# CALIFORNIA STATE SCIENCE FAIR
## 2003 PROJECT SUMMARY

**Name(s)**
Peter A. Lee

**Project Number**
**S1515**

**Project Title**
## Challenging the Theories of Dark Energy and the Expanding Universe with Photon Drag Mechanisms

**Abstract**

**Objectives/Goals**
Challenging the notion that intergalactic redshift is caused solely by Doppler-style galactic recession, this project identifies and characterizes two previously unevaluated non-Doppler causes of redshift to determine whether these tired-light photon energy loss mechanisms, gravitational drag and electric field drag, contribute to intergalactic redshift, thereby reducing or eliminating the need for the stop-gap theory of dark energy.

**Methods/Materials**
To evaluate the impact of photon drag mechanisms, two physics-based finite element computer models were written to analyze gravitational drag and electric field drag.

**Results**
The models successfully characterized gravitational drag and electric field drag and determined that they contribute at least part or perhaps all of observed intergalactic redshift.

**Conclusions/Discussion**
Given these results, the Doppler effect must play a smaller role in causing intergalactic redshift, which means that the universe is expanding more slowly, if at all, than is currently believed. Consequently, dark energy may not exist.

**Summary Statement**
Analyzing previously overlooked interactions between photons and deep-space hydrogen atoms reveals that the universe may not be expanding and dark energy may not exist.

**Help Received**
Parents helped assemble board