CV Summary

- Researcher applying novel engineering approaches to improve and miniaturise biomedical optical imaging technology.
- 18 published journal articles (8 first author). h-index 8. Citations >290. 3 journal front covers. 5 patents filed.
- Funding includes £170k CRUK Award (co-author), £60k EPSRC Impact Award (co-investigator), £125k Wellcome Trust Fellowship (lead-investigator) and $250k NASA Advanced Concepts Award (independent collaborator).

Research Experience

- **Wellcome Trust Junior Interdisciplinary Fellowship: University of Cambridge** 2019–2021

Research: Unifying optical imaging modalities through nanophotonics for early cancer detection.
Funding scheme allowing physical scientists to apply their research to solve problems in the basic biological and biomedical sciences. 2-year funding (£125k) as lead-investigator.

- **Visiting Researcher: National Institute of Aerospace (NIA) & NASA Langley, VA, US** 2019–current

Collaboration with Dr. Hyun Jung Kim (NASA) on phase-change tunable optical (infrared) devices.

- **Junior Research Fellowship**: **Wolfson College, University of Cambridge** 2018–2021

Active member: Finance committee, Strategic planning workgroup, Governing Body, Mentoring scheme.

- **Research Associate: Dept. of Engineering and Dept. of Physics, University of Cambridge** 2017–current

Research: Development of a multimodal imaging system for early-stage cancer detection based on nanostructured optics. Supervisors: Prof. Sarah Bohndiek and Prof. Timothy Wilkinson. Funded by a £170k Cancer Research U.K. (CRUK) Pioneer Award I helped initiate.

- **PhD Researcher: Dept. of Engineering, University of Cambridge** 2013–2017

Thesis: Plasmonic nanostructures for enhanced optical devices. Supervisor: Prof. Timothy Wilkinson
Led to 11 journal publications, 1 patent, 2 collaborations, £120k R&D multinational consultancy project.

- **Postgraduate Researcher: Qioptiq (Excelitas Technologies), Wales** 2013 (3month)

Industrial research: Integrated metamaterials for imaging systems. Led to a sponsored PhD (at UCL).

Education

PhD, Engineering: University of Cambridge 2013–2017
MRes, Photonic Systems Development (Distinction): University of Cambridge 2012–2013
MPhil, Micro and Nanotechnology (Distinction): University of Cambridge 2011–2012
BSc, Physics (First Class, Hons.): Cardiff University 2008–2011

Research Funding

- **Engineering and Physical Sciences Council (EPSRC): Impact Acceleration Award (IAA)** £ 60,000 **[Co-Investigator]** 2020–2021

Project: Custom Multispectral Filter Arrays for Advanced Biomedical Imaging
Aim is to build an operational multispectral imaging system targeted to haemoglobin. The funding will support key next steps towards creating a viable commercial product.

- **Nanoscale Research Centre, University of Nottingham: 'Nanoprime': Pump prime award (collaboration)** £ 15,000 **[Co-Investigator]** 2020

Project: Hyper-pixels: Redesigning the Eye for optimal, low-cost Diagnostic Medical Imaging
To design, fabricate and test 2D arrays of HyperPixels: hyperspectral pixels with bespoke spectral responses optimised for detecting specific chemical compounds relevant for medical imaging. [Funding postponed due to COVID-19]

- **Wellcome Trust / University of Cambridge: Junior Interdisciplinary Fellowship** £ 125,000 **[Lead-investigator]** 2019–2021

Project: Unifying optical imaging modalities through nanophotonics for early cancer detection
To develop a prototype multimodal imaging system comprising a tunable image sensor through integration of nanophotonics and metasurfaces in device design.

- **National Aeronautics and Space Administration (NASA): Innovative Advanced Concepts (IAC) Award** $ 125,000 USD /year **[Co-author, Collaborator]** 2018–2021

Project: Tunable mid-wave infrared filters based on $Ge_xSb_yTe_z$ for multispectral thermal imaging
Independent collaboration with Dr. Hyun Jung Kim (NASA). The proposal was selected by the Langley Science Council (NASA), with only 1/5 projects successful. Competitive renewal in 19/20 and 20/21 awarded.
Devices to launch to the International Space Station as part of the MISSE-14 Flight Facility (2021), for on-board testing.

- **Cancer Research UK (CRUK): Pioneer Award** £ 170,000 **[Co-author, named researcher]** 2017–2019

Project: Shedding light on cancer using nanoplasmonic metapixels
Investigating the hybridisation of different optical imaging modalities in a single system, used to enhance tissue contrast in the diagnosis and treatment of cancer.

- **R&D Consultancy Project**: **Multinational company (NDA in place)** £ 120,000 **[Co-author, named researcher]** 2016–2017

Project: Plasmonic holographic security tags.
Lead researcher for the project with a multinational US company (under NDA), during PhD.

Scholarships and Awards

Junior Interdisciplinary Fellowship: Wellcome Trust /Cambridge: worth ~£125,000 2019–2021
Junior Research Fellowship: Wolfson College, University of Cambridge: worth ~£8,000 2018–2021
PhD Studentship: EPSRC fully-funded research studentship: worth ~£60,000 2012–2016
Best Conference Poster Award: British Liquid Crystal Society (BLCS) UK Conference '14. 2014
OSA Travel Award: Frontiers in Optics ('14) conference, Arizona (2014): worth ~£1,500. 2014
IOP Undergraduate Award: Physics bursary for outstanding academic merit: worth~£3,000 2008–2011

Academic Responsibilities and Activities

Teaching Supervisor: Undergraduate Physics Supervisions, Corpus Christi, University of Cambridge 2019–current
2nd year, Part IB Physics (A)*: Oscillations, Waves and Optics;* 3 groups, 7 students.
Conference Session Chair: POEM 2019: Meta and Plasmonics Symposium, London. 2019
Research Supervisor and Examiner: Day-to-day supervisor for: 3 PhD students, >6 Master's and 2018–current
Undergraduate students across Dept. of Physics and Dept. of Engineering.
Technical Advisor and examiner for PhD first year viva for PhD student (Dept. of Engineering).
Early Career Member: SPIE, OSA and IET professional societies. 2018–current
Mentor: Wolfson College mentoring scheme for 2 STEM-based PhD students. 2018–current
Equipment Trainer: Photolithography, electron-beam evaporator; Nanoscience Centre (CAM). 2018–current
Exam Marking: Paper Part IB Physics (A), Dept. of Physics. 2018
Practical Demonstrator: Electron-beam lithography short-course practical for doctoral (CDT) students. 2018–2020
Reviewer: >15 paper reviews, including journals: Nano Letters, Optica and Optics Letters. 2015-current
i-Teams' member: 'Carbon solder' innovation & commercialisation team, *with Prof. Krzysztof Koziol.* 2011–2012

Public Engagement and Science Communication

Demonstrator at public events: Hands-on science & engineering experiments for the public at: 2015–current
European Researchers' night; CRUK Cambridge Institute open days; Dept. of Engineering open days;
Institute of Physics (IOP) 'Science in Schools' (East Anglia).
i-LAB Demonstrator: i-LAB (*interactive Learning Across Boundaries*) provides secondary school 2017–2018
students the experience of university-level STEM education; hands-on programming and electronics.
Co-founder of The Optical Society (OSA) Cambridge Chapter: Optics-focused events for the public 2015–2017
and STEM students: organiser of stands at Cambridge Science Festival, technical seminars for students.
Science Freelance writer: *ExtremeTech* news, article examples: *extremetech.com/author/cwilliams* 2015–2016

Intellectual Property

6. Solid-state frequency agile filter for LIDAR: multilayer optical design and exotic phase-change materials-based active tuning. NASA Invention Disclosure, NTR ID 1590245039. 2020 [patent in process]. Inventors: **C.Williams**, H.J.Kim
5. MWIR tunable filter based on exotic phase-change materials for multispectral imaging in science instruments NASA Invention Disclosure, LAR-19451-1. 2019 [patent in process]; Inventors: M.Julian, **C.Williams**, H.J.Kim
4. Optically Switched Continuously Tunable Phase-change Plasmonic Nanoholes for MWIR Imaging U.S. Patent App. **62/946,285,** 2019. Inventors: M.Julian, **C.Williams**, H.J.Kim
3. A single step lithography colour filter WO Patent. **WO/2019/239,139,** 2019. Inventors: **C.Williams,** G.S.D.Gordon, T.D. Wilkinson S.E.Bohndiek
2. Holographic endoscopy: Methods of characterising and imaging with an optical system U.K. Patent No. **1818290.7**, 2018. Inventors: G.S.D.Gordon, **C.Williams,** S.E.Bohndiek
1. Nanostructured plasmonic metapixels. U.K. Patent No. **1708407.0,** 2017. Inventors: **C.Williams,** T.D.Wilkinson U.S. Patent App. **16/613,604,** 2020

Selected Conference and Invited Talks

Talks at 8 international and 5 national conferences; 4 invited talks. 8 conference proceedings.

- Bespoke multispectral filter arrays based on Fabry-Perot optical cavities fabricated using large-area grayscale photolithography, **SPIE Photonics Europe**, 11359-46, Strasbourg, France [Moved online] Apr. 2020
- Development of multispectral imaging sensors for early-stage cancer diagnosis (Invited Talk) Jan. 2020
  STFC Cancer Diagnosis Workshop, Precision and Quantitative Imaging, Leicester, UK
- Active tunable filters based on GeSbTe phase-change materials and surface plasmon resonance Jan. 2020
  SPIE Photonics West, Optical Components XVII, Paper 11276-11, San Francisco, (CA), US
- Spectral Band Selection and Tolerancing for Multispectral Filter Arrays Oct. 2019
  Frontiers in Optics, Paper JW4A.126, Washington DC, US
- Multispectral filter arrays for biophotonic imaging applications (Invited Talk) Jun. 2019
  Hamlyn Symposium: Advanced Biophotonics: from 'bench to bedside', London, UK
- Multispectral filter arrays using grayscale lithography with metal-insulator-metal geometry (Invited Talk) Apr. 2019
  Photonic and Optoelectronic Materials Conference '19 (POEM2019), London, UK
- Enhancing contrast in biomedical imaging through micro and nanophotonics (Invited Talk) Mar. 2019
  NASA Langley Research Centre, Hampton (VA), US

Journal Publications

- Total 18 journal articles (8 first author, 4 second author); 4 articles without PhD / Postdoc supervisors.
- h-index 8. Citations >290. 3 journal front covers. [Google Scholar]

18. Reversible optical tuning of GeSbTe phase-change metasurface spectral filters for MWIR imaging
M.Julian, **C.Williams**, S.Borg, S.Bartram, H.J. Kim. **Optica** 7(7), 746-754 (2020)
+ NASA Langley independent collaboration. Invention disclosure filed.

17. Tunable mid-wave infrared Fabry-Perot bandpass filters using phase-change GeSbTe
C.Williams, N.Hong, M.Julian, S.Borg, H.J. Kim. **Optics Express** 28(7), 10583-10594 (2020)
+ Selected as 'Editors pick'. NASA Langley independent collaboration. Patent filed.

16. Grayscale-to-color: Scalable fabrication of custom multispectral filter arrays
C.Williams, G.S.D.Gordon, T.D.Wilkinson, S.E.Bohndiek. **ACS Photonics** 6(12), 3132-3141 (2019)
+ Featured on journal front cover. Article views >2000. Patent filed. Led to industrial collaboration.

15. Single nanowire spectrometers
Z.Yang, T.A.Owen, H.Cui, J.A.Webber, F.Gu, X.Wang, T.C.Wu, **C.Williams**, P.Wang, A.Zayats, W.Cai, Y.Ye, D.Lun, S.Hofmann, M.Overend, Q.Yang, L.Tong, Z.Sun, T.Hasan. **Science** 365, 1017-1020 (2019)
+ Cited >26 times. Widespread media coverage inc. Materials Today and PhysicsWorld.

14. Characterising optical fibre transmission matrices using metasurface reflector stacks for lensless imaging without distal access. G.S.D.Gordon, M.Gataric, A.G. Ramos, J.Yoon, **C.Williams**, R.Mouthaan, T.D.Wilkinson, S.E. Bohndiek. **Physical Review X,** 9, 041050 (2019)
+ Patent filed.

13. Quantitative phase and polarisation imaging through an optical fibre applied to detection of early oesophageal tumourigenesis. G.S.D.Gordon, J.Joseph, M.Alcolea, T.Sawyer, **C.Williams**, C.R.M.Fitzpatrick, M.di Pietro, R.C.Fitzgerald, T.D.Wilkinson, S.E.Bohndiek. **Journal of Biomedical Optics** 24(12), 126004 (2019)

12. Full-field quantitative phase and polarisation-resolved imaging through a flexible fibre bundle. G.S.D.Gordon, J.Joseph, A.MacFaden, **C.Williams**, T.Sawyer, T.D.Wilkinson, S.E.Bohndiek
Optics Express 27(17), 23929-23947 (2019)

11. Measuring chirality in the far-field from a racemic nanomaterial: diffraction spectroscopy from plasmonic nanogratings. C.Kuppe, X.Zheng, **C.Williams**, A.W.Murphy, J.Collins, S.Gordeev, G.A.Vandenbosch, V.K.Valev
Nanoscale Horizons 10,1039 (2019)
+ Independent collaboration. Featured on journal front cover; '2019 most popular' paper in journal.

10. Circular dichroism in higher order diffraction beams from chiral quasi-planar nanostructures
C.Kuppe, **C.Williams**, AJ.Collins, S.Gordeev, T.D.Wilkinson, N.C.Panoiu, V.K.Valev
Advanced Optical Materials 6, 1800098 (2018)
+ Featured on journal front cover. Widespread media coverage (inc. Photonics.com).

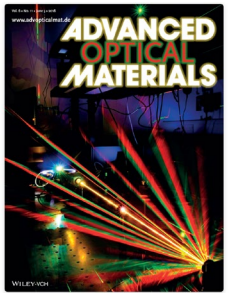
9. Nanostructured plasmonic metapixels
C.Williams, G.Rughoobur, A.J.Flewitt, T.D.Wilkinson. **Scientific Reports** 7, 7745 (2017)
+ Cited >17 times. Featured in AZO Optics news. Patent filed.

8. Plasmonic metalens for narrowband dual-focus imaging
C.Williams, Y.Montelongo, T.D.Wilkinson. **Advanced Optical Materials** 5, 1700811 (2017)

7. Signal enhancement of laser ablated volume holograms
J.M.Versnel, **C.Williams,** C.A.B.Davidson, T.D.Wilkinson, C.R.Lowe **Optical Materials,** 73, 400–407 (2017)

6. Plasmonic nanohole electrodes for active color tunable liquid crystal transmissive pixels
R.Bartholomew, **C.Williams**, A.A.Khan, R.Bowman, T.D.Wilkinson . **Optical Letters,** 42(14), 2810–2813 (2017)

5. Fabrication of nanostructured transmissive optical devices on ITO-glass with UV1116 photoresist using high-energy electron beam lithography
C.Williams, R.Bartholomew, G.Rughoobur, A.J.Flewitt, T.D.Wilkinson. **Nanotechnology,** 27, 485301 (2016)



4. Single-step fabrication of thin-film linear variable bandpass filters based on MIM geometry
C.Williams, G.Rughoobur, A.J.Flewitt, T.D.Wilkinson. **Applied Optics**, 55, 9237–9241 (2016)
+ Cited >15 times.

3. Self-assembled liquid crystalline nanotemplates and their incorporation in dye-sensitised solar cells
M.A.Kamarudin, A.A.Khan, **C.Williams**, S.Said, S.Nosheen, A.J.Flewitt, M.M.Qasim, T.D.Wilkinson
Electrochimica Acta, 222, 657–667 (2016)

2. Engineered pixels using active plasmonic holograms with liquid crystals
C.Williams, Y.Montelongo, J.Tenorio-Pearl, A.Cabrero-Vilatela, S.Hofmann, W.I.Milne, T.D.Wilkinson
Phys. Stat. Solidi RRL 9(2), 125–129 (2015) **+ Cited >17 times. Led to invited 1st author SPIE Newsroom paper.**

1. Plasmonic nanoparticle scattering for color holograms
Y.Montelongo, J.O.Tenorio-Pearl, **C.Williams**, S. Zhang, W.I.Milne, T.D.Wilkinson
Proc. Natl. Acad. Sci. (PNAS) USA 111(35), 12679–12683 (2014)
+ Cited >135 times. Widespread media coverage inc. Yahoo News and IEEE Spectrum.