INTRODUCTION

This year’s keynote speakers were Professor Ari Rabl of Ecole des Mines, Paris, France, and Dr. Leopold Summerer of the European Space Agency, Noordwijk, The Netherlands. Professor Rabl was a previous keynote speaker at the 2nd symposium in our series, back in 1987. Since that time, he has expanded his field of renown beyond solar energy, and has become a celebrated expert at quantifying the hidden costs of energy systems. One important conclusion that emerged from this presentation and the discussion that followed (which was, as usual, transcribed for reproduction in this volume) is that nuclear energy probably has the lowest environmental cost of all present-day large-scale energy alternatives. But, as Professor Rabl sadly puts it: “Our problem with radioactive waste storage is more societal than technical”.

Dr. Summerer’s presentation also enabled us to distance ourselves slightly from the kind of solar researches with which most of us concern ourselves, by viewing the situation from Space. In particular, he reviewed the current status of various proposals that have been made to collect solar energy with Earth-orbiting satellites and beam it down for use on the ground. Because such satellites do not suffer from a day-night problem, as do terrestrial-based solar systems, they could in principle provide an alternative to fossil-fuelled base-load electricity. The only problem at the present time seems to be the enormous cost of putting such systems into orbit. However, some of the options that Dr. Summerer discussed indicate that this problem may eventually be solvable.

In addition to the keynote speakers, 70 people from Israel and abroad participated in the 13th Symposium.

It is, of course, always a pleasure to acknowledge our sponsors for their generous help in supporting these symposia. This year they were: Ben-Gurion University of the Negev, the Blaustein International Center for Scientific Cooperation, The Israel Power Engineering Chapter of the IEEE, The Israel Section of the International Solar Energy Society, Ormat Industries Ltd, and Solel Solar Systems Ltd.

Last but not least, this symposium could not have been possible without the hard work of the dedicated staff of the National Solar Energy Center, specifically, Dov Bukovza, Shoshana Dann, Shlomo Kabalo and Vladimir Melnichak. To each of them we owe a big thank you for their preparatory work and for their after-hours attention to details during the symposium.

David Faiman
Sede Boqer, March 2006
Ben-Gurion University of the Negev  
The Jacob Blaustein Institutes for Desert Research  
84990 Sede Boqer Campus, Israel

13th Sede Boqer Symposium  
on Solar Electricity Production  
October 31 – November 1, 2005

Sponsored by:

Ben-Gurion University of the Negev.  
Blaustein International Center for Scientific Cooperation.  
IEEE – Israel Power Engineering Chapter  
International Solar Energy Society - Israel Section  
Ormat Industries Ltd.  
Solel Solar Systems Ltd.

Program

Monday, October 31, 2005

10:00-10:30  Arrival at the Ben-Gurion National Solar Energy Center, Midreshet Ben-Gurion,  
Registration

10:30-11:00  Opening Greetings  
(Chair: Prof. David Faiman, BGU Blaustein Institutes, Sede Boqer)  
Prof. Jimmy Weinblat (Rector, Ben Gurion University)  
Prof. Yair Zarmi (Director, Albert Katz Int’l School for Desert Studies)  
Blaustein Institutes for Desert Research, BGU
11:00-12:15  **Session 1: Solar-Thermal Systems**

1. **Photovoltaic versus Solar Thermal Electricity Costs**
   **Aharon Roy**
   Department of Chemical Engineering, Ben-Gurion University, POB 653, 84105 Beersheva, Israel

2. **SEGS technology update review 2005**
   **Eli Mandelberg**
   Solel Solar Systems Ltd., POB 811, 99000 Bet Shemesh, Israel

3. **Flow rate distribution in evaporating parallel pipes for direct steam generation in parabolic troughs**
   **Uri Minzer**, Dvora Barnea and Yehuda Taitel
   School of Engineering, Tel Aviv University, Ramat Aviv, 69978 Tel Aviv, Israel

4. **Open Cycle gas turbines for solar applications**
   **Joseph Sinai**, Chemi Sugarmen and Uri Fisher
   Ormat Systems Ltd., POB 68, New Industrial Zone, Yavneh, Israel

5. **Seeding a direct absorbing receiver by elutriating fine particles from a spouted bed.**
   **Hanna Helena Klein**
   Department of Environmental Science and Energy Research, Weizmann Institute of Science, 76100 Rehovot, Israel

12:30-13:30  **Lunch** (continuing late registration)

14:00-15:15  **Session 2: Concentrator Photovoltaics**

(Chair:  Prof.  **Moshe Levy**, Weizmann Institute of Science)

1. **Co-generation with concentrating photovoltaics**
   **Abraham Kribus** and Gur Mittleman
   School of Mechanical Engineering, Tel Aviv University, Ramat Aviv, 69978 Tel Aviv, Israel

2. **Realization of compact, passively cooled, high-flux PV prototypes**
   **Daniel Feuermann**
   Department of Solar Energy and Environmental Physics, Jacob Blaustein Institutes for Desert Research, Ben Gurion University, 84990 Midreshet Ben Gurion, Israel

3. **Planar photovoltaic concentrators near the Étendue limit**
   **Roland Winston**\(^1\) and **Jeffrey M. Gordon**\(^2\)
   \(^1\)University of California, Merced, USA,  \(^2\) Department of Solar Energy and Environmental Physics, Jacob Blaustein Institutes for Desert Research, Ben Gurion University, 84990 Midreshet Ben Gurion, Israel

4. **Localized irradiation probing of multijunction solar cells: Experimental study**
   **Eugene A. Katz**, Jeffrey M. Gordon, Wondesen Tassew and Daniel Feuermann
   Department of Solar Energy and Environmental Physics, Jacob Blaustein Institutes for Desert Research, Ben Gurion University, 84990 Midreshet Ben Gurion, Israel
5. **Localized irradiation probing of concentrator solar cells: Modeling**

Wondesen Tassew, Eugene A. Katz, Jeffrey M. Gordon and Daniel Feuermann
Department of Solar Energy and Environmental Physics, Jacob Blaustein Institutes
for Desert Research, Ben Gurion University, 84990 Midreshet Ben Gurion, Israel

**15:15-15:45 Coffee break**

**15:45-16:45 Session 3: Invited Keynote Lecture and Discussion**

(Chair: Prof. Yair Zarmi, BGU Blaustein Institutes)

*Environmental costs of fossil fuels and benefits of solar*

**Dr. Ari Rabl,**
Armines/Ecole des Mines, Paris, France

**16:45-17:15 Coffee break**

**17:15-18:30 Session 4: Photovoltaic Devices**

(Chair: Prof. Hans Georg Beyer, Magdeburg University, Germany)

1. *Shading consideration in photovoltaic solar fields*

   **Dan Weinstock** and Joseph Appelbaum
   Tel Aviv University, Ramat Aviv, 69978 Tel Aviv, Israel

2. *An aspect of optimal construction for solar panels*

   **Moshe Averbukh**
   Sederot Yerushalayim 2/102, 84771 Beersheva, Israel

3. *Photovoltaic powered salt water chlorination for swimming pools*

   **Joseph Appelbaum** and Kame Khousam
   1. Tel Aviv University, Ramat Aviv, 69978 Tel Aviv, Israel
   2. Queensland University of Technology, Australia

**19:00-20:00 Festive Dinner**

**20:30-22:00 Concert**

**Raimonda Sheinfeld** (Piano)
Tuesday, November 1, 2005

8:30-9:45 Session 5: Photovoltaic Cells I

(Chair: Prof. Oded Millo, Hebrew University of Jerusalem)

1. How much can we gain from improved photon management in photovoltaic cells by up- and down conversion?
   Olivia Niitsoo, Igor Lubomirsky and David Cahen
   Department of Materials and Interfaces, Weizmann Institute of Science 76100 Rehovot, Israel

2. Local photoconductivity measurements of polycrystalline semiconductor films: The role of grain-boundaries
   Doron Azulay1, Oded Millo1, Isaac Balberg1 and D. Cahen2
   1The Racah Institute of Physics, The Hebrew University, 91904 Jerusalem, Israel
   2Department of Materials & Interfaces, Weizmann Institute of Science, 76100 Rehovot, Israel

3. Improvement of Si solar cell parameters due to back Al and B simultaneous diffusion
   Lev Kreinin, Ninel Bordin, Jack Broder and Naftali Eisenberg
   Jerusalem College of Technology, POB 16031, 91160 Jerusalem, Israel

4. Solution Processable SnS2 films and their exploitation in semiconducting polymer devices
   Eyal Aharon and Gitti L. Frey
   Faculty of Materials Engineering, Technion, 32000 Haifa, Israel

9:45-10:15 Coffee break

10:15-11:30 Session 6: Photovoltaic Cells II

(Chair: Prof. David Cahen, Weizmann Institute of Science)

1. Recent developments in Photovoltaic Dye Cells
   Jonathan Goldstein1, Inna Markovich1, Arie Zaban2 and Larissa Grinnis2
   1Orionsolar Ltd., AVX Building, 3 Hamarpeh St., Har Hotzvim Technology Park, 91450 Jerusalem, Israel
   2Department of Chemistry, Bar Ilan University, 52900 Ramat Gan, Israel

2. Substantial improvement of dye sensitized solar cell (DSSC) photovoltaic characteristics by conformal TiO2 and/or MgO Coatings of the titania nanocrystalline electrode
   Larissa Grinis, Ashi Ofir, Sveta Kotlyar, Snir Dor and Arie Zaban
   Department of Chemistry, Bar Ilan University, 52900 Ramat Gan, Israel

3. Enhancing electron transport in nanoporous TiO2 electrodes for dye sensitized solar cells
   Ashi Ofir1, S. Tirosh1, Th. Dittrich2, L. Grinish1 and Arie Zaban1
   1Department of Chemistry, Bar Ilan University, 52900 Ramat Gan, Israel
   2Hahn-Meitner-Institute, Glienicker Str. 100, D-14109 Berlin, Germany
4. The Effect of orientation in nanocrystallites TiO$_2$ layers on the electron transport properties: application in dye sensitized solar cells
   S. Tirosh$^1$, Th. Dittrich$^2$, A. Ofir$^1$, L. Grinis$^1$, A. Zaban$^1$
   $^1$Department of Chemistry, Bar Ilan University, 52900 Ramat Gan, Israel
   $^2$Hahn-Meitner-Institute, Glienicker Str. 100, D-14109 Berlin, Germany

5. Chemical bath deposited CdSe/CdS-sensitized porous TiO$_2$ solar cells
   Olivia Niitsoo, S.K. Sarkar, C. Pejoux, S. Rühle, David Cahen and Gary Hodes
   Department of Materials and Interfaces, Weizmann Institute of Science, 76100 Rehovot, Israel

12:00-13:00 Lunch

13:30-14:30 Session 7: Invited Keynote Lecture and discussion
   (Chair: Prof. Aaron Roy, Ben Gurion University)
   Solar Power from space: Current status and prospects
   Dr. Leopold Summerer,
   European Space Agency, Noordwijk, The Netherlands

14:30-15:00 Coffee break

15:00-16:15 Session 8: Improvement of System Efficiency and Economics
   (Chair: Eng. Yehuda Bronicki, Ormat Industries)
   1. Performance control for grid-connected PV systems
      Hans Georg Beyer
      University of Applied Sciences Magdeburg-Stendal, Magdeburg, Germany
   2. PV Systems with self-cleaning panels
      Sergey Biryukov
      Department of Solar Energy and Environmental Physics, Jacob Blaustein
      Institutes for Desert Research, Ben Gurion University, 84990 Midreshet Ben
      Gurion, Israel
   3. The Economic implications of transferring the Israel fossil electricity economy
      into a solar renewable energy economy.
      Dov Raviv and Roy Rosenstreich
      MST Ltd., 8 Heil Hahimush St., 75702 Rishon Lezion, Israel
   4. Electrifying African villages with CPV
      Dov Raviv and Roy Rosenstreich
      MST Ltd., 8 Heil Hahimush St., 75702 Rishon Lezion, Israel
   5. Economics of the Raviv CPV model
      David Faiman
      Department of Solar Energy and Environmental Physics, Jacob Blaustein
      Institutes for Desert Research, Ben Gurion University, 84990 Midreshet Ben
      Gurion, Israel

16:15 Closing Remarks
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Local photoconductivity measurements of polycrystalline semiconductor films: The role of grain-boundaries
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