The Becquerel Prize

since 1989

2024 edition

The Becquerel Prize

2024 edition

AWARDED PERSONALITIES FROM 1989 TO 2024

THE BECQUEREL PRIZE

The most prestigious European Prize awarded to those who made major contributions to the science, technology or application of photovoltaic solar electricity

cover images

· Building-integrated PV on building facade | Germany

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INTRODUCTION
FROM THE CHAIRMAN OF THE BECQUEREL PRIZE COMMITTEE

In 1839, Alexandre Edmond Becquerel discovered the photovoltaic effect at the age of 19. From a curiosity to niche applications to gigawatt solar parks, photovoltaic installations have grown tremendously and now play an important role in the electricity mix of many countries. They will play the major role in mankind's future energy supply, helping to reduce CO2 emissions to zero or even negative levels.

The establishment of the prize by the European Commission in 1989, on the occasion of the 150th anniversary of the original discovery, was truly visionary: at the time, the PV market was smaller by more than three orders of magnitude! Still, today, the prize is more relevant than ever: our current installation of solar (and its partner wind) will just be enough to halt the growth of CO2 emissions from the energy sector by 2024-2025. Decarbonising our societies by 2050 will still require a four- to five-fold increase in annual deployment, with many hurdles ahead.

The purpose of this always timely prize is to honour individuals who contribute to the development of photovoltaic solar energy through scientific, technical, or managerial merit, attained over a long period of continuous achievements, or, very exceptionally, for some extraordinary invention or discovery. It is primarily a European award but is not restricted exclusively to European citizens. The prize is granted by the European Commission and is awarded in the name of the European Photovoltaic Community as a highlight of the Opening Ceremony of the annual European Photovoltaic Solar Energy Conference (EU PVSEC).

The Becquerel Committee has decided to renew this brochure, with updated biographies from 1989 to 2024 to maintain a record of some of the pioneering work of those recognized for their intense engagement in PV. The first texts originate

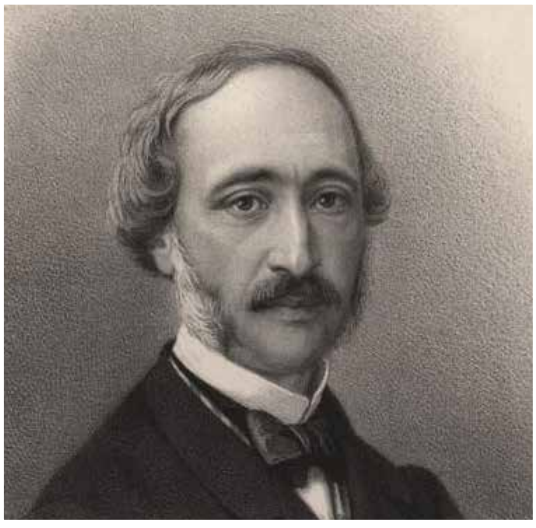
from a brochure published in 2004. The recognitions for the years 2005-2024 comprise excerpts from the official prize diplomas and curricula vitae. Some curricula vitae have been slightly updated since the last edition of the brochure in 2017. The brochure is a testimony to the variety and engagement of many remarkable individuals. It is also an amazing travel in the past of solar energy.

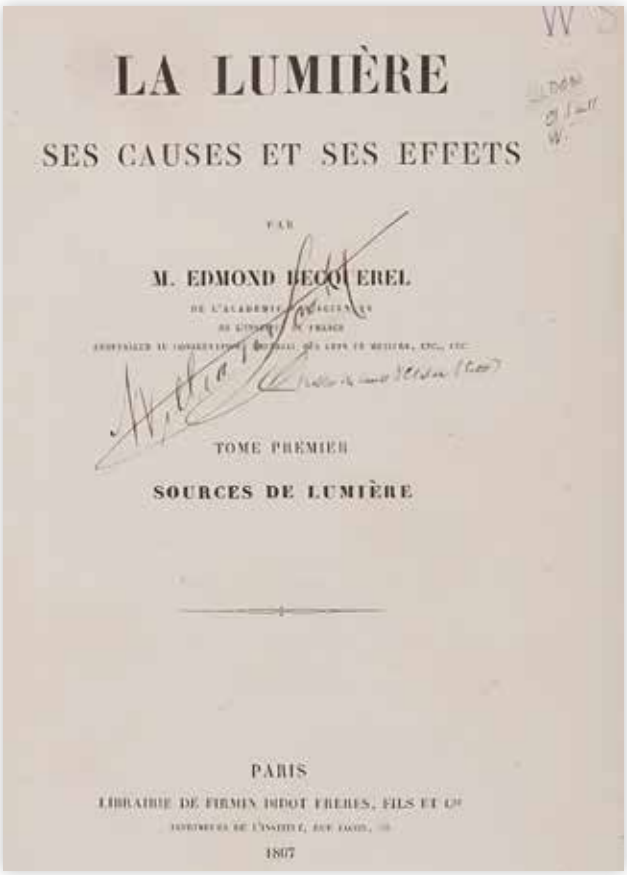
Certainly, there are many more whose contributions to PV which are of high significance and who could not receive the prize. They are also here wholeheartedly thanked, as they are all key members of a community that strives and works for a more sustainable and fairer world.

Neuchatel, September 2024

Prof. Christophe Ballif
Chairman of the Becquerel Prize Committee

1839





LA LUMIÈRE

SES CAUSES ET SES EFFETS

PAR

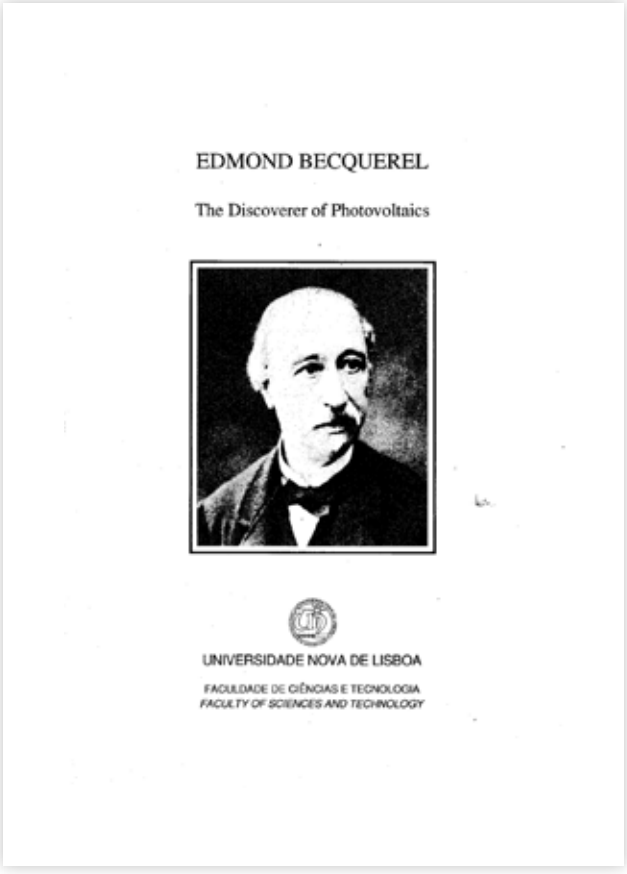
M. EDMOND BECQUEREL

TOME PREMIER

SOURCES DE LUMIÈRE

PARIS

1867



EDMOND BECQUEREL

The Discoverer of Photovoltaics

UNIVERSIDADE NOVA DE LISBOA

FACULDADE DE CIÊNCIAS E TECNOLOGIA

FACULTY OF SCIENCES AND TECHNOLOGY

ALEXANDRE EDMOND BECQUEREL

The Becquerel Prize is named after Alexandre Edmond Becquerel[1] (24 March 1820 – 11 May 1891). Alexandre Edmond Becquerel was born in Paris and was the assistant and later the successor of his father, Antoine César Becquerel, at the Musée National d'Histoire Naturelle.

In 1839, at the age of 19, he created and analyzed the world's first photovoltaic cell[2,3] in the laboratory of his father. The photovoltaic cell consisted of two electrodes in an acidic solution, separated by a thin membrane. He illuminated one of the electrodes. Especially when the electrodes were coated with AgCl or AgBr, he could observe a significant generation of electricity. Since he could exclude that this effect was due to temperature effects (induced by the illumination), he concluded that the light itself was the reason for his observation. Furthermore Becquerel already discovered the influence of the spectrum of light on the photovoltaic effect; he noted that blue light yielded the highest current generation.

Alexandre Edmond Becquerel was also very active in other research related to the effects of light like photography and phosphorescence. In 1867/68 he published the important book: "La lumière, ses causes et ses effets (Light, its causes and effects)".

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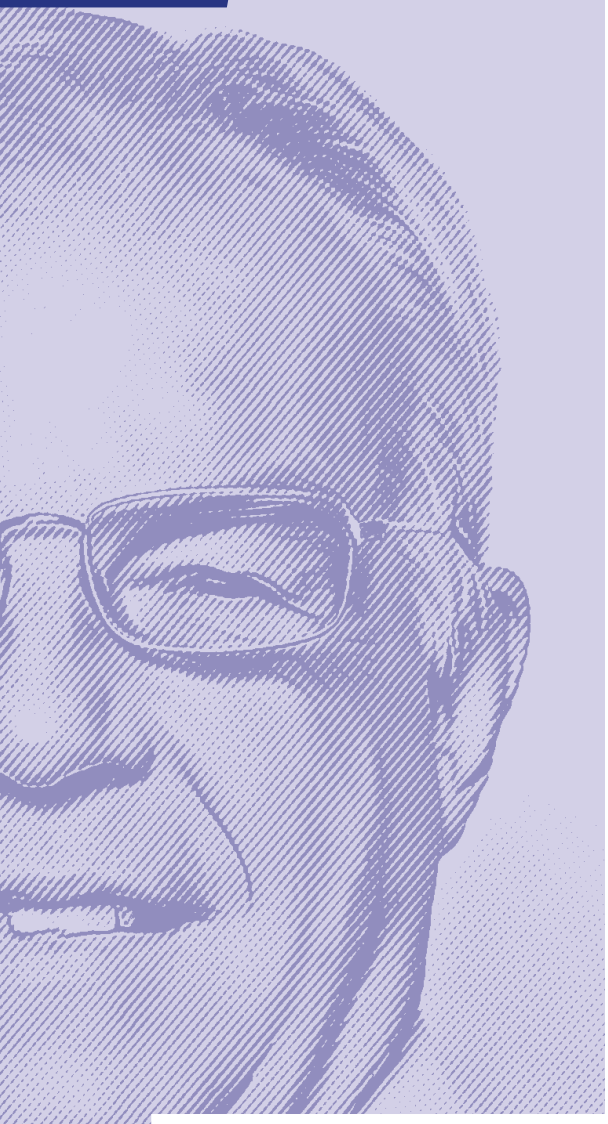
1 not to be confused with his son Henri Becquerel who received the Nobel Prize in Physics for the discovery of radioactivity

2 A.E. Becquerel, "Recherches sur les effets de la radiation chimique de la lumiere solaire au moyen des courants electriques", Comptes Rendus de L'Academie des Sciences, Vol. 9, pp. 145-149, 1839; also Annalen der Physik und Chemie, Vol. 54, pp. 18-34, 1841.

3 A.E. Becquerel, "Memoire sur les effects electriques produits sous l'influence des rayons solaires", Comptes Rendus de L'Academie des Sciences, Vol. 9, pp. 561- 567, 1839; also Annalen der Physik und Chemie, Vol. 54, pp. 35-42, 1841.

2024



DR.
DANIEL LINCOT

is the thirty-second Becquerel Prize winner. Dr Lincot receives the award for his life-long engagement in photovoltaic research, support for industrialisation, management of research, as well as dissemination and promotion of solar energy, in particular in France.

He has supervised multiple national and international collaborations and has contributed to the creation of several PV research institutes or solar companies. His contributions to photovoltaics and chemistry have been widely recognised, leading to his election at the French Academy of Technology (2023) and to holding the Liliane Bettencourt Technological Innovation Chair at Collège de France (2021-2022). Daniel Lincot also developed strong links with citizen initiatives in society, connecting more and more renewable energy developments with social and environmental practical concerns. Through his life-long, always enthusiastic engagement in multiple forms, Daniel Lincot has been an impactful promoter of photovoltaic energy.*

Daniel Lincot graduated from the French engineering School ESPCI-Paristech in 1978. He started his research in the field of solid-state photovoltaics, joined CNRS after his Ph.D. in 1980 at Chimie Paristech and devoted his whole career to photovoltaics research at the interface with chemistry and electrochemistry.

Scientific contributions

Daniel Lincot has published 322 papers in international journals, delivered more 200 invited conferences, deposited about 30 patents and supervised 32 PhD theses. He made key contributions in photoelectrochemistry and electrodeposition of chalcogenide semiconductors (CdTe, CIGS) and discovered the electrodeposition of zinc oxide layers and nanostructures. His work on chemical bath deposition provided the ground for developing the standard process of CdS buffer layers for CIGS solar cells. He extended his work on atomic layer deposition for sulfides and oxides, explored new

* Excerpt from the Becquerel Prize diploma 2024

concepts, like ultrathin CIGS solar cells and thin film microcells under high concentration and challenged tandem solar cells combining silicon bottom cells and wide band gap CIGS top cells.

Structuration of research

In 2005, he created and managed with EDF and CNRS a first joint laboratory dedicated to photovoltaics, the Institute on R&D for Photovoltaics, IRDEP (2005-2018) which was the seed of the future IPVF. In 2010, he became the first director (2010-2014) of the French Federation of Research on Photovoltaics (FedPV) which is now assembling about 10 laboratories. 2011 he initiated at CNRS, together with EDF, Total and Ecole Polytechnique, the project of creating a joint institute dedicated to photovoltaics in the Paris area. This succeeded in 2013 with the creation of the Institut Photovoltaïque d'Ile de France (IPVF). He took a key role in the development and the strategy of IPVF as scientific director from 2013 to 2019.

Industrial initiatives

In 2009, his research activity on CIGS led to the creation a spin off company from IRDEP, NEXCIS, which succeeded in developing a pilot line to produce CIGS modules by electrodepostion in 2015. In 2021, he created the company Soleil sur Yvette Photovoltaïque (SOYPV) at the University Paris Saclay to develop flexible, ultralight and highly efficient PV modules by electrodepsition, in synergy with CNRS, University Paris Saclay and IPVF.

International

Daniel Lincot contributed to the development of international PV research networks by organising congresses and symposia, in particular he co-initiated two important symposia series on chalcogenide materials for photovoltaics: at E-MRS in 1999, 2000, 2002... and every two years since. He chaired the International Conferences on Tertiary and Multinary Conferences (ICTMC) from 2002 to 2006. He participated in numerous European projects since 1980, on CdTe first and then on CIGS, with leading European partners (ZSW, UU, EMPA, GENT, IMEC...). Daniel Lincot was a member of several international advisory boards in the field of photovoltaics in Germany (Helmholtz Zentrum Berlin), Luxembourg (FNR) Netherlands (with FOM, DIFFER) or Japan (NEDO PV Project Full Spectrum).

Dissemination in the society

In 2005, Daniel Lincot started to promote solar energy and photovoltaics to a broader audience, starting in 2008 at EUPVSEC an international call for accelerating the deployment of PV. He considers that as fundamental to provide information about the development of research and to discuss on practical issues about applications for renewable electricity generation. This led to numerous contributions in newspapers, radio, TV, meetings, making him a spokesman for the public in France. He is also engaged in the associative citizens movements for developing local photovoltaic projects to accelerate the energy transition.

Recognition highlights

- **2004** Silver Medal of CNRS.
- **2008** Chairman of the 23rd EU PVSEC in Valencia.
- **2011** Scientific prize of the competivity cluster for renewable energies for buildings and industry.
- **2011** Charles Eichner Prize of the SF2M
- **2013** Prize of the Electrodeposition Division of the Electrochemical Society.
- **2015** Grand Prize Pierre Süe of the SCF
- **2019** Co-chairman of the national committee of EUPVSEC in Marseille.
- **2020** Prize Ivan Peychès awarded by the French Academy of Sciences.
- **2020** Chairman of international symposium in honor of Edmond Becquerel (200th anniversary)
- **2021-2022** Invited professor at Collège de France,
- **2023** Member of the French Academy of Technology
- **2023** Chairman of the symposium at Collège de France (50th anniversary of the UNESCO Congress) "The sun at the service of mankind"
- **2024** Alessandro de Nora Award
- **2024** Becquerel Prize of the EUPVSEC.

2023

DR.
GUNTER ERFURT

is the thirty-first Becquerel Prize winner. He receives the award for his engagement in re-establishing advanced manufacturing of silicon solar cells and modules in Europe.

Gunter Erfurt has lead the transformation of his company from an equipment supplier to a main European producer of solar cells and modules, ramping up highly automatized proprietary manufacturing solutions for silicon heterojunction technology with smart-wire contacting, all this under the constraint of the COVID crisis. He has been a tireless advocate for a renaissance of PV production in Europe, giving numerous talks in conferences, taking part in debates, and contributing in the media. He also regularly represented the industry in many meetings with the institutions in Europe where he became truly the "face" and "voice" for more local manufacturing. Through his actions, positions, and leadership, Dr Erfurt is an outstanding individual in the community.*

Gunter Erfurt is not only involved in the management of the company as CEO. As Chief Technology Officer, he is also responsible for the technologies that set Meyer Burger apart from its competitors. This is possible because prior to his role as CEO, Gunter Erfurt was primarily involved in research and development.

Gunter Erfurt was born in 1973 in Karl-Marx-Stadt (now Chemnitz) in the GDR. He was already interested in technology during his apprenticeship - and even then, he was particularly fascinated by renewable energies. After studying technical physics at the West Saxon University of Applied Sciences in Zwickau and spending time in Canada, he moved to the renowned Freiberg Mining Academy in Saxony, where he completed his Ph.D. in physics and became a research assistant at the Saxon Academy of Sciences in Leipzig.

The fascination of scientific work continued for several years, but Gunter Erfurt was drawn to where

** Excerpt from the Becquerel Prize diploma 2023*

science is applied - to industry. By 2003, Germany's first solar companies had made the leap from start-up mode to the stock exchange and to considerable size. One of the hopes of the new industry was Solarworld, which at the time was still almost unknown and was building large production facilities in the same place where Gunter Erfurt had already put down his first roots - in Freiberg. He applied for a job and was hired as a development engineer. A short time later, he became first laboratory manager and then project manager of one of the first large solar cell production plants in Germany.

The solar industry was booming - not only in Germany and Europe, but also in the United States. When Solarworld crossed the Atlantic in 2006, Gunter Erfurt was there. He moved to the West Coast with his family and, as project manager, implemented the construction of a fully integrated solar factory from crystallisation to module.

When the first boom years of the solar industry in the United States and Europe came to an end, Gunter Erfurt had already switched from operations to industrial research in 2011. As Managing Director of Solarworld AG's research company, he was responsible for finding new technologies to make production more cost-effective and solar cells more efficient.

Before the solar crisis triggered by Chinese dumping dragged the company and many others into the abyss, Gunter Erfurt left Solarworld in 2015 and joined Meyer Burger Technology AG in the same year. Two years later, he was appointed Chief Technology Officer and became a member of the Executive Board. In his area of responsibility, the Swiss-based company pursued the further development of PERC technology, which was highly regarded in the industry at the time. However, the future belonged to a new technology that Gunter Erfurt and his research colleagues at Meyer Burger had built the first industrial systems for and developed for mass production - heterojunction technology. They combined this with a special connection technology and secured the resulting know-how with patents.
During all his years in industry, Gunter Erfurt never lost touch with his roots as a scientist. He held a number of positions, including at the Fraunhofer ISE and the Institute for Solar Energy Research in Hamelin and was committed to supporting research and development in the field of photovoltaics in Germany.

2022

PROF.
MARKO TOPIČ

is the thirtieth Becquerel Prize winner. He receives this award in honour of his multiple seminal contributions to opto-electronic models, software tools, and novel measurement systems for PV devices and modules, as well as for his enormous engagement towards creating a strong European PV community.

Professor Marko Topič has contributed to the development of numerous new modelling and simulations tools, as well as to multiple hardware set-up for the characterisation of advanced solar cells and modules, which are used by many laboratories and industries.

Throughout his career, he has been continuously pushing to stimulate exchanges of people and knowledge, as well as training many scientists and engineers now active both in academia and PV industry, and he has been supporting the presence of an EU industrial PV sector. His scientific collaborations with numerous high-level research groups, his work as chairman of the European Technology and Innovation Platform for Photovoltaics (ETIP-PV) are, among others, all well recognized. Prof. Topič's work and remakable engagement towards creating a stronger PV community, make him an outstanding contributor to the development of photovoltaics.*

Marko Topič received his Ph.D. in Electrical Engineering from the University of Ljubljana, Slovenia, in 1996. Since 1992, he has been working at the Faculty of Electrical Engineering within the University of Ljubljana, where he later also became a full professor and since 2006 head of the Laboratory of Photovoltaics and Optoelectronics (LPVO). He has also been an Affiliate Professor at the Colorado State University since 2011.

Marko Topič and LPVO collaborators have successfully developed and applied own proprietary state-of-the-art simulation tools (SunShine, CROWM, ASPIN3, Nika) that have identified

** Excerpt from the Becquerel Prize diploma 2022*

bottlenecks and design rules for high performance thin-film solar cells. Several licences have been sold to industry (Schott, Bosch, Malibu, Kaneka, …) where they have been used in the design and optimisation of PV products. His team has collaborated with many renowned laboratories in Europe (EPFL/CSEM, HZB, FZJ, ISFH, ISE Freiburg, TUDelft, IMEC, …) and worldwide (Tokyo Institute of Technology, AIST, Colorado State University, NREL, …). Over two decades, they have successfully developed and applied various numerical modelling approaches: from one-dimensional to rigorous two- or three-dimensional optical modelling and in the electrical modelling of electronic devices in one or two dimensions using advanced transport mechanisms.

Based on a series of papers that have accumulated experience, a book has been written and published by CRC Press in 2013. A concept of Coupled Modelling Approach (CMA) has been introduced where different optical models are coupled together to achieve best performance in speed and accuracy of simulations. A Combined Ray-Optics Wave-Optics Model (CROWM) is presented as a simple example of CMA. Furthermore, a model of non-conformal layer growth is used to determine morphologies of internal interfaces and to select of suitable textures for defect-less thin-film silicon layer growth. CROWM was used to demonstrate the applicability of coupled modelling for the optimisation of macrotextures in organic solar cells.

Marko Topič and his team have successfully designed and developed a series of advanced solar cell and PV module monitoring systems for both outdoor and indoor long-term testing, which have been installed at EPFL/CSEM, TU Delft, HZB.

He has co-authored more than 250 papers in peer-reviewed international journals with more than 10'000 citations, 3 patents and more than 300 papers in international conference proceedings. He has been a Principal Investigator in several international and national projects, mainly in photovoltaics. His research interests include thin-film semiconductor materials, electronic devices, optoelectronics, electronic circuits, and reliability engineering.

Prof. Topič has served as the Chairman of the European Technology and Innovation Platform for Photovoltaics (2014-2022) and has received a fellowship from the Alexander von Humboldt Foundation in 2000 and the Zoisova nagrada in 2008. He is a Fellow of the Slovenian Academy of Engineering and the Slovenian Academy of Sciences and Arts and an associate member of the International Academy of Engineering since 2016.

Scientific Leadership Positions:

- **2016 - 2022** Chairman, ETIP PV
- **2014 - 2016** Chairman, European Photovoltaic Technology Platform
- **2007** - Steering Committee Member, European Photovoltaic Technology Platform
- **2006** - Chairman, Slovenian Photovoltaic Technology Platform
- **2011 - 2020** President, MIDEM Society and
- **2021** - Honorary President
- **2015–2020** President, Scientific Council of the Slovenian Research Agency ARRS
- **2018** Conference Vice-Chair, WCPEC-7
- **2016** General Chairman, EU-PVSEC
- **2015** Co-chairman of Congress: EMRS Spring Meeting
- **2008 - 2013** Co-chairman of Symposia: MRS2008-Symp KK, EMRS2009-Symp B, EMRS2011-Symp R, EMRS2013-Symp D
- **2006 - 2024** Chairman, SLO-PV 2006, 2008, 2010, 2012, 2014, 2016, 2018, 2022, 2023 and 2024 in Ljubljana, Slovenia
- **2007** - Member, EU PVSEC Executive Committee (2016, 2021-), International Scientific Advisory Committee (2017–) and Programme Committee (2007–)
- **2010** - Member, International Advisory Committees of Asian-Pacific PVSEC (2016–), IEEE PVSC (2010–2017) and WCPEC (2016–)

2021

ULRIKE JAHN

is the twenty-ninth Becquerel Prize winner. She receives the award in honour of her contributions to the field of quality performance and assessment of photovoltaic modules and systems.

Ulrike Jahn has worked all her career for the development of PV technology, with a focus on reliability and performance that new electricity generation technologies must demonstrate to be accepted in the market. Her activities have evolved from working for the 1000-Roof-PV programme in the 90s, to module reliability characterization and PV system performance assessment, up to the definition and establishment of methodologies for good practice to reduce the technical risks during the implementation and operating life of PV systems. Through her various activities, including within the IEA PVPS programme, she became not only one of the world leading experts, collaborating with 80 experts all around the world, but also one of the faces in the field and thereby a role model for young scientists and engineers.*

Ulrike Jahn began her studies in experimental physics at the University of Freiburg in 1981 and worked as a student assistant on stand-alone PV systems at the Fraunhofer Institute for Solar Energy Systems in Freiburg, which sparked her interest in solar energy research in the early 1980s. During her diploma thesis she specialised in the characterisation of new silicon technologies for solar cells, which she completed under Prof. A. Goetzberger, and received her Diploma Degree in Physics from the University of Freiburg in 1989. At the University of Oldenburg, Ulrike Jahn extended her knowledge in the Postgraduate Course 'Principles of Renewable Energy Use' and worked on PV water pumping systems for use in rural areas in Africa. She was awarded a Master of Science in Renewable Energy by Prof Joachim Luther at the University of Oldenburg in 1990.

From 1991 Ulrike Jahn worked at the Institute for Solar Energy Research (ISFH) in Hameln/Emmerthal and was the project manager of the 1000 Roofs

** Excerpt from the Becquerel Prize diploma 2021*

Programme in Lower Saxony, a nation-wide PV demonstration programme, in which experience was gathered with the dimensioning, installation and operation of grid-connected photovoltaic systems. In 1992, she published her first PV system paper at the 11th EU PVSEC Conference in Montreux, Switzerland, on the topic of 'The German 1000 Roof Photovoltaic Programme: System Design and Energy Balance'. In 1997, she took over the management of Task 2 in the IEA Photovoltaic Power Systems Technology Collaboration Programme (IEA PVPS), which dealt with the performance and operation of PV systems worldwide and compiled the experiences in Europe, the USA and Japan.

From 2008, Ulrike Jahn moved from the research institute to industry and continued her PV work at the Cologne-based testing service provider TÜV Rheinland. There she developed adapted methods and procedures for the measurement and characterisation of various PV module technologies - including thin-film PV modules - indoors and outdoors as part of research projects and industrial contracts. Further work focussed on the identification, classification, and evaluation of PV module defects in the field as well as the evaluation and quantification of technical risks of PV systems across the entire value chain.

Her journey has been enriched by collaborations such as Task 13 of the IEA PVPS programme, where she has been leading a team of 80 international experts from 25 countries since 2010. This task focuses on the reliability and performance of PV modules and systems, PV applications across different climate zones and the evaluation of the technical and economic aspects of PV power plants. In addition, Ulrike Jahn has been a member of various expert groups, including the Steering Committee of the European Technology and Innovation Platform for Photovoltaics (ETIP PV) since 2018, and has contributed significantly to the development of the Strategic Research and Innovation Agenda for Photovoltaics. Since 2021, she is vice-chair of the PV Quality Assurance & Reliability working group, which supports white papers and reports on research challenges in the field of PV reliability and quality aspects of PV components and systems. She was and is a member of various national and international advisory committees in the fields of solar energy, photovoltaics and related topics. She brings an industry perspective to PV module and system reliability, from technical due diligence for concept, design, safety and performance evaluation of PV systems and components to advanced type approval testing of PV modules and standardisation work for new technologies, proof of concept and economic feasibility studies.

Ulrike Jahn has joined the Fraunhofer Center for Silicon Photovoltaics CSP in March 2024 and holds a position as a Senior Scientist. In her new role at Fraunhofer CSP, she has the opportunity to use her expertise to provide targeted support for the industry's research needs and drive forward sustainable solutions for the energy transition on a regional and national level.

2020

PROF.
HENRY SNAITH

is the twenty-eighth Becquerel Prize winner. He receives the award in honour of his ground-braking work on solar cells based on organic-inorganic metal halide perovskites.

Professor Snaith has pioneered the development of organic-inorganic hybrid materials through a combination of material synthesis, device development, and theoretical studies. The rapid discovery of both extremely efficient single junction thin-film solar cells and tandem solar cells manufactured using perovskites has created a great and enduring stimulus within the photovoltaics community.

Prof Snaith is the co-founder and chief scientific officer of Oxford PV, a successful start-up company founded to commercialize the perovskite solar cell technology. This shows his commitment not only to achieve excellent scientific results but also to make significant contributions to the advancement of photovoltaics as a major global energy technology.*

Henry Snaith was born on 14th January 1978 in Norfolk, England. He did his undergraduate degree in Physics at Bristol University, UK, graduating in 2001. He undertook his PhD at Cambridge University under the supervision of Prof. Sir Richard Friend, working on polymer solar cell, graduating in 2004. He then moved to Lausanne Switzerland, to research solid-state dye-senstized solar cells under the supervision of Prof Michael Gratzel. He subsequently returned to Cambridge in 2006 to take up a Junior Research Fellowship at Clare College, continuing his research on hybrid solar cells, and also starting some research activity on polymer and hybrid light emitting diodes. He started his faculty position in the Physics Department, Clarendon Laboratory of Oxford University, initially as a "Research Council UK" Fellow, progressing to full lectureship after 5 years. He was subsequent promoted to "Reader" and then Professor in 2012. Since 2022, he has been appointed in the post of the named professorship, The Bink Professor in Renewable Energy.

** Excerpt from the Becquerel Prize diploma 2018*

Professor Snaith works on new materials and devices for photovoltaic solar energy conversion and optoelectronic applications. His multidisciplinary work spans activities from new materials discovery and synthesis, through device optimization to fundamental spectroscopic and theoretical investigations. Prof Snaith discovered that a new type of solar cell material, namely metal halide perovskites, can produce extremely efficient solar cells when processed as a solid thin-film and "sandwiched" between two charge selective contacts. By combining perovskites with silicon, in so-called "tandem cells", he has demonstrated efficiencies far beyond what is possible with existing commercial PV technologies, and promises to deliver the next generation of improved PV for powering the world towards net zero.

He was elected as a Fellow of the Royal Society at the age of 37, for "starting a new field of research attracting both academic and industrial following". He has also won numerous awards and accolades, including:

- **2024** Fred Kavli Distinguished Lectureship in Materials Science, Materials Research Society
- **2023** World Young Scientist Summit Sustainable Development Goal Award
- **2022** Rank Prize in Optoelectronics
- **2022** Leigh Ann Conn Prize in Renewable Energy
- **2020** Becquerel Prize – for merits in the field of photovoltaic solar energy
- **2018** Blavatnik Award for Young Scientists in the UK
- **2017** Named 1st Equal in Clarivate Analytical world's "Hottest Researchers"
- **2017** James Joule Medal and Prize, Institute of Physics
- **2017** Clarivate Citation Laureate
- **2017** Royal Society Kavli Medal and Lecture
- **2016** EU-40 Materials Prize, EMRS early carer award
- **2016** Named as the 2nd Most Influential Scientific Mind by Thomson Reuters
- **2015** Elected as Fellow of the Royal Society
- **2015** IEEE PVSC Young Professional Award
- **2014** Materials Research Society Outstanding Young Investigator Award 2014
- **2013** Named as one of "Nature's 10" people who mattered most in 2013
- **2012** Paterson Medal and Prize, Institute of Physics Early Career Award

In addition to academic research, Professor Snaith has been heavily involved in innovation. He is a co-Founder and Chief Scientific Officer of two early stage companies, Oxford PV commercializing metal halide perovskites for PV applications, and Helio Display Materials, commercializing metal halide perovskites for light emitting applications. He is also named inventor on over 60 patent families and 300 granted patents, with many of his early fundamental perovskite patents having priority dates which pre-date the explosion of interest in this area.

2019

DR.
PIERRE VERLINDEN

is the twenty-seventh Becquerel Prize winner. He receives the award in honour of his scientific and technological merits in the development of high-efficiency solar cells, modules and systems including back contact and rear side passivated silicon solar cells.

Throughout his career, Dr. Verlinden has pioneered the development of advanced solar cell structures, not limiting his work to just scientific progress but focusing on feasible implementation for industrial mass production. This combination of deep scientific understanding and his contributions to the global PV industry makes his work unique for the progress of photovoltaics over the last 40 years. He has been very active in the global photovoltaic scientific community, serving on numerous scientific boards. Committed to education and teaching for decades, Dr. Verlinden has passed on his great passion and deep knowledge of photovoltaics to generations of young scientists as well as manufacturing engineers.*

Pierre Verlinden is a Belgian-Australian engineer and scientist, born in D.R. Congo in 1957, with a Master's degree (1979) and a Ph.D. degree (1985) in Electrical Engineering from the Université Catholique de Louvain (UC Louvain), Belgium. Very early in his career, Pierre Verlinden chose to focus on the development of high-efficiency solar cells. He designed and fabricated his first solar cell in 1978 for his Master thesis: it was a silicon solar cell with selective emitter made by ion implantation with a boron-doped Back Surface Field (BSF). For his Ph.D. research and most of his professional work, Pierre Verlinden decided to concentrate his research on the design and fabrication of high-efficiency Interdigitated Back Contact (IBC) silicon solar cells, first for concentrated sunlight (CPV) and, later on, for one-sun flat-plate applications.

From 1979 until 1987, Pierre Verlinden was a member of the technical staff of the Microelectronic Laboratory at UC Louvain. In addition to his main

** Excerpt from the Becquerel Prize diploma 2019*

research on silicon solar cells, Pierre Verlinden also participated in semiconductor research, including PMOS, NMOS and CMOS process development, sensors, micromachining, Silicon-on-Insulator (SOI) technologies, and teaching. After finishing his Ph.D., Pierre Verlinden spent one year at Stanford University as a Visiting Scholar, in 1987, to continue the development of IBC solar cells for CPV applications with Professor Richard Swanson. At that time, the PV research group of Prof. Richard Swanson at Stanford University was one of the most advanced PV research teams in the world, famous for the development of Point Contact (PC) solar cell (a particular design of IBC cells) with efficiency up to 28.3% under concentrated sunlight. Pierre Verlinden's focus was on the integration of PC solar cells into a suitable and reliable package for CPV application. For this purpose, Pierre Verlinden developed a double-level metallisation process for PC cells with an efficiency of 27% under 100X concentration and a module-ready solar cell package for CPV application.

After his post-doc research at Stanford University, Pierre Verlinden returned to UC Louvain, from 1987 to 1991, as Assistant Professor to pursue an academic career. In 1991, Pierre Verlinden joined recent start-up SunPower Corporation as Manager Solar Cells and Applications, and rapidly became head of R&D, focusing the research on PC solar cells for CPV and high-value one-sun flat-plate applications, solar cell dense array packages (also for CPV applications), optoelectronic devices and light-triggered power devices (SCR, thyristors, triacs, solid-state relays). Among many technical achievements, one can note the first commercial demonstration and large-volume production of high-efficiency (>22%) IBC silicon cells for the Honda Dream solar race car, winner of the 1993 World Solar Challenge, and for the NASA solar unmanned airplanes (UAV) Pathfinder, Helios and Centurion.

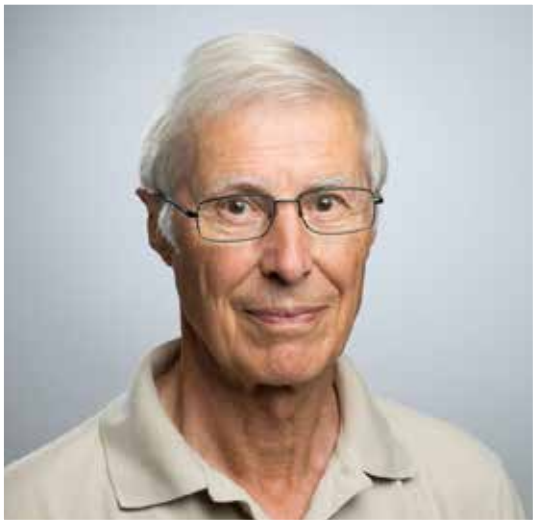
Pierre Verlinden left SunPower and moved to Australia in 2002. After a time at Origin Energy Solar, as Manager PV Technology and Operations, Pierre Verlinden joined Solar Systems from 2005 as Principal Scientist, managing the transition of CPV technology from SunPower-made 26% silicon IBC cells toward 39% multi-junction III-V solar cells, including a complete redesign of the cell dense array package, practically doubling the power output of the CPV system.

In 2012, Pierre Verlinden joined Trina Solar (Changzhou, Jiangsu Province, China) as Chief Scientist, Vice-President and Vice-Chair of the State Key Laboratory of PV Science and Technology (PVST). Pierre Verlinden established the technical leadership of Trina Solar, allowing the company to become one of the largest manufacturers of silicon PV cells and modules worldwide. He led the development of high-efficiency solar cell design and process development, helping Trina to claim many high-efficiency world records: PERC (22.6%), IBC (25%) and TOPCon (24.58%). He continued his relationship with Trina Solar on a part-time basis from 2018. Pierre Verlinden is also Chief Scientist at the Yangtze Institute for Solar Technology, JiangYin, China, a position he has occupied since 2022.

Pierre Verlinden has been Adjunct Professor at the Sun Yat-sen University, Guangzhou (2013-2019) and at the University of New South Wales, (2020-2023). From 2018 to 2022, he was an Independent Director of BT Imaging, Sydney, Australia, and Oxford PV, Oxford, UK.

Dr. Pierre Verlinden is the recipient of the 2016 William Cherry Award, awarded by the Institute of Electrical and Electronic Engineers (IEEE), as well as the 2017 Chinese Government is Friendship Award, the highest award given by China to foreigners. In 2023, he was awarded a Doctor Honoris Causa degree from the University of New South Wales, Australia, and the Francqui Chair at the University of Hasselt, Belgium. He has been nominated as Fellow Member of the IEEE since 2023.

2018



PROF.
PETER WÜRFEL

is the twenty-sixth Becquerel Prize winner. He receives the award in recognition of his fundamental contribution to the theory of photovoltaic energy conversion.

His theoretical approach is characterized by a consistent application of thermodynamic concepts: electrochemical potentials for modelling processes in the absorber material and the chemical potential of light - deduced from the generalization of Planck's radiation law – for characterizing the absorbed solar radiation and the emitted luminescent radiation of solar cells.

By providing a deeper understanding of photovoltaic energy conversion, the work of Prof. Wuerfel has significantly influenced the development of technologies like selective contacts or tools like the luminescence analysis of solar cells.*

Peter Würfel was born in 1938 in Schönebeck, Germany. He has made exceptional and lasting contributions to the field of photovoltaics. His work fundamentally changed and guided the understanding of the physics of solar cells and their underlying mechanisms, shaping the development research in solar energy. He obtained his Ph.D. in physics and continued his academic career at the University of Karlsruhe (now Karlsruhe Institute of Technology), where he became a full professor, mentoring generations of students and researchers.

Prof. Würfel is renowned for his revolutionary theoretical insights into the physics of solar cells, as described in his book, "The Physics of Solar Cells". This text, now a standard in the field, used by researchers, engineers, and students alike, is offering a new perspective on solar cell operation. His description of solar cells in thermodynamic terms, where the movement of charge carriers is driven by electrochemical potentials rather than the traditional pn-junction electric field model, provided a more general and comprehensive understanding of solar cells. This thermodynamic framework

** Excerpt from the Becquerel Prize diploma 2018*

encompasses the pn-junction as a special case, broadening the applicability and insight into various solar technologies.

Peter Würfel's work extended beyond theory, touching on a wide range of PV concepts, many of which are of fundamental significance. He contributed groundbreaking research on third-generation solar cells, including hot carrier solar cells and thermophotovoltaics, and calculated the theoretical limits of solar cell efficiency. His innovative application of the generalised Planck equation, which describes the spectral rate of spontaneous emission from photovoltaic materials, stands at the heart of much of his academic success. This equation, confirming the relationship between luminescence emission, temperature, material properties, and the separation of quasi-Fermi energies, proved crucial to both his theoretical and experimental work, particularly in crystalline silicon luminescence studies.

At the University of Karlsruhe, Peter Würfel and his team conducted extensive research on luminescence in crystalline silicon, leading to a deeper understanding of the critical links between luminescence emission and key solar cell parameters such as the open-circuit voltage. These studies laid the foundation for the quantitative luminescence imaging techniques now widely used in PV research and high-volume solar cell manufacturing. His contributions in this area have had a significant impact on the development of modern silicon wafers, solar cells, and modules, with his group's work serving as the bedrock for many advancements in the field.

Prof. Würfel also contributed to the development of novel characterisation tools. During a research visit to UNSW in 2007, he proposed the "two-filter method", a technique that provides depth-dependent information about the excess carrier density in silicon samples. This method, first used to determine diffusion length in silicon solar cells, was later adapted to measure bulk lifetime in non-passivated silicon bricks and is now implemented in commercial measurement systems.

Even after his retirement, his lifetime of scientific contributions, particularly his vision in recognising the power of luminescence as a measurement principle, continues to influence the global PV community. His work has shaped innovations in luminescence-based methods used in both academia and industry. His research has left a lasting impact on the progress of PV technologies and their application.

2017

DR.
STEFAN NOWAK

received the Becquerel Prize in honor of his merits in the field of integration of photovoltaic electricity into the future global sustainable energy system. The prize was awarded in 2017 on the occasion of the European Photovoltaic Solar Energy Conference in Amsterdam, The Netherlands.

Dr. Nowak is one of the leading strategists and promoters of targeted European and global cooperation on PV research, market assessment and deployment. Of particular importance are his longlasting activities as chairman of the International Energy Agency's «Photovoltaic Power Systems Programme» and as coordinator of the «Solar European Research Area Network».

His leadership, comprehensive and precise analyses and inspiring argumentation in strategic and institutional discussions have strongly contributed to the global credibility of photovoltaics as a basis of future energy systems. *

Stefan Nowak is an experimental physicist by training with a PhD from Fribourg University and EPFL, Switzerland, in 1986. In his early academic work, Stefan Nowak specialized in the field of plasma physics, in particular related to thermonuclear fusion research, where his PhD work concentrated on radiation losses in tokamak devices.

In the years of his PhD, Stefan Nowak developed his early interest for energy research. Following his PhD, after a brief activity in the area of radioactivity analysis following the Chernobyl nuclear accident in 1986, Stefan Nowak broadened his research activities to more industrially oriented plasma physics; namely for chemical analysis, surface treatment and analysis as well as thin films. He held a post-doc position at the Technical University of Eindhoven, Netherlands, and subsequently a position as senior research assistant at the University of Fribourg, Switzerland.

During his work at the University of Fribourg, Stefan

** Excerpt from the Becquerel Prize diploma 2017*

Nowak developed his interest for industrial research and technology transfer. Besides his position as senior research assistant, Stefan Nowak became head of the industry liaison unit of the University of Fribourg in 1992. In the same period, he was strongly involved in the evaluation of Swiss energy research. As a consequence of this activity, Stefan Nowak was asked to become programme manager of the Swiss federal photovoltaic research programme on behalf of the Federal Office of Energy. As part of this assignment and representing Switzerland, Stefan Nowak became a member of the Executive Committee of the IEA Photovoltaic Power Systems Technology Collaboration Programme (IEA PVPS) in 1996.

Combining his various activities and interests in the field of energy research, innovation, technology management and international cooperation, Stefan Nowak founded NET Nowak Energy & Technology Ltd., a consultancy specialized in renewable energy, energy and resource efficiency, in 1997. Stefan Nowak subsequently broadened his technological expertise with complementary experience in market assessment, communication and policy. In 2001, Stefan Nowak was elected chair of the Executive Committee of the IEA Photovoltaic Power Systems Programme (IEA PVPS).

The responsibility for this programme over the past 15 years has led to a large network, numerous contacts, experiences and travels related to PV technology and deployment in all 5 continents. From 2003 to 2004, Stefan Nowak was a member of the Photovoltaic Technology Research Advisory Council (PV-TRAC) of the European Commission and co-author of the first PV Vision report of this council. He then served as member of the Steering Committee and later vice-chair of the European Photovoltaic Technology Platform, a position that he held until 2013. During this period, Stefan Nowak was also core member and later co-ordinator of various subsequent European Solar Era Net and Solar Era Net Cofund projects, bringing together more than 20 EU ministries and agencies.

Stefan Nowak also leads the Secretariat of the Swiss REPIC platform, a governmental platform of four Swiss government agencies for the promotion of renewable energy, energy and resource efficiency in international cooperation. The REPIC platform aims at supporting projects in the early phase of deployment and the ambition of scale-up, replication and multiplication. Through more than 120 projects worldwide, managed 2017 within this programme over the last 12 years, Stefan Nowak has acquired a unique experience with setting up projects that are aimed at a sustainable deployment and multiplication of clean energy technologies in developing and emerging economies.

In Switzerland, Stefan Nowak is strongly involved in the energy research landscape. Besides his activities as programme manager of the Swiss federal photovoltaic research programme on behalf of the Federal Office of Energy, Stefan Nowak is a member of the Core Evaluation Panel of the Swiss Competence Centers for Energy Research (SCCER) since 2013 and president of this panel since 2017.

Relevant contributions to the photovoltaic sector

- Global analysis of potentials, economics, markets and policies of photovoltaics
- Definition and implementation of national and international photovoltaic research strategies
- Evaluation / review of photovoltaic research projects, programmes and institutions
- Evaluation / review of small to large photovoltaic industrial projects
- Co-author of IEA photovoltaic roadmaps
- Positioning photovoltaics in different IEA publications, e.g. Medium Term Renewable Energy Market Reports, Energy Technology Perspectives, World Energy Outlook
- Raising the global profile of the IEA photovoltaic technology collaboration programme (TCP) IEA PVPS to one of the largest and most successful IEA TCPs
- Regular invited for contributions to international photovoltaic conferences worldwide

2016

PROF.
CHRISTOPHE BALLIF

received the Becquerel Prize in honour of his scientific merits in the development of silicon hetero-junction solar cells. The prize was awarded in 2016 on the occasion of the European Photovoltaic Solar Energy Conference in Munich, Germany.

Prof. Ballif is one of the pioneers in the development of high efficiency crystalline solar cells with heterojunctions and passivated contacts. His work spans the field from fundamentals to novel manufacturing processes, pilot tools and production lines. His research on tandem solar cells with a focus on silicon/perovskite and silicon/ III-V compounds is highly recognized.

Prof. Ballif has published very extensively and is one of the most highly cited researchers in the field of solar cells. His unwavering enthusiasm has energized dozens of PhD students and postdoctoral fellows. His passionate promotion of solar energy technology as the main electricity source for the future has contributed enormously to its acceptance by society.*

Christophe Ballif is currently a professor at the Ecole Polytechnique Fédérale de Lausanne (EPFL), chairing the photovoltaics and thin film electronics laboratory in Neuchâtel. Since 2012 he directs the CSEM PV Centre, a non-profit technology organization supporting industrialization.

Christophe Ballif was born near Lausanne, in the Swiss Jura mountains, in 1969. He received both his M.Sc. and Ph.D. degrees in physics from the EPFL, Switzerland in 1994 and 1998 respectively. His work focused on novel photovoltaic materials based on the layered compounds MoS2 and WS2. He was then a postdoc- toral researcher with the National Renewable Energy Laboratory, Golden, CO, USA where he was involved in the characterization of compound semi-conductor solar cells such as CdTe and CIGS.

He then worked at the Fraunhofer Institute for Solar

** Excerpt from the Becquerel Prize diploma 2016*

Energy Systems in Germany, where he focused on crystalline silicon photovoltaics (monocrystalline and multicrystalline) until 2003, working on various aspects of hydrogenation, gettering, and metal contact formation to silicon emitters.

He then joined the Swiss Federal Laboratories for Materials Testing and Research (EMPA, Thun, Switzerland) where he worked on the mechanical properties of semi-conductors, laser bars and wafer sawing processes for solar wafers.

In 2004, he became full professor and chair of the Institute of Microengineering, University of Neuchâtel, Switzerland, taking over the activities of Prof. Arvind Shah. While accompanying the industrial developments of thin film silicon and pushing the technology to its limits, he set up a program on advanced crystalline silicon heterojunction devices. Within a short time, device voltages of about 700 mV could be demonstrated using a lean process based on parallel plate plasma enhanced chemical vapor deposition and sputtering, allowing for cost-effective production technology. This triggered industrial interest. In 2008, the company Roth and Rau established a subsidiary in Neuchâtel, starting a long cooperation to bring the technology to maturity later with the technology group Meyer Burger. In 2007, he was also a founder of Indeotec, a company that supplies new generation deposition tools to his laboratory.

In 2009, the Institute of Microengineering and the Chair of Prof. Ballif was transferred to EPFL, with the laboratories staying in Neuchâtel. In 2012, he was a founding member and new director of the new PV Center (Sustainability center since 2023) within the Swiss Center for Electronics and Microtechnology (CSEM) in Neuchâtel, a first official center in Switzerland dedicated to industrial solar research. Since then, he has shared his time between the two institutions, attempting to find the right synergies between more fundamental research at EPFL and applications at CSEM.

In recent years, his research groups have continued to expand and innovate, achieving world record two-junction devices obtained by combining III-V on top of Si heterojunction jointly with NREL,showing in june 2022, the first certified perovskite/silicon tandem devices over 30% both on textured and planar wafers. His work on passivating contacts extended to both alternative materials and contacts that are able to withstand high temperatures. He teams also developed activities in the field of building-integrated photovoltaics. Prof. Ballif was one of the inventors of the white "efficient" photovoltaic panels, now industrialized by the company Solaxess, and his team introduced high-resolution photographic and photovoltaic images. His teams further collaborates with around 40 companies for various product developments, including for high end application, such as for the autonomous connected watch T-Touch solar of Tissot, which contains a dial industrialised by CSEM. His activities increasingly include aspects related to battery chemistry and advanced battery management sytems, energy and electricity management, as well as digital energy.

Prof. Ballif authored or co-authored over 600 scientific and technical papers, as well as a number of patents. He continues to participate actively to debate on the energy transition, through public conferences, and various broadcosts and podcast in Switzerland and abroad.

2015

PROF.
ANDRES CUEVAS

received the Becquerel Prize in honour of his scientific merits in the development of silicon solar cells. The prize was awarded in 2015 on the occasion of the European Photovoltaic Solar Energy Conference in Hamburg, Germany.

Prof. Cuevas is one of the pioneers in the development of bifacial solar cells and also contributed significantly to the development of high-efficiency silicon solar cells. He made substantial contributions to determining and modelling the most important properties of silicon solar cells, including Auger recombination, bulk defect characterization, emitter properties, including detailed characterizations of many types of surface passivation. His work on the characterization of carrier lifetime parameters contributed considerably to the development of widely used key measurement methods like the quasi-steady-state photoconductance method.

His superior understanding of the physics of solar cells has made him one of the key authorities in the field. With his engagement and his outstanding presentations, Prof. Cuevas has inspired generations of students and young scientists.*

Andres Cuevas was born in 1953 in Ponferrada, Spain. After studying electronics and telecommunications engineering at the Universidad Politécnica de Madrid (UPM) in 1976, he dedicated his professional life to the development of silicon solar cells. The topic of his PhD, completed in 1980, was a double-sided solar cell for concentrator applications. Soon after becoming a postdoctoral researcher at the UPM he invented the albedo-collecting bifacial module, demonstrating for the first time that it can have a significantly higher energy yield than a conventional module. In recent years, bifacial PV modules have been widely adopted by the PV industry.

In 1985 he became an associate professor at the UPM and focused on improving the performance of conventional silicon solar cells. Breaking with the

** Excerpt from the Becquerel Prize diploma 2015*

past, he introduced the relatively deep, moderately doped diffusions that later became ubiquitous in high efficiency solar cell designs. Using such optimised diffusions, he achieved in 1988 a 19% conversion efficiency, which was a European record at the time. After obtaining a Fulbright Fellowship in 1989 he worked at Stanford University in the development of point-contact solar cells for concentrator applications.

In 1993 he moved to the Australian National University (ANU), where he gave courses in electronics, semiconductor devices, energy resources, photovoltaic technologies and solar cell physics. He was promoted to associate professor in 1998 and to professor in 2003. Among other academic appointments, he was head of the ANU School of Engineering and deputy dean of the College of Engineering and Information Technology.

His small, but highly productive research group at the ANU, has made numerous contributions to the advancement of solar cell technology across the areas of silicon materials, surface passivation and device fabrication. These contributions include the characterization of defects and impurities in silicon, the improvement of multicrystalline and upgraded metallurgical silicon, the determination of the fundamental limits to bulk recombination and solar cell efficiency, the development of effective surface passivation materials and techniques, the quantification of heavy doping effects, and the development of novel passivating contacts and carrier-selective conductors for high performance silicon solar cells. He has helped to understand the physics of solar cells, clarifying common misconceptions and deriving theoretical and computer models to support such understanding.

He has published more than 400 scientific papers, book chapters and patents, many of them having a high impact in the field. He has collaborated extensively with both academia and industry and has been a visiting researcher at the Fraunhofer ISE and ISFH in Germany, the CNRS in France, CNR and ENEA in Italy, ECN in the Netherlands, University of Lisbon in Portugal, UPC in Spain, EPFL in Switzerland and University of Florida and Stanford University in the USA. In 2014 he was elected to the degree of fellow of the IEEE for contributions to the science and technological development of silicon solar cells. Since 2018 he has been an Emeritus Professor of the Australian National University.

2014

PROF.
STEFAN GLUNZ

received the Becquerel Prize for his pioneering work in high-efficiency silicon solar cells. The prize was awarded 2014 on the occasion of the European Photovoltaic Solar Energy Conference in Amsterdam, The Netherlands.

Prof. Glunz is a pioneering leader in both ba- sic and application-oriented research on silicon wafer-based photovoltaic energy conversion. His research has addressed a wide range of topics that are crucial for increasing the efficiency of solar cells and reducing the cost of solar electricity generation. This includes the analysis of electrically active defects in solar cells, development of performance-increasing technologies for solar cell manufacture and minimizing the material demand in the production of solar cells. Dr. Glunz has taken a leading role in transferring research results into industrial production.

He was very active in setting up the European Strategic Research Agenda for Photovoltaics and is the initiator of a highly successful series of international workshops for PhD students (Silicon- FOREST). With his engagement Prof. Glunz contributed considerably to the worldwide success of photovoltaic electricity generation.*

Stefan Glunz was born in Dortmund, Germany in 1966. He received his diploma in physics in 1992 and his PhD in 1995 from the University of Freiburg. After his PhD he started working as a scientist in the research group for high-efficiency silicon solar cells at the Fraunhofer Institute for Solar Energy Systems ISE in Freiburg. He became responsible for the silicon solar cell development in the clean-room of Fraunhofer ISE and is now one of the heads of the division «Photovoltaics» at Fraunhofer ISE.

His division consists of more than 400 members, including 30 PhD students. Their work focuses on high-efficiency solar cells, characterization and emerging photovoltaics. He has extensive experience in managing both industry and public financed

** Excerpt from the Becquerel Prize diploma 2014*

projects, including several large European projects. His research concentrates on the design, fabrication, and analysis of high-efficiency silicon solar cells, including the detailed characterization of the Si-SiO2 interface and other dielectric passivation layers like Al2O3, the analysis of the metastable BO defect in Czochralski silicon and fundamental semiconductor parameters like Auger recombination.

Other research fields are the development of new process technologies for the fabrication of high-efficiency silicon solar cells, like passivating contacts consisting of thin interfacial oxides and doped polycrystalline silicon layers contacts (TOPCon). The TOPCon technology is one of the most widely used technologies in the photovoltaic industry today. His group at Fraunhofer ISE has set several international records, including the first both-sides contacted silicon solar cells reaching an efficiency of 26%. Beyond pure silicon photovoltaics he is especially interested in silicon-based tandem cells.

In 2021, a team of silicon and III-V specialists in his division at Fraunhofer ISE have managed to achieve an efficiency of 35.9% for a monolithic III-V/silicon triple-junction cell. Another route which is intensively followed by Fraunhofer ISE are perovskite silicon tandem solar cells with a special focus on long-term stability and upscaling of process technology.

Since 2015, Stefan Glunz is full professor at the University of Freiburg, Germany. He is one of the founding professors of the new Institute for Sustainable Systems Engineering (INATECH) at the Faculty of Engineering, University of Freiburg. The research of INATECH is dedicated to energy systems, sustainable materials and resilience. In 2015, a new master program was started at the university, which focuses on these topics. Prof. Glunz is responsible for courses such as “Solar Energy” and “Photovoltaic Laboratory”. His research at the university focuses on emerging PV technologies, such as perovskite solar cells and tandem cells.

Prof. Glunz is author/co-author of more than 230 journal articles and 360 conference papers and founding editor of the IEEE Journal of Photovoltaics. In 2008, he received the Eni Award for the promotion of science and technology in the field of renewable energy. He is a scientific committee member for several conferences and workshops in the field of photovoltaics and has initiated an international conference on crystalline silicon photovoltaics (SiliconPV).

2013

PROF.
GABRIEL SALA

received the Becquerel Prize for his pioneering work on concentrator photovoltaic system development. The prize was awarded 2013 on the occasion of the European Photovoltaic Solar Energy Conference in Paris, France.

Gabriel Sala was among the first scientists in Europe who set up complete concentrator PV systems with power ratings up to almost half a megawatt. He coordinated several important European projects like EUCLIDES which were devoted to the research and development of concentrator photovoltaic technology. Through all his activities he paved the way for the industrialization of the concentrator photovoltaic technology.

Prof. Gabriel Sala is not only a pioneer in the development of photovoltaic concentrator systems; he also earned great merits in the field of analyses and evaluation of concentrator photovoltaic modules and power plants. With his expertise he contributed considerably to the development of several international standards for the concentrator photovoltaic technology.*

Prof. Gabriel Sala Pano was born in Barcelona, Spain in 1945. He graduated in Telecommunication Engineering (1970) by the Universidad Politécnica de Madrid (UPM) and obtained his PhD on the topic "Varicap Diode Made by Double Diffusion" (1973).

Serving as associate professor from 1973 and upgraded to chair in 1983, he was the director of 14 Ph.D. theses at UPM, all in the field of PV.

He was director of the Department of Electronic Physics for two eight-year periods (1987-1995 and 2004-2012) and served as director of the Institute of Solar Energy (UPM) in 1985, 2014 and 2015.

He was the responsible for the technology transfer and industrialisation of the bifacial silicon solar cell and module technology to the company ISOFOTON, founded in 1981.

** Excerpt from the Becquerel Prize diploma 2013*

His work in silicon, devices and solar cells shifted to instrumentation for testing and concentrating photovoltaics in the early eighties. Between 1978 and 1984, he developed the Ramón Areces (1981) and MINER (1984) concentrator arrays.

He was the inventor of the "Silicon on Glass" Fresnel lens (patented in 1979) which is used by 90 % of the industry.

He developed several innovative cell testing instruments for Isofoton and for the INTA (Spain) and the European Space Agency (Noordwijk, NL).

At UPM, he became the head of the research group "Instruments and System Integration" whose main activities are photovoltaic concentration (CPV) and instrumentation for PV testing from its creation till 2017.

He participated in 37 competitive projects over the last 30 years. Nine of them were funded by the European Commission in the successive framework programs FP5 to H-2020. He was project coordinator for five of these projects. Of the remaining 28 national projects, he acted as principal investigator in 18. His research group has participated in 46 collaborative projects with industries and research centres; fifteen of which were not Spanish.

He is co-author of 5 patented inventions and 4 projects dealing with technology transfer to industry. All of them focus on CPV technology and CPV characterization equipment to be used both at the lab level or in the production line. He is co-author of Chapter 10 "Photovoltaic Concentrators" in the Handbook of Photovoltaic Science and Engineering, 2nd Edition, Wiley, (2011).

He is a co-founder of Solar Added Value (http://solaraddedvalue.com), a technology company and spin-off from UPM, which focuses on the energy sector, particularly CPV technology. This company has received know-how developed by his research group, such as the solar simulators "Helios 3198" and "Helios 3030" for the indoor CPV module and receiver power measurement and binning in the production line. The tri-band heliometer (CU-3J35) for spectral characterisation of the DNI in CPV installations and in solar simulators is commercialised by the company.

He has served as a scientific committee member for 15 international conferences, as well as chair of the Technical Program Committee of the 10th EPVSEC, chairman of ICSC-4 Conference, head of the Spanish team of Working Group 7 of the IEC Technical Committee 82, which is devoted to the development of a CPV international normative and member of the National Committee AEN/CTN 206/SC82. He was also a member of the management board and coordinator of Sub-Programme 4 of Photovoltaics EERA (European Energy Research Alliance) up to 2015. Since 2015, he is Emeritus Professor at UPM.

2012

DR.
WINFRIED HOFFMANN

received the Becquerel Prize for his pioneering work in the industrialization of photovoltaic technologies. The prize was awarded in 2012 on the occasion of the European Photovoltaic Solar Energy Conference in Frankfurt am Main, Germany.

Winfried Hoffmann performed pioneering work in application-oriented research and development on both wafer-based and thin-film photovoltaic energy conversion. Through well targeted cooperations he established an intensive and highly effective information exchange between academia and industry which fostered substantially the progress in photovoltaics.

In leading positions in industry Winfried Hoffmann was the driving force behind the set-up of innovative large scale production sites as well as the manufacture of novel production equipment. In particular the integrated SmartSolarFab was one of the pioneering steps in photovoltaic manufacture.
Winfried Hoffmann strongly contributed to the market stimulation of photovoltaics through his tireless engagement in national and international organizations; for many years he was president of the European Photovoltaic Industry Association (EPIA) and the German Bundesverband Solarwirtschaft (BSW). Winfried Hoffmann assisted in many European countries in the introduction of photovoltaic market support programs. With his engagement on the political level he helped to bring photovoltaic electricity generation on its way towards a future sustainable energy supply.

With this prize, the European Photovoltaic Community at its gathering in Frankfurt, Germany, expresses its recognition to Dr. Winfried Hoffmann for his extraordinary achievements in the field of PV Solar Electricity.*

Dr. Winfried Hoffmann was born 1949 in Speyer (Germany). He graduated in physics and received his PhD- thesis in biophysics. He joined the just formed photovoltaic R&D group for thin-film solar cells at

** Excerpt from the Becquerel Prize diploma 2012*

NUKEM (RWE) in 1979 and took over its leadership in 1985. His focus was Applied Research towards industrialization in the area of CdS/Cu2S – thin-film solar cells and modules, amorphous silicon as well as dye solar cells. In the mid-1980s and 90s, a pilot production for MIS-inversion layer c-Si solar cells and large area modules was put in operation. The focus on PV systems in these years was for decentralized off-grid applications (e.g. Solar Home Systems and water pumping in developing countries).

He initiated the photovoltaic joint venture between NUKEM and Daimler-Benz Aerospace to form «Angewandte Solarenergie – ASE GmbH» in 1994, where he served as Managing Director. In the same year the acquisition of 100 % shares of Mobil Solar as a subsidiary company was done with special focus on their developed ribbon EFG technology. In the late 90s, the company was renamed RWE Solar GmbH and was one of the worldwide 5 biggest production companies for solar cells and modules. The first inline PECVD machines for SiN were developed and built during these years.

In October 2002, the joint venture between RWE Solutions and SCHOTT, the RWE SCHOTT Solar GmbH, was founded, where he served as Chairman of the Board. Effective in 2005, SCHOTT acquired the shares of RWE Solutions and the company was renamed SCHOTT Solar GmbH, where he was member of the Management Committee.

In 2007, he joined Applied Materials to become Chief Technology Officer and Vice President of the Solar Business Group and member of the Management Board of the German based Applied Materials GmbH. From November 2010 he served with his consulting company Applied Solar Expertise – ASE to the solar business of Applied Materials.

He served many years until 2008 as member of the Board of the German Solar Economy Association (Bundesverband Solarwirtschaft – BSW Solar), lastly as president. For 17 years until March 2014, he served as member of the board for the European Photovoltaic Industry Association (EPIA, now SolarPower Europe), half of that time as president. In 2010/11 he was member of the High-Level Group on Key Enabling Technologies to advise three EU-commissioners on a strategy to strengthen particularly the European production industry.

Until 2016 he was member of the supervisory board of the company SMA Solar Technology AG as well as chairman of the Supervisory Board of Solar-Fabrik AG.

For many years he has been a member of the Board of Trustees to the Fraunhofer Institute for Solar Energy Systems ISE, the Centre for Solar Energy and Hydrogen Research (ZSW), the Helmholtz Centre in Berlin (HZB) and a member of the Board of Trustees of chairman of the scientific board of DLR-Institute of Networked Energy Systems (Oldenburg).

He is member of the Scientific Board of the Institute for Solar Energy Research in Hamelin (ISFH) and member of the Advisory Board of the EPC company SOLNET Oy.

Since 2011 he gives lectures about Renewable Energy at the universities of Konstanz and Freiburg. In 2012 he received the John Bonda prize from EPIA (today SolarPower Europe) and the „European Becquerel Prize for Outstanding Merits in Photovoltaics“ from the European Commission. He was rewarded from the World Renewable Energy Network (WREN) as “Solar Pioneer” in 2014, from the Solar Business Club as “Visionary Solar Advocate” in 2019 and in 2024 with the „Global Solar Leaders Award“.

2011

PROF.
WIM C. SINKE

received the Becquerel Prize for his pioneering work on wafer-based silicon photovoltaic cells and modules. Wafer-based silicon constitutes today's dominant technology family for photovoltaic solar electricity generation. The prize was awarded 2011 on the occasion of the European Photovoltaic Solar Energy Conference in Hamburg, Germany.

Wim Sinke worked successfully over many years towards the understanding and the improvement of silicon solar cells, in particular in the areas of surface passivation, doping and contact formation, and on integrating cell and module designs. He took a leading role in transferring research results into production.

Wim Sinke has great merits as the coordinator of the extensive European integrated project on wafer-based silicon photovoltaics "CrystalClear." The project contributed substantially to the development of the PV sector in Europe.

As chairman of the Working Group on Science, Technology & Application, Wim Sinke contributed considerably to the development of the Strategic Research Agenda of the European Technology Platform.*

Wim C. Sinke (21.11.1955, Vlissingen, NL) was Principal Scientist Solar Energy at ECN (later part of TNO) in Petten, the Netherlands, and Professor of Photovoltaic Energy Conversion at the University of Amsterdam, until his retirement in 2022. He also was a visiting scientist at research institute AMOLF in Amsterdam, and chairman as well as co-chairman of the European Technology and Innovation Platform for Photovoltaics (ETIP PV).

Wim Sinke studied experimental physics at Utrecht University, where he graduated in 1981, working on a project concerning ultra-fast direct casting of crystalline silicon for photovoltaic applications. Subsequently, he carried out his PhD research at AMOLF on ion implantation and pulsed laser

** Excerpt from the Becquerel Prize diploma 2011*

annealing for controlled doping of crystalline silicon for solar cells. He received a doctoral degree from Utrecht University in 1985 for a thesis entitled “New physical processes for silicon solar cells”.

From 1986 to 1987 he was a visiting scientist at the Hitachi Central Research Laboratory in Tokyo, where he worked on the atomic structure of thin-film amorphous silicon. In 1987, he re-joined AMOLF to work on crystalline silicon solar cells, material properties of amorphous silicon, and ion and laser processing of semiconductors. In 1990, he moved to the Energy Research Centre of the Netherlands ECN to set up a new group on photovoltaics. This group grew to a size of 80 staff and covered a range of topics, including industrial processing of wafer-based silicon solar cells and modules, roll-to-roll processing of thin-film solar cells and modules, wafer/thin-film hybrid tandem devices, environmental and economic analyses of PV, and PV applications.

From 1994 to 2012, he was professor of Physics and Chemistry of Thin Films and Science & Applications of Sustainable Energy Systems at the University of Utrecht. Wim Sinke has been a member of various national and international advisory committees in the field of solar energy, renewable energy and related topics. He has published hundreds of scientific and popular papers and gave numerous scientific and popular lectures on all aspects of solar energy.

Wim Sinke has received several prestigious awards, including the FOM Jacob Kistemaker Prize in 1992 and the Royal Dutch/Shell Prize for Sustainability and Energy in 1999. In 2015 he was appointed a Knight in the Order of the Netherlands Lion for his contributions to the development and promotion of solar energy.

2010

PROF. HANS-WERNER SCHOCK

received the Becquerel Prize for his pioneering work on copper indium gallium diselenide (CIGS) thin film solar cells. This technology is one of the most promising thin film technologies with the highest efficiency of any thin film solar cell today. The prize was awarded 2010 on the occasion of the European Photovoltaic Solar Energy Conference in Valencia, Spain.

Hans-Werner Schock worked successfully over many years towards understanding the extraordinary properties of chalcopyrite materials concerning defect tolerance, junction formation and grain boundary recombination. He took a leading role in transferring his results into production.

He also has great merits as coordinator of several European (EUROCIS) research projects on chalcopyrite-based solar cells. These projects contributed substantially to the development of European CIGS companies. Record efficiencies for several chalcopyrite-based systems were achieved in his laboratory.*

Hans-Werner Schock was born in Tuttlingen, Germany in 1946. He received his diploma in electrical engineering from the University of Stuttgart in 1974, where he worked on compound semiconductor thin films for solar cells and electroluminescence. In 1982 he joined the Institute of Physical Electronics at the University of Stuttgart as a research group member and scientific project leader for polycrystalline thin film solar cells.

In 1986 he received his PhD for the development of evaporation technologies for thin film solar cells. His work was one of the pillars for the foundation of the Centre for Solar Energy Research in Stuttgart.

As a coordinator of a series of European projects (EUROCIS) from 1985 to 2004, he promoted the CIGS solar cell technology on a European level, involving a number of research groups from various countries who contributed a variety of approaches for making

** Excerpt from the Becquerel Prize diploma 2010*

CIGS technology manufacturable.

In 2000, he contributed as a research scholar at the Institute of Energy Conversion, University of Delaware to the development of deposition processes of CuIn(Se,S)2 films. Hans-Werner Schock authored or co-authored more than 330 contributions in books, reviewed journals and conference proceedings. He is inventor or co-inventor of more than 10 patents in the field of thin films and thin film solar cells.

In 2004, he took on the position as Director of the institute "Technology" at the Hahn-Meitner-Institut in Berlin (now Helmholtz-Zentrum Berlin). In 2005, he was appointed Honorary Professor at the faculty of Electrical Engineering and Computer Science of the Technische Universität Berlin. He was awarded an honorary doctoral degree at the Tallinn University of Technology, Tallinn Estonia in 2013.

From 2006 to 2011, he was spokesperson of the Solar Energy Research Division at the Helmholtz Zentrum Berlin.

He was a member of numerous scientific committees and has acted as session organiser of many photovoltaic conferences and of MRS and EMRS symposia. He chaired the 10th and 16th Conference on Ternary and Multinary Compounds.

Since his retirement in 2015, he works as an independent consultant for companies and research institutions.

2009

PROF. DR.
ANDREAS BETT

received the Becquerel Prize for his pioneering work on monolithic multi-junction solar cells leading to a world record efficiency of 41.1% in 2009. The prize was awarded 2009 on the occasion of the European Photovoltaic Solar Energy Conference in Hamburg, Germany.

He introduced the lattice mismatched growth technique that is a key to record efficiencies. He further developed characterization techniques and simulation tools for concentrator multi-junction solar cells. In his laboratory, he researched and achieved significant advances in concentrator modules and systems including long term stability. The FLATCON concept was developed and successfully introduced into production.

Prof. Dr. Bett is not only a pioneer in research and development of III-V multi-junction solar cells but he also earned great merits for the industrialization of concentrating photovoltaic technology. He is a cofounder of Concentrix Solar which is today one of the leading companies in this market sector.*

Andreas Bett was born in Furtwangen, Germany, in 1962. He began his studies in physics, mathematics and sports at the University of Freiburg in 1981. In 1987 he joined the Fraunhofer Institute for Solar Energy Systems in Freiburg as a diploma student. He finalized his diploma thesis "Optimizing GaAs/AlGaAs epitaxial layers for application in solar cells" in 1988 and received a diploma degree in physics from the University of Freiburg. He continued his research at Fraunhofer ISE and worked on the topic III-V on Si for solar applications. In 1992 he published his PhD thesis "Development of GaAs solar cells on foreign substrates" and received his PhD degree from the University Konstanz.

In 1993 he became the head of the "III-V Solar Cells and Epitaxy" group at Fraunhofer ISE. He pushed for the development of high-efficiency GaAs solar cells. He developed liquid-phase technology processes based on the etch-back regrowth principle to

** Excerpt from the Becquerel Prize diploma 2009*

fabricate single-junction heteroface GaAs solar cells. Later he used molecular beam epitaxy before metalorganic vapor epitaxy became the industrial feasible technology for III-V-based multi- junction solar cells. He and his team developed very radiation-hard solar cells for space and transferred this technology to AZUR Space Solar Power in Germany.

In order to deploy high-efficient multi-junction solar cells on the earth, he started research on concentrating photovoltaic technology. In co-operation with colleagues from the Ioffe-Institute, Russia, the FLATCON technology was developed at Fraunhofer ISE. A specialty of this module type is the use of Fresnel lenses made in silicon-on-glass technology. This technology has been transferred to industry. By introducing and pushing the metamorphic growth concept, the efficiency of triple-junction solar cell could be enhanced up to 41.1 % in 2009. This was the world record efficiency at that time. This achievement was recognized by receiving the Becquerel Prize that year. Another highlight of his work was the achievement of an efficiency of 46.1% for a wafer-bonded four-junction solar cell in 2015. A mini-module equipped with a four-junction solar cells yielded 43.4% module efficiency in 2016. Today the III-V group at Fraunhofer ISE hold the world record efficiency of 47.6% using a four-junction cell fabricated by wafer-bonding technology.

The R&D on III-V cells and CPV modules continues as Prof. Dr. Andreas Bett became Head of the Division of Materials – Solar Cells and Technology in 2007. In this role he was responsible for silicon material development for photovoltaic applications.

Since 2017, he is the director of the Fraunhofer Institute for Solar Energy Systems ISE in Freiburg, Germany and in 2020 he accepted the professorship of "Solar Energy - Materials and Technologies" in the Faculty of Mathematics and Physics, University of Freiburg.

Prof. Dr. Andreas Bett was and is very active in transferring R&D achievements into industrial production. In 2006 he co-founded the company Concentrix, a spin-off of Fraunhofer ISE that aimed to commercialize the FLATCON technology. He was a Member of the Board until the company was bought by Soitec in 2009. In 2015 he co-founded the company NexWafe as a spin-off from Fraunhofer ISE. This company commercializes a kerfless silicon wafer technology which was developed in his division.

Prof. Dr. Bett has received widespread recognition for his work. In 2010 he received the Joseph-von-Fraunhofer Prize and the European Earto Prize. In 2012 he received, together with Hansjoerg Lerchenmüller, the high-ranking Deutscher Umweltpreis for his efforts and achievements in the industrialization of CPV technology.

Prof. Dr. Bett authored more than 500 publications and holds 20 patent families. He has served and serves in many international scientific conference committees and several academic and industrial boards.

2008

MECHTILD ROTHE

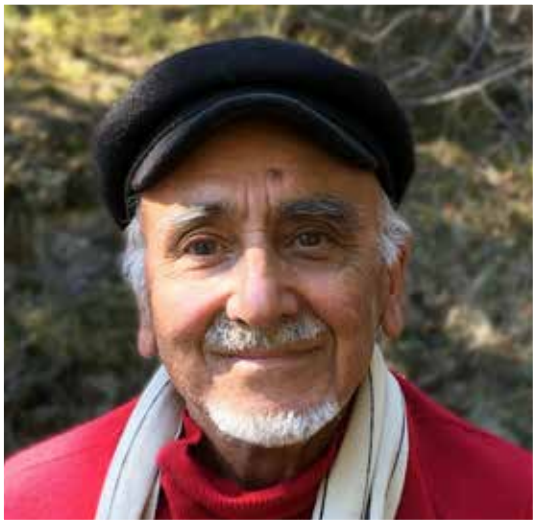
received the Becquerel Prize for her enormous merits in the success of photovoltaics and all renewables. The prize was awarded 2008 on the occasion of the European Photovoltaic Solar Energy Conference in Valencia, Spain.*

In 1994, she became the Socialist rapporteur for the Parliament́ s Initiative calling for a European Renewable Energy Action Plan. Later, when the EU Commission published the Green Paper for the Renewable Energies in 1996, the White Paper a year later, setting a target of 3 GW of PV for Europe by 2010, and eventually the EU Directive for Renewable Electricity in 2001, she was in each case a key supporter in her role as the Parliament́ s official rapporteur. This work was completed in 2006 with her being the rapporteur of the EU Directive on Energy Efficiency.

Since 2003 she took the leadership of the association EUFORES, the network for the pomotion of the Renewable Energies among Parlamentarians across Europe.

** Excerpt from the Becquerel Prize diploma 2008*

2007



PROF.
ARVIND SHAH

received the Becquerel Prize for his ground-breaking work on silicon thin film solar cells. The prize was awarded 2007 on the occasion of the European Photovoltaic Solar Energy Conference in Milan, Italy.

Arvind Shah is the founder of the Photovoltaic Laboratory at the Institute of Microtechnology at the University of Neuchâtel, where he developed with his team the VHF (very high frequency) deposition technique for high-rate low-cost deposition of amorphous silicon. At this laboratory he further developed microcrystalline silicon as a novel and viable solar cell material.

The PV Laboratory in Neuchâtel under Arvind Shah subsequently demonstrated the concept of the microcrystalline-amorphous ("micromorph") tandem solar cell. This tandem solar cell combines the advantage of amorphous and microcrystalline silicon. The "micromorph" concept has become one of the main avenues followed by industrial laboratories worldwide to establish low-cost solar cell production.*

Arvind Shah was born on 4 December 1940 in Bombay, India. He attended the Swiss Federal Institute of Technology (ETH) in Zürich, where he graduated as an electrical engineer in 1964. In 1968, he completed his PhD in applied physics on the topic of memory applications of ferroelectrics. He was a lecturer and group leader of R&D at the Department of Industrial Research of the ETH Zürich from 1968 to 1975.

In 1975, he founded and co-directed the Centre for Electronics Design and Technology (CEDT) at the Indian Institute of Science in Bangalore. CEDT is now one of India's leading University Centres in the field of Electronics. It has a strong industrial orientation.
In 1979, Arvind Shah was appointed Professor at the University of Neuchâtel in Switzerland, where he set up the Photovoltaics Research Laboratory (PV Lab Neuchâtel) as a part of the Institute of

** Excerpt from the Becquerel Prize diploma 2007*

Microtechnology (IMT).

PV Lab Neuchâtel has done pioneering work in the establishment of low-cost production methods for solar cells based on silicon. In 1987, PV Lab introduced a novel plasma-assisted deposition method called "VHF deposition", permitting a significant increase in the deposition rate for thin-film silicon layers. In 1994, PV Lab Neuchâtel introduced microcrystalline silicon deposited by VHF plasma and with very low oxygen content as a novel photovoltaically active material for use as absorber layer within thin-film solar cells. Since 2003, VHF deposition has been adopted by many industries in Europe, the USA and Japan.

PV Lab Neuchâtel also performed significant work on the development of transparent conductive oxides as contact layers for solar cells. At PV Lab Neuchâtel, zinc oxide layers with a very high degree of texturing were developed; these permitted an enhanced light-trapping effect within the solar cells. PV Lab Neuchâtel has also been active in demonstrating novel methods for the design and fabrication of lightweight, low-cost flexible solar cells.

In recent years at PV Lab Neuchâtel, special emphasis is increasingly being given to (a) high-efficiency solar cells, (b) transparent contact layers and other layers for light trapping and light management within solar cells, (c) all fabrication steps in solar module production, (d) solar module testing and (e) architectural integration of photovoltaics.

Since 1987, Arvind Shah has been a part-time professor at the EPF Lausanne, Switzerland. In October 2005, he retired from his position as head of the PV Lab and professor at the University of Neuchâtel and EPFL. Since then, he has been active as a scientific consultant to the PV Lab and to various industries in Europe, India and the United States.

Arvind Shah is the author or co-author of more than 250 papers in scientific journals.

He was also the initiator, main contributor and editor of two books:

- "Thin-Film Silicon Solar Cells", published by the EPFL Press in 2010
- "Solar Cells and Modules" published by SPRINGER in 2020

Arvind Shah was awarded the Swiss Solar Prize, together with Johannes Meier in 2005.

2006

PROF.
RICHARD M. SWANSON

received the Becquerel Prize in 2006 for his ground-breaking work on high-efficiency silicon solar cells. The prize was awarded on the occasion of the European Photovoltaic Solar Energy Conference in Dresden, Germany.

Prof. Swanson developed record-setting silicon solar cells, first during his long career at Stanford University and later at the company SunPower, of which he was the founder and president. His group at Stanford achieved 23 % efficiency on large area silicon cells and 28% under concentrated light. Prof. Swanson's industrial cells powered the winning car of the 1993 Solar Challenge and NASA's unique high-altitude solar-powered airplane. His recent success is the establishment of a company which produces the highest efficient commercial PV modules. Furthermore Dr. Swanson published more than 150 articles. He combines in an exemplary way outstanding science and industrial leadership.*

Richard Swanson was born in Davenport, Iowa in 1945. He received his BSEE and MSEE from Ohio State University in 1969 and then began dissertation research as a National Science Foundation Fellow at Stanford University. His research into the modelling and fabrication of CMOS integrated circuits for micro-power applications resulted in the theory and first published experimental data on threshold adjustment by ion-implantation, which is now a common industrial practice that enables low-voltage, battery powered electronics. He also developed the first theory on the operation of MOS transistors in the "weak inversion" regime. His paper, "Ion-implanted Complementary Transistors in Low-voltage Circuits", jointly authored with Prof. Meindl, was awarded classic paper status by the Journal of Solid State Circuits in 2003 as one of the ten most cited papers since the inception of the journal in 1966.

After receiving the Ph.D. in 1974, he received an IBM post-doctoral fellowship at Stanford University to study techniques for solar-electric power

** Excerpt from the Becquerel Prize diploma 2006*

generation. In 1976, he joined the faculty at Stanford as assistant professor of Electrical Engineering and obtained funding from the Electric Power Research Institute to investigate thermophotovoltaic energy conversion for solar applications. Since then, he has been actively involved in photovoltaic research and industrialization. He was promoted to Associate Professor in 1982.

At Stanford Prof. Swanson supervised 13 doctoral students, many of whom are active in the photovoltaics industry. His areas of research have generally involved investigation into the semiconductor properties of silicon relevant for better understanding the operation of silicon solar cells. This has included studies of heavy doping effects, surface recombination, minority carrier transport, gettering, defect recombination kinetics, Auger recombination, and light-trapping. These studies have helped pave the way for steady improvement in silicon solar cell performance. Prof. Swanson and his group conceived and developed the point-contact solar cell. Laboratory version of these cells achieved 28 percent conversion efficiency in concentrator cells and 23 percent large-area one-sun cells.

In 1991 Prof. Swanson resigned from his faculty position to devote full time to SunPower Corporation, a company he founded to develop and commercialize cost-effective photovoltaic power systems. In its early days, SunPower solar cells powered Honda to victory in the 1993 World Solar Challenge, and powered NASA's high altitude solar powered airplane, Helios, to 96,500 feet, a record altitude for any non-rocket aircraft. SunPower received the NASA Public Service Award for its contribution to the Helios program. These record-setting cells received the IR100 award in 1995. Prof. Swanson retired from SunPower in 2012.

Prof. Swanson has received widespread recognition for his work. In 2002, he was awarded the William R. Cherry award by the IEEE for outstanding contributions to the photovoltaic field. He was elected a Fellow of the IEEE in 2008 and a member of the National Academy of Engineering in 2009. He received the 2009 Economist Magazine Energy Innovator Award. In 2010, he was awarded the IEEE Jun-ichi Nishizawa Medal for the conception and commercialization of high-efficiency point-contact solar cell technology, and in 2011 the Karl Boer Solar Energy Medal of Merit Award.

2006

DR.
DIETER BONNET

received the Becquerel Prize as one of the main pioneers of solar cells derived from II-VI compounds. Dieter Bonnet has committed his whole professional life to their development and promotion. The prize was awarded in 2006 on the occasion of the World Conference on Photovoltaic Energy in Hawaii, USA.

From the 1960s onwards, he was one of Europe's leaders in the field and did not vacillate when the world's PV policy was less supportive. Today's commercial success proves him right. Dr. Bonnet started his career in 1965 at the Battelle Institute in Frankfurt, Germany. In 1970, he developed the world's first CdTe/CdS thin-film solar cells in the presently known configuration and in 1972 he achieved an AM0 efficiency of 6%. In 1993, he created the successful solar firm ANTEC.

Dieter Bonnet has initiated SOLARPACT, a global network that connects research groups and industrial units to promote the technology of photovoltaic modules based on CdTe and related components towards a cost-competitive mass production and is currently the coordinator of it.*

Dieter Bonnet was born on May 27, 1937, in Stuttgart, Germany. He received his master degree at the University of Frankfurt in 1961, followed by his Ph.D. in 1963 on photoelectric properties of organic materials.

Dr. Dieter Bonnet started his professional career in 1965 at the Battelle Institute in Frankfurt, Germany, where he quickly rose to head of the Department of Solid State Physics. He dedicated many years to R&D in photovoltaic thin-film technologies, making significant advancements to CdSe, CdS and CdTe starting in 1968.

When the Battelle Institute was closed in 1993, Dieter Bonnet and other employees initiated a buyout from the institute, making him a co-founder and shareholder of ANTEC GmbH, out of which grew

** Excerpt from the Becquerel Prize diploma 2006*

the solar firm ANTEC Solar in Arnstadt, Thuringia. As head of the Solar Energy Department of ANTEC, Dieter Bonnet continued the development of the CdTe technology, eventually bringing it to commercial viability. This enabled ANTEC Solar to start the operation of the worldwide first commercial CdTe thin film solar production in 2001.

In June 2001, in recognition of his contributions to the industry and the establishment of the first solar factory in Arnstadt, the City Council of Arnstadt named a street after him, “Dr.-Bonnet-Weg”. Later, numerous solar companies followed the example of ANTEC Solar and settled in Arnstadt.

During his time with ANTEC, Dieter Bonnet joined together the European scientific CdTe community and became coordinator of several European CdTe research projects funded by the EU Commission.

After his retirement, he did not rest but remained as active as before. As an advisor, he supported the creation of CTF Solar as the successor company of the ANTEC group. His expertise and guidance were widely sought by scientists and engineers alike, and he maintained active involvement in consulting for European and American research groups for as long as his health allowed. Dieter Bonnet passed away in November 2016.

2005

PROF.
JOACHIM LUTHER

received the Becquerel Prize for his outstanding contributions in the field of photovoltaics through successful leadership of the Fraunhofer Institute for Solar Energy Systems ISE, in selecting and organizing R&D on the most promising topics in silicon, III-V solar cells, concentrators, thermophotovoltaics and organic cells. The prize was awarded in 2005 on the occasion of the European Photovoltaic Solar Energy Conference in Barcelona, Spain.

Already in the 1970s, Joachim Luther outlined the important role of renewables in a future energy system in publications. Prof. Luther has assumed leading positions in major international solar associations and served in high level government advisory councils. He earned great merits for promoting collaborations between European PV industries and research institutions.*

Joachim Luther was born on March 31, 1941 in Hanover, Germany. He received his PhD in atomic physics from the University of Hanover in 1970. From 1974 to 1993, he was Full Professor of Applied Physics at the University of Oldenburg, Germany. Since 1993, he has held the position of Full Professor of Solid State Physics and Solar Energy at the University of Freiburg, Germany, while also serving as Director of the Fraunhofer Institute for Solar Energy Systems ISE in Freiburg, Germany until 2006. In 2008, Prof. Luther became Founding Director and Chief Executive Officer of the newly established Solar Energy Research Institute of Singapore (SERIS). Prof Luther has been a leading member of numerous important national and international organisations.

Joachim Luther has nearly forty years of experience in research and development of renewable energies. His main areas of focus is on solar electricity generation, solar and energy efficient buildings and sustainable energy systems based on renewable energy sources.

** Excerpt from the Becquerel Prize diploma 2005*

In photovoltaic energy conversion, his main focus was on silicon wafer-based solar cells and modules, photovoltaic energy converters under optical concentration (CPV) based on III-V semiconductors and organic photovoltaics. In PV system technology, his activities on smart power electronics (including the use of novel semiconductors) and the field of energy weather forecasting may be highlighted. Fraunhofer ISE has been and continues to be an important industry-oriented R&D institute in these fields and holds many world records in efficiency and cost-reducing technologies.

At the University of Oldenburg under Joachim Luther, the autonomous energy laboratory "Energielabor" was realised in 1982. Under his direction, Fraunhofer ISE moved into a modern, energy-efficient laboratory building in 2001 and in 2006 a complete R&D production line for silicon wafer PV cells (industrial size) was inaugurated at Fraunhofer ISE.

In 2005, Joachim Luther recieved the German Environmental Award of the Deutsche Bundesstiftung Umwelt and the International Rheinland Prize for Environmental Protection. In 2006, he was awarded the Fraunhofer Coin "for outstanding merits within the Fraunhofer society". In 2008 he was recognized by TIME magazine as Hero of the Environment, and in 2009, he won the Achievement through Action Award of the International Solar Energy Society (ISES).

Since 2006, Joachim Luther has been Professor Emeritus at the University of Freiburg and Director Emeritus of the Fraunhofer Institute for Solar Energy Systems ISE, Freiburg.

2004

PROF.

MASAFUMI YAMAGUCHI

Awarded with the Becquerel Prize in 2004 on the occasion of the 19th European Photovoltaic Solar Energy Conference in Paris / France.*

Professor Emeritus and Invited Research Fellow at the Toyota Technological Institute, former Director of the Super High Efficiency Photovoltaics Research Centre and the Smart Energy Technology Research Centre. Masafumi Yamaguchi was born on February 3 1946 in Hokkaido, Japan. He received his B.S. and Ph.D. degrees from Hokkaido University in 1968 and 1978, respectively.

In 1968, he joined the NTT Electrical Communications Laboratories, where he was engaged in research on radiation damage to semiconductor devices, blue light emitting diodes, MBE, heteroepitaxy on Si, III-V compound solar cells and materials, photonic functional devices and integration working as a supervisor and head of section.

Dr. Yamaguchi was the first to demonstrate the superior radiation-resistance of InP materials and solar cells and discovered the light-illumination-enhanced annealing phenomena of radiation damage to InP. His group also developed high-efficiency and radiation-resistant InP cells with efficiencies of 17% at AM0 and demonstrated the great potential of InP cells for space applications in 1983. The first satellite using InP cells (the lunar mission of the Japanese scientific satellite MUSES-A) was launched in early 1990. His group also proposed a double-hetero structure tunnel junction to realise a high performance and stable multi-junction cell interconnection and a 20.2% AlGaAs/GaAs 2-junction solar cell in 1987. They developed high-efficiency (20% at AM1.5G) GaAs solar cells fabricated on Si substrates in 1989 and demonstrated space flight experiment using GaAs-on-Si cells in 1994.

In 1994, he moved to his current Institute. He has contributed to the achievement of high efficiency InGaP/ GaAs/InGaAs and InGaP/InGaAs/

** Excerpt from the Becquerel Prize diploma 2004*

Ge 3-junction cells with efficiencies of 37.9% (1-sun AM1.5G) and 44.44% (300-sun AM1.5). Both efficiencies were previous world records. He has also contributed to the development of high-efficiency InGaP/GaAs/Ge 3-junction solar cell modules (area of about 7,000cm2) with an outdoor efficiency of 28.0% in collaboration with Daido Steel, Daido Metal and Sharp Co. Recently, he is conducting R&D for solar-powered vehicles and high-efficiency Si tandem solar cells. His group has also achieved a new world record efficiency of 33.7% with InGaP/GaAs/Si 3-junction tandem solar cell module with an area of 775 cm2.

Regarding his activities in academic societies, Dr. Yamaguchi has contributed to organize the international PV conferences. He was Vice General Chair, Vice Programme Chair and Program Chair of the 1st, 2nd and 3rd World Conference on Photovoltaic Energy Conversion (WCPEC) in 1994, 1998 and 2003, respectively. He was also the General Chair of the 17th International Photovoltaic Science and Engineering Conference (PVSEC-17) in 2007. He has also been the Project Leader of the Japanese PV R&D Project under the NEDO (New Energy and Industrial Technology Development Organization) and the Research Supervisor of the Area for Clean Energy Generation by using Solar Energy under the JST (Japan Science and Technology Agency). He is now the Chairman of the Review Committee of the Japanese R&D Programme of the NEDO.

He has published more than 450 original papers and presented at more than 350 international conferences. He received the William Cherry Award from the IEEE in 2008, the PVSEC Award in 2011 and the WCPEC Award in 2014 in addition to the Becquerel Prize in 2004 for his outstanding contributions to the science and technology of the photovoltaics, especially high-efficiency multi-junction solar cells, concentrator solar cells, space solar cells, fundamental studies on imperfections in semiconductors.

2003

DR. RER. NAT.
WOLFGANG PALZ

Awarded with the Becquerel Prize in 2003 on the occasion of the 18th European Photovoltaic Solar Energy Conference, jointly organised with the 3rd World Conference on PV Technology in Osaka / Japan.*

Wolfgang Palz holds a Ph.D. in Physics from the University of Karlsruhe, Germany. His thesis covered infrared photovoltaic effects in CdS.

He was a Professor of Electronics in Nancy, France, before becoming head of the French PV Programme in the early 1970s on behalf of CNES, the National Space Agency in Paris.

In 1973, he was the organiser of the PV section of the UNESCO Congress "The Sun in the Service of Mankind" in Paris. Later, UNESCO published his book "Solar Electricity" in 7 languages.

In 1974, as a French delegate, he participated in the drafting of the Commission's first Renewable Energy Programme where he ensured that PV had a prominent position. From 1977 onwards, he directed that Programme at the Commission in Brussels for 20 years, overseeing a total budget of well over 500 million Euro. The programme played a central role in all European development and accompanied a market growth from almost nothing to 9,000 million Euro.

The focus of PV development was on silicon and the whole family of the 2-6 compounds. To prepare the markets, system technology was given due attention early on. Integration into buildings was promoted and by 1983, a total of 1 MW of PV power had been developed all over Europe as part of the European programme. In 1977, Dr. Palz initiated the European PV Conferences, which became one of the most important conferences in the world. In the mid-1980s, he initiated EPIA, the European PV Industry Association.

** Excerpt from the Becquerel Prize diploma 2003*

After organising, on behalf of the European Commission, the Congress "Solar Energy for Development" in Varese, Italy in 1979, bringing together 80 Government delegations from 4 continents, Wolfgang Palz proposed "Power for the World" in early 1990s, targeting the rural poor. From 1997 to 2002, he was in charge of the Commission's renewable energy (RE) projects for aid to developing countries.

In 1997, he was one of the initiators of the EU White Paper setting RE targets for 2010. From 2000 to 2002, he was a member of the Bundestag Commission for Energy in Berlin, which proposed energy targets for Germany up to 2050.

For his role in wind energy, he was named Wind Energy Pioneer by the British Wind Energy Association in 1996 and was awarded the EWEAS' Poul la Cour Prize in 2003. Also in 2003, he was awarded the Order of Merit of the Federal Republic of Germany.

2001

PROF.
VIACHESLAV ANDREEV

Awarded with the Becquerel Prize in 2001 on the occasion of the 17th European Photovoltaic Solar Energy Conference in Munich / Germany.*

Prof. Viacheslav Andreev, born 18.09.1941, in Astrakhan, USSR, Russian citizen. Professor and Head of the Laboratory of the A. F. Ioffe Physico-Technical Institute.

Field of Investigations

Physics and technology of the devices based on III-V heterostructures such as solar cells, thermophotovoltaic cells, hetero lasers, light emitting diodes and radiation detectors.

The Main Achievements

He obtained for the first time, AlGaAs/Ga heterostructures in early 1967, high-voltage (900V) diodes and light emitting diodes (LED) based on these heterostructures. In 1976, he achieved the LED external quantum efficiencies of: 40-45% for wavelengths of 800-900 nm and 10% for the wavelength of 670 nm.

At the end of 1969, he invented (with Zh. Alferov) double heterojunction AlGaAs/GaAs/AlGaAs lasers and obtained for the first time the laser generation in continuous mode at room temperature. He invented AlGaAs/GaAs solar cells (at the end of 1969). He developed and promoted the technology of high scale production of space solar cells in NPO “Kvant”. In 1994 he achieved efficiencies of 24.7% (AMO, 100 suns) and 27.6% (AM 1.5, 140 suns) in single junction cells and 32-33% (AM1.5D, 100-300 suns) in tandem cells.

He designed (with V. Rumyantsev) concentrator photovoltaic modules based on high efficiency single and tandem solar cells with point and linear focus concentrators. He designed high efficiency cells for thermophotovoltaic generators based on fuel-fired emitter. He designed the isotope powered batteries and radiation detectors.

** Excerpt from the Becquerel Prize diploma 2001*

Scientific Biography

- **1963** Graduated from St. Petersburg Electotechnical University
- **1969** PhD obtained at A.F. Ioffe Institute
- **1972** Awarded the National "Lenin Prize" for the R&D of heterostructures devices
- **1979** Doctor of Sciences Degree obtained at A.F. Ioffe Institute
- **1981** Head of Photovoltaics Laboratory of A.F. Ioffe Institute
- **1983** Title of Professor
- **1984** Head of Photovoltaic Section in the Council at Russian Academy of Sciences
- **1986** Obtained the National "State Prize" for the R&D of the optoelectronic devices
- **1996** Obtained the "A.F. Ioffe Prize for Semiconductor Physics"
- **1999** Corresponding (foreign) member of the Spanish Royal Academy of Engineering
- **2001** Obtained the "European Becquerel Prize" for the R&D in the field of Photovoltaics

2000

FREDERICK C. TREBLE

Awarded with the Becquerel Prize in 2000 on the occasion of the 16th European Photovoltaic Solar Energy Conference in Glasgow, Scotland / United Kingdom.*

Fred Treble was one of the pioneers of photovoltaics. After a distinguished career in aerospace engineering, he joined a group of Britain's Royal Aircraft Establishment (RAE) in 1959 to investigate new means of generating electricity. Photovoltaics proved to be the most promising, marking the beginning of his long involvement with PV technology development and application.

In 1960, Treble was appointed head of the Solar Cell Group in the Space Department at RAE, where he remained until his retirement in 1977. During his time at RAE, he was responsible for all aspects of photovoltaic systems for satellites and for managing R&D contracts on crystalline silicon and cadmium sulfide (CdS) cells and modules.

Upon retiring, Treble established himself as a consultant and worked closely with the European Commission programmes on the selection and monitoring of PV R&D and demonstration projects. He collaborated with the Joint Research Centre (JRC) in Ispra to develop test and measurement procedures and his work on the European PV Pilot projects emphasized the importance of design qualification tests. The Results of his efforts were adopted as international standards at that time.

Treble remained active in his later years, continuing to contribute to the solar energy community. He was highly involved in the Solar Energy Society (UK-ISES) and the British Photovoltaic Association (PV-UK), serving on committees and giving lectures to share his knowledge and promote the further development of PV technologies.

** Excerpt from the Becquerel Prize diploma 2000*

Fred Treble passed away in August 2010, leaving behind a rich legacy of innovation and an extraordinary career that played a crucial role in advancing photovoltaics from its early experimental stages to an essential technology with global reach.

1998

DR.
WALTER SANDTNER

Awarded with the Becquerel Prize in 1998 on the occasion of the 15th European Photovoltaic Solar Energy Conference, jointly organised with the 2nd World Conference on PV Technology in Vienna / Austria.*

Dr. Walter Sandtner was born in Rosenheim (Germany) on October 12, 1943. He studied law, including international law, at the University of Munich, the Ecole Nationale d'Administration (ENA) in Paris and at the Harvard University and Fletcher School of Law and Diplomacy in Cambridge, Massachusetts, USA.

After spending four years in the Bavarian State Ministry of Finance in Munich and working with the Commission for the Reform of the German Constitution, Bonn, he joined the Federal Ministry for Research and Technology (BMFT) in Bonn in 1974. In his early role, he was first responsible for overseeing European Research Organisations, including CERN, EMBL, ESO, OECD-IEA, OECD-NEA and Eurochemic. In May 1981 he became Scientific Attaché at the German Permanent Representation with the EU in Brussels.

From 1989 to 1996, he was the Head of the Division for Renewable Energies in the BMFT, where he elaborated several renewable energy programmes. The most prominent contribution was the "Thousand Roofs PV Programme", which came into force on July 1st, 1990. At the time, this was the most significant photovoltaic program worldwide.

Though called the "thousand roofs" program for simplicity, the initiative supported more than 2,000 roof-installed PV systems across Germany. The programme met with considerable interest of scientists, research institutions, firms and the public at large. There was hardly any national or international conference where this programme did not play a major role. The later "100,000 Roofs PV Programme", introduced on the initiative of German Federal Deputy Mr. Scheer, built on the success of

** Excerpt from the Becquerel Prize diploma 1998*

the “Thousand Roofs” program.

Dr. Sandtner also contributed substantially to the “250 MW Wind Programme”, which was at the origin of the German wind power development with an installed capacity in 2004 of more than 13.000 MW. Furthermore he elaborated the “ELDORADO Programme”, under which PV and wind power plants in eight selected developing countries were supported, among them Brazil, China and Indonesia. In September 1996 he was appointed Head of the Division for International Nuclear Organisations. This Division was transferred in December 1998 to the Federal Ministry of Economics and Labour.

1997

PROF.
ADOLF GOETZBERGER

Awarded with the Becquerel Prize in 1997 on the occasion of the 14th European Photovoltaic Solar Energy Conference in Barcelona / Spain.*

Goetzberger received his Dr. rer. nat. degree in Physics from the University of Munich in 1955. He spent 10 years in the United States, with five years at the Shockley Transistor Laboratory in Palo Alto, California and five more at Bell Telephone Laboratories in Murray Hill, New Jersey. During this time he published fundamental work about the Si-SiO2- interface. In 1968, he returned to Germany to accept the position as Director of the Fraunhofer Institute for Applied Solid State Physics, which he modernized and expanded significantly. In 1981, he founded the Fraunhofer Institute for Solar Energy Systems, which became one of Europe's leading solar energy research institutions. The institute is engaged in a broad spectrum of work in most aspects of solar energy conversion. Solar cell technology, solar materials research, thermal conversion, systems engineering and energy storage are the main activities.

Although he retired as director of the institute in 1993, he remained actively involved in publishing and advising within the solar energy sector.

Scientific achievements: Development of fluorescent solar collectors, first theory of light trapping in thin silicon solar cells by diffuse reflectors, development of transparent insulation for buildings, planning and construction of the first self-sufficient grid independent solar house in Germany in 1992. He held numerous patents in photovoltaics, thermal solar energy, daylighting, and systems technology.

Prof. Goetzberger was President of the International Solar Energy Society (ISES) from 1991-1993 and remained on the Board of the Society until 1999, since 2000 as an Honorary Director. From 1993 to 1997, he was President of the German Solar Energy Society (DGS) and he later became the Honorary President of this organization. He was also a fellow of IEEE and

**Excerpt from the Becquerel Prize diploma 1997*

held positions on the International Advisory Boards of all three International Photovoltaic Conferences. Additionally, he was a member of the EU High Level Advisory Board on Photovoltaics.

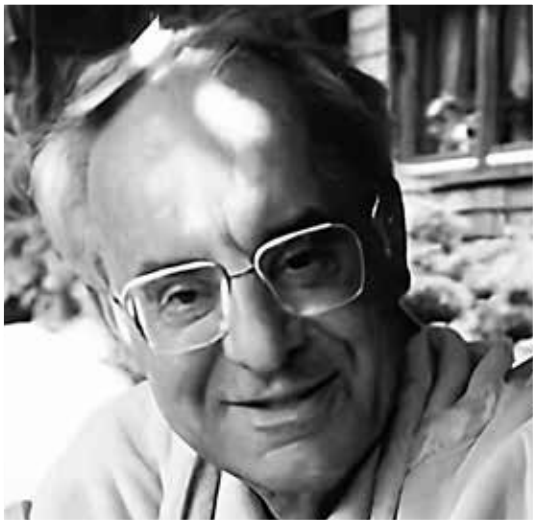
In 1995, Prof. Goetzberger was awarded an Honorary Doctorate (Doctor Honoris Causa) from Uppsala University in Sweden. His numerous accolades include the German Cross of Merit First Class and the Medal of Merit of the State of Baden-Württemberg.

He was honored with a number of international awards:

- **1983** the J. J. Ebers Award of the IEEE-Electron Devices Society
- **1995** the Daniel Farrington Award of the International Solar Energy Society
- **1997** the Karl W. Boer Solar Energy Medal of Merit Award, the Alexandre Edmond Becquerel Prize of the European Commission, and the William R. Cherry Award of the IEEE.

Prof. Adolf Goetzberger passed away in February 2023, leaving behind an extraordinary legacy of contributions to the field of solar energy.

1995



DR.
KARLHEINZ KREBS

Awarded with the Becquerel Prize in 1995 on the occasion of the 13th European Photovoltaic Solar Energy Conference in Nice / France.*

Karlheinz Krebs stood out in the history of the European Photovoltaics as one of its heroes, committing his career and his life to the promotion of this noble task, even when his direct working environment was unfavourable or hostile.

Born in Freiburg, Germany, he concluded his studies in physics there, culminating in a Ph.D. After a postdoctoral position at the Imperial College in London and a professorship at UCLA in California. However, in 1960 he returned to Europe and embarked on a 34-year career at the EU Commission's Joint Research Centre (JRC) in Ispra, Italy. Initially, the JRC was primarily a nuclear research center, and his early work focused on neutron physics, an area in which he excelled, earning 7 patents and publishing 25 scientific articles.

By the early 1970s, Dr. Krebs shifted his attention toward the development of solar energy. His early efforts centered around solar concentrators for photovoltaics, where he led a team of researchers in building and experimenting with practical systems. True to his nature, he did not merely engage in theoretical studies but actively worked to build and implement real-world solutions.

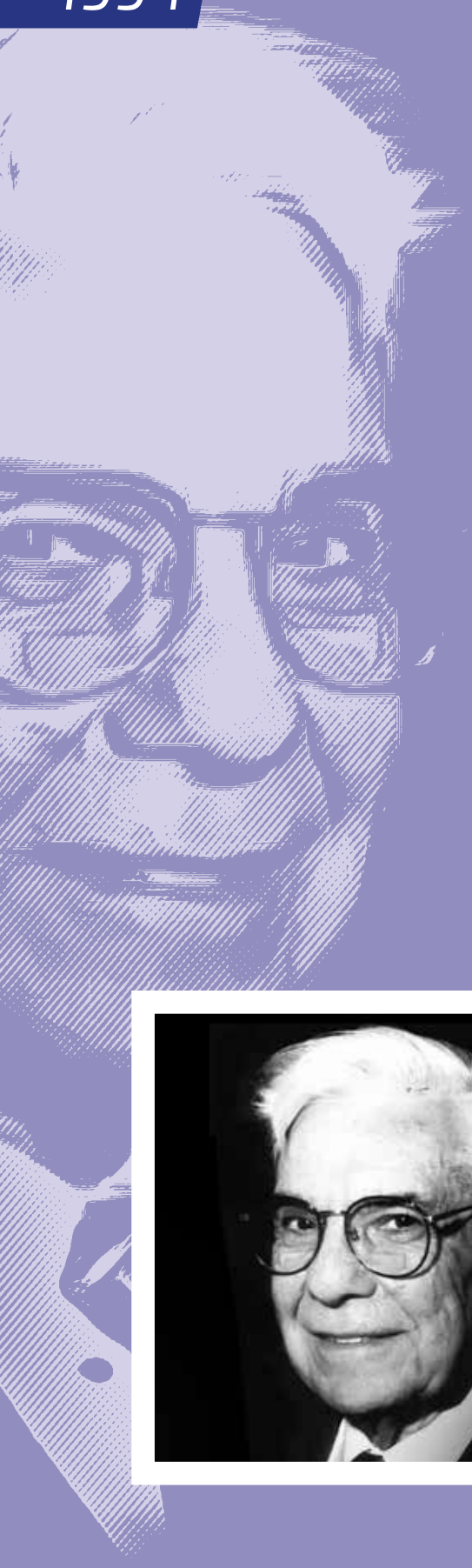
By the mid-1970s, Dr. Krebs had laid the foundation for the European Solar Test Installation (ESTI), where he played a pivotal role in developing standards and testing methodologies for photovoltaic cells and modules. ESTI became a pioneering institution not only in Europe but also on the global stage.

In 1974, the Commission's first Renewable Energy programme was drafted. Karlheinz Krebs and Wolfgang Palz were the only delegates who recognized the importance of photovoltaics and took the initiative to draft that section of the program.

** Excerpt from the Becquerel Prize diploma 1995*

Karlheinz Krebs received the Becquerel Prize for his outstanding merits for European PV, just a few months after he passed away in 1995.

1994



DR.
MORTON PRINCE

Awarded with the Becquerel Prize in 1994 on the occasion of the 12th European Photovoltaic Solar Energy Conference in Amsterdam / The Netherlands.*

Morton B. Prince was born in Philadelphia, Pennsylvania on April 1, 1924, and attended the school in the same city. He received his Bachelor of Arts degree in Physics from Temple University in 1947, followed by a Ph.D. in Physics from the Massachusetts Institute of Technology (MIT) in 1951. After receiving his Ph.D., he joined the Bell Telephone Laboratories (BTL) in Murray Hill, New Jersey, working under Dr. William Shockley, carrying out studies in the properties of germanium and silicon, and analyzed the physical properties of the new grown p-n junction germanium transistors. In 1953, he started to work on semiconductor devices in Dr. Jack Morton's device development department, where he participated in the analysis and experimental development and improvement of the newly "invented" Bell Solar Battery. He developed a diffusion technique for producing junctions in silicon without compromising the material's minority carrier lifetime (Patent No. 2, 790, 940). This allowed him to develop an extremely efficient silicon (conductivity modulated) power rectifier using a p-i-n structure, for which he gained significant recognition. Among significant devices he developed were a high frequency silicon diode and a family of diffused silicon Zener diodes. His paper entitled "Silicon Solar Energy Converters" published in May 1955, in the Journal of Applied Physics, remains the most relevant to photovoltaics.

In 1956, he joined the Hoffman Electronics Corporation, Semiconductor Division, initially as Director of Research and Development, where he helped to commercialize the products he had been involved with at BTL.

This department started with five members and grew to approximately 100 technical personnel (including Martin Wolf, Gene Ralph, Hans

** Excerpt from the Becquerel Prize diploma 1994*

Rauchenbach and Bernd Ross) within four years and included work on semiconductor materials and techniques, semiconductor device development and semiconductor device applications. It was in 1957 that his organization showed the Vanguard Satellite engineers the potential for using solar cells for space power. Convinced of their utility, the engineers incorporated Hoffman (the only producer at that time) solar cells into the first space satellite powered by solar cells, launched in March 17, 1958.

Hoffman developed a special sized cell for this application and produced solar cell modules for many satellites and probes after that time. In 1960, Dr. Prince became Division Manager and Corporate Vice-President and was responsible for overall administrative, technical, marketing, manufacturing and financial operations of the Semiconductor Division, encompassing two separate plants, employing more than 1,000 employees. The solar cell efficiency grew from 8% in 1957 to 14% in 1960, by incorporating many new techniques in both material production and device design. Probably, the most important development was the gridded contact on the front of the cell. In 1960, he co-organized the first Photovoltaic Conference in Los Angeles, bringing together researchers and engineers from industry, universities and government laboratories to develop standards for the measurement of solar cells. This preceded the start of the regular IEEE Photovoltaic Specialists Conference.

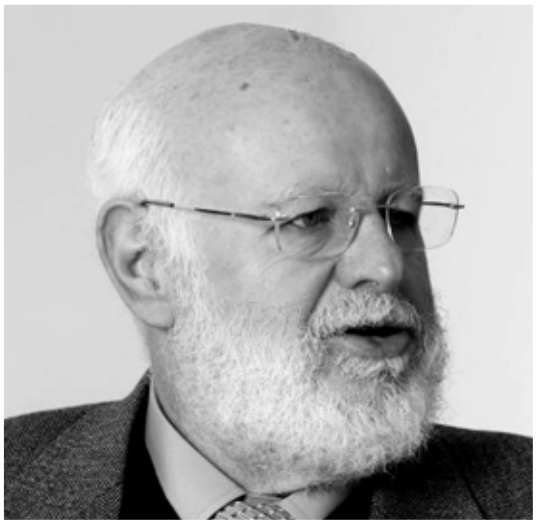
After leaving Hoffmann, he became involved in other activities including his own organization that developed and produced photon counting equipment. However, in 1975, when the Energy Research and Development Administration (ERDA) (later the Department of Energy) was created, he was invited to join the organization to lead its photovoltaic section. In this role he was responsible for planning, funding and monitoring the Federal Photovoltaic Program. The funding of this program grew from $5,000,000 in 1975 to $150,000,000 in 1980 and he stimulated many successful solar cell developments by giving technical and managerial guidance. During the 1980s, with a decreasing interest in solar energy in the U.S. government, the program's budget was significantly reduced, and despite his best efforts, many laboratories and researchers were lost to the program due to budget constraints. Dr. Prince retired from the program in 1993.

Dr. Prince was the editor of Volume 8 of "Advances in Solar Energy", published chapters in five books, authored fourteen peer-reviewed papers, presented thirty- five conference papers and gave twenty-eight invited talks. In addition to the Becquerel Prize of the European Commission in 1994, he was awarded the Marconi Premium of the British Institute of Radio Engineers in 1958 for a paper on solar cells.

In addition to his technical contributions, Dr. Prince served on numerous committees for organizations such as the Institute of Radio Engineers, American Institute of Aeronautics and Astronautics, WESCON, Institute of Electrical and Electronic Engineers and American Solar Energy Society.

Dr. Prince passed away in late 2022, leaving behind a legacy of pioneering work in photovoltaics and semiconductor research, as well as a profound impact on the field of renewable energy.

1992



PROF.
ANTONIO LUQUE

Awarded with the Becquerel Prize in 1992 on the occasion of the 11th European Photovoltaic Solar Energy Conference in Montreux / Switzerland.*

Prof. Antonio Luque, born in Malaga, Spain, in 1941, is Dr. Engineer in Telecommunication from the Technical University of Madrid. His doctoral thesis was in the field of lasers and he built the first laser in Spain in 1966. Later on, in 1969, he installed a semiconductor laboratory at his university, the first in Spain with the capacity manufacture devices. Since 1970, he has been Professor of Electronic Technology at the Technical University of Madrid, where he leads the Institute of Solar Energy which he founded in 1979, based in the Laboratory of Semiconductors.

Since 1975, Prof. Luque's research activity is mainly devoted to the photovoltaic conversion of solar energy. In 1976, he invented the bifacial cell. This cell was manufactured by Isofotón, a company he founded in 1981, which was one of the world's top ten and located in more than 40 countries. In addition, he has proposed the new mid-gap band solar cell and is working to demonstrate this concept experimentally. This concept might overcome fundamental efficiency limitations of conventional solar cells and has attracted numerous researchers around the world. He has published more than 200 scientific papers in English, as well as several books and holds 12 patents, 6 of them in exploitation.

Prof. Luque has obtained, among others, Spanish National Prizes for Technology Research in 1989 and for Technology Transfer in 2003, both awarded every two years by the King of Spain, the King James I Award to environmental research delivered by the Crown Prince in 1999 and the Alexander-Edmond Becquerel Prize in PV research, granted by the EC in 1992. He is member of the Royal Academy of Engineering of Spain since 1994 and Member of Honour of the Loffe Physico-Technical Institute of St. Petersburg since 2003.

** Excerpt from the Becquerel Prize diploma 1992*

1991

PROF. DR.-ING
WERNER H. BLOSS

Awarded with the Becquerel Prize in 1991 on the occasion of the 10th European Photovoltaic Solar Energy Conference in Lisbon / Portugal.*

Werner H. Bloss, born in 1930 at Winterbach near Stuttgart, Germany, studied Physics at the Universities of Tübingen and Stuttgart. In 1955, he joined the Institute of Gas Discharge Techniques and Photoelectronics at the University of Stuttgart. Already in his doctoral thesis he focused on unconventional energy conversion: thermionic converters. He later published his postdoctoral thesis as a book titled "Elektronische Energiewandler". From 1967 to 1970 he held a position as Visiting Professor at the University of Gainsville, Florida, USA, where he concentrated on optical image processing while maintaining an interest in energy conversion, particularly in renewable energies.

After returning from the United States, he was appointed in 1970 to the chair of his former Institute at the University of Stuttgart, which he renamed the Institute of Physical Electronics.

He started with a group of 15 people, and within a few years, he successfully established new research fields and formed close relationships in the national and international research scenery. The maxim of actions was always to initiate research activities that were beneficial to society. In this spirit, he focussed the Institute's efforts on optical and digital image processing with applications in medicine, diagnostics of spark ignition and combustion, contributing to the benefit of environment, and photovoltaics, especially thin-film solar cells for renewable energy use. Thanks to his initiative and dedication, the Institute gained high international reputation in all fields pursued by himself and his co-workers.

His attitude was not to remain in the ivory tower of pure science, but to cultivate excellent relations with industry and to promote technology transfer as essential.

** Excerpt from the Becquerel Prize diploma 1991*

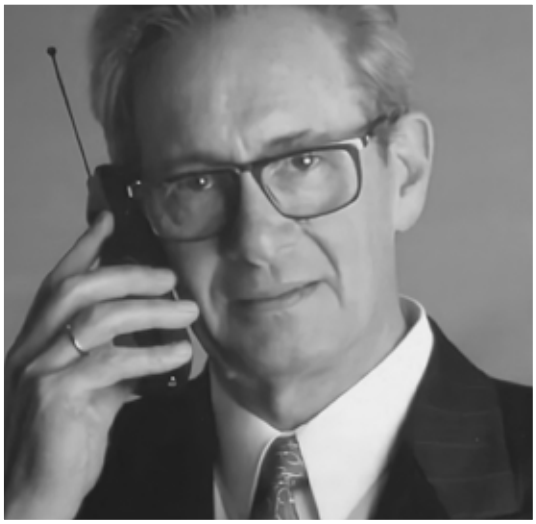
Under his directorship the Institute grew to 50 co-workers and the annual third-party income ranging between five to eight million CM.

In addition to his work at the Institute, Professor Bloss was a driving force behind several major initiatives. He was one of the initiators of the German-Saudi Arabian HYSOLAR project, which aimed at developing solar hydrogen production and use. He was also the founder and the first Director of the Center of Solar Energy and Hydrogen Research Baden-Württemberg, a foundation of public interest that later became one of the leading solar energy research centres in Germany.

In addition, Werner Bloss was an active advisor to a number of national and international boards.
His activities and his merits were honoured in 1989 with the Solar Price of the German section of ISES, in 1990 with the First Class Order of the Federal republic of Germany, and in 1991 with the Becquerel Price of the Commission of the European Communities.

In February 1995, Professor Bloss retired, attaining emeritus status. Sadly, he passed away in June 1995, leaving behind a legacy of significant contributions to the field of renewable energy and solar technology.

1989



PROF.

ROGER VAN OVERSTRAETEN

Awarded with the Becquerel Prize in 1989 on the occasion of the 9th European Photovoltaic Solar Energy Conference in Freiburg / Germany.*

Roger Baron Van Overstraeten, born 7.12.1937, in Vlezenbeek, Belgium, deceased, 29.4.1999, Leuven, Belgium.

Roger Van Overstraeten obtained his engineering degree in electronics and in mechanics from the Katholieke Universiteit Leuven (KU Leuven), Belgium, in 1960. That same year, he received a BAEF fellowship to study in the United States. In 1963, he obtained a Ph.D. in Physical Electronics from Stanford University. In 1965, Roger Van Overstraeten became a professor at the KU Leuven. He was the founder and director (until 1984) of the Laboratory for Electronics, Systems, Automation, and Technology (E.S.A.T.) at KU Leuven. 1984, he became President of the Interuniversity Microelectronics Laboratory (IMEC v.z.w.) in Leuven, Belgium.

Professor R. Van Overstraeten authored or co-authored more than 100 papers in scientific journals, mainly focusing on the fields of physical electronics and photovoltaic (PV) technology.

He also held positions as General Chairman or Technical Chairman of several International Conferences, was a fellow of IEEE (Institute of Electrical and Electronical Engineers, Inc.) and member of the Belgium Royal Academy of Sciences.

Additionally, he was a member of the Board of Directors of several companies.

** Excerpt from the Becquerel Prize diploma 1989*

- **1986** Insead Innovator Prize
- **1987** Honorary Doctoral Degree I.N.P.G., Grenoble, France
- **1989** Becquerel Prize
- **1991** Flanders Technology International Innovation Award
- **1994** Semi-Award
- **1999** IEEE Frederik Philips Award

BYLAWS
OF THE BECQUEREL PRIZE COMMITTEE

Status February 2022

1. The Alexandre Edmond Becquerel Prize was established in 1989 by the European Commission at the occasion of the 150th anniversary of Becquerel's classical experiment in which he discovered the photovoltaic effect. Its purpose is to honour scientific, technical or managerial merit in the development of photovoltaic solar energy, attained over a long period of continuous achievements, or very exceptionally, for some extraordinary invention or discovery. It is primarily a European Award but not restricted exclusively to European citizens.
2. The Prize is awarded periodically to a single individual. The prize cannot be awarded posthumously. The Prize cannot be shared nor given to an institution or team.
3. This periodicity is linked to the European Photovoltaic Solar Energy Conference, of one year, at whose opening the Prize shall be awarded in a solemn ceremony.
4. The Becquerel Prize is granted by the European Commission and awarded in the name of the European Photovoltaic community at the annual European Photovoltaic Solar Energy Conference. The Becquerel Prize Committee selects the individual to be honoured with the prize. The Committee must maintain the spirit of the prize, implementing the necessary modifications to the bylaws to insure in perpetuity the selection of appropriate candidates.
5. This committee is formed by: (a) all the past awardees, (b) the Chairperson of the European Photovoltaic Solar Energy Conference where the prize will be awarded, (c) one representative of the European Commission, (d) the organiser of the conference where the prize will be awarded.
6. The Committee is chaired by one of the past awardees. He/she must be elected by the Committee after the annual awards ceremony of the prize. His/her term will expire after the next awards ceremony. The Chairperson can be re-elected.
7. With the exception of changes of the bylaws any decision of the committee must be taken by the majority of votes among all members participating in the vote with the Chairperson's vote deciding in case of a tie between opposite options. Assemblies and voting can be held without physical presence, but the usual rules of information and debate held in assemblies with physical presence must be respected in all cases. Secret votes are forbidden for the committee members. Changes of the bylaws have to be approved by a two thirds majority of votes among all members participating in the vote. The chairperson announces the meeting of the committee which will normally be held at the annual European Photovoltaic Solar Energy Conference after the awards ceremony.
8. The Becquerel Prize consists of a diploma including a short notice of the Alexandre Edmond Becquerel germinal achievement in photovoltaics. It must also mention the edition of the Prize, the awardee's name and affiliation and a mention of the award motivation. If possible it must be complemented by a check. The diploma will be signed by a Commission Representative and the chair of the Becquerel committee.
9. The prize is announced publicly for submission of proposals for new candidates together with the announcement of the conference. Proposals should be addressed to the awards chair. The announcement to the PV community shall be made in a broad way; at least via the website of the conference where the prize is granted and via the website of the Becquerel Prize Committee. Proposals of new candidates have to be accompanied by a justification including a list of scientific and technical publications and/or achievements in the area of photovoltaics as well as a curriculum vitae of the proposed candidate. The Becquerel Committee screens the proposals and identifies by means of the

procedure outlined in section 10 candidates who may in principle become Becquerel Prize awardees. In the context of these bylaws these persons are called "nominees".

10. Approximately five months before the Prize ceremony the awards chair sends all received proposals for new candidates including the additional information (section 9) to the Prize committee for evaluation. All proposals that are supported by at least 25% of the members of the Committee participating in the voting are regarded as nominees and are added to the existing list of nominees, as carried forward from the preceding year. In this procedure each individual member of the committee may vote for one or several proposals submitted according to section 9. The awards chair will distribute the updated list of existing nominees before each Committee meeting (section 7) to all Committee Members.
11. Approximately four months before the Prize ceremony the awards chair initiates a first vote. The members of the committee may vote for three different nominees from the list of nominees (section 10). Those nominees who receive zero votes during this procedure are taken off from the list of nominees. If no group of favorites emerges from this vote, then, upon the decision of the chairperson of the committee, the first vote can be repeated once, with a list retaining the first half of the best ranked nominees.
12. Approximately three months before the Prize ceremony the awards chair prepares a list for a second voting. This list contains candidates who have received the highest number of votes in the first voting process. The chair will then submit this list to the committee for the second vote. The procedure for the voting is laid down in section 7; the criteria are defined in section 1 and 9.
13. In the case that one candidate of the second voting process receives the majority of the votes cast he/she is the winner of the Becquerel Prize. If none of the candidates receives the majority of the votes in the second voting a third voting will be initiated by the awards chair. For the third and final vote the awards chair prepares a list with the two candidates (or more if there are ties) who have received the highest number of votes in the second voting process. The chair will then submit this list to the committee for the final vote. The procedure for the voting is laid down in section 7; the criteria are defined in section 1 and 9.
14. The ceremony should consist of a Laudatio of the awardee. The Laudator shall be chosen by the Becquerel Prize Committee Chairperson, usually at the suggestion of the awardee, followed by the offering of the award itself, by a Commission Representative, and finally by a keynote speech given by the awardee.
15. The awardee will be notified of his/her selection by a letter jointly signed by a Commission Representative and the Becquerel Prize Committee Chairperson at the latest two months before the ceremony. At this time the awardee's name should be published on the websites of the Becquerel Prize Committee and of the Conference. Moreover, the awardee and his or her lecture should be announced in the printed conference program.

IMPRESSUM

Editor

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www.becquerel-prize.eu

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European Commission

EU PVSEC

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23- 27 September 2024 in Vienna, Austria.

www.photovoltaic-conference.com