



Department of Physics & Astronomy

Sudipfest 2019

Bhaumik Lecture Series

THURSDAY, APRIL 4, 2019 at 5:00 p.m.
Centennial Ballroom (AB),
UCLA Luskin Conference Center



Robert B. Laughlin,
Stanford

THE BRAYTON BATTERY: This talk will give an overview of work I have been doing off campus for the past several years on the matter grid energy storage using reversible heat engines and molten nitrate salt. The most recent work, a secret project at X code named "Project Malta", was revealed in Bloomberg on 31 Aug 17. My own scientific writing on the matter came out about the same time as *J. Renew. Sustain. Energy* 9, 044103 (2017). The two key patents (US 9932839) and (US10012448) issued in April and July of 2018. A spinoff company, Malta Inc, was announced in Bloomberg in December 2018. The talk will touch on the grid storage problem itself and why I think heat beats all other ways of solving it - including in particular electrochemistry. The bulk of the talk will focus on the concept of a closed-cycle Brayton engine and the many aspects of "old time physics" associated with it: equation of state thermodynamics, adiabatic efficiency, metals creep, entropy creation in counterflow heat exchange, salt corrosion, high-speed bearings, hard permanent magnetism, torque limits of high-speed motor-generators imposed by Maxwell's equations and vibration physics, simulation of physical linkages with power semiconductors, and so forth. The larger idea underneath is that lowering costs to the bone is the problem, and that the physics of heat transfer facilitates this. The technology has no land use issues, it can be easily scaled up to the size of megacities at low cost, and it is safe - meaning that the nuclear weapon's worth of energy one must store cannot be released all at once. I will show images of the (tiny) released prototype engine, which is about 2 m long, 0.6 m in diameter, and has the power of a diesel locomotive.

