962-53-1312 **Ruth Gornet*** (gornet@math.ttu.edu), Dept. of Mathematics & Statistics, Texas Tech University, Lubbock, TX 79409-1042, and **Maura B. Mast** (mmast@cs.umb.edu), Dept of Mathematics, University of Massachusetts Boston, Boston, MA 02125. *The length spectrum and isospectral Riemannian nilmanifolds.*

The spectrum of a closed Riemannian manifolds is the set of eigenvalues of the Laplace-Beltrami operator. The length spectrum is the set of lengths of smoothly closed geodesics. Of great interest is determining if the Laplace spectrum determines the length spectrum of a closed Riemannian manifold. Using the heat kernel, Y. Colin de Verdiére showed that, generically, the Laplace spectrum determines the length spectrum. This also follows from results of Duistermaat & Guillemin using the wave trace. The results presented here focus on Riemannian two-step nilmanifolds, which are of the form $(\Gamma\backslash G, g)$ where G is a simply connected two-step nilpotent Lie group, Γ is a cocompact (i.e., $\Gamma\backslash G$ compact), discrete subgroup of G, and g arises from a left invariant metric on G. Nilmanifolds have played a vital role in proving geometric properties not determined by the Laplace spectrum. The authors prove that all known methods for producing families of isospectral two-step nilmanifolds must also produce manifolds with the same length spectrum. The authors use their formulation of the length spectrum of two-step nilmanifolds at the Lie algebra level to prove this result. (Received October 03, 2000)