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**Mourad E. H. Ismail\*** (ismail@math.ucf.edu), Department of Mathematics, University of Central Florida, Orlando, FL 32816, and **Ruiming Zhang**, School of Mathematics, Guangxi Normal University, Guilin City, Guangxi 541004, Peoples Rep of China. *Chaotic and Periodic Asymptotics for  $q$ -Orthogonal Polynomials.*

We derive Plancherel-Rotach asymptotic expansions for the  $q^{-1}$ -Hermite,  $q$ -Laguerre and the Stieltjes-Wigert polynomials using a discrete analogue of Laplace's method. We also give an estimate of the error term. The asymptotics around and beyond the largest zero contain the Ramanujan function and in the bulk exhibit chaotic behavior when a certain variable is irrational. In the rational case the main terms in the asymptotic expansion involves theta functions. This is in contrast with the corresponding asymptotics of the Hermite and Laguerre polynomials or polynomials orthogonal with respect to exponential weights which involve Airy and trigonometric functions. (Received September 25, 2006)