Computations in algebraic topology can effectively be divided up into rational information together with information at each prime. Refinements of this led to a division of homotopy theory according to primes. I'll discuss how Quillen connected homotopy theory to formal group laws, leading to effective invariants of stable homotopy groups in terms of Bernoulli numbers and modular forms. We'll then move on to discussing ongoing work connecting this to work of Picard on modular functions in two variables, as well as modular forms with level structure.