

CV

Dr. rer. nat. Jan Christoph Goldschmidt

Qualifications

- 08/2005-11/2009 **PhD (Dr. rer. nat.) in Physics** at **University of Konstanz**, Germany and Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany, Dissertation “Novel Solar Cell Concepts”, Grade: Summa cum laude
- World record efficiency of luminescent solar concentrator system
 - First successful demonstration of efficiency increase due to application of photonic structures to luminescent solar concentrators
- 10/1999-02/2005 **Dipl.-Phys.** at **Albert-Ludwigs Universität Freiburg**, Germany and University of New South Wales (UNSW), Sydney, Australia

Employment

- Since 08/2017 **Head of Group** “Novel Solar Cell Concepts” at **Fraunhofer Institute for Solar Energy Systems ISE**, Freiburg, Germany
- Leading excellent research group with currently 12 international employees
 - Coordinating collaborative BMWi project “PersiST” and Fraunhofer Leitprojekt “MaNiTU” targeted at realizing high efficiency perovskite silicon tandem solar cells
 - Generating and realizing new ideas how to overcome the fundamental limits of solar energy conversion
 - Development of Perovskite-based tandem solar cells (Modelling, Manufacturing, Characterization)
 - Manufacturing of nanophotonic structures for the control of luminescence and light trapping
 - Setting up labs for perovskite-silicon tandem solar cell manufacturing and characterization
- 01/2010-07/2017 **Head of Team** “Novel Solar Cell Concepts” at **Fraunhofer Institute for Solar Energy Systems ISE**, Freiburg, Germany, 6 months family leave each in 2011 and 2016
- Coordinating European FP7 project “Nanospec – Nanomaterials for harvesting sub-band-gap photons via upconversion to increase solar cell efficiencies”, targeted at realizing a system architecture I invented during my PhD
 - Establishing an internationally recognized research agenda in the field of photon management for photovoltaics
 - Investigating novel materials for photon management and solar cell applications
 - Developing theoretical models for photonic structures and luminescence phenomena
 - Setting up a lab for calibrated photoluminescence measurements and solar cell characterization
- 09/2012-09/2013 **Visiting Researcher** at **Imperial College**, London, United Kingdom in the Department of Physics
- Investigating the fundamental efficiency limits of upconversion of low energy photons with thermodynamic approaches
 - Assessing economic and technological pathways of future solar photovoltaic technology developments
- 04/2005-06/2005 Associate Intern **McKinsey & Company Inc.**, Consultant in Risk Management

Grants & Awards

- 2019 **Fraunhofer Leitprojekt**, Co-Coordinator, “MaNiTU – Materialien für nachhaltige Tandemsolarzellen mit höchster Umwandlungseffizienz”, overall volume 8.9 Mio€
- 2018 **BMWi collaborative project**, “ProTandem – Perovskite Silicon Tandem Solar Cells” 570 k€ available for research at Fraunhofer ISE
- 2016 **BMWi collaborative project**, “PersiST – Perovskite Silicon Tandem Solar Cells” overall volume 4.5 Mio€, of which around 1.5 Mio available for research at Fraunhofer ISE
- 2015 **Sustainability Centre Freiburg**, Pilot Project “Nanostructures for luminescence enhancement increasing the efficiency of LEDs and solar cells”, volume 280 k€
- 2013 **Dahrendorf-Fellowship** for short-term stay at Mercator Research Institute on Global Commons and Climate Change, Berlin, Germany
- 2012 **PostDoc research grant** German Academic Exchange Service (DAAD)
- 2011 **BMBF collaborative project** Infravolt (2011-2014) and **DFG project** Nanosun II
- 2010 **EU FP7 Project** “Nanospec” overall volume 4.2 Mio, around 900 k€ at Fraunhofer ISE
- Since 2010 Acquisition of several internal and **industry projects**, overall volume more than 400 k€.
- 2005 **PhD scholarships** from Deutsche Bundesstiftung Umwelt, Studienstiftung des deutschen Volkes and Heinrich-Böll Foundation
- 1999-2005 **Student scholarships** from Studienstiftung des deutschen Volkes and DAAD

Supervision

- Since 2010 **11 PhD students**, who received scholarships from Deutsche Bundes Stiftung Umwelt, Reiner-Lemoine Stiftung, Heinrich-Böll Stiftung and Chinese Academy of Science
- Since 2005 **25 Master and Bachelor students**, of which at least 5 won scholarships

Teaching Activities

- Since 2017 Lecture “**Emerging and Future Photovoltaic Technology Options**” at University Freiburg
- 2017-2018 Lecture & Seminar “**Energy Economics and Energy Policy**” at University Freiburg
- 2015/2016 Contribution to lecture series of Prof. S. W. Glunz “**Photovoltaics**” at University Freiburg
- 2014-2018 Invited lecture “**High efficiency silicon solar cells**” at KIT, Germany
- Since 2012 **Tutor (“Vertrauensdozent”)** of **Heinrich-Böll Foundation**
- 2012 Contribution to **online Master “Photovoltaics”** of University Freiburg, Germany

Organisation of Scientific Meetings

- 2020 **SPIE Photonics Europe** “Photonics for Solar Energy Systems VIII”
- Since 2019 **European PV Solar Energy Conference and Exhibition** “Perovskites, other Non-Silicon-Based Photovoltaics and Multi-Junction Devices: Tandems”
- 2019 **Conference on Lasers & Electro-Optics** “Photonics for Renewable Energy & Sustainability”
- 2015 **DPG Focus Session** “Nanophotonic concepts and materials for energy harvesting – Plasmonics, transformation optics, upconversion and beyond”
- 2013-2016 **OSA topical meeting** “Optical Nanostructures & Advanced Materials for Photovoltaics”
- 2013 **International workshop** “Advanced Systems for Photon Management for Photovoltaics”
- 2006 **Interdisciplinary seminar** “Energy, Power and Rationality”, Tübingen, Germany

Commissions of Trust

- Since 2014 **Scientific Evaluator**, Technology Foundation STW, The Netherlands; Fund for Scientific Research (F.R.S.-FNRS), Belgium
- Since 2012 **PhD Thesis Evaluator**, at University of Sydney, Australia; Martin-Luther-University Halle-Wittenberg, Germany; TU Delft, The Netherlands; Aarhus University, Denmark
- Since 2005 **Reviewer** (selected) for Appl. Phys. Lett., J. of Phys. Chem., J. of Phys. and Chem. of Solids, J. of Spacecraft and Rockets, Nature, Nature Energy, Nature Materials, Nature Nanotechnology, Progress in Photovoltaics, Scientific Reports, Solar Energy Materials & Solar Cells

Publications

Overview

- Publication of 68 journal papers and more than 70 conference papers, 5 granted patents
- Main topics: Perovskite silicon tandem solar cells, Photon Management for Photovoltaics
- H-Index 35 (Google Scholar, February 2020)
- 3647 Citations (Google Scholar, February 2020)

Research Topics and Highlights

Perovskite Silicon Tandem Solar Cells

A. J. Bett, K. M. Winkler, M. Bivour, L. Cojocaru, Ö. S. Kabakli, P. S. C. Schulze, G. Siefer, L. Tutsch, M. Hermle, S. W. Glunz, J. C. Goldschmidt „Semi-Transparent Perovskite Solar Cells with ITO Directly Sputtered on Spiro-OMeTAD for Tandem Applications“ **ACS applied materials & interfaces** 11, 49, 45796-45804 (2019)

A. J. Bett, P. S. C. Schulze, K. M. Winkler, Ö. S. Kabakli, I. Ketterer, L. E. Mundt, S. K. Reichmuth, G. Siefer, L. Cojocaru, L. Tutsch, M. Bivour, M. Hermle, S. W. Glunz, J. C. Goldschmidt „Two-terminal Perovskite silicon tandem solar cells with a high-Bandgap Perovskite absorber enabling voltages over 1.8 V“ **Progress in Photovoltaics: Research and Applications** 28, 2, 99-110 (2019)

N. Tucher, O. Höhn, J.N. Murthy, J.C. Martinez, M. Steiner, A. Armbruster, E. Lorenz, B. Bläsi, J.C. Goldschmidt „Energy yield analysis of textured perovskite silicon tandem solar cells and modules“ **Optics Express** 27, 20, A1419-A1430 (2019) *1 citation*

P. S. C. Schulze, A. J. Bett, K. Winkler, A. Hinsch, S. Lee, S. Mastroianni, L. E. Mundt, M. Mundus, U. Würfel, S. Glunz, M. Hermle, and J. C. Goldschmidt, “Novel Low-Temperature Process for Perovskite Solar Cells with a Mesoporous TiO₂ Scaffold”, **ACS applied materials & interfaces** 9, 36, 30567–30574 (2017) *7 citations*

Photon Management for Photovoltaics

S. Fischer, E. Favilla, M. Tonelli, and J. C. Goldschmidt, “Record efficient upconverter solar cell devices with optimized bifacial silicon solar cells and monocrystalline BaY₂F₈. 30% Er³⁺ upconverter”, **Solar Energy Materials & Solar Cells** 136, 0, 127–134 (2015). *76 citations*

J. C. Goldschmidt and S. Fischer, “Upconversion for Photovoltaics - a Review of Materials, Devices and Concepts for Performance Enhancement”, **Advanced Optical Materials** 3, 4, 510– 535 (2015). *232 citations*.

S. Fischer, J. C. Goldschmidt, P. Löper, G. H. Bauer, R. Brüggemann, K. Krämer, D. Biner, M. Hermle, and Glunz, S. W., “Enhancement of silicon solar cell efficiency by upconversion. Optical and electrical characterization”, **Journal of applied physics** 108, 4, 44912 (2010) *246 citations*

J. C. Goldschmidt, M. Peters, A. Bösch, H. Helmers, F. Dimroth, S. W. Glunz, and G. Willeke, “Increasing the efficiency of fluorescent concentrator systems”, **Solar Energy Materials & Solar Cells** 93, 176–18282 (2009). *226 citations*

Broader Context of Photovoltaics

N.M. Haegel, ..., J.C. Goldschmidt, ..., A.W. Bett, “Terawatt-scale photovoltaics: Transform global energy”, **Science**, 364, 6443, 836-838 (2019) *25 citations*

F. Creutzig, P. Agoston, J. C. Goldschmidt, G. Luderer, G. Nemet, and R. C. Pietzcker, “The underestimated potential of solar energy to mitigate climate change”, **Nature Energy** 2, 9, 17140 (2017) *191 citations*