

Dr David Swainsbury  
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School of Biological Sciences  
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## Career history

May 2022 - present - Lecturer in Biochemistry - University of East Anglia - School of Biological Sciences

Aug 2015 - Apr 2022 - Post doctoral research associate - School of Biosciences - University of Sheffield

Jan 2012 - Jul 2015 - Post doctoral research assistant - School of Biochemistry - University of Bristol

Oct 2007 - Dec 2011 - PhD candidate - Department of Biochemistry - John Innes Centre

Oct 2004 - Jul 2007 - BSc (Hons) Biochemistry - Schools of Biological Sciences - University of East Anglia

## Research Interests

My research centres on structure/function studies of photosynthetic protein complexes, and applying the outputs of these fundamental studies to engineer photosynthetic organisms to utilise more of the solar spectrum for energy generation.

I use a suite of methods including cryogenic electron microscopy, steady-state and transient absorbance and fluorescence spectroscopy, computational protein design and electrochemistry.

For enquiries about PhD studentships and projects in my lab please contact me by e-mail.

## Research outputs

- Sulfoquinovosyl diacylglycerol is required for dimerisation of the *Rhodobacter sphaeroides* reaction centre-light harvesting 1 core complex**  
Martin, E. C., Bowie, A. G. M., Welfare Reid, T., Hunter, C. N., Hitchcock, A. & Swainsbury, D. J. K., 3 Jul 2024, In: *Biochemical Journal*. 481, 13, p. 823-838 16 p.
- Excitation energy transfer in proteoliposomes reconstituted with LH2 and RC-LH1 complexes from *Rhodobacter sphaeroides***  
Huang, X., Vasilev, C., Swainsbury, D. J. K. & Hunter, C. N., 29 Feb 2024, In: *Bioscience Reports*. 44, 2, BSR20231302.
- The structure and assembly of reaction centre-light-harvesting 1 complexes in photosynthetic bacteria**  
Swainsbury, D. J. K., Qian, P., Hitchcock, A. & Hunter, C. N., 31 May 2023, In: *Bioscience Reports*. 43, 5, BSR20220089.
- Photosynthesis in the near infrared: The  $\gamma$  subunit of *Blastochloris viridis* LH1 red-shifts absorption beyond 1000 nm**  
Hitchcock, A., Swainsbury, D. J. K. & Hunter, C. N., 31 Mar 2023, In: *Biochemical Journal*. 480, 6, p. 455-460 6 p.
- Enhancing the spectral range of plant and bacterial light-harvesting pigment-protein complexes with various synthetic chromophores incorporated into lipid vesicles**  
Hancock, A. M., Swainsbury, D. J. K., Meredith, S. A., Morigaki, K., Hunter, C. N. & Adams, P. G., Dec 2022, In: *Journal of Photochemistry and Photobiology B-Biology*. 237, 112585.
- Zeta-carotene isomerase (Z-ISO) is required for light-independent carotenoid biosynthesis in the cyanobacterium *Synechocystis* sp. PCC 6803**  
Proctor, M. S., Morey-Burrows, F. S., Canniffe, D. P., Martin, E. C., Swainsbury, D. J. K., Johnson, M. P., Hunter, C. N., Sutherland, G. A. & Hitchcock, A., Sep 2022, In: *Microorganisms*. 10, 9, 1730.
- Cryo-EM structures of the *Synechocystis* sp. PCC 6803 cytochrome  $b_6f$  complex with and without the regulatory PetP subunit**  
Proctor, M. S., Malone, L. A., Farmer, D. A., Swainsbury, D. J. K., Hawkings, F. R., Pastorelli, F., Emrich-Mills, T. Z., Siebert, C. A., Hunter, C. N., Johnson, M. P. & Hitchcock, A., Jul 2022, In: *Biochemical Journal*. 479, 13, p. 1487-1503 17 p.
- FRET measurement of cytochrome  $bc_1$  and reaction centre complex proximity in live *Rhodobacter sphaeroides* cells**  
Vasilev, C., Swainsbury, D. J. K., Cartron, M. L., Martin, E. C., Kumar, S., Hobbs, J. K., Johnson, M. P., Hitchcock, A. & Hunter, C. N., 1 Feb 2022, In: *Biochimica Et Biophysica Acta-Bioenergetics*. 1863, 2, 148508.

9. **Engineering purple bacterial carotenoid biosynthesis to study the roles of carotenoids in light-harvesting complexes**  
Sutherland, G. A., Qian, P., Hunter, C. N., Swainsbury, D. J. K. & Hitchcock, A., 2022, *Methods in Enzymology*. Wurtzel, E. T. (ed.). Elsevier, Vol. 674. p. 137-184 48 p.
10. **Cryo-EM structure of the Rhodobacter sphaeroides light-harvesting 2 complex at 2.1Å**  
Qian, P., Swainsbury, D. J. K., Croll, T. I., Castro-Hartmann, P., Divitini, G., Sader, K. & Hunter, C. N., 9 Nov 2021, In: *Biochemistry*. 60, 44, p. 3302-3314 13 p.
11. **Cryo-EM structure of the dimeric Rhodobacter sphaeroides RC-LH1 core complex at 2.9Å: The structural basis for dimerisation**  
Qian, P., Croll, T. I., Hitchcock, A., Jackson, P. J., Salisbury, J. H., Castro-Hartmann, P., Sader, K., Swainsbury, D. J. K. & Hunter, C. N., Nov 2021, In: *Biochemical Journal*. 478, 21, p. 3923-3937 15 p.
12. **Cryo-EM structure of the monomeric Rhodobacter sphaeroides RC-LH1 core complex at 2.5Å**  
Qian, P., Swainsbury, D. J. K., Croll, T. I., Salisbury, J. H., Martin, E. C., Jackson, P. J., Hitchcock, A., Castro-Hartmann, P., Sader, K. & Hunter, C. N., Oct 2021, In: *Biochemical Journal*. 478, 20, p. 3775-3790 16 p.
13. **Cryo-EM structure of the Rhodospirillum rubrum RC-LH1 complex at 2.5Å**  
Qian, P., Croll, T. I., Swainsbury, D. J. K., Castro-Hartmann, P., Moriarty, N. W., Sader, K. & Hunter, C. N., 7 Sep 2021, In: *Biochemical Journal*. 478, 17, p. 3253-3263 11 p.
14. **Structures of Rhodopseudomonas palustris RC-LH1 complexes with open or closed quinone channels**  
Swainsbury, D. J. K., Qian, P., Jackson, P. J., Faries, K. M., Niedzwiedzki, D. M., Martin, E. C., Farmer, D. A., Malone, L. A., Thompson, R. F., Ranson, N. A., Canniffe, D. P., Dickman, M. J., Holten, D., Kirmaier, C., Hitchcock, A. & Hunter, C. N., 13 Jan 2021, In: *Science Advances*. 7, 3, eabe2631.
15. **A thermostable protein matrix for spectroscopic analysis of organic semiconductors**  
Sutherland, G. A., Polak, D., Swainsbury, D. J. K., Wang, S., Spano, F. C., Auman, D. B., Bossanyi, D. G., Pidgeon, J. P., Hitchcock, A., Musser, A. J., Anthony, J. E., Dutton, P. L., Clark, J. & Hunter, C. N., 12 Aug 2020, In: *Journal of the American Chemical Society*. 142, 32, p. 13898-13907 10 p.
16. **Carotenoid-to-(bacterio)chlorophyll energy transfer in LH2 antenna complexes from Rba. sphaeroides reconstituted with non-native (bacterio)chlorophylls**  
Niedzwiedzki, D. M., Swainsbury, D. J. K. & Hunter, C. N., 1 May 2020, In: *Photosynthesis Research*. 144, 2, p. 155-169 15 p.
17. **A photosynthetic antenna complex foregoes unity carotenoid-to-bacteriochlorophyll energy transfer efficiency to ensure photoprotection**  
Niedzwiedzki, D. M., Swainsbury, D. J. K., Canniffe, D. P., Hunter, C. N. & Hitchcock, A., 24 Mar 2020, In: *Proceedings of the National Academy of Sciences of the United States of America*. 117, 12, p. 6502-6508 7 p.
18. **Cryo-EM structure of the spinach cytochrome  $b_6/f$  complex at 3.6 Å resolution**  
Malone, L. A., Qian, P., Mayneord, G. E., Hitchcock, A., Farmer, D. A., Thompson, R. F., Swainsbury, D. J. K., Ranson, N. A., Hunter, C. N. & Johnson, M. P., 21 Nov 2019, In: *Nature*. 575, 7783, p. 535-539 5 p.
19. **Atoms to phenotypes: Molecular design principles of cellular energy metabolism**  
Singharoy, A., Maffeo, C., Delgado-Magnero, K. H., Swainsbury, D. J. K., Sener, M., Kleinekathöfer, U., Vant, J. W., Nguyen, J., Hitchcock, A., Israelewitz, B., Teo, I., Chandler, D. E., Stone, J. E., Phillips, J. C., Pogorelov, T. V., Mallus, M. I., Chipot, C., Luthey-Schulten, Z., Tieleman, D. P., Hunter, C. N., & 3 othersTajkhorshid, E., Aksimentiev, A. & Schulten, K., 14 Nov 2019, In: *Cell*. 179, 5, p. 1098-1111.e23 14 p.
20. **Single-molecule study of redox control involved in establishing the spinach plastocyanin-cytochrome  $b_6/f$  electron transfer complex**  
Mayneord, G. E., Vasilev, C., Malone, L. A., Swainsbury, D. J. K., Hunter, C. N. & Johnson, M. P., 1 Jul 2019, In: *Biochimica Et Biophysica Acta-Bioenergetics*. 1860, 7, p. 591-599 9 p.
21. **Engineering of B800 bacteriochlorophyll binding site specificity in the Rhodobacter sphaeroides LH2 antenna**  
Swainsbury, D. J. K., Faries, K. M., Niedzwiedzki, D. M., Martin, E. C., Flinders, A. J., Canniffe, D. P., Shen, G., Bryant, D. A., Kirmaier, C., Holten, D. & Hunter, C. N., 1 Mar 2019, In: *Biochimica Et Biophysica Acta-Bioenergetics*. 1860, 3, p. 209-223 15 p.
22. **Modelling of the cathodic and anodic photocurrents from Rhodobacter sphaeroides reaction centres immobilized on titanium dioxide**  
Bialek, R., Swainsbury, D. J. K., Wiesner, M., Jones, M. R. & Gibasiewicz, K., 1 Oct 2018, In: *Photosynthesis Research*. 138, 1, p. 103-114 12 p.
23. **Carotenoid to bacteriochlorophyll energy transfer in the RC-LH1-PufX complex from Rhodobacter sphaeroides containing the extended conjugation keto-carotenoid diketospirilloxanthin**  
Šlouf, V., Keşan, G., Litvín, R., Swainsbury, D. J. K., Martin, E. C., Hunter, C. N. & Polívka, T., 1 Mar 2018, In: *Photosynthesis Research*. 135, 1-3, p. 33-43 11 p.
24. **Probing the local lipid environment of the Rhodobacter sphaeroides cytochrome  $bc_1$  and Synechocystis sp. PCC 6803 cytochrome  $b_6/f$  complexes with styrene maleic acid**  
Swainsbury, D. J. K., Proctor, M. S., Hitchcock, A., Cartron, M. L., Qian, P., Martin, E. C., Jackson, P. J., Madsen, J., Armes, S. P. & Hunter, C. N., Mar 2018, In: *Biochimica Et Biophysica Acta-Bioenergetics*. 1859, 3, p. 215-225 11 p.

25. **A mechanoresponsive phase-changing electrolyte enables fabrication of high-output solid-state photobioelectrochemical devices from pigment-protein multilayers**  
Ravi, S. K., Swainsbury, D. J. K., Singh, V. K., Ngeow, Y. K., Jones, M. R. & Tan, S. C., 1 Feb 2018, In: *Advanced Materials*. 30, 5, 1704073.
26. **Identification of protein W, the elusive sixth subunit of the Rhodospseudomonas palustris reaction center-light harvesting 1 core complex**  
Jackson, P. J., Hitchcock, A., Swainsbury, D. J. K., Qian, P., Martin, E. C., Farmer, D. A., Dickman, M. J., Canniffe, D. P. & Hunter, C. N., Feb 2018, In: *Biochimica Et Biophysica Acta-Bioenergetics*. 1859, 2, p. 119-128 10 p.
27. **Engineered photoproteins that give rise to photosynthetically-incompetent bacteria are effective as photovoltaic materials for biohybrid photoelectrochemical cells**  
Liu, J., Friebe, V. M., Swainsbury, D. J. K., Crouch, L. I., Szabo, D. A., Frese, R. N. & Jones, M. R., 2018, In: *Faraday Discussions*. 207, p. 307-327 21 p.
28. **Engineering of a calcium-ion binding site into the RC-LH1-PufX complex of Rhodobacter sphaeroides to enable ion-dependent spectral red-shifting**  
Swainsbury, D. J. K., Martin, E. C., Vasilev, C., Parkes-Loach, P. S., Loach, P. A. & Neil Hunter, C., Nov 2017, In: *Biochimica Et Biophysica Acta-Bioenergetics*. 1858, 11, p. 927-938 12 p.
29. **The effectiveness of styrene-maleic acid (SMA) copolymers for solubilisation of integral membrane proteins from SMA-accessible and SMA-resistant membranes**  
Swainsbury, D. J. K., Scheidelaar, S., Foster, N., van Grondelle, R., Killian, J. A. & Jones, M. R., Oct 2017, In: *Biochimica et Biophysica Acta - Biomembranes*. 1859, 10, p. 2133-2143 11 p.
30. **Photoprotection through ultrafast charge recombination in photochemical reaction centres under oxidizing conditions**  
Ma, F., Swainsbury, D. J. K., Jones, M. R. & van Grondelle, R., 26 Sep 2017, In: *Philosophical Transactions of the Royal Society B: Biological Sciences*. 372, 1730, 20160378.
31. **Origin of the S\* excited state feature of carotenoids in light-harvesting complex 1 from purple photosynthetic bacteria**  
Niedzwiedzki, D. M., Swainsbury, D. J. K., Martin, E. C., Hunter, C. N. & Blankenship, R. E., 17 Aug 2017, In: *Journal of Physical Chemistry B*. 121, 32, p. 7571-7585 15 p.
32. **Cytochrome c provides an electron-funneling antenna for efficient photocurrent generation in a reaction center biophotocathode**  
Friebe, V. M., Millo, D., Swainsbury, D. J. K., Jones, M. R. & Frese, R. N., 19 Jul 2017, In: *ACS Applied Materials and Interfaces*. 9, 28, p. 23379-23388 10 p.
33. **Enhanced output from biohybrid photoelectrochemical transparent tandem cells integrating photosynthetic proteins genetically modified for expanded solar energy harvesting**  
Ravi, S. K., Yu, Z., Swainsbury, D. J. K., Ouyang, J., Jones, M. R. & Tan, S. C., 5 Apr 2017, In: *Advanced Energy Materials*. 7, 7, 1601821.
34. **Directed assembly of defined oligomeric photosynthetic reaction centres through adaptation with programmable extra-membrane coiled-coil interfaces**  
Swainsbury, D. J. K., Harniman, R. L., di Bartolo, N. D., Liu, J., Harper, W. F. M., Corrie, A. S. & Jones, M. R., 1 Dec 2016, In: *Biochimica Et Biophysica Acta-Bioenergetics*. 1857, 12, p. 1829-1839 11 p.
35. **On the mechanism of ubiquinone mediated photocurrent generation by a reaction center based photocathode**  
Friebe, V. M., Swainsbury, D. J. K., Fyfe, P. K., van der Heijden, W., Jones, M. R. & Frese, R. N., 1 Dec 2016, In: *Biochimica Et Biophysica Acta-Bioenergetics*. 1857, 12, p. 1925-1934 10 p.
36. **Plasmon-enhanced photocurrent of photosynthetic pigment proteins on nanoporous silver**  
Friebe, V. M., Delgado, J. D., Swainsbury, D. J. K., Gruber, J. M., Chanaewa, A., van Grondelle, R., von Hauff, E., Millo, D., Jones, M. R. & Frese, R. N., 13 Jan 2016, In: *Advanced Functional Materials*. 26, 2, p. 285-292 8 p.
37. **Bacterial reaction centers purified with styrene maleic acid copolymer retain native membrane functional properties and display enhanced stability**  
Swainsbury, D. J. K., Scheidelaar, S., van Grondelle, R., Killian, J. A. & Jones, M. R., 27 Oct 2014, In: *Angewandte Chemie - International Edition*. 53, 44, p. 11803-11807 5 p.
38. **Evaluation of a biohybrid photoelectrochemical cell employing the purple bacterial reaction centre as a biosensor for herbicides**  
Swainsbury, D. J. K., Friebe, V. M., Frese, R. N. & Jones, M. R., 15 Aug 2014, In: *Biosensors and Bioelectronics*. 58, p. 172-178 7 p.
39. **Calcium ion binding properties of medicago truncatula calcium/calmodulin- dependent protein kinase**  
Swainsbury, D. J. K., Zhou, L., Oldroyd, G. E. D. & Bornemann, S., 4 Sep 2012, In: *Biochemistry*. 51, 35, p. 6897-6907 11 p.