev, C., Johnson, M., Cadby, A., Hunter C.N. (2015). Super-resolution imaging of photosynthetic membranes. Imaging Life Postgraduate Symposium 2015, Sheffield.

Leadership and Outreach

- eLife Early Career Peer Reviewer in structural biology and molecular biophysics (2021-present).
- Chair of the MBI Postgraduate Committee (2019-2021).
- Co-founder of the Singapore National Postdoc Society (2020).
- Organiser of the Inaugural Singapore National Postdoc Symposium (2021).
- Organiser and Abstract/Presentation Judge of the MBI Young Scientist Symposium (2020).
- Organising committee member and session chair Frontiers in Mechanobiology Symposium (2019).
- Session chair MBI Mechanobiology of Morphogenesis (2020).
- Safety Lead for the Kanchanawong Lab and member of the MBI Safety Committee (2018-2021).
- Member of the MBI Artificial Intelligence Working Group (2019-2020).
- Organising Committee member of the Imagine: Imaging Life postgraduate symposia (2015-2016).
- Member of the Green Labs Initiative at MBI (2019-2020)
- Article peer reviews for Nature Communications, PNAS, Nature Materials, Nature Cell Biology, Nano Letters in concert with Pakorn Kanchanawong (2019-2021).
- Review of BBSRC grant with Pakorn Kanchanawong (2019).
- Outreach events at Sheffield Krebs Festival, Discovery Night and Researchers Night (2014-2016).
- Volunteer with the Sheffield based science charity Science Brainwaves (2013-2014).

Teaching and Supervision

- Demonstrator in a first-year undergraduate course teaching LabVIEW and Python (2015-2017).
- Demonstrator in a data analysis module for biochemistry undergraduates (2013).
- Supervisor for postgraduate students (PhD and MSc) and undergraduate interns (2013-2021).
- Guest lecturer on Optogenetics (2019-2021).
- Basics of MATLAB course (2020).

Academic Honours, Awards, and Grants

1. Max Planck Guest Postdoctoral Fellowship Award (2021).
2. Poster prize, MMM conference (2021).
3. Photosynthetic Antenna Research Centre Scientific Exchange Program (2016) - $3,000 USD.
4. Biochemical Society General Travel Grant (2015) - £500 GBP.
5. University of Sheffield 2022 Futures 3.5 year PhD Scholarship (2013) - £13,500 GBP per annum + tuition.
6. BBSRC Masters Scholarship (2012) - £13,500 GBP stipend + tuition.

Technical approaches for my research programmes

- Protein over-expression, purification, and characterisation.
- Nanopatterning of proteins through surface chemistry.
- Light microscopy (fixed & live) of cyanobacteria, chloroplasts, bacteria, algae and mammalian cells
- Microscopy techniques: STORM/PALM; SIM; LSCM; SDCM; TFM; TIRF; FRAP/FLIP; qSFM; FLIM; FRET; SAIM; HCM.
- Cell biology: Cell culture, transient/stable transfection, immunofluorescence, live-cell imaging, flow cytometry.
- X-ray Crystallography
- Characterisation of protein fluorophores for epi- and super-resolution imaging.
- Microscope development, construction, upkeep and maintenance.
- Chemical inducible dimerization and optogenetics.
- Software: Illustrator, NIS Elements, Metamorph, Imaris, FIJI.
- Computer programming (LabVIEW, MATLAB and Python):
    - Hardware interfacing for controlling instrumentation.
    - Analysis software for novel data structures e.g. spectral STORM, non-destructive readout.
    - Deep Learning algorithms.
    - Modelling of the molecular clutch.

References

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