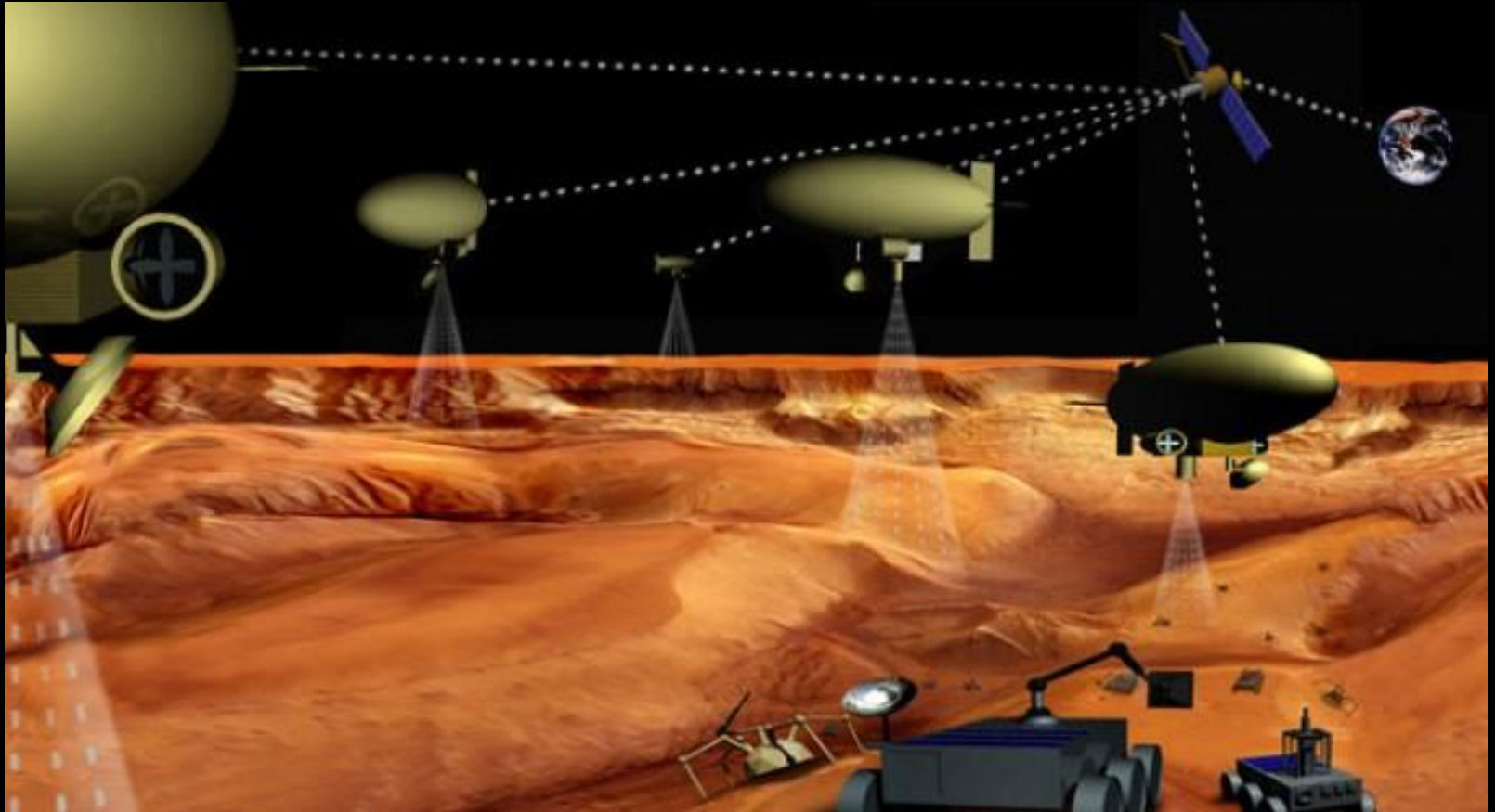


If X = Jedi Skills  
and  
Y = Scientific Prowes  
then  
*Equate Yourself to  
Big Bang Theory  
Cast Member*



# Autonomous Resource Synthesis on Mars Utilizing Hydrogen (H<sub>2</sub>) Inflated Exploration Dirigibles



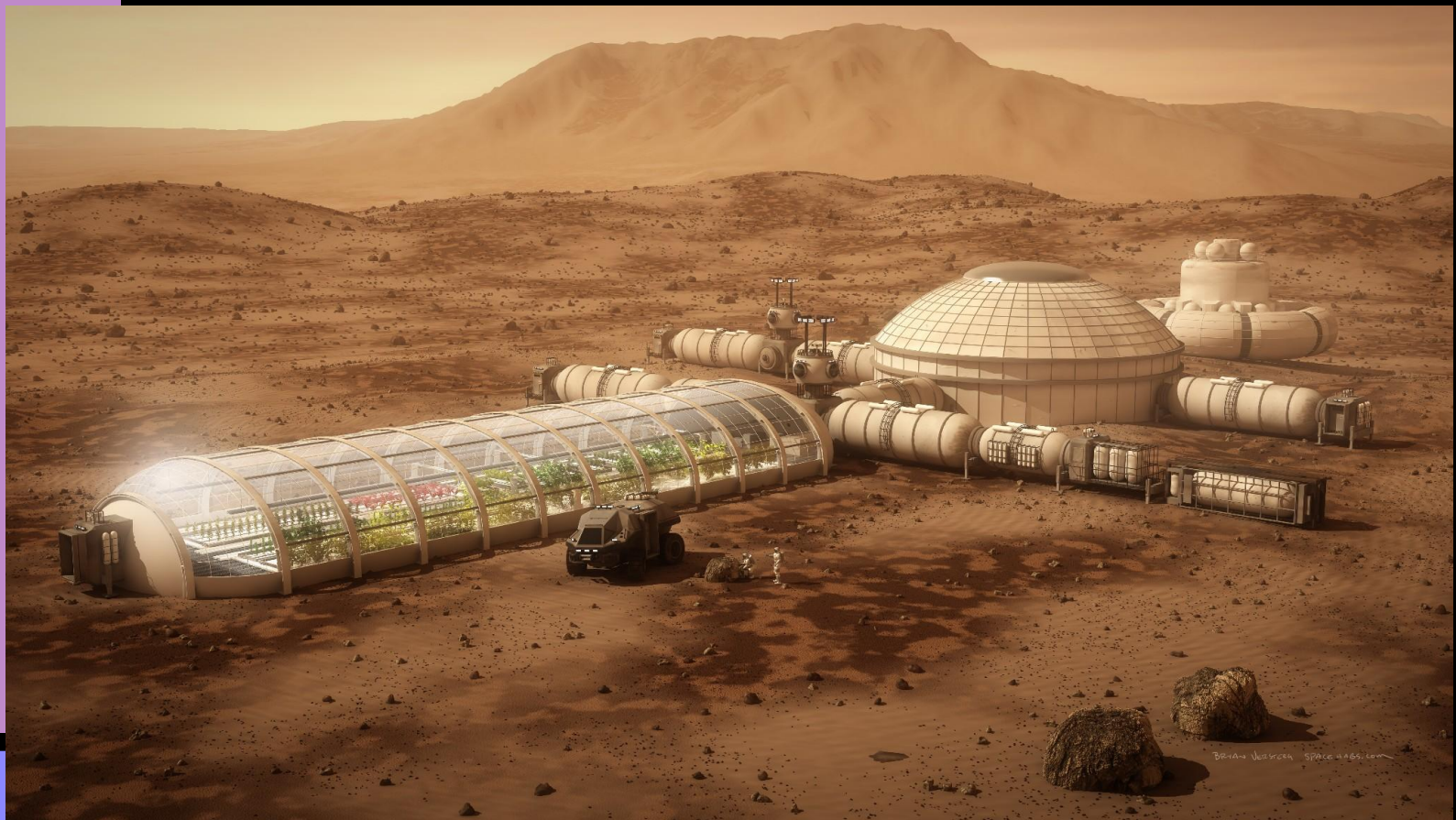
Madrigal, Alexis (2009) Humans, Shmumans: What Mars Needs Is an Armada of Robots and Blimps, Wired 10.29.09



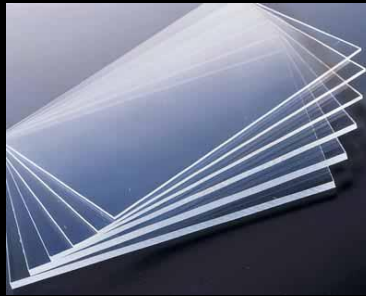


**...or Martian Robotic Snowball Making!**



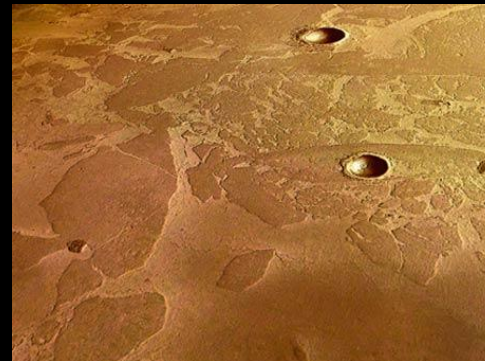


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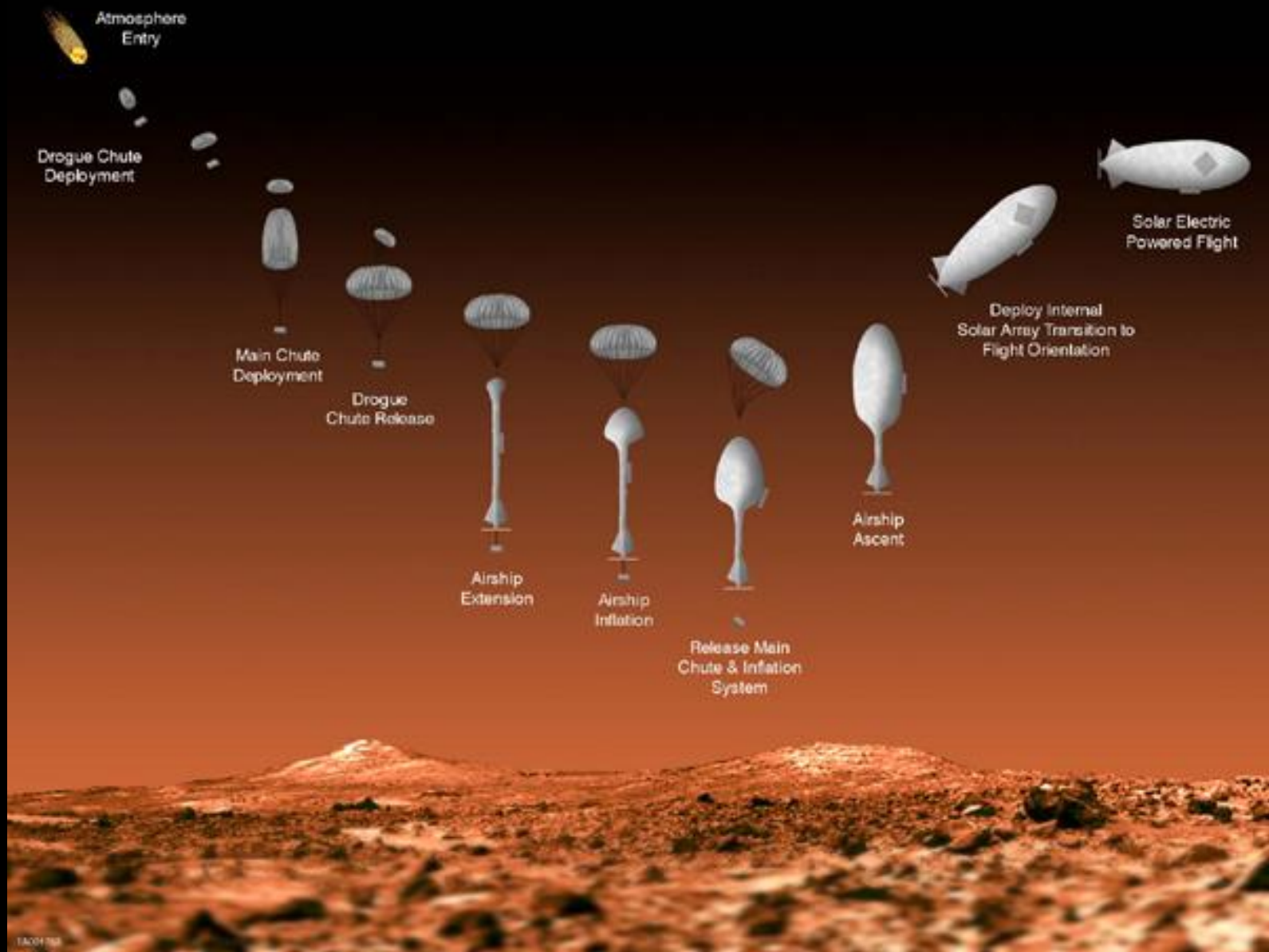


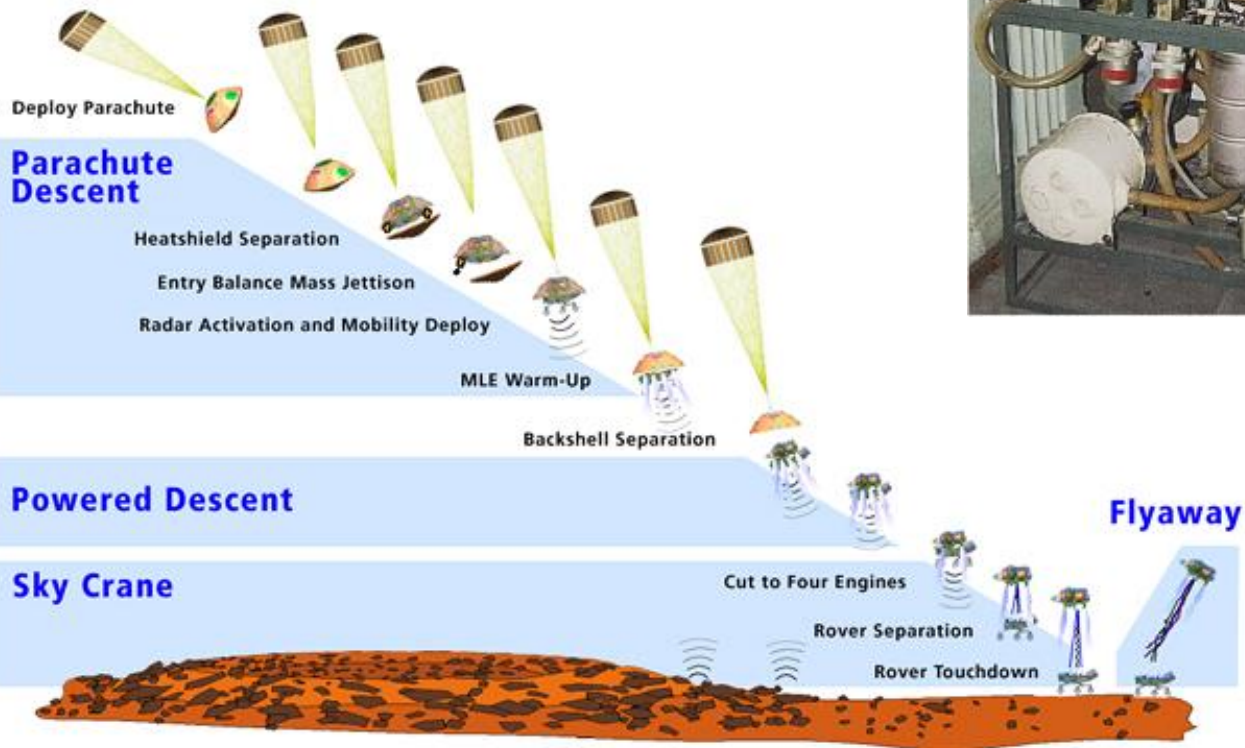
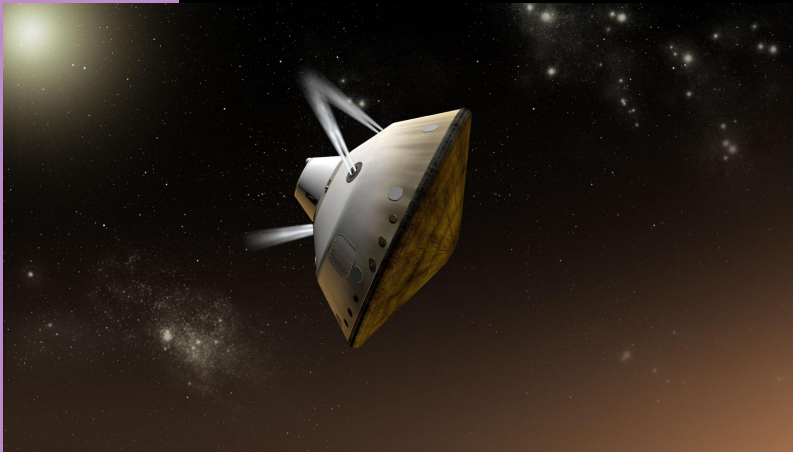


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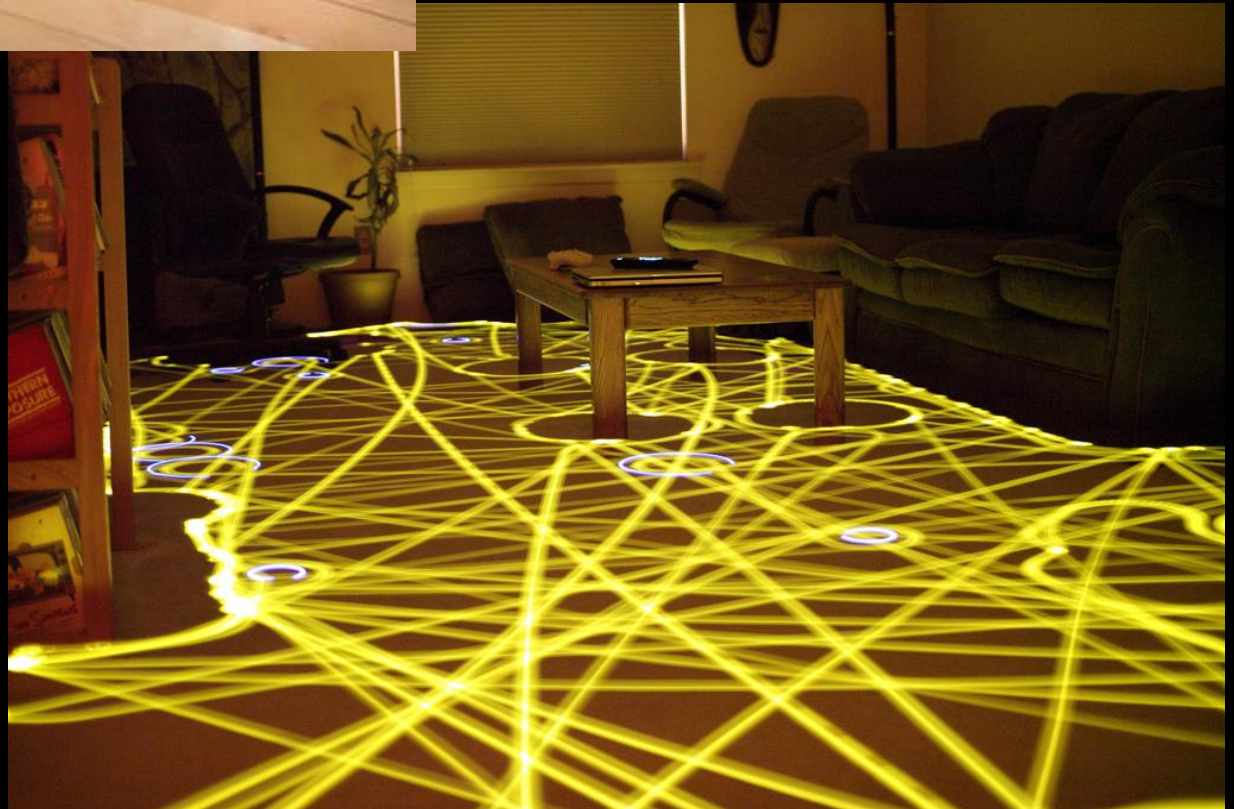
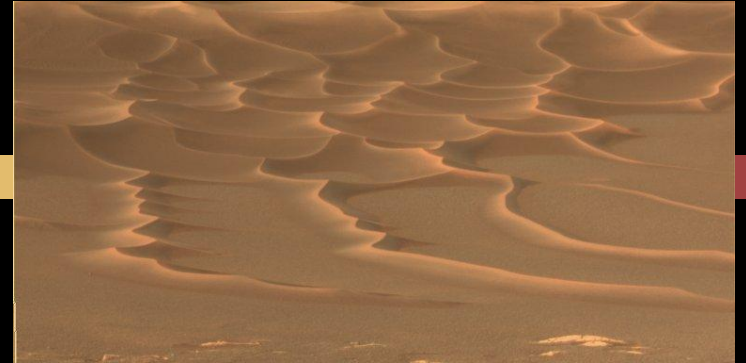














*Sabatier reaction: (named after the French chemist Paul Sabatier)*

$\text{CO}_2$  (primary component of Martian atmosphere) +  $4\text{H}_2 \rightarrow \text{CH}_4$  (methane/fuel) +  $2\text{H}_2\text{O}$  (water)

An alternative “stoichiometric equation” big words for “balanced”

$3\text{CO}_2 + 6\text{H}_2 \rightarrow \text{CH}_4$  (rocket fuel) +  $2\text{CO}$  (carbon monoxide) +  $4\text{H}_2\text{O}$  (more water)

NASA is using the additional process to recover water on the International Space Station

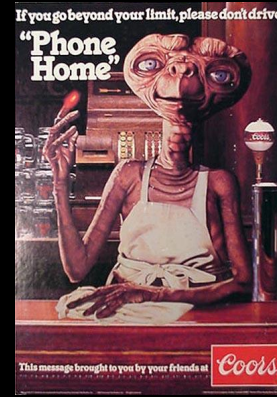
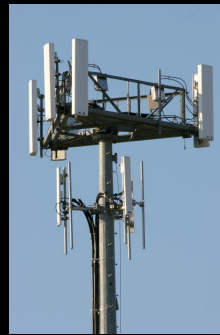
$2\text{H}_2\text{O} \rightarrow \text{O}_2 + 2\text{H}_2 \rightarrow$  (respiration)  $\rightarrow \text{CO}_2 + 2\text{H}_2 + 2\text{H}_2$  (added)  $\rightarrow 2\text{H}_2\text{O} + \text{CH}_4$  (discarded)

...and by adding a little electricity from wind or solar power we can generate  $\text{O}_2$  and recover  $\text{H}_2$  for recycling back into the system...keeping the balloons afloat.

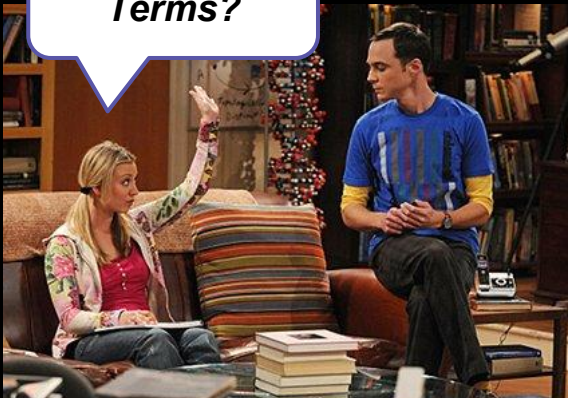
Add heat and we get Carbon useful for manufacturing:

$\text{CH}_4 + \text{heat} \rightarrow \text{C}$  (remember this) +  $2\text{H}_2$





Layman's  
Terms?



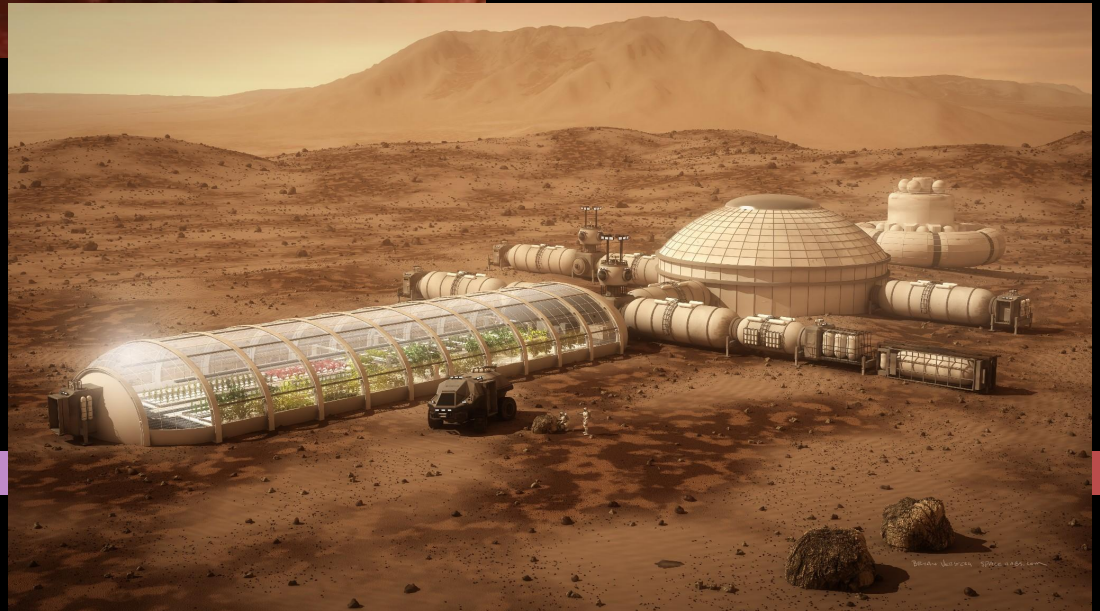
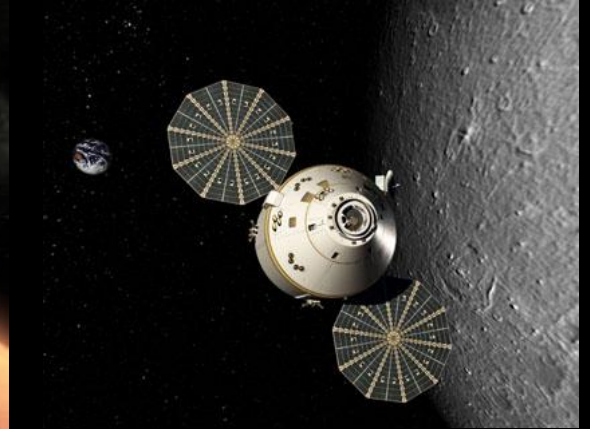
It's Obvious!







**Ted Tague - Inventor of the Hades Micro Steel Refining Furnace  
CrowdSourced & Kickstarter Funded**



**The Age of Crowdsourced Planetary Exploration & Colonization**