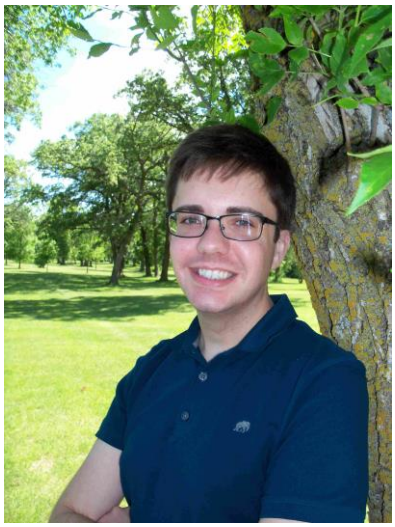
LABORATORY FOR ELEMENTARY-PARTICLE PHYSICS (LEPP)

Theory Seminar



Grant Remmen

Berkeley

Weak Gravity Conjecture from Black Hole Entropy

We prove that higher-dimension operators contribute positively to the entropy of a thermodynamically stable black hole at fixed mass and charge. Our results apply whenever the dominant corrections originate at tree level from quantum field theoretic dynamics. More generally, positivity of the entropy shift is equivalent to a certain inequality relating the free energies of black holes. These entropy inequalities mandate new positivity bounds on the coefficients of higher-dimension operators. One of these conditions implies that the charge-to-mass ratio of an extremal black hole asymptotes to unity from above for increasing mass. Consequently, large extremal black holes are unstable to decay to smaller extremal black holes and the weak gravity conjecture is automatically satisfied. Our findings generalize to arbitrary spacetime dimension and to the case of multiple gauge fields. The assumptions of this proof are valid across a range of scenarios, including string theory constructions with a dilaton stabilized below the string scale.

Wednesday, October 24, 2018
2:00pm
401 Physical Sciences Building