

Nature will inspire future solar energy conversion systems



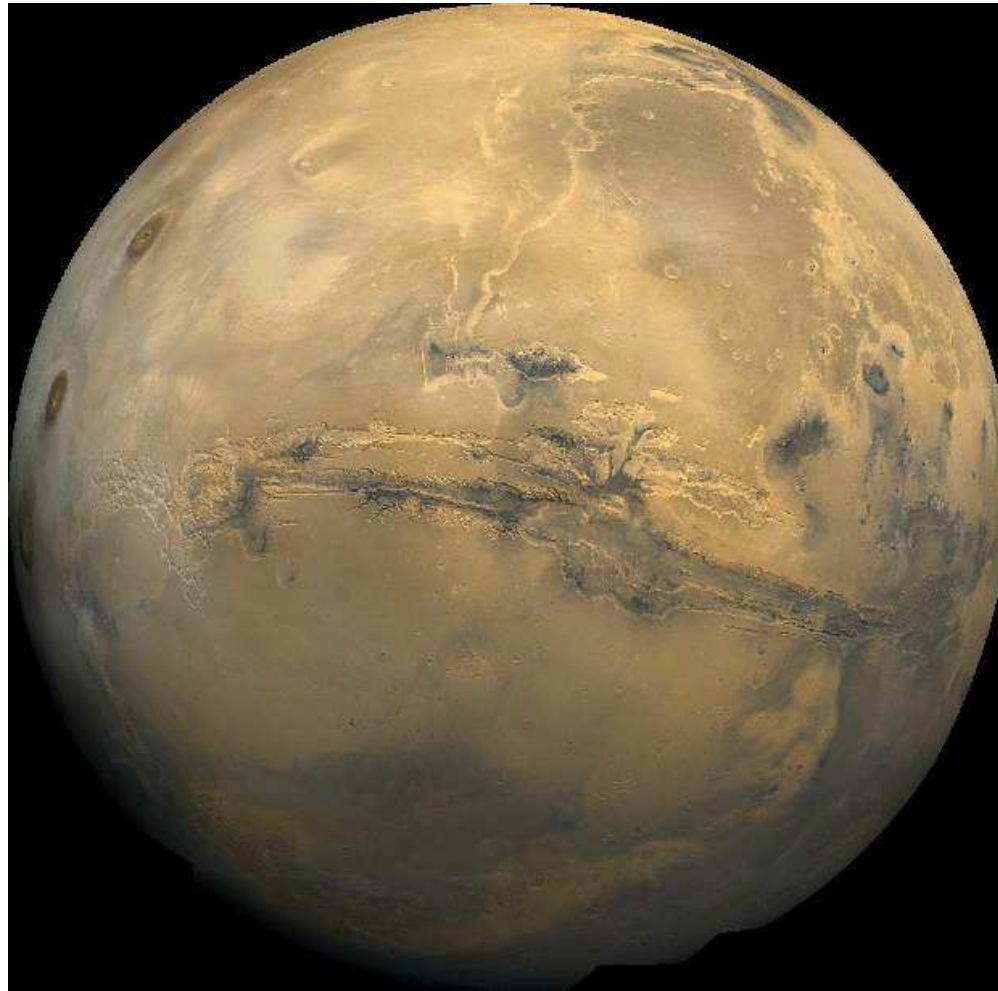
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What makes Earth something nicer?

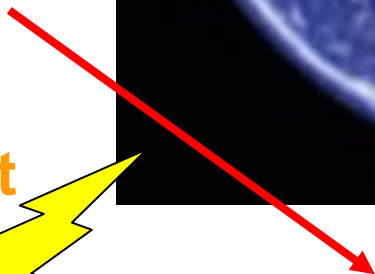




Photosynthesis



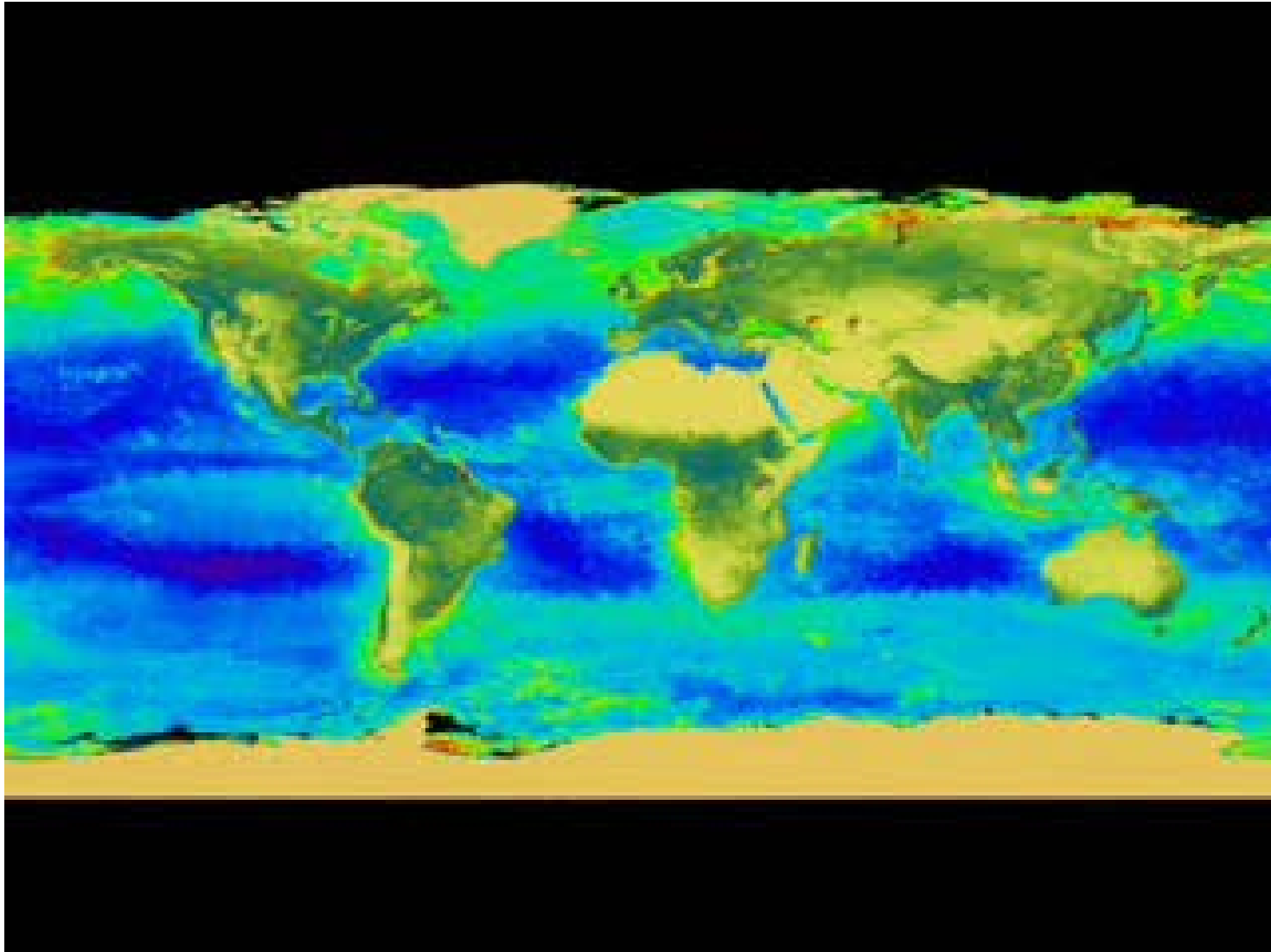
Sunlight



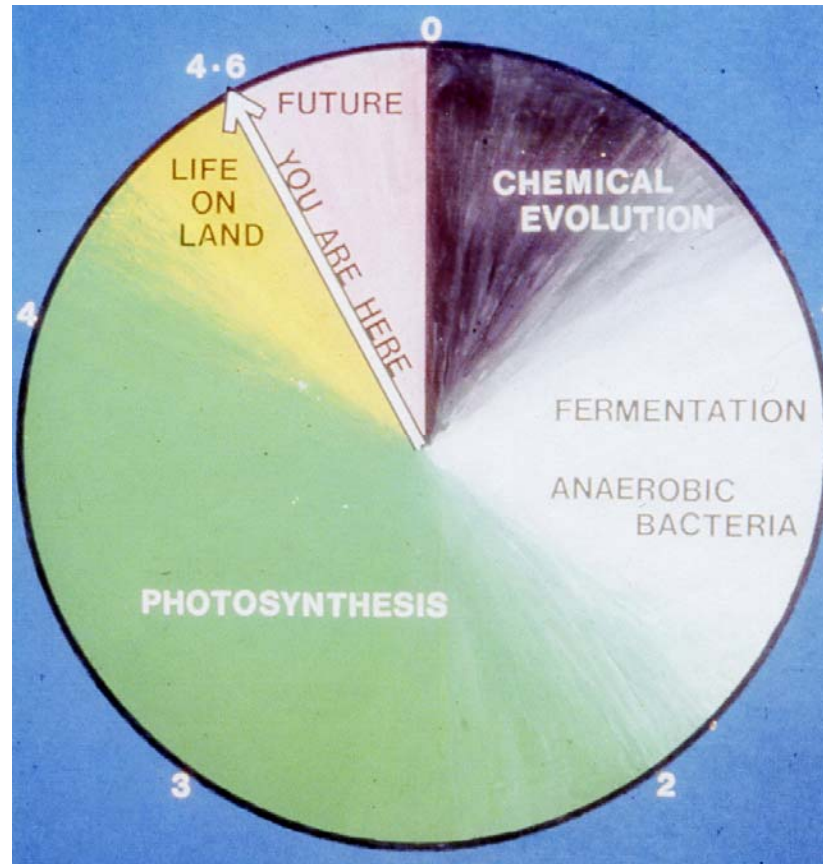
Organic
molecules
of life



Sunlight makes CO₂ conversion possible



The 5 billion year clock

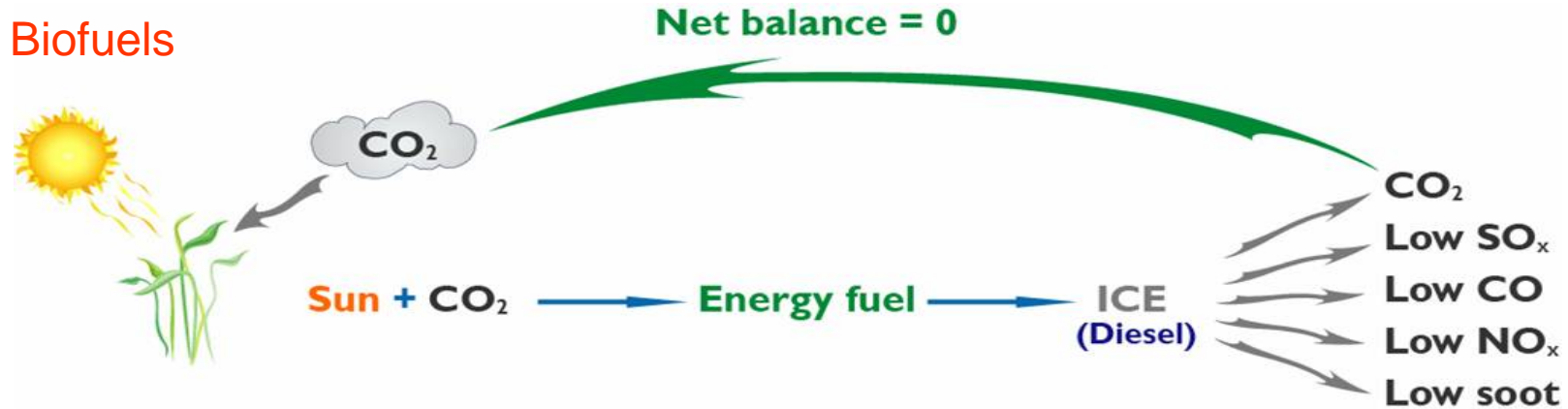


1 year of fossil fuel consumption = 1 million years of photosynthesis

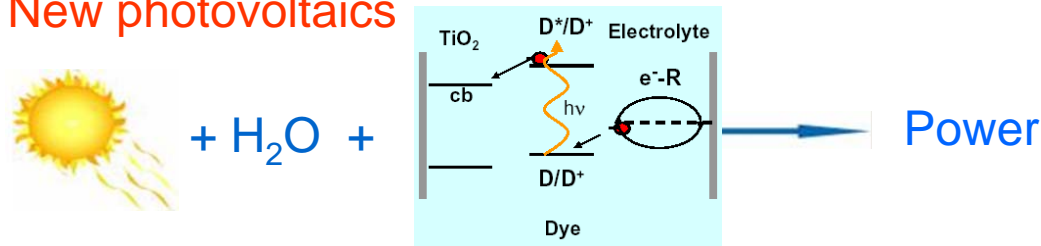
Can we get this clock running faster?

Possible answers

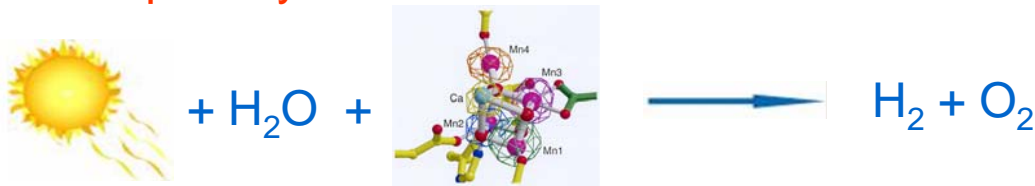
Biofuels



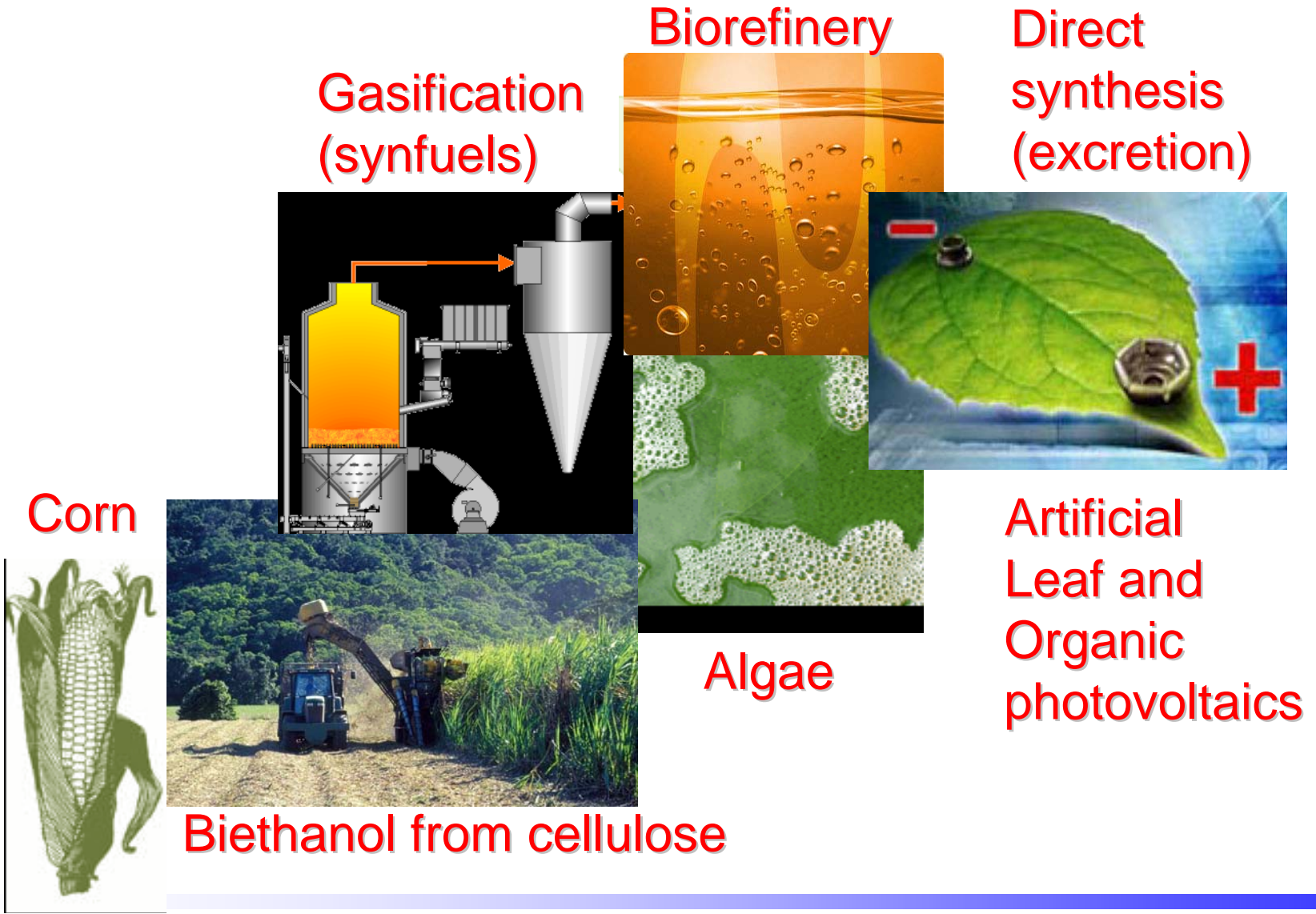
New photovoltaics



Water photolysis and CO₂ reduction to fuels



Along an ambitious pathway



Some case studies from Piedmont: Ethanol for lignocellulosic biomass



Main advantages:

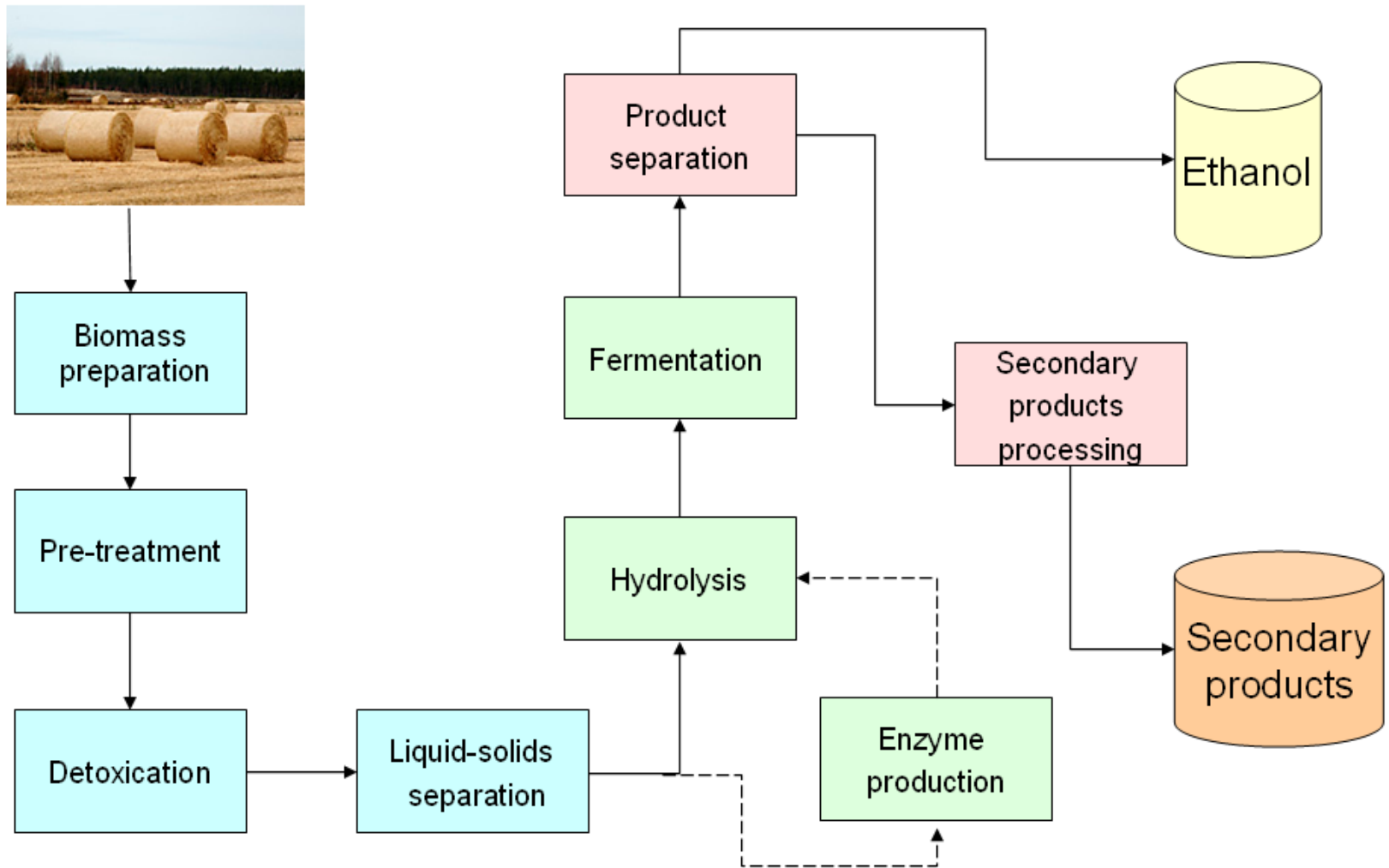
- Biomass abundance (trees+agricultural wastes)
- Low biomass cost
- 4 times higher yields compared to 1st generation sources (up to 10 t/ha of ethanol)
- No competition with food



GRUPPO MOSSI & GHISOLFI

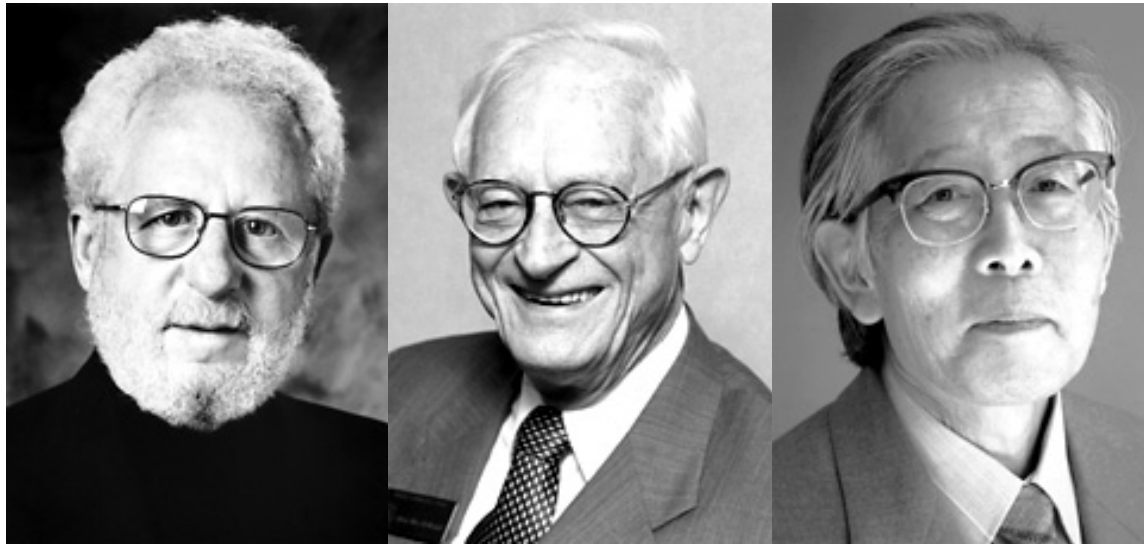


The process



Conducting polymers

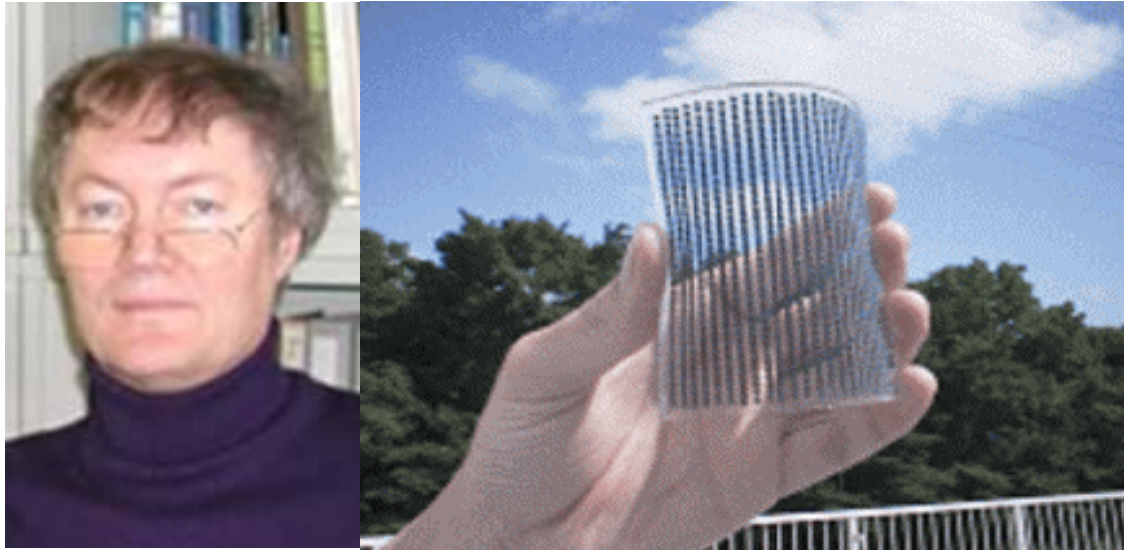
Nobel Prize in Chemistry 2000



Alan J. Heeger Alan G. MacDiarmid Hideki Shirakawa

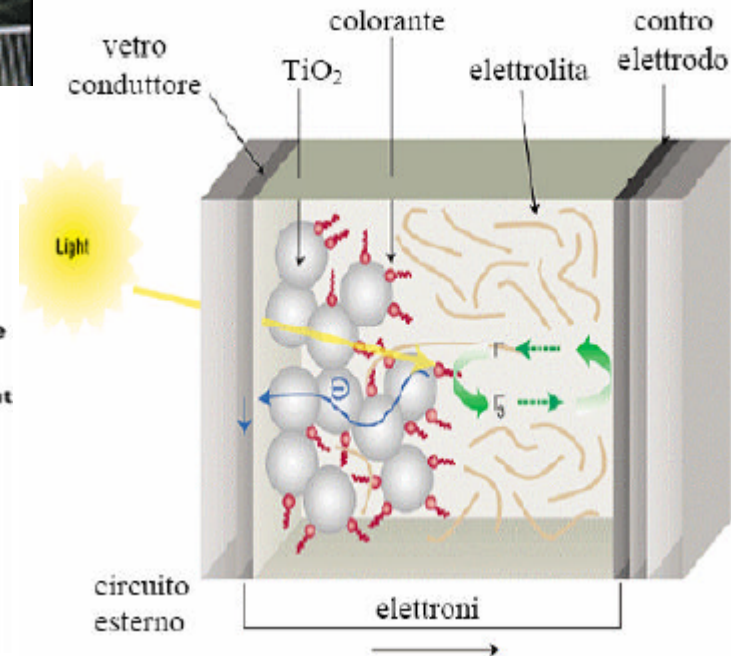
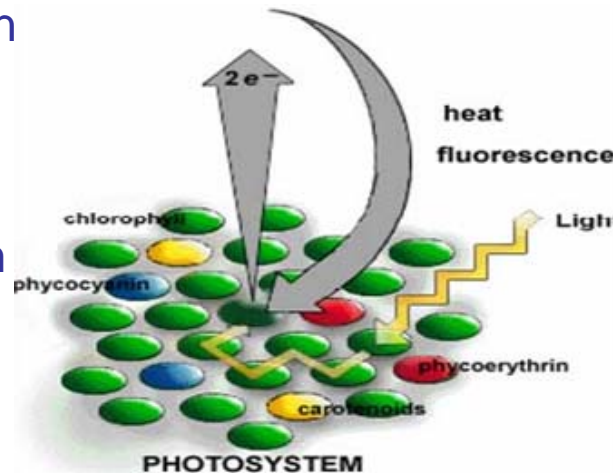


Dye-Sensitized Cells

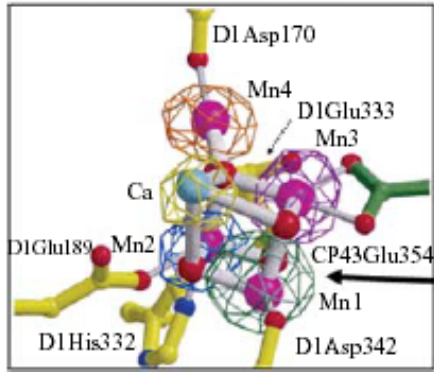
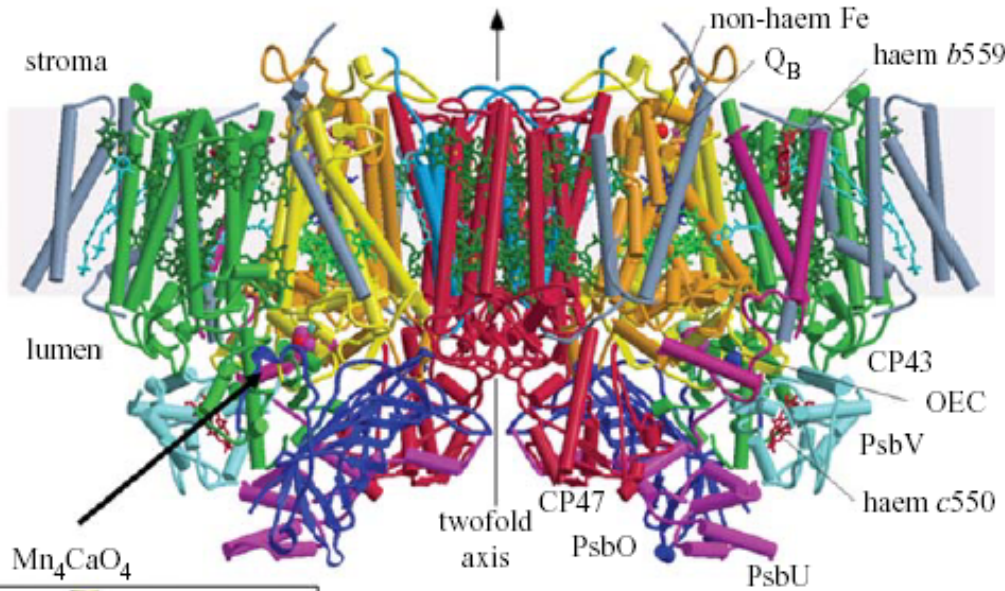


Michael Graetzel
Italgas Prize 2003

In Graetzel-type photovoltaics the function of chlorophyll is carried out by the dye “antocyanine”; light excites an electron which moves through the cell.



Some case studies from Piedmont: Seeking water photolysis



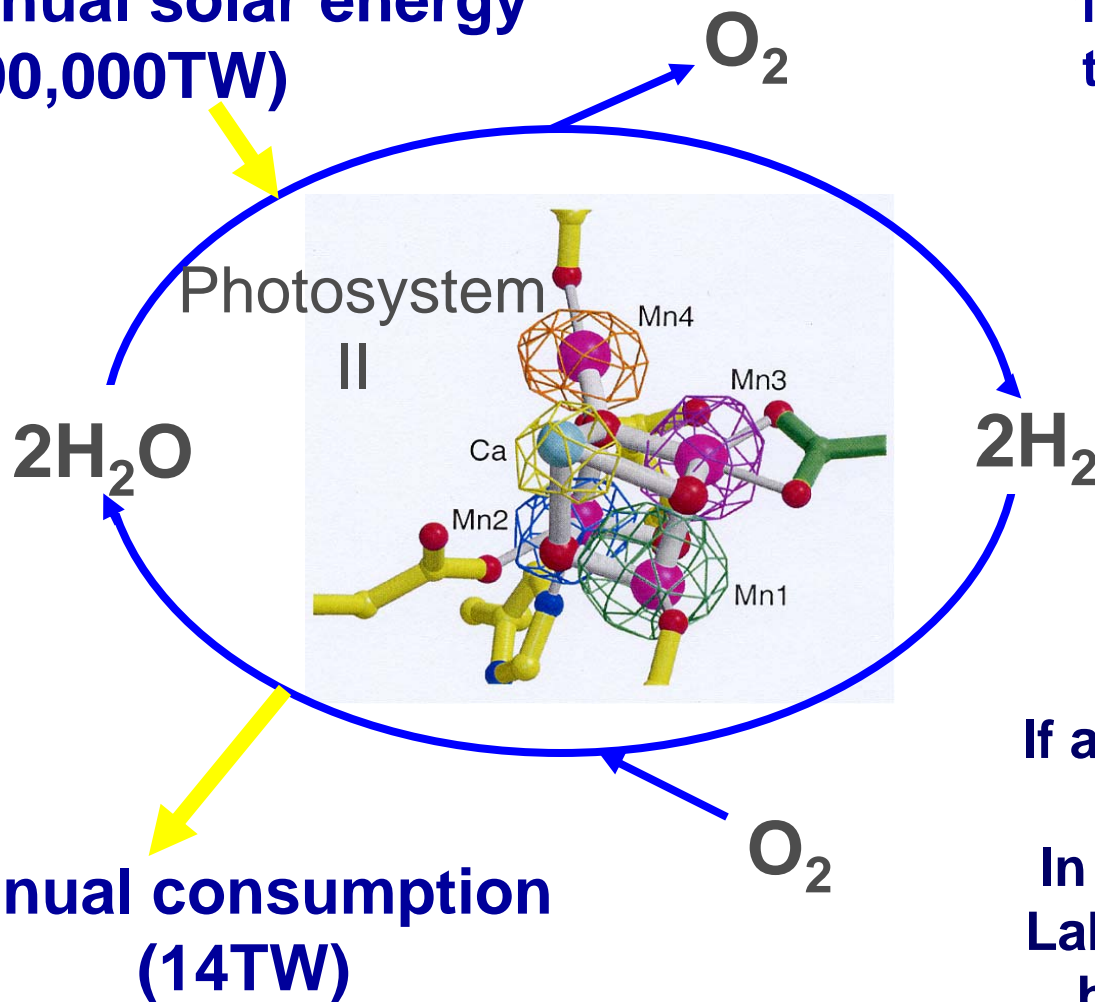
Photosystem II



Jim Barber
Italgas Prize winner 2005

Some case studies from Piedmont: The Biosolar Lab

Annual solar energy
(100,000TW)



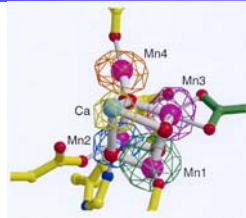
1 hour of solar energy to
the planet equals 1 year
consumption



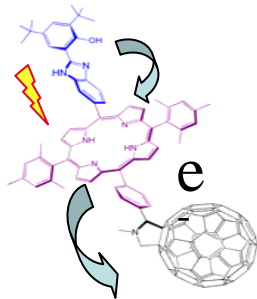
If a leaf can do it we must be
able to do it?

In Alessandria the Biosolar
Lab lead by Prof. Barber will
be officially inaugurated

A possible device (the SOLHYDROMICS project)



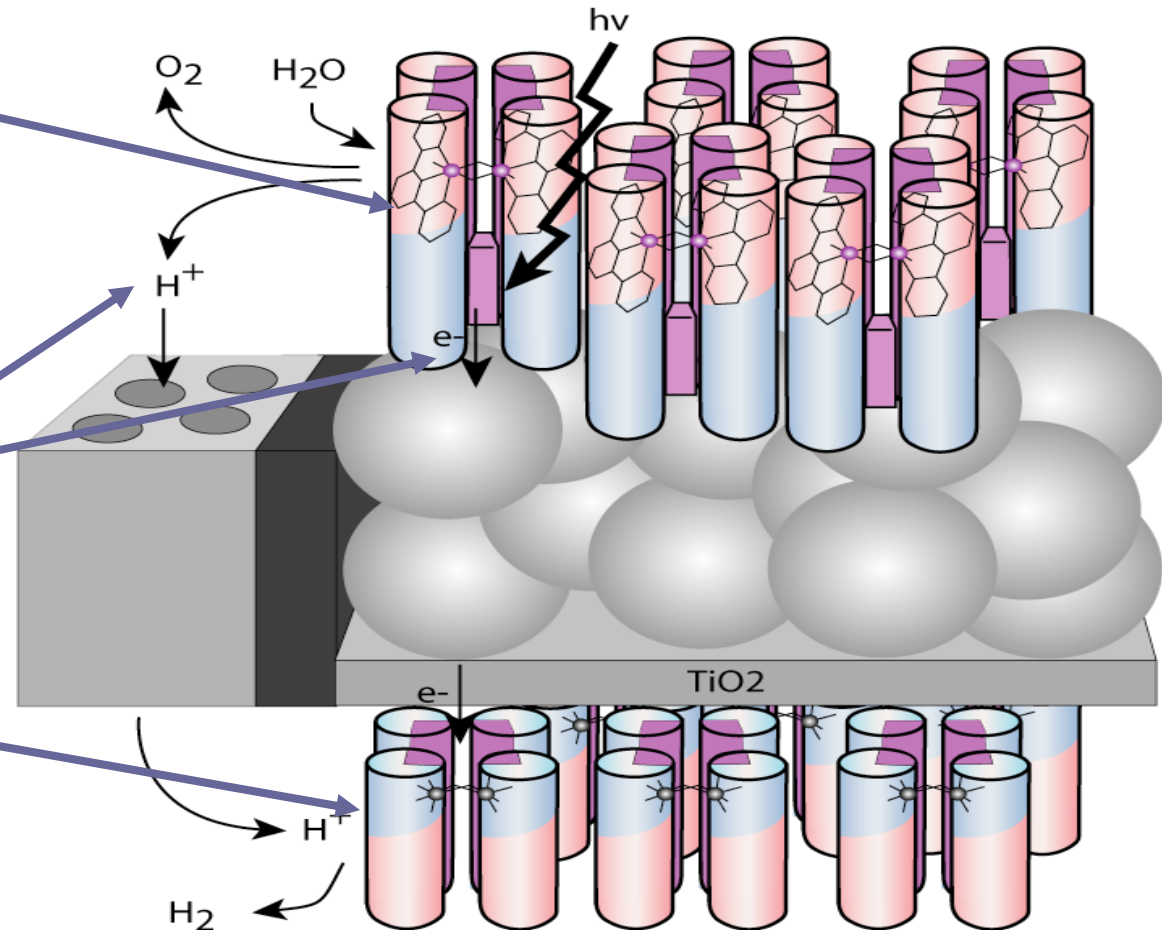
Mimic PSII



Charge separation

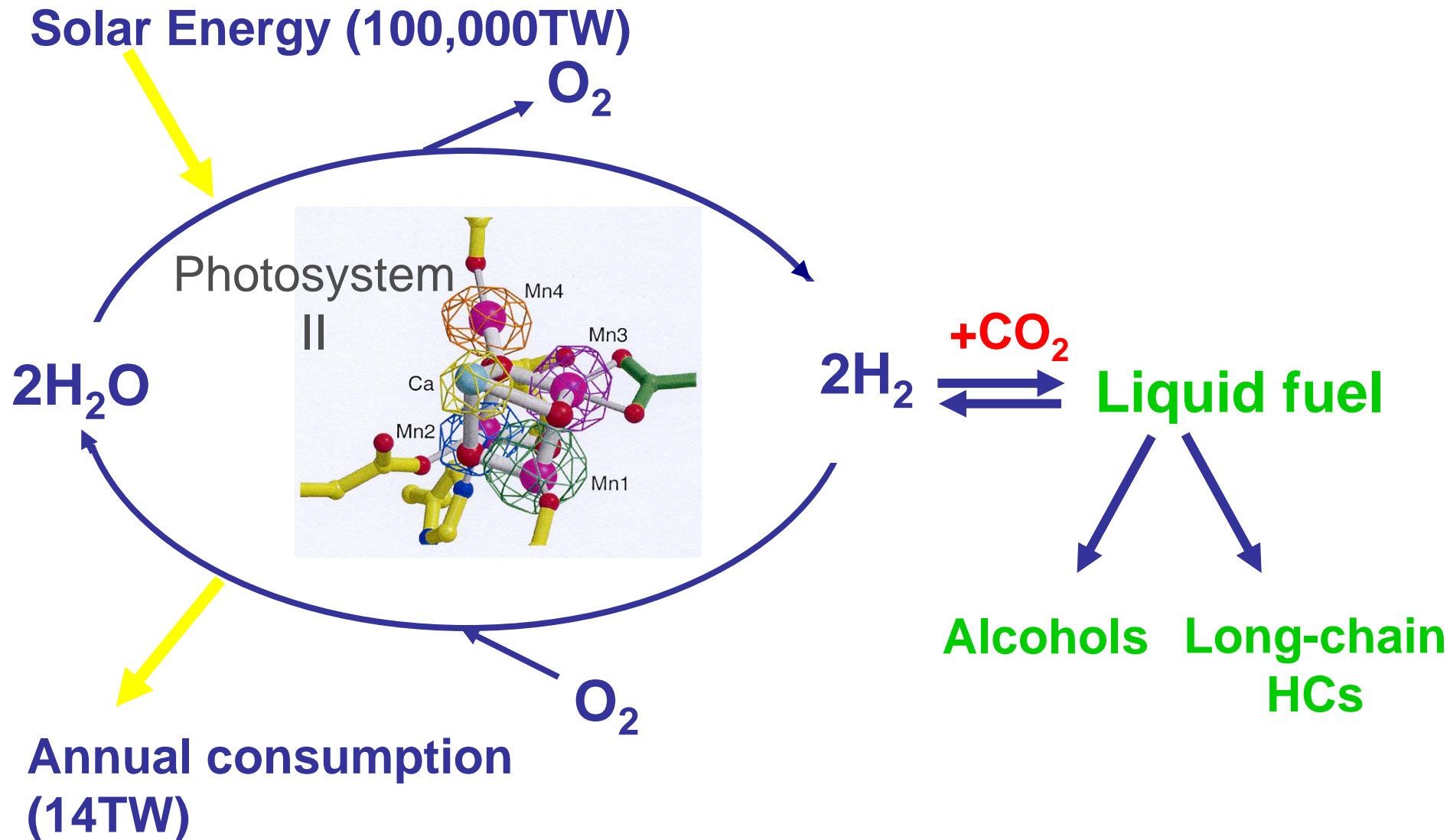


Mimic
Hydrogenase



Based on model by Dutton & Moser

Some case studies from Piedmont: An even more ambitious route





Thank you!