

1052-58-231

**Bruno Colbois** and **Emily B. Dryden\***, Department of Mathematics, Bucknell University, 380 Olin Science, Lewisburg, PA 17837, and **Ahmad El Soufi**. *Upper bounds for eigenvalues of submanifolds.*

The problem of finding upper bounds for eigenvalues of the Laplace operator has a rich history, beginning with Hersch's sharp upper bound on  $\lambda_1$  for the sphere. In contrast, Colbois and Dodziuk showed that for manifolds of dimension three and higher, the eigenvalues can be unbounded unless additional geometric constraints are imposed. We discuss upper bounds on eigenvalues in the setting of compact submanifolds of Euclidean space. Our bounds depend on the dimension and volume of the submanifold and the order of the eigenvalue, plus a geometric constraint which measures the "volume concentration" of the submanifold. (Received August 31, 2009)