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The Electronic News Net of the
SIAM Activity Group on Orthogonal Polynomials and Special Functions

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Topics:

Calendar of Events:

June 7-11, 2021

33rd International Colloquium on Group Theoretical Methods in Physics (Group33)
Cotonou, Benin
http://www.cipma.net/group33-cotonou-benin

June 20-26, 2021

8th European Congress of Mathematics (8ECM)
Mini-symposium on Orthogonal Polynomials and Special Functions
Organized by Paco Marcellán, Juan J. Moreno-Balcázar and Galina Filipuk,
Portorož, Slovenia
https://www.8ecm.si/minisymposia

July 19–24, 2021
Mathematical Congress of the Americas (MCA 2021)
Special Session on *Special Functions and Orthogonal Polynomials*
Organized by Diego Dominici, Luis E. Garza, Jan Felipe van Diejen
Buenos Aires, Argentina—**Now virtual due to COVID-19 outbreak.**
http://www.mca2021.org/en

January 10–14, 2022—**Updated new date due to COVID-19 outbreak.**
9th International Conference on Computational Methods and Function Theory (CMFT 2021)
Federico Santa María Technical University, Valparaíso, Chile
http://cmft2021.inf.utfsm.cl/

July 11–15, 2022—**Tentative new dates due to COVID-19 outbreak.**
OPSFA-16
Centre de Recherches Mathématiques, Montreal, Canada

August 2022—**Updated new date due to COVID-19 outbreak.**
OPSFA Summer School 2021
Radboud University, Nijmegen, The Netherlands
https://www.ru.nl/radboudsummerschool/courses/2021/opsfa-summer-school/

Summer 2022—**Tentative new date due to COVID-19 outbreak.**
Functional Analysis, Approximation Theory and Numerical Analysis (FAATNA)
Matera, Italy
http://web.unibas.it/faatna20/

Topic #1 ——— OP – SF Net 28.1 ——— January 15, 2021

From: Peter Clarkson (P.A.Clarkson@kent.ac.uk)
Subject: Message from the Chair

Happy New Year! Let's hope that 2021 is better year than 2020, though the start of 2021 has been much the same as 2020 in many parts of the world.

There was some positive news for our Activity Group in 2020 with the renewal of our SIAM Charter for another two years. SIAM still have concerns about our SIAG, in particular the membership numbers. We have made some suggestions as to how SIAM might help.

It is disappointing that two major events for our Activity Group have been postponed to 2022. The 16th OPSFA International Symposium will now take place in July 2022 in Montreal, Canada and the next OPSFA Summer School will now take place in August 2022 in Nijmegen, The Netherlands.

Whilst there have been no physical conferences and workshops to attend in 2020, the OPSF community has been involved with various virtual events in 2020. The was an invited presentation by Andrei Martínez-Finkelshtein and mini-symposium organised by Andrei and Walter Van Assche at the SIAM Annual Meeting in July. There has been seminar series on "Orthogonal Polynomials, Special Functions, Operator Theory and Applications" (OPSFOTA) organised by Ana Loureiro, Thomas Bothner, Adri Olde Daalhuis, Walter Van Assche and Jani Virtanen, which is hosted by the ICMS in Edinburgh, Scotland. From a personal point of view, whilst much of my time in 2020 was taken up with teaching and admin related matters, much additional work due to the pandemic, it has been good to (virtually) attend a number of seminars on a virtual basis.

As reported elsewhere in this newsletter, there was a Special Session on the Legacy of Dick Askey at the JMM 2021 meeting earlier this month organized by George Andrews, Howard Cohl and

Mourad Ismail. I expect most conferences, minisymposia, special sessions and workshops will be virtual for several months to come.

I wish you a safe 2021 and hope to be able to see many or, virtually or physically, during the year.

Peter

Topic #2 ——— OP - SF Net 28.1 ——— January 15, 2021

From: Walter Van Assche (walter.vanassche@kuleuven.be)
Subject: Announcement: **Peter Clarkson** awarded the Senior Anne Bennett Prize

Peter Clarkson, Chair of the SIAM Activity Group on Orthogonal Polynomials and Special Functions, has been awarded the Senior Anne Bennett Prize in recognition of his tireless work to support gender equality in UK mathematics, and particularly for his leadership in developing good practice among departments of mathematical sciences. This prize is offered by the London Mathematical Society (LMS) every three years.

Clarkson, Professor of Mathematics at the University of Kent, School of Mathematics, Statistics and Actuarial Science, is an eminent mathematician with a long record of service to the profession. Most notable are his considerable efforts in the area of gender equality, in which he has had a tremendous impact as a Head of Department at Kent, as a member of the Athena SWAN advisory group at Equality Challenge Unit (ECU), and as one of the longest-serving and most active members of the LMS Women in Mathematics Committee. From joining the committee in 2007, he was a driving force behind its work, particularly in the establishment of the highly successful Good Practice Scheme (GPS) to support university Mathematics Departments. He was one of the founding members of the GPS Steering Group and chair from 2013–2018. Peter was one of the key GPS players (along with Cathy Hobbs and Gwyneth Stallard) involved in commissioning the first ever national benchmarking survey of good practice in UK mathematics departments.

As a highly regarded Head of Department, Peter provided a bridge between the LMS WIM Committee, ECU and Heads of Department of Mathematical Sciences (HoDoMS). His understanding of the issues and practicalities facing heads of departments was hugely important in shaping the GPS, ensuring that it is relevant and supportive to departments, and enabled him to provide valuable guidance and advice to ECU around the development of the Athena SWAN Charter process.

Peter's energy and commitment to improving gender diversity in the UK mathematics community has been substantial, inspiring and successful. He has a huge personal commitment and drive to ensure that women are able to flourish in their mathematical careers and has acted as mentor, both formally and informally, for many women at different levels of their careers. He has provided enormous moral and practical support in enabling the chairs of the WIM Committee to fulfill their roles successfully—in a world that is still predominantly male, the active support of a highly regarded male professor is of enormous benefit and importance.

More details about the 2020 LMS Prize Winners can be found at:
https://www.lms.ac.uk/news-entry/26062020-1657/lms-prize-winners-2020.

Topic #3 ——— OP - SF Net 28.1 ——— January 15, 2021

From: OP-SF Net Editors
Subject: Announcement: *Introduction to q-analysis* by **Warren Johnson**

We would like to draw your attention to the following book "An Introduction to q-analysis," by Warren P. Johnson: Connecticut College, New London, Connecticut. It is published by the American Mathematical Society, Providence, 2020, xv+519.

Link to AMS: https://bookstore.ams.org/mbk-134.

Description: Starting from simple generalizations of factorials and binomial coefficients, this book gives a friendly and accessible introduction to q-analysis, a subject consisting primarily of identities between certain kinds of series and products. Many applications of these identities to combinatorics and number theory are developed in detail. There are numerous exercises to help students appreciate the beauty and power of the ideas, and the history of the subject is kept consistently in view.

The book has few prerequisites beyond calculus. It is well suited to a capstone course, or for self-study in combinatorics or classical analysis. Ph.D. students and research mathematicians will also find it useful as a reference.

Readership: Undergraduate students interested in q-analysis, combinatorics, and number theory.

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Topic #4 ——— OP - SF Net 28.1 ——— January 15, 2021

From: Tom Koornwinder (thkmath@xs4all.nl)
Subject: Obituary for **Mogens Flensted-Jensen** (1942-2020) by **Tom Koornwinder**

This was prepared by Tom Koornwinder (with thanks to Henrik Schlichtkrull).

The Danish mathematician Mogens Flensted-Jensen, Professor Emeritus of the University of Copenhagen, passed away in December 2020. See an extensive obituary on https://www.math.ku.dk/english/about/news/obituary-of-professor-mogens-flensted-jensen/.

I got acquainted with Mogens when we both participated as graduate students in a special year on noncommutative harmonic analysis at the Mittag-Leffler Institute in Djursholm, Sweden during the academic year 1970-71. We have kept friendly contacts during the fifty years since then. Precisely in the middle of that half century, in the fall of 1995, we were again together for a longer period at the Mittag-Leffler Institute on the same theme as in 1970 (see the photo).

In 1970-71 Mogens worked on harmonic analysis for Jacobi functions $\phi_\lambda^{(\alpha,\beta)}$. His motivation came from the occurrence of these functions as spherical functions on noncompact Riemannian symmetric spaces of rank one, for instance on the hyperbolic space $\mathrm{SO}_0(p,1)/\mathrm{SO}(p)$. In joint work [1] we obtained the positive convolution structure for Jacobi function expansions. In the late seventies we had two further joint papers on Jacobi functions.

Mogens Flensted-Jensen (right) and Tom Koornwinder in Djursholm, 1995.

Mogens also studied the case of parameter values for which the Fourier-Jacobi transform has a Plancherel formula with (finitely many) discrete terms for certain imaginary values of λ. Such Jacobi functions occur in several group settings. They can be generalized spherical functions with respect to one-dimensional K-types, notably for $G = \mathrm{SU}(p,1)$, $K = \mathrm{S}(\mathrm{U}(p) \times \mathrm{U}(1))$. They also live as K-invariant functions on semisimple symmetric spaces G/H of rank one. For instance, $G = \mathrm{SO}_0(p,q)$, $H = \mathrm{SO}_0(p,q-1)$, $K = \mathrm{SO}(p) \times \mathrm{SO}(q)$. The discrete spectrum for Jacobi functions living there gives rise to subspaces of $L^2(G/H)$ which are invariant and irreducible under G and contain a nonzero K-fixed vector (K-spherical discrete series for G/H).

Mogens Flensted-Jensen in 2013

Also Mogens' most important work dealt with the discrete series on G/H, but now of general rank and the discrete series being not necessarily K-spherical. His paper [2] in 1980 in Annals of Mathematics gave a simple sufficient condition in terms of G and H for existence of infinitely many discrete series representations on G/H. In 1984 Oshima and Matsuki showed the condition also to be necessary. The problem is still open to find all discrete series representations for each G/H. Recently Mogens was considering this on some special G/H. The K-spherical discrete series for general rank is relevant here. This means to find the discrete mass points in

the Plancherel formula for Opdam's Jacobi functions associated with root systems, which may occur if there are negative root multiplicities. Right now, but too late for Mogens to watch it, some progress has been reported on this.

During 1979–2007 Mogens was a professor at the Royal Veterinary and Agricultural University in Copenhagen. His tasks of teaching and administration there were quite a change from doing analysis on Lie groups, but he performed them with great enthusiasm and success.

[1] M. Flensted-Jensen and T. Koornwinder, The convolution structure for Jacobi function expansions, Ark. Mat. 11 (1973), 245–262.
[2] M. Flensted-Jensen, Discrete series for semisimple symmetric spaces, Ann. of Math. (2) 111 (1980), 253–311.

Topic #5 ——— OP – SF Net 28.1 ——— January 15, 2021

From: George Andrews (gea1@psu.edu)
Subject: Obituary for **Dick Askey** (1933–2019) from the LMS Newsletter by **George Andrews**

The following obituary, Richard Askey (1933–2019), written by George Andrews, appeared in the London Mathematical Society Newsletter, *Obituaries of Members*, Issue 487, March 2020, page 51.

⋆ ⋆ ⋆

Richard Allen (Dick) Askey was born on June 4, 1933, in St. Louis, Missouri, to Philip and Bessie Askey. He received his B.A. from Washington University in 1955, an M.A. from Harvard in 1956 and from there went to Princeton University where he received his Ph.D. in 1961 under the direction of Salomon Bochner. His thesis was titled "Mean Convergence of Orthogonal Series and Conjugate Series", foreshadowing extensive and important contributions to the study of orthogonal polynomials.

After instructorships at Washington University and the University of Chicago, Dick joined the faculty of the University of Wisconsin, Madison in 1963 where he remained for 40 years until retirement in 2003. At Madison, he was named Gábor Szegő Professor of Mathematics in 1986 and in 1995 was awarded a John Bascom Professorship.

His many honors included Fellowships in the American Academy of Arts and Sciences (1993), the National Academy of Sciences (1999), the Society of Industrial and Applied Mathematics (2009), and the American Mathematical Society (2012). Also, he was appointed an Honorary Fellow of the Indian Academy of Sciences and received an honorary doctorate from SASTA University in India (2012). He was an invited speaker at the ICM in Warszawa (1983).

Dick's impact and influence in the world of special functions and orthogonal polynomials cannot be overstated. His early work with George Gasper yielded an inequality that was central to Louis deBrange's proof of the Bieberbach conjecture. In the mid-1980's, building on long-neglected work of L.J. Rogers, Dick wrote two AMS memoirs, the first with Mourad Ismail and the second with Jim Wilson. The latter memoir not only introduced the now widely used Askey-Wilson polynomials but also included the famous Askey-scheme which provided a hierarchical classification of the classical orthogonal polynomials. The influence of L. J. Rogers is also especially evident in the series of papers, "Sieved Orthogonal Polynomials," a topic initiated by Askey and extended by Ismail and others. This latter series pointed to a new connection with number theory which is in its infancy.

Dick was not just a powerful researcher. He was a charismatic force in the mathematics community generally. Early in his career, he determined that the three-volume work, *Higher Transcendental Functions*, (a.k.a. the Bateman Project) needed to be extensively updated. His vision and persistence inspired many, and it is not unreasonable to suggest that the Digital Library of Mathematical Functions owes much to the influence of Richard Askey.

Dick was also passionate in his efforts to improve mathematics education at all levels. He was extremely skeptical of many fads that promised instant improvement and delivered little.

All of the above points to the importance of Askey's contributions; however, the charm, the kindness and the mischievous sense of humor are perhaps impossible to convey here. I will close with a short anecdote that at least hints at these latter qualities:

In the early 1990s, Paul Halmos wrote an article for the MAA Focus entitled *The Calculus Turmoil*. I thought it was a wonderful defense of the traditional teaching of calculus and wrote to tell him so. Halmos wrote back an equally warm response. I then called Dick to discuss the article and to tell him of my exchange with Halmos. Dick's first words were, "I hated that article". Adrenaline surged in my system. It seemed to me there were only two possible reasons for Dick's words. Either I had completely misread the article (unlikely), or this was going to be my first real educational clash with Dick. Having seen how effective he was in debate, I was not looking forward to the rest of the conversation. I managed to stammer out: "What makes you say that?" He replied, "I HATED it! I cannot stand to agree with a single word Paul Halmos writes, and I agreed with every word in that article."

Topic #6 ——— OP - SF Net 28.1 ——— January 15, 2021

From: George Andrews (gea1@psu.edu)), Howard Cohl (howard.cohl@nist.gov)
and Mourad Ismail (mourad.eh.ismail@gmail.com)
Subject: Report on JMM 2021 Special Session on the Legacy of **Dick Askey**

A special session on the Legacy of Dick Askey at JMM 2021 was organized by George Andrews, Howard Cohl and Mourad Ismail. The special session was composed of two different sessions. In the first session on Thursday January 7, there were 8 speakers (Diaconis, Koornwinder, Driver, Koelink, Christiansen, Rosengren, Howe and Cuoco) and in the second afternoon session there were 10 speakers (Andrews, Ono, Vinet, Zeilberger, Stanton, Johnson, Post, Berndt, Cooper, Ismail).

The first morning session started with a lecture by **Persi Diaconis** (joint work with Chenyang Zhong) entitled, *Orthogonal polynomials and the Burnside Process*. Diaconis' talk began by expressing how important it was to Askey—that theories should be not only elegant and complete, but also useful to scientists working in other fields. Diaconis gave an example of thinking via the Askey scheme which is a natural problem in enumerative combinatorics where Hahn polynomials allow for very sharp answers. Consider the set $\mathcal{X}$ of binary n-tuples. The symmetric group $S(n)$ acts on $\mathcal{X}$ by permuting coordinates. The Burnside process, specialized to this setting, allows a choice of a uniformly random orbit. From $x \in \mathcal{X}$, choose a permutation w fixing x (uniformly at random). From w choose a binary n-tuple y fixed by w. This is one step of a Markov chain, going from x to y. This chain has discrete Chebyshev polynomial eigenfunctions and this permits us to prove that the chain 'gets random' in a few steps, no matter how large n. The Discrete Chebyshev polynomials are a special case ($\alpha = \beta = 1$) of the Hahn polynomials. We managed to deform the chain to give a natural chain with general (symmetric) Hahn eigenfunctions. This deformation gives an abstract generalization for all applications of the Burnside process. The next talk was by **Tom Koornwinder** entitled, *Charting the Askey and q-Askey scheme* which discussed the

preprint by Luis Verde-Star, arXiv:2002.07932, which showed that the q-hypergeometric representations of the OPs in the q-Askey scheme can be described by $3+3+5$ parameters under three constraints and four invariances. Koornwinder presented a q-Askey scheme where each arrow implies the vanishing of a parameter. Koornwinder also gave the dependence on these parameters of the structure constants in the Zhedanov algebra and gave a q-Zhedanov scheme where each arrow implies the vanishing of a structure constant. Then **Kathy Driver** presented a talk entitled *Zeros of Jacobi polynomials*. Driver explained that it is known that the zeros of the Jacobi polynomials $P_n^{(\alpha,\beta)}(x)$ and $P_{n-1}^{(\alpha+t,\beta+k)}(x)$ interlace when $\alpha,\beta>-1$, $0\leq t,k\leq 2$. Driver explained how to prove that partial, but in general not full, interlacing holds between the zeros of $P_n^{(\alpha,\beta)}(x)$ and $P_{n+1}^{(\alpha+t,\beta+1)}(x)$ for $t\in\{0,1\}$. Then **Erik Koelink** (joint work with Maarten van Pruijssen and Pablo Román) presented a talk entitled *Multivariable matrix valued orthogonal polynomials from representation theory*. Koelink explained how by using group representations one can derive multivariable matrix valued orthogonal polynomials for the root system of type A. This is done by viewing the corresponding compact group as a symmetric space, and studying matrix spherical functions. Then **Jacob Christiansen** (joint work with Barry Simon and Maxim Zinchenko) presented a talk entitled *Residual polynomials*. Christiansen started by explaining how Dick Askey was a great fan of Gabor Szegő as seen by his wonderful, readable notes on Szegő's papers in Szegő's complete works, which Dick edited as a clear labor of love. In particular, it is clear that Askey was fond of Szegő asymptotics so he dedicated an extension of such asymptotics for Residual Polynomials to Dick's memory. Then **Hjalmar Rosengren** presented a talk entitled *On the Kanade-Russell identities*. Rosengren explained that the Kanade-Russell identities are a collection of Rogers-Ramanujan-type identities for triple series, which are related to affine Lie algebras and to partition theory. Rosengren discussed how to prove some of these conjectures, using quadratic transformations for Askey-Wilson polynomials. This work resulted in some new summation identities for ${}_2\phi_1$ functions. Then **Roger Howe** presented a talk entitled *Dick Askey and Mathematics Education*. In that talk Howe gave several examples of the many contributions of Richard Askey to the national conversation on how to improve mathematics education in the U.S. One major contribution was the founding and hosting for over 20 years of the discussion group MathEd. However, his activities also included writing reviews, advising projects, and speaking at and organizing conferences. Then **Al Cuoco** presented a talk entitled *Adventures with Dick in Mathematics Education*. There, Cuoco discussed Dick's important help as a critical reviewer for the CME high school mathematics program and Dick's approach to elementary trigonometry. The talk ended with a video clip from a talk Dick gave in Santiago, Chile in 2010. See also the following link which points to a set of Dick's lecture notes on trigonometry edited by Al Cuoco and Shaun Cooper.

George Andrews started out the afternoon session by presenting a talk entitled *Chebyshev polynomials and Compositions*. The object of the presentation was to reveal the relationship of the Chebyshev polynomials to the theory of integer compositions. Numerous classical identities for Chebyshev polynomials were given combinatorial interpretations and proofs. Then **Ken Ono** presented a talk entitled *Variants of Lehmer's Conjecture on Ramanujan's tau-function*. Ono explained how Dick was a key figure in his career, and how grateful he was for the opportunity to share some of his recent work with friends on Ramanujan's tau-function. Ono's lecture was on variations of Lehmer's Conjecture. He explained how to rigorously determine whether any given non-zero integer alpha appears as a value of Ramanujan's tau function. The method makes use of the theory of Lucas sequences and modular forms which reduce the problem to a search for special rational points on specific curves of hyperelliptic and Thue type. Among the results, he showed that the odd primes less than 100 are never absolute values of tau-values. The next talk by **Luc Vinet** was entitled *A unified algebraic underpinning for the Hahn polynomials and rational functions*. Vinet explained that at present, we have a useful description of the polynomials of the Askey scheme based on the representation theory of algebras said to be of the Askey-Wilson type. Vinet's presentation explored the possibility of accounting similarly for the bispectral prop-

erties of biorthogonal rational functions. He presented such a picture for functions of the Hahn class based on an algebra called meta-Hahn. The study leads one to believe that there should exist other meta algebras that could offer a unified description of the Askey scheme augmented with associated biorthogonal rational functions. Then **Doron Zeilberger** presented a talk entitled *How Richard Askey Inspired the Happy Marriage of Special Functions and Combinatorics*. In that talk Zeilberger explained that While Dick Askey was not a combinatorist himself (he only had one paper, joint with Tom Koornwinder and Mourad Ismail) that may be called combinatorial proper), he inspired lots of seminal combinatorics. He first popularized that first revolution of combinatorial special functions initiated by Joseph Gillis, and through his challenges, inspired the second revolution initiated by Dominique Foata. Zeilberger discussed first revolution, that implied that the EXACT number of ways of deranging a standard deck of cards (ignoring suits) is EXACTLY:

$$149380444449909335491628429018894803122988046955 6.$$

The next talk by **Dennis Stanton** was entitled *Combinatorics of type R_I orthogonal polynomials*. In 1995 Ismail and Masson defined a new general family of orthogonal polynomials by perturbing the 3-term recurrence relation. Stanton described the combinatorial theory for these polynomials which corresponds to Viennot's theory. He included path models for the polynomials as well as moments, continued fractions and Hankel determinants. Examples are given in the Askey scheme, including Askey-Wilson and q-Racah polynomials. Then **Warren Johnson** presented a talk entitled *Functional Equations in the Research and Teaching of Dick Askey*. Johnson went through several functional equation arguments that Dick gave either in his papers or in his Special Functions class. One argument evaluated the beta function assuming no previous knowledge of the Gamma function, one derives Ramanujan's ${}_1\psi_1$ summation formula, and the other worked out a generalization of the Askey-Wilson integral. Johnson also evaluated a determinant that generalizes one of Sylvester that Dick was interested in. Then **Sarah Post** (joint work with Ian Marquette and Lisa Ritter) presented a talk entitled *Exceptional Orthogonal Polynomials and rational solutions of Painlevé Equations*. In that talk Post described how rational solutions of Painlevé IV, expressed in terms of Hermite polynomials, can be obtained from considering superintegrable Hamiltonian systems connected with exceptional orthogonal polynomials. She then described how this method can be extended to Jacobi polynomials and their connection to rational solutions of Painlevé VI. Then **Bruce Berndt** presented a talk entitled *Ramanujan's Beautiful Integrals*. In that talk Berndt offered a selection of some of Ramanujan's most fascinating integrals. Representatives were taken from his published papers, (earlier) notebooks, lost notebook, and questions he posed in the Journal of the Indian Mathematical Society. The lecture concluded with two entries on Gaussian quadrature and orthogonal polynomials from the unorganized pages in Ramanujan's second notebook that were proved by Richard Askey. Then **Shaun Cooper** presented a talk entitled *Some elliptic integrals in Ramanujan's lost notebook*. He outlined how an integral recorded by Ramanujan can be incorporated into a broad theory that can be used to create series for $1/\pi$. He gave a new integral of a similar type that was not recorded by Ramanujan, and described how it and several other functions studied by Ramanujan, e.g., the Rogers-Ramanujan continued fraction, fit within the theory. Then **Mourad Ismail** ended the session by presenting a talk entitled *Mathematical Reminisce about Dick Askey*. Ismail talked about his association and friendship with Dick Askey and Dick's influence on his research and his outlook on mathematics. He was Dick's post doctorate assistant and their collaboration continued for many years. They worked on combinatorial problems involving orthogonal polynomials, moment problems, specific systems of orthogonal polynomials, and positivity.

The special session was recorded and the videos will be available for meeting participants on the Meeting Platform within a couple weeks.

From: James Mc Laughlin (jmclaughlin@wcupa.edu)
Subject: Report on JMM 2021 Special Session on Continued Fractions

An AMS Special Session on Continued Fractions was held at the Joint Mathematics Meetings on January 8th 2021.

This special session was co-organized by **James G. Mc Laughlin**, West Chester University, **Geremías Polanco Encarnación**, Hampshire College, **Barry Smith**, Lebanon Valley College and **Nancy Wyshinski**, Trinity College.

This special session is the latest in a series of special sessions on continued fractions, with the first (organized by Jimmy and Nancy) taking place at JMM 2004 in Phoenix. Previous special sessions were held at the:

- 2019 Joint Meetings in Baltimore
- 2017 Joint Meetings in Atlanta
- 2015 Joint Meetings in San Antonio
- 2013 Joint Meetings in San Diego
- 2011 Joint Meetings in New Orleans
- 2009 Joint Meetings in Washington, D.C.
- 2006 Joint Meetings in San Antonio
- 2004 Joint Meetings in Phoenix

This year the special session was held remotely due to the coronavirus (as was the entire JMM), and this was likely the reason that there were fewer presentations than in previous years.

The schedule of talks was as follows:

- 8:00 – 8:45 AM Subgroups of $SL_2(Z)$ characterized by certain continued fraction representations. Johann Thiel, Sandie Han, Ariane Masuda and Satyanand Singh, New York City College of Technology – CUNY.
- 9:00 – 9:20 AM On Hurwitz stability of Composite Polynomials. Saroj Aryal and Sarita Nemani, Georgian Court University.
- 9:30 – 10:15 AM Random knots obtained from finite continued fractions in +1 and -1. Moshe Cohen and Keith Grover, State University of New York at New Paltz.
- 1:00 – 1:45 PM Approximation on Affine Subspaces: A Khintchine Type result. Daniel Alvey, Wesleyan University.

The topic of the first talk, by **Johann Thiel**, may be described as follows. For positive integers u and v, let

$$L_u = \begin{bmatrix} 1 & 0 \\ u & 1 \end{bmatrix} \text{ and } R_v = \begin{bmatrix} 1 & v \\ 0 & 1 \end{bmatrix}.$$

Let $S_{u,v}$ be the monoid generated by L_u and R_v, and $G_{u,v}$ be the group generated by L_u and R_v. In the talk the author describes an expansion of a characterization of matrices

$$M = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

in $S_{k,k}$ and $G_{k,k}$ when $k \geq 2$ given by Esbelin and Gutan to $S_{u,v}$ when $u, v \geq 2$ and $G_{u,v}$ when $u, v \geq 3$. He gives a simple algorithmic way of determining if M is in $G_{u,v}$ using a recursive function and the short continued fraction representation of b/d.

In the second talk, by **Saroj Aryal**, a conjecture on the robustness of stable transfer polynomials has been settled. In this talk, the author formulates a characterization of stable transfer polynomials, which are used to identify a class of polynomials satisfying the conjecture. Further results are derived as variations of the conjecture.

In the third talk, by **Moshe Cohen**, is random knots obtained from finite continued fractions in +1 and -1. A knot is a circle embedded in 3-space. A 2-bridge knot can be described by a finite sequence of nonzero integers counting crossings in alternating twist regions; such a knot is also called a rational knot. A Chebyshev knot diagram has in its finite continued fraction only +1 and -1, giving way to fewer knot diagrams for the same knot. Schubert translated results on continued fractions into results on 2-bridge knots, and Koseleff and Pecker, in formalizing Chebyshev knots, built on these results for continued fractions in +1 and -1. Together with Sunder Ram Krishnan and then Chaim Even-Zohar, the speaker developed this into a model for random knots. In this talk the speaker presents extensions of this work, including new work with the second author, an undergraduate student.

The topic of the fourth talk, by **Daniel Alvey**, is motivated by a conjecture of Mahler, which led to a rich tradition of investigating the Diophantine properties of subspaces of Euclidean space. Mahler's original conjecture was concerned with the extremality of a specific manifold. Another such property is that of Khintchine type, or whether the zero-one law of Khintchine's Theorem is inherited by the measure on a subspace. The author presented a Khintchine type for divergence result for affine subspaces which satisfy a certain multiplicative Diophantine condition.

The special session was recorded and the videos will be available for meeting participants on the Meeting Platform within a couple weeks.

Topic #8 ——— OP - SF Net 28.1 ——— January 15, 2021

From: Erik Koelink (e.koelink@math.ru.nl)
Subject: Postponement: *OPSF-S9 Summer School*, Radboud University, Nijmegen

Due to the current developments in the COVID crisis, we have decided to reschedule the OPSFA Summer School at the Radboud University, Nijmegen, the Netherlands (originally planned for August 2020, and initially postponed to August 2021) to **August 2022**. Precise dates will follow later.

Please see the Calendar of Events for a complete list of postponements and updates.

Topic #9 ——— OP - SF Net 28.1 ——— January 15, 2021

From: OP-SF Net Editors
Subject: Preprints in arXiv.org

The following preprints related to the fields of orthogonal polynomials and special functions were posted or cross-listed to one of the subcategories of arXiv.org during November and December

2020. This list has been separated into two categories.

OP-SF Net Subscriber E-Prints

http://arxiv.org/abs/2011.00045
Computing Equilibrium Measures with Power Law Kernels
Timon S. Gutleb, José A. Carrillo, Sheehan Olver

http://arxiv.org/abs/2011.00255
On difference equations of Kravchuk-Sobolev type polynomials of higher order
Roberto S. Costas-Santos, Anier Soria-Lorente

http://arxiv.org/abs/2011.02187
Strichartz Estimates with Broken Symmetries
Felipe Gonçalves, Don Zagier

http://arxiv.org/abs/2011.02463
A compact presentation for the alternating central extension of the positive part of $U_q(\widehat{\mathfrak{sl}}_2)$
Paul Terwilliger

http://arxiv.org/abs/2011.02710
On positivity of orthogonal series and its applications in probability
Paweł J. Szabłowski

http://arxiv.org/abs/2011.03171
An application of the Goulden-Jackson cluster theorem
Ira M. Gessel

http://arxiv.org/abs/2011.04630
On the Logarithmic Energy of Points on S^2
Stefan Steinerberger

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Boris Bychkov, Petr Dunin-Barkowski, Maxim Kazarian, Sergey Shadrin

http://arxiv.org/abs/2012.14924
Cutoff profile of ASEP on a segment
Alexey Bufetov, Peter Nejjar

http://arxiv.org/abs/2012.15108
Multiple Series Representations of N-fold Mellin-Barnes Integrals
B. Ananthanarayan, Sumit Banik, Samuel Friot, Shayan Ghosh

http://arxiv.org/abs/2012.15611
Semi-Parametric Estimation of Incubation and Generation Times by Means of Laguerre Polynomials
Alexander Kreiss, Ingrid Van Keilegom

http://arxiv.org/abs/2012.15646
Massive One-loop Conformal Feynman Integrals and Quadratic Transformations of Multiple Hypergeometric Series
B. Ananthanarayan, Sumit Banik, Samuel Friot, Shayan Ghosh

Topic #10 ——— OP - SF Net 28.1 ——— January 15, 2021

From: OP-SF Net Editors
Subject: Submitting contributions to OP-SF NET and SIAM-OPSF (OP-SF Talk)

To contribute a news item to OP-SF NET, send e-mail to one of the OP-SF Editors howard.cohl@nist.gov, or spost@hawaii.edu.

Contributions to OP-SF NET 28.1 should be sent by March 1, 2021.

OP-SF NET is an electronic newsletter of the SIAM Activity Group on Special Functions and Orthogonal Polynomials. We disseminate your contributions on anything of interest to the special functions and orthogonal polynomials community. This includes announcements of conferences, forthcoming books, new software, electronic archives, research questions, and job openings as well as news about new appointments, promotions, research visitors, awards and prizes. OP-SF Net is transmitted periodically through a post to SIAM-OPSF (OP-SF Talk).

SIAM-OPSF (OP-SF Talk) is a listserv of the SIAM Activity Group on Special Functions and Orthogonal Polynomials, which facilitates communication among members, and friends of the Activity Group. See the previous Topic. To post an item to the listserv, send e-mail to siam-opsf@siam.org.

WWW home page of this Activity Group:
http://math.nist.gov/opsf

Information on joining SIAM and this activity group: service@siam.org

The elected Officers of the Activity Group (2020-2022) are:

Peter Alan Clarkson, Chair
Luc Vinet, Vice Chair
Andrei Martínez-Finkelshtein, Program Director
Teresa E. Pérez, Secretary and OP-SF Talk moderator

The appointed officers are:

Howard Cohl, OP-SF NET co-editor
Sarah Post, OP-SF NET co-editor
Diego Dominici, OP-SF Talk moderator
Bonita Saunders, Webmaster and OP-SF Talk moderator

Topic #11 ——— OP - SF Net 28.1 ——— January 15, 2021

From: OP-SF Net Editors
Subject: Thought of the Month by **George Pólya**

"The elegance of a mathematical theorem is directly proportional to the number of independent ideas one can see in the theorem and inversely proportional to the efforts it takes to see them."

George Pólya (1887–1985), Mathematical Discovery. On Understanding, Learning, and Teaching Problem Solving, Volume I, John Wiley & Sons, New York-London, MA, 1962.