

Phoebe M. Pearce | CV

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Education

Department of Physics, Imperial College London

Doctor of Philosophy, Physics

October 2016–August 2020

PhD student in the Experimental Solid State Physics group, working on new materials and designs for high-efficiency solar cells. The project encompassed both simulation and experimental methods used to study new materials and device architectures.

Energy Futures Lab, Imperial College London

MSc Sustainable Energy Futures, Distinction (82%)

October 2015–September 2016

Award for best research project & thesis (88%). Research project on the modelling the effectiveness of feed-in tariffs in Great Britain, using an agent-based model implemented in R, in addition to taught courses on different energy conversion and storage technologies, energy policy, finance, energy markets and entrepreneurship.

Emmanuel College, University of Cambridge

MSci Experimental and Theoretical Physics, First (76.4%)

2014–2015

Independent research project and thesis on perovskite solar cells (78%).

Examined courses including Advanced quantum condensed matter physics (78%), Quantum field theory (89%), General physics (73%).

BA Natural Sciences / Experimental and Theoretical Physics, Upper Second (69.5%) 2010–2014

2013–2014 Part II: Experimental and Theoretical Physics 10 modules: five 1st class and five 2.1

2011–2012 Part IB: Physics A (2.1), Physics B (1) and Mathematics (2.1)

2010–2011 Part IA: Physics, Chemistry, Mathematics, Biology of Cells

United World College Maastricht

International Baccalaureate (IB), Total 42 (max. 45)

2008–2010

Awarded Bilingual Diploma Award and Valedictorian for overall highest marks.

Cambridge IGCSE, 11 subjects: 7 A, 2 A, 2 B*

2006–2008

Awards & Scholarships

Harvard-Emmanuel PRISE fellow: Herchel Smith fund at Emmanuel College

2014

Grant for carrying out research at Harvard as part of the PRISE program

Honorary Bachelor Scholarship: Emmanuel College, University of Cambridge

2015

Academic award for excellent results in the Natural Sciences MSci

Best Research Project & Thesis: Sustainable Energy Futures MSc, Imperial College

2016

Prize for best thesis and research project in the 2015-2016 SEF cohort (88%)

Research Experience

ARC Centre of Excellence for Exciton Science, UNSW Sydney

Sydney, Australia

Research Fellow

January 2022–

Space Photovoltaics Group, University of Cambridge

Cambridge, UK

Research Associate

August 2020–November 2021

Research on ultra-thin solar cells for space applications. Primarily simulation work focused on developing grating-based light-trapping structures for III-V cells for space applications. These simulations are used to understand data measured from real devices and to explore how devices can be improved in the future.

Vecitis Lab, Harvard School of Engineering and Applied Sciences **Cambridge, MA**
Harvard PRISE Fellow *June–September 2014*

Recipient of a competitive scholarship to pursue research at Harvard. Assisted in developing new production methods for graphene oxide films with applications in electronics and water filtration. Including experimental work, theoretical modelling, programming and data analysis in MATLAB

Quantum Optoelectronics Group, Cavendish Laboratory **Cambridge, UK**
Undergraduate research assistant *June–September 2012*

Assisted a PhD student in the Quantum Optoelectronics group studying semiconductor quantum dots, collecting data and developing programmes for data analysis as well as presenting results to the group.

Teaching Experience

University of Cambridge

Supervisor *October 2020–Present*
Teaching undergraduate students in small groups. Subjects: Mathematics, Electrodynamics & Optics, and Optoelectronic devices.

Private Tutor

Self-employed, Part-time *2015–2020*
Freelance private tutor, having taught the following subjects: GCSE Physics, Maths, Chemistry and Biology, A-level Physics, Maths and Further Maths, University-level Quantum Mechanics, Classical Mechanics, Electromagnetism and Semiconductor physics

Department of Physics, Imperial College London

Teaching Assistant *October 2016–June 2017*
Teaching assistant for first year undergraduate physics tutorial classes. Subjects: Maths, Vibrations and Waves, Electronics, Quantum Physics and Relativity.

Other Professional & Administrative Experience

European Photovoltaic Solar Energy Conference and Exhibition

Topic Organiser *January–September 2021*
Responsibility for the abstract review and selection of contributions for one of the topic areas of the conference (Fundamental Studies of solar cell energy conversion), organizing the programme for this section of the conference, and putting forward speakers for plenary and keynote sessions. Also acted as chair for several poster, oral and panel discussion sessions.

Imperial Consultants (ICON)

Consultant on solar photovoltaics and spectroscopy *March 2017–May 2019*
Technical consultancy: two separate projects, one focusing on the feasibility of the implementation of solar power for a well-known multi-national company, the other performing spectroscopic measurements for industry applications.

MSc Sustainable Energy Futures

SEF MSc Conference Representative *November 2015–September 2016*
Responsibility for organising the end of year thesis project conference for the MSc, including booking a venue, organising the schedule of talks, securing corporate sponsorship and designing printed materials.

Ampyx Power

Translator (part-time) *July–August 2015*
Translation (Dutch to English) of internal company documents and publicity materials for an innovative wind power company.

Other Skills & Details

Programming: Extensive experience with Python, R, LaTeX and MATLAB. Familiar with Mathematica and C++.

Other IT skills: Experience with all major operating system types (Windows, MacOS, Linux) including UNIX/command line environments, basic website design, use of high performance computing (HPC) servers.

Languages: Fluent in English and Dutch, B1 level (CEFR) Certificate in French.

Right to work: Dutch and British citizen. Australian permanent resident.

Selected Publications

- [1] Phoebe M. Pearce, Christopher A. Broderick, Michael P. Nielsen, et al. "Electronic and optical properties of $\text{Si}_x\text{Ge}_{1-x-y}\text{Sn}_y$ alloys lattice-matched to Ge". In: *arXiv preprint* (Sept. 2021). arXiv: 2109.02782.
- [2] Larkin Sayre, Eduardo Camarillo Abad, Phoebe Pearce, et al. "Ultra-thin GaAs solar cells with nanophotonic metal-dielectric diffraction gratings fabricated with displacement Talbot lithography". In: *Progress in Photovoltaics: Research and Applications* August (Sept. 2021), pp. 1–13. ISSN: 1062-7995. DOI: 10.1002/pip.3463.
- [3] Phoebe Pearce, Larkin Sayre, Andrew Johnson, et al. "Design of photonic light-trapping structures for ultra-thin solar cells". In: *Physics, Simulation, and Photonic Engineering of Photovoltaic Devices IX*. Ed. by Alexandre Freundlich, Masakazu Sugiyama, and Stéphane Collin. March. SPIE, Mar. 2020, p. 28. ISBN: 9781510633131. DOI: 10.1117/12.2550136.
- [4] D. Alonso-Álvarez, A. Augusto, P. Pearce, et al. "Thermal emissivity of silicon heterojunction solar cells". In: *Solar Energy Materials and Solar Cells* 201 (2019), p. 110051. ISSN: 0927-0248. DOI: 10.1016/j.solmat.2019.110051.
- [5] A. Pusch, P. Pearce, and N. J. Ekins-Daukes. "Analytical Expressions for the Efficiency Limits of Radiatively Coupled Tandem Solar Cells". In: *IEEE Journal of Photovoltaics* 9.3 (May 2019), pp. 679–687. ISSN: 2156-3381. DOI: 10.1109/JPHOTOV.2019.2903180.
- [6] Yajie Jiang, Mark J. Keevers, Phoebe Pearce, et al. "Design of an intermediate Bragg reflector within triple-junction solar cells for spectrum splitting applications". In: *Solar Energy Materials and Solar Cells* 193 (2019), pp. 259–269. ISSN: 0927-0248. DOI: 10.1016/j.solmat.2019.01.011.
- [7] Phoebe Pearce, Alexander Mellor, and Nicholas Ekins-Daukes. "The importance of accurate determination of optical constants for the design of nanometallic light-trapping structures". In: *Solar Energy Materials and Solar Cells* 191 (2018), pp. 133–140. ISSN: 09270248. DOI: 10.1016/j.solmat.2018.11.008.
- [8] Phoebe Pearce and Raphael Slade. "Feed-in tariffs for solar microgeneration: Policy evaluation and capacity projections using a realistic agent-based model". In: *Energy Policy* 116 (2018), pp. 95–111. ISSN: 03014215. DOI: 10.1016/j.enpol.2018.01.060.
- [9] D. Alonso-Álvarez, T. Wilson, P. Pearce, et al. "Solcore: a multi-scale, Python-based library for modelling solar cells and semiconductor materials". In: *Journal of Computational Electronics* (2018), pp. 1–25. ISSN: 15728137. DOI: 10.1007/s10825-018-1171-3. arXiv: 1709.06741.

DOI numbers are clickable links.

Conference Presentations

Photonics West 2020

Contributed talk

Design of photonic light-trapping structures for ultra-thin solar cells

San Francisco

February 2020

IEEE PVSC 2019

Poster

Open-source integrated optical modelling with RayFlare

Chicago

June 2019

MRS Fall Meeting 2018

Contributed talk

SiGeSn as a Candidate Material System for use in Thin-Film Multi-Junction Solar Cells

Boston

November 2018

PlusAlliance project meeting on Advanced PV devices

Invited talk

Rigorous coupled-wave analysis and the effect of inconsistent optical constant data on modelling outcomes

Chicheley Hall

October 2018

SOLARISE project workshop

Invited talk

Assessing and projecting the effectiveness of feed-in tariffs for residential solar photovoltaic systems

University of Portsmouth

September 2018

WCPEC-7

Posters

1. Quantifying Parasitic Losses from Metal Scattering Structures in Solar Cells (Best Poster Award)

2. Characterization of SiGeSn for Use as a 1 eV Sub-Cell in Multi-Junction Solar Cells

Waikaloa, Hawaii

June 2018

SPREE Public Research Seminar

Invited seminar

Implementation of feed-in tariff policy for solar microgeneration in Great Britain ([Video](#))

UNSW

February 2018

33rd European Photovoltaic Solar Energy Conference and Exhibition

Contributed talk

Evaluating Effectiveness of Past and Future Feed-In Tariff Policy in Great Britain with an Agent-Based Model

Amsterdam

September 2017

33rd European Photovoltaic Solar Energy Conference and Exhibition

Poster

III-V Multi-Junction Solar Cells Utilising Group IV SiGeSn Alloys as a 1.0 eV Component Sub-Cell

Amsterdam

September 2017

UK Semiconductors 2017

Poster

SiGeSn: a novel group IV alloy for use as a 1 eV sub-cell in multi-junction solar cells

Sheffield

July 2017

PVSAT-13

Contributed talks

1. SiGeSn as a 1.0eV component sub-cell in III-V multi-junction solar cells

2. Agent-based modelling of the effect of government policy on the adoption of domestic photovoltaic systems in Great Britain

Bangor

April 2017

References

PhD supervisor

Dr. Nicholas Ekins-Daukes

School of Photovoltaic and IQE plc, Cardiff, Wales

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Industry supervisor

Dr. Andrew Johnson

Principal Investigator

Dr. Louise Hirst

Department of Physics

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