Orthogonal Polynomials and Special Functions

SIAM Activity Group on Orthogonal Polynomials and Special Functions

★ ★ ★ ★ **Newsletter** ★ ★ ★ ★

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Contents

From the Editors

As announced, this is our first issue as Co-editors of the Newsletter, and this is not the only change, since beginning this year, we have new officers of the Activity Group, elected last fall, who will lead us to the new millennium. They are

Chair:

Daniel W. Lozier
National Institute of Standards and Technology, Gaithersburg, MD, USA

Vice-Chair:

Walter Van Assche
Katholieke Universiteit Leuven, Leuven, Belgium

Secretary:

Charles F. Dunkl
University of Virginia, Charlottesville, VA, USA

Program Director:

Francisco Marcellán
Univ. Carlos III de Madrid, Leganés, Spain

We congratulate all of them, and hope to continue collaborating with them for the next two years. Also let us to point out the letter from Tom H. Koornwinder that appeared in the November 15, 1998 issue of OP-SF NET (Volume 5, Number 6)

> It is about 5 years ago that the first issue of OP-SF NET came out. The first volume (December 1993 - December 1994) had nine issues, the next four volumes had six issues in a year. The first two volumes I have edited alone. Since 1996 I have been co-editing OP-SF NET together with Martin Muldoon. Now I feel the time has come

for me to stop this editorial activity. First of all because my present administrative duties do not leave me enough time for this, but also because after five years new ideas by a new co-editor will be welcome.

It was very interesting for me during these five years to observe and document, via OP-SF NET, developments in the field of OP & SF, but also in many other fields of mathematics and other sciences with which OP & SF interacts. Furthermore, the social context and the technical possibilities for OP & SF have changed and developed. Most noteworthy are developments in computer hardware and software. For instance, the World Wide Web was still unknown in 1993 (except maybe to a very small group). Now it is a daily tool for most of us.

The field of OP & SF has great promises for the future, provided it is not defined in the narrow sense. I have high expectations about the new team of officers we have elected this fall, and I hope to remain a member of this Activity Group for many years in order to see how they will continue and expand our mission.

Tom H. Koornwinder
(thk@wins.uva.nl)

We thank Tom for his great work in the Group and wish him much success with his new administrative duties.

In this connection, our new Chair, Daniel W. Lozier, presents a Message from the Chair below.

As usually, a lot of material comes from OP-SF NET.

Renato Álvarez-Nodarse
(ran@cica.es)
Rafael J. Yáñez
(ryanez@ugr.es)

Message from the Chair

This is my first message to the membership as chair of the activity group. I wish to extend my greetings to everyone and to express my hope that together we can advance the programs and activities of the group. Please feel free to contact me if you have any concerns about the group, or any suggestions or recommendations to improve the functioning of the group.

The group was chartered by SIAM on January 1, 1990, for an initial term of three years. Charles Dunkl was one of the founders of the group, and he served as its first chair. Under his leadership the group grew and its charter has been renewed by SIAM at the end of each 3-year term. In addition to chairing the group in the first term, Charles served in this capacity in the second and third terms. I am honored to follow him as chair for the fourth term, and I am pleased that he is continuing his service to the group as secretary. I look forward to working with him and with the other two officers, Walter Van Assche and Francisco Marcellán.

Now for a word or two about the upcoming meeting in Atlanta. I am negotiating with SIAM to arrange an informal social gathering at the hotel for activity group members and other interested people. The minisymposium that is being organized by Jeff Geronimo is scheduled for Friday, May 14, 4:30 - 6:30, and Saturday, May 15, 10:45 - 12:45. Tentatively, the social gathering

will be for one hour immediately following the Friday minisymposium. Light refreshments will be served. I will provide updated information in the next OPSF-Net.

Finally, let me mention changes that will be occurring in OPSF-Net and OPSF-Talk. Currently Tom Koornwinder is providing subscription and archiving on his computer system in Amsterdam. He is also acting as moderator for OPSF-Talk to prevent the dissemination of inappropriate messages such as those that were disseminated a few times last year. These services will be shifted elsewhere soon. I will provide an update in the next OPSF-Net. For now, I wish to thank Tom for his dedicated service to the group, and for his generous willingness to continue for a short time until new arrangements can be made.

Daniel Lozier
(dlozier@nist.gov)

Introducing the New Officers

Chair: Daniel W. Lozier

I grew up in Portland, Oregon, and attended Oregon State University. I graduated with my baccalaureate degree in mathematics in 1962. After a year at the University of Washington in Seattle, I took a job at the Army Engineer Center in Virginia near Washington, DC. This started my career with the United States government which has continued without interruption. Since 1969 I have been employed at the National Bureau of Standards (now the National Institute of Standards and Technology) in Gaithersburg, Maryland. While working I took graduate courses in mathematics at American University, George Washington University and the University of Maryland, receiving my doctoral degree in applied mathematics from Maryland in 1979 under the supervision of Frank Olver. I live with my wife Elaine in Washington, DC. I have a son who also lives in Washington.

My current work is strongly connected with the NIST project to construct a Web-based successor to the popular 1964 NBS Handbook of Mathematical Functions, edited by Abramowitz and Stegun. This project was described in OP-SF Net vol. 4, no. 5, Sept. 1997, OP-SF Newsletter vol.8, no. 1, Oct. 1997, and SIAM News, vol.31, no. 2, March 1998. The project Web address is http://math.nist.gov/DigitalMathLib. The project is expected to result in a Web site with many interactive and dynamic features, to be maintained indefinitely by NIST, together with a book and CD-ROM. Its style and scope will be reminiscent of the old NBS Handbook but its content will be brought up to date and extended to include selected applications in physical sciences. My co-editors are Frank Olver, Charles Clark and Ron Boisvert. We are being assisted by a distinguished board of associate editors, in addition to several NIST staff.

Vice-Chair: Walter Van Assche

I was born and grew up in Kapellen, a village north of Antwerp, Belgium on the border of the Netherlands (but rest assured, I am Belgian, as Poirot would put it). I studied mathematics at the Katholieke Universiteit Leuven, Belgium and received my degree (licentiaat) in 1980. I prepared my doctoral dissertation as a research assistant of the Belgian National Fund for Scientific Research and obtained my degree in 1985. My monograph "Asymptotics of Orthogonal Polynomials" (Springer Lecture Notes in Mathematics 1265) contains most of my doctoral dissertation. I am still a full time researcher (Research Director) of the National Fund for Scientific Research working at the university in Leuven, but since 1988 I am also teaching part-time at the university and presently I am part-time professor of the department of mathematics in Leuven. I have been a visiting professor at Georgia Tech in Atlanta, GA (1986 and again in 1999), The University of Michigan, Ann Arbor (1988) and Facultés Universitaires Notre Dame de la Paix, Namur (Belgium, 1993). I like travelling and attending conferences because it is an excellent way to find out what is going on in OPSF and to meet many of my international friends. My scientific interest is in orthogonal polynomials, in particular the analytic aspects of the theory, such as the asymptotic behaviour, and the analysis of the recurrence rela-

tion. I like to work with explicit examples, usually provided by classical orthogonal polynomials or terminating hypergeometric series, which give me insight and a feeling of what to expect for general orthogonal polynomials. Recently I became interested in extensions of the notion of orthogonality and I am now working on matrix orthogonality, Sobolev orthogonality and my latest interest is multiple orthogonality, where the orthogonality conditions are spread over several measures. I believe that the SIAM activity group has done a very good job with the newsletter (both on paper and electronically), but I feel that the activity group should also organize international meetings, both in the North America and Europe but certainly also on other continents, such as Africa and Asia, because there is a great potential of young researchers there.

Program Director: Francisco Marcellán

I was born in Zaragoza, Spain, in 1951. I went to a public school in Jaca, a very nice city near to the Pirineos Mountains and attended the University of Zaragoza where I was graduated in Mathematics in 1973 and I got my Ph. D. in 1976. I was involved with teaching activities from 1974 in several engineering schools (Zaragoza, Vigo, Madrid). From 1991 I am contributing as a Full Professor in the Department of Mathematics to the development in the South of Madrid of a new State University, Universidad Carlos III. At present time I am Vice-President of Research in this University. My research interests are orthogonal polynomials and approximation theory. I enjoy finding constructive approaches to polynomials orthogonal with respect to non standard inner products and trying to perform them, from a numerical point of view as well as their applications in several domains of science and technology. One of the most important activities of our activity group must be the promotion of our research area, in order to offer our colleagues (with special emphasis to the young researchers) an active organization promoting dissemination of information, the scientific exchanges through meetings and advanced seminars and the support of the activities of our members.

Secretary: Charles Dunkl

I was born in Vienna, went to school in Vienna and Toronto and got my Ph. D. at the University of Wisconsin-Madison. The teachers that I consider most memorable include P.G. Rooney, H.S.M. Coxeter, W. Kahan, R. Askey, and my Ph.D. adviser, Walter Rudin. My research interests are in harmonic analysis and special functions. I enjoy finding exact answers and discovering structure. Thus I prefer functions and polynomials of hypergeometric type to inequalities and estimates. I have been working with the activity group to promote our research area as an important and lively part of mathematics. It is a continued pleasure to have talented and energetic colleagues who work hard on the various aspects of our activities.

Message from the editor of OP-SF NET

The most recent issue of OP-SF NET (6.1) is the first which does not bear the name of Tom Koornwinder as Editor. Tom was the driving force behind the creation of the NET over five years ago and the credit for its continuing vitality is almost entirely due to him. As one of the leaders in the fields covered by our group, he has been in close contact with those active in these areas throughout the world. Although the NET has depended heavily on submissions from readers, it often seemed as if Tom could create a full issue based on what his own contacts and correspondence produced. He was constantly aware of the need to make sure that the OP-SF NET was performing a useful service and that the methods of delivery were appropriate for the varying levels of technology available to readers and potential readers in different countries. He was at the forefront in making arrangements for our web site, for opsftalk, and for archives of papers in our areas.

It has been a privilege to work with Tom as co-editor for the past few years. It has made it possible for me to contemplate continuing as editor for two more years. I ask for the assistance of all readers in this task. In particular, please let me know of any new conferences, books, software or any other item which you think may be of in-

terest to our community. Do not assume that I will become aware of them automatically!

I would like to hear from anyone who would like to join me in the task of editing OP-SF NET. At the very least, it would be important to have an overlap period between my term and that of the next editor(s). But I can use help right now. I can let interested people know what is involved. The appointment of editors or co-editors is a matter for the Officers of the Activity Group.

Martin Muldoon
(muldoon@yorku.ca)

Memorial Note about A.P. Prudnikov (1927-1999)

The sad mails from Moscow and Sophia were distributed at the beginning of 1999. A well-known mathematician, the co-author of five volumes of "Integrals and Series" and the author of many other books and articles about operation calculus (Laplace transforms and etc.), Prof. Anatolii Platonovich Prudnikov, died in Moscow on January 09, 1999 from a heart attack.

Anatolii Platonovich Prudnikov was a very active and enthusiastic man with a huge internal energy which he spent on mathematical research and different organizational jobs in mathematical directions. He burned himself in this activities in despite of his health

He was 72 years old and he devoted all his life to mathematics and related activities. At the beginning of his scientific career, together with prof. V.A.Ditkin, he published several handbooks about Laplace transforms and operational calculus which were translated to English and became classical ones. But, probably, he got the most popularity when he published (together with Yu.A.Brichkov and O.I.Marichev) the five volumes of "Integrals and Series" (1981-1992): the largest in the world handbook-project about integrals and series.

I met him and was cooperating with him from 1969-1971. But we started our co-authorship in 1978 and common work with him became the brightest period in my life. I have to point out that without Anatolii Platonovich the world would have not seen the 5 volumes of "Integrals and Series" which were published firstly in Russian Publishing House "Nauka" (in 1981-1986, vols 1-3), and then, in 1986-1992 in Gordon and Breach Sci. Publ. House (all 5 vols) and in Japan in 1991 (vols. 1-2).

In the last years (starting in 1993) Anatolii Platonovich organized the new periodic journal "Integral Transforms and Special Functions" and the series "Analytical Methods and Special Functions" (Gordon & Breach) where he joined people who work in these directions.

Anatolii Platonovich Prudnikov was far from the world of computers. But his books have had a large influence on the developing of the world's best integration system in the computer-algebra system Mathematica. They are permanently used by the developers as very convenient and complete handbooks which contain the biggest tables of integrals and series and algorithms for their evaluation.

This is a big loss for all mathematical community and for all people who knew him and were happy to work with him. I have lost a nice friend, co-author and colleague with whom we made huge project. The mathematical world lost a great mathematician and organizer of mathematical activities who belonged to so rare (today) classical mathematical school.

With condolences to his family, friends and colleagues,

Oleg Marichev
(oleg@wolfram.com)

Reports from Meetings and Conferences

1. VIIth International Scientific Krawtchouk Conference: Kiev, Ukraine, May 14-16, 1998

The *7th International Krawtchouk Conference* took place in Kiev, Ukraine, from May 14 to May 16, 1998. Below are some titles of the reports related to orthogonal polynomials, special functions and integral transforms.

- M. Khomenko, M. Krawtchouk's background
- V. Zelenko, Recent development of M. Krawtchouk's ideas: related articles
- Yu. Bily, M. Krawtchouk on international mathematical forums

- M. Babyuk, Integral Hankel type transforms of the 1st kind and spectral parameter in a boundary condition
- N. Virchenko, About integral equations with generalized Bessel type functions
- V. Gaidei, New generalization of integral transform of the Bessel type
- V. Zelenkov, V. Savva, Orthogonal polynomials as a tool to solve differential equations describing multilevel systems dynamics
- V. Korolyuk, Stochastic Krawtchouk polynomials
- A. Mazurenko, V. Savva, Discrete variable polynomials: Analog of the Christoffel formula and its application to solve some differential equations
- Yu. Mamteev, V. Stukalina, T. Hoochraeva, Features of an algorithm for calculating the modified function by recurrence relations
- M. Mironenko, Pair adder equation in periodic contact problems
- A. Mironov, On the integral equations for the Riemann function
- G. Prizva, Generalization of classical orthogonal polynomials of discrete variable
- E. Seneta, Characterization of Markov chains by orthogonal polynomial systems
- S. Tsurpal, Interaction of simple single waves with a structure as Chebyshev-Hermite functions of any index in the materials with microstructure
- O. Manzyi, Decomposition of the ratio of Appell hypergeometric functions F_3 into the ramified chain fraction

The 8th Conference is to be held in May 2000.

Vadim Zelenkov
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2. International Workshop on Orthogonal Polynomials: Numerical and Symbolic Algorithms, Madrid, June 29-July 2, 1998

From June 29 to July 2 the biannual *International Workshop on Orthogonal Polynomials* was held at the University Carlos III de Madrid in Leganés (near Madrid).

This year the emphasis was on *Numerical and symbolic algorithms* as was clearly indicated by the choice of invited lecturers, each giving two one hour lectures:

1. Walter Gautschi (Orthogonal polynomials and quadrature, Gauss Quadrature for rational functions).
2. Gene Golub (Bounds for the entries of matrices with applications to pre-conditioning, Inverting shape from moments).
3. Wolfram Koepf (Software for the algorithmic work with orthogonal polynomialsand special functions).
4. Yvon Maday (The basic spectral element and mortar element methods for elliptic problems, The spectral element method for resolution of the Stokes and Navier-Stokes problems).
5. Marko Petkovšek (Linear operators and compatible polynomial bases).
6. Doron Zeilberger (The unreasonable effectiveness of orthogonal polynomials in combinatorics).

Furthermore there were 24 short communications on different subjects and the meeting was concluded with a problem session.

The mathematical contents and the weather were important ingredients to make this IWOP a great success, but the most important factor was the excellent organization! Without wanting to underestimate the work done by all of the organizers (much in the background) special thanks go to Renato Álvarez-Nodarse and Rafael Yáñez.

We have something to look forward to in two years again.

Marcel G. de Bruin
(M.G.deBruin@twi.tudelft.nl)

This was one of the most exciting and enjoyable conferences that I have ever participated in. The organizers, Paco Marcellán and Renato Álvarez-Nodarse did a superb job in making everyone comfortable. Renato's boundless energy, enthusiasm and friendliness, and Paco's leadership are an excellent recipe for a great conference.

Most of the talks, both invited and contributed, were first-rate. It was remarkable to see the breadth and depth of the Spanish school of orthogonal polynomials and special functions, many of whose members are academic descendants of Paco Marcellán.

Another unique feature of this meeting was its combining numeric and symbolic computations. The older tradition of numeric computation, and the younger tradition of symbolic computations have completely different cultures, concerns, and methodology. I am sure that they both can benefit from a cross-fertilization. By choosing three of the invited speakers (Golub, Gautschi, Maday) from the former camp, and the other three (Koepf, Petkovšek, Zeilberger) to be from the later, the participants and speakers each learned much more than they would in yet another specialized meeting in their field.

Myself, who is almost ignorant of numerical analysis, learned so much from Gautschi's and Golub's talk, and even from Maday's 300 words/per/minute talk.

The conference also fostered many personal discussions. In particular, I had a fascinating discussion with Marcel de Bruin (who was the only one, incidentally, to hand in the homework that I have assigned during my talk), about determinants. He turned out to be a real determinant-whiz,

and later has sent me little-known, but very interesting, papers by van der Corput (in Dutch!).

On a more personal note, I was happy to meet Gene Golub for the first time, after I have heard so much about him from our mutual friend Marvin Knopp. I was also happy to meet the famous Walter Gautschi, who was the first to believe de Branges!

As the years go on, the memories of most conferences blend into a dull continuum. Not this one! It will always be remembered as a very happy singularity.

Doron Zeilberger
(zeilberg@euclid.math.temple.edu)

A four-day *International Workshop on Orthogonal polynomials: Numerical and Symbolic Algorithms* was hosted by the Departamento de Matemáticas, Universidad Carlos III de Madrid, which took place during the past June 29-July 2, 1998.

A total of 72 participants, 47 Spanish ones from 14 different institutions and 25 foreign ones from 23 different places, were engaged in friendly discussions along the whole meeting. There were 6 invited lectures by Walter Gautschi (Purdue University, USA), Gene Golub (Stanford University, USA), Wolfram Koepf (Hochschule für Technik, Wirtschaft und Kultur Leipzig, Germany), Yvon Maday (Université Pierre et Marie Curie, France), Marko Petkovšek (University of Ljubljana, Slovenia) and Doron Zeilberger (Temple University, USA)

The sessions were completed by 24 half-hour communications given by María Álvarez de Morales, Manuel Bello, Andrei B. Bogatyrev, Francisco Cala Rodríguez, Daniela Calvetti, Cecilia Costa, María Victoria Fernández-Muñoz, Esther García Caballero, Peter Kravanja, Stanisław Lewanowicz, Guillermo López Lagomasino, Pedro López, Miguel Lorente, Juan C. Medem, Lionello Pasquini, Carmen Perea Marco, Lothar Reichel, Paolo E. Ricci, Jorge Ruano, Ahmed Salam, Javier Segura, Hossain O. Yakhlef and Rafael J. Yáñez.

All speakers were kindly invited to submit written versions of their talks for the proceedings of the meeting which will be published as a special issue of *Electronic Transactions on Numerical Analysis* (ETNA) (see the URL site `http://etna.mcs.kent.edu/`).

The Organizing Committee was: Manuel Alfaro (Univ. de Zaragoza), Renato Álvarez-Nodarse (Secretary) (Univ. Carlos III), Jorge Arvesú (Univ. Carlos III), and Francisco Marcellán (Chairman) (Univ. Carlos III).

On behalf of the Organizing Committee I want also to thank some other people who have collaborated with the Organization Committee. They are Esteban Moro Egido, Antonio Pastor, Niurka Rodríguez Quintero, Enrique San Millán from the Universidad Carlos III, Rafael Yáñez from Universidad de Granada and Alejandro Zarzo from Universidad Politécnica de Madrid. The workshop was sponsored by Departamento de Matemáticas de la Universidad Carlos III de Madrid, Vicerrectorado de Investigación de la Universidad Carlos III de Madrid, INTAS, Comunidad de Madrid (Consejería de Educación y Cultura) and the Ministerio de Educación y Cultura of Spain (CICyT). Finally, we thank Compact and Addlink for helping us with the hardware and software respectively. To all these institutions our most sincere acknowledgement.

Renato Álvarez-Nodarse
(ran@cica.es)

3. Minisymposium on Problems and Solutions in Special Functions
SIAM Annual Meeting 1998: Toronto, Canada, July 13-17, 1998

On July 14, 1998, our Activity Group sponsored a Minisymposium *Problems and solutions in Special Functions* (Organizers: Willard Miller, Jr. and Martin E. Muldoon) at the SIAM Annual Meeting in Toronto. The organizers recognized that by providing concrete and significant problems, the problem sections in journals such as SIAM Review and the American Mathematical Monthly have been influential in advancing mathematical research and have played a role in attracting young people to the mathematical profession. At a time when the SIAM Review is phasing out its problem sections (see Newsletter 8.2, pp. 19–21) it seemed appropriate to assess the history and impact of the problems sections and their future evolution.

Cecil C. Rousseau, University of Memphis offered a retrospective on the 40-year history of the SIAM Review Problems and Solutions Section, based on his experience as a collaborating editor and then as an editor of the Section. We learned that of the 777 problems proposed, 329 were starred (no solution submitted by the proposer). The title most used was "A definite integral" while the keywords occurring most frequently were "integral" (131 times), "inequality" (47), "identity" (33), "series" (25) and "determinant" (24). The most frequent problem proposers were M. S. Klamkin (46), M. L. Glasser (38), D. J. Newman (24) and L. A. Shepp (20).

Cecil chose a specific issue (April, 1972) and mentioned Problem 72-6 by Paul Erdős (*"A solved and unsolved graph coloring problem*) that provided the first contact between Erdos and the Memphis graph theory group (Faudree, Ordman, Rousseau, Schelp), and in that way led to more than 40 joint papers involving Erdos and the members of this group. He mentioned Problem 72-9 (*An extremum problem*) by Richard Tapia, who, coincidentally, was honored on the same day as our Minisymposium by a Minisymposium for his 60th birthday. In the same issue, the solution to Problem 71-7 (*Special subsets of a finite group*) was the

very first publication by Doron Zeilberger. Rousseau himself had a solution of Problem 71-7 proposed by L. Carlitz, which called for a proof that a certain integral involving the product of Hermite polynomials was nonnegative. At the time, Rousseau looked for, but did not find, a combinatorial interpretation of the integral that would immediately imply its nonnegativity. That there is such an interpretation was shown by Foata and Zeilberger in 1988. Later in the discussion, Rousseau mentioned that problems sometimes get repeated in spite of the best efforts of the editors; for example, Problem 95-6 repeats part of Problem 75-12 but that he had found the relevant double integral later in Williamson's Calculus (6th ed), 1891!

Otto G. Ruehr, Michigan Technological University, discussed the forty-year history of the Section with particular attention to the second half. He offered an anecdotal description of the trials, tribulations and satisfactions of being editor. Special attention was paid to problems in classical analysis, particularly those relating to orthogonal polynomials and special functions. He regretted that some problems he had proposed (73-12, 84-11) attracted only one solution other than that of the proposer. Sometimes, sheer luck played a role as in a solution of his which depended on the relatively sharp inequality $27e^2 < 200$. In spite of the best editorial efforts, errors often crept in. In the very last issue which contained problems a complicated asymptotic expression (Problem 97-18) was correct except for an error in sign! Nevertheless, it led to collaboration between one of the proposers (D. H. Wood) and J. Boersma.

Otto mentioned that, very appropriately, the last issue (December 1998) of the Section will be dedicated to its founding editor, Murray S. Klamkin. In some brief remarks, Murray discussed some highlights and problems such as *A network inequality* and (the very first) Problem 59-1 *The ballot problem*, Proposed by Klamkin and Mary Johnson. This has not been solved in the general case.

Willard Miller, Jr., University of Minnesota, spoke on *The Value of Problems Sections in Journals*. He stressed their importance in getting young people interested in mathematics and as a place where a person not expert in an area can get their feet wet. He offered Doron Zeilberger as someone who exemplified the value of problem sections. Bill mentioned that by participation in problems sections you can get established researchers in other areas interested in what you have to say. People see that a problem is hard and when the solution comes out they are interested in it and are challenged to find a better proof.

Richard Askey, University of Wisconsin, was unable to attend the Minisymposium but submitted a written statement, some of which was read by Bill Miller, and which offered some thoughts about problems and the role that a problem section can play in a scientific journal.

Askey's first example was on the generalization to Jacobi polynomials of an inequality for trigonometric functions (Problem ??-?). Rather than writing a one page paper, he decided to submit it as a problem to have people work on it. Unfortunately his plan failed. Nobody else submitted a solution because he had not been explicit enough about a limiting case which would be more familiar to readers.

Askey also described some of the history (including an incorrect published solution) of Problem 67-7 proposed by James Lyness and Cleve Moler. It was required to show that the sum from 1 to n of

$$(-1)^{k+1}\left(\frac{\sin(kx)}{k\,\sin x}\right)^{2m}$$

is positive for all real $x, m = 1, 2, \ldots$.

Askey described his favorite SIAM Review problem as Problem 74-6 (*Three multiple integrals*) submitted by a physicist, M.L. Mehta. It called for the evaluation of a multidimensional normal integral. "I spent many hours on this problem, unsuccessfully. Eventually, a multidimensional beta integral which Atle Selberg had evaluated about 1940, and published a derivation of in 1944, came to light. Then it was easy to prove the Mehta-Dyson conjecture, as Dyson realized once Bombieri told him of Selberg's result. I heard about this from George Andrews, who was in Australia at the time, and he heard of it from Kumar, a physicist there. I worked out what should happen in a q-case, and published my conjectures in SIAM Journal of Mathematical Analysis. All of these conjectures have now been proven. Ian Macdonald heard about Selberg's result from someone in Israel, and he came up with some very significant conjectures about other q-beta integrals. He had been working on questions like this for root systems, and his conjecture for a constant term identity for BC(n) was equivalent to Selberg's result. Some of this would have been done exactly as it was without Mehta's problem in SIAM Review, but I doubt that I would have appreciated the importance of Selberg's result as rapidly if I had not spent so much time on the Mehta-Dyson conjecture."

In the general discussion which followed there was mention of "opsftalk" the discussion forum for this Activity Group. It was generally agreed that it could not replace Problem Sections of the kind being discussed both because of the limited readership and the fact that it is restricted to orthogonal polynomials and special functions.

Dick Askey had cautioned: "I am afraid that having a problem section only on line will lead to a restricted group of readers, those with a love of problems for their own sake, and not reach the wider group of mathematicians, applied mathematicians, and scientists who could use some of the results in these problem sections."

A wide-ranging discussion continued informally between those attending. Some of the points raised in these discus-

sions follow:

It was felt that it was very important to stress that any web initiative for a Problem Section should cover all areas. It would be unsatisfactory to have separate operations for say, the various SIAM activity groups.

There was some skepticism about the web proposal. In particular, the importance of careful editing was stressed. It is a commonplace that much material on the web is sloppy and done in a hurried manner. It will be very important to make sure that the present proposal is carefully monitored. There was also a sense that "putting it on the web" is sometimes offered as a panacea for all sorts of information distribution without a realistic understanding of the work involved.

Nevertheless, the advantages of speed and access which are provided by a web site are eagerly anticipated by those interested in preserving and enhancing the SIAM Review Problem Section.

There should be a part of the web initiative devoted to problems suitable for high school students. This has the potential to greatly broaden the audience for the problem sections and to attract more young people to mathematics research.

The web pages should be divided into two parts. Part A would contain the problems and refereed solutions, and would be comparable to what appears in the SIAM Review now (but with hyperlinks and other bells and whistles). Part B would be more informal. It would contain proposed solutions (before they have been fully refereed), comments on the solutions and other comments and background information related to the problems. Part B would be more timely. The editor would still control what is posted in Part B but wouldn't vouch for the accuracy of all proofs. Part B would be more lively, and give a better indication of how mathematics research is actually carried on. Part A would be more polished.

There should be some way to archive in print the problems and solutions of Part A. Perhaps a volume could be produced every few years.

SIAM should refer routinely to the website in the Review, say a paragraph in each issue.

Once the website is well launched, there should be an article about the project in the SIAM Newsletter.

Martin Muldoon
(muldoon@yorku.ca)

4. International Confress of Mathematicians: Berlin, Germany, August 18-27, 1998

ICM'98 (the International Congress of Mathematicians) was held during August 18-27, 1998 in Berlin, Germany. Orthogonal Polynomials and Special Functions were no major theme at this Congress, but some was represented, scattered over the sections:

7. Lie groups and Lie algebras
8. Analysis
11. Mathematical physics
15. Numerical analysis and scientific computing
16. Applications

Here is a (probably not exhaustive) list.

- Fields Medal Winners:

  One of the winners, Richards E. Borcherds, has obtained generalizations of Macdonald identies in connection with generalized Kac-Moody algebras (just as the Macdonald identities follow from denominator identities for affine Kac-Moody algebras).

- Plenary Lectures:

  I.G. Macdonald, "Constant term identities, orthogonal polynomials and affine Hecke algebras"

- Invited Section Lectures:

  Ivan V. Cherednik, "From double Hecke algebra to analysis" (contains some one-variable q-identities for which Cherednik would like to hear from others a classical proof)

  Barry McCoy, "Rogers-Ramanujan identities: A century of progress from mathematics to physics"

  Percy Alec Deift, "Uniform asymptotics for orthogonal polynomials" (very recommended)

  Leslie Frederick Greengard, "A new version of the fast Gauss transform" (uses Hermite polynomials)

- Short Communications and Poster Sessions:

  N. Jing, "Quantized Kac-Moody algebras and symmetric functions"

  Boris Rubin, "Fractional calculus and wavelet transforms in integral geometry"

  Ahmed I. Zayed, "Wavelets in closed form"

  Thomas C. Kriecherbauer, "Asymptotics of orthogonal polynomials via integrable methods" (relates to Deift's lecture)

  Margit Rosler, "Positivity of Dunkl's intertwining operator"

  Raoul R.F.G. Gloden, "Proprietes des polynomes orthogonaux. Developpements de cas particuliers"

  Kathy A. Driver, "Zeros of hypergeometric functions"

  William C. Connett, "Measure algebras that have oblate spheroidal wave functions as characters"

  Alan L. Schwartz, "Hypergroups and their maximum subgroup"

Andreas Ruffing, "On Schrödinger-Hermite operators in lattice quantum mechanics"

Vitaly Tarasov, "q-Hypergeometric solutions of the quantized Knizhnik-Zamolodchikov equation"

All abstracts are available at the ICM'98 web site

http://elib.zib.de/ICM98

There you will also find a link to a site from which you can download the files of the papers of the Invited Section Lectures.

Tom H. Koornwinder
(thk@wins.uva.nl)

Forthcoming Meetings and Conferences

1. Fifth International Conference on Approximation and Optimization in the Caribbean: Guadeloupe, French West Indies, March 29-April 2, 1999

Aim and Scope of the Conference

This conference is the fifth of a series dedicated to research on Approximation and Optimization in the Caribbean. This series was jointly initiated by Humboldt Universität (Berlin), RWTH (Aachen) and Universidad de la Habana (La Habana). The first two issues were held in Havana in 1987 and 1993. Since then, these meetings are organized every two years in a new country from the Caribbean area: Puebla (Mexico) in 1995, Caracas (Venezuela) in 1997, Pointe à Pitre (Guadeloupe) in 1999. They are supervised by an Executive Committee.

The **goal** of these conferences is to support the development of high level education and research in the Caribbean. They propose tutorials, mini-symposia, invited lectures and contributed talks, on the following topics:

1. *Approximation:* Wavelets, polynomial and rational approximation, splines, orthogonal polynomials, interpolation, asymptotic analysis, radial basis functions. Quadrature formulas
2. *Optimization:* Nonlinear equations and inequalities, continuous and discrete optimization, parametric, stochastic and global optimization, nonsmooth analysis, critical point theory, control theory.
3. *Mathematical Economics:* Fixed point theory, equilibria of competitive economies, financial markets, cooperative and non-cooperative games.
4. *Applications:* Engineering and energy models, robotics, pattern recognition, image restoration, applications in biology, economy and sciences.

Executive Committee: M. Florenzano (Paris), J. Guddat (Berlin), M. A. Jiménez (Puebla), H. Th. Jongen (Aachen), G. López Lagomasino (La Habana).

Organizing Committee: S. Allende (La Habana), U. García Palomares (Caracas), R. Janin (Poitiers), M. Lassonde, A. Moudafi, O. Nakoulima, J. Narayaninsamy (Pointe à Pitre).

Scientific Program:

1. **Tutorials:** *Wavelets Methods for Numerical Simulation* by A. Cohen and Y. Meyer (France), *Convex Analysis and Nonsmooth Optimization* by J. Borwein (Canada).
2. **Invited talks:** A. P. Araujo (Brazil), H. Attouch (France), A. Bensoussan (France), P.-L Butzer (Germany), F. Clarke (France), I. Ekeland (France), C.C. Gonzaga (Brazil), T. Ichiishi (U.S.A.), A. Ioffe (Israel), E. Saff (U.S.A.), S. Smale (Hong-Kong), H. Stahl (Germany), W. Van Assche (Belgium).

General Organization: The Conference will take place in a nice building of the campus of the Antilles-Guyane University located on a hill above the Marina. A Hotel close to the campus will be proposed to the participants. Lunches will be taken on the campus. The lectures will start on Monday (29th March) and finish on Friday (2nd April). The social program of the conference will start on Sunday (28th March) by a Welcome Party. Wednesday afternoon will be devoted to an excursion. A banquet is also planned.

The conference fee should be between 600 F and 900 F (between 100 US$ and 150 US$), depending on the financial situation, to be paid on arrival. The fee covers lunches, the whole social program and the book of abstracts. If your participation in the Conference is conditional on financial support, please let us know; we hope to be able to provide some partial support. In any case, the organizers will do the best to exempt from the fee at least the participants from the Caribbean area.

Contributions, Submission and Program Committee: Applicants to the tutorials should send a short CV via e-mail to:

appopt5@univ-ag.fr, subject: tutorial

Contributors are invited to submit abstracts in TEX or LATEX via e-mail to:

appopt5@univ-ag.fr, subject: abstract

Participants can also propose a mini-symposium on a specific topic with 4-5 speakers. A proposal for a mini-symposium, stating the theme, the list of speakers and the abstracts, should be sent via e-mail to:

appopt5@univ-ag.fr, subject: mini-symposium

The **deadline** for applications to the tutorials and for submissions of contributions is 30 October 98. Admission in tutorials and acceptance of abstracts or mini-symposia will be notified by 15 December 98.

Research results which are obtained from joint Caribbean projects and which involve young researchers are especially welcomed. We intend to publish the proceedings of the conference in a special volume of the Caribbean Journal of Mathematics and Computing Sciences (CJMCS).

Program Committee Chair: J. Guddat

- *Approximation:* D. Hinrichsen (Germany), D. Lubinsky (South Africa), F. Marcellán (Spain), W. Roemisch (Germany), H. Wallin (Sweden)
- *Optimization:* J.-B. Hiriart-Urruty (France), P. Kall (Switzerland), B.S. Mordukhovich (U.S.A.), J. Stoer (Germany), M. Tapia (U.S.A.)
- *Mathematical Economics:* B. Cornet (France), C. Herrero (Spain), E. Jouini (France), H. Keiding (Denmark), V. Vasilev (Russia)

To get more information please contact:

M. Lassonde,
Département de Mathématiques,
Université des Antilles et de la Guyane,
97159 Pointe à Pitre, Guadeloupe, France.
e-mail: appopt5@univ-ag.fr

For updated information visit the Conference WWW page
http://www.univ-ag.fr/uag/mathinfo/conference/appopt5.html

Francisco Marcellán
(pacomarc@ing.uc3m.es)

2. Workshop Orthogonal Polynomials: Approximation and Harmonic Analysis. Ballenstedt, Germany, April 23–26, 1999

The second Workshop on Orthogonal Polynomials will focus on approximation theoretic methods and the relationship to abstract harmonic analysis. The Workshop will take place in Ballenstedt in the Harz mountains southwest of Berlin. For more information consult the homepage of the workshop.

Invited Speakers: P. Butzer, (Aachen), C. Dunkl (Charlottesville), W. Gautschi (Purdue) H. Mhaskar (Los Angeles), A. Singh (Delhi), R. Szwarc (Wrocław)

Language: German and English

Organizing Committee: F. Filbir, R. Lasser, J. Prestin

Mailing Address:

Prof. R. Lasser or Dr. J. Prestin
Institute of Biomathematics and Biometry
GSF - National Center for Environment and Health
D - 85764 Neuherberg
WWW: http://www.gsf.de/institute/ibb/prestin/work2.html

Jürgen Prestin
(prestin@gsf.de)

3. Workshop on Special Functions and Applications, Lund, May 7, 1999

A Workshop on Special Functions and Applications will take place on Friday May 7, 1999, at the Centre of Mathematical Sciences, University of Lund.

Speakers: C. Berg (Copenhagen) H. P. Jakobsen (Copenhagen) P. W. Karlsson (Copenhagen) T. H. Koornwinder (Amsterdam) B. Shapiro (Stockholm)

Organizers: J. Peetre (jaak@maths.lth.se) H. Rosengren (hjalmar@maths.lth.se) L. Vretare (lv@maths.lth.se)

For more information, please, contact the organizers. A detailed program will appear at

http://www.maths.lth.se/matematiklu/personal/hjalmar/snickarbod.html

Hjalmar Rosengren
(hjalmar@maths.lth.se)

4. Minisymposium; Orthogonal polynomials; Theory and Applications. Atlanta, May 12-15, 1999

A Minisymposium "Orthogonal polynomials; Theory and Applications" will be held during the SIAM Annual Meeting in Atlanta, May 12-15, 1999. The invited speakers are:

1. Percy Deift (New York)
2. Charles Dunkl (Charlottesville, Virginia)
3. Jeff Geronimo (Atlanta)
4. Leonid Golinski (Columbus, Ohio)
5. Sergei Suslov (Tempe, Arizona)
6. Walter Van Assche (Leuven)
7. Gerald Teschl (Vienna)
8. Hugo Woerdeman (Williamsburg, Virginia)

Further information will appear in a later issue of OPSF NET. For more information on the SIAM meeting visit the Web site: www.siam.org/meetings/an99/ or e-mail the SIAM Conference Department at: meetings@siam.org.

Recently, SIAM provided the information that the Minisymposium is scheduled for Friday, May 14, 4:30 to 6:30 pm and Saturday, May 15, 10:45 am to 12:45 pm.

Jeff Geronimo
(geronimo@math.gatech.edu)

5. International Conference on Rational Approximation: Antwerp, June 6-11, 1999

The following information is taken from
http://win-www.uia.ac.be/u/icra99/

The conference will focus on rational approximation theory in the broadest sense, including all computational aspects and applications. Contributions are welcomed on the subjects of Padé Approximation, Continued Fractions, Orthogonal Polynomials and Rational Approximation in general.

More details can be found at the URL http://win-www.uia.ac.be/u/icra99/or using the e-mail address icra99@uia.ua.ac.be.

Organizing Committee: Annie Cuyt (Annie.Cuyt@uia.ua.ac.be), Brigitte Verdonk (verdonk@uia.ua.ac.be).

Scientific Committee: Adhemar Bultheel (Leuven), Annie Cuyt (Antwerpen), Alphonse Magnus (Louvain La Neuve), Jean Schmets (Liège), Jean-Pierre Thiran (Namur), Marc Van Barel (Leuven), Paul Van Dooren (Louvain La Neuve), Brigitte Verdonk (Antwerpen).

Invited Speakers: George A. Baker Jr. (Los Alamos), Peter Borwein (Simon Fraser University), Peter R. Graves-Morris (Bradford), William B. Jones (University of Colorado at Boulder), George Labahn (Waterloo), Lisa Lorentzen (Trondheim), Doron S. Lubinsky (University of Witwatersrand), Hans J. Stetter (Wien).

Proceedings: Kluwer Academic Publisher and Baltzer Science Publishers have agreed to publish the proceedings of this international conference, which will be distributed over issues of the following three journals:

- Numerical Algorithms
- Reliable Computing
- Acta Applicandae Mathematicae

The participants who wish to contribute to the proceedings, should indicate on their registration form to which journal they want to submit their paper.

Registration: The registration fee of 9500 BEF includes lunch on campus from Monday to Friday, all social events, the conference dinner, transportation from and to town, the coffee-breaks and a copy of the proceedings. Payment for registration should be done by bank transfer on account number 001-3214170-54 of CANT, University of Antwerp (UIA), Universiteitsplein 1, B-2610 Antwerp, Belgium. Be sure to mention "ICRA99".

Deadlines: The deadlines for registration and submission of abstracts is April 1, 1999 and for submission of papers July 1, 1999.

For further information, please, contact

Annie Cuyt or Brigitte Verdonk
Universiteit Antwerpen (UIA)
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B 2610 Antwerpen-Wilrijk
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http://win-www.uia.ac.be/u/icra99/

Wolfram Koepf
(koepf@imn.htwk-leipzig.de)

6. International Workshop on Special Functions: Hong Kong, June 21-25, 1999

An *International Workshop on Special Functions* will take place on June 21-25, 1999 at the *City University of Hong Kong*. The main focus will be on *Asymptotics*, *Harmonic Analysis*, and *Mathematical Physics*. For details, see http://www.cityu.edu.hk/ma/conference/iwsf/.

Objective: The purpose of the conference is to provide a forum for an exchange of ideas among experts in various topics listed below. It also aims at disseminating information on recent advances made in these areas.

Plenary Speakers: K. Aomoto (Nagoya University, Japan), R. Askey (University of Wisconsin-Madison, USA), T. Baker (University of Melbourne, Australia), C. Berg (University of Copenhagen, Denmark), C. Dunkl (University of Virginia, USA), G. Gasper (Northwestern University, USA), W. Gautschi (Purdue and ETH (Zurich), Switzerland), E. Koelink (Universiteit van Amsterdam, The Netherlands), A. McBride (University of Strathclyde, UK), F. Olver (University of Maryland, USA), R. O'Malley (University of Washington, USA), E. Opdam (University of Leiden, The Netherlands), R. Simion (George Washington University, USA), D. Stanton (University of Minnesota, USA), N. Temme (CWI, Amsterdam,The Netherlands), A. Terras (University of California, San Diego, USA), V. Totik (Joszef Attila University, Hungary), L. Vinet (CRM, Université de Montréal, Canada), R. Wong (City University of Hong Kong), Y. Xu (University of Oregon, USA)

Session Topics: Asymptotics, Classical Special Functions, Combinatorics, Harmonic Analysis and Quantum Groups, Mathematical Physics and PDEs, Orthogonal

Polynomials.

Organizing Committee: Charles Dunkl, U. of Virginia, USA; Mourad Ismail, U. of South Florida, USA; Roderick Wong, City U. of Hong Kong.

Call for Papers: Titles and abstracts of contributed papers must be received by April 15, 1999. The abstracts should be preferably typed in LaTeX, not to exceed one page, and sent to the Workshop Secretary (see address below) by e-mail.

Information: Colette Lam, IWSF '99 Workshop Secretary, Department of Mathematics, 83 Tat Chee Avenue, Kowloon, Hong Kong; phone: +852 2788-9816, fax: +852 2788-8561; e-mail: malam@cityu.edu.hk

e-mail: hkconf99@weyl.math.virginia.edu.

Charles F. Dunkl
(cfd5z@virginia.edu)

7. Methods and applications of asymptotic analysis. Edinburgh, 5-9 July 1999

Adri Olde Daalhuis (Edinburgh) and Nico Temme (Amsterdam) are organizing a mini-symposium on asymptotics during ICIAM 99 in Edinburgh, 5-9 July 1999 entitled "Methods and applications of asymptotic analysis". We have five speakers for a first session. If more people are interested in participating, we can try to submit a second session. Please respond soon, and send us your title, abstract, and affiliation.

Asymptotic analysis is an important tool in many branches of mathematics, physics and other application areas. When solving problems described in terms of differential equations or integrals, it is often required to obtain qualitative information on the solution of the problem. Another area of interest is the study of the behaviour of certain special functions for large values of one or several (complex) parameters and the application of uniform asymptotic expansions in computing special functions for a large domain of the parameters. This mini-symposium presents several actual problems in which asymptotics plays an important role.

Speakers:

1. Roger J. Hosking, James Cook University, Australia. Title: Asymptotic evaluation of Fourier integral solutions for the response of a flexible plate to a moving load
2. David Kaminski, University of Lethbridge, Canada Title: Hills and valleys at infinity for the steepest descent method
3. Jose L. Lopez, Universidad de Zaragoza, Spain Title: Uniform asymptotic expansions of Bernoulli and Euler polynomials.
4. Richard B. Paris, University of Abertay, Dundee, Scotland Title: The asymptotic expansion of Gordeyev's integral
5. Alastair Wood, Dublin City University, Ireland Title: Asymptotically assisted numerics in MHD stability problems

The ICIAM 99 web site at http://www.ma.hw.ac.uk/iciam99 contains up-to-date information about the Congress. (See also OP-SF NET 5.5, Topic #4)

Nico M. Temme
(nicot@cwi.nl)

8. Conference on Analytic Methods of Analysis and Differential Equations, Minsk, Belarus, September 14-18, 1999

First Announcement

The Institute of Mathematics of the Belarusian National Academy of Sciences and the Belarusian State University (BSU) together with Moscow State University and the Computer Center of the Russian Academy of Sciences will organize the International Conference "Analytic Methods of Analysis and Differential Equations" (AMADE) on September 14-18, 1999, in Minsk, Belarus. The arrival and departure days are September 13 and 19.

Section Titles:

1. Integral Transforms and Special Functions.

2. Differential Equations and Applications.

3. Integral, Difference, Functional Equations and Fractional Calculus.

The length of plenary invited lectures is 45 min, reports - 20 min, and short communications - 10 min. The publication of the abstracts is planned. The Proceedings of Conference are supposed to be published in the Journal "Integral Transforms and Special Functions".

Organizing Committee: Chairmen: Academician I.V.Gaishun (Belarus), Academician V.A.Il'in (Russia) and Rector of BSU A.V.Kozulin. Vice-Chairmen: V.V.Gorokhovik (Belarus), A.A.Kilbas (Belarus), V.I.Korzyuk (Belarus) and A.P.Prudnikov (deceased) (Russia).

Secretaries: M.V.Dubatovskaya (Belarus), S.V.Rogosin (Belarus).

Members: P.Antosik (Poland), C.Brezinski (France),

L.Debnath (USA), I.H.Dimovski (Bulgaria), L.Gatteschi (Italy), J.Gilewicz (France), H.-J.Glaeske (Germany), R.Gorenflo (Germany), V.I.Gromak (Belarus), N.A.Izobov (Belarus), N.K.Karapetyants (Russia), V.S.Kiryakova (Bulgaria), O.I.Marichev (USA), E.I.Moiseev (Russia), A.F.Nikiforov (Russia), O.A.Oleinik (Russia), O.A.Repin (Russia), V.N.Rusak (Belarus), M.Saigo (Japan), S.G.Samko (Portugal), A.A.Sen'ko (Belarus), H.M.Srivastava (Canada), B.Stankovic (Yugoslavia), P.K.Suetin (Russia), N.A.Virchenko (Ukraine), P.P.Zabreiko (Belarus), A.H.Zemanian (USA), E.I.Zverovich (Belarus), L.A.Yanovich (Belarus), N.I.Yurchuk (Belarus).

Our address: Belarus, 220050 Minsk 50, Fr. Skaryny Avenue 4, Belarusian State University, Department of Math & Mech, AMADE;

e-mail addresses: amade99@im.bas-net.by and amade99@mmf.bsu.unibel.by

Let us know by the end of December 1998, about your intention to participate in the Conference. Please send the following information:

1. Name, Surname
2. Affiliation and Position
3. Mailing Address and Telephone (FAX)
4. e-mail
5. Section Title
6. Title of Report

The second announcement with preliminary list of participants, registration fee, travelling information, accommodation, etc will be sent in March 1999.

Sergei Rogosin
(rogosin@mmf.bsu.unibel.by)

9. Fifth International Symposium On Orthogonal Polynomials, Special Functions And Their Applications (OPSFA) in Honour of Theodore Chihara: Patras, September 20-24, 1999

Dear colleague and friend,

The Department of Mathematics of the University of Patras is delighted to host the Fifth International Symposium on Orthogonal Polynomials, Special Functions and their Applications (OPSFA, for short), which will be held for the first time in Patras in the period September 20 - 24, 1999. The Scientific Committee has decided that the Symposium should be dedicated to Professor Theodore Chihara. Based on the overwhelming response to the first circular, we expect about 150 scientists from all over the world. If you would like to give a talk, please indicate its title on the registration form. We shall do our best to set up a balanced program. The city of Patras, with its friendly people, its numerous sights and its diverse surroundings, has much to offer to create a pleasant and enjoyable atmosphere surrounding the Symposium.

We look forward to seeing you in Patras in September.

The scientific program includes plenary lectures and research seminars. An approximate time table will be given in the third circular, which will be sent to all those who register for the Symposium. The final program will be distributed at the registration desk on Sunday 19 and Monday 20 September.

Plenary Lectures and Research Seminars

There will be 10 plenary lectures and about 100 research seminars or contributed talks organized into parallel sessions. The time assigned for a plenary lecture is 60 minutes (50 minutes for presentation and 10 minutes for discussion). Research seminars are assigned 25 minutes (20 minutes for presentation and 5 minutes for discussion). All participants are invited to submit a 25-minute research talk.

The plenary lectures are as follows:

- D. Bessis (France): On the application of Moment Methods to non-linear partial differential equations of parabolic type in arbitrary dimensions.
- T. Chihara (USA): 45 years of Orthogonal Polynomials: a View from the Wings.
- J. Dehesa (Spain): Quantum Entropies and Orthogonal Polynomials.
- A. Elbert (Hungary): Some recent results on the zeros of Bessel functions and Orthogonal Polynomials.
- N. Everitt (U.K.) - Orthogonal polynomials, linear differential equations and the Kramer sampling theory.
- W. Gautschi (USA) - Orthogonal polynomials and quadrature.
- T. Kriecherbauer (Germany) - A Riemann-Hilbert approach to asymptotic questions in Orthogonal Polynomials.
- A. Kuijlaars (Belgium) - Asymptotics of Orthogonal Polynomials with Slowly Decaying Weights.
- V. N. Sorokin (Russia) - Applications of simultaneous orthogonal polynomials in number theory, theoretical physics and dynamical systems
- R. Wong (Hong Kong) - Asymptotics and Orthogonal Polynomials.

Abstracts

Participants who wish to present a research talk, are asked to send a title and an abstract written in English before May 30. The abstract should not exceed one page but should have a minimum of 15 lines with the description of the topic covered in a comprehensive manner. Since the abstracts will be reproduced directly in the book of abstracts, their typographical quality should be as good as possible.

The invited speakers are also requested to send a one page abstract of their presentation.

Publications

The book of abstracts will be distributed to the participants upon registration at the Symposium desk. The Proceedings of the Symposium will be published in Journal of Computational and Applied Mathematics.

Registration, fees and accommodation

Please complete the **Registration Form** (available from the organizers) and return it before May 30 to the Symposium Mailing Address (below).

NOTE: (US)$1 = 300 drachmas, approximately

The following fees are applicable for the Symposium:

Participants: 50000 drachmas
Students: 20000 drachmas
Accompanying persons: 20000 drachmas

After May 30, all participants and their companions must pay an additional fee of 10000 drachmas for late registration. Participant and student fees include:

- Admission to the Symposium
- Symposium documents
- Book of Abstracts
- Symposium Proceedings
- Official Reception
- Greek evening
- Guided visit to ancient Olympia
- Other social events are being considered

Accompanying persons' fee includes:

- Official Reception
- Greek evening
- Guided visit to ancient Olympia
- Other social events are being considered

Payment of the registration fee should be made in Greek currency by bank-to-bank transfer to bank account no. 131 01 0091 79 92 of Agricultural Bank of Greece, Patras branch. A copy of the corresponding bank receipt should be sent together with the Registration Form. In each payment the name(s) of the participant(s) must be stated.

Cancellations should be made to the local organizing committee in writing. The following, rules will apply:

cancellation received before July 15, 1999: 80% refund
cancellation received before August 30, 1999: 50% refund
cancellation received after August 30, 1999: no refund

The registration / information desk will be open on:

Sunday, September 19, from 16:00 - 21:30

Other days, from 9:00 to 18:00

Accommodation: All participants will be lodged in rooms at some of the hotels of Patras, which are near the Symposium Site or in the centre of Patras. (Details from the organizers.) On the registration form, please put the hotels in order of preference. Because the number of available rooms in each hotel is limited, we will reserve your rooms strictly in order of response. The cost of accommodation will be paid directly to the hotel. We intend to arrange transportation from hotels to the Symposium Site when this is not provided by the hotels.

Official Invitations

In special cases, the Organizing Committee is prepared to send a personal invitation for participation to the Symposium. It should be understood that such an invitation is not a commitment on the part of the organizers to provide any financial support.

Symposium Site

The Symposium will be held at the Conference and Cultural Hall of the University of Patras, located at the University Campus (well connected by bus to Patras city centre.) The city and its surroundings are special attractions. Patras may be reached easily by car, bus (3 hours from Athens by National Road) train (3.5 hours from Athens) and ship (especially for people coming from Italy).

Deadlines

Registration must be received before May 30. Abstracts must be received before May 30 preferable as soon as possible.

Scientific Committee: Walter Van Assche (Belgium), Marcel de Bruin (Holland), Evangelos Ifantis (Greece), Andrea Laforgia (Italy), Lance Littlejohn (USA), Paco Marcellán (Spain), Martin Muldoon (Canada), Panayiotis Sia-

farikas (Greece).

Local Organizing Committee: Evangelos Ifantis (Greece), Chrisoula Kokologiannaki (Greece), Panayiotis Siafarikas (Greece)

Further Communications

There will be a third (final) circular in June sent only to those who will have submitted the registration form. We suggest that you make your registrat

Mailing address:

Fifth international Symposium OPSFA
Department of Mathematics
Prof. P. D. Siafarikas
University of Patras
Patras 26500 Greece
Fax: +(3) 061 997169
E-Mail: OPSFA@math.upatras.gr

WWW site: http://www.math.upatras.gr/opsfa/

Panos D. Siafarikas
(panos@math.upatras.gr)
(On behalf of the Organizing Committee)

Books and Journals

Book Announcements

1. Encyclopedia of Mathematics and its Applications 71: Special Functions
Andrews, George E., Askey, Richard and Roy, Ranjan

Encyclopedia of Mathematics and its Applications 71, Cambridge University Press, 1998, Hardback 0-521-62321-9 , 560 pp.

The following is taken from the Cambridge University Press On-line catalog (http://www.cup.org/)

Special functions, which include the trigonometric functions, have been used for centuries. Their role in the solution of differential equations was exploited by Newton and Leibniz, and the subject of special functions has been in continuous development ever since. In just the past thirty years several new special functions and applications have been discovered. This treatise presents an overview of the area of special functions, focusing primarily on the hypergeometric functions and the associated hypergeometric series. It includes both important historical results and recent developments and shows how these arise from several areas of mathematics and mathematical physics. Particular emphasis is placed on formulas that can be used in computation. The book begins with a thorough treatment of the gamma and beta functions that are essential to understanding hypergeometric functions. Later chapters discuss Bessel functions, orthogonal polynomials and transformations, the Selberg integral and its applications, spherical harmonics, q-series, partitions, and Bailey chains. This clear, authoritative work will be a lasting reference for students and researchers in number theory, algebra, combinatorics, differential equations, applied mathematics, mathematical computing, and mathematical physics.

Contents:

Tom H. Koornwinder
(thk@wins.uva.nl)

2. Partitions
George E. Andrews

Cambridge Mathematical Library, 1998, Paperback 0-521-63766-X, 269 pp.

George Andrews' Book "Partitions" has been reprinted in a paperback edition by Cambridge University Press with the correction of some misprints.

This announcement is from http://www.cup.org/

This book develops the theory of partitions. Simply put, the partitions of a number are the ways of writing that number as sums of positive integers. For example, the five partitions of 4 are 4: 3+1, 2+2, 2+1+1, and 1+1+1+1. Surprisingly, such a simple matter requires some deep mathematics for its study. This book considers the many theoretical aspects of this subject, which have in turn recently found applications to statistical mechanics, computer science and other branches of mathematics. With minimal prerequisites, this book is suitable for students as well as researchers in combinatorics, analysis, and number theory.

Contents:

2. Infinite Series Generating Functions
3. Restricted Partitions and Permutations
4. Compositions and Simon Newcomb's Problem
5. The Hardy-Ramanujan-Rademacher Expansion of p(n)
6. The Asymptotics of Infinite Product Generating Functions
7. Identities of the Rogers-Ramanujan Type
8. A General Theory of Partition Identities
9. Sieve Methods Related to Partitions
10. Congruence Properties of Partition Functions
11. Higher-Dimensional Partitions
12. Vector or Multipartite Partitions
13. Partitions in Combinatorics
14. Computations for Partitions

Tom H. Koornwinder
(thk@wins.uva.nl)

Problems and Solutions

Thus far 20 problems have been submitted seven of which had been solved in previous issues (#**1**, **2**, **4**, **6**, **7**, **10**, **14**) Still unsolved are Problems #**3**, **5**, **8**, **9**, **11**, **12**, **13**, **15**, **17**, **18** and **19**. This time a new problem has been submitted.

19. Uniform Bounds for Shifted Jacobi Multiplier Sequences. For Fourier series the following is immediate: Suppose the real or complex sequence $\{m_k\}$ generates a bounded operator on $L^p(\mathbf{T})$, $1 \le p \le \infty$, i.e., for polynomial f

$$\Big\|\sum m_k \hat f_k e^{ik\varphi}\Big\|_{L^p(\mathbf{T})} \le \|m\|_{M^p(\mathbf{T})} \Big\|\sum \hat f_k e^{ik\varphi}\Big\|_{L^p(\mathbf{T})} ,$$

then one has for the shifted sequence $\{m_{k+j}\}_{k\in\mathbf{Z}}$ that

$$\sup_{j\in\mathbf{N}_0} \|\{m_{k+j}\}\|_{M^p(\mathbf{T})} \le C\,\|m\|_{M^p(\mathbf{T})}\,,\ 1 \le p \le \infty\,. \quad (1)$$

Looking at cosine expansions on $L^p(0,\pi)$ one easily derives the analog of (1) via the addition formula

$$\cos(k \pm j)\theta = \cos k\theta \cos j\theta \mp \sin k\theta \sin j\theta$$

provided the periodic Hilbert transform is bounded, i.e., for $1 < p < \infty$. More generally, by Muckenhoupt's transplantation theorem [2, Theorem 1.6],

$$\Big(\int_0^\pi \Big|\sum m_{k+j}\, a_k\, P_k^{(\alpha,\beta)}(\cos\theta)\Big|^p \sin^{2\alpha+1}\frac{\theta}{2}\cos^{2\beta+1}\frac{\theta}{2}\,d\theta\Big)^{1/p}$$

$$\equiv \Big(\int_0^\pi \Big|\sum m_{k+j}\, b_k\ \phi_k^{(\alpha,\beta)}(\cos\theta)\Big|^p w_{\alpha,\beta,p}(\theta)\,d\theta\Big)^{1/p}$$

$$\approx \Big(\int_0^\pi \Big|\sum m_{k+j}\, b_k\ \cos k\theta\Big|^p w_{\alpha,\beta,p}(\theta)\,d\theta\Big)^{1/p},$$

where $P_k^{(\alpha,\beta)}$ are the Jacobi polynomials, $\phi_k^{(\alpha,\beta)}(\cos\theta)$ are the orthonormalized Jacobi functions with respect to $d\theta$, and

$$w_{\alpha,\beta,p}(\theta) = \sin^{(2-p)(\alpha+1/2)}\frac{\theta}{2}\cos^{(2-p)(\beta+1/2)}\frac{\theta}{2}\,.$$

Therefore, the above argument for cosine expansions also applies to Jacobi expansions provided the periodic Hilbert transform is bounded with respect to the weight function $w_{\alpha,\beta,p}$; hence, the analog of (1) holds for Jacobi expansions when

$$\frac{2\alpha+2}{\alpha+3/2} < p < \frac{2\alpha+2}{\alpha+1/2}\,, \qquad \alpha \ge \beta \ge -\frac12\,.$$

(i) Can the above p-range be extended? By Muckenhoupt [2, (1.3)], a fixed shift is bounded for all p, $1 < p < \infty$.

(ii) Consider the corresponding problem for Laguerre expansions (for the appropriate setting see [1]); a fixed shift is easily seen to be bounded for all $p \ge 1$.

Both questions are of course trivial for $p = 2$ since $\ell^\infty = M^2$ by Parseval's formula.

References

[1] Gasper, G. and W. Trebels: On necessary multiplier conditions for Laguerre expansions, Canad. J. Math. 43 (1991), 1228 – 1242.

[2] Muckenhoupt, B.: Transplantation Theorems and Multiplier Theorems for Jacobi Series, Memoirs Amer. Math. Soc., Vol. 64, No. 356, Providence, R.I., 1986.

(Submitted on May 19, 1998)

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20. Question about Elliot's formula Generalization of Legendre's identity for complete elliptic integrals

Let E, K be the complete elliptic integrals. Then

$$K'E + KE' - KK' = \pi/2 \qquad (*)$$

This is the special case $p = r = -a+1/2$, $q = c+a-3/2$ in Elliott's identity (see Erdelyi e.a., Higher Transcendental Functions, Vol. 1, p. 85):

$$\begin{aligned} &F(p+\tfrac12,-r-\tfrac12,1+p+q;z)F(-p+\tfrac12,r+\tfrac12;1+q+r;1-z)\\ &+F(p+\tfrac12,-r+\tfrac12,1+p+q;z)F(-p-\tfrac12,r+\tfrac12;1+q+r;1-z)\\ &-F(p+\tfrac12,-r+\tfrac12,1+p+q;z)F(-p+\tfrac12,r+\tfrac12;1+q+r;1-z)\\ &=\frac{\Gamma(p+q+1)\Gamma(q+r+1)}{\Gamma(p+q+r+\frac32)\Gamma(q+\frac12)} \qquad (**)\end{aligned}$$

Question 1. Is there a counterpart of Legendre's identity (*) for incomplete elliptic integrals?

Question 2. The Elliott identity (**) provides a generalization of the identity (*) to hypergeometric functions. The only handbook where I have seen this identity is Bateman vol. I. Has Elliott's identity been used or mentioned elsewhere in papers/books?

Question 3. Are there generalizations of the Elliott identity (**) to the ${}_pF_q$ case or to other generalizations of hypergeometric functions?

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Miscellaneous

1. Student Travel Awards for 1999 Conferences

During 1999, SIAM will make a number of awards for $300 to support student travel to each of the following SIAM conferences:

1. Tenth Annual ACM-SIAM Symposium on Discrete Algorithms, January 17-19, Baltimore, MD
2. Ninth SIAM Conference on Parallel Processing for Scientific Computing, March 22-24, San Antonio, TX
3. Fifth SIAM Conference on Mathematical and Computational Issues in the Geosciences, March 24-27, San Antonio, TX
4. Sixth SIAM Conference on Optimization, May 10-12, Atlanta, GA
5. SIAM Annual Meeting, May 12-15, Atlanta, GA
6. Fifth SIAM Conference on Applications of Dynamical Systems, May 23-27, Snowbird, UT
7. Sixth SIAM Conference on Geometric Design, November 2-5, Albuquerque, NM

The awards are to be made from the SIAM Student Travel Fund, created in 1991 and maintained through book royalties donated by generous SIAM authors.

Any full-time student in good standing is eligible to receive an award plus gratis meeting registration. Top priority will be given to students presenting papers at the meeting, with second priority to students who are co-authors of papers to be presented at the meetings. Only students traveling more than 100 miles to the meetings are eligible for the awards.

An application for a travel award must include:

1. A letter from the student describing his/her academic standing and interests, his/her expected graduation date and degree, advisor's name, and, if available, a URL for a working Web page.
2. A one-page vita that includes the student's research interests, projects, and papers published.
3. A detailed letter from the student's faculty advisor indicating why the student is deserving of receiving a travel award and any special circumstances.
4. If applicable, the title(s) of the paper(s) to be presented (co-authored) by the student at the meeting.

Applications should be sent to the SIAM office (Attention: SIAM Student Travel Awards), 3600 University City Science Center, Philadelphia, PA 19104-2688. Students also may apply by e-mail to bogardo@siam.org or by fax to 215-386-7999.

Complete applications must be received at the SIAM office no later than TWO MONTHS before the first day of the meeting for which support is requested.

Winners will be notified FIVE WEEKS before the first day of the meeting. Checks for the awards will be given to the student awardees when they arrive at the given meeting and pick up their registration packet at the SIAM Registration Desk.

Allison Bogardo
(bogardo@siam.org)

2. ICIAM 99 Travel Grants

The Society for Industrial and Applied Mathematics (SIAM) is pleased to announce a travel grant program for the International Congress on Industrial and Applied Mathematics (ICIAM 99), to be held on July 5-9, 1999 in Edinburgh, Scotland (http://www.ma.hw.ac.uk/iciam99/). This travel support program is funded by a grant from the National Science Foundation (NSF).

The travel award will cover air transportation and lodging costs consistent with the rules and procedures of the NSF. Support of $1000 to $1400 will be awarded depending upon point of origin and need, and requires that a SIAM travel form be completed and mailed to SIAM with all applicable receipts.

Who May Apply: Mathematicians and computer scientists from United States institutions are eligible to apply for the travel grants.

How to Apply: An application form can be found on SIAM's web site (http://www.siam.org/iciam99/travel.htm). You can submit this form over the web. For junior faculty and postdocs, a letter of support from a senior faculty member is recommended, and for graduate students a letter from the student's advisor is required.

Applications can also be sent to:

ICIAM 99 Travel Grants
c/o SIAM
Society for Industrial and Applied Mathematics
3600 University City Science Center
Philadelphia, PA 19104
Telephone: 215-382-9800
Fax: 215-386-7999
E-mail: iciam99@siam.org
URL: www.siam.org

Deadline: February 15, 1999

Review of applications will begin on February 16, 1999. Applications received after February 15, 1999 will be placed on a waiting list for subsequent review and will be considered only

if support is still available.

Award Procedure: A committee of senior mathematicians and computational scientists will review the applications.

Selection will be based upon merit, in particular, research contributions in the areas emphasized by ICIAM 99. Junior faculty and postdocs who do not already have travel support and who are organizing a minisymposium or presenting a paper in a session at ICIAM 99 will be given preference. Selection of graduate students will be based on recommendations from faculty advisors, and preference will be given to students who are within one year of completing their theses.

Applications from women and under-represented minorities are encouraged.

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3. Dahlquist Prize

SIAM will present the Dahlquist Prize at the Fourth International Congress on Industrial and Applied Mathematics (ICIAM 99) in Edinburgh, Scotland, July 5-9, 1999. The award honors the contributions of Germund Dahlquist to numerical analysis and scientific computing.

Eligibility: The prize, established in 1995, is awarded to a young scientist (normally less than 45) for original contributions to fields associated with Germund Dahlquist, especially the numerical solution of differential equations and numerical methods for scientific computing.

Description of the Award: The award is to include a certificate containing the citation and a cash prize of $1,000 plus reasonable travel costs to ICIAM 99. The recipient is expected to present a talk at the conference and encouraged to submit a paper to an appropriate SIAM publication.

Nominations: A letter of nomination, including a description of the achievements, should be sent by January 15, 1999, to:

Dahlquist Prize Selection Committee
c/o Allison Bogardo
SIAM
3600 University City Science Center
Philadelphia, PA 19104-2688

Supporting letters, or names of knowledgeable persons from whom such letters might be solicited, are also welcome.

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4. The Ralph E. Kleinman Prize

SIAM will present the Ralph E. Kleinman Prize at the SIAM Annual Meeting in Atlanta, Georgia, May 12-15, 1999. The award honors the late Ralph E. Kleinman, a long-time SIAM member and UNIDEL Professor of Mathematical Sciences at the University of Delaware and director of the Center for the Mathematics of Waves.

Eligibility: The prize, established in 1998, is awarded to an individual for outstanding research or other contributions that bridge the gap between mathematics and applications. Work that uses high-level mathematics and/or invents new mathematical tools to solve applied problems from engineering, science, and technology is particularly appropriate. The prize may be awarded for a single notable achievement or for a collection of such achievements. Any member of the scientific community who meets the general criteria for the prize is eligible to receive the prize.

Description of the Award: The prize will consist of a certificate and a cash award of $5,000, plus reasonable travel expenses.

Nominations: A letter of nomination, including a curriculum vita and description of the achievement(s) should be sent by February 15, 1999, to:

Ralph E. Kleinman Prize Selection Committee
c/o Allison Bogardo
SIAM
3600 University City Science Center
Philadelphia, PA 19104-2688

Supporting letters, or names of knowledgeable persons from whom such letters might be solicited, are also welcome.

Selection Committee: Members of the selection committee are George Papanicolaou (Stanford University), Ivar Stakgold (University of Delaware), and Michael Vogelius, Chair (Rutgers University).

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How to Contribute to the Newsletter

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preferably by e-mail, and in LaTeX format. Other formats are also acceptable and can be submitted by e-mail, regular mail or fax.

Deadline for submissions to be included in the June issue 1999 is May 15, 1999.

Back issues of the Newsletter can be obtained from http://www.imn.htwk-leipzig.de/~koepf/siam.html .

The Activity Group also sponsors an electronic news net, called the **OP-SF Net**, which is transmitted periodically by SIAM. The Net provides a rather fast turnaround compared to the Newsletter. To *receive* transmissions, just send your name and e-mail address to poly-request@siam.org (as with other nets, nonmembers can also receive the transmissions). Your OP-SF Net *contributions* should be sent to poly@siam.org. Please note that submissions to OP-SF Net are automatically considered for publication in the Newsletter, and vice versa, unless the writer requests otherwise.

The Net is organized by Martin Muldoon (muldoon@yorku.ca). Back issues of OP-SF Net can be obtained by anonymous ftp from ftp.wins.uva.nl, in the directory

pub/mathematics/reports/Analysis/koornwinder/opsfnet.dir

or by WWW at the addresses

http://turing.wins.uva.nl/~thk/opsfnet/

http://www.math.ohio-state.edu/JAT

Martin Muldoon also manages our home page

http://www.math.yorku.ca/siamopsf/

on World Wide Web. Here you will find also a WWW version of the OP-SF Net. It currently covers the topics

- Conference Calendar
- Books, Conference Proceedings, etc.
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- Meeting Reports
- Projects
- Problems
- Personal, Obituaries, etc.
- History
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Activity Group: Addresses

The *SIAM Activity Group on Orthogonal Polynomials and Special Functions* consists of a broad set of mathematicians, both pure and applied. The Group also includes engineers and scientists, students as well as experts. We now have around 140 members scattered about in more than 20 countries. Whatever your specialty might be, we welcome your participation in this classical, and yet modern, topic. Our WWW home page http://www.math.yorku.ca/siamopsf/ is managed by Martin Muldoon (muldoon@yorku.ca).

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