

## Dr. Benjamin Alexander Palmer

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Nationality: British  
Date of Birth: 12/04/1986

### EDUCATION & EMPLOYMENT

- 2019-** Assistant Professor, Department of Chemistry, Ben-Gurion University of the Negev, Israel.  
**2018-2019** Senior Postdoctoral Fellow, Weizmann Institute of Science, Israel (Profs. Lia Addadi and Steve Weiner).  
**2015-2018** Human Frontiers Postdoctoral Fellow and Koshland Scholar, Weizmann Institute of Science, Israel (Profs. Lia Addadi and Steve Weiner).  
**2014-2015** Dean of Faculty Postdoctoral Fellow and Koshland Scholar, Weizmann Institute of Science, Israel (Profs. Lia Addadi and Steve Weiner).  
**2012-2013** Postdoctoral Research Assistant, Centre for Nanohealth, Swansea University (Joint project between Swansea (Prof. Steve Wilks) and Texas A&M University (Prof. Kenith Meissner)).  
**2008-2012** PhD: *Structural Properties, X-ray Birefringence and Crystal Growth of Solid Organic Inclusion Compounds*, School of Chemistry, Cardiff University (Prof. Kenneth Harris).  
**2006-2007** Research & Development Scientist, GE Healthcare, Amersham  
**2004-2008** MChem, 1<sup>st</sup> Class Honours, Cardiff University

### FELLOWSHIPS, AWARDS & SCHOLARSHIPS

- 2019** Azrieli Faculty Fellowship (\$210,000).  
**2018** Feinberg Graduate School Prize for Outstanding Achievements in Postdoctoral Research.  
**2018** Senior Postdoctoral Fellowship, Weizmann Institute of Science.  
**2015** IUCR Young Scientist Award.  
**2015** Human Frontiers Science Programme Cross-Disciplinary Fellowship.  
**2015** Marie Curie Fellowship (declined fellowship offer in preference for HFSP fellowship).  
**2014** The Welsh Livery Guild Gold Award.  
**2014** Koshland Prize.  
**2014** Dean of Faculty Fellowship, Weizmann Institute of Science.  
**2013** Welsh Livery Guild Travel Scholarship.  
**2013** Feinberg Graduate School Scholarship, Weizmann Institute of Science.  
**2012** Awarded EPSRC Bridging the Gaps grant as Principal Investigator.  
**2010** RSC bursary to attend EuCheMS Chemistry Congress, Nuremberg, August 2010.  
**2009** Welsh Livery Guild Travel Scholarship.  
**2008** The Pfizer award for 'Best 4<sup>th</sup> Year MChem research project' and the GE Healthcare award 'Outstanding 4<sup>th</sup> year MChem performance'.  
**2007** Royal Society of Chemistry award for 'Best 3<sup>rd</sup> Year Performance'.

### GRANTS

- 2019** ERC Starting Grant 'CRYSTALEYES' (1,966,000 EUR).  
**2019** Lead Principal Investigator on VATAT Equipment Grant (3,600,000 NIS).

### PUBLICATIONS

- B.A. Palmer\***, V. J. Yallapragada, N. Schiffmann, E. Merary Wormser, N. Elad, E.D. Aflalo, A. Sagi, S. Weiner, L. Addadi, D. Oron, A Highly Reflective Biogenic Photonic Material from Core-Shell Birefringent Nanoparticles, *Nature Nanotechnology*, **2020**, doi:10.1038/s41565-019-0609-5.
- G. Zhang, A. Hirsch, G. Shmul, L. Avram, N. Elad, V. Brumfeld, I. Pinkas, Y. Feldman, R. Ben Asher, **B.A. Palmer**, L. Kronik, L. Leiserowitz, S. Weiner, L. Addadi, Guanine and 7,8-dihydroxanthopterin reflecting crystals in the zander fish eye: crystal locations, compositions, and structures, *J. Am. Chem. Soc.*, **2019**, *141*, 19736-19745.
- V. J. Yallapragada, **B.A. Palmer\***, Animal Eyes: Filtering out the Background, *Curr. Biol.* **2019**, *29*, R938-R941.
- K. Christensen, P.A. Williams, R. Patterson, **B.A. Palmer**, M. Couzi, F. Guillaume, K.D.M. Harris, Reply to comment on Couzi *et al.* (2018): a phenomenological model for structural phase transitions in incommensurate alkane/urea inclusion compounds, *R. Soc. Open. Sci.* **2019**, *6*, 190518.

5. A. Hirsch, **B. A. Palmer**, A. Ramasubramaniam, P.A. Williams, K.D.M. Harris, B. Pokroy, S. Weiner, L. Addadi, L. Leiserowitz, L. Kronik, Structure and Morphology of Light-Reflecting Synthetic and Biogenic Polymorphs of Isoxanthopterin: A Comparison, *Chem. Mater.*, **2019**, *31*, 4479-4489
6. Y. Zhou, R. Patterson, **B.A. Palmer**, G.R. Edwards-Gau, B.M. Kariuki, S. Nambalan Sivaraman, D. W. Bruce, I.P. Dolbnya, S.P. Collins, A. Malandain, K.D.M. Harris, Spatially Resolved Mapping of Phase Transitions in Liquid Crystalline Materials by X-ray Birefringence Imaging, *Chemical Science* **2019**, *10*, 3005-3011.
7. Y. Tsarfati, S. Rosenne, H. Weissman, L. J. W. Shimon, D. Gur, **B. A. Palmer**, B. Rybtchinski, Crystallization of Organic Molecules: Nonclassical Mechanism Revealed by Direct Imaging, *ACS Central Science* **2018**, *4*, 1031-1036.
8. **B.A. Palmer**, D. Gur, S. Weiner, L. Addadi, D. Oron, The Organic Crystalline Materials of Vision: Structure-function Considerations from the Nanometer to the Millimeter scale, *Adv. Mater.* **2018**, *30*, e1800006.
9. **B.A. Palmer\***, A. Hirsch, V. Brumfeld, N. Elad, D. Oron, L. Kronik, L. Leiserowitz, S. Weiner, L. Addadi, Optically Functional Isoxanthopterin Crystals in the Mirrored Eyes of Decapod Crustaceans, *Proc. Natl. Acad. Sci. U.S.A.*, **2018**, *115*, 2299-2304.
10. **B.A. Palmer\***, G.J. Taylor, V. Brumfeld, D. Gur, M. Shemesh, N. Elad, A. Osherov, D. Oron, S. Weiner, L. Addadi, The Image-Forming Mirror in the Eye of the Scallop, *Science* **2017**, *358*, 1172-1175. highlighted in *New York Times*, *Chemical & Engineering News*, *Phys.org*, *The Atlantic*, *The Independent*, *Daily Mail & others*.
11. A. Hirsch, **B.A. Palmer**, D. Gur, S. Weiner, L. Addadi, L. Kronik, L. Leiserowitz, Biologically Controlled Morphology and Twinning in Guanine Crystals, *Angew. Chem. Int. Ed.* **2017**, *56*, 9420-9424.
12. N. Funt, **B.A. Palmer**, S. Weiner, L. Addadi, Koi Fish Scale Iridophore Cells Orient Guanine Crystals to Maximize Light Reflection, *ChemPlusChem*, **2017**, *82*, 914-923.
13. D. Gur, **B.A. Palmer**, S. Weiner, L. Addadi, Light Manipulation by Guanine Crystals in Organisms: Biogenic Scatterers, Mirrors, Multilayer Reflectors and Photonic Crystals, *Adv. Func. Mater.* **2017**, 1603514.
14. M. Couzi, F. Guillaume, K.D.M. Harris, **B.A. Palmer**, K. Christensen, S.P. Collins, The True Structural Periodicities and Superspace Group Descriptions of the Prototypical Incommensurate Composite Materials: Alkane/urea Inclusion Compounds, *Europhys. Lett.* **2016**, *116*, 56001.
15. **B.A. Palmer**, S.P. Collins, J. Hulliger, K.D.M. Harris, Determining Molecular Orientations in Disordered Materials from X-ray Linear Dichroism at the Iodine L1-Edge, *J. Am. Chem. Soc.*, **2016**, *138*, 16188-16191.
16. J.P. Sutter, I.P. Dolbnya, S.P. Collins, K.D.M. Harris, G.R. Edwards-Gau, B.M. Kariuki, **B.A. Palmer**, Novel Technique for Spatially Resolved Imaging of Molecular Bond Orientations using X-ray Birefringence, *AIP Conf. Proc.* **2016**, *1741*, 0500009.
17. D. Gur, **B.A. Palmer**, B. Leshem, D. Oron, P. Fratzl, S. Weiner, L. Addadi. The Mechanism of Color Change in the Neon Tetra Fish: a Light-Induced Tunable Photonic Crystal Array, *Angew. Chem. Int. Ed.*, **2015**, *54*, 12426-124301. Paper highlighted in *Phys.Org*.
18. J. Sutter, I.P. Dolbnya, S.P. Collins, G.R.E. Edwards-Gau, K.D.M. Harris, **B.A. Palmer**. Theoretical analysis of the background intensity distribution in X-ray Birefringence Imaging using synchrotron bending-magnet radiation, *J. Appl. Phys.*, **2015**, *117*, 164902.
19. **B.A. Palmer**, G.R.E. Edwards-Gau, B.M. Kariuki, K.D.M. Harris, I.P. Dolbnya, S.P. Collins, J. Sutter. X-ray birefringence Imaging of Materials with Anisotropic Molecular Dynamics, *J. Phys. Chem. Lett.*, **2015**, *6*, 561-657.
20. **B.A. Palmer**, G.R.E. Edwards-Gau, B.M. Kariuki, K.D.M. Harris, I.P. Dolbnya, S.P. Collins. X-ray birefringence Imaging, *Science* **2014**, *344*, 1013-1016. Paper highlighted in *Science*, *Chemical & Engineering News*, *The Engineer*, *Phys.Org* and *Diamond Annual Review 2015*.
21. **B.A. Palmer**, A. Le Comte, K.D.M. Harris, F. Guillaume, Controlling Spatial Distributions of Molecules in Multi-Component Organic Crystals, with Quantitative Mapping by Confocal Raman Microspectrometry, *J. Am. Chem. Soc.*, **2013**, *135*, 14512-14515.
22. S.P. Collins, I.P. Dolbnya, **B.A. Palmer**, G.R.E. Edwards-Gau, A. Morte-Rodenas, B.M. Kariuki, G.K. Lim, K.D.M. Harris, Y. Joly, X-ray Birefringence in Highly Anisotropic Materials, *J. Phys. Conf. Ser.*, **2013**, *13*, 132015.
23. K.D.M. Harris, C.E. Hughes, **B.A. Palmer**, F. Guillaume. New Strategies for Exploring Crystallization Processes of Organic Materials, *Trans. Am. Crystallogr. Assoc.*, **2012**, *43*, 97-112.
24. **B.A. Palmer**, G.R.E. Edwards-Gau, A. Morte-Rodenas, B.M. Kariuki, G.K. Lim, K.D.M. Harris, I.P. Dolbnya, S.P. Collins. X-ray Birefringence: A New Strategy for Determining Molecular Orientation in Materials, *J. Phys. Chem. Lett.*, **2012**, *2*, 3216-3222. highlighted in the *Diamond Annual Review 2013*.

25. K.D.M. Harris, **B.A. Palmer**, G.R. Edwards-Gau, Reactions in Solid-State Inclusion Compounds, *Supramolecular Chemistry: From Molecules to Nanomaterials*, (Ed: J.W. Steed and P.A. Gale), John Wiley & Sons, Chichester, **2012**, Volume 4, pp. 1589-1612.
26. **B.A. Palmer**, B.M. Kariuki, A. Morte-Rodenas, K.D.M. Harris, Structural Rationalisation of the Phase Transition Behaviour in a Solid Organic Inclusion Compound: Bromocyclohexane/Thiourea, *Cryst. Growth Des.*, **2012**, *12*, 577-582.
27. **B.A. Palmer**, A. Morte-Rodenas, B.M. Kariuki, K.D.M. Harris, S.P. Collins. X-ray Birefringence from a Model Anisotropic Crystal, *J. Phys. Chem. Lett.* **2011**, *2*, 2346-2351.
28. **B.A. Palmer**, B.M. Kariuki, V.K. Muppidi, C.E. Hughes, K.D.M. Harris. An Incommensurate Thiourea Inclusion Compound, *Chem. Comm.* **2011**, *47*, 3760-3762.
29. **B.A. Palmer**, K.D.M. Harris, F. Guillaume, A Strategy for Retrospectively Mapping the Growth History of a Crystal, *Angew. Chem. Int. Ed.* **2010**, *49*, 5096-5100. highlighted in *Chemical & Engineering News*
30. O. A. Hazzazi, S.E. Huxter, R. Taylor, **B.A. Palmer**, L. Gilbert, G.A. Attard. Electrochemical Studies of Irreversibly Adsorbed Ethyl Pyruvate on Pt{hkl} and Epitaxial Pd/Pt{hkl} Adlayers, *J. Electroanal. Chem.* **2010**, *640*, 8-16.

### INVITED TALKS

- 2021 **Invited Lecture:** Annual Meeting of the Society for Integrative and Comparative Biology (SICB).
- 2020 **Invited Lecture:** Israel Society for Microscopy Annual Meeting.
- 2020 **Invited Lecture:** Gordon Conference on Crystal Engineering
- 2020 **Invited Lecture:** Biological and Bio-inspired Optics Faraday Discussion, University of Cambridge.
- 2019 **Departmental Seminar:** Department of Chemistry, Tel Aviv University.
- 2019 **Departmental Seminar:** Department of Biotechnology Engineering, Ben-Gurion University.
- 2019 **Invited Plenary Lecture:** Bioinspired Materials (ETH & EPFL), Lago di Maggiore, Switzerland.
- 2019 **Invited Lecture:** International Conference on Chemistry of the Solid State (ICCOSS), NYU.
- 2018 **Department Seminar:** Faculty of Chemistry, Technion.
- 2018 **Department Seminar:** Department of Chemistry, Ben-Gurion University of the Negev.
- 2018 **Department Seminar:** Institute of Chemistry, Hebrew University of Jerusalem.
- 2018 **Department Seminar:** Department of Neurobiology, Weizmann Institute of Science.
- 2018 **Department Seminar:** Department of Ecology, Evolution and Behavior, Hebrew University of Jerusalem.
- 2018 **Department Seminar:** Faculty of Chemistry, Weizmann Institute of Science.
- 2017 **Invited Lecture:** MPI, Colloids & Interfaces, Potsdam, Germany.
- 2017 **Invited Lecture:** User Meeting, BESSY Synchrotron, Berlin, Germany.
- 2017 **Department Seminar:** School of Biological Sciences, Bristol University, U.K.
- 2017 **Department Seminar:** School of Engineering, EPFL, Lausanne, Switzerland.
- 2017 **Invited Lecture:** MRS Fall Meeting, Boston, USA.
- 2017 **Invited Lecture:** American Crystallographic Association Meeting, New Orleans, USA.
- 2017 **Departmental Seminar:** Department of Structural Biology, Weizmann Institute.

### OTHER PRESENTATIONS

- 2018 **Poster presentation:** Human Frontiers Science Programme Awardees Meeting, Toronto.
- 2017 **Oral presentation:** Human Frontiers Awardees Conference, Lisbon, Portugal.
- 2017 **Poster presentation:** The 82<sup>nd</sup> Annual Meeting of the Israeli Chemical Society, Israel.
- 2016 **Oral presentation & poster:** Human Frontiers Awardees Conference, Singapore.
- 2016 **Oral presentation:** Living Light Conference, Scripps Institute of Oceanography, San Diego, U.S.A.
- 2016 **Seminar:** School of Biological Sciences, Bristol University, UK.
- 2016 **Poster presentation:** Batsheva de Rothschild Seminar on Biomineralization, Israel.
- 2015 **Oral presentation:** BIOMIN XIII Conference, Granada, Spain.
- 2015 **Oral presentation:** International Conference on the Chemistry of the Organic State (ICCOSS), Niigata, Japan.
- 2015 **Seminar:** Weizmann Institute of Science, Rehovot, Israel.
- 2015 **Seminar:** Ben Gurion University of the Negev, Beer Sheva, Israel.
- 2015 **Seminar:** Max Plank Institute of Colloids and Interfaces, Golm, Germany.
- 2014 **Seminar:** School of Chemistry, Bristol University, UK.
- 2014 **Seminar:** School of Chemistry, University of Birmingham, UK.
- 2014 **Poster presentation:** Gordon Research Conference on Biomineralization, New Hampshire, U.S.A.

**2013 Seminar:** Department of Structural Biology, Weizmann Institute of Science, Israel.

**2010 Poster presentation:** EuCheMS Chemistry Congress, Nuremberg, August 2010.

### **COLLABORATIONS**

- **Prof. Leslie Leiserowitz** (Weizmann Institute): Organic crystallization and crystal twinning.
- **Prof. Leeor Kronik** (Weizmann Institute): DFT crystal structure prediction & theoretical prediction of optical properties of organic crystals.
- **Dr. Gavin Taylor** (Lund University, Sweden): Optical ray tracing simulations.
- **Prof. Amir Sagi** (Ben-Gurion University, Israel): Visual ecology & genetic manipulation of biological crystallization.
- **Prof. Kenneth Harris** (Cardiff University, UK): X-ray Birefringence Imaging, order-disorder phase transitions of urea inclusion compounds & diffraction properties of incommensurate and aperiodic materials.
- **Prof. Dan Oron** (Weizmann Institute, Israel): Optical reflectivity simulations of natural optical devices.

### **RESEARCH INTERESTS & EXPERTISE**

- Cryo-Scanning Electron Microscopy.
- TEM/electron diffraction
- Structural chemistry.
- Biomineralization.
- Vision in animals & natural photonics.
- Bio-inspired crystal growth and crystal engineering.
- Development of X-ray Birefringence Imaging techniques.