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

http://math.nist.gov/opsf

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Calendar of Events:

July 6-17, 2020
2nd Joint SIAM/CAIMS Annual Meeting (AN20)—**Happening Virtually**
Originally scheduled in Toronto, Ontario, Canada
https://www.siam.org/conferences/cm/conference/an20
The following sessions are being held virtually:
MS32: *Numerical Computation of Special Functions*
   Organized by Amparo Gil, Javier Segura and Nico Temme
   https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=68911

MS49: *Orthogonal Polynomials, Random Matrices and Asymptotic Methods*
   Organized by: Andrei Martinez–Finkelshtein and Walter van Assche
   https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=69288
The following sessions were accepted for presentations:
MS: *Symbolic Computation and Special Functions I and II*
   Organized by: Veronika Pillwein and Manuel Kauers
   https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=69014
   https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=69015
MS: *Orthogonal Polynomials, Integrable Systems and Combinatorics I and II*
   Organized by: Luc Vinet and Mourad Ismail
   https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=68831
   https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=68832
MS: *Basic Hypergeometric Series and q-Orthogonal Polynomials*
   Organized by: Diego Dominici and Mourad Ismail
   https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=68986

July 13–17, 2020—**Postponed due to COVID-19 outbreak.**
XXI Lluis Santaló School *Random and Deterministic Point Configurations*
Universidad Internacional Menéndez Pelayo, Santander, Spain
https://www.ub.edu/santalo20/

July 13–18, 2020—**Postponed due to COVID-19 outbreak.**
Combinatorics around the q-Onsager algebra, celebrating the 65th birthday of Paul Terwilliger
 Satellite event of the 8th European Congress of Mathematics
 which will be held the prior week in Portorož, Slovenia,
Kranjska Gora, Slovenia
https://conferences.famnit.upr.si/indico/event/15/overview

August 12–13, 2020
Ari Laptev's 70th birthday online conference—**Happening Virtually**
NTNU Norwegian University of Science and Technology,
Trondheim, Norway
https://www.iadm.uni-stuttgart.de/en/ari-laptevs-70-birthday-conference/

June 7–11, 2021—**New date due to COVID-19 outbreak.**
33rd International Colloquium on Group Theoretical Methods in Physics (Group33)
Cotonou, Benin
http://www.cipma.net/group33-cotonou-benin

June 20–26, 2021—**New date due to COVID-19 outbreak.**
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 6–9, 2021—**New date due to COVID-19 outbreak.**
Functional Analysis, Approximation Theory and Numerical Analysis (FAATNA)
Matera, Italy
http://web.unibas.it/faatna20/

July 12–16, 2021
9th International Conference on Computational Methods and Function Theory (CMFT 2021)
Federico Santa María Technical University, Valparaíso, Chile
http://cmft2021.inf.utfsm.cl/

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
http://www.mca2021.org/en/sessions/item/28-special-functions-and-orthogonal-polyomials

August 9–13, 2021—**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/

Topic #1 ─────── OP – SF Net 27.4 ─────── July 15, 2020

From: Doron Lubinsky (lubinsky@math.gatech.edu)
Subject: First announcement: CMFT 2021, Valparaíso, Chile

First Announcemen: CMFT 2021

The Federico Santa María Technical University in Valparaíso, Chile, will be hosting
The 9th International Conference on Computational Methods and Function Theory (CMFT 2021).
Conference Dates: July 12–16, 2021.
Conference website: http://cmft2021.inf.utfsm.cl

The conference will be held in memory of Stephan Ruscheweyh, who initiated the series of CMFT conferences and has been the driving force behind all the previous conferences. He was also one of the founding editors of the Computational Methods and Function Theory (CMFT) Journal. Stephan Ruscheweyh devoted his life to encouraging mathematics research and collaboration internationally. The organisers are honored to contribute to the continuation of his work.

The general theme of the meeting concerns various aspects of interaction of complex variables and scientific computation, including related topics from function theory, holomorphic function spaces, approximation theory and numerical analysis. Another important aspect of the CMFT meetings, previously held in Valparaíso 1989, Penang 1994, Nicosia 1997, Aveiro 2001, Joensuu 2005, Ankara 2009, Shantou 2013, and Lublin 2017, is to promote the creation and maintenance of contacts with scientists from diverse cultures.

The conference program consists of invited one-hour lectures, of invited and contributed 25 minute talks and of poster sessions. The organizers are very proud that the following ten eminent mathematicians have agreed to deliver the plenary one-hour lectures:

- Christopher Bishop, Stony Brook
- Mario Bonk, UCLA
- Martin Chauqui, Pontificia Universidad Católica de Chile
- Nuria Fagella, University of Barcelona
- Stephen Gardiner, University College Dublin
- Erik Lundberg, Florida Atlantic University

- Masatoshi Noumi, Kobe University
- Igor Pritsker, Oklahoma State University
- Ed Saff, Vanderbilt University
- Malik Yonsi, University of Hawaii

Limited funds are expected to be available for partial support of travel/local expenses of participants from developing countries.

Topic #2 ——— OP – SF Net 27.4 ——— July 15, 2020

From: Fritz Gesztesy (fritz_gesztesy@baylor.edu)
Subject: **Ari Laptev**'s 70th Birthday Online Conference

Dates: August 12 – 13, 2020

On the happy occasion of Ari Laptev's 70th birthday, a Zoom conference will be hosted at NTNU Norwegian University of Science and Technology, Trondheim, Norway, to honor Ari's fundamental contributions to Partial Differential Equations, Spectral Theory, and Mathematical Physics.

Speakers:
- R. Benguria (Santiago)
- M. Esteban (Paris)
- R. Frank (Caltech & LMU Munich)
- E.H. Lieb (Princeton)
- B. Simon (Caltech)
- S. Smirnov (Geneva)
- S.T. Yau (Harvard)

The detailed program can be found at:
 https://www.iadm.uni-stuttgart.de/en/ari-laptevs-70-birthday-conference/

where one can also register for the event (registration is mandatory and free).

Organizers: Pavel Exner, Rupert Frank, Fritz Gesztesy, H. Holden, and Timo Weidl

Topic #3 ——— OP – SF Net 27.4 ——— July 15, 2020

From: Ana Loureiro (A.Loureiro@kent.ac.uk)
Subject: Orthogonal Polynomials, Special Functions and Operator Theory Seminar Series

Adri Olde Daalhuis, Jani Virtanen, Thomas Bothner, Walter Van Assche and I are organising a virtual weekly seminar series on *Orthogonal Polynomials, Special Functions and Operator Theory—OPSFOTA*. The meetings are supported by [ICMS (International Centre for Mathematical Sciences in the UK)](#).

We will be meeting every Thursday 15.30 –16.30 BST for the foreseeable future. The first seminar took place on Thursday 18 June 2020. Previous speakers include Fredrik Johansson (INRIA Bordeaux, France), Emma Bailey (University of Bristol, UK), Grzegorz Swiderski (KU Leuven, Belgium) and Håkan Hedenmalm (KTH Stockholm, Sweden).

Upcoming speakers:

- 16 July: Sergey Denisov: (University of Wisconsin, USA)
- 23 July: Roozbeh Gharakhloo: (Colorado State University, USA)
- 30 July: Manuela Girotti: (University of Montreal, Canada)
- 06 August: Robert Milson: (Dalhousie University, Canada)
- 13 August: Maurice Duits: (KTH Royal Institute of Technology, Sweden)

Further details and videos of previous talks are available at https://www.icms.org.uk/OPSFOTA.php.

To register to attend the seminar please complete this form. Registration will close at 12.00 on the day of the seminar. The meetings will be held using Zoom and joining details will be sent after 12.00 on the day of the seminar.

Everyone is very welcome to attend and please feel free to circulate the information amongst your research networks.

Best wishes, Ana (on behalf of the organising committee)

Organizers: Adri Olde Daalhuis, Jani Virtanen, Thomas Bothner, Walter Van Assche and Ana Loureiro

Topic #4 ——— OP – SF Net 27.4 ——— July 15, 2020

From: Benjamin Eichinger (benjamin.eichinger@hotmail.de)
Subject: Online SFB/QMC Talks Seminar

From July 2020 until the end of 2020 (break August 2020) the *Quasi-Monte Carlo Methods: Theory and Applications FWF Special Research Program* will organize a series of online talks.

A number of speakers will offer single lectures or workshops depending on the topic.

If you are interested in getting regular email–updates please complete this form:
https://forms.gle/qrnQsCswN7KQTMkg7
and we will send you the Zoom link for the talks.

Registration will close at 12:00 (Vienna) on the day of the talk. The Zoom link and the abstract will be sent after 12:00 on the day of the seminar. If you have any problems to subscribe to the mailing list or have any questions please send an email to officeSFB@jku.at.

Everyone is very welcome to attend and please feel free to circulate the information among your research networks.

Next dates:

- **Barry Simon**:
  Monday July 20, 2020, 4:00–5.30 pm
  Tales of Our Forefathers

  Tuesday July 21, 2020, 4:00–5.30 pm
  Spectral Theory Sum Rules, Meromorphic Herglotz Functions and Large Deviations

Wednesday July 22, 2020, 4:00-5.30 pm
Poncelet's Theorem, Paraorthogonal Polynomials and the Numerical Range of Compressed GGT matrices

Thursday July 23, 2020, 4:00-5.30 pm
The Tale of a Wrong Conjecture: Borg's Theorem for Periodic Jacobi Matrices on Trees

- **David Damanik**, Autumn 2020.

Further details are available at: http://www.sfb-qmc.jku.at/sfb-activities/workshops
where updates will be posted.

Organizers: Benjamin Eichinger and Aicke Hinrichs
Local Organizer: Lucia Del Chicca

Topic #5 ———— OP – SF Net 27.4 ———— July 15, 2020

From: Howard Cohl (Howard.Cohl@nist.gov)
Subject: Eight remembrances and communications to **Richard A. Askey**, Part III

Eight remembrances and communications to
Richard Allen Askey
(June 4, 1933—October 9, 2019)

by Driver, Schlosser, Suslov, Temme, Vinet, Iverson, Zeilberger and Zhedanov

An obituary of Richard A. Askey appeared in OP–SF Net 26.6, published on November 15, 2019. Below are eight remembrances of Dick from some of his colleagues, students, and friends:

Kathy Driver, Michael Schlosser, Sergeǐ Suslov, Nico Temme, Luc Vinet, Patsy-Wang Iverson, Doron Zeilberger, Alexei Zhedanov.

The following collection of eight individual contributions regarding Dick represent *part III* of a multi-part series selected from the Askey Liber Amicorum, a Friendship Book for Dick Askey. The Askey Liber Amicorum was described in OP–SF Net 27.1, published on January 15, 2020.

⋆ ⋆ ⋆

Kathy Driver, University of Cape Town, South Africa.

On every occasion that I met Dick, he was affirming and encouraging no matter which problem I bombarded him with. He would sit and discuss insights he had with me and then always refuse to have his name on the paper!

On the occasion of the celebration of Dick's 65th birthday at Mt. Holyoke, Peter Duren and I approached Dick at his birthday dinner and, after exchanging greetings, we told him we had used recent asymptotic results of Peter Borwein and Weyu Chen to obtain an asymptotic result for zeros of some $_2F_1$ polynomials. All worked well, their methods had been successfully applied. The only concern we had was that when we checked numerical plots of the zeros of our class of $_2F_1$ polynomials, instead of the pleasing picture of the zeros hurrying towards the curve as n increased, **all** the zeros actually lay **on** the curve for each value of n, which was, in that case, the circle $|z - 1| = 1$. The zeros were expected to approach the circle, not lie on the circle....

Peter and I explained what we had done and asked Dick if he could offer any insight or reasons. Dick took out a sheet of paper, thought for about 20 seconds, wrote down a formula and said: "*You are looking at the zeros of scaled and shifted ultraspherical polynomials.*".

He was able to do this without telling us that we had not properly done our homework... This anecdotal and amusing story (which wasn't such fun at the time) sums up my many fruitful and wonderful discussions with Dick. It was always about the subject he loved, never about himself. Peter and I did our homework and wrote some papers thanks to Dick.

Dick was not just helpful and interested when approached. He was also positively encouraging and would take the initiative by setting aside times at meetings to talk. I have several "originals" arising from those great discussions with Dick at conferences where he was so generous with his time.

My favourite story about Dick emanates from the first time I met him at an *OPSF conference* in Granada in 1991, the first international conference that I attended. He told me he didn't like the notation I used in my talk. After this admonition to do better next time, he and I then attended a talk where he promptly fell asleep (not quietly, much to the amusement of all), had a wonderful nap for the entire duration of the talk, and the moment it ended and applause subsided, Dick's hand shot up and he asked a penetrating question. I remember thinking Hmmm, this guy really is a star.

Kathy

<div align="center">⋆ ⋆ ⋆</div>

Michael Schlosser, University of Vienna, Vienna, Austria.

A tribute to Dick Askey
A small contribution to the September 2019 Richard Askey Liber Amicorum
Michael J. Schlosser

Dick Askey has always been very supportive to the mathematical community in general, and in particular to his mathematical family: the Special Functions community which he cared about and steadily nurtured (like a Godfather, but completely gently and nonviolently!). I wish to thank him for his support and advice over the years (during which he several times gave me encouraging feedback on my work, was writing recommendation letters when being asked, was giving me specific valuable advice on old literature to read—for instance, by Heinrich August Rothe [1], and by Ferdinand Schweins [2]—, and so on).

It is difficult to estimate the value or the impact of a single person in one's life. Dick Askey has had a steady light impact on me (just like water which is inconspicuously dripping but is ultimately creating a canyon by erosion). He was already one of the great shots in Special Functions when I started to study Mathematics at the University of Vienna, so for me he has always been around (and I took that for granted, I never knew anything else). It was in June 1996 (I just had completed my PhD thesis, working under the direction of Christian Krattenthaler on multivariate basic hypergeometric series) when I first met Dick, namely at the *Miniconference on q-Series* which Gaurav Bhatnagar and Stephen Milne organized at the Ohio State University. It was at this meeting where I first personally experienced Dick Askey in action promoting special functions and supporting young people. There were several other occasions where I was lucky to attend the same conference where Dick was, including a conference on Ramanujan in Mysore, India, in December 2012, to single out a somewhat (for me) exotic place where we met as well.

I now want to turn to mathematics, first abstractly, then concrete. On this occasion of compiling a contribution to the Richard Askey Liber Amicorum, I would like to offer an (at least small) piece

of mathematics to Dick as a gift, as a (small) token of appreciation. Various keywords come to (my) mind while contemplating about Dick Askey and his work. *Special functions* and *q-series* definitely belong to the main keywords. The imperative "*Read the masters!*" certainly comes to one's mind as well. Dick has always stressed the importance of reading the work of the old masters (Euler, etc.) for a better understanding of mathematics (or in the creative art of actually doing mathematics), and argued that this would also have a strong impact on one's research ability, either by discovering what the old masters already knew or just by learning from their thought process. Last but not least, *positivity problems* and *problems of analytic flavor* are intimately connected to Dick Askey's work too. A mathematical gift to Dick should ideally connect various of the keywords just mentioned. (I admit that I have left out "*orthogonal polynomials*" but allow me a certain degree of artistic freedom to justify my—albeit arbitrary—thought process!)

Consider the well-known binomial theorem,

$$(1+z)^n = \sum_{k \geq 0} \binom{n}{k} z^k, \tag{1}$$

with the binomial coefficient defined by

$$\binom{n}{k} = \frac{n(n-1)\cdots(n-k+1)}{k!}.$$

In (1), the exponent n is a priori a nonnegative integer. Isaac Newton, one of the old masters, experimented with this identity, formally replaced the exponent n by some fraction such as $\frac{1}{2}$, etc., and showed that the identity still holds when both sides make sense. (Today we know that in the nonterminating case, i.e., when n is not a nonnegative integer, z is required to satisfy the condition $|z| < 1$, unless z is considered a formal power series variable.) Newton was thus the first person to consider a "fractional" extension of the binomial theorem. In fact, as we know today, the integer parameter n in (1) can be replaced by any complex number α; the identity then still holds (provided $|z| < 1$, or if z is simply a formal variable).

I would like to dedicate an observation, at this moment actually still a conjecture, to Dick, which can be regarded to be a *fractional* extension of limiting cases of the First and Second Borwein Conjectures (cf. [3]).

Let q be a complex variable with $0 < |q| < 1$. As usual, the q-shifted factorial is defined as $(a;q)_0 = 1$ and

$$(a;q)_n = (1-a)(1-aq)\cdots(1-aq^{n-1}).$$

This also makes sense for $n = \infty$; then the product has infinitely many factors. For convenience, we shall also define

$$(a_1, \dots, a_m; q)_n = (a_1; q)_n \cdots (a_m; q)_n$$

(of which we will only use the $m = 2$ case in this tribute).

The celebrated First Borwein Conjecture (made by Peter Borwein around 1990, see [3]) asserts that for each nonnegative integer n, the polynomials $A_n(q)$, $B_n(q)$ and $C_n(q)$ appearing in the dissection

$$(q, q^2; q^3)_n = A_n(q^3) - qB_n(q^3) - q^2C_n(q^3) \tag{2}$$

are actually polynomials in q with *nonnegative* integer coefficients.

This conjecture was open for a long time and has only very recently been settled by Chen Wang, in his 2019 doctoral thesis at the University of Vienna (supervised by Christian Krattenthaler), see also [4] (which is part of his thesis). Chen Wang's method of proof (which follows a suggestion made by George Andrews in [3]) is analytic in nature and makes careful use of asymptotic estimates to establish bounds on the coefficients.

The First Borwein Conjecture is actually easy to show in the limit case $n = \infty$. In that case one can make use of the famous Jacobi triple product identity to prove the claimed nonnegativity of the series $A_\infty(q)$, $B_\infty(q)$ and $C_\infty(q)$.

The Second Borwein Conjecture (still being open) concerns a similar dissection in terms of powers of q, but with the expression on the left-hand side of (2) being squared.

Gaurav Bhatnagar (whom I know in person as long as Dick) and I have recently formulated partial theta function extensions of the first two Borwein Conjectures, see [5]. There we replaced all the factors in the respective q-shifted factorials by partial theta functions and observed that similar positivity properties appear to hold. My aim here is not to redeliver the results I have obtained with Gaurav but rather to present something entirely new (and unspoiled!):

Conjecture 1 (Dedicated to Dick Askey). *Let q be a complex number with $0 < |q| < 1$ (or view q as a formal power series variable). Further, let d be a real number satisfying*

$$0.22799812734\ldots \approx \frac{9 - \sqrt{73}}{2} \le d \le 1 \quad \textit{or} \quad 2 \le d \le 3.$$

Then the series $A^{(d)}(q)$, $B^{(d)}(q)$, $C^{(d)}(q)$ appearing in the dissection

$$(q, q^2; q^3)_\infty^d = A^{(d)}(q^3) - qB^{(d)}(q^3) - q^2C^{(d)}(q^3) \tag{3}$$

are power series in q with nonnegative real coefficients.

(The $d = 3$ case of the above conjecture is the $n = \infty$ case of an observation made by Chen Wang, communicated to the community by Christian Krattenthaler in his recent plenary talk at OPSFA15 in Hagenberg, Austria, in July 2019.)

Dick, I hope you like the above conjecture and can help to settle it!

I wish you many more years of joy and productivity.
Thanks a lot for serving as an idol and inspiration!

References

[1] H. A. Rothe. *Systematisches Lehrbuch der Arithmetik*. Johann Ambrosius Barth, Leipzig, 1811.

[2] F. Schweins. *Analysis*. Mohr und Winter, Heidelberg, 1820.

[3] G. E. Andrews. On a conjecture of Peter Borwein. *Journal of Symbolic Computation*, 20(5–6):487–501, 1995. Symbolic computation in combinatorics Δ_1 (Ithaca, NY, 1993).

[4] C. Wang. An analytic proof of the Borwein Conjecture. 2019. arXiv:1902.10886.

[5] G. Bhatnagar and M. J. Schlosser. A partial theta function Borwein conjecture. *Annals of Combinatorics*, 23:561–572, 2019. arXiv:1902.04447.

⋆ ⋆ ⋆

Sergeĭ Suslov, Arizona State University, Tempe, Arizona, USA.

I first met Dick, Professor Askey, in front of the Kurchatov Institute in Moscow, when he visited the USSR in the mid 1980s. He energetically shook my hand and said "*Askey*". When we went to the seminar room for foreigners outside the institute, he immediately mentioned that

"*the blackboard is too small and the (meeting) table is too long*". Dick was the first American I ever met. Later that evening he gave a talk at Gel'fand's seminar at Moscow State University, which unfortunately I missed because I couldn't get past the security guard in the main university building [sic]. After that there were numerous meetings/conversations/collaborations with Dick on different conferences all over the world: St. Petersburg, Florida, Hong Kong, Germany, to name a few, and later in the United States. I am very grateful to Dick and Liz for a wonderful possibility to stay in their home in Madison for a few days during my second visit to Canada and the United States (see pic below). Once again, for the first time, I had an opportunity to celebrate Thanksgiving holidays and enjoy the hospitality of the entire Askey family.

Sergeĭ Suslov, Dick Askey, Ramanujan's bust, and George Gasper
in Dick Askey's house in November 1993.

Most of Dick's professional life is related to the University of Wisconsin–Madison. It's well-known that Van Vleck Hall, the home of math department there, is named after the founder of modern theory of magnetism. It's less known that he followed Dirac's ideas published in only one article without applications. Dirac visited Madison during his first world round trip and got paid $1800 for his stay in Madison, his first ever large royalty! Many years later (following the tradition?), Dick donated $1000 towards my first laptop computer, my father added $800 (enormous amount in the last years of the USSR!) and because of those two wonderful gifts I was able to LaTeX papers in Moscow in the following two years on my own laptop computer when I couldn't travel. Needless to say that the library of Dick's math department has practically every book on orthogonal polynomials and special functions. One of our joint papers with Dick and Mizan Rahman was written there in "regular office hours" and during the following evenings at Dick's house!

It is always exciting to discuss math (and physics) with Dick, and just bumping into him during Annual AMS Meetings. In Boston, for instance, I was lucky to stop him for quite a while in the covered path between hotels and the convention center in order to tell him that the first draft

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of our article S. I. Kryuchkov, S. K. Suslov and J. M. Vega-Guzman, *The minimum-uncertainty squeezed states for atoms and photons in a cavity*, had been rejected by J. Phys. B in 24 hours! Obviously, he found some words to encourage us and an extended revision was later published [1]. And this is just one example of Dick's friendly support of our research; he always has been an uncompromised judge of novelty and quality of publications in many areas of analysis and later in mathematical education.

When I was originally hired as a senior lecturer by the Arizona State University in the late 1990s, my first permanent job in the United States, Dick immediately said that in the classroom I would always be a professor! Next year, when my NSF grant application had been approved, he called the analysis program director in order to tell him that he had made the right choice! There are many other "real life stories" like that; for instance, Dick's presentation of our talk in the International Congress of Mathematicians in Warsaw, when Arnold Nikiforov "couldn't attend" in 1983; but this will be a very long story!

In conclusion, I believe that I may say that my English/American second language is too poor to express fully my respects, gratitude and friendship. We all love you Dick! You always had been an "American Royalty" for me and my students.

p.s. Dick's Erdős number is 2, and therefore my Erdős number is 3 (Erdős–Boas–Askey–Suslov, one of the paths) which is due to Dick. Dick's Landau number is 3 (Landau–Smorodinskiĭ–Suslov–Askey) as a result of our collaboration.

[1] S. I. Kryuchkov, S. K. Suslov, and J. M. Vega-Guzmán. The minimum–uncertainty squeezed states for atoms and photons in a cavity. *Journal of Physics B: Atomic, Molecular and Optical Physics*, 46(10), 5 2013. (IOP=Institute Of Physics SELECT and HIGHLIGHT for 2013).

Dick and Liz Askey at Urbana, Illiois in 1987.
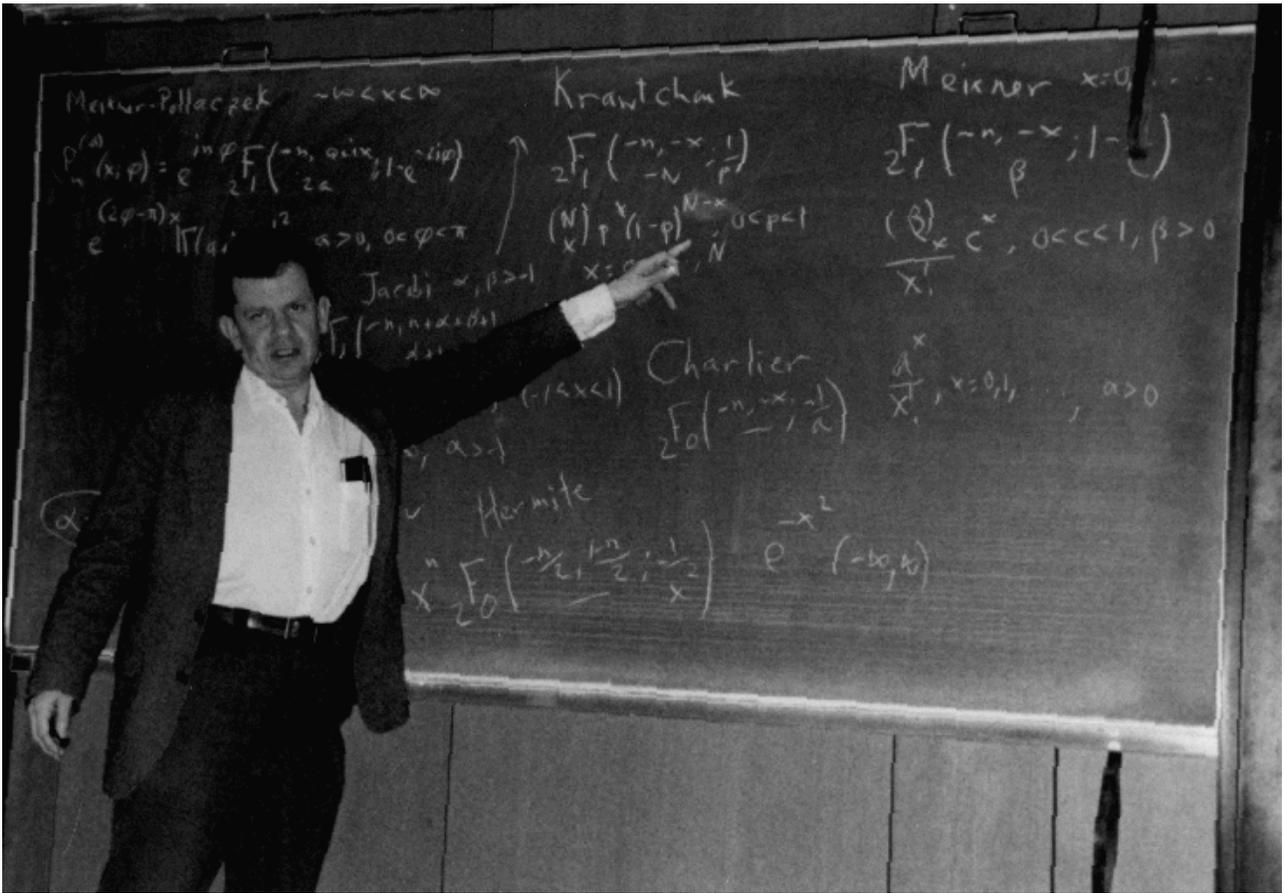
Dick Askey at Oberwolfach, Germany in March 1983
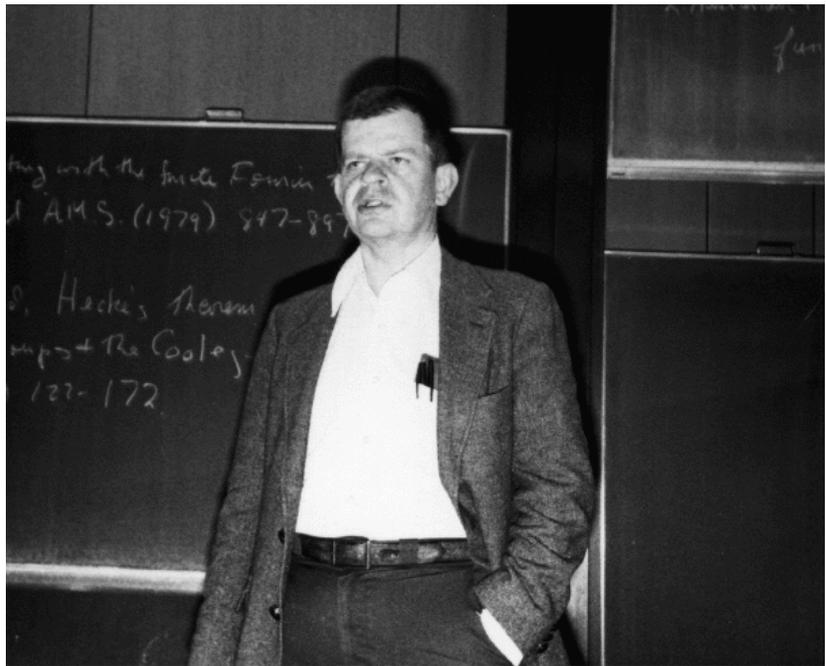
Dick Askey at Oberwolfach, Germany in March 1983

Conversations, conversations...

Conversations, conversations...

l to r: Doron Lubinsky, Paul Nevai, Dick Askey, Tom Koornwinder
attending OPSFA1 Polynômes Orthogonaux et Applications,
Bar-le-Duc, France, October 1984.

Dick Askey, Liz Askey and Mourad Ismail.
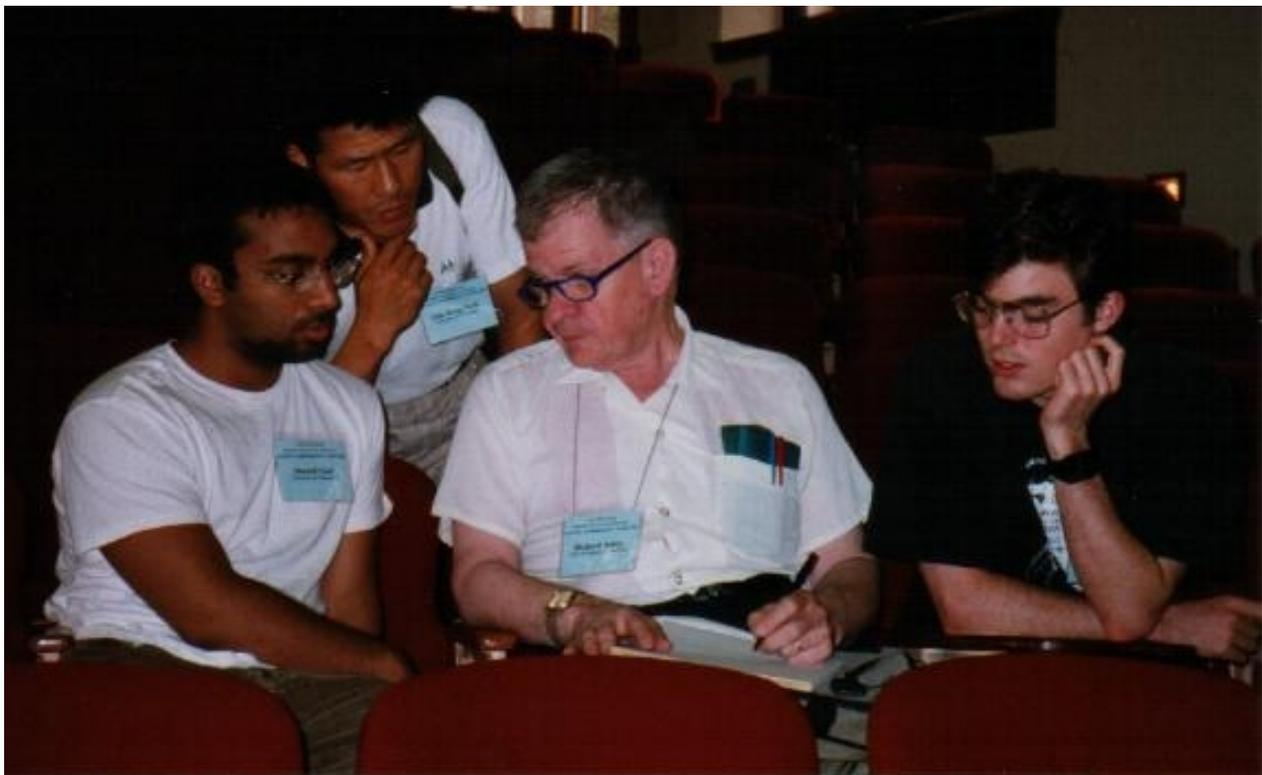
Dick Askey with graduate students.

l to r: Arun Ram, Dick Askey, Steve Milne, George Gasper, Shaun Cooper in 1994.

Dick Askey.

<div align="center">★ ★ ★</div>

Nico Temme, Centrum Wiskunde & Informatica, Amsterdam, The Netherlands.

Dick Askey's sabbatical year in Amsterdam, 1969–1970

Nico Temme
CWI, Amsterdam

Dick visited the Mathematisch Centrum (MC) in Amsterdam[1] from July 1969–August 1970. He was guest researcher of the Department Toegepaste Wiskunde (TW, Applied Mathematics). Dick didn't know any of us, although he was familiar with the work of department chief Hans Lauwerier, who had written publications on asymptotic analysis and special functions. In fact these topics were extensively studied in the Netherlands by Prof. J. G. van der Corput, who became an expert in asymptotic problems in number theory. Van der Corput was one of the four founders of the MC in 1946 and he gave lectures on asymptotic analysis, he organized colloquia, and because of these activities many mathematicians in Amsterdam and in the country became interested in these topics. Among them was N. G. de Bruijn, who wrote the well-known book Asymptotic Methods in Analysis [1].

Around the time that Dick arrived in Amsterdam, there was some skepticism in the country about special functions, because computers could take over this topic. The special approach by Dick, in particular by linking elements of group theory with classical analysis, has caused his work to become more accepted and viewed from a different perspective.

Dick's enthusiasm was contagious, he was very active in writing publications during his sabbatical year, see his list at the end. The TW-reports became publications in journals. He gave many introductory lectures on orthogonal polynomials; eight lectures are bundled in the MC-report TC 51/70. At the end of that report Dick wrote: "*I would much rather want the reader to learn the above moral: do not study special functions for their own sakes. Without motivation and problems from some other field this area becomes sterile very fast. Of course this warning is not unique for special functions, but holds for any other specialized field of mathematics. And with this remark I close my series of lectures.*"

The lectures attracted always a large audience, because Dick managed to start with simple examples, and his mathematical approach was always very clear. Many people admired his capability of writing new formulas with one hand, and cleaning a used part of the black board with his other hand in one go. He didn't use notes, everything came right from memory.

Dick's sabbatical year was of great influence on a group of young MC-researchers: Tom Koornwinder, Herman Bavinck and I myself. We learned by visiting his lectures, from the problems and research topics suggested by Dick, from referee jobs he had to do and which he gave us to obtain our impression of the paper, and from daily contacts and discussions.

Among the advice he has given me, I remember the following two:

1. *When you take a formula from a book, be careful, it may not be correct.*

2. *When you do not remember a formula by heart, you do not understand it.*

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[1]In 1983 the name of the institute changed into Centrum Wiskunde & Informatica (CWI).

Dick gave lectures in several colloquia outside the department:

1. Staff Colloquium of the Mathematical Institute of the University of Amsterdam: Applications of orthogonal polynomials, from projective spaces to numerical analysis.

2. MC-Colloquium Orthogonal Polynomials: 3 lectures.

3. MC Colloquium *Elementary topics explained from a higher point of view*: Certain rational functions whose power series have positive coefficients.

In the MC Annual Report 1970 we read in the Section *Approximation Theory and Special Functions*: Preparing a formula book in this area asked a lot of time. For that purpose, it turned out to be necessary to study extensively especially the discrete orthogonal polynomials (Charlier, Meixner and Hahn). Many new formulas were derived. One result found by Szegő on the positivity of the integral of a product of three Laguerre polynomials could be extended. About this and a number of similar results, an article will be published in collaboration with G. Gasper (Northwestern University, Illinois, USA).

MC-publications written by Dick:

1. MC Report TW 112, Orthogonal polynomials and positivity, 34 pages.

2. MC Report TW 113, Mean convergence of orthogonal series and Lagrange interpolation, 23 pages.

3. MC Report TW 114, Three notes on orthogonal polynomials, 17 pages.

4. MC-report TC 51/70, Eight lectures on orthogonal polynomials, 68 pages.

5. MC-Report ZW 1970-006, Certain rational functions whose power series have positive coefficients, 11 pages.

To download these publications, visit CWI's repository
https://ir.cwi.nl/#filter=author:Askey .

I am very thankful to Dick, for all educational contacts during his sabbatical year in Amsterdam, for the warm interest in my activities and for suggesting problems for my research on special functions and asymptotic analysis. For example, he was interested in the asymptotic properties of a class of polynomials biorthogonal on the unit circle. I have received many emails from colleagues who first asked Dick for help, and when there was an asymptotic element in the question, Dick referred to me. In this way, I have received many interesting research questions.

Nico Temme
Centrum Wiskunde & Informatica, Amsterdam, The Netherlands.

References

[1] N. G. de Bruijn. *Asymptotic methods in analysis*. Dover Publications, Inc., New York, third edition, 1981.

Photo taken during: "International Conference on Analysis, Applications and Computations, In Memory of Lee Lorch 1915–2014," September 28–30, 2015, The Fields Institute, Toronto, Canada.
l to r: Roderick Wong, Martin Muldoon, Vladimir Vinogradov, Chandler Davis, Robert Corless, Priscilla Greenwood, unknown, Mourad Ismail, Man–Duen Choi, Dick Askey, Man Wah Wong, Nico Temme.

Luc Vinet, Centre de recherches mathématiques, Université de Montréal, Canada.

A MODEST TRIBUTE TO DICK ASKEY, A FRIENDLY GIANT
Luc Vinet

I have not known Dick very well nor for a very long time but through my encounters with him over the last years, I have developed a sincere fondness for him and it felt as this was reciprocal. Also, I have been acquainted with Dick's mathematical achievements for the past thirty years only but it was like a revelation when it happened.

Looking for exact solutions to interesting physical models is a well-proven tradition in mathematical physics to which I belong. Special functions abound in this context. There is also a belief that models can be solved exactly because they possess symmetries. Looking for mathematical structures expressing symmetries and their representations in terms of special functions is often the key to making advances in physical understanding and discovering solvable systems. Hence my interest in exploring the symmetries encoded in orthogonal polynomials and vice-versa.

Quantum groups were being actively developed around the time I was on sabbatical at UCLA in 1989. Uninformed of the immense work on q-series, quite naively, I had the feeling that interesting functions should emerge from the representations of these quantum groups. Weather being always nice in LA, the campus bookstore would often put books on display outside. One lucky morning, as I was walking to the Physics Department, I stumbled by chance on the book of Gasper and Rahman prefaced by Dick. It was the light I was looking for—an amazing eye-opener—and how I learned about the Askey-Wilson polynomials and caught the q-disease.

This got Floreanini and I started on the connection between quantum groups and algebras and q-special functions. Later, with Lapointe I worked on the Jack and Macdonald polynomials providing their raising operators solving Macdonald conjectures. In so doing, and at about the same time realizing that we were independently pursuing parallel research on quadratic algebras and superintegrable systems, Zhedanov and I joined forces and began our on-going collaboration. I did not meet Dick much during those years, moving I suppose in different circles. Moreover from 1999 to 2010, I got rather busy with university administration.

From 2010 onward, after I had finished my terms as Provost and Rector, I think I met Dick almost every year. I apologize for having spoken too much about me but this aimed to stage my few personal anecdotes about Dick. They are all rooted in various conversations and meals that we enjoyed together.

In spite of his encyclopedic knowledge, I do not think that Algebra was Dick's area of predilection. Often times, he came to me saying: *Please stop talking about the Askey-Wilson algebra, I have nothing to do with that—call it the Zhedanov algebra.* This gives an example of his modesty. Alas Dick, it is too late; I am afraid the name will stick and that you wont be able to get rid of your algebra!

I wish to mention a question that Dick has regularly put to me and that has yet to be resolved. Seven or eight years ago, Zhedanov and I sorted out properties of the Bannai- Ito

polynomials and began talking about -1 orthogonal polynomials. Dick kept saying: you ought to be able to give similar treatments for other roots of unity. There should be connections to sieved polynomials. Go ask Mourad. Well we asked Mourad and wrote with him papers ... but on different topics. I keep remembering Dick's words and given his legendary insight, I am sure there is much to be understood there. I hope to make good some day on this inspiration that Dick is still instilling directly. Anyone wishing to join is welcome.

Dick is also passionate about mathematical education. Here again my discussions with him on that topic are always on my mind as I try to increase the role of the CRM in this sector in Quebec.

Last, I want to stress again Dick's kindness. Two years ago, Paul Terwilliger invited me to give a seminar in Madison. Unexpectedly, Dick came. This really touched me because it was especially difficult for him as he was in the process of moving.

Dick, many many thanks for your mathematics and for encouraging us all to climb on the shoulders of the giant that you are.

Most sincerely,
Luc

$\star\,\star\,\star$

Patsy Wang-Iverson

Dick and I began communicating online in the late 90's over our common interest in the TIMSS (then called the Third International Mathematics & Science Study, with the T subsequently changed to Trends with the 2003 study) data and the Singapore approach to teaching mathematics. We subsequently obtained a small NSF grant (after he introduced me to Susan Sclafani, then Assistant Secretary of Education) that allowed us to convene a TIMSS Work Session at Wingspread in 2004, bringing together a small group of mathematicians and mathematics educators to analyze the TIMSS videos. The results were organized by Cathy Kessel and uploaded to the Research for Better Schools website, with Dick and me as Co-editors (no longer available).

Dick opened many doors for me, including introducing me to Madge Goldman, President of the Gabriella & Paul Rosenbaum Foundation, saying, "*You may find each other interesting.*" We three then embarked upon an effort to study use of Singapore Mathematics in American classrooms. Dick played a vital role as a sounding board and critical reviewer for Madge, examining carefully materials she sent him before publication.

Dick and I collaborated on a number of presentations at national and state conferences for mathematics educators and got together at national and international conferences (see photo from *12th International Conference on Mathematical Education* (ICME-12) in Seoul, South Korea).

We transcended the work relationship to become good friends. I had the opportunity to visit him and Liz in Madison when he called to tell me I might be interested in attending the 2008 MathFest in Madison, as Erik Demaine was to be the keynote lecturer. After the conference, Dick and Liz took David and me sightseeing to visit a Frank Lloyd Wright house,

and, of course, the famous cheese store. When we went to the house, and I commented on the walls of books throughout the house, Dick said he was in the process of trying to downsize his collections. Not doing so, he said, would be akin to child abuse.

In addition to mathematics education, Dick, Liz, a children's librarian, and I shared a love for children's books, in particular pop–up books. I treasure the Alice in Wonderland pop–up birthday card they sent me.

I called Dick on June 4 to wish him a Happy Birthday. He sounded good, thus it was a shock to receive the news about his deteriorating health from Suzanne.

I hope to see you in the near future, Dick.

With love,
Patsy Wang–Iverson

<center>⋆ ⋆ ⋆</center>

Doron Zeilberger, Rutgers University, New Brunswick, New Jersey, USA.

Dick Askey: a special (and very important!) guru indeed
Doron Zeilberger

Special Functions are functions that occur so often that they deserve a name, but even more important than functions are *people*, and Dick Askey is one of the most special people I have ever met. In this brief note, let me mention a small sample of the very significant mathematics that he inspired.

- It was Dick who challenged Dominique Foata to find a combinatorial proof of the Mehler formula, and that lead to Foata's beautiful combinatorial approach to Special Functions, pursued by him, his collaborators, and many others.

- It was Dick who had brilliant PhD students, including Dennis Stanton, that became the absolute unit of quality for all PhD students. Being x-Dennis with $x > \frac{1}{2}$ means that the student is very good. Of course $x \leq 1$, and the inequality is *sharp*, with only one case (guess who?) achieving $x = 1$.

- Dick is very passionate about mathematics education, something very rate amongst research mathematicians, and is a 'gadfly' (with co–gadfly George Andrews) about what they deemed misguided reforms in K–12 education, stating that *Good intentions are not enough*. Dick did not just criticize, but set an example by writing insightful articles for the *Mathematics Teacher*, the leading periodical for high–school teachers, about Fibonacci and Lucas numbers.

- The 'Askey scheme' (aka *tableau d'Askey*), hanging in my office (nicely designed by Jacques Labelle), was the **conceptual skeleton** of lots of great research in special functions, highlighting the Askey hypergeometric hierarchy, with the Racah and Askey–Wilson polynomials on the top.

- Dick caught the q–disease, and along with George Andrews and others (Mizan Rahman, George Gasper, Dennis Stanton, Frank Garvan to name a few) inspired lots of insightful q-*analogs* of classical theorems, that led to insightful combinatorial interpretations (Xavier Viennot and his school, Bill Chen and his school, and many others).

<center>21</center>

Dick Askey on a seesaw in 2012.

- The *Askey-Gasper inequality* was the **crucial fact** needed in the proof of one of the most *important* open problems of the 20th century, Louis de Branges' proof of the Bieberbach conjecture.

  Finally, let me mention Dick's influence on myself.

- Dick was a great professional father–figure. He is the one who challenged me to prove George Andrews' q–Dyson conjecture, that I did, in 1983 (published in 1985) in collaboration with Dave Bressoud. He is the one who challenged me to prove the G_2 case of Ian Macdonald's Constant Term Conjecture (that I did, also done independently by Laurent Habsieger), where I used the Dixon identity, that I learned from him and from Foata. Dick also challenged me to prove the G_2–dual case of the same conjecture, that I did using what I called the *Stembridge-Stanton* trick. That method was later used by another whiz, Frank Garvan, to prove the F_4 case.

- Dick was an implicit, but very strong, influence in the development of so–called: *Wilf-Zeilberger algorithmic proof theory*.

Thank you Dick!

$\star\ \star\ \star$

Alexei Zhedanov, University of Virginia, Charlottesville, Virginia, USA.

As a mathematician, I was born under the *constellation of Askey*.

Salieri, the main character of Pushkin's drama "Mozart and Salieri" «Мо́царт и Салье́ри» says (Translated by Alan Shaw):

Что говорю? Когда великий Глюк	*What am I saying? When great Gluck himself*
Явился и открыл нам новы тайны	*Appeared, unfolding us new mysteries*
(Глубокие, пленительные тайны),	*(And deep enthralling mysteries they were),*
Не бросил ли я все, что прежде знал,	*Did I not give up all I'd known before,*
Что так любил, чему так жарко верил,	*And dearly loved and fervently believed in?*
И не пошел ли бодро вслед за ним	*Did I not briskly follow him, without*
Безропотно, как тот, кто заблуждался	*A murmur, like a man who's lost his way,*
И встречным послан в сторону иную?	*And meets another who can set him right?*

Askey has played the similar role of the "great Gluck". The area of my research changed when Askey–Wilson polynomials appeared in the mathematical World.

During several years, I was trying to find a simple algebraic explanation of the Askey–Wilson polynomials. This was finally done in 1991 when the Askey–Wilson algebra $AW(3)$ was shown to describe all basic properties of these remarkable polynomials: duality, recurrence relation and q–difference equation. Although Dick always warned against the name "Askey–Wilson algebra", I still believe that this name is quite appropriate, stressing the main role of the objects to which the algebra is applied.

In the following years, my activity was mainly related to Askey's topics. Together with my friends and colleagues (I can mention those with whom I collaborated for many years: Slava Spiridonov, Satoshi Tsujimoto and Luc Vinet), we have tried to generalize and to extend

the Askey scheme in different directions: Bannai–Ito polynomials, elliptic biorthogonal rational functions, algebraic Heun operators, etc.

I would like to say many thanks to Dick for his influence to my life and to my results.

l to r: Dick Askey, Alexei Zhedanov at Difference Equations and Special Functions, Bexbach, Saarland, Germany in October 26–30, 2002.

l to r: Kathy Driver, Dick Askey, Alexei Zhedanov at *Conference on Difference Equations, Special Functions and Applications*, Munich, Germany in July 2005.

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 May and June 2020. This list has been separated into two categories.

OP-SF Net Subscriber E-Prints

http://arxiv.org/abs/2003.05228
A faster and more accurate algorithm for calculating population genetics statistics requiring sums of Stirling numbers of the first kind
Swaine L. Chen, Nico M. Temme

http://arxiv.org/abs/2005.01059
The endless beta integrals
Gor A. Sarkissian, Vyacheslav P. Spiridonov

http://arxiv.org/abs/2005.01523
A matrix version of Dwork's congruences
Frits Beukers

http://arxiv.org/abs/2005.01665
Fourier Uncertainty Principles, Scale Space Theory and the Smoothest Average
Stefan Steinerberger

http://arxiv.org/abs/2005.02203
Multidimensional matrix inversions and elliptic hypergeometric series on root systems
Hjalmar Rosengren, Michael J. Schlosser

http://arxiv.org/abs/2005.03516
Asymptotic behavior of Wronskian polynomials that are factorized via p-cores and p-quotients
Niels Bonneux

http://arxiv.org/abs/2005.04133
A note on Stirling permutations
Ira M. Gessel

http://arxiv.org/abs/2005.04217
An algebraic description of the bispectrality of the biorthogonal rational functions of Hahn type
Satoshi Tsujimoto, Luc Vinet, Alexei Zhedanov

http://arxiv.org/abs/2005.04227
Some Additions to a Family of Integrals related to Hurwitz' Zeta Function
Michael Milgram

http://arxiv.org/abs/2005.04903
On a weighted spin of the Lebesgue Identity
Ali K. Uncu

http://arxiv.org/abs/2005.04944
On Rational and Hypergeometric Solutions of Linear Ordinary Difference Equations in $\Pi\Sigma^*$-field extensions
Sergei A. Abramov, Manuel Bronstein, Marko Petkovšek, Carsten Schneider

http://arxiv.org/abs/2005.05737
Asymptotics of the Mittag-Leffler function $E_a(z)$ on the negative real axis when $a \to 1$
R. B. Paris

http://arxiv.org/abs/2005.06951
Analytical valuation of some non-elementary integrals involving some exponential, hyperbolic and trigonometric elementary functions and derivation of new probability measures generalizing the gamma-type and normal distributions
Victor Nijimbere

http://arxiv.org/abs/2005.06957
New realizations of algebras of the Askey-Wilson type in terms of Lie and quantum algebras
Nicolas Crampe, Dounia Shaaban Kabakibo, Luc Vinet

http://arxiv.org/abs/2005.06961
Degenerate Sklyanin algebras, Askey-Wilson polynomials and Heun operators
Julien Gaboriaud, Satoshi Tsujimoto, Luc Vinet, Alexei Zhedanov

http://arxiv.org/abs/2005.07020
Extending Ono and Raji's relations between class numbers and self-conjugate 7-cores
Kathrin Bringmann, Ben Kane

http://arxiv.org/abs/2005.08152
Asymptotic solutions of inhomogeneous differential equations having a turning point
T. M. Dunster

http://arxiv.org/abs/2005.08237
Reflections on Euler's reflection formula and an additive analogue of Legendre's duplication formula
Ritesh Goenka, Gopala Krishna Srinivasan

http://arxiv.org/abs/2005.08316
Superimposing theta structure on a generalized modular relation
Atul Dixit, Rahul Kumar

http://arxiv.org/abs/2005.08957
Voros Coefficients and the Topological Recursion for a Class of the Hypergeometric Differential Equations associated with the Degeneration of the 2-dimensional Garnier System
Yumiko Takei

http://arxiv.org/abs/2005.09114
On the Widom factors for L_p extremal polynomials
Gökalp Alpan, Maxim Zinchenko

http://arxiv.org/abs/2005.09772
A CMV connection between orthogonal polynomials on the unit circle and the real line
M. J. Cantero, F. Marcellán, L. Moral, L. Velázquez

http://arxiv.org/abs/2005.09809
A Semicircle Law for Derivatives of Random Polynomials
Jeremy G. Hoskins, Stefan Steinerberger

http://arxiv.org/abs/2005.10769
The singular support of the Ising model
George E. Andrews, Jethro van Ekeren, Reimundo Heluani

http://arxiv.org/abs/2005.11685
Self-similar solutions of some model degenerate partial differential equations of the second, third and fourth order
Michael Ruzhansky, Anvar Hasanov

http://arxiv.org/abs/2005.12380
Common Factors in Fraction-Free Matrix Decompositions
Johannes Middeke, David J. Jeffrey, Christoph Koutschan

http://arxiv.org/abs/2005.13444
A Calabi-Yau algebra with E_6 symmetry and the Clebsch-Gordan series of $sl(3)$
N. Crampe, L. Poulain d'Andecy, Luc Vinet

http://arxiv.org/abs/2005.13515
An analytic generalization of the Catalan numbers and its integral representation
Feng Qi, Wen-Hui Li, Jian Cao, Da-Wei Niu, Jiao-Lian Zhao

http://arxiv.org/abs/2006.00207
Fourth Painlevé and Ermakov equations: quantum invariants and new exactly-solvable time-dependent Hamiltonians
Kevin Zelaya, Ian Marquette, Véronique Hussin

http://arxiv.org/abs/2006.00668
Differential identities for the structure function of some random matrix ensembles
Peter J. Forrester

http://arxiv.org/abs/2006.01829
Solution to the fractional equation with left-sided fractional Bessel derivatives of Gerasimov-Caputo type
Elina Shishkina, Sergey Sitnik

http://arxiv.org/abs/2006.01961
Automatic Counting of Restricted Dyck Paths via (Numeric and Symbolic) Dynamic Programming
Shalosh B. Ekhad, Doron Zeilberger

http://arxiv.org/abs/2006.02309
Statistical Mechanics of Confined Polymer Networks
Bertrand Duplantier, Anthony J. Guttmann

http://arxiv.org/abs/2006.03126
Exact pointwise estimates for polynomial approximation with Hermite interpolation
Kirill A. Kopotun, Dany Leviatan, Igor A. Shevchuk

http://arxiv.org/abs/2006.03253
Enumeration of standard barely set-valued tableaux of shifted shapes
Jang Soo Kim, Michael J. Schlosser, Meesue Yoo

http://arxiv.org/abs/2006.04997
The Norton algebra of a Q-polynomial distance-regular graph
Paul Terwilliger

http://arxiv.org/abs/2006.06242
Some remarks on the power product expansion of the q-exponential series
Johann Cigler

http://arxiv.org/abs/2006.07596
Gaussian unitary ensemble with two jump discontinuities, PDEs and the coupled Painlevé
II and IV systems
Shulin Lyu, Yang Chen

http://arxiv.org/abs/2006.07599
Generalized Beta-type integral operators
M. Ali, M. Ghayasuddin, R. B. Paris

http://arxiv.org/abs/2006.07884
On variation of zeros of classical discrete orthogonal polynomials
K. Castillo, F. R. Rafaeli, A. Suzuki

http://arxiv.org/abs/2006.08120
Ratios of Hahn-Exton q-Bessel functions and q-Lommel polynomials
Jang Soo Kim, Dennis Stanton

http://arxiv.org/abs/2006.08351
Remark on "When Are All the Zeros of a Polynomial Real and Distinct?"
K. Castillo

http://arxiv.org/abs/2006.09893
On two classes of generalized fractional operators (with short historical survey of fractional
calculus)
E. L. Shishkina, S. M. Sitnik

http://arxiv.org/abs/2006.10025
The Adelic Grassmannian and Exceptional Hermite Polynomials
Alex Kasman, Robert Milson

http://arxiv.org/abs/2006.10205
Counting Standard Young Tableaux With Restricted Runs
Manuel Kauers, Doron Zeilberger

http://arxiv.org/abs/2006.10708
Polynomials with Zeros on the Unit Circle: Regularity of Leja Sequences
Stefan Steinerberger

http://arxiv.org/abs/2006.10787
Construction of potential functions associated with a given energy spectrum – An inverse problem. II
Abdulaziz D. Alhaidari, Houcine Aounallah

http://arxiv.org/abs/2006.11131
Generalization of Szász operators involving multiple Sheffer polynomials
Mahvish Ali, Richard B. Paris

http://arxiv.org/abs/2006.11187
The Hermitian Jacobi process: simplified formula for the moments and application to optical fibers MIMO channels
Nizar Demni, Tarek Hamdi, Abdessatar Souissi

http://arxiv.org/abs/2006.11554
On some Sobolev spaces with matrix weights and classical type Sobolev orthogonal polynomials
Sergey M. Zagorodnyuk

http://arxiv.org/abs/2006.11752
A method of composition orthogonality and new sequences of orthogonal polynomials and functions. The square of Macdonald function weight case
Semyon Yakubovich

http://arxiv.org/abs/2006.12639
A fourth-order superintegrable system with a rational potential related to Painlevé VI
Ian Marquette, Sarah Post, Lisa Ritter

http://arxiv.org/abs/2006.12985
The Boundedness of General Alternative Gaussian Singular Integrals on variable Lebesgue spaces with Gaussian measure
Eduard Nava, Ebner Pineda, Wilfredo Urbina

http://arxiv.org/abs/2006.13569
Two variable degenerate Bell polynomials associated with Poisson degenerate central moments
Dae San Kim, Taekyun Kim, Han-Young Kim, Hynseok Lee

http://arxiv.org/abs/2006.13821
Series solutions of Bessel-type differential equation in terms of orthogonal polynomials and physical applications
A. D. Alhaidari, H. Bahlouli

http://arxiv.org/abs/2006.14021
Terminating basic hypergeometric representations and transformations for the Askey-Wilson polynomials
Howard S. Cohl, Roberto S. Costas-Santos, Linus Ge

http://arxiv.org/abs/2006.14391
Ladders operators for general discrete Sobolev orthogonal polynomials
Galina Filipuk, Juan F. Mañas-Mañas, Juan J. Moreno-Balcázar

http://arxiv.org/abs/2006.14522
Product formulas and convolutions for two-dimensional Laplace-Beltrami operators: beyond the trivial case
Rúben Sousa, Manuel Guerra, Semyon Yakubovich

http://arxiv.org/abs/2006.14757
Painlevé V and the Hankel Determinant for a Singularly Perturbed Jacobi Weight
Chao Min, Yang Chen

http://arxiv.org/abs/2006.15236
Orthogonal polynomials and Hankel Determinants for certain Bernoulli and Euler Polynomials
Karl Dilcher, Lin Jiu

http://arxiv.org/abs/2006.15352
Extensions of beta and related functions
M. Ghayasuddin, M. Ali, R. B. Paris

http://arxiv.org/abs/2006.15534
The expansion of Wronskian Hermite polynomials in the Hermite basis
Codruţ Grosu, Corina Grosu

http://arxiv.org/abs/2006.15677
A new way to classify 2D higher order quantum superintegrable systems
Bjorn K. Berntson, Ian Marquette, Willard Miller, Jr

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Reduction of quad-equations consistent around a cuboctahedron I: additive case
Nalini Joshi, Nobutaka Nakazono

Other Relevant OP-SF E-Prints

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Derivatives and integrals: matrix order operators as an extension of the fractional calculus
C. B. da Porciuncula

http://arxiv.org/abs/2005.00588
Fractional integral inequalities of Hermite-Hadamard type for convex functions with respect to a monotone function
Pshtiwan Othman Mohammed

http://arxiv.org/abs/2005.00793
Upper and lower bounds for Littlewood–Paley square functions in the Dunkl setting
Jacek Dziubański, Agnieszka Hejna

http://arxiv.org/abs/2005.01100
Beta Jacobi ensembles and associated Jacobi polynomials
Hoang Dung Trinh, Khanh Duy Trinh

http://arxiv.org/abs/2005.01210
Quantum particle motion on the surface of a helicoid in the presence of harmonic oscillator
Marcos C. R. Ribeiro Jr., Márcio M. Cunha, Cleverson Filgueiras, Edilberto O. Silva

http://arxiv.org/abs/2005.01354
Geometric properties of the four parameters Wright function
Sourav Das, Khaled Mehrez

http://arxiv.org/abs/2005.01414
Hölder–logarithmic stability in the Fourier analysis
Mikhail Isaev, Roman G. Novikov

http://arxiv.org/abs/2005.01676
Some properties of generalized hypergeometric Appell polynomials
L. Bedratyuk, N. Luno

http://arxiv.org/abs/2005.01695
Cosine polynomials with few zeros
Tomas Juškevičius, Julian Sahasrabudhe

http://arxiv.org/abs/2005.02004
Building singular solutions for degenerate high order equations
B. Yu. Irgashev

http://arxiv.org/abs/2005.02017
Zeta functions and nonvanishing theorems for toric periods on GL_2
Miyu Suzuki, Satoshi Wakatsuki

http://arxiv.org/abs/2005.02216
A closed form for the generalized Bernoulli polynomials via Faà di Bruno's formula
Sumit Kumar Jha

http://arxiv.org/abs/2005.02391
Recurrence Relations for Values of the Riemann Zeta Function in Odd Integers
Tobias Kyrion

http://arxiv.org/abs/2005.02685
General infinite series evaluations involving Fibonacci numbers and the Riemann Zeta function
Robert Frontczak, Taras Goy

http://arxiv.org/abs/2005.02707
On algebraic differential equations concerning the Riemann-zeta function and the Euler-gamma function
Qiongyan Wang, Manli Liu, Nan Li

http://arxiv.org/abs/2005.02874
Green functions and propagation in the Bopp-Podolsky electrodynamics
Markus Lazar

http://arxiv.org/abs/2005.02996
Fourier interpolation with zeros of zeta and L-functions
Andriy Bondarenko, Danylo Radchenko, Kristian Seip

http://arxiv.org/abs/2005.03365
A Schur-Nevanlinna type algorithm for the truncated matricial Hausdorff moment problem
Bernd Fritzsche, Bernd Kirstein, Conrad Mädler

http://arxiv.org/abs/2005.03392
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Alexandre Eremenko, Andrei Gabrielov, Gabriele Mondello, Dmitri Panov

Topic #7 ——— OP – SF Net 27.4 ——— July 15, 2020

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
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Contributions to OP-SF NET 27.5 should be sent by September 1, 2020.

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Topic #8 ——— OP – SF Net 27.4 ——— July 15, 2020

From: OP-SF Net Editors
Subject: Thought of the Month by **Richard Allen Askey**

"I would much rather want the reader to learn the above moral: do not study special functions for their own sakes. Without motivation and problems from some other field this area becomes sterile very fast. Of course this warning is not unique for special functions, but holds for any other specialized field of mathematics. And with this remark I close my series of lectures."

Richard Allen Askey (1933–2019), *Eight Lectures on Orthogonal Polynomials*, Report TC 51/70, Mathematisch Centrum, Amsterdam, 1970.

Contributed by Nico Temme.