



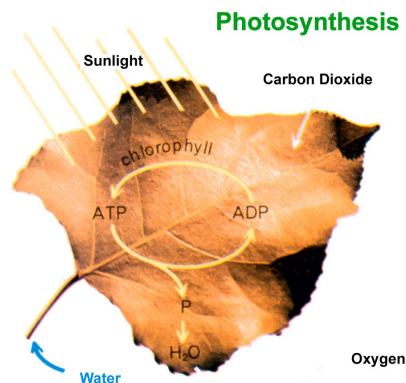
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Green Plants: Using Sunlight to Make Hydrogen From Water



Photosynthesis: The Original Solar Hydrogen Production System

There is a remarkable historical precedent for shifting to solar hydrogen technologies and resources. On the primitive earth, some 4 billion years ago, the first protein-scale nanoorganisms evolved by extracting the hydrogen they needed for metabolism from the hydrocarbon molecules that were contained in the “primordial soup.” The energy conversion efficiency for this chemical process was about 40%, but the primordial soup was similar to oil in the sense that it was non-renewable, and it was being exponentially consumed. As a result, more and more nanobes found themselves competing for fewer and fewer resources, just as humans now find themselves competing for fewer and fewer fossil fuels. In order to avoid a massive die-off, the nanobes and their microbial machines developed a new technology that could extract the hydrogen from water with solar energy: photosynthetic green plants.



At the heart of every photosynthetic plant is a highly complex chlorophyll molecule that uses solar energy to chemically separate water into its principal elements of hydrogen and oxygen. The hydrogen is kept for energy storage in the form of carbohydrates, and the oxygen is then released into the atmosphere as a by-product of the reaction. Thus every tree, flower or blade of grass is a solar hydrogen machine.

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It is important to note that the photosynthetic process is only about 1% efficient, compared to the much more efficient (40%) process of extracting the hydrogen from hydrocarbon molecules, but it was a renewable and sustainable method of extracting hydrogen from water on a global scale. Indeed, although photosynthesis is less efficient, this “transition of substance” to renewable solar hydrogen resources allowed the nanobes and microbes to prosper on a global scale for over 3.5 billion years. The lesson from *Mother Nature* is that efficiency is obviously not as important as sustainability.

Just as the nanobes shifted to solar hydrogen production systems to save their civilization, Harry Braun's Phoenix Project plan will allow America and the rest of the human community to shift from fossil and nuclear fuels, which are highly polluting and rapidly diminishing, to solar hydrogen production systems and resources that are mass-producible, inexhaustible and essentially pollution-free. It is not a question of technology, but of political priorities.



Harry Braun

Analyst and Author

Independent Candidate for President

6128 North 28th Street, Phoenix, Arizona 85016

Telephone: 602-977-0888

Fax: 602-955-5444



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