Semi-classical orthogonal polynomials and the Painlevé equations

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In this talk I shall discuss the relationship between the Painlevé equations and orthogonal polynomials with respect to semi-classical weights. It is well-known that orthogonal polynomials satisfy a three-term recurrence relation. I will show that for some semi-classical weights, the coefficients in the recurrence relation can be expressed in terms of Wronskians that arise in the description of special function solutions of a Painlevé equation. The orthogonal polynomials discussed will include semi-classical Laguerre and Hermite weights, orthogonal polynomials with discontinuous weights and semi-classical generalizations of the Charlier and Meixner polynomials, which are discrete orthogonal polynomials.

Joint work with Kerstin Jordaan (University of Pretoria, South Africa) and J G Smith (University of Kent, United Kingdom).