CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
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Project Number
S1906

Project Title
Relativistic Stress: A Phantom Force Emerging from the Interaction between Matter and Curved Space

Abstract

Objectives/Goals
My project explores the effects of a phenomenon which emerges from the interaction of matter with curved space. My postulate is that rigid materials resist changes in the curvature of space, and the goal of this project was to prove that.

Methods/Materials
A potential energy proof of this phenomenon is fairly straightforward. Materials that are moved from one region of space to a differently curved region of space have to contort. It requires energy to contort materials, and since some of the energy put into moving the material into curved space must go into contorting it, it follows that the material will resist moving to a region of differently curved space.

Results
For a material falling toward some gravitating body (like a planet), it is simple to calculate the amount of force with which the material will resist movement by comparing the potential energy gained in contortion to the potential energy lost in falling toward the planet, since any system will try to minimize potential energy. Unfortunately, the effect is not very visible under low curvatures of space. To float a triangle above the earth, it would have to be made at least 30 orders of magnitude more rigid than ordinary materials. However, simulation shows that under special circumstances, this effect is of an observable magnitude.

Conclusions/Discussion
If there is some efficient way to employ this effect, it has many applications. The most obvious one is in space travel: using this effect may dramatically reduce the cost of launching something into orbit. There are many ways to test this effect, the simplest of which is dropping two materials of different rigidity and measuring the difference in acceleration. The most practical means of demonstrating the effect with current technology is to fill an ultracentrifuge with a rigid material. Due to the high apparent curvature of space in an ultracentrifuge, it will take more energy to spin a rigid material than a malleable material in the centrifuge.

Summary Statement
My project is about the fact that rigid materials should resist changes in the curvature of space.

Help Received
Bounced ideas off my father.