HONORS THESIS PROJECT OUTLINE

UNIVERSITY OF NEW MEXICO
DEPT. OF MATHEMATICS AND STATISTICS

TITLE: *Lie algebras and groups: theory and applications to special metric.*

APPLICANTS: Fred Kaul and Joseph Edwards

Research in Lie algebras and Lie groups requires knowledge of abstract algebra, real and complex analysis, and differential geometry. We will emphasize the following during our honors project:

(i)   deformations, contractions, and rigidity of Lie algebras with emphasis on the theory as applied to Lie algebras supporting additional geometric structures.

(ii)   applications of the studied Lie algebra/group theory in topics in differential geometry – Einstein metrics, contact structures.

Our objective is to study the topics in the theory of Lie algebras and Lie groups with applications to the existence and explicit construction of Einstein metrics. There will be an emphasis on recent advances, where such research is accessible to the advanced undergraduate. We will then complete separate theses presenting our findings. Each thesis will include:

(i) an introductory section outlining the core definitions and demonstrating the basic theorems utilized in later sections;

(ii) an investigatory section which will emphasize particular aspects of Lie algebra/group theory to be utilized in the final section;

(iii) an expository section, in which the previous results are applied to one or more applications in differential geometry.

We will compose our theses and present our findings to the Undergraduate Honors Committee.