
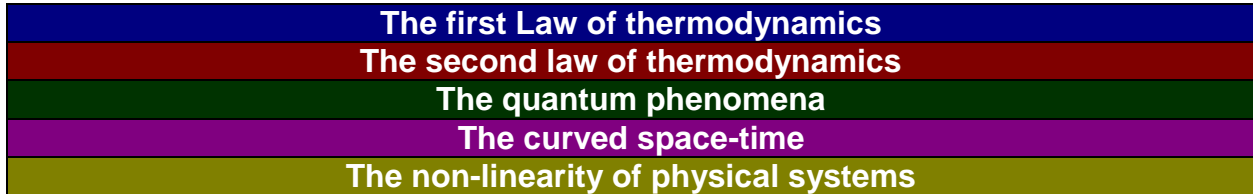


## The Sixth Paradigm of Physics: Mathematical Formulation

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Science is an intellectual activity that extends the process of consciousness to the most abstract and the most fundamental levels. The existing five paradigms have changed the fundamental concepts physicists have about the relationship of space, time and matter (Fig. 1). In order to



**Fig. 1. The five paradigms of physics**

interpret the data and develop satisfactory theories to explain them, a sixth paradigm of physics needs to be introduced. This paper suggests the mathematical structure of this new paradigm<sup>§</sup> (Fig. 2a, b).

$$\int \delta \mathcal{L}(q_i, \frac{dq_i}{dt}, t, \mathfrak{R}, \Theta, \zeta, \eta, \xi) \Pi dq_i = 0; i, j = 1, 2, \dots, n$$

Generalized Hamilton's Principle

$$\delta \mathfrak{R} \left( q_i(A), q_i(B); \frac{dq_i(A)}{dt}, \frac{dq_i(B)}{dt}; t, \Theta; \zeta; \eta; \xi \right) = 0$$

Principle of least Curvature

**Fig. 2a, b. Mathematical structure of the sixth paradigm (a) generalized Hamilton's principle, (b) principle of least curvature**

where  $L$  is the Lagrangian density,  $\mathfrak{R}$  the measure of curvature,  $\Theta$  the quantum state measure (spin, antisymmetry, parity),  $\zeta$  the measure of entropy,  $\eta$  the measure of nonlinearity and  $\xi$  describing distribution of mass (energy) in space. This holds also for nonlinear systems having terms like  $\zeta \otimes \eta$ , etc. The condition  $\mathfrak{R} = \text{constant}$  corresponds to the principle of geodesic.

**Keywords:** Matter • Space • Time

**Web address of this document:** <https://www.ngds-ku.org/Presentations/Paradigm.pdf>

<sup>§</sup>3-year later these results have been published in a peer-reviewed journal:

Kamal, S. A., K. A. Siddiqui and Naseeruddin (2000). The sixth paradigm of physics. *Karachi University Journal of Science*, **28** (2): 11-16, full text: <https://www.ngds-ku.org/Papers/J24.pdf>

11 years after publication of the above paper, fourth law of thermodynamics was added to the existing laws of thermodynamics:

Kamal, S. A. (2011, March 28-30). The fourth law of thermodynamics. *The Pakistan Institute of Physics Conference (PIPC 2011)*, University of Engineering and Technology, Lahore, Pakistan, paper#PIPC-11-25, full text: <https://www.ngds-ku.org/Papers/C83.pdf>