1046-34-1355 **Andrea Bruder*** (`Andrea_Bruder@baylor.edu`), Baylor University, Department of Mathematics, One Bear Place #97328, Waco, TX 76798. *An application of the left-definite spectral theory to the Jacobi differential equation for non-classical parameters.*

In 1929, S. Bochner classified all second order equations of hypergeometric type that have orthogonal polynomial eigenfunctions. Up to a complex change of variable, the only such equations are the Hermite, Laguerre, Jacobi, and the Bessel polynomial equations. Since then, it has been well known that, for $-\alpha, -\beta, -\alpha-\beta-1 \notin \mathbb{N}$, the Jacobi polynomials $\left\{P_n^{(\alpha,\beta)}(x)\right\}_{n=0}^{\infty}$ are orthogonal on $\mathbb{R}$ with respect to a bilinear form of the type

$$(f,g)_\mu = \int_{\mathbb{R}} f\overline{g}d\mu,$$

for some measure μ. However, for negative integer parameters α and β, an application of Favard's theorem shows that the Jacobi polynomials cannot be orthogonal on the real line with respect to a bilinear form of this type for any measure. But it is known that they are orthogonal with respect to a Sobolev inner product.

After discussing this Sobolev orthogonality, I will give an introduction to the left-definite spectral theory and show how it can be applied to construct a self-adjoint operator that is generated from the Jacobi differential expression (for non-classical parameters) having the entire sequence of Jacobi polynomials as a complete set of eigenfunctions. (Received September 15, 2008)