# Discussion on the *Derivations* of *Newton's Laws*, *Law of Gravity*, and the *Gravitational Constant* as founded on *Fundamental Philosophical Principles* and *Formulated* using *Geometric* and *Numeric Reasonings* ©

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**Abstract**

Strobel's derivations of *Newton's Laws*, the *Law of Gravity*, and the *Gravitational Constant* (*G*) are based on *Most Fundamental Defacto–Apriori Philosophical Principles* and *Higher Level Ipso–Facto Principles* supporting *Geometric* and *Numeric* operations on *Standardized Metrics* of *Differential Orders* of *Generalized Momentums* and *Generalized Positions*. *Metrics* are defined in *Context* with *Normalized Magnitudes* in all *Differential Orders* and follow *Quantum Mechanics* type *Constructs* being *Forward* and *Inverse Operations* between two *Standardized Metric Spaces* where one is *Calibrated* and the other *Normalized*. The calibration from the *Mathematical Construction* into the *Physical* uses the *Universal Calibration Constant* for *Mass* (m̃) determined from *Planck's Constant* and a reduced form for *Einsteins Mass—Energy Equation*. The terms of the general form approach *Zero* at appropriately low *Order* for *Newton Mechanics* and they are valid for all *Scientific Investigations* having *Primary Constants* of *Mass*, *Distance*, and *Time* calculated using *Standardized Units*.

The *Gravitational Constant G* is a *Context Dependent Universal Constant* that is shown not to be *Universal* as is the *Convention*. The derived *Gravitational Constant* is a prediction of the *Emperical Value* subject to the *Constraints* of the *Context*. Introducing *Constraints*—namely those of the *Center of Mass Context*—makes it a *Universal Constant* for *Standardized Derivations* in all *Contexts* subject to those *Constraints*. In *Classical Mechanics* they can be determined for any *Calibrated System* of *Measure* and converted to any other *System of Measurement* using only the conversion factor for the *Units of Measure* for *Mass*.

A value for *G* in *SI* units for *Mass/Time* (*gm*/ sec), is calculated with *Planck's Constant* implicit in it's *Emperical Value* from the more *Fundamental Universal Constant* for *Mass* m̃. A second, independent calculation for *G* is obtained using empirical *FPS* values for *h* and *c* and the conversion factor for *Mass* between *pounds* and *grams*. The variance between these two completely independent calculations for *G* from independent measurements for *h* is roughly of the *Order* of 72 parts in one-billion.

*G* is a *Transcendental Number* and *Planck's Constant* is the computed value in the *Inverse Operation* and is *Transcendental* and a *Universal Constant* based on it's *Conventional* treatment. The *Mathematical Equivalent* (*N*) for *G* is a *Most Fundamental Construct* of *Mathematics* that *Transforms* between two *Normalized Metric Spaces* as contrasted to *G* which *Transforms* between a *Normalized Metric Space* and a *Calibrated Metric Space*. The *Mathematics* of *N* falls in the field of *Modular Forms*.

Assuming bodies with *Homogeneous Density Mass Distribution* and in *Context*, the *Bulk Masses* for *Planets Modelled* in this simplest of cases are calculated to be half that accepted under conventional analysis.