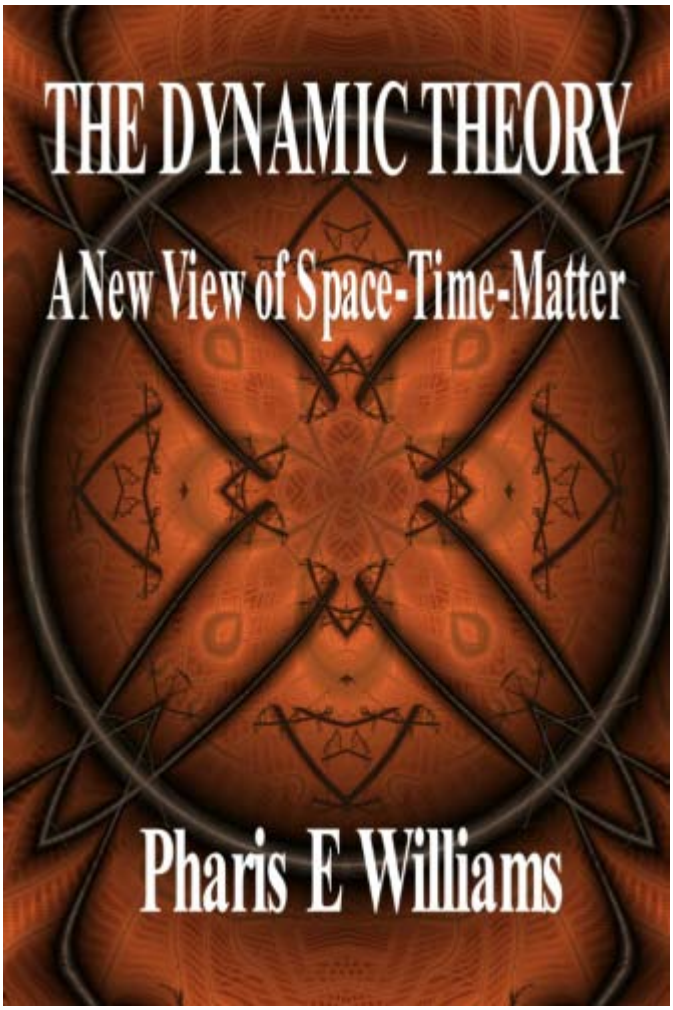

This book supplies the details of the derivations by which I arrived at many conclusions concerning the natural universe of space, time and matter starting only from the three laws of classical thermodynamics. The combination of the conservation of energy in the First Law and the Second Law produce the concept of entropy for both thermodynamic and mechanical systems. Entropy is shown to best be described as 'energy that becomes unavailable' as it becomes infinite as velocities approach a universal limiting velocity. The universal limiting velocity required by the First and Second Laws introduces velocity dependent forces that vanish as the velocity approaches the limiting velocity. Systems with constant entropy are the most stable systems that may occur in nature and systems whose mechanical entropy remains constant are shown to obey quantum mechanical equations.

However, the real power of the classical laws of thermodynamics is displayed when thermodynamic and mechanical forces are included in the laws at the same time. The design of steam engines was done while conserving mass which reduces the five dimensional First Law to a four dimensional statement. The five dimensional gauge function required of fundamental particles is dependent upon space, time and mass and produce fields that are also five dimensional and these fields are quantized. The space-time-matter universe may be restricted to a four dimensional universe of space-time by using conservation of mass with the result that the four dimensional surface embedded into the five dimensional universe must have a curvature specified by Einstein's field equations. Five dimensional isentropic states are described by five dimensional quantum mechanics. The imposition of conservation of mass upon these isentropic states produces a quantization of Einstein's general relativity.

The gauge function for fundamental particles depends exponentially upon space, time and mass. The space dependence displays the classical long range dependence of gravitational and electrical fields. The short range space dependence is very different from the singular classical fields that tend to infinity as the separation between particles tends to zero. The short range space dependence of the five dimensional gauge fields in non-singular which requires them to return to zero as particle separation vanishes. This new short range space dependence of the gauge fields leads to a description of nuclear phenomena currently ascribed to the nuclear forces and leads to predictions of new nuclear phenomena. The time dependence of the gauge fields shows up in phenomena that involve large time differences. One such phenomenon is shifting of the frequency of light emitted by distant stars as it travels toward the Earth. The first order

approximation of the predicted red shift of light results in the Hubble red shift. The full prediction shows that more massive stars may have much larger red shifts than their distance alone would require which would allow for the much larger red shifts of quasars without great distances. The time dependence of the gauge function is shown to lead to a weakening of the gravitational field over time and this, in turn, leads to an understanding of dark matter and dark energy through this time dependent gravitational field. The non-singular space dependence predicts a cosmology with expansion properties without a big bang beginning.

In summary, the book presents detailed derivations of numerous applications of the classical thermodynamic laws with the result that phenomena currently covered by Newtonian, relativistic and quantum mechanics are predicted by these three laws. This is a significant reduction of the number of required fundamental assumptions in the description of these phenomena. Additionally, many new phenomena are predicted that lead to new views of the universe.