Orthogonal Polynomials and Special Functions

SIAM Activity Group on Orthogonal Polynomials and Special Functions

★ ★ ★ ★   Newsletter   ★ ★ ★ ★

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Edition Typeset March 17, 1993

The News

The recent election of Activity Group Officers has resulted in the following somewhat international line-up. Charles Dunkl remains as Chair; George Gasper moves to Vice Chair; Martin E. Muldoon from Canada is newly elected to Program Director; and Tom Koornwinder from Holland becomes the new Secretary. This marks the first time that we have chosen a representative who resides outside the U.S., and in fact we now have chosen two such. Hearty congratulations to all.

A few responses to the informal survey have begun to come in. Bille Carlson said his main interest is in the theoretical aspects of special functions, rather than in their orthogonality structures. Tom Koornwinder also has mostly theoretical interests, and an emphasis on the interplay of special functions with Lie groups, quantum groups, and computer algebra. He is also concerned with the role of special functions in teaching, as well as their role in consulting. Henry Thacher would like to make special functions more readily available to the scientific and engineering users—through the development of algorithms for producing numerical approximations. As there are still many members who have yet to be heard from, we encourage you to send in your comments. They need not be lengthy.

At the SIAM annual meeting in Philadelphia we will again sponsor a minisymposium. Details on the speakers and their topics are found later in this edition.

George Gasper has just acquired a new e-mail address which is: g-gasper@nwu.edu. Also, your Editor has a new address which you will find on page 4, in the section **About the Newsletter.**

As there were no submissions whatever for the logo design, the Editor has supplied the above one; so we can now get on with more serious matters unless someone objects. For the curious, meanwhile, the boundary of the inside wavy set is defined by the Chebyshev polynomials T_1 and T_5.

Also in this edition we print the updated list of members. You may want to check your listing for accuracy and omissions.

Meetings and Conferences

1. Tom Koornwinder informs us that an International Workshop on "Symmetry Methods in Physics" is being organized in Dubna, July 6 to 9, 1993, in memory of Prof. Ya. A. Smorodinsky. The workshop will be devoted to current theoretical investigations of symmetry methods in physics, and the following topics will be discussed: dynamical symmetry and super-integrable systems, quantum algebras and groups, special functions and group representation theory, geometric methods in quantum theory, quantum optics and coherent states, the symmetry method in nuclei, Lie symmetries and the few-body problem, new applications.

The program will consist of the invited talks of 30 minutes duration, some shorter contributions of 20 minutes, as well as discussions.

The registration fee for the Workshop will amount to U.S.\$ 200-250. This will cover the cost of the Proceedings, the hotel accomodations at Dubna, plus transportation from Moscow to Dubna and return.

Additional information can be obtained from

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2. The following item was unfortunately received too late for this edition but we include it anyway.

The Number Theory and Algorithmic Group of the University of Limoges is organizing a workshop on "Computer Algebra and Special Functions" for March 15 and 16. Here is the preliminary program.

P. Flajolet (INRIA): "Arbres de recherche, équations différentielles, fonctions hypergéométriques et dilogarithms".

B. Salvy (INRIA): "Hypergeometric Sequences and Series in Computer Algebra".

A. Duval (Lille): "Équations Géométriques et groups de Galois Différentiels".

W. Van Assche (Leuven): "Logarithmic Potential Theory as a Tool for Studying the Zero Distribution of Orthogonal Polynomials".

T.C. Scott (Oxford): "Recipes for Solving Broad Classes of Definite Integrals Based on the Exploitation of Special Functions".

R. Caboz (Pau): -Physique. Titre à préciser.

3. Tom Koornwinder also sends the following. During the first half of 1993 a weekly seminar on hypergeometric functions will be held at the University of Utrecht. It is being organized by E. Looijenga and will deal in particular with the several variable approaches by Gel'fand-Kapranov-Zelevinsky and by Heckman-Opdam. It will be held on Tuesdays 15:00-17:00. For further information contact

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on
Orthogonal Polynomials and Special Functions

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◇

THE PURPOSE *of the Activity Group*
is to promote basic research in orthogonal polynomials and special functions; to further the application of this subject in other parts of mathematics, and in science and industry; and to encourage and support the exchange of information, ideas, and techniques between workers in this field, and other mathematicians and scientists.

The final three items (**4**, **5**, and **6**) are being carried over from the previous edition of the newsletter (where they had different numbers). So if you read them there, you will not find anything new here.

4. A conference on "Nonlinear Numerical Methods and Rational Approximation" will be held at the University of Antwerp from September 5 to 11, 1993. Registration will cover housing, participation, and a copy of the conference proceedings—which will be similar to the 1987 proceedings. Special attention will be paid to housing and to social events for the participants.

The emphasis will be on Padé approximation, rational interpolation, rational approximation, continued fractions, and orthogonal polynomials. Each of these topics will be introduced by a one hour survey lecture. Also welcome are contributions on multivariate or multidimensional problems, error analysis, software development, and applications. Participants are invited to present a 20 minute research talk.

The invited speakers will be A. Gonchar (Moscow), M. Gutknecht (Zürich), W.B. Jones (Boulder, USA), D. Lubinsky (Witwatersrand, South Africa), and E. Saff (Tampa, USA).

For more information contact the organizer, who is

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5. A conference on "Applications of Hypergroups and Related Measure Algebras" will be held in Seattle from 31 July to 6 August 1993. For more information please contact

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6. In Leiden, and also in Toulouse, the 100th anniversary of T.J. Stieltjes' premature death will be commemorated on 31 December 1994. A number of activities are planned at both locations. Thomas Jan Stieltjes was born in 1856, in Zwolle, Holland. An astronomer who became a mathematician, he developed interests in analysis and in number theory. T.J. Stieltjes eventually became a professor at the University of Toulouse and he was a friend of Charles Hermite.

First of all, in April 1994 the Congress of Wiskundig Genootschap (Dutch Mathematical Society) will be held in Leiden, where Richard Askey will give the Stieltjes Lecture. Contact:

Prof. G. van Dijk
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2300 RA Leiden, The Netherlands

Then in Toulouse there will be a colloquium, of perhaps three days, in the spring of 1995, where it has been agreed that the academic year 1994-1995 will be known as "l'année Stieltjes". The focus will be on continued fractions and moment problems, orthogonal polynomials, Laplace transforms, the Riemann hypothesis, and other topics. This will have a somewhat historical character. There will also be an emphasis on the work of Stieltjes in both the graduate and undergraduate seminars.

Contact:

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Preceding these activities in Leiden and Toulouse, a new edition of the collected works of Stieltjes will appear at the beginning of 1993. It will be edited by G. van Dijk and published by Springer-Verlag. In addition to containing all the Stieltjes papers (as in the first edition published by Noordhoff in 1914/1918), there will be a short biography of Stieltjes, an English translation of his important paper "Recherches sur les fractions continues", and four other contributions:

"The Impact of Stieltjes' Work on Continued Fractions and Orthogonal Polynomials", by W. Van Assche

"The Stieltjes Integral and Its Influuence on Analysis", by W.A.J. Luxemburg

"The Contributions of Stieltjes to Number Theory", by F. Beukers

"Stieltjes and The Riemann Hypothesis", by H.J. te Riele

Also, The University of Leiden has taken the initiative to create a "Stieltjes Institute" of mathematics. This will be a joint effort involving several Dutch Universities.

Finally, G. van Dijk is preparing an article on the life and work of Stieltjes for The Mathematical Intelligencer.

The Minisymposium in Philadelphia

At the upcoming SIAM annual meeting in Philadelphia July 12-16, 1993, we will again sponsor a Minisymposium. This one will be called "Applications of Special Functions". Here, in alphabetical order, is the official list of speakers along with the titles of their talks.

Adel Faridani, Oregon State University: "Quasiregular Sampling and Computed Tomography". faridani@math.orst.edu

Hans J. Haubold, United Nations, New York: "Special Functions Applied in Astrophysics and Cosmology". hjh2@aip.org
(This involves joint work with A.M. Mathai.)

Peter A. McCoy, U.S. Naval Academy: "Special Functions, Boundary Value Problems, and Linear Elliptic Partial Differential Equations". pam@math2.sma.usna.navy.mil

Dennis Stanton, University of Minnesota: "Basic Hypergeometric Orthogonal Polynomials and Combinatorics". stanton@math.umn.edu

The organizer is Charles F. Dunkl, cfd5z@virginia.edu.

Problems

Submitted problems may range from elementary to advanced, either solved or unsolved. This gives several possibilities since the proposer need not disclose whether or not the solution is known.

1. Prove or disprove

$$\prod_{n=1}^{\infty} \frac{\cos\left(t/2^n\right) - \cos\left(\pi 3^n/5\right)}{1 - \cos\left(\pi 3^n/5\right)} = \frac{4\cos(t)}{\sqrt{5}+5} + \frac{1}{\sqrt{5}}.$$

Submitted by R. William Gosper, August 13, 1992.

2. Is it true that

$$x^2 t^x \, {}_2F_1(x+1,\, x+1;\, 2;\, 1-t)$$

is a convex function of x whenever $-\infty < x < \infty$ and $0 < t < 1$?

Submitted by George Gasper, August 19, 1992.

3. The following Toeplitz matrix arises in several applications. Define for $i \neq j$

$$A_{ij}(\alpha) = \frac{\sin \alpha \pi (i-j)}{\pi(i-j)},$$

and set $A_{ii} = \alpha$. Conjecture: the matrix

$$M = (I - A)^{-1}$$

has positive entries. A proof is known for $0 < \alpha \leq 1/2$. Can one extend this to $0 < \alpha < 1$?

Submitted by Alberto Grünbaum, November 3, 1992.

Solutions

Solutions should appear eventually, whereupon they will be printed together with the original statement of the problem.

About the Newsletter

The **Newsletter** is a quarterly publication of the *SIAM Activity Group on Orthogonal Polynomials and Special Functions*. To join the group and receive the newsletter, please contact

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Like most newsletters, this one relies on input from the members it is supposed to serve. You may send your contributions to the Summer Edition by 1 May, 1993 to the Editor

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Please note Eugene's new street address, zip code, and fax number. His phone number and e-mail, however, will remain unchanged. If you prefer, you may send contributions to the Chair of the Activity Group

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Along about the middle of May a draft of the Summer Edition will be sent to SIAM headquarters for reproduction and mailing.

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