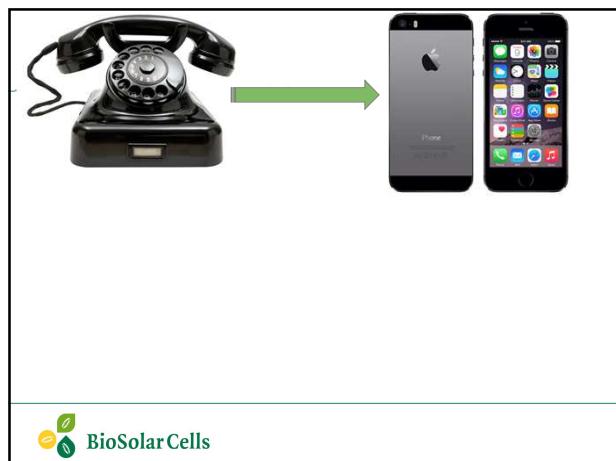


BioSolar Cells

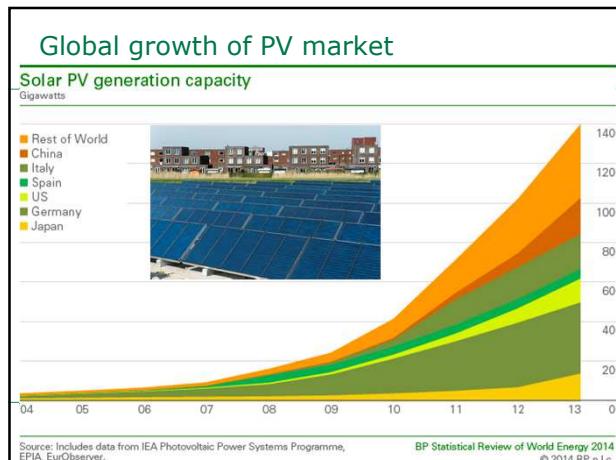
Solar fuel by artificial photosynthesis:
The light-driven Production of hydrogen gas
from water.

Joost Reek,
University of Amsterdam

<http://www.biosolarcells.nl>



BioSolarCells

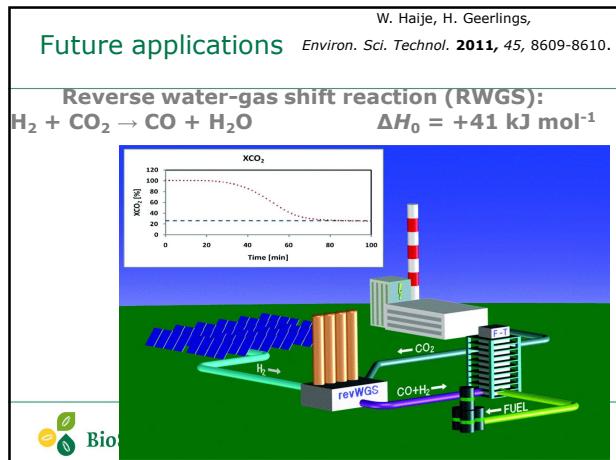


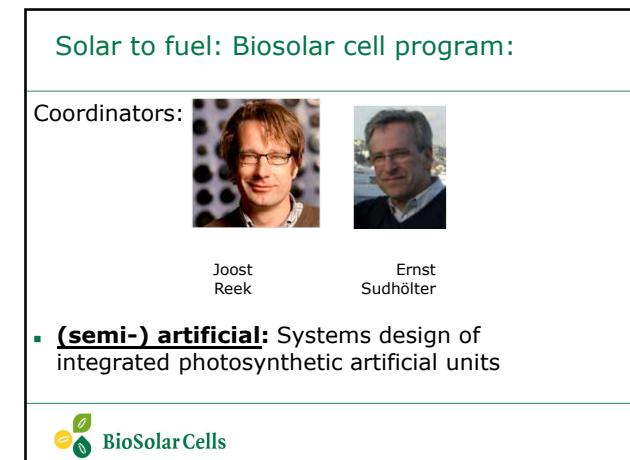
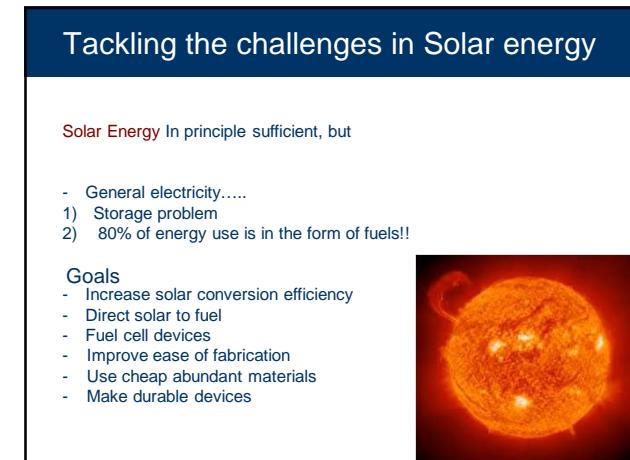
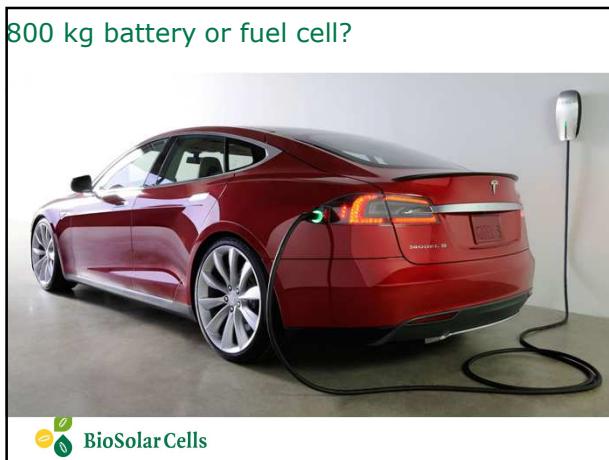
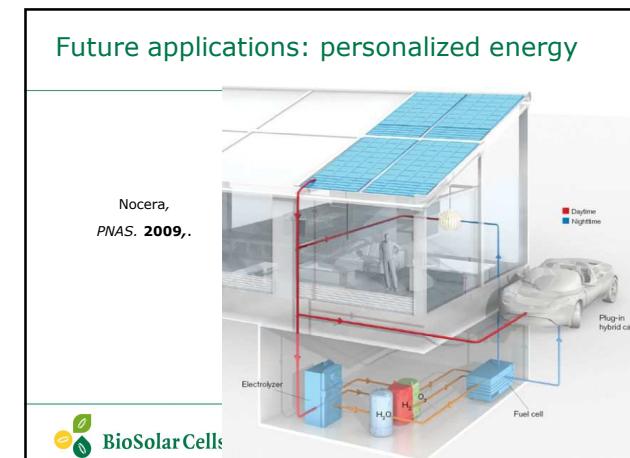
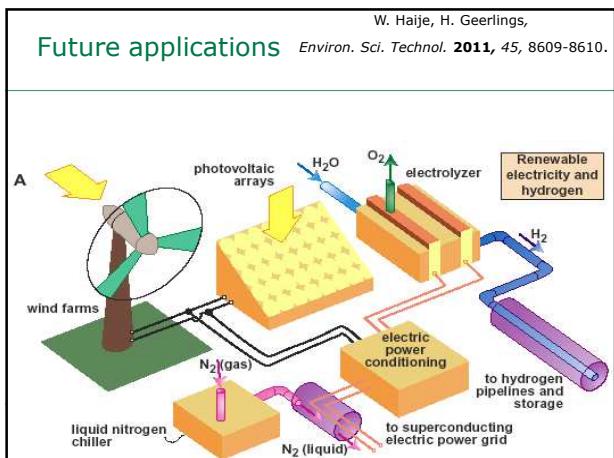
Tackling the challenges in Solar energy

Solar Energy In principle sufficient, but

- General electricity.....
- 1) Storage problem
- 2) 80% of energy use is in the form of fuels!!

BioSolarCells





Team: 16 research projects, 7 Universities

Catalysts

- UvA Reek/Detz/v.d. Vlugt
 - UL Bouman/Koper
 - UL de Groot/Hetterscheid
 - TUD B. Dam/Smith
 - TUWente Mul
- Devices**
- TUD B. Dam/Smith
 - UL Koper/de Groot
 - TuTwente Gardeniers
 - TuTwente Huskens
 - TUE Janssen
 - TuTwente Mul

TUE Haverkort

- #### Absorption and charge separation
- VU Orro/Lammertsma
 - UvA Brouwer/Reek
 - TUD Sudhölder
 - UL de Groot
- #### Spectroscopy/theory
- VU Kennis/Frese
 - UvA Brouwer
 - UL de Groot
 - VU Wijngaarden



Goal

The creation of efficient, robust and scalable energy convertors based on cheap and abundant materials that can be employed on large scale and contribute to conversion and storage of solar energy

Costs

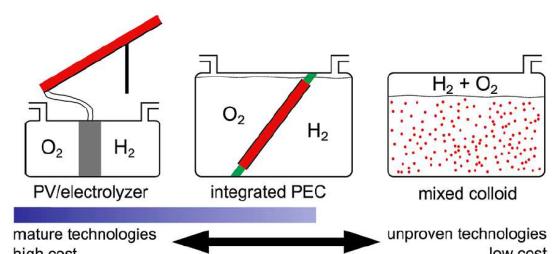
Efficiency

Scalability

Durability



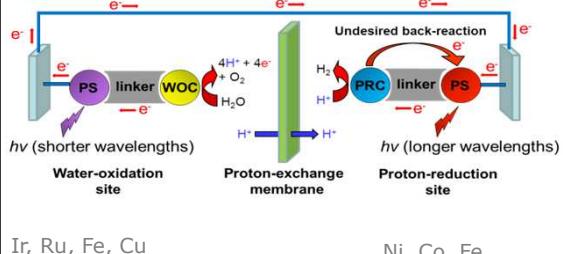
Device designs: maturity vs. cost



J. R. McKone, N. S. Lewis, H. B. Gray, *Chem. Mater.* **2014**, 26, 407–



Two approaches: molecular components

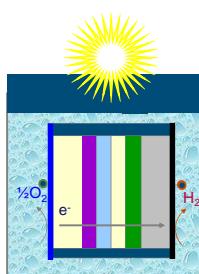
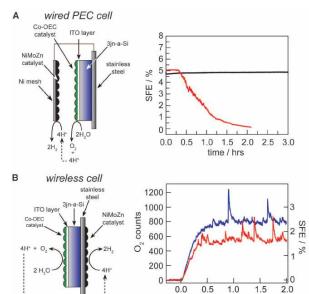


Ir, Ru, Fe, Cu

Ni, Co, Fe,



Two approaches: integrated PV/Electrolyser

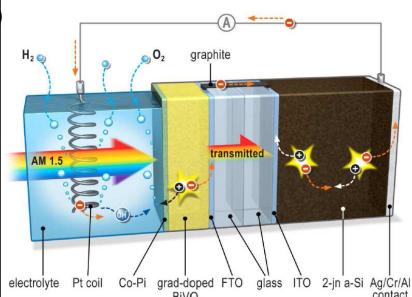


S.Y. Reece, J. A. Hamel, K. Sung, T. D. Jarvi, A. J. Esswein, J. J. H. Pijpers, D. G. Nocera, *Science*, **2011**, 334, 645.



Combined device of gradient-doped W:BiVO4 and a-Si solar cell

STH ~5 %



- Steps to take:
- Replace Pt
 - Improve photo-absorption
 - Improve catalysis

B. Dam, R. van de Krol, *Nature Commun.* **2013**, 4, 2195

