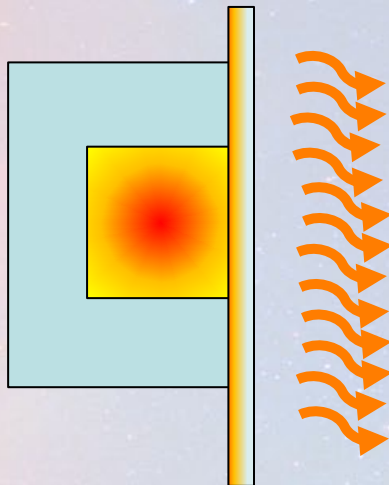
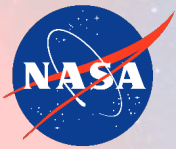


Thermoradiative cell for converting heat to electrical power

Geoffrey A. Landis
NASA Glenn Research Center
Cleveland OH
geoffrey.landis@nasa.gov



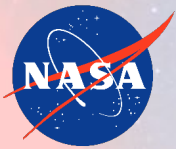


What is a Thermoradiative cell?

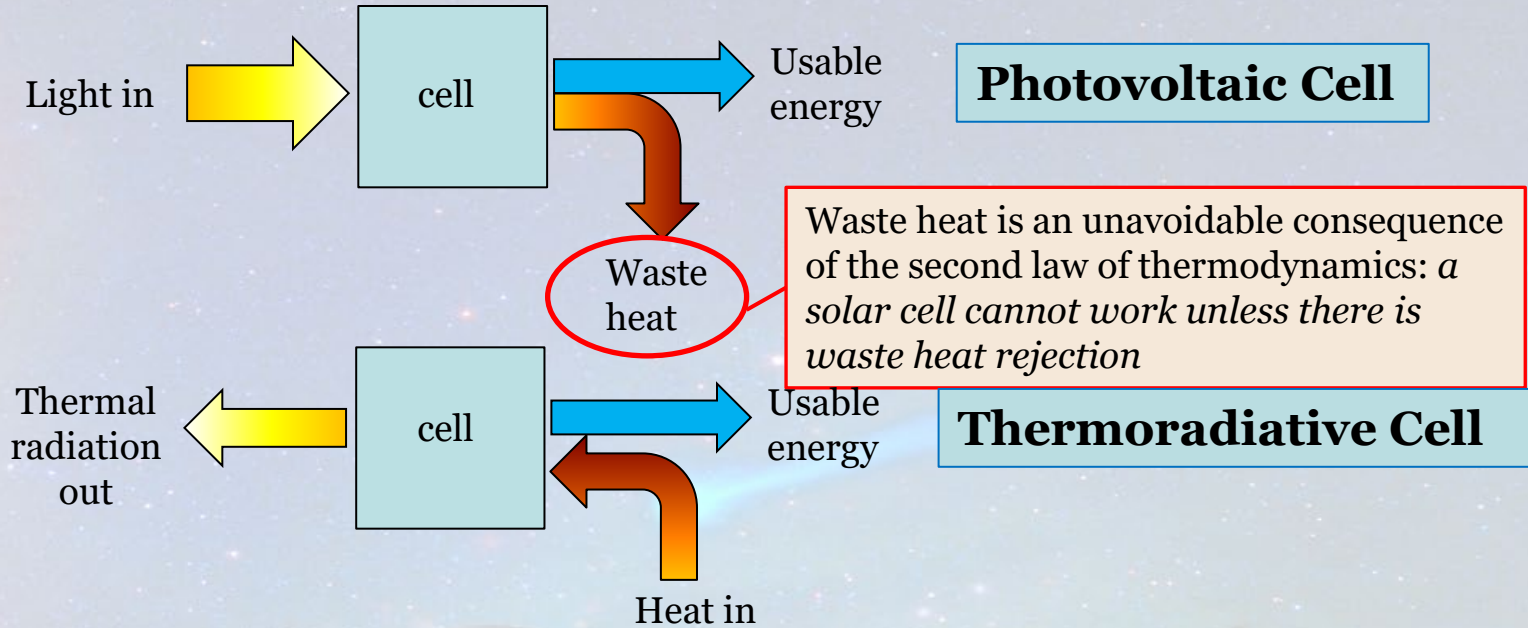
And why should we care?

- A thermoradiative cell is a new method for converting heat energy into electrical power
 - First detailed by Strandberg in 2015 (based on concepts elucidated by Byrnes, Blanchard, and Capasso in 2014)
 - Operationally similar to a photovoltaic cell, but thermodynamically exactly backwards
- No moving parts
- Think of it as a panel that acts like a **thermal radiator that generates power**



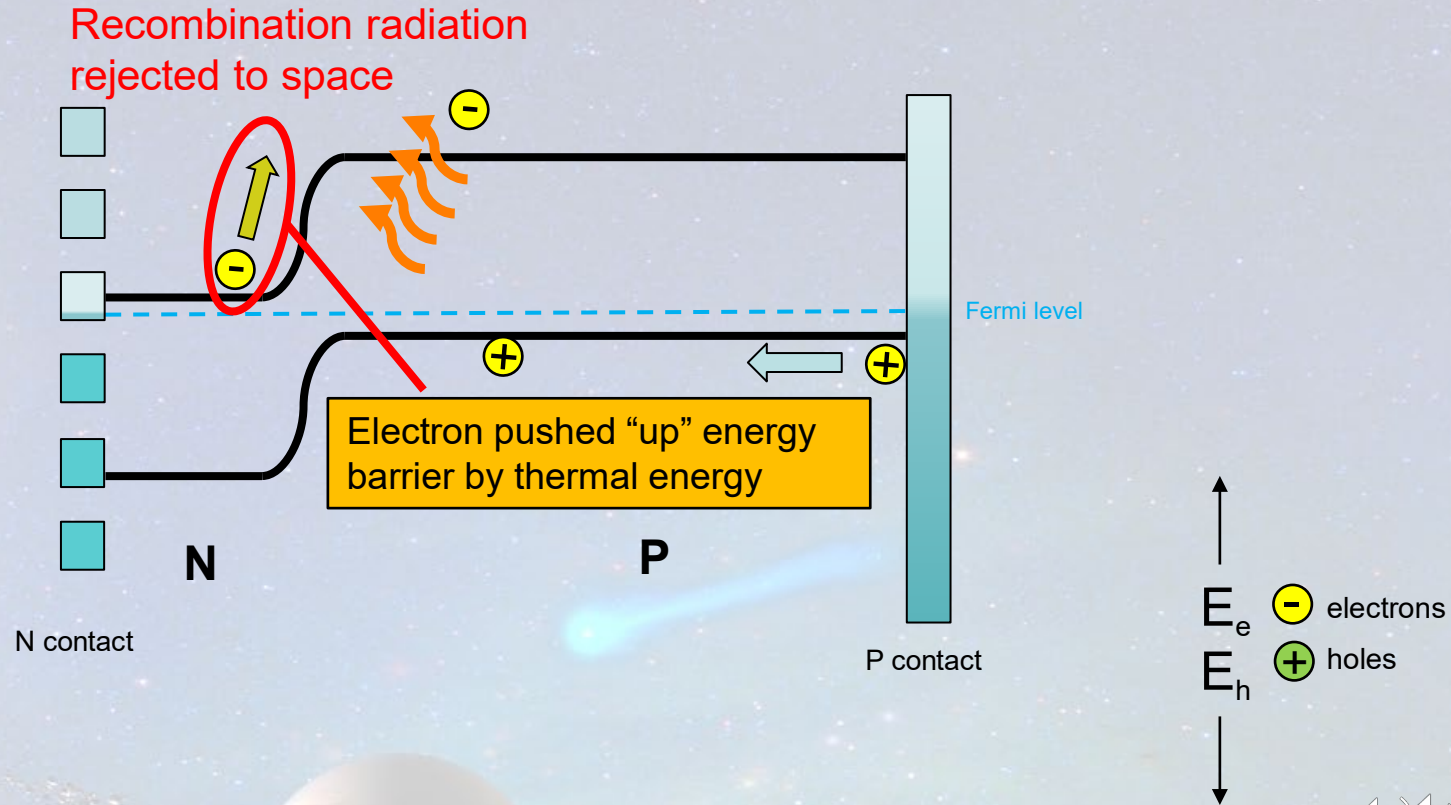


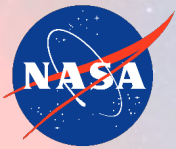
Photovoltaic Cell vs Thermoradiative Cell



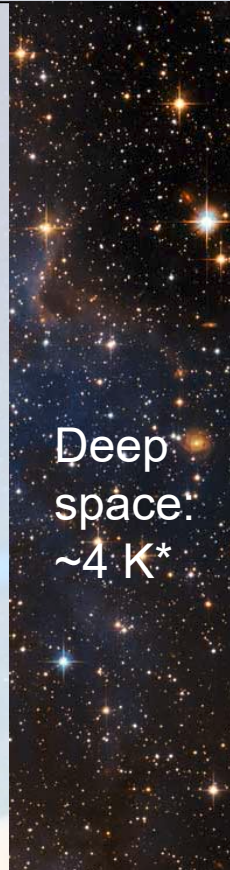
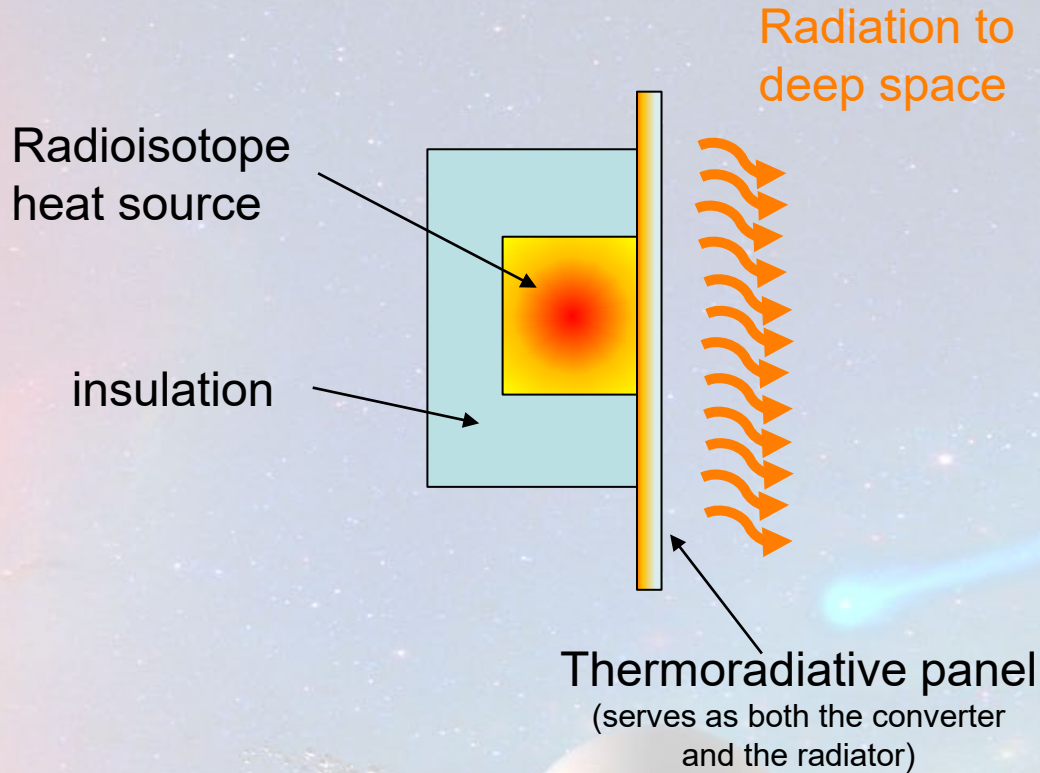


Operation of thermoradiative cell: band diagram





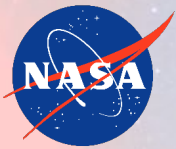
Conceptual operation of thermoradiative cell in space



Deep space:
~4 K*

*in fact, the effective temperature of deep space is only 4K if you are outside the solar system. Inside the solar system zodiacal light makes the effective temperature more like 10-12K





Acknowledgements

I would like to thank Jianjian Wang of Advanced Cooling Technologies and Prof. Jamie Philips of University of Michigan (now at University of Delaware) for useful discussions

