

**Report on the Evaluation  
of Chapter 33  
Unification of Spacetime, the Forces,  
Matter, and Energy  
in  
“The Grand Unified Theory of  
Classical Physics”  
by Dr. Randell L. Mills**

Prepared by

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## Executive Summary

In my analysis, I verified calculations and equations involving the Unification of Spacetime, the Forces, Matter, and Energy found in Chapter 33 of the book “The Grand Unified Theory of Classical Physics” (January 2020 edition) by Dr. Randell L. Mills. I verified equations and calculations to a high degree of accuracy that are associated with these subjects. There is a remarkable agreement between the GUTCP calculated equations and the equations I get from my calculations. I verified the equations from 33.1 through 33.46.

## Purpose

Chapter 33 starts with the information that spacetime has an impedance of  $\eta$ , which is important since it gives rise to the limiting speed of propagation of  $c$  for any wave, including gravitational and electromagnetic waves. In a dual relationship, matter/energy acts on spacetime and in return, spacetime acts on matter/energy. Matter and energy also have a dual relationship since they are interchangeable.

Another dual relationship in the Universe is the action/reaction forces of Newton’s Third Law of Motion. Another dual relationship is the electric field/magnetic field in Relativity. Here, the magnetic field in one inertial frame is seen as an electric field in another inertial frame. A stationary charge will give rise to an electric field in one frame. But seen by an observer in a frame moving at a constant velocity with respect to the first frame, the observer will see the charge as a moving charge, which gives rise to a magnetic field. Inertial and gravitational mass are equivalent, and form another dual relationship.

From the spacetime metric and tensor, for  $r < r_n$ , there is no mass, and spacetime is Flat or Euclidean. At  $r = r_n$ , there is a discontinuity of mass for the atomic orbital. The discontinuity results in, for  $r > r_n$ , radial length contraction and time dilation that results in the curvature of spacetime. The Schwarzschild metric gives the relationship where matter causes relativistic corrections to spacetime that determines the curvature of spacetime - and that is the origin of gravity. The Schwarzschild metric can be reduced to Newton’s Law of Gravity when  $r_g/r_\alpha^* \ll 1$ , where  $r_\alpha^* = \lambda_c\text{-bar}$ .

A review of Maxwell’s Equations, Newtonian Mechanics, and Special Relativity are given next. General Relativity from Chapter 32 gives the relationship between the proper time and the coordinate time of particle production. Next, we are reminded of the equivalence of the mass energy, the Planck equation energy, the electric potential energy, the magnetic energy, the gravitational potential energy, and the mass/spacetime metric energy from Chapter 32.

The Planck mass  $m_u$ , the gravitational velocity  $v_G$ , and the impedance  $\eta$  formulas are given next. In the process, we see that the charge  $e$  is quantized as a direct result of the quantization of the angular momentum of the photon as  $\hbar$ .

The Universe undergoes harmonic expansion and contraction since Chapter 32 showed that it is finite, closed, and oscillating. The equation for the radius of the Universe was derived in Chapter 32 and we are reminded of that equation here in Chapter 33 as well. Spacetime expands as mass is released as energy.

The mass-energy to expansion-contraction ratio,  $Q$ , is derived and the value of  $Q$  is determined from it, in units of kg/sec. It's shown that the period of the spacetime expansion/contraction,  $T$ , is equal to the particle decay/production,  $\tau$ , for the Universe. This fact determines such things as the mass of fundamental particles, the equivalence of inertial and gravitational mass, etc. The ratio of the proper time to coordinate time is shown to be equal to  $v_G/c$ .

At the present time in the cycle of the Universe, the proper time and the coordinate time are about equal, the ratio of the gravitational radius  $r_g$  and the radius of the Universe are about equal to one, and the gravitational escape velocity  $v_g$  is equal to the speed of light. This implies the rule that "When the gravitational radius  $r_g$  is the radius of the Universe, the proper time is equal to the coordinate time, and the gravitational escape velocity  $v_g$  of the Universe equals the speed of light". The equation for the period of the Universe,  $T$ , is given next and the value for  $T$  is found in both seconds and in years.

The chapter ends by reflecting on the fact that the Wave Equation is more general than just describing the propagation of light waves and electromagnetic waves. The Wave Equation also describes the propagation of any wave in the Universe, such as gravitational waves, the effects of mass and particle production on spacetime, and the evolution of the Universe itself.

## Calculations

I have verified that Equations 33.1-33.9 are true and correct.

I have also verified that Equations 33.10-33.17 are also correct.

I have verified that Equations 33.18-33.24 are correct.

And I have verified that Equations 33.25-33.30 are correct as shown in the book.

I have verified that the value of  $c^3/(4\pi G)$  is correct in the second line after Eqn. (33.31).

I have verified that Equations 33.33-33.34 are correct.

I have shown that Equations 33.36-33.39 are true.

And I have shown that Equations 33.40-33.46 are correct as shown.

## **Conclusion**

I was able to verify that the GUTCP results of Chapter 33 are in excellent agreement with my own calculations and derivations of equations. I successfully reproduced all of the equations and derivations found in Chapter 33. This chapter demonstrates that the GUTCP theory is successful at describing Spacetime, Forces, Matter, and Energy, and their unification, to a high degree of accuracy.

I find my results and calculations to be confirmation that the derivations and equations of Chapter 33 are indeed accurate, reproducible, and valid.