

# Special Issue OPSFA15

## Orthogonal Polynomials, Special Functions and Applications

Guest editors: Galina Filipuk, Christoph Koutschan,  
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The special issue OPSFA15 contains the proceedings of the 15th International Symposium on *Orthogonal Polynomials, Special Functions and Applications*, which was held in Hagenberg, Austria, from July 22 to July 26, 2019. It was organized by the Research Institute for Symbolic Computation (RISC) of the Johannes Kepler University Linz (JKU) and the Johann Radon Institute for Computational and Applied Mathematics (RICAM) of the Austrian Academy of Sciences (ÖAW).

This was the fifteenth edition in a series of conferences that take place approximately every two years and which started in 1984 with the meeting *Polynômes Orthogonaux et Applications* in Bar-le-Duc (France) at the occasion of the 150th anniversary of Laguerre. This was followed by meetings in Segovia (Spain, 1986), Erice (Italy, 1990), Evian (France, 1992), with four similar meetings in Columbus, Ohio (USA, 1989), Delft (The Netherlands, 1994), and Granada and Sevilla (Spain, 1991 and 1997) which, for some mysterious reason, are not counted as OPSFA meetings, even though they should. Then Special Functions were added to the theme of the conferences for the meeting in Patras (Greece, 1999), followed by conferences in Rome (Italy, 2001), Copenhagen (Denmark, 2003), München (Germany, 2005; a joint meeting with ICDEA and SIDE), Luminy (France, 2007), Leuven (Belgium, 2009) and Leganés (Spain, 2011). Up to that time all the conferences were in Europe (except for the NATO-ASI meeting in Columbus, Ohio). In order to reach interested participants everywhere, OPSFA12 was organized in Sousse (Tunisia) in 2013 and OPSFA13 at NIST in Gaithersburg, Maryland (USA) in 2015. The two latest meetings were OPSFA14 in Canterbury (UK, 2017) and then finally OPSFA15 at Hagenberg, Austria, for which the proceedings are in this special issue of *Integral Transforms and Special Functions*. The next meeting will be in Montréal, Canada. See <https://wis.kuleuven.be/events/archive/OPSFA> for more information about the OPSFA meetings.

The 2019 edition of the OPSFA conference was attended by exactly 200 registered participants, coming from 40 different countries around the world. The scientific committee consisted of Walter Van Assche, Diego Dominici, Kathy Driver, Galina Filipuk, Frank Garvan, Mourad Ismail, Doron Lubinsky, Zeinab Mansour, Francisco Marcellán, Bruno Salvy, Michael Schlosser, and Thomas Trogdon. The local organizers were Christoph Koutschan and Peter Paule. The program was split into twelve topical mini-symposia, organized by members of the OPSFA community on such diverse topics as functional equations, hypergeometric functions, orthogonal polynomials in weighted Sobolev spaces,

multivariate special functions related to Lie algebras, multiple orthogonal polynomials and Hermite-Padé approximation, symbolic computation, asymptotics (via non-standard orthogonality), extremal polynomials and almost periodicity, potential theory, and  $q$ -series. The conference featured invited plenary lectures by Peter Clarkson, Christian Krattenthaler, Irina Nenciu, Veronika Pillwein, Mikhail Sodin, Alan Sokal, Armin Straub, and Luc Vinet. As it is the tradition for OPSFA meetings, the Gabor Szegő Prize was awarded to an early-career researcher in the area of orthogonal polynomials and special functions: this year Thomas Bothner received the prize for his work on Riemann-Hilbert problems. Richard Askey's manifold contributions to the area of orthogonal polynomials and special functions were recognized by a Lifetime Achievement Award; unfortunately, he was not able to attend the meeting in person, but the award was given to him a few weeks later<sup>1</sup>.



The papers in this special issue all have orthogonal polynomials, special functions and their applications as a common theme. Most of the papers correspond to one of the contributed talks at the conference. Orthogonal polynomials and their extensions are investigated in

- Recurrence relations for Wronskian Laguerre polynomials (N. Bonneux, M. Stevens)
- Symmetric differential operators for Sobolev orthogonal polynomials of Laguerre- and Jacobi-type (C. Market)
- Classical discrete  $d$ -orthogonal polynomials (N. Ayadi, H. Chaggara)
- Limit relations involving 2-orthogonal polynomials (I. Lamiri, J. Weslati)
- On matrix Cauchy biorthogonal polynomials (S. Medina Peralta)
- On differential systems related to generalized Meixner and deformed Laguerre orthogonal polynomials (A. Dzhamay, G. Filipuk, A. Stokes)

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<sup>1</sup>Richard Askey passed away later that year on October 9, 2019.

- Interlacing of zeros of Laguerre polynomials of equal and consecutive degrees (J. Arvesú, K. Driver, L. Littlejohn)
- Logarithmic asymptotics of multi-level Hermite-Padé polynomials (L.G. González Ricardo, G. López Lagomasino, S. Medina Peralta)
- Strong asymptotics of Jacobi-type kissing polynomials (A. Barhoumi)
- A generalized sextic Freud weight (P. Clarkson, K. Jordaan)
- Multiple  $q$ -Kravchuk polynomials (J. Arvesú, A.M. Ramírez-Aberasturis)

Other special functions are found in

- Matrix hypergeometric functions, semi-classical orthogonal polynomials and quantum Painlevé equations (K. Inamasu, H. Kimura)
- Voros coefficients of the Gauss hypergeometric differential equation with a large parameter (T. Aoki, T. Takahashi, M. Tanda)
- On the WKB theoretic transformation to the boosted Airy equation (T. Takahashi)
- Voros coefficients and the topological recursion for the hypergeometric differential equation of type (1,4) (Y. Takei)

Orthogonal polynomials and special functions appear in many applications, such as differential equations, operator theory, harmonic analysis, number theory and moment problem, as can be seen in

- Non-homogeneous wave equation on a cone (S. Olver and Y. Xu)
- Hyponormal Toeplitz operators on weighted Bergman spaces (B. Simanek)
- Fourier series for coherent pairs of Jacobi matrices (Ó. Ciaurri, J. Mínguez)
- Construction of modular function bases for  $\Gamma_0(121)$  related to  $p(11n + 6)$  (R. Hemmecke, P. Paule, C.-S. Radu)
- The complex moment problem of Dirichlet type (F. Szafraniec, M. Wojtylak)

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