

Colloquium Announcement

Title: A Geometric Analysis of Force

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Abstract:

The formalism of Newtonian classical mechanics is well known and has been firmly established. The formalism of relativistic classical mechanics is also well known, but not as well understood. The usual approach toward a relativistic dynamical law is the Minkowski force, wherein Newton's parametric time is replaced with Einstein's geometric proper time. This approach is correct and necessary, but insufficient. It has some peculiar consequences when it is applied as the sole relativistic correction; for example, it implies that interactions are instantaneous, in spite of the causal restrictions imposed by the speed of light. As a result, no truly mechanical interpretation of electromagnetism is known.

During this presentation, the geometrical relationship between force and trajectory will be re-examined and more rigorously developed in order to obtain an appropriate generalization from Newtonian classical mechanics to relativistic classical mechanics -- or, indeed, to any other possible formulation of classical mechanics; for example, to a space of arbitrary dimension and structure. The resulting generalization predicts a relationship between potential energy and inertial mass that is not present in the usual application of the Minkowski force. Examples will be presented for electromagnetism and gravitation. It will be seen that this formalism yields a purely mechanical treatment of electrodynamics without introducing electric and magnetic fields that is in complete agreement with classical electromagnetic theory. The problems associated with defining causal, light-like interactions between relativistic particles will be introduced and the plans toward a resolution put forth.

Sponsored by UAB Department of Physics

Thursday, November 2, 2006

12:30 p.m. – 1:45 p.m.

Campbell Hall 274

Refreshments served at 12:00 p.m. in CH 361

1300 University Boulevard

For further information, please contact the
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