UNIVERSITEIT VAN PRETORIA
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Faculty of Natural and Agricultural Sciences
Fakulteit Natuur- en Landbouwetenskappe
Lefapha la Disaense tša Tlhago le Temo

Invitation

Public Lectures on
Solar Energy and Photosynthesis

www.up.ac.za

This public lecture series will bring together cutting-edge fundamental science of solar energy conversion and practical implementation of solar energy technologies in Southern Africa.

Light refreshments will be served after each lecture.

Make sure that you register at the following link to secure your seat:
https://forms.gle/uvNLJL4PqJVSA3f58
[if the link does not work, copy–paste the link in your web browser]

Date: 23 – 26 September 2019

Time: 17:30 – 19:00

Venue: Sci-Enza
University of Pretoria

Background

The present global energy demand of approximately 17 TW is predicted to increase twofold by 2050 as the result of population and economic growth. Africa's energy demand will probably be the highest of all continents. The challenge in fulfilling in a sustainable way our high demand for energy is not one of an inherent lack of available energy. In fact, the amount of solar energy reaching the earth's surface in one hour is more than mankind's energy demand for an entire year. The solution is already found in nature: photosynthesis is the only process that converts solar energy into chemical energy on a massive scale. We have reached a stage in mankind's history where scientists know the intricate details of the photosynthetic process sufficiently well to use the underlying design principles as inspiration for solar energy technologies.

In the first two lectures, leading scientists from Germany and Poland will explain some remarkable aspects of solar energy conversion in photosynthesis and organic solar cells, while the last two lectures will showcase various projects where solar energy technologies have been successfully implemented in Southern Africa.

Please contact Prof. Tjaart Krüger (tjaart.kruger@up.ac.za) for any questions.

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Make today matter

23 Sept. 2019
The fascinating world of light-driven molecular machines

Prof. Artur Osyczka
Department of Molecular Biophysics, Faculty of Biochemistry, Biophysics and Biotechnology, Jagiellonian University, Kraków, Poland

Plants use light energy to convert carbon monoxide into sugars and other chemical compounds that build organisms on earth. This process, called photosynthesis, is not only a crucial energy conserving process, but also a main source of oxygen, which both contribute enormously to support life on earth. Photosynthesis takes place in assemblies of very complex molecular machines that in a controlled manner capture light and use its energy to transfer electrons between different compartments of the cells to store energy in a biologically useful form. Scientists, fascinated by precision and efficiency of these molecular "factories", intensely work to find out how they work at molecular level. In this context, the main focus of this lecture will be to provide an overview of what is known and remains unknown about the mechanisms of action of the molecular machines of photosynthesis. This knowledge provides not only fundamentals for developing basic science, but also possibilities for applications in various areas such as nanotechnology, biotechnology and agriculture.

24 Sept. 2019
Towards breaking the barrier to 100% charge transfer

Prof. Dirk M. Guldi
Department of Chemistry and Pharmacy & Interdisciplinary Center of Molecular Materials, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

Chemistry affects almost every aspect of our existence, so that it will be an essential component of solutions in global issues in health, materials, and energy. For this reason, the design and synthesis of novel molecular materials lies at the forefront of transformative research and has game-changing character. A leading example for such shifts in existing scientific paradigms is surpassing the Shockley-Queisser limit, which places an upper bound on solar conversion efficiency for a single p-n junction solar cell at slightly more than 30%, by means of singlet fission (SF) in molecular acenes, the molecular analogue to multiple exciton generation (MEG). In an optimal SF process, the lowest singlet excited state of one molecule (S_1) that is positioned next to a second molecule in its ground state (S_0) is down-converted into two triplet excited states (T_1) each residing on one of the two adjacent molecules. The two triplet states initially form a correlated pair state $^1(T_1T_1)$, which then evolves into two separated triplet states ($T_1 + T_1$). As such, the energetic requirement for SF is $E(S_1) \geq 2 \times E(T_1)$. Shifting the focus to intramolecular SF in dilute solutions rather than intermolecular SF in crystalline thin films enabled important breakthroughs.

25 Sept. 2019
Clean Energy for a Sunny South Africa

Dr Karen Surridge-Talbot
Centre Manager, Renewable Energy Centre of Research and Development (RECORD), South African National Energy Development Institute (SANEDI)

Energy is required, in some form or other, in all areas of human existence. The questions then arise, what energy source does one use and to what end? What criteria are used to make decisions and how do these decisions effect downstream applications? This seminar aims to outline SANEDI and what it is/does, energy sources available, how South Africa gets its energy and what is happening in the energy mix and finally options for energy efficiency as well as possible renewable energy interventions with particular focus on Solar Energy Solutions.

26 Sept. 2019
Innovative business models for solar energy in rural areas: experiences from Mozambique, Malawi and Lesotho

Larissa Setaro
Project Manager, Positive Planet International in Lesotho
AND
Casper Sikkema
Managing Director, Solar Works! in Sub-Saharan Africa,

Over the past 10 years, a range of solar energy technologies have been developed as alternatives to the electricity grid. They have the potential to provide access to affordable and reliable energy to rural communities. Yet, energy access is still a challenge in Sub-Saharan Africa, where roughly 600 million people do not have access to electricity .

Why doesn't an existing solution enter the market? How can we ensure that our technologies are accessed by those who need them most? A number of challenges exist that prevent renewable technologies to reach scale in the African markets. Among others, affordability, quality, distribution, logistics and culture should be considered.

This talk will investigate barriers and solutions of solar energy technologies to reach rural communities in Southern African markets. We will present our experiences and the lessons we have learned in the field during our work with Positive Planet International and Solar Works! in Lesotho, Mozambique and Malawi.

Positive Planet International is working towards creating a local social enterprise for the distribution and promotion of energy efficient and renewable energy devices for rural communities. Solar Works! is a Dutch company operating in Malawi and Mozambique with experience in Pay-As-You-Go business models for solar home systems.