

A review of  
**Patterns in Physics – toward a Unifying Theory**  
Réjean Plamondon, 2012, Presses Internationales Polytechnique

This 200-page book is a bold proposal toward a theory based on Bayes’ Theorem that provides a new foundation for Relativity and Quantum Physics. Its author, Professor Réjean Plamondon, is well known in the IAPR community for his log-normal neuro-muscular models of handwriting and other small learned motions, for co-founding and co-directing the Unipen Consortium and the International Graphonomics Society, and for his many scholarly articles on handwriting recognition. He also served as CEO of the Polytechnique de Montreal and he writes delightful poetry.

This work is a radical departure from all of the above. It is based on the analogy that Einstein’s 16-dimensional product of the space-curvature tensor and the energy-motion tensor can be viewed as a joint probability. This is justified by the Principle of Interdependence, according to which the two tensors constitute an inextricable information space that defines the observable Universe. To represent an infinitesimal subset of this Universe, the corresponding probability density functions are expressed via Bayes’ formula as a ratio of two densities multiplied by a conditional density. The duality between deterministic and probabilistic formulation is resolved by the Principle of Asymptotic Convergence which states that when a physical system consisting of many subsystems can be described – using the Central Limit Theorem – by a multivariate normal function, its constituents can be considered either deterministic or probabilistic without affecting the predictions of the resulting model.

In a macroscopic description, the space-times of each individual particle must be synchronized. Therefore, their probabilities add, which leads to their convolution converging, by virtue of the Central Limit Theorem, to a normal distribution with mean zero and a single covariance parameter *sigma*. The resulting formulation is integrated to determine the gravitational constant with the parameter *sigma* set to the appropriate scaling factor for the Sun. (The No Free Lunch and Ugly Duckling theorems of Pattern Recognition are invoked to explain the seemingly arbitrary choice of the Sun.) The result matches Newton’s Square Law for large distances, but includes an *erfc* (complementary error function) factor that keeps the force from diverging at zero distance. According to the proposed Law, the global gravitational field of the Sun (considered as an ideal static spherically symmetric massive system) has a point of inflection at a radius of 20,000 km on either side of which it decreases smoothly to a value of zero at both zero and infinite radius.

Starting with the gravitational constant *G*, Plamondon uses only the single scaling parameter *sigma* to derive the speed of light *c*, the Boltzmann Constant, Avogadro’s Number, the Hubble Constant, and the masses of the proton and the electron. The values of many other physical constants, including the Fine Structure Constant and permittivity and permeability of vacuum, are derived further on, as well as new equations for the Electrostatic, Weak and Strong forces. The constants are all calculated to nine decimal places to show the slight differences from accepted values. For example, the computation indicates that the speed of light is about 22 km/s lower than its defined value. (It is, of course, the meter that is defined in terms of *c*, not vice-versa, so perhaps it is the meter that is longer.) Plamondon hypothesizes that the discrepancy may explain known anomalies in computing the trajectory of the Pioneer spacecraft, various orbits near Mars, and the crash of the Mars Polar Lander.

The *erfc;sigma* metric permeates all subsequent calculations and accounts for most of the proposed changes in the values of the constants and potential functions. Importantly, *erfc* also eliminates all discontinuities and singularities from the various forces and potentials, as illustrated in numerous figures. Extending his model of the solar system to the galaxy and to the entire Universe, Plamondon builds on the lack of singularities to question the existence of black holes and even of the Big Bang.

The new paradigm is applied at scales ranging from the astronomical to the sub-atomic. Most of the quantum-mechanical predictions are based on the error of convergence in the CLT due to a finite rather than infinite number of additive components. Some results are applicable to high-energy Collider experiments. In the chapter dedicated to the very small in contrast to the very large, Plamondon suggests that the putative behavior of tauons on Saturn and of muons on Jupiter is comparable with that of electrons on Earth.

In summary, what is proposed is a unifying theory that predicts, using various mappings and projections in high-dimensional information spaces, the values of all the physical constants instead of modifying existing theory to accommodate the constants' observed values. The theory is supported on three legs: the analogy of a tensor product with a joint probability with multivariate components, the Principle of Interdependence, and the Principle of Asymptotic Convergence. The new paradigm is stated completely enough to be *falsifiable* and provides concrete, verifiable predictions. In fact, diverse experiments and further explorations of the theory are suggested to validate or reject it.

The narrative is clear throughout and, in places, inspiring. The illustrations, many of which were prepared by the Maple general relativity software, are excellent. There are 100 references, mostly to classical and contemporary results in physics. A more complete index would be helpful because of the book's structure as an expanding spiral.

If you would enjoy exploring the fundamental nature of the Universe from a pattern recognition perspective and thrive on insights interspersed with page-long equations, this book is for you.

*(Disclosure: This book requires far more physics and mathematics than probability or statistics. I was not able to follow either the arguments or the derivations at more than a superficial level because I lack any knowledge of modern physics beyond a 1959 BEng in Engineering Physics. I cannot tell a Covariant from a Contravariant Tensor, a Christoffel Symbol from a Schwarzschild Metric, or a Muon from a Tauon. Nevertheless and perhaps surprisingly, I enjoyed reading Plamondon's astounding revelations.)*

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