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Calendar of Events:

April 21–23, 2022
International Conference on Orthogonal Polynomials, Celebrating Francisco Marcellán’s 70th birthday
Cádiz, Spain
https://www.marcellanfest.es/

May 23–27, 2022
Baylor Analysis Fest: From Operator Theory to Orthogonal Polynomials, Combinatorics, and Number Theory
Baylor University, Waco, TX, USA
https://tinyurl.com/BAFconference
May – November, 2022
Symmetries: Algebras and Physics
Thematic Semester, includes the following workshops:

May 23–June 10, 2022
Non-commutative algebras, representation theory and special functions

July 25–August 19, 2022
Graph theory, Algebraic combinatorics and mathematical physics

September 12–October 7, 2022
Integrable systems, exactly solvable models and algebras
Centre de Recherches Mathématiques, Montréal, Quebec, Canada
http://www.crm.umontreal.ca/2022/Symmetries22/index_e.php

June 13–17, 2022—new dates due to coronavirus pandemic.
OPSFA–16
Centre de Recherches Mathématiques, Montréal, Quebec, Canada
http://www.crm.umontreal.ca/2022/OPSFA22/index_e.php

July 5–8, 2022—new dates due to coronavirus pandemic.
Functional Analysis, Approximation Theory and Numerical Analysis (FAATNA)
Matera, Italy
http://web.unibas.it/faatna20/

August 8–12, 2022
OPSF–S9: Radboud OPSFA Summer School
Nijmegen, The Netherlands
https://www.ru.nl/radboudsummerschool/courses/2022/opsfa-summer-school/

Topic #1  OP – SF Net 29.1  January 15, 2022

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

Happy New Year!

After the difficulties in the past couple of years due to the Covid–19 pandemic, we have to hope that the situation improves in 2022. Hopefully travel will be simpler, and without the risk of being stranded somewhere since a border has been closed at short notice. Personally I did no international travel in 2020 or 2020, the first years I’ve not done so for many, many years.

A highlight of this year is the 16th International Symposium on "Orthogonal Polynomials, Special Functions and Applications", due to be held in Montreal, Canada in June, which was postponed from last year. The conference is to be dedicated to the memory of Richard Askey, who made many significant contributions to our activity group and its research, as well as many other aspects of Mathematics. I’m sure that we all hope that this conference will take place as planned. Montreal is a city I have visited a number times and have always enjoyed my visits, in fact it’s one of my favourite cities in North America. Another activity of our activity group taking place this year is the OPSFA Summer School due to be held in Nijmegen, The Netherlands in August.

In recent months I have been pressing SIAM to reduce the cost of a SIAM activity group membership for Outreach Members of SIAM, which is for residents of developing countries. SIAM Outreach members can join SIAM at a discounted rate, thought they don’t get a discount for membership of a SIAM activity group. In comparison, student members of SIAM get free membership in two SIAM
activity groups. There is support from several SIAM officers for an activity group discount for Outreach members, there has been no change to do. During the coming year I will keep pressing that SIAM make the change which I believe will help our activity group.

I hope to be able to see many members of our activity group during the coming year

Peter Clarkson

Topic #2  ______  OP – SF Net 29.1  ______  January 15, 2022

From: Walter Van Assche (walter.vanasse@kuleuven.be),
David Gómez-Ullate (david.gomez-ullate@fis.ucm.es), Manuel Mañas (manuel.manas@ucm.es) and Andrei Martínez–Finkelshtein (andrei@ual.es)
Subject: Announcement: Marcellán Fest, International Conference on Orthogonal Polynomials

We would like to announce the following conference to celebrate Francisco Marcellán's 70th birthday.

International Conference on Orthogonal Polynomials
Celebrating Francisco Marcellán’s 70th birthday
Cádiz (Spain), April 21st –23rd 2022
Website: https://www.marcellanfest.es/

It is our hope to hold this conference as a regular conference with invited and contributed talks in a regular lecture room (not online or hybrid).

We will keep an eye on the evolution of the COVID situation and re-examine the situation as the date approaches, reaching a final decision on April 1st.

Registration for the conference opens on February 1, 2022.
For now please save the dates if you are interested in participating.

Topic #3  ______  OP – SF Net 29.1  ______  January 15, 2022

From: OP–SF Net Editors
Subject: Announcement: Dick Askey Memorial Tribute in the Notices of the AMS

We would like to draw your attention to a Memorial Tribute, The Legacy of Dick Askey (1933–2019) by Howard S. Cohl, Mourad E. H. Ismail, and Hung–Hsi Wu that appears in the January 2022 issue of Notices of the American Mathematics Society. The article brings together several remembrances of Dick including,

1. History, by Paul Terwilliger
2. Askey’s Contribution to Mathematics Research
   - Askey and Ramanujan, by Krishnaswami Alladi
   - Askey and Ramanujan’s notebooks, by Bruce C. Berndt
   - Askey and algebra, by Luc Vinet and Alexei Zhedanov
   - Askey and combinatorics, by Dennis Stanton
• Askey and beta integrals, by Mourad E. H. Ismail
• Askey, positivity, inequalities, and applications, by George Gasper
• Very positive memories about Dick Askey, by Tom H. Koornwinder

3. Askey’s Contribution to Mathematics Education

• Askey’s contributions to school mathematics education, by Hung-Hsi Wu
• Remembering Dick Askey, by Al Cuoco
• Askey and mathematics education, by Roger Howe.


Topic #4   OP – SF Net 29.1   January 15, 2022

From: Erik Koelink (e.koelink@math.ru.nl)
Subject: Announcement: Special session for Ph.D. students and postdocs at OPSFA-16 at CRM

If you are a Ph.D. student or a postdoc in the field of Orthogonal Polynomials and Special Functions and you have not been invited as a lecturer for one of the mini symposia at OPSFA-16, you might be eligible to give a presentation at the mini symposium for Ph.D. students and postdocs. This mini symposium will be organized for the first time at an OPSFA Conference. In this session we also plan to have time for networking and issues pertinent to young researchers. The OPSFA-16 symposium will take place from June 13–17, 2022 at the Centre de Recherches Mathématiques (CRM) in Montréal, Québec, Canada.

If you are interested in lecturing in this special session, please fill in this form by May 1, 2022 with the following info:

• Proposed title and abstract (150 words) for a 20min lecture with 5 minutes question time;
• Name and email address of your (Ph.D. and/or postdoc) Supervisor ;
• (Expected) date of PhD;
• Brief CV (max 1 page).

Participants in this mini symposium will have to register for OPSFA-16.

Depending on the number of applicants and available time slots, a selection will be made by Erik Koelink (Radboud U, Nijmegen), Francisco Marcellán (U Carlos III, Madrid), Sarah Post (U Hawaii) and Luc Vinet (CRM, Montreal). If you have any questions, please send an email to Josée Savard at: josee.savard@umontreal.ca.

Topic #5   OP – SF Net 29.1   January 15, 2022

From: Gaurav Bhatnagar (bhatnagarg@gmail.com), Atul Dixit (adixit@iitgn.ac.in) and Krishnan Rajkimar (krishnan.rjkmr@gmail.com)
Subject: Annual Report 2021: Topics in Special Functions and Number Theory Seminar Series

Organisers:

Gaurav Bhatnagar, Ashoka University;
Atul Dixit, Indian Institute of Technology Gandhinagar;
Krishnan Rajkumar, Jawaharlal Nehru University.

We meet approximately once every other week. The current timing is Thursdays, 4:00–5:00 PM (IST). In case you wish to be informed of future talks, please drop a line to the organizers at: sfandnt@gmail.com.

The talks in the year 2021 (listed below) are all available on our website: https://www.sfnt.org.

The first talk of the year will be on January 27, 2022, and it is the Ramanujan Special 2022 talk. This year’s speaker is Alan Sokal. In addition to talks every other week, we plan a mini-course: An introduction to probabilistic number theory, by Kaneenka Sinha, IISER, Pune, in the summer. We welcome suggestions for talks.

Talk Announcement: Ramanujan Special 2022

Title: Coefficientwise Hankel–total Positivity
Speaker: Alan Sokal, University College London and New York University
When: January 27, 2022, 4:00 PM – 5:00 PM IST (Note: IST=GMT−5:30)
Where: Virtual (Zoom): Please write to sdandnt@gmail.com for the Zoom link.

Talks from 2021

The talks are available on: https://www.sfnt.org.
The list of speakers, in reverse lexicographic order, is as follows.

1. Ramanujan Special 2020. Wadim Zudilin, Radboud University, Nijmegen: 10 years of q-rious positivity. More needed!
2. Meesue Yoo, Chungbuk National University, Korea: Elliptic rook and file numbers.
3. Liuquan Wang, Wuhan University, PRC: Parity of coefficients of mock theta functions.
5. Neelam Saikia, University of Virginia: Frobenius trace distributions for Gaussian hypergeo-metric function.
6. Siddhi Pathak, Penn State: Special values of L-functions.
7. Ritabrata Munshi, ISI, Kolkata: 100 years of sub-convexity.
10. Bibekananda Maji, IIT, Indore: On Ramanujan’s formula for \(\zeta(\frac{1}{2})\) and \(\zeta(2m + 1)\).
13. Christian Krattenthaler, University of Vienna, Austria: Determinant identities for moments of orthogonal polynomials.
17. Anup Dixit, IMSc, Chennai: On Euler–Kronecker constants and the class number problem.
19. Peter A. Clarkson, University of Kent, UK: Special polynomials associated with the Painlevé equations.
22. Koustav Banerjee, RISC, Johann Kepler University, Linz, Austria: Inequalities for the modified Bessel function of first kind and its consequences.
23. Debika Banerjee, Indraprastha Institute of Information Technology, IIIT, Delhi: Bessel functions and their application to classical number theory.
24. R. Balasubramanian, IMSc, Chennai: Hardy’s approximation to the Riemann Zeta Function.

Topic #6  _______  OP – SF Net 29.1  _______  January 15, 2022

From: DLMF Editors  
Subject: Annual Report: DLMF Summary Update for 2022


The DLMF has considerably extended the scope of the original handbook as well as improving accessibility to the worldwide community of scientists and mathematicians. To cite a few examples, the new handbook contains more than twice as many formulas as the old one, coverage of more functions, in more detail, and an up–to–date list of references. The website covers everything in the handbook and much more: additional formulas and graphics, math–aware search, interactive zooming and rotation of 3D graphs, internal links to symbol definitions and cross–references, and external links to online references and sources of software.

While the original Handbook still receives an enormous number of citations, citations to the DLMF are steadily growing in relation to the original handbook. Google Scholar now reports more than 7,262 citations to the DLMF, a roughly 16% increase from 2020. The number of DLMF website pages served up and the number of unique visitors to the website each increased by 7% over calendar 2020.

Today’s DLMF is the product of many years of effort by more than 50 contributors. Its initial release in 2010, however, was not the end of the project. Corrections to errors, clarifications, bibliographic updates, and addition of new material all need to be made on a continuing basis. And new chapters covering emerging subject areas need to be added to assure the continued
vitality of the DLMF deep into the 21st century. Since December of 2020, there were five DLMF releases, 1.1.0 (2020-12-15), 1.1.1 (2021-03-15), 1.1.2 (2021-06-15), 1.1.3 (2021-09-15), and 1.1.4 (2022-01-15) which kept us on our quarterly release schedule.

Release 1.1.0 was a significant revision from the previous year’s release (1.0.28). Most notable in this release was the development and implementation for the possibility of new chapters, sections, subsections and equations being introduced with a decimal numbering scheme using “_” to delimit intermediate numbers for sections, equations, etc. Since that release, thirty-four new equations and two new sections have been introduced into the DLMF.

The updating of various DLMF chapters and the development of new ones continues. These include a new chapter on Several Variable Orthogonal Polynomials (SVOP) and substantial updates to the chapters on Orthogonal Polynomials (OP), Algebraic Methods (AM), Painlevé Transcendents (PT) and Zeta and Related Functions (ZE). Four authors and two validators were identified to carry out the work. Drafts are now available for three of the chapters and are being internally reviewed. External validation of the chapters is following in much the same manner as the original DLMF. The ZE chapter revision with full validation was completed in release 1.1.4. The OP validation is underway it is expected that the full revision of the OP and AM chapters, will be released in 2022.

One of the design goals for the DLMF was that each formula would be connected to a proof in the literature. This data, visible as annotations on the website, provides either a proof for the formula, a reference to the proof for the formula or, for definitions, a reference which gives that definition. Unfortunately, this information has not previously been provided in all cases. Our work to systematically verify the completeness and traceability to published proofs for DLMF formulae at the equation level is well underway. This audit has been completed for Chapter 9 (Airy and Related Functions) and Chapter 25 (Zeta and Related Functions, with validation provided by Gergő Nemes) and is actively continuing for Chapters 1–5 and 22–30. Furthermore, inherited metadata at the subsection and section levels has been fully deployed.

There have been notable additional advances during the last year.

• When the DLMF is viewed using a MathML accessible browser, one may now “hover” over particular objects and an English description of the object is revealed.

• A significant number of errata (all errata in the DLMF has been tracked since Version 1.0.0, May 7, 2010), mathematical formulas, and new mathematical information have been provided, many of which originated from the DLMF readership, validation staff, and contributors. Furthermore, mathematical constraints and symbols associated with equations and in the text, have been improved, clarified, fixed or disambiguated.

• Proof sketches in Chapters 9 (Airy and Related Functions), 25 (Zeta and Related Functions), and elsewhere are now carefully differentiated at the equation level providing useful metadata for the origination of formulas.

• Improved notations such as the Knuth notation for harmonic numbers

\[ H_n = \sum_{k=1}^{n} k^{-1}, \]

and updated citations have been introduced.

Selected sections where explicit modifications have been made include:

• §3.2(vi). Linear Alg. Lanczos Tridiagonalization of a Symmetric Matrix
• §3.5(vi). Linear Alg. Eigenvalue/Eigenvector Characterization of Gauss Quadrature Formulas
• §19.25(vi). Symmetric Integrals. Relations to Other Functions. Weierstrass Elliptic Functions
Selected formula additions which include:
(see above DLMF update 1.1.0 for description of the decimal numbering scheme using the “_”)

- (14.30.8_5). Herglotz generating function for spherical harmonics in §14.30. Spherical and Spheroidal Harmonics, \( a = (\frac{1}{2\alpha} - \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, 1) \), \( x = (r \sin \theta \cos \phi, r \sin \theta \sin \phi, r \cos \theta) \):

\[
e^t e^{-x} = \sqrt{4\pi} \sum_{n=0}^{\infty} \frac{t^n r^n \lambda^n}{(2n+1)(n+m)!} Y_n, \theta, \phi
\]

- (16.4.2_5). Lerch Sum:

\[
F^2_3 \left( -n, a, c \ ; 1 \right) = \sum_{k=0}^{n} \frac{(a)_k}{(c)_k} = \frac{c - 1}{c - a - 1} \left( 1 - \frac{(a)_{n+1}}{(c - 1)_{n+1}} \right),
\]

with limiting form \( a(\psi(a + n + 1) - \psi(a)) = \frac{a}{(a)_{n+1}} \frac{d}{da} (a)_{n+1} \), in the case \( c = a + 1 \).

- (15.5.16_5). Contiguous relation for Gauss hypergeometric function:

\[
F(a, b; c; z) - F(a - 1, b; c; z) - \frac{bz}{c} F(a, b + 1; c + 1; z) = 0.
\]

- (17.6.4_5). Formula related to Andrews-Askey Sum (\( |cq^3| < |b^2| \)):

\[
\_2\phi_1 \left( b^2, b^2/c ; q^2, cq^3/b^2 \right) = \frac{1}{2b(cq^2, cq/b^2, q^2)} \left( \frac{(cq/b; q)_\infty}{(b; q)_\infty} - \frac{(-cq/b; q)_\infty}{(-b; q)_\infty} \right).
\]

- (17.8.8). Sum related to Andrews-Askey Sum (\( |cq^2| < |b^2| \)):

\[
\_2\psi_2 \left( b^2, b^2/c ; q^2, cq^2/b^2 \right) = \frac{1}{2} \left( \frac{(c_\infty, cq_\infty, bq_\infty, cq^2_\infty, bq^2_\infty)_{\infty}}{(c_\infty, bq^2_\infty, cq^2_\infty, bq^2_\infty, cq^2_\infty)_{\infty}} \right) \left( \frac{(c_\infty, cq_\infty, bq^2_\infty, cq^2_\infty, bq^2_\infty)_{\infty}}{(b_\infty, cq^2_\infty, bq^2_\infty, cq^2_\infty, bq^2_\infty)_{\infty}} + \frac{(-c_\infty, cq_\infty, bq^2_\infty, cq^2_\infty, bq^2_\infty)_{\infty}}{(-b_\infty, cq^2_\infty, bq^2_\infty, cq^2_\infty, bq^2_\infty)_{\infty}} \right).
\]

- (17.9.3_5). \(_2\phi_1\) expressed as sum of two \(_3\phi_2\)'s with a vanishing denominator parameter:

\[
\_2\phi_1 \left( a, b/c \ ; q, z \right) = \frac{(c, c/(ab); q)_\infty}{(c, c/(ab); q)_\infty} \left( \_3\phi_2 \left( a, b, abz/c ; qab/c, 0 ; q, q \right) + \_3\phi_2 \left( c/a, c/b, z ; q, q \right) \right).
\]

- (19.2.11_5). Integral definition for a Bulirsch integral:

\[
\text{el}1(x, k_c) = \int_0^{\arctan x} \frac{1}{\sqrt{cos^2 \theta + k_c^2 sin^2 \theta}} d\theta.
\]

- (15.4.34). Gauss hypergeometric sum:

\[
F(3a, a; 2a; e^{i\pi/3}) = \sqrt{\pi} e^{ira/2} \frac{2^{2a} \Gamma \left( \frac{1}{2} + a \right)}{3^{3a+1}/2} \left( \frac{1}{\Gamma \left( \frac{1}{3} + a \right) \Gamma \left( \frac{2}{3} + a \right)} + \frac{1}{\Gamma \left( \frac{2}{3} + a \right) \Gamma \left( \frac{1}{3} + a \right)} \right),
\]

where the limit interpretation (15.2.6)

\[
F \left( -m, b/c ; z \right) = \lim_{a \to -m} F \left( a/b \ ; a - \ell \ ; z \right),
\]

needs to be taken when \( a = 0, -1, -2, \ldots \).
• (19.5.4_1). Legendre’s incomplete elliptic integral of the first kind given as an Appell function of the first kind:

\[
F(\phi, k) = \sum_{m=0}^{\infty} \left( \frac{1}{2} \right)_m \frac{\sin^{2m+1} \phi}{(2m + 1)m!} \, _2F_1 \left( m + \frac{1}{2}, \frac{1}{2}; \sin^2 \phi; k^2 \sin^2 \phi \right) k^{2m} = \sin \phi \, _2F_1 \left( \frac{1}{2}; \frac{1}{2}, \frac{1}{2}; \sin^2 \phi, k^2 \sin^2 \phi \right).
\]

• (19.5.4_2). Legendre’s incomplete elliptic integral of the second kind given as an Appell function of the first kind:

\[
E(\phi, k) = \sum_{m=0}^{\infty} \left( -\frac{1}{2} \right)_m \frac{\sin^{2m+1} \phi}{(2m + 1)m!} \, _2F_1 \left( m + \frac{1}{2}, \frac{1}{2}; \sin^2 \phi; k^2 \sin^2 \phi \right) k^{2m} = \sin \phi \, _2F_1 \left( \frac{1}{2}; \frac{1}{2}, -\frac{1}{2}; \sin^2 \phi, k^2 \sin^2 \phi \right).
\]

• (19.5.4_3). Legendre’s incomplete elliptic integral of the third kind given as a sum of Appell functions of the first kind:

\[
\Pi (\phi, \alpha^2, k) = \sum_{m=0}^{\infty} \left( \frac{1}{2} \right)_m \frac{\sin^{2m+1} \phi}{(2m + 1)m!} \, _2F_1 \left( m + \frac{1}{2}, \frac{1}{2}, 1; m + \frac{3}{2}; \sin^2 \phi, \alpha^2 \sin^2 \phi \right) k^{2m}.
\]

• (5.15.9). Asymptotic expansion of the polygamma function

\[
\psi^{(n)}(z) \sim (-1)^{n-1} \left( \frac{(n-1)!}{z^n} + \frac{n!}{2z^{n+1}} + \sum_{k=1}^{\infty} \frac{(2k+n-1)!}{(2k)!} \frac{B_{2k}}{z^{2k+n}} \right),
\]

as \( z \to \infty \) in \( |\text{ph} \, z| \leq \pi - \delta \), and \( B_{2k} \) are the Bernoulli numbers.

Topic #7   OP – SF Net 29.1   January 15, 2022

From: OP–SF Net Editors
Subject: Two more remembrances of Brian David Sleeman (1939–2021)

Two more remembrances of
Brian David Sleeman
(August 4, 1939—July 19, 2021)

by Gridrod and Dassios

Below are two remembrances of Brian Sleeman from some of his colleagues:  
Peter Grindrod and George Dassios.

For a link to Sleeman’s obituary, see

* * *
Brian D. Sleeman Memoriam

Figure 1: Brian thinking about a mathematical question asked by an attendee of the meeting. Ross Priory, Strathclyde University (1989)

Brian Sleeman was a very special, well liked, and well-known member of the UK and the International Mathematics Communities. He was held in very high regard by his peers as a wonderful and insightful contributor within a number of fields of maths.

Brian undertook post graduate research at the University of London supervised by Felix Arscott. He was awarded a Ph.D. in 1966 for his thesis, “Some Boundary Value Problems Associated with the Heun Equation”. This type of mathematical endeavour seems almost archaic to some nowadays: but, in fact, the rigour and resourcefulness required laid a very strong foundation for Brian, being useful in both scattering theory and the spectral theory of differential operators. The boundary conditions were always critical since they specified the spectrum of such operators.


I remember meeting Felix (his Ph.D. supervisor) and Felix’s wife at a dinner at the Sleeman home in 1985. I was Brian’s Ph.D. student and then became his Post Doc researcher at Dundee: it was interesting to see him as a protegee rather than as my mentor. These were great times for us all.

In the 1980s I would observe him in the afternoon Applied Analysis research seminars. His eyes would often close, but at the end of the talk, when the chairman asked “Any questions?”, he would
suddenly spring into action, and almost regardless of the subject of the seminar he would ask “What happens when you change the boundary conditions?”

After a couple of years, Douglas Jone told Brian that it would be a good idea if he spent a year at the Courant Institute of Mathematical Sciences at New York University in Joe Keller’s group. There Brian rubbed shoulders with some of the really biggest names in the world of mathematics at that time. He had arrived.

Writing more recently in a paper with John Ockendon, Brian said, “I was influenced by Joe’s enthusiasm and ideas which led to his investigations into the rigorous justification of the geometrical theory of diffraction, an interest in nerve impulse transmissions, as well as inverse problems.”

Figure 2: Lunch time. Brian keeps thinking, a very familiar instance of Brian (with Gary Roach). Ross Priory, Strathclyde University (1989)

In the 1980s Brian became an early champion of mathematical Biology. Many of his Ph.D. students, like me, followed that discipline. He had a huge impact both first hand, and second hand, through all of us, on the initiation and growth of UK mathematical biology. He himself addressed a range of important applications, including heart physiology, nerve pulse transmission, chemical reactions, tumour growth, and epidemics.

Among other honours given to Brian was that he was elected President of the Edinburgh Mathematical Society, and a Fellow of the Royal Society of Edinburgh in 1976.

All of the professional recognitions and mathematical achievements do not really represent the mathematician and man that Brian truly was. He was much more than the sum of those elements. He could be intellectually brave and bold. I felt it. He could be cautious and rigorous. He would never shirk an analysis problem: “I’m not going to be afraid of that”, he would say, before embarking on some reckless analysis which often would turn out so ridiculously well. He would smile the broad “Sleeman smile”, and he would laugh!

***

George Dassios, Professor of Applied Mathematics Division of Applied Mathematics Department of Chemical Engineering, University of Patras, Greece.
Obituary for the late Professor Brian Sleeman

The fundamental work of Brian Sleeman, on Mathematical Analysis, Functional Analysis, Numerical Analysis, Wave propagation and Scattering, Structural Stability, Nonlinear Analysis, Cancer Biology and of course, Modeling and General Problems in Applied Mathematics, is well known to everybody. His extensive scientific work is considered to be deep and innovative. All this work of his, as well as the honorary recognitions and prizes he won, is nowadays available to everybody. This is the reason why I decided to focus these lines on several not so well-known moments of my contacts with Brian.

It was the fall of 1973 when I started working on my Doctoral Dissertation in the University of Illinois at Chicago under the guidance of Victor Twersky. My problem was connected with low-frequency scattering by penetrable ellipsoids and I had to find bibliographical information on the subject. Since the Internet did not exist at the time, I had to spend an enormous amount of time in the library trying to find relative work in the existing literature. But I was lucky enough because Twersky guided me right away to look at two basic papers, one by A. F. Stevenson (1953) (Solution of Electromagnetic Scattering Problems as Power Series in the Ratio (dimension of Scatterer)/wavelength, Journal of Applied Physics. 24, pp. 1134–1142) and one by B. D. Sleeman (1967) (The Low-Frequency Scalar Dirichlet Scattering by a General Ellipsoid, Journal of the Institute of Mathematics and its Applications. 3, pp. 291–312). This was the first time that I ever heard about Brian Sleeman and this was the beginning of a continuous and fruitful collaboration with Brian and his work.

I met Brian in person a few years later in Dundee and after that we became good friends. Brian visited Greece a few times and I remember taking him to archaeological sites like Ancient Olympia, Ancient Delphi, and as well to some mountain places which Brian liked very much. In fact, he was very much impressed by the rudiments of the ancient Olympic Stadium and he did not miss the opportunity to walk a couple of times the whole length of 197 meters of this stadium. In this straight line track (almost 200 meters long), athletes from all over the ancient world would run forward and backward, every four years for almost eleven centuries. In fact, the legend says...
that this distance was the 200 steps of Hercules, who was invited to determine the length of the stadium (this is the origin of the word stadium). I remember that Brian was very moved with all this history. During these tours we had the opportunity to explore our mutual interests in wave propagation, scattering theory, and other applied mathematical problems, as well as to discuss social, political and cultural issues. He was interested in many different aspects and we both enjoyed our conversations.

Brian met my Greek colleagues and I can assure you that everyone was impressed with his politeness, quick mind and generosity in helping people with their mathematical problems. It is amazing that all these people here in Greece had the same reaction when they heard that Brian was not with us anymore: “We lost a wonderful person”.

I had many times the opportunity to appreciate his quick and clear way of mathematical thinking in action during our discussions as we were walking, having coffee, or after dinner drinks in many places all over the world from Glasgow, Scotland to Oberwolfach, Germany; from the Greek mountains to the dream castle of Ross Priory to the (Abdus Salam) International Centre for Theoretical Physics in Trieste, Italy (ICTP). During our discussions Brian was literally radiating mathematical ideas. I remember once, sitting on a bench in a central square of Glasgow overlooking the James Watt statue, we were discussing the problem of identifying the size and orientation of a triaxial ellipsoid through high frequency measurements. We actually solved the problem through discussion without any writing and we only had to do a few calculations before we saw it published, Dassios & Sleeman (1991) (A Note on the Reconstruction of Ellipsoids from the X-ray transform, IMA Journal of Mathematics Applied in Medicine and Biology, 8, pp. 141–147). In fact when we were exchanging ideas on ellipsoidal harmonics, we were communicating just with isolated symbols, we did not have to explain to each other what these symbols represent. This was quite obvious to us.
Brian and Juliet’s hospitality was mythical. I recollect the day that my wife and I were invited to their house in Dundee, Scotland for dinner, where they had tried to find in Dundee as much Greek food as possible. Although we had not missed Greek food, we were very much moved by their efforts to please us. Everybody knows that Brian Sleeman was an applied mathematician that had solved problems in a wide range of interesting real life applications. But in my eyes Brian was a pure classical analyst with a deep understanding of what was needed to be solved.

One of the major mathematical interests of Brian during the last years was the growth of tumors and in fact we have proved together that the growth of an ellipsoidal tumor has no stable states as the sphere does. It is a tragic irony that he was always telling me “George, we have to accept that no matter what we do, the tumor will eventually win”.

Brian was a gifted mathematician, a sensitive human being and a British gentleman. A friend that we will remember, since he will always be present in our hearts.

Topic #8  OP – SF Net 29.1  January 15, 2022

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 2021. This list has been separated into two categories.

**OP–SF Net Subscriber E–Prints**

http://arxiv.org/abs/2111.00650
The Strong Gauss Lucas Theorem and Analyticity of Correlation Functions via the Lee–Yang Theorem
Barry Simon

http://arxiv.org/abs/2111.01279
Pattern–avoiding ascent sequences of length 3
Andrew R. Conway, Miles Conway, Andrew Elvey Price, Anthony J. Guttmann

http://arxiv.org/abs/2111.02105
Legendre pairs of lengths \( \ell \equiv 0 \pmod{5} \)
Dursun Bulutoglu, Ilias Kotsireas, Christoph Koutschan, Jonathan Turner

http://arxiv.org/abs/2111.02832
Automating John P. D’Angelo’s method to study Complete Polynomial Sequences
Shalosh B. Ekhad, Doron Zeilberger

http://arxiv.org/abs/2111.05103
Series solutions of linear ODEs by Newton–Raphson method on quotient \( D \)–modules
Yik Man Chiang, Avery Ching, Chiu Yin Tsang

http://arxiv.org/abs/2111.05104
Semi–classical Jacobi Polynomials, Hankel Determinants and Asymptotics
Chao Min, Yang Chen
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<td>Global and Local Scaling Limits for Linear Eigenvalue Statistics of Jacobi $\beta$-Ensembles</td>
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<td>A Short Course on Orthogonal Polynomials and Special Functions</td>
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<td>The elliptic hypergeometric function and $6j$-symbols for SL(2,(\mathbb{C})) group</td>
<td>S. E. Derkachov, G. A. Sarkissian, V. P. Spiridonov</td>
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<td>S. Ole Warnaar</td>
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<td>Spectral enclosures and stability for non-self-adjoint discrete Schroedinger operators on the half-line</td>
<td>David Krejcirik, Ari Laptev, Frantisek Stampach</td>
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<td>Moduli of quadrilaterals and quasiconformal reflection</td>
<td>Semen Nasyrov, Toshiyuki Sugawa, Matti Vuorinen</td>
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<td>Apéry limits for elliptic $L$-values</td>
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<td>The asymptotic expansion of a Mathieu–exponential series</td>
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<td>Relations between different Hamiltonian forms of the third Painlevé equation</td>
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<td>Birth–death chains on a spider: spectral analysis and reflecting–absorbing factorization</td>
<td>Manuel D. de la Iglesia, Claudia Juarez</td>
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<td>A distribution function from population genetics statistics using Stirling numbers of the first kind: Asymptotics, inversion and numerical evaluation</td>
<td>Swaine L. Chen, Nico M. Temme</td>
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<td>Asymptotic behaviours of $q$–orthogonal polynomials from a $q$–Riemann Hilbert Problem</td>
<td>Nalini Joshi, Tomas Lasic Latimer</td>
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<td>Zero Attractors of Partition Polynomials</td>
<td>Robert P. Boyer, Daniel Parry</td>
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The integral Mittag–Leffler, Whittaker and Wright functions
Alexander Apelblat, Juan Luis González–Santander

$N$–double poles solutions for nonlocal Hirota equation with nonzero boundary conditions using Riemann–Hilbert method and PINN algorithm
Wei–Qi Peng, Yong Chen

Sharp estimates for $W$–invariant Dunkl and heat kernels in the $A_n$ case
Piotr Graczyk, Patrice Sawyer

The Classification of All Singular Nonsymmetric Macdonald Polynomials
Charles F. Dunkl

Hankel determinants of middle binomial coefficients and conjectures for some polynomial extensions and modifications
Johann Cigler

Uniform tail asymptotics for Airy kernel determinant solutions to KdV and for the narrow wedge solution to KPZ
Christophe Charlier, Tom Claeys, Giulio Ruzza

Sequences in Overpartitions
George E. Andrews, Ali K. Uncu

Hypergeometric Structures in Feynman Integrals
J. Blümlein, M. Saragnese, C. Schneider

The rotation number for almost periodic potentials with jump discontinuities and $\delta$–interactions
David Damanik, Meirong Zhang, Zhe Zhou

Grass trees and forests: Enumeration of Grassmannian trees and forests, with applications to the momentum amplituhedron
Robert Moerman, Lauren K. Williams

Maximal functions and multiplier theorem for Fourier orthogonal series
Yuan Xu

The asymptotic expansion of Kratzel’s integral and an integral related to an extension of the Whittaker function
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Computational study of non-unitary partitions
A. P. Akande, Tyler Genao, Summer Haag, Maurice D. Hendon, Neelima Pulagam, Robert Schneider, A. V. Sills

The distribution of values of zeta and $L$–functions
Kannan Soundararajan

Limiting Betti distributions of Hilbert schemes on $n$ points
Michael Griffin, Ken Ono, Larry Rolen, Wei–Lun Tsai

Soliton shielding of the focusing Nonlinear Schrödinger Equation
Marco Bertola, Tamara Grava, Giuseppe Orsatti

On diagonalizable quantum weighted Hankel matrices
František Štampach, Pavel Šťovíček

Using a $q$–shuffle algebra to describe the basic module $V(\Lambda_0)$ for the quantized enveloping algebra $U_q(\widehat{\mathfrak{sl}_2})$
Paul Terwilliger

Widom Factors and Szegő–Widom Asymptotics, a Review
Jacob S. Christiansen, Barry Simon, Maxim Zinchenko

Coulomb problem revisited; a novel representation of the confluent hypergeometric function as an infinite sum of discrete Bessel functions
A. D. Alhaidari

Superpositions of coherent states determined by Gauss sums
Vyacheslav P. Spiridonov

On a General Method for Resolving Integrals of Multiple Spherical Bessel Functions Against Power Laws into Distributions
Kiersten Meigs, Zachary Slepian

A Series transformation formula and related degenerate polynomials
Taekyun Kim, Dae San Kim

Discrete Orthogonality Relations for the Multi–Indexed Orthogonal Polynomials in Discrete Quantum Mechanics with Pure Imaginary Shifts
Satoru Odake
http://arxiv.org/abs/2112.09576
Sums of powers of binomials, their Apéry limits, and Franel’s suspicions
Armin Straub, Wadim Zudilin

http://arxiv.org/abs/2112.09800
Macdonald polynomials and operators and Catalan Combinatorics
François Bergeron

http://arxiv.org/abs/2112.09819
Ramanujan and Koshliakov Meet Abel and Plana
Bruce C. Berndt, Atul Dixit, Rajat Gupta, Alexandru Zaharescu

http://arxiv.org/abs/2112.10169
On the weighted Bojanov–Chebyshev Problem and the sum of translates method of Fenton
Bálint Farkas, Béla Nagy, Szilárd Gy. Révész

http://arxiv.org/abs/2112.10561
On the Epstein zeta function and the zeros of a class of Dirichlet series
Pedro Ribeiro, Semyon Yakubovich

http://arxiv.org/abs/2112.11039
A finite sum involving generalized falling factorial polynomials and degenerate Eulerian polynomials
Taekyun Kim, Dae San Kim

http://arxiv.org/abs/2112.11639
Algebras of commuting differential operators for integral kernels of Airy type
W. Riley Casper, F. Alberto Grünbaum, Milen Yakimov, Ignacio Zurrian

http://arxiv.org/abs/2112.11882
Explicit values for Ramanujan’s theta function \( \varphi(q) \)
Bruce C. Berndt, Örs Rebák

http://arxiv.org/abs/2112.12075
Generalized \( q \)-difference equations for general \( q \)-polynomials with double \( q \)-binomial coefficients
Jian Cao, Sama Arjika, Mahouton Norbert Hounkonnou

http://arxiv.org/abs/2112.12076
\( q \)-Supercongruences from squares of basic hypergeometric series
Victor J. W. Guo, Long Li

http://arxiv.org/abs/2112.12354
A Riemann–Hilbert approach to the perturbation theory for orthogonal polynomials: Applications to numerical linear algebra and random matrix theory
Xiucai Ding, Thomas Trogdon

http://arxiv.org/abs/2112.12666
Fredholm Pfaffian \( \tau \)-functions for orthogonal isospectral and isomonodromic systems
M. Bertola, F. Del Monte, J. Harnad
http://arxiv.org/abs/2112.12732
Supercongruences involving Domb numbers and binary quadratic forms
Guo-Shuai Mao, Michael J. Schlosser

http://arxiv.org/abs/2112.12943
Generalized $L$–functions for meromorphic modular forms and their relation to the Riemann zeta function
Kathrin Bringmann, Ben Kane

http://arxiv.org/abs/2112.13420
Moment sequences of Beta distribution
Paweł J. Szabłowski

http://arxiv.org/abs/2112.15140
Broader Universality of Rogue Waves of Infinite Order
Deniz Bilman, Peter D. Miller

Other Relevant OP–SF E–Prints

http://arxiv.org/abs/2111.00182
Recursive formulas for the Kronecker quantum cluster algebra with principal coefficients
Ming Ding, Fan Xu, Xueqing Chen

http://arxiv.org/abs/2111.00458
Spherical curves whose curvature depends on distance to a great circle
Ildefonso Castro, Ildefonso Castro–Infantes, Jesús Castro–Infantes

http://arxiv.org/abs/2111.00800
Cluster Algebras and Scattering Diagrams, Part III. Cluster Scattering Diagrams
Tomoki Nakanishi

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Improved Constants for Effective Irrationality Measures from Hypergeometric Functions
Paul Voutier

http://arxiv.org/abs/2111.01094
On the Markov extremal problem in the $L^2$–norm with the classical weight functions
Gradimir V. Milovanović

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Cyclotomic matrices and hypergeometric functions over finite fields
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Dirichlet form analysis of the Jacobi process
Martin Grothaus, Max Sauerbrey
Positivity of Gibbs states on distance-regular graphs
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Exact controllability to eigensolutions of the bilinear heat equation on compact networks
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A further generalisation of sums of higher derivatives of the Riemann Zeta Function
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Upper and lower bounds for Dunkl heat kernel
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Multi–colored dimer models in one–dimension: lattice paths and generalized Rogers–Ramanujan identities
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Perturbed Bessel operators
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Machine–learning custom–made basis functions for partial differential equations
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The Jacobi Theta Distribution
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On the evaluation of the Appell $F_2$ double hypergeometric function
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Core size of a random partition for the Plancherel measure
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Asymptotic behavior of the Hurwitz–Lerch multiple zeta function at non–positive integer points
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Characterization of deferred type statistical convergence and $P$-summability method for operators: Applications to $q$–Lagrange–Hermite operator
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Estimating the $p$–adic valuation of the resultant
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Kontsevich’s deformation quantization: from Dirac to multiple zeta values
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Universal Families of Eulerian Multiple Zeta Values in Positive Characteristics
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Integral Evaluation of Odd Euler Sums, Multiple $t$–Value $t (3, 2, \ldots, 2)$ and Multiple Zeta Value $\zeta (3, 2, \ldots, 2)$
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Numerical Solution of Variable–Order Fractional Differential Equations Using Bernoulli Polynomials
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A Koopman Operator Tutorial with Orthogonal Polynomials
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$q$–Supercongruences from Gasper and Rahman’s summation formula
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The Riemann–Hilbert approach to the generating function of the higher order Airy point processes
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Higher order Airy and Painlevé asymptotics for the mKdV hierarchy
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Summation rules for the values of the Riemann zeta–function and generalized harmonic numbers obtained using Laurent developments of polygamma functions and their products
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About integral product formula for Jack polynomials of two variables
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The sinh–Gordon model beyond the self dual point and the freezing transition in disordered systems
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Optimal Gevrey Regularity for Certain Sums of Squares in Two Variables
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Determinantal point processes based on orthogonal polynomials for sampling minibatches in SGD
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A unified treatment of characteristic functions of symmetric multivariate and related distributions
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Yangian Ward Identities for Fishnet Four–Point Integrals
Luke Corcoran, Florian Loebbert, Julian Miczajka

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Square integrals of the logarithmic derivatives of Selberg’s zeta functions in the critical strip
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Orthogonal trigonometric polynomials from Riemann–Hilbert view
Zhihua Du

A complete answer to the Gaveau–Brockett problem
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Rings of Coefficients of Universal Formal Groups for Elliptic Genus of Level N
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Cumulants asymptotics for the zeros counting measure of real Gaussian processes
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Some $q$–supercongruences on double and triple sums
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Random Walk Models for Nontrivial Identities of Bernoulli and Euler Polynomials
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The logarithmic Schrödinger operator and associated Dirichlet problems
Pierre Aime Feulefack

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All the information in the integers is in the primes
Aidan Rocke

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Rational right triangles and the Congruent Number Problem
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Alexander Burstein, Louis W. Shapiro

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The three missing terms in Ramanujan’s septic theta function identity
Örs Rebák

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Two complementary relations for the Rogers–Ramanujan continued fraction
Sumit Kumar Jha

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Arithmetic and Thin Monodromy in Sp(6)
Jitendra Bajpai, Daniele Dona, Martin Nitsche

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Superconformal blocks in diverse dimensions and BC symmetric functions
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A combinatorial proof of the Gaussian product inequality conjecture beyond the MTP2 case
Frédéric Ouimet

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Hermite–Padé approximations with Pfaffian structures: Novikov peakon equation and integrable lattices
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Rogers–Ramanujan type identities and Chebyshev Polynomials of the third kind
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Superintegrability on the Dunkl oscillator model in three–Dimensional spaces of constant curvature
Shi–Hai Dong, Amene Najafizade, Hossein Panahi, Won Sang Chung, Hassan Hassanabadi

The Probabilistic Zeta Function of a Finite Lattice
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Monotonicity Properties of Gaussian Hypergeometric Functions with Respect to the Parameter
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Stieltjes constants appearing in the Laurent expansion of the hyperharmonic zeta function
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On pentagon identity in Ding–Iohara–Miki algebra
Yegor Zenkevich

Repeated differentiation and free unitary Poisson process
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Antonino De Martino, Kamal Diki

Solving Kepler’s equation via nonlinear sequence transformations
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Variations on the Resurgence of the Gamma Function
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On gamma matrices of local zeta functions associated with homogeneous cones
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Cameron’s operator terms of determinants, and hypergeometric numbers
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http://arxiv.org/abs/2112.15349
On the evaluation of the alternating multiple $t$ value $t(\{\overline{1}\}^a, 1, \{\overline{1}\}^b)$
Steven Charlton

Topic #9  ______  OP – SF Net 29.1  ______  January 15, 2022

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 29.2 should be sent by March 1, 2022.

OP–SF NET is an electronic newsletter of the SIAM Activity Group on Special Functions and Or-thogonal 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 Or-thogonal Polynomials, which facilitates communication among members, and friends of the Ac-tivity 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
“I was not a very sincere student of mathematics though, given that my sole purpose in studying it was to obtain more marks. But as the examinations approached and I immersed myself day and night in the subject, I began to see in it patterns, arrangements, rhythm, elegance. In one of Aldous Huxley’s stories, a character is moved to tears by the beauty of the Pythagorean theorem. Such a reaction was not surprising to me once I had begun to relish how mathematics — ripple upon ripple, branch growing from branch — led one to the uncanny and wonderful.

It was only later, when I was in Oxford and writing *Tughlaq*, that I realized how studying mathematics has shaped my working process. While proving a theorem, it is important at the outset to identify its constituent parts, the relationships between those parts, and how they are held in balance. It is mathematics that taught me that, while working out an individual part, I always had to be vigilant about the effect it had on other parts, and how it changed the overall structure as well as the interrelationships between various parts. This is essential technical training for a playwright.”

**Girish Karnad** (1938–2019), in *This Life at Play, Memoirs*, 2021, translated by Girish Karnad and Srinath Perur. Aldous Huxley’s story mentioned in the quote is *Young Archimedes*.

*Contributed by Gaurav Bhatnagar and Tom H. Koornwinder*