Abstract Submitted
for the TSS21 Meeting of
The American Physical Society

The relic abundance of dark matter – a nontrivial physics and mathematics problem TREVOR CROTEAU, CADEN LAFONTAINE, BRANDON TORRES, SPENCER ELLIS, SABRINA HERNANDEZ, DRUE LUBANSKI, BAILEY TALLMAN, DIEGO CRISTANCHO GUERRERO, ROLAND ALLEN, Texas A&M University — A vast number of dark matter candidates have been proposed, but almost none of them have provided a well-defined and natural explanation of the observed abundance of dark matter. We will discuss the following aspects of this problem: (1) The "WIMP miracle": A weakly interacting massive particle can have very roughly the observed abundance if its mass is $\sim$ 100 GeV and the interactions responsible for annihilation in the early universe are not too strong (or too weak). (2) A nonlinear Boltzmann equation can be derived that yields the relic abundance in the present universe, but this equation is quite nontrivial to solve. One approach will be described. (3) The cross-section for annihilation has been found to be too large for the most natural dark matter candidate of supersymmetry, a relatively light neutralino, making the relic density too small by about an order of magnitude. (4) We propose a candidate, resulting from an extended Higgs sector, that will yield the observed abundance with a particle mass of about 75 GeV, as described in two other talks at this conference.

Roland Allen
Texas A&M University

Date submitted: 11 Mar 2021 Electronic form version 1.4