**Prof. Dr. Khursheed Alam Khan Memorial Lecture** delivered, as nominee of Vice Chancellor, University of Karachi, during *the Conference on General Relativity and Gravitation*, Department of Mathematics, University of the Punjab, February 11-13, 2010 (Friday, February 12, 2010, 1220h-1245h, Al-Raazi Hall, Center for Undergraduate Studies), Morning Session, abstract#15, p 12

# A Minkowski-Type Metric for Curved Spacetime

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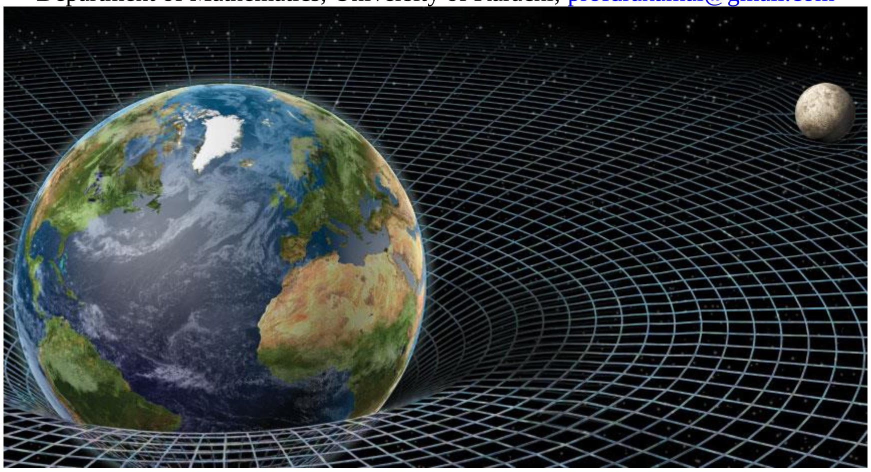

**Fig. 1. The curving of spacetime — relating mechanics (force concept) to geometry (curving of spacetime)**
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There has been a considerable interest among mathematicians and theoretical physicists to construct a quantum theory as a possible approach towards unification of all forces. Theory of general relativity and quantum field theory are not in agreement with each other, which is the main problem in making a mathematically consistent quantum theory of gravitation. Wigner describes it as: “There is, hardly, any common ground between general theory of relativity and quantum mechanics”. One encounters the problems of infinities in the quantum theory of gravity. The theory is not renormalizable, because Newton’s constant has dimensions of (energy)$^{-2}$. The lagrangian for Einstein’s gravity is a sum of curvature scalar $L_{gravity}$ (kinetic energy of the graviton) and $L_{matter}$ (all the other fields and their interactions with the gravitational field). For a physical theory to be valid it is not, always, necessary that the mathematical formulation must be simple. There are examples, when theories with a complex mathematical formulation, but simple ideas, worked. The lagrangian of SU(2) × U(1) representation of Glashow, Weinberg and Salam, when proposed for the first time, looked so complex that people thought it would not work. Another example is, Einstein’s general theory of relativity. It is based on a 10-dimensional tensorial field with complex mathematical formulation. However, it is based on the simple ideas of equivalence of a uniform gravitation field and uniform acceleration. Even special theory of relativity, as presented by Einstein, did not seem elegant, mathematically. It was Minkowski, who put the theory in spacetime-vector-field formulation. The formulation of general relativity available to us is not adequate to unite gravity and quantum mechanics. General relativity is a tensorial theory, while quantum mechanics is a linear theory based on the principle of superposition, which is valid, only, for linear systems. In this paper, an attempt was made to formulate general relativity by writing curved-spacetime metric describing riemannian geometry, whose tensorial components in a particular coördinate basis are given by $g_{\mu\nu}$, in a form similar to flat-spacetime metric describing minkowskian geometry, whose components are given by $\eta_{\mu\nu}$, in extra dimensions. Curvature infinities may be avoided by writing a linearized version of curved-spacetime-metric tensor. Transformation of coördinates has, also, been used to avoid infinities from Lorentz transformations and the Poincaré transformations. Use of extra dimensions to describe physical systems has been a practice in theoretical physics. Some well-known examples are Kaluza-Klein theories and superstring theories. This lecture was dedicated to the memory of Prof. Dr. Khursheed Alam Khan (whose contributions to theory of relativity cannot be overlooked), who passed away in October 2009. A research student of Roger Penrose of University of Oxford, he was associated with the Sir Syed University of Engineering and Technology at the time of his death.

*Keywords*: Quantum gravity, general relativity, spacetime physics

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