

Zacharie JEHL LI-KAO, PhD

Photovoltaic R&D | Device Modelling | PV Software | Industry Consulting

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15+ yrs PV R&D	4 countries (FR / JP / ES / US)	€1.3M+ secured funding
74 papers, h-index 26, 2,700+ cites	Industry consulting (US PV)	SOLEY: 150k+ LoC, deployed

Professional Summary

PhD physicist and tenure-track professor with 15 years of photovoltaic R&D experience across France, Japan, and Spain. Architect and sole developer of **SOLEY**, a first-principles PV simulation platform distributed as a desktop application. Active industry consultant for a US PV company, patent inventor on commercial solar cell technology, and coordinator of an 8-partner EU project. Track record of translating device physics into production software, leading multi-partner programmes, and bridging academic research with commercial PV.

Core Expertise

PV Devices & Materials

- Thin-film chalcogenides (CIGS, CIGSe, CuInSeTe)
- a-Si:H / a-SiC:H, c-Si tandems, perovskite, HJT, TOPCon
- Hot-carrier cells, artificial synapses
- Lift-off processes, MBE, epitaxy

Modelling & Simulation

- TMM optics, scattering, light trapping
- Detailed-balance, drift-diffusion (SCAPS)
- Multijunction (2T / 3T / 4T)
- Defect spectroscopy, Hecht collection, J-V/EQE fitting

Software & Delivery

- Python (production scale), MATLAB, FastAPI
- Desktop application deployment (Windows, macOS, Linux)
- Open-source release (Zenodo, GitHub)
- Industry reporting, technical documentation

Languages: French (native) | English (fluent, C2) | Spanish (fluent, B2) | Japanese (conversational proficiency)

Selected Achievements

- **Ramón y Cajal grant (2022)** – Spain’s top research grant, awarded to the top ~1% of applicants nationally.
- **Marie Skłodowska-Curie Individual Fellowship (2018)** – top European grant for returning researchers.
- **Coordinator, EU SOLIS project (2024–2029)** – €588k, 8 international partners across 5 countries.
- **World-record efficiency for CuInSeTe solar cells (2013)** under NEDO programme at Aoyama Gakuin University.
- **Built and deployed SOLEY (2020–present)** – 150,000+ lines, peer-reviewed in *Solar RRL* (2025).
- **First inventor on industrial PV patent** from PhD work; co-inventor on bifacial semi-transparent solar panel patent (IREC, 2020); co-inventor on artificial visual synapse patent (UPC/Ritsumeikan, 2025).

Professional Experience

Tenure-Track Professor (Ramón y Cajal)

Sep 2020 – Present

Polytechnic University of Catalonia (UPC), Barcelona

Founder member, Solar Energy Materials Group

- Built the modelling and characterisation function from scratch; group now serves multiple PhD/postdoc projects and industry collaborations.
- **Coordinator of EU SOLIS project (2024–):** €588k budget, 8 partners across 5 countries, monthly milestone reporting to European Commission.
- Secured **€1M+ in competitive funding** across 3 grants (Ramón y Cajal, Generación de Conocimiento ULTRASYN, MSCA legacy).
- Architected and deployed **SOLEY** – a TMM-based PV simulation platform with extended detailed-balance solver – and validated it in a peer-reviewed publication (*Solar RRL*, 2025).
- Supervises 2 PhD students; teaches Power Electronics (BSc) and Energy Engineering (MSc).

Independent Industry Consultant

Feb 2023 – Present

US photovoltaic company

Device modelling missions

- Optical and electrical modelling of tandem solar cells, delivered as technical reports and complete simulation files for the experimental team.

Guest Professor

Dec 2023 – Jun 2026 (3 stays)

Ritsumeikan University, Kyoto, Japan

- Initiated and lead a research line on **piezophototronic visual synapses**, bridging Spanish thin-film expertise with Japanese mechanical engineering.
- Building a long-term Japan–Spain collaboration; three return stays formalise an emerging shared funding pipeline.

Senior Researcher (Marie Curie Fellow)

Aug 2018 – Aug 2020

Catalonia Institute of Energy Research (IREC), Barcelona, Spain

Tech-transfer focus, building-integrated PV

- Won **Marie Skłodowska-Curie Individual Fellowship** (top return-to-Europe grant); led activities across 3 EU and 2 national projects.
- Patented a high-efficiency **bifacial semi-transparent solar panel architecture**; led proof-of-concept device fabrication.
- Monthly reporting to industrial stakeholders; short-term research stay at FAE (Spain).

Researcher (JSPS Fellow)

Dec 2014 – Aug 2018

The University of Tokyo, Japan

NEDO-funded Hot Carrier Solar Cell programme

- Awarded **JSPS Fellowship**. Active member of NEXTPV (3 Japanese + 4 French institutions).

Assistant Professor

Apr 2013 – Nov 2014

Tokyo University of Science, Japan

NEDO-funded thin-film tandem solar cells

- Industry collaboration with Showa-Shell / Idemitsu (formerly Solar Frontier); developed in-house optical modelling tools.

Assistant Professor

Jul 2012 – Mar 2013

Aoyama Gakuin University, Japan

NEDO programme on narrow-bandgap semiconductors for tandem solar cells

- **Achieved world-record efficiency for CuInSeTe solar cells**. Cleanroom and MBE system stewardship.

PhD Researcher & Short-term Postdoc

Dec 2008 – Jun 2012

CNRS laboratory, Université Paris-Saclay, France

- Pioneered **film lift-off and room-temperature back-contact processing** for ultrathin CIGS; landmark publications in lift-off PV.
- **First inventor on industrial PV patent**.

Selected Software (open-source)

SOLEY – PV optoelectronic modelling software, desktop application for Windows, macOS and Linux. Peer-reviewed: [Solar RRL \(2025\)](#).

Other tools (Zenodo): Detailed Balance Calculator, EQE Current Density Calculator, Dual-SMU Characterisation Tool (Keithley 26xx), Light Spectrum Converter, IPV-IoT Matching Diagram, Transfer Matrix Optical Model.

Education

PhD in Physics (with honours), Université Paris-Saclay, 2008–2012. *Thesis: Realisation of Ultrathin CIGS Solar Cells*.

MSc in Physics of Energy, Université Paris-Saclay, 2005–2006.

MSc in Fundamental Physics (2005) & **BSc in Fundamental Physics** (2004), Pierre and Marie Curie University (PARIS VI).

Selected Funding (Total: €1.3M+)

2025–2029	EU SOLIS MSCA Staff Exchange (Coordinator)	€588,800
2023–2028	Ramón y Cajal RYC2021-033239-I	€275,000
2023–2026	Generación de Conocimiento PID2022-139445OA-I00 (ULTRASYN)	€151,150
2018–2020	Marie Skłodowska-Curie Individual Fellowship	~€180,000
2014–2016	JSPS (Japan Society for the Promotion of Science) Fellowship	~€70,000